



The First 40 Years of AIDS: Promising Programs, Limited Success

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Abstract

HIV-prevention program planning, implementation, and evaluation began in the United States shortly after reports of a mysterious, apparently acquired, immune deficiency syndrome appeared in summer 1981. In San Francisco, New York City, and elsewhere, members of LGBT communities responded by providing accurate information, giving support, and raising money. During the first decade of the AIDS pandemic (1981–1990), social and behavioral scientists contributed by designing theory-based and practical interventions, combining interventions into programs, and measuring impact on behavior change and HIV incidence. In the second decade (1991–2000), federal, state, and local agencies and organizations played a more prominent role in establishing policies and procedures, funding research and programs, and determining the direction of intervention efforts. In the third decade (2001–2010), biomedical interventions were prioritized over behavioral interventions and have dominated attempts in the fourth decade (2011–2020) to integrate biomedical, behavioral, and structural interventions into coherent, efficient, and cost-effective programs to end AIDS.

Keywords Behavior change · Impact · Intervention · Outcome · Risk Reduction

Resumen

La planificación, implementación y evaluación de programas de prevención del VIH comenzaron en los Estados Unidos poco después de que aparecieran informes de un misterioso síndrome de inmunodeficiencia aparentemente adquirida en el verano de 1981. En San Francisco, la ciudad de Nueva York y otros lugares, los miembros de las comunidades LGBT respondieron proporcionando información precisa, apoyo y recaudación de fondos. Durante la primera década de la pandemia del SIDA (1981–1990), los científicos sociales y del comportamiento contribuyeron diseñando intervenciones prácticas y basadas en la teoría, combinando intervenciones en programas y midiendo el impacto en el cambio de comportamiento y la incidencia del VIH. En la segunda década (1991–2000), las agencias y organizaciones federales, estatales y locales desempeñaron un papel más destacado en el establecimiento de políticas y procedimientos, la financiación de investigaciones y programas y la determinación de la dirección de los esfuerzos de intervención. En la tercera década (2001–2010), las intervenciones biomédicas se le dieron prioridad sobre las intervenciones conductuales y han dominado los intentos en la cuarta década (2011–2020) de integrar intervenciones biomédicas, bio conductuales y estructurales en programas coherentes, eficientes y económicos para acabar con el SIDA.

*History will recall, Reagan and Bush did nothing at all.
George Bush, you can't hide. We charge you with genocide.
Bringing the dead to your door. We won't take it anymore.
(Ashes Action chant of desperate and dying men and women; gay,
lesbian and straight supporters, and their loved ones, outside the
gates of the White House, District of Columbia, October 11, 1992)
Source: ACT UP Historical Archive ([https://actupny.org/divatv/
synopsis75.html](https://actupny.org/divatv/synopsis75.html)). Accessed 14 Oct 2021.*

Introduction

After AIDS was first detected in 1981 [1], public health authorities struggled to understand what occurred, why, and—most important—what to do to prevent new cases from occurring [2, 3]. When I joined the Centers for Disease

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Control and Prevention's (CDC) Task Force on Kaposi's Sarcoma and Opportunistic Infections for its inaugural meeting on June 18, 1981, my assignment was to help discover what was causing an unprecedented outbreak of bizarre opportunistic infections among people without underlying immune system disorders. Once we learned that cause, we could find ways to prevent the suffering and death AIDS inevitably brought with it in those early days.

Now as we look back on 40 years of those efforts, my aim is to review and assess some of the programs created over the past 40 years to prevent the spread of HIV in communities and bring the HIV/AIDS epidemic in the United States (US) under control. To protect public health, we rely on programs to bring about behavioral, social, and cultural change [4–6]. Programs consisting of one or more interventions have been designed, developed, and implemented with varying degrees of success in achieving their stated objectives [7, 8].

If we were to imagine our HIV-prevention efforts as a ship racing to aid individuals tossed unwittingly into a stormy sea, we would come to realize that our vessel has frequently been blown off course. By critiquing the four-decade history of bewildering shifts in program priorities, baffling decisions to act at times and not at other times, and disappointing outcomes of many interventions designed to interrupt HIV transmission, my goal in this Commentary is to provide insights that could improve the collaborative processes of planning, implementing, evaluating, and, ultimately, increasing the effectiveness of HIV-prevention programs.

Beginnings: 1981–1990

The AIDS pandemic likely began with the silent spread of an undetected pathogen in sub-Saharan Africa in the early years of the 20th century [9]. The infectious agent—labelled “lymphadenopathy-associated virus” (LAV) when it was discovered in 1983 [10] and designated “human immunodeficiency virus” (HIV) by the International Committee on Taxonomy of Viruses in 1986 [11]—arrived on the island of Hispaniola (which is divided into the nations of Haiti and the Dominican Republic) in the 1960s and spread from there to the North American continent [12, 13]. Early infections in New York City primarily occurred among men who engaged in anal intercourse with other men and people who injected drugs (PWID) [14]. As HIV began to destroy their immune systems, individuals who had contracted HIV began to develop a range of conditions associated with severe immune deficiency, including Kaposi's sarcoma (KS), *Pneumocystis pneumonia* (PCP), and other opportunistic infections (OIs) that would come to define AIDS. Effective

combination therapy would not arrive until 1996, and few of those infected before that time survived the devastating effects of HIV.

Recognition

Even before the “official” recognition of what would come to be known as AIDS, a growing number of people were already concerned. On May 18, 1981, Dr. Lawrence Mass, a health columnist for the *New York Native*, noted, “Last week there were rumors that an exotic new disease had hit the gay community in New York. From the New York City Department of Health, Dr. Steve Phillips explained that the rumors are for the most part unfounded” [15]. Three weeks later, on June 5, a report published in CDC's *Morbidity and Mortality Weekly Report (MMWR)* described 5 cases of PCP among young, previously healthy, homosexual men in Los Angeles [16]. This report would come to be seen as the “official” recognition of the beginning of the epidemic in the US.

On July 3, 1981, both the *MMWR* and the *New York Times* simultaneously published reports of KS outbreaks; 26 cases of KS in *MMWR* [17] and an article on page A-20 of the *New York Times*, “Rare Cancer Seen in 41 Homosexuals: Outbreak Occurs Among Men in New York and California” [18]. These reports heralded the recognition of AIDS as a problem of unknown magnitude and consequences. Although it was not taken as a serious threat to the public's health in summer 1981, the “exotic new disease” was real [19].

Response in New York

Although the first cases were reported in Los Angeles, New York would be the earliest epicenter of the AIDS epidemic—and the community response would take place very early in the process. On August 11, 1981, over 80 gay men met in playwright and author Larry Kramer's apartment to discuss the strange illnesses affecting their friends and lovers and to raise funds for research [20]. A few months later, on January 4, 1982, Kramer and 5 other men who attended the earlier meeting created the Gay Men's Health Crisis (GMHC), the first community-based service provider for gay men with AIDS in the US [21]. Over time, GMHC responded to the fears and anguish of members of the lesbian, gay, bisexual, and transgender (LGBT) community and their families by providing support, offering workshops, and teaching prevention practices and interpersonal negotiation skills [22].

HIV spread quickly in the absence of behavioral interventions. On the community side, two New York activists who were living with AIDS, Michael Callen and Richard Berkowitz, would attempt to address the behaviors that appeared to be driving the epidemic in their 1983 self-published book, *How to Have Sex in an Epidemic: One*

Approach [23]. But a cohort study of 378 men who have sex with men (MSM) would later show that 6.6% were infected with HIV in 1978–1979 and the cumulative prevalence of HIV infection continued to increase after 1981 in spite of self-reports of annual decreases in sexual activity [24]. The dearth of information about the agent causing AIDS, the lack of any significant government intervention or assistance to the populations hardest hit in the early days of the epidemic (MSM and PWID) by the city of New York, and the long latency period of HIV would contribute to staggering numbers of cases in the years to come.

Frustrated with the lack of progress in discovering a safe and effective treatment, vaccine, or cure for AIDS, Larry Kramer and other activists established the AIDS Coalition to Unleash Power (ACT UP) in 1987 to protest the slow pace of scientific research, engage in civil disobedience, and “get drugs into bodies” [25].

Response in San Francisco

Members of San Francisco’s LGBT community were among the first to respond to early rumors and subsequent reports of a previously unrecognized “gay-related immune deficiency” syndrome [26]. There were multiple community efforts to address the burgeoning epidemic. In June 1982, the Sisters of Perpetual Indulgence, a gay-rights activist group, prepared and distributed a sexually explicit booklet, *Play Fair!*, to draw attention to sexually transmitted infections (STIs) and demonstrate how to prevent acquiring them [27]. The Kaposi’s Sarcoma Research and Education Foundation (later the San Francisco AIDS Foundation) was formed in May 1982 [28], and joined other local health services organizations (like the Shanti Project—an organization formed in the early 1970s to support people with cancer) to provide helpful information, social services, and risk-reduction behavior-change programs under the umbrella of a collaborative community-mobilization project called “Stop AIDS San Francisco” [29].

By late 1983, community mobilization began to result in gradual reductions in high-risk sexual behavior [30] and in HIV incidence among gay and bisexual men [31, 32]. The *Stop AIDS* program in San Francisco was built on the belief that “the most effective communication campaigns make use of multiple communication channels” [33, p. 157] and on the premise that “community-based AIDS prevention campaigns are most effective in bringing about rapid, large-scale, behavior change” [33, p. 160]. The program maximized community mobilization to minimize HIV transmission.

“The centerpiece of the campaign was the effort to promote interpersonal communication about the epidemic, its impact, and meaning” [33, p. 162]. Mass-media messages, testing, and individual counseling were assigned secondary

roles. “In AIDS prevention, the task is to access informal peer networks among communities of individuals who are at high risk of infection” [33, p. 163]. “The *Stop AIDS* project used hundreds of volunteers to reach 25,000 men in face-to-face sidewalk conversations about AIDS prevention. Seven thousand attended evening-long, peer-facilitated, *Stop AIDS* meetings in homes throughout the city” [33, p. 162]. Reported risk behaviors declined, rates of STIs fell, and many sex clubs closed because of declining patronage.

Investigators at the University of California, Berkeley School of Public Health, and University of California, San Francisco (UCSF) School of Medicine, were involved in early biomedical and epidemiological research on AIDS prevention. When the UCSF Center for AIDS Prevention Studies (CAPS) was established in 1986, CAPS researchers began focusing on social, behavioral, and policy research [34]. CAPS behavioral scientists developed the AIDS Risk-Reduction Model, which posited 3 stages of behavior change: (1) labeling of high-risk behaviors as problematic, (2) making a commitment to reducing high-risk behaviors, and (3) seeking and enacting solutions directed at reducing high-risk activities [35]. In addition, the peer-led *Mpowerment* program subsequently developed by CAPS researchers successfully reduced high-risk sexual activities among young gay men on the West Coast. It consisted of multiple components: outreach, educational workshops with small groups, and a publicity campaign [36].

Response from the Centers for Disease Control and Prevention

In 1981, CDC, with its partners in state, municipal, and territorial health departments, (1) developed a case definition for AIDS and collected 159 case reports, (2) conducted a case-control study of homosexual and bisexual men (CDC AIDS Project 1) [37], and (3) carried out a series of other investigations to help identify the cause of the outbreak [38]. Based on findings from AIDS surveillance and observational epidemiologic studies, CDC, the Food and Drug Administration (FDA), and the National Institutes of Health (NIH) issued interagency guidelines for the prevention of AIDS in March 1983 [39]. Following the identification of LAV in May 1983 [10] and licensing of ELISA (enzyme-linked immunosorbent assay) and Western blot tests for HIV antibodies in 1985 [40], CDC began to support health education for risk-reduction (HE/RR) and counseling, testing, referral, and partner notification (CTRPN) programs in health department clinics and other sites [41].

Response from the US Public Health Service

The US Public Health Service’s (USPHS) plan to prevent and control AIDS was drafted in 1985 [42]. In that draft, the

USPHS proposed “programs to effect behavior changes for persons at risk” and to provide “up-to-date information on AIDS” with the clearly stated goal of eliminating transmission of HIV by the year 2000.

The following year, the USPHS plan was expanded [43] to include specifics on how that goal was to be achieved and it was refined once again in 1988 [44]. “A strategy to control and prevent AIDS should involve voluntary counseling and testing for persons at increased risk of [HIV] infection and imparting to infected patients those Public Health Service recommendations concerning personal behaviors that must be observed if spread of the virus is to be halted” [43, pp. 345–6].

Interventions sought to: (1) Raise awareness and educate Americans through “national information and education campaigns...targeted to individuals and groups whose behavior places them at high risk for AIDS.” (2) Assure that uninfected persons at increased risk “know how to protect themselves.” (3) Provide “culturally sensitive, meaningful information and education” to racial and ethnic minority populations. To assess impact, “[USPHS] should encourage and assist in the evaluation and comparison of all interventions for prevention and control of AIDS” [43, p. 346].

America Responds to AIDS

On October 22, 1986, US Surgeon General C. Everett Koop introduced his straightforward and nonjudgmental 20-page *Surgeon General’s Report on AIDS* [45]. The Reagan administration followed up in October 1987 by launching a multiphased mass media and social marketing campaign titled *America Responds to AIDS* (ARTA). And in May 1988, the federal government mailed an 8-page pamphlet, *Understanding AIDS*, to alert all Americans to the threat of AIDS and what could be done to prevent it (Fig. 1).

Woods et al. [46] described the development of ARTA as “one of the most comprehensive formative research processes in the history of public service campaigns.” They added, “Maximum input from all relevant constituencies is obtained to ensure that they support the campaign’s objectives and implementation strategy” [46, p. 616]. The overall objective of ARTA was to enlist the media as a partner in the effort to establish a clear national public health agenda on AIDS by reaching as many Americans as possible with disease-prevention information in a credible and acceptable way [47].

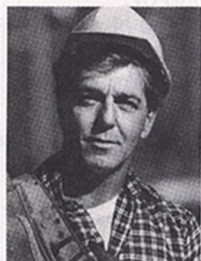
A model emerged from the planning process indicating that a combination of techniques, including utilizing the tools offered by the burgeoning field of “social marketing,” could result in maximum exposure in both news stories and public affairs programming. The initial results seemed positive. For the government’s investment of \$7.36 million, the

media aired public service announcements about ARTA a minimum of 59,113 times between October 1987 through January 1991 “at a commercial value of \$67.8 million” [46, p. 620].

The nature of the AIDS epidemic called for new strategies to educate the public—but CDC had never been involved in this type of public health campaigning before. In an informal evaluation of ARTA, Bev Schwartz pointed to 5 obstacles that hindered full impact of the ARTA social marketing campaign [48]: (1) Few officials understood the fundamentals of marketing, and few seemed interested in learning about them. (2) Few opportunities were afforded to target messages to specific audiences and build appropriate reach and frequency strategies into the media plan. (3) Dealing with government officials, institutional clearances, and individual approvals took an incredible amount of time “to plan, develop, implement, and evaluate a program” [48, p. 32]. (4) Communication principles and values often took a backseat to science, medicine, and the corporate culture of a federal agency. Her personal reflections also noted: “At CDC, science and epidemiology set the context in which everything evolves. Political climates and agendas need to be managed from the beginning to the end of the marketing process. We must explain strategic marketing principles and objectives as a coordinated, collaborative, and supportive venture” [48, pp. 33–34].

In addition to ARTA, CDC Director James Mason and colleagues [49] described a variety of educational programs that the agency was undertaking to provide support for behavior-change programs that decreased the risk of HIV transmission, including school health education to prevent the spread of HIV among adolescents and AIDS community demonstration projects. In an article assessing AIDS information and education campaigns, Harvard professor Harvey Fineberg [50] suggested that efforts were probably insufficient to achieve the objective of changing sexual behavior to the extent necessary to halt HIV transmission in the US. In February 1988, he wrote: “When social change occurs, the evolution of life-style and habit can unfold over a period of decades, or longer” and “our nation has yet to mount a coordinated, intensive, and comprehensive AIDS prevention program. In this sense,” he concluded, “education to prevent AIDS has not been given the full-scale test it deserves” [50, p. 596].

The Presidential Commission on the HIV Epidemic [51] offered an interim report in 1988 that called for a \$20-billion, 10-year effort to fight AIDS, and its final report included 20 major findings and recommendations, “which together comprise a comprehensive national strategy for managing the HIV epidemic.” They included recommendations for: (1) development and implementation of education programs, (2) immediate implementation of preventive measures, such as confidential partner notification, and (3) addressing ethical



Under- standing AIDS

What Do You Really Know About AIDS?

Are You At Risk?

AIDS And Sex

Why No One Has Gotten AIDS From Mosquitoes



OTIS R. BOWEN, M.D.,
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This brochure has been prepared by the Surgeon General and the Centers for Disease Control, U.S. Public Health Service. The Centers for Disease Control is the government agency responsible for the prevention and control of diseases, including AIDS, in the United States.

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Fig. 1 Understanding AIDS, the America Responds to AIDS brochure mailed to every residential address in the United States, 1988

issues raised by the HIV epidemic. One of the 13 Commission members noted, “We underscored the need to select carefully the blend of education, service, volunteerism, and official action that would take each jurisdiction farthest. One of the enduring lessons of public health is that solutions must be tailored to circumstances, and that local ‘ownership’ of both problem and solution are essential to long-term success” [52].

On April 28, 1988, by a vote of 87 to 4, the US Senate passed the AIDS Research and Information Act, a first step toward establishing an overall federal AIDS policy [21]. For fiscal 1988, the bill authorized almost \$700 million in research and education funds to be channeled through CDC and NIH. Two amendments were added, however. One from Senator Jesse Helms prohibited the use of federal AIDS education funds for activities that “promote or encourage, directly, homosexual sexual activity.” Another from Senator Edward Kennedy required AIDS education programs to “stress the public health benefits of abstinence and a single monogamous relationship and the avoidance of illegal intravenous drug use.” These restrictions severely limited the effectiveness of HIV-prevention programs funded by the US government and supported by CDC. *MMWR* editors concluded their review of “The HIV/AIDS Epidemic: The First 10 Years” with two prophetic sentences: “AIDS will remain a major public health challenge worldwide in the twenty-first century. Education of all persons about AIDS to prevent transmission of HIV infection is critical to controlling this problem” [53] (Fig. 2).

Assessments, Achievements, and Alterations: 1991–2000

The first decade of AIDS was marked by transitions from ignorance to awareness, from denial to confrontation, and from stunned inertia to collective action. Social and behavioral scientists, activists, and armies of volunteers contributed to community mobilization efforts and helped to forge programs aimed at beneficial behavioral and social change. Change was apparent as viable programs were assessed, altered, and adapted in the second decade of the AIDS pandemic.

Popular Opinion Leaders

Smaller cities could not generate the kinds of collective efforts witnessed in major metropolitan areas of the Northeast and on the West Coast. An alternative was to recruit well-known community members and have them endorse risk-reduction behaviors to influence the sexual risk practices of others in their social networks [54–56]. In an intervention city in the southern US, the proportion of men who

engaged in unprotected anal intercourse over a 2-month period decreased 25% (from 36.9 to 27.5%), with a 30% reduction (from 27.1 to 19.0%) for unprotected receptive anal intercourse, a 16% increase in condom use during anal intercourse, and an 18% decrease in the proportion of survey respondents reporting multiple sexual partners. Population-level changes in risk behavior observed in this series of studies were attributed to natural styles of communication—conversations among members of peer networks about curtailing their risks and changing community norms. Little or no change was observed among men in two comparison cities over the same 2 months [54].

Follow-up studies showed that the “popular opinion leader” model consistently produced reductions of 15 to 29% from baseline levels for unprotected anal intercourse, with similar patterns replicated in all 3 cities [55]. Statistically significant reductions in the mean frequency of unprotected anal intercourse during the previous months (baseline 1.68 occasions; follow-up 0.59, $p=0.04$) and an increase in the mean percentage of occasions of anal intercourse protected by condoms (baseline 44.7%; follow-up 66.8%, $p=0.02$) were reported. Increased numbers of condoms taken from dispensers in intervention-city bars corroborated risk-behavior self-reports.

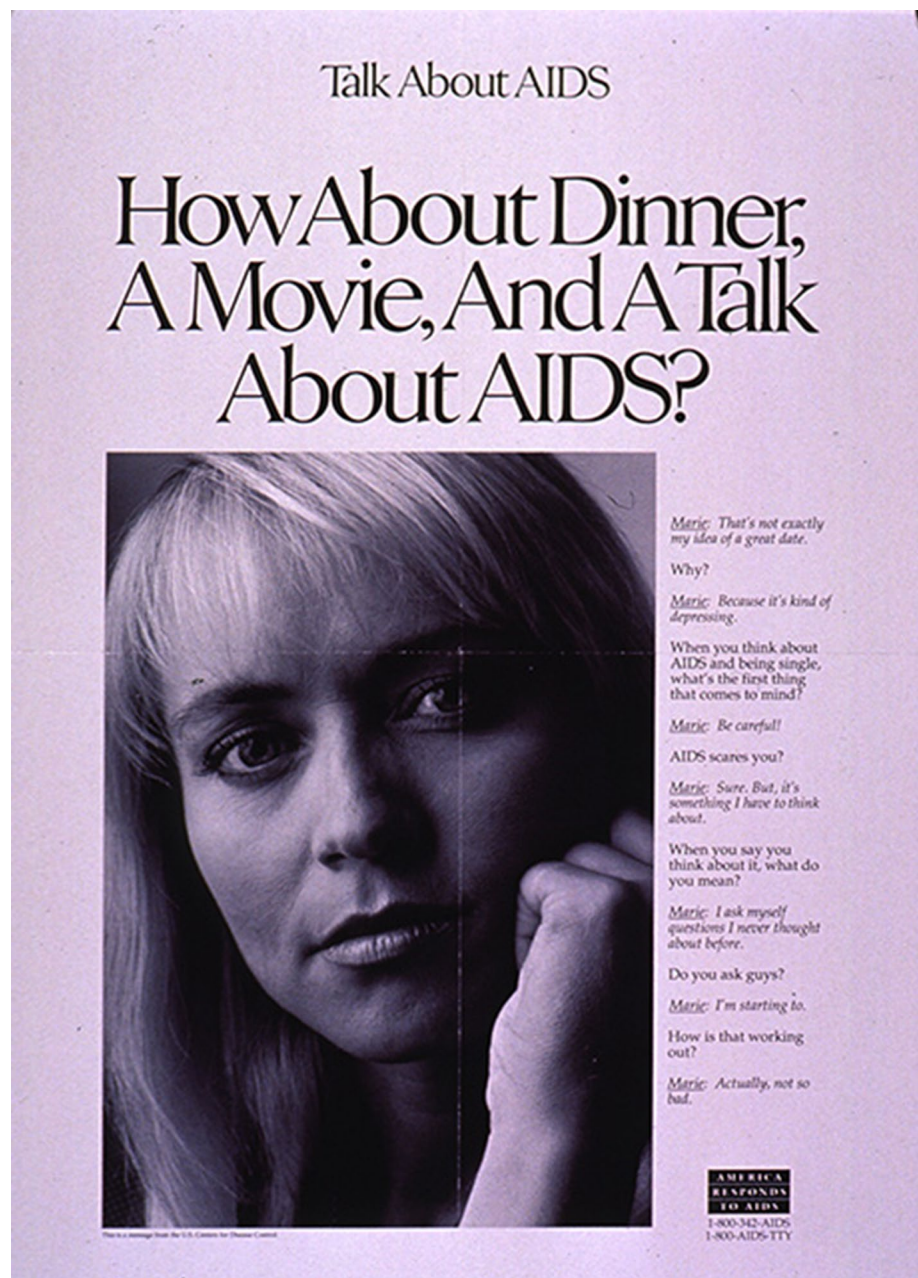
Harm Reduction

The concept of “harm reduction” evolved in the early 1980s in response to increasing hepatitis B virus (HBV) infections among PWID in the Netherlands [57]. The idea was to minimize harm to individual PWID, not abolish substance use. Trusting people to make better choices by providing accurate risk information was central to the approach. Treating “marginalized” and “unpopular” people with dignity turned out to be a viable intervention that could empower change [58]. Evidence of less harm was taken as a measure of success [59]. It led to the creation of one of the best available strategies for reducing the spread of HBV—and later HIV—among PWID: syringe services programs (SSPs), which included syringe exchange.

In addition to offering safe injection equipment, SSPs connected PWID with health care providers who could offer HIV testing, counseling, and treatment. They also reached out to people with addictions and encouraged them to enter and continue treatment for substance use disorders. Humane treatment spurred self-care. Self-care displaced self-destruction. Syringe exchange, as part of a comprehensive prevention program, minimized the risks of HIV, HBV, and hepatitis C virus infections and the spread of these and other blood-borne diseases to others in many places [60].

Evaluating comprehensive harm-reduction programs was difficult because of variations in the component interventions, implementation, and interaction effects [61].

Fig. 2 America Responds to AIDS prepared and distributed public service announcements, posters, and other educational materials to encourage young women and other key populations to *Talk About AIDS*



Nevertheless, sterile syringe and medically assisted treatment programs led to reductions in heroin use and HIV incidence [62]. In New York City, PWID began contracting HIV during the mid-1970s and the virus spread rapidly between 1979 and 1983 [14]. From 1984 through 1987, the HIV seroprevalence rate stabilized between 55 and 60% due to “increasing conscious risk reduction” [14]. The use of potentially contaminated syringes declined from 51 to 7% of injections after PWID were able to access unsanctioned syringe exchanges [63]. The subsequent authorization of SSPs was critical in the reduction in HIV infections, but community outreach to educate PWID and motivate them to practice safer injection and safer sex also contributed to

overall success. Harm-reduction programs were effective in interrupting HIV transmission, especially when they treated PWID with dignity and respect, provided convenient locations and hours of operation, and minimized bureaucratic hassle [64].

AIDS Community Demonstration Projects

The AIDS Community Demonstration Projects (ACDP) were community-level intervention trials funded by CDC to increase behaviors designed to prevent HIV transmission [65]. Originally established in 1986 to examine the effects of voluntary HIV counseling and testing in clinics and

storefronts, ACDP adopted a multisite protocol in October 1989. It required formative ethnographic research, a theoretically driven program plan with multiple interventions, and cross-sectional assessments within five intervention and five control communities before, during, and after exposure to role-model stories and other face-to-face interventions delivered by peer volunteers to PWID and their sex partners, sex workers, and other high-risk, hard-to-reach, populations [66].

Over a 3-year period, movement toward consistent condom use during vaginal intercourse with “main (spouse or steady)” and “nonmain (casual, one-time, paying)” partners was greater in intervention than in comparison communities. The percentage of individuals in intervention communities who reported consistent condom use with their main partners increased from 8.5% at baseline to 17.0%. The percentage using condoms with nonmain partners increased from 25 to 33%. Respondents recently exposed to the intervention were more likely to carry condoms and to have higher “stage-of-change” scores for consistent condom use during vaginal sex and use of bleach to decontaminate injection equipment [67].

The final report from CDC concluded that:

No single intervention can be 100% effective. The challenge now faced by HIV-prevention researchers and practitioners is to refine and integrate intervention efforts to optimize behavior change. Coordinating community-level interventions in a comprehensive HIV-prevention plan with other, more intensive approaches, such as HIV counseling and testing and group interventions for skill building, may yield greater behavior change. Unless society is willing to address the basic issues that sustain the HIV epidemic, most HIV-prevention programs will achieve only limited success [67, p. 343].

Comprehensive Programs and Mathematical Models

The inability of biomedical scientists to develop a vaccine and discover a cure for AIDS in the 1980s—and beyond—was preceded by considerable success controlling gonorrhea in the 1970s. Some members of the USPHS who were involved in syphilis eradication efforts in the 1960s and gonorrhea control efforts in the 1970s learned from their experiences and applied the lessons they learned to HIV-prevention efforts.

In 1972, CDC’s Venereal Disease Control Division (VDCD) became concerned about rising rates of gonorrhea among teenagers and young adults and reports of penicillinase-producing *Neisseria gonorrhoeae* among servicemen returning to the US from Asia [68]. VDCD launched a National Gonorrhea Control Program (NGCP)

consisting of educational communications and enhanced surveillance, screening, and contact tracing. It led to decreases of 74% in reported gonorrhea rates in the US between 1976 and 1996 [69]. Decreases and subsequent stabilization of gonorrhea rates most likely resulted from changes in behavior; particularly, increases in condom use in response to information about AIDS that was forthcoming in the mid- to late-1980s.

As part of NGCP, pilot operational research projects were established to investigate STIs in Colorado and Ohio [70]. The El Paso County Health Department in Colorado Springs was interested in evaluating classical “venereal disease” testing, patient interviewing, and contact-tracing strategies [71–74] to find and treat cases of gonorrhea in the community and at a near-by military base.

A medical epidemiologist familiar with “the ring strategy” [75] of targeted vaccinations that helped conquer smallpox [76] and other behavioral interventions for interrupting disease transmission [77] served as a liaison and assisted. The research team was well-suited and eager to test implications of a gonorrhea-transmission core-group model [78] in the 1970s and a model of HIV-transmission dynamics when it was proposed in the 1980s [79, 80].

Support for a cross-sectional study of HIV infections in sex workers in 1985–87 (CDC AIDS Project 72) was continued with a cooperative agreement to conduct a prospective study of sociosexual networks of HIV transmission in Colorado Springs in 1988–90 (CDC AIDS Project 90) [81, 82]. The aim was to stop community transmission by: (1) focusing education efforts on high-risk groups, (2) providing continuous outreach in high-risk settings, (3) promoting condom use and safer-sex practices, (4) counseling individuals in civilian and military clinics and local test sites, and (5) conducting assiduous contact tracing, enhanced by ethnographic observations and network analysis [83]. Interviews with 595 Project 90 participants yielded information about the sociosexual relationships of 8759 individuals connected by 31,147 links and the identification of a gigantic component of 7151 people who shared injection equipment or had sexual contact with another.

The prospective study provided insights into network structures of human relationships and how HIV is transmitted in a community [84, 85]. Leadership by an erudite county health officer and collaboration among an experienced interdisciplinary team that included epidemiologists, social scientists, clinicians, and laboratory technicians produced a comprehensive program of HIV case finding, disease management, and infection control that responded judiciously to the public health needs of the local population [83]. In Colorado Springs, a program of “low tech” interventions designed, administered, and carried out by an enthusiastic, tenacious, well-trained, and experienced team of committed public health workers demonstrated reductions

of HIV and other STI transmissions in an American community. Despite these results, CDC largely ignored the Colorado Springs study to go in a very different direction after the inauguration of President William Clinton in January 1993.

Community Planning for HIV Prevention

In December 1993, CDC mandated that all 65 health department grantees receiving cooperative agreements for HIV-prevention services (50 states, 8 US territories, 6 major metropolitan areas, and the District of Columbia) involve affected communities and relevant scientific experts in a shared program planning process [86]. The planning process was to follow 7 “necessary steps,” recognize 9 “essential components,” and observe “13 principles,” including prioritizing program activities based on “behavioral theory, population needs, intervention effectiveness and cost-effectiveness, and local values and norms.” The 13 principles were drawn from CDC’s “Planned Approach to Community Health,” a planning model “designed to strengthen state and local health departments’ capacities to plan, implement, and evaluate community-based health promotion activities” [87].

Community planning involved thousands of people with diverse backgrounds, interests, and abilities [88]. The approach was established to provide evidence-based and culturally competent programming consistent with community-identified and validated needs, priorities, and values. It sought to maximize participation, inclusion, and representation. Implementation, however, was far from ideal, because community planning groups often lacked the knowledge and skills required to assess and interpret available data, and the resources and competency required to gather additional data needed to make informed decisions about interrupting disease transmission in their communities. Critics of the program-planning process cited Tversky and Kahneman [89] and concluded, “The absence of relevant data can create conditions where personal biases and inappropriate shortcuts can easily occur and adversely affect the quality of decision making” [90].

Many members of community planning groups were good-hearted souls determined to help, but they were not well-qualified or suited to take on the difficult and complex tasks they were asked to do. Evaluations of the first 5 years of community planning showed a smaller percentage of federal dollars allocated to counseling and testing activities and a higher percentage spent on health-education programs targeted at reducing risk of HIV infection [91], but this would soon change. Community planning was doomed to fail because it put “community” ahead of—or at least on a level playing-field with—more powerful players in “the AIDS industry” [92]. As results of randomized control trials (RCTs) of highly active anti-retroviral therapy (HAART)

were reported, mortal blows were dealt to community HIV prevention efforts. With evidence that combination antiretroviral therapy (ART) could offset the lethal consequences of HIV infection [93] and, if sustained, could render infected patients noninfectious [94], attention turned to biomedical interventions (especially serologic screening) to find individuals with HIV, and a continuum of HIV care to treat them.

Proven efficacy of ART meant HIV infection was to become more like a chronic disease [93]. Patients would live longer, could resume sexual activities, and, perhaps, become infected and re-infected with a host of STIs [95].

From Mobilization to Medicalization: 2001–2010

The second decade of AIDS ushered in the discovery of life-saving antiviral treatment, leading to increased control over HIV-prevention programs by governmental agencies and the decline of influence by behavioral scientists and community activists. Emphasis on using biomedical tools in an expanding toolbox meant that the alphabet soup of abstinence, being faithful, or using a condom for HIV prevention (otherwise known as “ABC”) [96] would be replaced by stronger tonics: chemoprophylaxis and treatment as prevention. The third decade saw the continued dissipation of social and behavioral interventions as physicians promoted the uptake of pills for lifetime treatment of HIV infections, pre-exposure prophylaxis, and post-exposure prophylaxis.

Community Mobilization to Eliminate Disparities in HIV Disease

In 1999, CDC considered HIV to be 1 of 6 chronic diseases affecting racial and ethnic minority populations in the US that required significant attention. The Racial and Ethnic Approaches to Community Health (REACH 2010) program sought to eliminate racial and ethnic disparities in health, a major goal of Healthy People 2010 [97]. The Broward County (Florida) Coalition to Eliminate Disparities in HIV Disease was one of 42 grantees CDC funded to conduct a formative evaluation and develop a community action plan (CAP) in Phase I (1999–2000) and to implement and evaluate the CAP in Phase II (2000–2004). The Broward Coalition consisted of 3 community-based organizations (CBOs), local health department representatives, and public health professionals affiliated with a Hispanic-serving academic institution that served as the central coordinating organization (CCO).

The Broward Coalition adopted the PRECEDE-PROCEED model for community planning and health promotion [98], conducted an extensive needs assessment, and agreed to support 4 interventions to complement ongoing

HIV-prevention activities in the county [99]. The Coalition chose horizontal outreach to residents, vertical outreach to stakeholders and gatekeepers, strategic communications, and CBO capacity building and infrastructure development to promote behavioral and social change. CDC officials approved the CAP and awarded a cooperative agreement to the CCO to implement and evaluate the program over the next 4 years “subject to the availability of funds” (Fig. 3).

During Phase II, increases in awareness, testing, and actions to address AIDS in minority communities were

noted in a series of cross-sectional surveys with residents [100]. HIV-incidence rates among the Black population decreased by 60.5%. By the end of the study, HIV incidence rates among Hispanics were the same as among the predominantly White population. Reductions in reported HIV diagnoses were greater among Black residents living in the south Florida media market than in other metropolitan areas of the state. Community mobilization appeared to be a promising strategy for eliminating disparities in HIV disease, but no funds to continue REACH 2010 in south Florida were forthcoming after the demonstration project ended. In fact, the project was severely hampered

Fig. 3 Racial and Ethnic Approaches to Community Health (REACH 2010), Broward County, Florida, 2001–2005: *Stay HIV Free*—Spoken-word messages from poets residing in priority communities



in reaching its goal because CDC cut its annual allocation in half during Year 4 “due to a shortage of funds.”

The CDC Synthesis Project: A Portfolio of Options for a Concentrated Epidemic

The CDC HIV Prevention Research Synthesis (PRS) Project was created in 1996 to identify evidence-based interventions (EBIs) for planning groups and providers to choose and implement those most appropriate for their local programs [101]. PRS relied on meta-analyses of systematic intervention trials to show that behavioral interventions substantially reduced sexual risk among young adults, MSM, heterosexual men and women, and PWID [102]. By 2006, 50 behavioral interventions for high-risk populations met stringent criteria for scientific rigor and efficacy [103]. They were described in a *Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention* that was first published in 1999 [104]. To facilitate adoption, a dozen efficacious interventions were packaged for use by local programs and training on how to adapt them “with fidelity” was offered through a Diffusion of Effective Behavioral Interventions (DEBI) project launched in March 2002 [105].

With Republican George W. Bush in the White House and Dr. Julie Gerberding serving as Director of CDC, the agency withdrew its support for “homegrown” interventions and required 38 of 50 state health department grantees, 6 cities, Washington, DC, and Puerto Rico to implement interventions CDC had decided could qualify as “evidence-based” [106]. From October 2002 to April 2005, DEBI staff trained 4549 participants from 2001 agencies to use at least one of the 12 packaged interventions in 68 cities throughout 35 states, Puerto Rico, and the Virgin Islands [103]. Critics objected to having the EBIs shoved down their throats through a top-down mode of dissemination that failed to embrace and bolster community concerns and contributions and ignored contextual and critical methodological considerations [107]. Broward Coalition members were furious when their new CDC project officer told them that they would be ineligible for renewed funding because they “had not implemented high-impact interventions.” CDC was proud of its massive effort to disseminate efficacious “off-the-shelf” interventions [108–110], but some of their “community partners” were left feeling disrespected, dismayed, and distraught.

The Serostatus Approach, Advancing HIV Prevention, and HIV Prevention for Positives

The Serostatus Approach to Fighting the Epidemic (SAFE) was created by CDC in response to increases in HIV incidence, a growing population of people living with HIV and AIDS (PLWHA), and the availability of a rapid HIV test

(OraQuick®) [111]. SAFE prioritized those living with HIV and those who were HIV-negative but at high behavioral risk. Objectives were to increase: (1) the number of persons with HIV aware of their serostatus, (2) the use of health care and preventive services, (3) high-quality care and treatment, (4) adherence to HIV therapy, and (5) the number of people with HIV who adopted and sustained safer sexual behaviors.

“Advancing HIV Prevention: New Strategies for a Changing Epidemic” supported SAFE [112]. It advocated the use of four “proven public health approaches” (routine screening, identification of new cases, partner notification, and increased availability of treatment and prevention services) and four priority strategies (making HIV testing a routine part of medical care, diagnosing HIV infections outside medical settings, working with persons diagnosed with HIV and their partners, and further decreasing perinatal HIV transmission). In addition to continuing to support other prevention activities, the new CDC initiative incorporated evaluation in demonstration projects, created national HIV incidence and behavioral surveillance systems, and established new performance indicators for state and local health departments and CBOs. In a major shift in emphasis, CDC announced that it was *requiring* health departments to make PLWHAs *the highest priority* for prevention services.

With ART, HIV became a chronic disease requiring life-long care [93]. In this brave new world of HIV and STI prevention, physicians were called upon to use active listening techniques and talk *with* (rather than *at*) their patients [113]. A “Best Practices Guide” developed in 2009 in San Francisco clearly stated that prevention for HIV-positive persons was to be achieved “through HIV education and skills-building interventions, counseling and emotional support, disclosure support, and testing and services for partners of HIV-positive persons” [93]. Behavioral scientists warned that transitioning efforts away from those at risk in a community to those aware of infection should not overlook the principles of positive HIV prevention, relational, and emotional dynamics [114]. Furthermore, screening through a “serologic dragnet” to detect and surveil the more than 250,000 undiagnosed cases in the US must not be done at the expense of proper medical care and respect for human rights [115].

Belittling Behavioral Interventions

Reviews of behavioral interventions implemented and evaluated from 1985 to 2005 to reduce the risks of HIV infection led some critics to conclude that behavioral interventions were limited with respect to the magnitude of behavior change, ineffective with respect to decreasing HIV incidence, and too costly when compared with more efficacious biomedical and less-expensive structural alternatives [116]. As the standard for “effectiveness” was changed to reflect a

focus on the biomedical approach, the utility of one-on-one counseling sessions conducted in conjunction with standard and rapid HIV testing came under considerable scrutiny [117]. The counseling model advocated by CDC since 1993 was “client centered” and emphasized interactive communication rather than simply telling a patient what to do [41].

Project RESPECT was a CDC-sponsored RCT conducted between July 1993 and September 1996 at STI clinics in Baltimore, Denver, Newark, Long Beach, and San Francisco. The trial enrolled 5,758 heterosexual, HIV-negative patients to evaluate the efficacy of 2-session and 4-session interactive counseling [118]. Compared with a control condition (didactic teaching), brief interactive counseling resulted in a 30% reduction in incident STIs at 6 months and a 20% reduction at 12 months. Results warranted inclusion of Project RESPECT in the first edition of the *Compendium of HIV Prevention Interventions with Evidence of Effectiveness* [104]. “Booster counseling” was offered as an EBI from 2006 until 2014, when it was “archived” as a result of follow-up studies reporting less-convincing results [119–121].

EXPLORE evaluated “intensive” 10-session, behavior-modification counseling with 4,295 HIV-negative MSM [122]. After 48 months of observation, EXPLORE resulted in a 18.2% (95% CI – 4.7–36.0%) lower rate of HIV acquisition in those exposed to the intervention compared with standard counseling. Adjustment for baseline covariates attenuated the effect to 15.7% (95% CI – 8.4–34.4%). Investigators argued that intensive counseling for MSM was “plausibly efficacious” and showed that acquired HIV infections were often associated with the use of alcohol or drugs before sex, overall use of amphetamines and heavy alcohol, and unprotected receptive anal intercourse with multiple sexual partners of unknown or presumably HIV-negative serostatus [123]. An analysis of 127 articles that cited results of the EXPLORE study more often judged extensive counseling ineffective (80%) than effective (20%), adversely influencing adoption of a “highly effective” way of reducing HIV incidence among MSM [124]. With evidence of a >35% reduction in HIV incidence 12 to 18 months after extensive counseling [125], EXPLORE did not qualify as an EBI. It was never included in CDC’s updated compendia.

In 2006, CDC reviewed the history of biomedical and behavioral interventions and declared that HIV-prevention programs must evolve to address new challenges [126]. This meant that programs must incorporate biomedical advances in preexposure and postexposure prophylaxis, microbicides, male circumcision, vaccine development, and effects of antiretroviral treatment on infectivity. In addition, programs were to include innovations in HIV-testing technologies and other biomedical breakthroughs.

“Restoring Public Health Principles and Traditions” and PEPFAR

In 2005, Thomas Frieden, then Commissioner of the New York City Health Department, and colleagues [127] argued that the failure to apply standard disease-control methods undermined society’s ability and responsibility to control the HIV epidemic. Now was the time “to adopt traditional disease-control principles and proven interventions that can identify infected persons, interrupt transmission, ensure treatment and case management, and monitor infection and control efforts throughout the population,” they contended [127, p. 2397]. Core interventions for the control of communicable disease are prompt diagnosis, systematic partner notification and follow-up, and accountability for treatment of all patients. “Until we implement prevention programs with proven efficacy more widely, make voluntary screening and linkage to care a normal part of medical care and expand screening in community settings, and improve treatment, risk reduction, monitoring, and partner notification, we will continue to miss opportunities to reduce the spread of HIV infection” [127, p. 2400].

In 2015, Frieden (now Director of CDC) and colleagues [128] presented a progress report and argued: “We must improve immediate reporting, rapid investigation, follow-up, and service to affected persons and communities; use molecular epidemiology to identify chains of transmission that can be interrupted by ART; and screen all adults and adolescents for HIV infection at least once, whether or not clinicians perceive that a patient is at risk, and repeat screening at least annually for people at high risk” [128, p. 2283]. Dr. Frieden and his colleagues had little to say about the role of behavioral and structural interventions in HIV prevention in this or the earlier article about public health principles and traditions.

In 2003, President George W. Bush revealed his administration’s President’s Emergency Plan for AIDS Relief (PEPFAR) and Congress authorized an \$18 billion initiative to address HIV and AIDS abroad [129]. It was the largest commitment by any nation for a single disease [130]. In 2008, Congress reauthorized and expanded PEPFAR funding to \$48 billion [131]. PEPFAR offered resources through bilateral agreements to countries that promised to promote abstinence while domestic HIV-prevention programs were deprived of a much-needed financial boost to fully implement approved activities. AIDS relief overseas looked to some like a diminution of dollars in the US and a curtailment of interest and support for domestic programs. The “thousand points of light” seen by his father, President G. H. W. Bush, faded, and for some—like the Broward Coalition to Eliminate Disparities in HIV Disease—were extinguished for lack of oxygen in the administration of the son, President G. W. Bush.

Mainstreaming AIDS: 2011–2021

In March 2010, during the administration of Barack Obama (2009–2017), Congress passed the Patient Care and Affordable Care Act (ACA); it was fully implemented in 2014. The ACA expanded the availability of health insurance, provided more Americans with access to health care, and offered opportunities for improving services to persons living with HIV [132]. It was followed by a National HIV/AIDS Strategy (NHAS), an HIV-care continuum, and aspirations to end AIDS.

A National Strategy, A Continuum of Care, and The End of AIDS

The NHAS released by the Obama Administration in July 2010 [133] maintained that “implementation of combination high-impact, HIV-prevention strategies,” “data-driven decision making,” “integration and consolidation of the continuum of HIV care,” and “the reorganization of relationships among public health agencies, researchers, community-based organizations, and HIV advocates” could be used to reduce racial and ethnic health disparities, but the effort would “require multidisciplinary teams...to successfully engage groups at highest risk of HIV and those already infected with HIV” [134, p. 237]. Overall, HIV incidence was to be dramatically reduced through “combination prevention,” defined as “the integration of behavioral, biomedical, and structural HIV intervention strategies” and akin in potential to combination antiretroviral therapy [135].

In 2011, the White House Office of National AIDS Policy presented an HIV-care continuum to portray the estimated number of PLWHA receiving the full benefits of the medical care and treatment they needed [136]. The continuum modeled HIV care through 5 distinct and dynamic stages consisting of: (1) diagnosis, (2) linkage to care, (3) retention in care, (4) adherence to antiretroviral therapy, and (5) viral suppression. Data showed the proportion of PLWHA decreased at each successive step of the treatment cascade, beginning with an estimated 86% who were diagnosed and dropping dramatically to approximately 30% of PLWHA who were virally suppressed [137]. Interventions were required to improve treatment outcomes [138].

Both the Obama [139] and Trump administrations expressed bold aspirations to exceed goals of 90–90–90 (90% of all people living with HIV will know their HIV status, 90% of those diagnosed will be on antiretroviral therapy, and 90% of those on therapy will achieve viral suppression) [140] and end AIDS [141] by 2030. In 2019, President Donald J. Trump announced his administration’s goal to reduce HIV incidence in the US by 75% within 5 years and 90%

within 10 years [142]. The Trump initiative to end AIDS rested on 4 sturdy pillars: (1) diagnose all individuals with HIV as early as possible after infection, (2) treat HIV infection rapidly and effectively to achieve sustained viral suppression, (3) prevent at-risk individuals from acquiring HIV infection (by expanding the use PrEP), and (4) rapidly detect and respond to emerging clusters of HIV infection to further reduce new transmissions.

Test and Treat

Mathematical models suggested that the effective use of antiretroviral therapy could control the spread of HIV if all five steps in the HIV-care continuum were to be achieved [143]. A study by the HIV Prevention Trials Network (HPTN 065) conducted between September 2010 and December 2014 in the Bronx borough of New York City and in Washington, DC, was designed to determine the feasibility of the “test and treat” strategy in the US [144]. Chicago, Houston, Miami, and Philadelphia were chosen as “nonintervention comparison sites” in the 3-year “Test, Link-to-Care, plus Treatment” (TLC-Plus) study [145].

Compared with the 3 years before (2008–2010), diagnoses of new HIV infections annually reported to CDC declined by 13.3% in New York City and by 20.2% in Washington, DC, during the 3 years that TLC-Plus interventions were implemented (2011–2013), and by 14.8% in New York and by 20.0% in DC in the 3 years after (2014–2016). Diagnoses of new HIV infections in the nonintervention comparison sites fell by 13.5% during and by 9.2% after TLC-Plus, compared with 15.5% and 16.3% for the two intervention cities combined. Six other high HIV-prevalence urban areas saw new HIV diagnoses fall by 5.7% during and by 0.5% after these same 3-year periods (Table 1).

New York City [146] and Washington, DC, [147] were having difficulty controlling the spread of HIV before NIH stepped in and generously supported efforts to find people living with HIV, link them to care, and treat them with ART [148]. Stepped-up screening [149] and related activities were associated with reported declines in new HIV infections in the Bronx and DC, but declines were also noted in nonintervention comparison sites and, to a lesser extent, other “hot spots.” Effects attributable to the influx of funds and expertise for TLC-Plus were difficult to disentangle from effects attributable to other efforts simultaneously employed to reduce HIV incidence in selected areas of the US [150, 151].

Enhanced Comprehensive HIV Prevention Programs

In collaboration with NIH and others, CDC introduced the Enhanced Comprehensive HIV Prevention Planning (ECHPP) Project to better target resources, meet NHAS goals, and increase local impact [152]. From September

Table 1 Diagnoses and estimated rates of HIV infection reported to the Centers for Disease Control and Prevention from 12 Metropolitan Statistical Areas in the United States: 2008–2017*

City/MSA	2008	2009	2010	Before ECHPP 2011	2012	2013	2014	2015	2016	After ECHPP 2017
Atlanta	1678	1333	1184	4195	1271	1361	1214	1095	1472	1701
Rate	47.0	37.7	30.0	30.3	47.3	34.7	34.7	25.9	25.8	29.4
Baltimore	1354	700	819	2873	650	687	650	549	618	531
Rate	-	-	-	33.8	33.3	36.5	36.5	24.3	22.1	19.0
Chicago	1620	1391	1091	4102	1360	1393	1387	1190	1221	1125
Rate	-	20.6	16.7	21.5	24.5	23.3	23.3	18.7	16.6	15.4
Dallas	1246	1321	1335	3902	1361	1217	1197	1311	1282	1348
Rate	22.4	21.8	22.6	24.1	20.5	20.4	20.4	21.5	18.0	18.6
Houston	1458	1463	1430	4351	1420	1483	1469	1474	1470	1493
Rate	28.9	26.2	26.6	26.8	25.6	24.6	24.6	24.1	22.1	21.8
Los Angeles	2367	2101	2341	6809	2175	2178	2048	2235	2197	2198
Rate	-	-	24.6	21.6	21.8	18.1	19.4	16.5	16.5	16.5
Miami	3355	2741	2521	8617	2481	2330	2502	2399	2332	2346
Rate	70.3	52.0	49.7	46.0	41.8	44.3	42.8	38.8	38.8	38.7
New York	4306	4031	3730	12,067	3502	3607	3351	3286	2920	2707
Rate	48.0	43.7	39.7	36.5	28.8	27.1	25.2	20.3	20.3	18.8
Philadelphia	1634	1331	1199	4164	1126	1173	1098	742	862	790
Rate	13.5	-	-	20.6	21.0	20.3	20.3	16.8	14.2	13.0
San Fran	924	886	873	2683	809	840	791	725	716	741
Rate	-	-	24.0	21.1	20.1	18.2	17.4	15.4	15.4	15.8
San Juan PR	672	511	475	1658	470	498	448	458	374	397
Rate	33.3	26.4	29.7	26.6	28.7	24.6	23.5	17.0	18.4	18.4
Wash, DC	2277	1551	1718	5546	1437	1504	1482	1108	1308	1122
Rate	15.2	-	-	34.5	33.2	33.5	33.5	21.6	21.5	18.3
United States	49,614	45,173	43,576	42,815	42,168	41,994	40,472	40,022	42,305	38,726
Rate	19.6	17.6	16.3	15.9	15.4	15.0	13.9	12.3	12.3	11.8

CDC HIV Surveillance Report Vol. 20 (2008); Vol. 21 (2009); Vol. 22 (2010); Vol. 23 (2011); Vol. 24 (2012); Vol. 25 (2013); Vol. 26 (2014); Vol. 27 (2015); Vol. 28 (2016); Vol. 29 (2017)

*ECHPP was supported by CDC grant awards for four consecutive years: 2010–2013. In Table 1, except for the Chicago and New York Divisions, HIV cases diagnosed and estimated rates of HIV infection per 100,000 population are reported for the MSA of residence

2010 to September 2013, CDC divided \$42.8 million for enhanced prevention planning, coordination, and partial implementation among 12 grantees [153]. Each grantee could include up to 24 interventions; 14 were required and 10 more recommended. Planning was guided by principles laid out by CDC and “situational analysis.”

In 2016, Fisher and colleagues [154] conducted a multi-level evaluation spanning multiple years (2008–2015) and using multiple data sources. Initial analysis indicated that the 12 ECHPP grantees increased HIV testing, condom distribution, and partner services, and expanded delivery of prevention programs for PLWHA. Future reports were to assess whether activities specific to ECHPP contributed to changes in client outcomes, and whether client outcomes were associated with changes in community-level impact.

Miami-Dade County (Florida) developed and implemented a locally tailored plan that reinforced local partnerships, identified neighborhoods with highest unmet needs, improved condom distribution, established a new walk-in center for transgender client needs, and resolved incompatibilities in health department and Ryan White Program computer record systems to facilitate more efficient patient services [155]. As a TLC-Plus nonintervention comparison site, the Miami MSA reported 15.1% fewer newly diagnosed HIV cases during ECHPP and 3.2% fewer after ECHPP (Table 1). The apparent impact of changes made during the 3-year ECHPP project were puzzling to several observers who were on the ground during the 2011–2019 administration of Florida Republican “Tea Party” governor, Rick Scott.

“From 2015 to 2017, Florida was forced to return to the federal government \$54 million in unspent grants for combating HIV,” according to an article published in the *Guardian* [156]. In 2015, Scott’s administration blocked 2 CDC grant applications that could have won Miami and Broward counties approximately \$16 million. “‘I think Rick Scott fueled the epidemic in Florida,’ said Marlene LaLota, a 28-year veteran of the Florida Department of Health who was the administrator of its HIV/AIDS section from 2014 to 2016.”

Despite reductions in newly diagnosed cases of HIV, the Miami Division continued to report in 2019 the highest rate of new HIV infections of any MSA division in the US (42.4 per 100,000)—more than twice the rate reported by New York City (17.7), San Francisco (15.8), and Los Angeles (14.8) [157]. A virologist working at the University of Miami Medical Center was quoted in *Science* magazine as saying, “We’re in a mess. Miami is the epicenter of the epicenter of HIV/AIDS in the United States” [158].

High Impact, A Functional Framework, and Five (or More) D’s

To accelerate action to end the HIV epidemic, high-impact HIV prevention, care, treatment, and outbreak response strategies were to be implemented in the US [159]. “High Impact HIV Prevention” was defined as “using scalable interventions with demonstrated potential to reduce new infections in the right populations to yield a major impact on the epidemic” [159, p. 1]. CDC prioritized “high-impact strategies” for funding over behavioral alternatives which the agency deemed less efficacious, because CDC-supported interventions must be “highly effective, scalable, and cost-effective” [159]. However, no behavioral intervention could be deemed “efficacious” if it was never systematically studied and eligible for consideration by CDC’s criteria.

In recognition of “landmark advances” and an “evolving landscape,” NIH staff proposed in 2017 a functional framework to highlight four major domains for current and future behavioral and social science research (BSSR) on HIV disease [160]. The 4 domains characterized were: (1) understanding vulnerable populations and contexts of risk (Basic BSSR), (2) improving approaches to risk reduction, prevention, and care (Elemental BSSR), (3) strengthening the design of biomedically focused research (Supportive BSSR), and (4) contributing building blocks to integrated prevention and treatment approaches (Integrative BSSR). Integrative BSSR “will advance implementation science at the clinic and community level and will model the best combinations of individual, biomedical, and structural interventions to achieve impact,” promised the two authors from NIH [160, p. 379].

With high-impact prevention and a functional framework came recommendations to: (1) de-emphasize differences between HIV and other diseases, (2) destigmatize HIV testing and treatment, (3) decouple HIV counseling from testing, (4) de-implement risk-reduction counseling, and (5) deconstruct the biomedical model that was driving all these changes in HIV-prevention strategies. One of the ways to end AIDS, some thought, was to end “AIDS exceptionalism” and to treat HIV like any other serious, but manageable, disease [161]. By testing everyone between the ages of 16 and 65 at least once, CDC believed it could take the stigma out of HIV testing [117].

Although a 2012 meta-analysis of over 20 studies ($n = 52,465$) concluded that single-session behavioral interventions can have a substantial impact on those counselled (odds ratio = 0.65; 95% CI 0.55–0.77) and rivaled the effects observed for biomedical technologies targeting HIV and STI prevention [162], counseling was declared to be a barrier to testing and was eliminated. Other researchers thought EBIs for promoting behavior change could be

more effectively accumulated using “ontologies, a systematic method for articulating a ‘controlled vocabulary’ of agreed-upon terms and their inter-relationships” [163] and research into the antecedents of HIV-risk practices favored a sociological, interpretive, and structural orientation, not a biomedical individualistic orientation. “Thus, with respect to NIH-funded HIV prevention science, there exists a major disjunct in the guiding epistemological orientations of how scientists understand HIV risk, on the one hand, and how they engineer behavior change in behavioral interventions, on the other” [164].

By the 40th anniversary of AIDS, more bad news was being reported. In an RCT of PrEP among gay couples, investigators found “complete indifference” toward STIs among MSM using biomedical prevention [165]. A meta-analysis showed that persons who became aware of their HIV infection were more likely to adopt preventive behaviors and use condoms soon after notification, but this effect diminished and even disappeared over time [166]. And in 2019, 2.5 million cases of chlamydia, gonorrhea, and syphilis were reported to CDC, marking the sixth consecutive year of record-breaking cases of STIs in the US [167].

Program Science, A Macro-level Evaluation, and Healthy Information

With the shift towards combination HIV-prevention packages and biomedical, behavioral, and structural interventions being implemented concurrently, measuring the overall impact on HIV incidence and the contribution of each component posed significant evaluation challenges [168]. Each package should be sufficiently flexible to include a variety of EBIs that serve each dynamic population they prioritize, particularly those who are most vulnerable [169]. To optimize impact, well-designed implementation science studies are vital. “Efficacy in a clinical trial does not necessarily translate to effectiveness at the population-level,” warned Padian and colleagues [169, p. S22]. Studies should investigate programmatic implementation, operations scale-up, and “methods to monitor and evaluate these processes both for organization and cost-effectiveness.”

Program Science was introduced in 2011 as “the systematic application of theoretical and empirical scientific knowledge to improve the design, implementation, and evaluation of public health programs” [170]. It proposed an iterative, multi-phase, and interdisciplinary framework whereby programs drive scientific inquiry, and both program and science are aligned towards a collective goal of improving population health [171]. Three spheres in a program cycle included: (1) strategic planning to make informed decisions about program priorities and resource allocation, so the program is aligned with the local epidemic context, (2) program implementation to make informed decisions about ‘where,’

‘what,’ ‘how,’ and ‘for whom’ to deliver interventions, and (3) program management and evaluation to generate robust evidence for continuous improvements in program delivery and outcomes. Understanding complexity required consideration of feedback loops, path dependence, phase transitions, compensatory mechanisms, and emergent properties [172].

Combination interventions can produce substantial effects on HIV transmission, as illustrated in an important study reported by our neighbors to the north. In Ontario, Canada, CBOs educated vulnerable populations and communities, developed meaningful relationships through community outreach, and delivered services that accounted for the impact of stigma, culture, and human rights, as well as the social, behavioral, and structural factors that affect HIV risk. Community-based and behavioral interventions were effective in: (1) reducing risky sexual behavior and the incidence of STIs in high-risk populations, (2) increasing condom use, (3) increasing knowledge of HIV transmission and prevention, (4) improving adherence to ART, and (5) improving retention in care and treatment [173]. From 1987 to 2011, province-wide, community-based programs helped to avert an estimated 16,672 HIV infections, saving Ontario’s health care system approximately \$6.5 billion Canadian dollars (range 4.8–7.5B). From 2005 to 2011, every dollar invested in these programs saved about \$5.

While the US Surgeon General has reason to worry about the circulation of health misinformation in the digital age [174], we can still turn to books [175, 176], review articles (Table 2), and other sources that can teach us about the history of the AIDS pandemic and the significant contributions of so many social, behavioral, and other scientists in finding solutions. Among the more recent contributions with cogent arguments and compelling ideas for improving health-promotion programs are *Extra Life* [177], *People Count* [178], and *Stuck* [179]. Lindsey McGoey [180, 181] published a pair of books well worth reading, and Adam Kucharski reminded us in *The Rules of Contagion* [182] that the reproduction number, R , still depends on DOTS: (1) duration of infectiousness in a host, (2) opportunities hosts have to spread an infectious agent to others, (3) transmission probabilities, and (4) susceptibility of contacts in a population. We must always keep our eye on the prize—stopping the spread of HIV and other infectious pathogens in vulnerable communities.

Summary

Like Johnny Appleseed, we have planted, fertilized, and trimmed a variety of trees (developed interventions) over the past 40 years, but we have not paid close attention to growing *an entire forest* (everything that constitutes viable and ecologically robust HIV-prevention programs). Decisions

Table 2 Anniversary reviews after 10, 15, 20, 25, 30, and 40 years of the HIV/AIDS pandemic

Anniversary	Article, Book, or Online posting
10 Years	Centers for Disease Control and Prevention. The HIV/AIDS epidemic: The first 10 years. <i>MMWR</i> 1991;40(22):357. Grmek MD. History of AIDS: Emergence and Origin of a Modern Pandemic. Princeton, NJ: Princeton University Press; 1993.
15 Years	Fauci AS. AIDS in 1996: Much accomplished, much to do. <i>JAMA</i> 1996;276:155–6.
20 Years	Brodie M, Hamel E, Brady LA, Kates J, Altman DE. AIDS at 21: Media coverage of the HIV epidemic, 1981–2002, <i>Columbia Journalism Review</i> 2004;Suppl. March/April: A1–8. Centers for Disease Control and Prevention. Twenty Years of AIDS [Video]. Available at: https://www.youtube.com/watch?v=LabdrWmUN4w%26t=242s . Gottlieb MS. AIDS: Past, present, and future. <i>N Engl J Med</i> . 2001;344(23):1788–91. Sepkowitz KA. AIDS—The first 20 years. <i>N Engl J Med</i> . 2001;344(23):1764–72. https://doi.org/10.1056/NEJM200106073442306 Steinbrook R, Drazen JM. AIDS—Will the next 20 years be different? <i>N Engl J Med</i> . 2001;44 (23):1781–2. https://doi.org/10.1056/NEJM200106073442308 .
25 Years	Centers for Disease Control and Prevention. Twenty-five years of HIV/AIDS—United States, 1981–2006. <i>Morb Mort Wkly Rep (MMWR)</i> . 2006;55(21):585–9. Fauci AS. 25 years of HIV. <i>Nature</i> . 2008;453(7193):289–90. https://doi.org/10.1038/453289a . Greene WC. A history of AIDS: Looking back to see ahead. <i>Eur J Immunol</i> . 2007;37:S94–102. Kalichman SC. Time to take stock in HIV/AIDS prevention. <i>AIDS Behav</i> . 2008;12(3):333–4. https://doi.org/10.1007/s10461-008-9377-1 .
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have bounced in different directions because of competing concerns about constituents, priorities, and influential interest groups. Decision makers have not been able to steer a steady course of choosing what is most important for the public's health.

Priorities over the past 40 years sometimes favored communities—places where people live, work, and play. At other times, they have favored clinics—places where health care providers see patients and practice medicine. Primary objects of concern sometimes favored addressing behaviors associated with reducing risks of HIV transmission and other times focused on helping PLWH to achieve undetectable viral loads. A public health focus on people who engaged in “protected” or “condomless” sexual activities with others was to be replaced instead by a focus on pills and

adherence to medications. A major interest in primary prevention was undermined by competing interests in secondary and tertiary prevention. Stages of behavior change were superseded by steps in an HIV-care continuum. Tools for the biomedical tool kit, strategies, and activities competed for resources with tailored, integrated, and efficiently operating programs. As the measure of “success,” efficacy was preferred to effectiveness. Strategic plans—with expectations of automatic 5-year renewal or of planned obsolescence—were preferred to rigorous evaluation and reform, with the optimal blend of program activities and services tied to reliable metrics of declining HIV and STI incidence. Participation, inclusion, and representation were displaced by guidance, capacity building, and technical assistance. Programs that “advance HIV prevention through research synthesis” were

funded while programs that interrupted HIV transmission in vulnerable communities were not. Propaganda, slogans, and bureaucratic bullying seemed at times to be more important than sustained efforts, progress, and realized outcomes.

Tulchinsky and Varavikova [183, p. 49] noted in their 2009 book about contemporary public health: “The interactions among community public health, personal health services, and health-related behavior, including their management, are the essence of the New Public Health.” When federal agencies dictate to grantees how funds must be spent to control HIV transmission in local communities, there is no meaningful interaction and there is no “public” health. Effective HIV-prevention programs arise from interdisciplinary collaboration, interagency cooperation, and careful consideration of all of the evidence [184].

Conclusion

The most important lesson to learn from the first 40 years of AIDS is that the ship of HIV prevention has too frequently been blown off course. Early on, a mathematical model suggested that we should focus our HIV-prevention efforts on R_0 . But too many admirals and too many deckhands have had too many different ideas about where the ship should be heading. They may have agreed that the final destination was to end AIDS, but they could not agree on how to get there.

In the end, all HIV-prevention programs must be implemented at the local level—in vulnerable communities and with people who live there. Success in the next 40 years will depend on the quality of HIV-prevention programs that are created for diverse ecological environments and susceptible populations, fully implemented and continually improved by well-trained and enthusiastic public health workers, and supported by community members who are invested in, contribute to, and benefit from potent, synchronized, and appropriately delivered interventions.

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