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Original Investigation

UNAIDS 90-90-90 Campaign to End the AIDS Epidemic in Historic Perspective

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Policy Points:

- Examining the reasons for the failure of 20th-century syphilis eradication programs (difficulties in finding cases, tracing contacts, procuring consistent funding, overcoming moral framing, and rectifying social problems that create vulnerable environments) provides insight into the possibility that today's UNAIDS campaign may not achieve its goal.
- Disease eradication, although applicable to smallpox, may not be a realistic goal for public health officials who are designing programs to control sexually transmitted diseases (STDs) like AIDS. STDs such as AIDS have a distinctive array of socioeconomic, behavioral, biologic, and epidemiologic features that may not make these diseases amenable to eradication.

Context: Throughout its course, there has been talk of ending the AIDS epidemic. Initially aspirational in nature, this discourse has now taken the form of an explicit UNAIDS proposal to maximize the number of infected people who are tested and receive antiretroviral treatment (ART). If the milestones are met by 2020, the proposal states, an end to the AIDS pandemic could be achieved by 2030. This article uses a historical approach to explore whether this strategy to end the epidemic is feasible.

Methods: In this article, I identify historical analogues of today's UNAIDS plan for STDs. I then examine features of today's HIV campaign and compare them with elements of syphilis eradication campaigns that carried out widespread testing and treatment between the 1930s and 1960s.

Findings: Twentieth-century syphilis campaigns failed because they did not issue specific proposals that would enable them to achieve their eradication goal.

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They could not change the features of the disease that impeded their test-and-treat strategy: the moral framing (stigma deters people from testing), biologic factors (asymptomatic periods of contagiousness), and epidemiologic issues (difficulty tracking contacts occurring in private settings). Furthermore, they could not ensure sustainable funding, rectify social problems that create vulnerable environments, or issue educational messages to curb unsafe behaviors. Today's UNAIDS campaign offers no new provisions to address those factors that led to the failure of earlier syphilis campaigns.

Conclusions: The distinctive array of socioeconomic, biologic, and epidemiologic factors that characterize STDs like syphilis also apply to AIDS and weaken the assumption that the AIDS epidemic can be ended by implementing today's UNAIDS plan. The discourse of ending the AIDS epidemic may be a carryover from the successful elimination, before the appearance of AIDS, of smallpox—a disease that is not comparable to AIDS owing to different biologic qualities, social concerns, epidemiologic behaviors, and the possession of an effective vaccine. Future AIDS control campaigns should therefore concentrate on maximizing ART distribution and not targeting the end of the epidemic.

Keywords: syphilis, venereal, AIDS, eradication.

The "90-90-90" plan issued by the Joint UN Program on HIV/AIDS (UNAIDS) has set an admittedly "ambitious" goal of ending the AIDS epidemic by 2030.* The plan seeks to achieve this goal by optimizing the number of cases detected and entered into effective treatment.[1] Specifically, by 2020, 90% of people living with HIV should be diagnosed; 90% of HIV-infected patients diagnosed should be receiving antiretroviral treatment (ART); and at least 90% of those on ART should achieve viral suppression. The end target is to obtain an undetectable viral load in 73% (26.9 million) of the 37 million HIV-infected patients globally by 2020 and to sustain this for one decade. Citing mathematical modeling predictions, the plan states it will achieve "nothing less than the end of the AIDS epidemic by 2030" if its target milestones are reached.[1]

*In the 1930s and 1960s, the term "eradication" was used to describe the reduction or elimination of an epidemic as a public health hazard. While more recently, "eradication" is used to mean the reduction of disease to zero, I use the term in this paper with respect to how it was used by historic figures quoted.

Public health experts and government officials are hopeful that the UNAIDS goals can be attained. They are heartened by the tangible progress already made in the fight against AIDS by expanding ART on a global basis.[2] Noting that between 2000 and 2015, new HIV infections fell by 35%, AIDS-related deaths decreased by 42%, and life expectancy has been restored in several sub-Saharan African nations, epidemiologist Gerald Friedland considers the expansion of ART to be "a historic turn of events . . . [and] one of the greatest scientific, medical and public health realignment of resources between rich and poor."[3(p145)] The conviction of experts that HIV may be defeated has now been embraced by the general public. In his State of the Union address on January 13, 2016, President Barak Obama compared the goal of HIV eradication with President John F. Kennedy's legendary 1961 prediction that a man would land on the moon within a decade. Obama's analogy is clear: the seemingly improbable can be reached if one has the will, the technology, and the appropriate commitment of resources. Obama and the audience were inspired by the prospect of conquering AIDS. As he said to rousing applause, "Right now, we're on track to end the scourge of HIV/AIDS. That's within our grasp."[4]

Public health experts are, nonetheless, uncertain about whether the UNAIDS goals can be met by 2030. Their concerns are based on how far away we are presently from reaching the 90-90-90 milestones.[3] In fact, of all HIV-positive people around the world today, only 54% have been diagnosed; 76% of those are being treated; and 78% of those receiving ART have undetectable HIV viral load.[5] Thus, only 32% of the global HIV-infected population (11.6 million) presently have viral suppression—15.3 million below the 26.9-million milestone (73% of HIV-infected people) that needs to be reached by 2020.[5] In addition, because ART remains a lifelong therapy, challenges of linkage to care, medicine adherence, and loss to follow-up all impinge on sustained viral suppression.[6,7] Furthermore, because UNAIDS does not provide subsidies, it is unclear whether the projected incremental costs of approximately $7 billion per year (from the current $13 billion per year rising to an estimated $20 billion per year) that will be required to achieve the 90-90-90 goals will be bearable.[8] Finally, it remains to be seen whether the political will of local and international communities needed to support the plan can be sustained for the long term.[8] For these reasons, some experts are uncertain whether we are indeed on the path of ending the HIV epidemic within the UNAIDS specified time frame.[3,9]

Can historic analogues provide insight into these uncertainties surrounding the attainability of today's UNAIDS campaign to end the AIDS epidemic? This article examines 20th-century campaigns to eradicate syphilis from the 1930s to the 1960s to inform us about the feasibility and possible limitations of the current UNAIDS plan to end AIDS. It also addresses the larger question of whether it is appropriate to design campaigns to end epidemics of sexually transmitted diseases (STDs) like syphilis and HIV.

The UNAIDS Plan to End the AIDS Epidemic: A Departure From Earlier Efforts to Control HIV

The 2013 UNAIDS 90-90-90 plan differs from earlier movements to end the HIV epidemic in that it is based on the premise put forth in 2011 that ART—as a result of suppressing viral load in blood, semen, and vaginal secretions—essentially renders a patient noninfectious.[10] This finding supported the idea that the benefit of ART could extend to the public health realm, a concept termed "treatment as prevention."[11] A "test-and-treat" strategy based on this premise then emerged to identify as many infected, untreated persons as possible and to treat them until they no longer were infectious.[12] The premise of this strategy was bolstered by a mathematical modeling prediction that universal HIV testing combined with ART for those who tested positive could nearly abolish AIDS within 50 years.[13] In 2011, Secretary of State Hillary Clinton speculated on the potential of maximizing ART globally to "set the stage for a historic opportunity . . . to change the course of this pandemic and usher in an AIDS-free generation."[14] Clinton was contemplating what might be possible if ART were to be optimized; she did not propose to end the AIDS epidemic per se.[15] The 90-90-90 plan issued in 2013 is based on a similar "treatment as prevention" premise and shares the same "test-and-treat" strategy as Clinton's "AIDS-free generation" speculation. Unlike Clinton's idea, however, today's UNAIDS plan lays out explicit milestones for ART coverage and an expedited time line for ending the epidemic set by the UN Sustainable Development Goal to improve global health over a 15-year span.[16] Today's UNAIDS plan is the first campaign to declare an explicit time line for ending the HIV epidemic and to provide specific milestones and targets for testing and suppressing HIV viral load with treatment.

The UNAIDS 90-90-90 program also differs from earlier UNAIDS treatment programs. UNAIDS efforts began in the early 2000s when officials began to argue that the response to HIV had been inadequate at the international level.[17] Their advocacy to make ART available to HIV-infected individuals worldwide was prompted by disparities between the large numbers of people who continued to die worldwide and the abrupt decline in mortality from AIDS in developed countries after the introduction of ART in 1996. UN officials contended that it was a violation of human rights not to provide lifesaving ART to people living in developing countries because they were at an economic disadvantage.[18] To distribute ART to low- or medium-income nations, donor countries agreed to provide large amounts of foreign aid and reduce drug prices through generic programs and the restructuring of intellectual property rights.[19] UNAIDS followed by issuing proposals to expand ART coverage to people living in low-income countries throughout the world—first the "3 by 5" initiative (provide ART to 3 million by 2005) and then the MDG Goal 6A "15 by 15" plan (place 15 million on ART by 2015).[20,21] These programs succeeded in meeting their numerical goals, with ART coverage increasing from 800,000 people in 2003 to the current number of 17 million.[22] In contrast to these earlier UNAIDS efforts, scaling up ART in the current 90-90-90 campaign is not specified as a goal in itself but as a means to achieving the goal of ending the AIDS epidemic.

The 90-90-90 plan's emphasis on maximizing testing and contact tracing also is a departure from earlier approaches to handling HIV. In the mid-1980s, an approach that Ronald Bayer termed "AIDS exceptionalism" emerged.[23,24] At that time, gay activists worried that a positive test would be used for discrimination in housing and employment and that mandatory testing and contact tracing would violate their civil liberties and could deprive them of their livelihoods. Some gay statesmen from the Gay Men's Health Crisis in New York and other advocacy groups supported voluntary and anonymous testing and counseled members of their community to behave responsibly.[25] These arguments prevailed in the courts, which required that informed consent be obtained for testing, a requirement different from that for other STDs. The additional steps required to obtain informed consent, however, became a disincentive for clinicians to test and a deterrent to the widespread case finding that had been the backbone of previous public health campaigns.[26] After the introduction of ART, the informed consent and anonymous testing that

in the 1980s had been seen as championing the civil rights of individuals became viewed as potentially detrimental to overall public health.[26,27] Today's 90-90-90 campaign, with its emphasis on widespread testing and extensive contact tracing, represents a departure from the more restrictive testing approach that characterized the early phase of the AIDS epidemic.

Today's UNAIDS campaign also differs from earlier discourses to end AIDS. Discussions of abolishing HIV emerged in 1984 when Margaret Heckler, then secretary of health and human services, joined Robert Gallo, a virologist at the National Institutes of Health (NIH), at a conference where he announced the discovery of the virus that causes AIDS and predicted that "a vaccine [for this dread affliction] would be ready for testing within 2 years."[28(p18)] These hopes culminated in 1998 when President Bill Clinton channeled federal funds for a dedicated new AIDS vaccine research center (VRC) at NIH and set an ambitious goal to manufacture an effective AIDS vaccine. As Clinton stated, "Only an effective HIV vaccine can ... eliminate the threat of AIDS.... Let us commit ourselves to developing an AIDS vaccine within the next decade."[29] At the address, Clinton compared his proposal with the determined goal that President Kennedy set in 1961 of reaching the moon.[29] Heckler's comments in 1984 and Clinton's predictions in 1997 underscore their abiding faith in biomedicine to end epidemic disease. Their comments also indicate that in the earlier stage of the AIDS epidemic, talk of ending HIV was essentially aspirational, as they lacked a specific tool in hand to accomplish their goal.

Today's 90-90-90 plan has transformed the aspirational nature of the earlier discourse of ending HIV into an explicit proposal to use currently available therapies to end the AIDS epidemic within an expedited time frame. The key elements of today's UNAIDS plan are similar to those of 2, pre-AIDS, 20th-century campaigns to end the epidemic of another STD: syphilis.

A Historic Analogue for UNAIDS Movement: 20th-Century Syphilis Campaigns

Syphilis is an appropriate analogue for HIV because the two STDs have comparable features. Medically, the two have an array of nonspecific

manifestations that can mimic, and be difficult to distinguish from, other conditions. Biologically, both have a long period of asymptomatic infection during which time the individual is highly contagious and may be unaware that he or she can transmit infection. Since sexual contact occurs privately, partner identification is dependent on disclosure by the individual. Furthermore, case finding may be difficult because people may be reluctant to reveal the names of their intimate contacts to strangers or hesitate to be tested themselves because of stigma associated with the moral framing of each disease. In addition, social problems that displace individuals from their social network—during wars, natural disasters, or migrant work; along with poverty, joblessness, wealth imbalance, and prostitution—create a ready environment for the spread of each infection. Moreover, several components of earlier syphilis eradication programs are similar to those of the UNAIDS 90-90-90 plan.

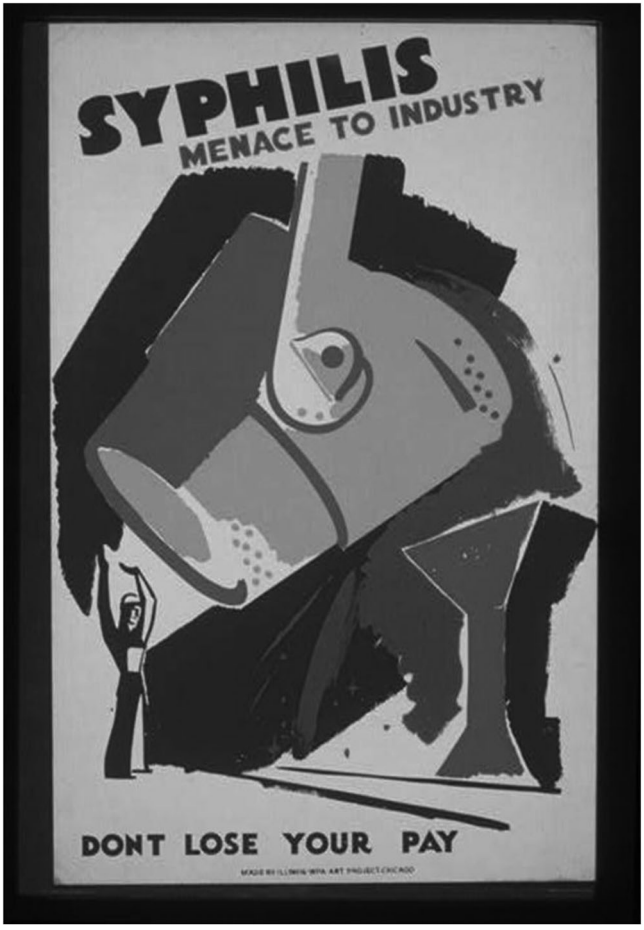
The earliest 20th-century syphilis control program employed a test-and-treat strategy during World War I. Armed with Paul Ehrlich's 1910 discovery of salvarsan (compound 606) to treat syphilis, the US secretary of war, Newton Baker, initiated a campaign in 1918 to control the disease that he believed could weaken America's fighting troops.[30] Congress, prompted by the need to keep the military fit for duty, passed the Chamberlain–Kahn Act on July 9, 1918, which created the Division of Venereal Disease (VD) Control in the US Public Health Service (USPHS) and appropriated funds ($1 million per year for years 1919 and 1920) to subsidize state bureaus for VD control.[30] The public regarded the act as necessary to the war effort.[31,32] The elements of this control included the widespread availability of laboratory testing, the reporting of cases, the tracing of contacts, and the provision of salvarsan.[33] It also established treatment facilities and a public education program run by sexual hygienists that targeted sexual morality—eliminating promiscuity and prostitution and restoring chastity.[34] But the national effort and funds began to be curtailed shortly after 1920 during the "returning to normalcy" spirit that epitomized Warren Harding's presidency.[35(p85)] Noting that this funding was rescinded in 1926, Thomas Parran, a USPHS officer who had been appointed chief of the Division of VD Control, remarked that "the enthusiasm [to control syphilis] that had gone up like a rocket came down like a stick."[35(p85)] Parran pointed out that when treatment was provided, the attack rate had declined, but when the funding was rescinded, it relapsed.[35(p131)] In regard to syphilis in the United States after World War I, he said, "No further thought

was given to syphilis, and the first national public health effort came to an untimely end."[35(p85)] Parran lamented that syphilis had receded from public consciousness following the war—a trend that had also occurred in 1918 with influenza.

In 1936, after the governor of New York, Franklin D. Roosevelt, became president of the United States, he appointed New York state health commissioner, Thomas Parran, as the US surgeon general. Shortly after assuming his position, Parran initiated a national eradication program using treatments available at the time to prevent the spread of syphilis after the war. He was determined to control syphilis at a time when it was causing serious problems of disability, and the costs of its long-term effects (eg, the commitment of those to a public institution because of blindness or insanity or, while working on the public payroll, the absenteeism or inability to complete tasks among those who had relief jobs created by President Roosevelt's Works Progress Association) were conspicuous during the Great Depression nationwide[36] (Figure 1). In addition to the premature withdrawal of government funding, Parran cited another reason for the resurgence of syphilis in America: the moralistic way in which the disease had been approached by sexual hygienists.[37] Instead, Parran proposed a scientifically oriented plan based on a treatment as prevention precept. He explained, "The backbone of the whole control program [is that] treatment of all cases must be required in the public health interest to the point where each case becomes noninfectious."[35(p254)] Concluding that treatment provided a "duty to the community," he reasoned that the "non-infectiousness of the patient is achieved by a few doses of arsphenamine. It is important from the public health standpoint, since it means that one link in the chain of infection has been broken."[35(p254)] Parran based his premise on evidence that following treatment, spirochetes from clinical specimens were poisoned and killed, thereby sterilizing open lesions.[35(pp7,48,205,221,255)] His proposition that the patient became noninfectious once treatment had diminished the presence of the microbe from relevant samples was, in many respects, a conceptual precursor of today's UNAIDS plan.

Parran proposed what he termed a "find-and-treat" strategy to maximize case finding and to address the retention of patients in clinic.[35(pp7,48,205,221,255)] The essence of Parran's eradication strategy was to use the Wasserman serology to identify as many cases as possible and to treat all cases.[35(pp26,255)] He emphasized that even though doctors had the scientific and medical means at hand to handle syphilis, carrying it out

Figure 1. Syphilis: Menace to Industry, 1936-1940



This poster illustrates the importance to workers to maintain their health and avoid contracting syphilis. Workers with syphilis who develop complications with motor skills may lose their job and/or be unable to complete their work duties, thereby compromising industrial productivity. Workers with syphilis can also harm others if they cause an accident at work as a result of an impairment. During the Great Depression, concerns about the national recovery resonated with Americans. (Image from Erin Wuebker, Library of Congress, Venereal Disease Visual History Archive, http://vdarchive.newmedialab.cuny.edu/exhibits/show/exhibits/introduction.)

would pose sizable, albeit surmountable, problems. He said, "The whole control program of 'find and treat' is so deceptively simple that most of its details are much more difficult than they sound. . . . The practice is less simple but possible."[35(pp26,255)] To overcome what he called the "stumbling block" of case-finding, he recommended a universal, voluntary "Wasserman dragnet" be applied to capture the greatest percentage of the population through available means: persons who were hospitalized, expectant mothers, those applying for marriage licenses, or those undergoing exams for life insurance or by their family doctor.[35(pp163,289)] This process, he believed, would capture persons without symptoms or with nonspecific symptoms, and those who may not otherwise get tested or be unwilling to reveal the identity of their sexual contacts because of the stigma attached to syphilis.[35(p283)] To optimize the key elements of his campaign—case finding, contact tracing, and reporting—Parran stressed the importance of attaining the cooperation of private physicians to overcome their reluctance to violate their patients' privacy and to report their cases to a public health officer.[35(p245)] Parran also stressed the importance of retaining patients in clinical care to complete their treatment with arsphenamine. Even though arsphenamine had fewer side effects than its precursor drug salvarsan, completing the treatment required to become noninfectious could be prolonged (up to 2 years), be painful to the patient, require several office visits, and entail an expense that many patients could not afford.[35(p47)] Parran nevertheless insisted that patients must be held to a full-treatment schedule to reverse the trend of the disease.[35] Thus, on a strictly conceptual basis, the "find-and-treat" component of Parran's campaign can be considered a forerunner of today's UNAIDS plan to end the AIDS epidemic.

In order to place his campaign in the sphere of science and medicine, Parran actively sought to reverse earlier anti-VD social hygienists' emphasis on morality. He asked citizens to remove the stigma of talking about syphilis openly in order to make the disease a political priority and to receive financial support for its control, reasoning that an overly moralistic attitude would hinder his campaign by compelling people to conceal their disease and avoid using treatment facilities. He asserted that Americans must think of syphilis scientifically as a dangerous communicable disease, just as they had done with typhoid, diphtheria, and tuberculosis.[35(p267)] In fact, throughout his career, Parran had sustained a scientific public health focus, as he had previously worked in Joseph Kinyoun's Hygienic Laboratory in Washington, DC, and had been

assigned as a PHS officer to investigate outbreaks of diarrhea in rural America before he became chief of the USPHS DVD in 1926.[38] By insisting that people break their silence regarding syphilis, Parran was attempting to transform the discourse of VD from a moral framework into traditional medical and public health approaches.[25(p141),39] He succeeded in removing the reluctance to talk about syphilis by writing in popular magazines about the seriousness of the venereal problem to the American public.[37] He also addressed social problems that he believed enabled the spread of syphilis: the problems of displaced populations, urbanization, poverty, and income inequality that led to prostitution and an environment vulnerable to the spread of syphilis.[35(pp209-223)] The public's response to Parran's open discourse was highly supportive, matched by strong backing from the medical and public health communities.[40-44]

After raising the public's concern about syphilis as a national problem, Parran lobbied for federal funding of an eradication campaign. The government, he reasoned, must provide money to retain people in care who were unable to afford long-term treatments, to create free treatment clinics, and to staff them with knowledgeable physicians.[37] Public expenditures to fight syphilis would, he said, save the nation money by preventing the expense of managing its chronic, disabling complications. There was, he noted, precedence for the state's providing funds to disrupt the spread of other epidemics, like cholera and typhoid fever (eg, sanitary measures, purification of water). Why, he asked, shouldn't the state likewise support measures to halt the spread of America's "most pressing" health problem—syphilis?[35(p56)] To that end, he organized a USPHS national conference on VD control in Washington, DC, on December 28, 1936, at which more than 900 delegates (city health officers and public health nurses) from 30 states supported the allocation of federal funds to support an anti-VD campaign.[45] Parran felt that arousing public interest was key to getting the federal funding (from tax dollars) needed to "stamp out" syphilis and bring "its epidemic aspects under control."[39(p3)] A receptive President Franklin D. Roosevelt responded in a message sent to the conference: "The Federal Government is deeply interested in . . . reducing the disastrous results of venereal disease," and he also supported the provision of federal funds to be dispersed to the states to prevent VD and reduce the amount of spending for the consequences of the disease.[41(p39)]

With the advocacy of the surgeon general, the backing of the president, and the arousal of the public's attention, the federal government

subsidized a national anti-VD program with the LaFollette–Bulwinkle bill.[46] Passed and signed into law by President Roosevelt on May 25, 1938, this bill, known as the National VD Control Act, raised the federal appropriation from $80,000 a year in 1936 to $3,080,000 in 1938, and another $10 million to be split over the next 2 years.[47] Congress authorized the PHS to administer the grant by allocating funds to state boards in response to summaries of each state's VD control activities.[25(p144)] The legislation also authorized 10% of the $8 million that had become available through Title VI of the 1936 Social Security Act to be channeled to state boards to establish a comprehensive anti-VD program, to set up diagnostic and treatment facilities, to train necessary personnel, and to carry out testing and treatment.[48(p95)]

With federal funding now available to implement the widespread testing and treatment he had been advocating, Parran believed he was on the road to eradicating syphilis. Now that syphilis had been openly addressed in the media as a disease to be eradicated through scientific means and not as a moral infraction, and now that he had obtained federal funding for a coordinated national plan, he believed what he called "the eradication equation" could be solved.[35(p267)] He noted that unlike the United States, the Scandinavian countries had reduced syphilis rates because they did not stigmatize the disease and they had a central program of funding that ensured widespread testing and treatment facilities.[35(p159)] Similarly, he believed that America now had the elements to solve what he termed the "equation of what is needed":

> teamwork of government, professions, industry, citizens + money for drugs and facilities + trained personnel for finding and treating cases = eradication of syphilis.[35(p267)]

Parran predicted that "the whole program to make syphilis a rare disease . . . will take place in a generation."[35(pp287,296)]

But Parran's goal of a nation freed from syphilis never materialized. For a brief period, some indicators suggested that his program was beginning to work: clinic facilities for the treatment of VD had grown; public subsidies provided practitioners with diagnostic and epidemiologic services, as well as free drugs; and the number of patients receiving minimum required therapy increased from 15% to 60%.[49] Nonetheless, despite Parran's attempts to redefine the epidemic as a public health menace that could be extinguished through modern scientific approaches, these trends were short-lived, and syphilis rates failed to

decline (from 318 cases per 100,000 in 1936 to 368 cases per 100,000 in 1941).[35(p298),49] By 1941, with the onset of World War II, hundreds of thousands of young men were displaced from their homes and mobilized to army camps throughout the country, followed by prostitutes.[47(p13),50] This was an environment that Parran himself had noted was conducive to the spread of syphilis, and his attempts to optimize case finding and enter all civilians into treatment proved ineffective under wartime circumstances.

Later on during the war, the effort to control syphilis to preserve able troops needed to defeat the enemy and to maintain a healthy civilian population was reinvigorated. An increase in federal funding to $8 million annually that began in 1942 allowed the addition of so-called rapid treatment centers (RTCs) to ramp up the widespread serologic testing, treatment, and contact tracing in order to meet wartime needs, and by 1946 they had been established in 46 states.[51] By 1944, as John Parascandola notes, when the US Army adopted penicillin as the routine treatment for syphilis, there was new hope that syphilis among the troops might be controlled with the aid of the new "miracle drug."[48(p130),52] With a new tool to fight syphilis—a one-shot cure that could render a patient noninfectious—combined with an increase in government funds, the rates began to wane. When the decline persisted into the 1950s (363 cases/100,000 in 1942 to 109/100,000 cases in 1952), an article titled "The End of Syphilis in Sight" claimed that it would not be long before medical students would have to consult textbooks to obtain information about the disease.[53] But with the falling rates during postwar times, state and local health departments began to reduce their support of the full-scale public health approach,[51(p503)] and the federal appropriation of funds for VD control was cut from $9.8 million in 1953 to less than $2 million by 1955.[54] These budget cuts were evident in the rise in rates of syphilis (from 66 cases/100,000 in 1954 to 78 cases/100,000 in 1959) when VD control programs were forced to curtail their comprehensive approach.[51(p504)] Noting the reversal in the downward trends into the 1960s, Malcolm Merrill, director of the California State Department of Health, remarked, "VD control nearly became another victim of the rhetoric that all communicable disease had been conquered."[55(p36)]

Surgeon General Luther Terry responded to the continued rise in syphilis rates by renewing the attack on VD in 1962. Terry, a

pathologist, had previously served as chairman of the medical board of the National Institutes of Health's Clinical Center. There, he developed an interest in preventive measures that he later applied as surgeon general in crusades against syphilis and cigarette smoking as public health hazards.[56] Terry appointed a task force to make recommendations on how to renew efforts to eradicate syphilis as a public health problem, and in 1952, he appointed Leona Baumgartner, commissioner of New York City's Public Health Department, as its head. The department's first woman commissioner, Baumgartner, a pediatrician, already had been carrying out municipal programs in disease prevention, childhood nutrition, and treatment of VD.[57] Her task force recommended a comprehensive anti-VD plan that was derived from Parran's premise (treatment as prevention) and patterned after his design (test and treat).[58(pp1-30)] Indeed, Baumgartner acknowledged that Parran's 1930s campaign was the model and inspiration for her recommendations.[58(p8)]

Baumgartner stressed that her plan would need to offer something new in order to succeed. Previous campaigns, she believed, were never able to overcome the obstacles to case finding that Parran had previously identified: patients' hesitancy to identify sexual partners and private physicians' reluctance to report cases of VD that they treated to public health officials.[59] An insufficient number of cases and their sexual contacts created a large reservoir of unknown, uncontrolled, and untreated cases, she maintained.[55(p38)] It was this reservoir—what she termed the "margin of failure" of 40,000 or more cases—that was driving the spread of the epidemic.[58(p25)] Baumgartner asserted that this "margin" needed to be identified and treated. She also attributed the failure of earlier syphilis campaigns to overhasty budget reductions.[58(p5)] William Brown, chief of the Communicable Disease Center's VD Branch, agreed that past efforts had failed because funding was reduced before the epidemic had ended and because society was disinclined to bear that cost.[60] Baumgartner concluded that unless she could add something new to previous syphilis campaigns, her program would be nothing more than "another crack at an old and familiar enemy."[59(p29)] Malcolm Merrill concurred, stating if they could not improve on earlier campaigns, "then we shall have to live with this disease indefinitely."[55(p37)]

Baumgartner and her task force sought to strengthen Parran's methods of case finding, reporting, and tracing. She proposed widespread premarital, preemployment, and prenatal testing, much like Parran's "Wasserman dragnet."[58] To maximize case finding, she and Warren

Davis, chief of Program Services of the VD Branch of the Communicable Disease Center, extended Parran's contact-tracing efforts to include "cluster contacts": contacting acquaintances of patients, not only their sexual contacts, to maximize the number of cases captured.[58,61] Davis also maintained that health care workers needed to pay more attention to the psychological factors that prevented patients from divulging the names of sexual contacts to a stranger. Furthermore, Baumgartner and Rudolph Kampmeier, a professor of medicine at Vanderbilt University, noted that public officials had not been working well with private doctors and private laboratories to perform adequate case reporting and tracing.[62] From the 1930s to the 1960s, the reporting capacity of diseases to the national PHS had been strengthened by the introduction of the Council for State and Territorial Epidemiologists—a body responsible for deciding national notifiable diseases and updating case definitions.[63] These developments, however, had not advanced the detection of syphilis cases. Although Baumgartner discussed how to enhance case finding and capture the "margin of error," she did not provide any specific proposals for actually carrying them out.

Baumgartner and Terry also addressed the social and economic conditions responsible for the growing problem of syphilis. For example, Baumgartner identified problems that she believed led to an increase in the incidence of syphilis: mobility (creating more opportunities to form casual sex relationships than possible in a small community) and the breakdown of old cultural patterns and mores (children are less closely supervised in cities than in small towns).[64,65] Like Parran, however, she offered no proposals on how to rectify the course of the social trends she identified.[58(p23),65] Furthermore, Baumgartner addressed the importance of sustained government funding to subsidize the costs of a multifaceted syphilis control campaign.[58(p10)] But neither the surgeon general nor the task force could offer any specific provisions to ensure that this funding would continue throughout her campaign.

Baumgartner began to write articles in academic journals and popular magazines to heighten public consciousness about syphilis as a growing problem that needed to be confronted, funded, and controlled. Teenagers in the 1960s, she noted, were brought up in the penicillin era and thus no longer witnessed the death and insanity that had been common outcomes of syphilis before penicillin.[65] William Brown, of the Communicable Disease Center's VD Branch, believed that the increase in syphilis in this group was based in part on the faith in penicillin of both the public

and physicians to handle the disease.[60] They believed that the largest increase in syphilis was in young persons under age 24 who had become familiar with the power of the one-shot penicillin cure of syphilis.[60(p24)] Baumgartner believed that "less inhibition about sexual activity . . . especially among teenagers" could be rectified with educational messages about the ravages of syphilis that she believed had previously served as a deterrent to promiscuity.[65] Like Parran, Baumgartner and Terry took their anti-VD crusade and educational messages about the rising incidence of syphilis to popular magazines to warn readers about the dangers of syphilis and also to place the eradication of syphilis high on the national agenda to obtain funding for her anti-VD program.[64-67] Baumgartner's open warnings of the dangers of syphilis had a favorable response, as periodicals including *Time*, *The Nation*, *The New Republic*, and *Consumer Reports* acknowledged the problem of syphilis and called for something to be done by the medical and public health communities to control the epidemic.[67-73]

After increasing public awareness of the dangers of syphilis, Terry sought federal subsidies for his anti-VD program. Terry, like Parran, maintained that he was justified in seeking federal funding for a social problem that stemmed from a vulnerable environment rather than a moral problem and a failure of individual will.[54] With the advocacy of the surgeon general, the Community Health Services and Facilities Act, enacted by the 87th Congress, was signed into law by President John F. Kennedy on October 5, 1961.[54] It funded grants to the states for the expansion of medical services facilities like nursing homes and medical programs for general public health and outpatient services. It also extended and strengthened the 1946 Hill–Burton Act that enabled the federal government to provide funding to the states, especially for the creation of new treatment clinics, which, according to Terry, were vital to VD control.[54] Based on the task force's recommendations, these federal funds were to be used for comprehensive national anti-VD efforts, including medical services (diagnostic and treatment services and facilities to find, diagnose, and treat individuals with syphilis), epidemiological services (officers trained to interview patients, to trace their contacts, and to bring patients into treatment), and educational activities.[58(p19)] The federal subsidies to control syphilis had increased from $3 million per year in 1955 to $9.5 million in 1964.[47(p144)] Without such a multifaceted, well-funded program, Baumgartner asserted, the epidemic would fester, as control efforts would be limited to

"mere firefighting" that would be unable to "eliminate permanently the conflagration."[58(p21)]

Baumgartner provided an accelerated time line for "the eradication of syphilis as a public health program."[58(p3)]. She said that if the comprehensive program recommended by the task force "can be secured and developed to the required level by 1963 . . . the epidemic spread of syphilis in this country can be stopped within ten years."[58(p5)] On the basis of the task force's report, President Kennedy in February 1962 recommended, and Congress endorsed, what he termed "the initiation of a major 10-year program of Federal grants and direct action aimed at the total eradication in this country of this age-old scourge of mankind."[48(pp140-142),74] The goal of eradicating syphilis was reaffirmed by President Lyndon B. Johnson after he assumed office.[75] William Brown, chief of the Division of Venereal Disease, said that even though to some people it may seem like a pipe dream, the task can be accomplished, much like getting a man to the moon, because we have reliable means of diagnosing and treating syphilis.[48(p141),60]

Nonetheless, Terry's plan failed. The rates of syphilis fell from 69 cases/100,000 when the campaign started in 1962 to fewer than 31 cases/100,000 in 1966 but then relapsed to its baseline by 1972, with 68 cases/100,000.[76,77(p1823)] Terry's campaign failed to secure sustained funding as syphilis was overtaken by other priorities.[78] In 1966, the task force, in fact, had expressed concern that the level of federal funding that was made available per year was insufficient to fully implement all the program activities they recommended.[48] But the lack of sustained funding was not the sole reason for the campaign's failure.[79-81] Despite Baumgartner's attempts to define syphilis as a medical disease, it was difficult to completely escape the moral framework that had prevented some people from being tested or being reluctant to reveal their contacts that compromised both her and Parran's attempts to maximize case finding.[60] Also, we do not know how effective education had been in moderating sexual behavior. Reformers from the social hygienists in the 1920s to Baumgartner in the 1960s had faith that education was a primary means of altering sexual behavior and that individuals would cooperate, but the efficacy of this intervention for STDs has yet to be verified. Furthermore, even though Baumgartner identified those social issues that led to a vulnerable environment, she offered no specific ideas of how to resolve them. Despite their own warnings to do otherwise, Baumgartner and Terry did not offer anything substantively new from earlier eradication programs, and their campaigns suffered an identical fate.

The Current UNAIDS Campaign: Similarities to Syphilis Eradication Programs

Today's UNAIDS 90-90-90 plan is, in essence, an extension of Parran's and Terry's failed anti-VD plans. Like syphilis eradication campaigns, today's UNAIDS campaign also calls for "new ways of operating" to end the epidemic.[1] But the 90-90-90 plan does not make specific provisions for adding anything new, not in finding cases, retaining patients in care, correcting social problems, or ensuring the financing needed to achieve the goal of ending the epidemic. Like the earlier syphilis campaigns, the UNAIDS plan specifies what needs to be done but lacks provisions to accomplish it.

The key features of today's UNAIDS plan are similar to those of earlier 20th-century syphilis campaigns. Its premise (treatment as prevention), design (test and treat), and promises (eradicate HIV within an expedited time span) are all similar to those of previous syphilis eradication plans. The UNAIDS plan, like the syphilis eradication plans, emphasizes the importance of carrying out widespread testing, getting all people into treatment to render them noninfectious, and obtaining central subsidies for their plan. According to the UNAIDS plan, "The world will need to combine political will . . . and sufficient financial resources . . . to reach the target [and] . . . to sustain lifelong HIV treatment for tens of millions worldwide."[1(p28)] But the 90-90-90 plan does not provide specific methods or offer procedures on how to achieve its targets of maximizing case detection (eg, surveillance that is the backbone of public health campaigns) and sustaining effective treatment for the entire life span of all infected persons. Moreover, despite bringing the importance of ending AIDS to the general public's awareness, the UNAIDS plan fails to stipulate how it will procure the sustained funding needed to carry out the program for its duration. Thus, neither the syphilis campaigns nor today's AIDS plan shows how it can achieve the key targets they identified—to diagnose all individuals and to retain them in care until they are treated and rendered noninfectious—and to obtain the consistent annual funding needed to achieve their goals within their accelerated time span.

Neither the syphilis eradication plan nor the UNAIDS 90-90-90 plan provides specific strategies to resolve the social problems that create vulnerable environments and to overcome the moral framing of disease

affecting case finding and retention in care. The UNAIDS plan does address the social ills and moral framing that create a susceptible environment: "Urgent efforts are similarly needed to scale up other prevention strategies, including . . . harm reduction services for people who inject drugs . . . to eliminate stigma, discrimination and social exclusion."[1(p17)] But like the syphilis programs of the 1940s, 1950s, and 1960s, the UNAIDS plan does not detail how to remedy these social problems, which include poverty and poor access to health care for people who live in remote areas. Thus, neither today's UNAIDS plan nor the syphilis programs that preceded it offer a comprehensive plan for how they would overcome the moral, social, and biological factors impeding their goals, or how they would sustain funding to reach their accelerated goals within one generation (Parran in 1936), one decade (Terry in 1962), or 17 years (UNAIDS plan in 2013).

The goals of today's UNAIDS program, in fact, may be even more challenging to achieve than those of earlier syphilis eradication efforts. The global scale of the UNAIDS campaign, as well as the appearance of new unexpected social and behavioral problems, add layers of complexity to the national syphilis campaigns that preceded it. How, for example, could a campaign be customized so that its message resonated with heterogeneous cultures in locales throughout the world? How could it adapt to the ever-changing needs of regions that arise when populations are displaced by war, disaster, or political instability? In addition, ART remains a lifelong therapy, thereby adding another dimension to the already significant challenges of sustained funding, retention in care, medicine adherence, and loss to follow-up that are especially pertinent in countries in sub-Saharan Africa that are battling overburdened health systems and shortages of staff and medicine. The costs of ART both economically (up to $3,000 monthly in industrialized nations) and physically (increased risk of bone fracture and coronary disease associated with some agents and medicines) accentuate these challenges.[82] Furthermore, unexpected HIV outbreaks, including one in a needle-sharing, multigenerational rural population addicted to prescription narcotic drugs, underscore the difficulties of HIV surveillance and treatment.[83] These difficulties are compounded by the burgeoning number of people under the influence of drugs (eg, methamphetamine), leading to disinhibition and risk-taking behaviors, and the growing popularity of soliciting anonymous partners through the Internet.[84] Finally, the admittedly "ambitious" target of 90% for case finding, treatment, and viral suppression specified by the

UNAIDS plan is derived from mathematical modeling studies, but the target is significantly higher than what has been actually demonstrated in HIV treatment clinics across countries and regions worldwide.[5] Thus, a historical approach examining the failure of less ambitious campaigns only deepens the skepticism voiced by some experts about whether the goals of the UNAIDS 90-90-90 plan are attainable.[3]

But a historical approach also allows us to address a larger question: is it feasible to talk about ending an STD epidemic at all? As Allan M. Brandt observed, attempts to define venereal diseases in a framework of scientific medicine has been only partially successful, as each remains to some extent a symptom of moral failure.[25(p160)] The moral framing of STDs, although diminished somewhat since the 1930s, has never completely disappeared. It continues to threaten the process of finding cases, reporting, and tracking contacts, which are indispensable public health tools now referred to as "surveillance" that Parran and Baumgartner relied on to control the epidemic.[63] Parran believed he could capture cases and their contacts and bring them into treatment with his "Wasserman Dragnet"; Baumgartner sought to improve on his plan and to eliminate the "margin of failure"; and the target of the current UNAIDS plan is to diagnose 90% of cases. But can any plan realistically state that it can diagnose the majority of infected individuals, even those who may feel reluctant to be tested or to seek treatment, in the face of the continued stigma associated with STDs? How can a campaign convince an infected individual who may hesitate to reveal the names of his or her sexual contacts, a secret that could shatter a relationship in the infected person's life? Can any campaign realistically plan to overcome the hurdles that it would take to capture the majority of infected people during their asymptomatic period so they are no longer infectious? Finally, how can educational efforts control STDs if sexual activity may not be subject to individual will or amenable to cognitive control at all?[85(p162)] Efforts to end STDs are challenged by social concerns (stigma deters people from testing), biologic factors (asymptomatic latent periods of contagiousness), epidemiologic issues (difficulty tracking contacts occurring in private settings), economic matters (lack of sustainable funding), and the challenges of educational campaigns to curb unsafe sexual behaviors. The distinctive arrays of socioeconomic, biologic, and epidemiologic factors that characterize syphilis also apply to AIDS and weaken the assumption that epidemics of STDs can be ended at all.

Does it matter whether the goals of any campaign to end STDs can be achieved? One could argue that it does not matter because there are indisputable benefits of campaigns to end STDs. The discourse of eradication in itself is inspiring, as evidenced by how elected officials who address it repeatedly invoke the sensational achievement of men reaching the moon. The biologist Rene Dubos also noted the emotional aspects of people's yearning to control epidemic disease.[86] As the AIDS public health expert Wafaa El-Sadr pointed out, the prospect of envisioning a world without epidemic HIV can serve as a rallying call for health care workers.[87] When inspired, workers worldwide can better focus their efforts on taming what some have called the scourge of our time.[17(pp250-255)] According to this line of thinking, the prospect of ending AIDS can galvanize multisectorial leaders to work together to increase access to ART and reduce the incidence of HIV as much as possible, a goal so laudable in itself that nobody could object if ending the epidemic were not achieved. Indeed, it could be argued that earlier syphilis eradication programs have demonstrated some degree of merit simply by persuading some individuals to seek treatment who otherwise would not have been persuaded and therefore temporarily diminishing the spread of disease. Campaigns to end disease, in this line of thinking, provide an undeniable benefit by exerting some control of the disease.

In contrast, declaring a goal of ending an epidemic when no explicit methods have been outlined to ensure that its milestones can be reached carries a potential downside. Initiating a campaign that is unlikely to succeed can risk misleading workers. Individuals who tirelessly work on achieving the goal can become disillusioned by unmet promises; lose their motivation; become resigned, bewildered, and embittered; and potentially curtail their efforts to continue working toward their goals. This can be compounded when experts voice conflicting views about the likelihood of ending the epidemic. Such a situation occurred in 2015, when UNAIDS had already articulated its 90-90-90 plan. At that time, Thomas R. Frieden, then director of the Centers for Disease Control and Prevention, viewed the Austin, Indiana, outbreak as a "sentinel event" because it had "a higher incidence of HIV than any country in sub-Saharan Africa."[88] In addition, as El-Sadr explained, a discourse of ending an epidemic could risk the withdrawal of resources by implying that disease elimination is forthcoming.[87] Such a discourse could paradoxically lead to a rebound in the HIV burden. Campaigns to end AIDS that cannot be met can result in misinforming and alienating not

only health care workers but also the donor countries and agencies that subsidize the effort.

How can the UNAIDS proposal avoid this potential shortcoming? One possibility would be to retain the present goal and truly attempt "new ways of operating." An "HIV Dragnet," for example, could be attempted to optimize case detection by implementing real-time, rapid HIV testing in door-to-door settings or mobile testing units or by using peer-driven recruitment (eg, in areas where stigma might otherwise limit access).[2] Incentive-based programs, including cash transfers, could be considered to aid linkage to care and to promote adherence to ART.[2] Improved treatment for substance use disorders could be implemented along with HIV treatment to boost adherence in the growing subset of people with HIV infection and substance abuse problems.[89] In addition, instituting structural HIV prevention programs (eg, universal needle exchange programs, decriminalization laws to protect the rights of gay citizens, and legalization and regulation of brothels to test and treat workers for STDs and ensure they are free of disease) would reduce environmental vulnerability.[90,91] The challenge of customizing these interventions to local regions internationally, however, is enormous, and the cost of subsidizing them globally would likely be prohibitive. Designing a multifaceted program that includes explicit proposals to increase case finding and retention in care and to address social barriers to end the epidemic may therefore not be fundable or attainable.

An alternative option for public health officials designing an AIDS control program would be to discard the goal of ending the epidemic altogether and to revert to using numerical goals of increasing ART distribution globally. This approach has repeatedly demonstrated success in fulfilling its goals of expanding ART distribution globally in 2005 (the "3 by 5" campaign) and again in 2015 (the "15 by 15" campaign). These programs, moreover, have decreased mortality and reduced the number of new cases worldwide. There is no reason to doubt that reinstituting a UNAIDS program with the goal of increasing ART distribution to a new numerical goal by a particular date (eg, the "25 by 25") would offer benefits to patients and the population that would be identical to those of an eradication campaign. Moreover, reinstituting a numerical goal for the next UNAIDS campaign would avoid the risk of misleading workers and donor agencies—the potential downside of a failed campaign to end AIDS.

Scientists, doctors, and public health experts have speculated that a cure, an effective vaccine, or both might be the biomedical breakthrough required to accelerate the end of the AIDS epidemic.[3,92,93] Undeniably, both advances would be a welcome addition for treatment and prevention. But there is no precedence for either one leading to ending an STD epidemic. The failure of the single-dose penicillin cure to eradicate the syphilis epidemic, for example, weakens the assumption that a curative HIV drug, if available, could end the AIDS epidemic. Furthermore, one can examine the use of an effective vaccine against another STD—HPV and its associated malignancies—as an indicator of what the utilization of an HIV vaccine may be. The widespread usage needed to end HPV-associated cancers has been hindered by heightened sexual anxieties of parents who fear that giving the vaccine to their teenaged sons or daughters would encourage promiscuity.[94] The current vaccine uptake (percentage of targeted population that is vaccinated) of 55% is below the herd immunity (indirect protection of infection for the entire population) required to protect those who have not been vaccinated, and the malignancy remains prevalent.[95] The same problems that have led to not fully utilizing the HPV vaccine—reluctance to encourage sexual behavior in targeted populations, including young teenagers—would likely apply to other STDs, including HIV. Thus, the 90-90-90 goal of ending AIDS may not be achievable even if a cure or an effective vaccine were to become available.

Discourse of Ending HIV: A Fixture of the HIV Epidemic

The repeated invocation of ending HIV throughout the AIDS epidemic raises this question: Why has this utopian ideal persisted? The initial discourse may have been a carryover of a widespread confidence in the decades preceding AIDS that epidemics could become a thing of the past. The success of antibiotics in treating bacterial infections that had previously been fatal, the elimination of polio in the Western Hemisphere, and the elimination of smallpox globally with the use of vaccines were able to reinforce the power of biomedical advances to handle infectious epidemics.[96] These advances of scientific medicine and technology bolstered the public's and public health officials' expectations that it was within their power to forever banish plagues and epidemics of years

past.[97,98] But the confident expectation that it was only a matter of time before epidemics were permanently conquered proved short-lived. When AIDS appeared in 1981 and shattered the false sense of confidence that epidemics had yielded to the laboratory's discoveries, scientists were mystified as to why the unexpected array of debilitating and perilous infections occurred in healthy homosexual men, and they immediately began to hunt for a microbial cause.[99] In 1984 when this research led to the discovery of the virus that causes AIDS, a discourse to end AIDS resurfaced, renewing confidence in the powers of biomedicine to control epidemic infections. The allure of this belief, fueled by the sensational success in eradicating smallpox globally, has been so powerful for scientists, elected officials, and public health experts that the discourse to end AIDS endures today.

The success in eliminating smallpox, however, is not applicable to HIV. The characteristics of diseases that have been eliminated (eg, smallpox, rinderpest) or others that have been nearly extinguished (polio, guinea worm disease [dracunculiasis]) are markedly different from those of STDs like syphilis or AIDS. Smallpox, for example, has distinct biologic properties: patients have a brief incubation period and only become contagious afterward when they are visibly symptomatic. These biologic features facilitate accurate case finding and eliminate the problems of testing asymptomatic persons that apply to STDs. Furthermore, direct spread to immediate household contacts facilitates accurate contact tracing, as there are no intimate, behind-doors acts of transmission as occurs with STDs. In addition, an effective vaccine is available when given to exposed, uninfected persons, and so-called ring vaccination permits a focused public health effort, as opposed to vaccination of an entire at-risk population. Finally, although stigma is not absent from any disease, unlike STDs, the stigma associated with smallpox did not nullify the basic public health tools needed to control smallpox: surveillance, contact tracing, and vaccination at public health clinics. Because of the differences of smallpox's biological, epidemiological, and social characteristics from those of syphilis and HIV, the success in eliminating epidemics like smallpox is not applicable to STDs.

Similarly, the history of public health campaigns against non-STDs has shown that the vast majority are not suitable for elimination. Eradication campaigns were begun in the early 20th century by the Rockefeller Foundation against hookworm disease in the southern United States and also against yellow fever and malaria before World War II.[100(pp49-97)]

Eradication was subsequently advocated by the World Health Organization (WHO), with campaigns against yaws, yellow fever, malaria, and, more recently, poliomyelitis and guinea worm disease.[101(pp1-18)] The malaria public health campaign illustrates why so few communicable diseases are suitable for eradication: biological factors (development of drug resistance in the microbe) combine with social and economic conditions (migrating worker populations continuously exposed to efficient vectors) to fuel recurrent epidemics, despite attempts to control the disease with prophylaxis.[102] Furthermore, even when campaigns approach success, they become so logistically complex that they require a growing number of resources from international health foundations (eg, UNICEF and WHO) and philanthropic organizations (eg, the Rockefeller Foundation, the Bill and Melinda Gates Foundation).[17(p7)] That is, the funding necessary to achieve disease eradication is not sustainable, as it crowds out resources and attention from other public health priorities. Consequently, some public health officials have questioned whether pursuing the eradication of specific human diseases could worsen overall health outcomes by depleting finances that could be used to improve overall health (eg, programs to promote better nutrition, oral rehydration techniques to fight diarrheal diseases) or combat other important diseases (eg, neglected tropical diseases) that are overlooked by an intense concentration on ending epidemics of specific human diseases, whether they be non-STDs, syphilis, or AIDS.[103]

Conclusion

The UNAIDS 90-90-90 program, like the syphilis programs before it, has not provided a comprehensive plan of how it will achieve its treatment objectives and accelerated goal of ending the respective epidemic. By not including these provisions, today's UNAIDS plan could well meet the fate of previous syphilis eradication campaigns, what Baumgartner in 1962 referred to as "another crack at an old and familiar enemy." Today's UNAIDS proposal, in this sense, has features that overlap with the aspirational discourse to end AIDS present in the early phase of the HIV epidemic. Moreover, the distinctive biological and socioeconomic features of STDs like syphilis and HIV may make these diseases unamenable to be conquered. The problem that Parran identified in 1936—that we have the medical and scientific knowledge in hand to

end syphilis but we don't know how to apply it—remains applicable to HIV today. Similarly, the repeated trope of reaching the moon remains relevant to today's HIV control program. But the motivational purposes for which it has been traditionally used may no longer be fitting. It may be more appropriate to say that science has assembled the spaceship capable of reaching its stellar goal of ending the HIV epidemic, but we don't yet know which switches to activate at mission control to land us there.

[Note: The archival papers of Parran and Baumgartner located at USPHS were beyond the scope of this paper. Nonetheless, these primary archival sources might be valuable for future studies as they may shed light on how Parran and Baumgartner arrived at the stated goals covered in this paper. They may also lead to a better understanding of what factors influenced them to emphasize certain interventions (eg, scientific training) and deemphasize others (eg, condom use).]

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