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Syphilis Elimination: Lessons Learned Again

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Abstract

It is estimated that approximately 20 million new sexually transmitted infections (STIs) occur each year in the United States. The federally funded sexually transmitted disease prevention program implemented by Centers for Disease Control and Prevention is primarily focused on the prevention and control of the three most common bacterial STIs: syphilis, gonorrhea, and chlamydia. A range of factors facilitate the transmission and acquisition of STIs, including syphilis. In 1999, Centers for Disease Control and Prevention launched the *National Campaign to Eliminate Syphilis from the United States*. The strategies were familiar to public health in general and to sexually transmitted disease control in particular: (1) enhanced surveillance, (2)expanded clinical and laboratory services, ((3) enhanced health promotion, (4) strengthened community involvement and partnerships, and (5) rapid outbreak response. This national commitment to syphilis elimination was not the first effort, and like others before it too did not succeed. However, the lessons learned from this most recent campaign can inform the way forward to a more comprehensive approach to the prevention and control of STIs and improvement in the nation's health.

Approximately 20 million new sexually transmitted infections (STIs) occur each year in the United States. The 2016 Sexually Transmitted Diseases (STD) Surveillance Report states, "Across the nation, at any given time, there are 110 million total (new and existing) infections. These infections can lead to long-term and costly consequences." Although not nationally reportable human papillomavirus (HPV) is thought to be the most common STI in the United States and persistent infection with some HPV types can cause cancer and genital warts.[1] Herpes simplex virus (HSV), also not nationally reportable, is also among one of the most prevalent STIs. It is believed that most persons with genital HSV infection have not received a diagnosis.[2] Among the three most commonly occurring bacterial STIs, chlamydia, gonorrhea, and syphilis, chlamydia rates are the highest, particularly among young women, the population currently targeted for routine screening. In 2016, over 1.5 million chlamydial infections were reported to the Centers for Disease Control and Prevention (CDC), for a rate of 497.3 cases per 100,000 population. Among women the chlamydia case rate was 657.3 per 100,000 females, which means that more than one million cases of chlamydia were diagnosed in American women. Equally significant in 2016 was the rate of gonorrhea in 2016. A total of 468,514 cases of the infection were reported in 2016 for a rate of 145.8 per 100,000; and the emerging threat of *N. gonorrhoeae* cephalosporin

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resistance raises concerns about the continued availability of effective gonorrhea treatment.[3] Although the number of primary and secondary (P&S) syphilis cases is substantially lower than the cases of HSV, chlamydia, and gonorrhea, the rate of P&S syphilis has increased almost annually since 2001. In 2016, 27,814 P&S cases were reported to CDC, a rate of 8.7 per 100,000 population, the highest rate reported since 1993, and a 17.6% increase in the rate from 2015. Also, in 2016, there were 628 reported cases of congenital syphilis, 41 of which were syphilitic stillbirths. The congenital syphilis rate in 2016 was 15.7 cases per 100,000 live births. Clearly, the burden of STDs, including syphilis, is a threat to the health of American citizens, and is a public health imperative.

The STD prevention program implemented by CDC is primarily focused on the prevention and control of the three most common bacterial STIs: syphilis, gonorrhea, and chlamydia. In 1999, at a time when infectious syphilis was close to its nadir nationally, CDC launched the *National Campaign to Eliminate Syphilis from the United States*. It was an ambitious plan, combining intensified traditional approaches in such a way as to generate new synergy to enhance the effectiveness of these approaches to accomplish the goal of reducing P&S syphilis cases in the United States to 1,000 or fewer (a rate of 0.4 per 100,000 population) and to increase the number of US syphilis-free counties to 90% by 2005.[4] Intensified though they were, the strategies were familiar to public health in general and to STD control in particular: (1) enhanced surveillance, (2) expanded clinical and laboratory services, (3) enhanced health promotion, (4) strengthened community involvement and partnerships, and (5) rapid outbreak response.

The campaign was launched in the fall of 1999. Yet by 2002 P&S syphilis cases were rising again, largely among men who have sex with men (MSM), a population that had had a history of high rates of infectious syphilis until the era of HIV/AIDS.[5] Studies suggest that perhaps one third to one half of the decline in P&S syphilis rates between 1990 and 1995 could be attributed to AIDS mortality among the MSM population. By 2004, more than 60% of P&S cases were occurring in MSM.[6,7]

In 2006, informed by the lessons learned from implementing the 1999 plan, and in consultation with external stakeholders, the national syphilis elimination plan was revised. The revised elimination goal was set at an overall rate of 2.2 per 100,000 population, and now included separate targets for men and women. For men, the new target rate was 4.2 per 100,000 population by 2010; and for women the new target rate was .38 per 100,000 by 2010. The revised target rate for congenital syphilis rate was set at 3.9 per 100,000 live births by 2010; and the black:white ratio target for 2010 was 3:1.

The updated plan now emphasized three process goals: (1) investment in, and enhancement of, public health services and interventions; (2) prioritization of evidence-based, culturally competent interventions; and (3) ensuring accountable services and interventions.[8] These new process goals were to be achieved through the implementation of nine specific strategies (see Table 1), and all were aimed at executing a broad line of attack on the syphilis spirochete. Meanwhile, the cases of chlamydia and gonorrhea also continued to rise.

COMPLICATIONS AND IMPLICATIONS

A range of factors facilitate the transmission and acquisition of STIs, including syphilis.[9,10] Some, such as the number of sexual partners a person has, are at the individual level, whereas others, such as the availability of sexual partners, are community or contextual factors. Still other factors are likely to be at the structural level, such as access to health care for screening, diagnosis, and treatment services that interrupt disease transmission. To respond effectively to a myriad of factors can demand a variety of interventions. The Health Impact Pyramid, developed by Thomas R. Frieden in 2010, provides a useful illustration for understanding the relationships between these various factors, as well as describing the intensity of effort needed to intervene at the different levels (See Fig. 1). A majority of common STD prevention and control efforts, including those highlighted in the syphilis elimination effort, tend to address the upper levels of the pyramid, consequently they are likely to require the greatest effort while rendering the smallest impact, particularly if they have as their singular focus the prevention and control of a single organism.

Local jurisdictions during the syphilis elimination effort frequently faced different phases of STD epidemics across their respective jurisdictions, in much the same way as they do now.[11–14] In some jurisdictions, for example, a target population with high endemic rates of gonorrhea and chlamydia can suddenly find itself in the throes of a spiking outbreak of syphilis. To be effective, a local health department can be called upon to mount a targeted out-break response while at the same time maintaining an ongoing program to address endemic diseases.

Further adding to the complexity of these efforts, in the US racial, ethnic, and sexual minority populations experience higher rates of reported STDs when compared with rates among whites.[15] Having a minority status is not in itself a source of risk for STDs, such as syphilis. However, returning to the Health Impact Pyramid, the social circumstances often commensurate with minority status in the United States, such as poverty, unemployment, and low educational attainment often place individuals in higher-risk situations.[16,17] Furthermore, to design effective interventions, it is important to understand and respect the cultural diversity of the populations impacted by syphilis and other STDs. Although it can be said that most STDs are similar in their transmission dynamics, the persons affected by these diseases often are not. Cultural backgrounds that give meaning to sexual encounters, and even historical experiences with government or health care institutions, can influence the effects of STD prevention and control interventions. The kind of patient discrimination, for example, that fosters patient distrust of providers can render *accessible* health care *unacceptable*, and therefore *unaccessed*.[18] These kinds of challenges plagued the syphilis elimination effort, and in some locations continue to impede STD prevention and control efforts today, regardless of the infecting organism.

A COMPREHENSIVE APPROACH TO SEXUAL HEALTH

Despite a commitment to implementing a coordinated, multidisciplinary program to eliminate infectious syphilis in the United States, the initiative did not succeed, but this most recent decade-long campaign was not the first of such efforts to fail. As early as 1931,

Thomas Parran advancing the position that sufficient scientific knowledge was already available and practical methods were known to stop syphilis, wrote:

> "To a student of the problem it seems strange that syphilis has not already been brought under control, so simple does the task seem as compared with other major health problems in which greater progress is being made."[19]

As another scientist of that day put it, "the golden decade of syphilis control" began in 1936.[20] By 1943 penicillin was an effective, widely available cure for syphilis. Yet by the early 1960s Congress was again asking a question similar to Parran's. A special task Force was appointed to study syphilis in the United States and reported to the surgeon general that nearly 19,000 persons had contracted infectious syphilis in 1961, the highest number of cases reported since 1950. The report described a chain reaction in the spread of syphilis infection, especially among teenagers, noting that the actual cases far outnumbered the cases reported; and that effective techniques of control and therapy were available but not applied widely enough; and that unless a "vigorous, stepped-up program" was inaugurated immediately the increased spread of syphilis could be accelerated. The task force report also set forth the elements of such program: (1) public health workers conducting physicians' visits; (2) improving laboratory reporting to health departments; (3) intensifying partner services (interviewing/investigations); (4) educating providers and general public; (5) conducting research in: syphilis immunology and therapy, laboratory procedures, and sexual behavior of adolescents and young adults; and (6) providing "unstinted support" of the program by federal, state, and local governments even after the reported number of syphilis cases began to decline.[21] The task force report to the then surgeon general called for the eradication of syphilis. It did not happen.

Three decades later, in the 1997 publication, *The Hidden Epidemic*, the Institute of Medicine (IOM) offered a vision to address the epidemics of STIs, including syphilis: "An effective system of services and information that supports individuals, families, and communities in preventing STDs, including HIV infection, and ensures comprehensive, high-quality, STD-related health services for all persons." The report included four overarching strategies to accomplish sexual health for all Americans: (1) overcome barriers to adaption of healthy sexual behaviors; (2) develop strong leadership, strengthen investment, and improve information systems for STD prevention; (3) design and implement essential STD-related services in innovative ways for adolescents and underserved populations; and (4) ensure access to and quality of essential clinical services for STDs. The authors of the report stressed the need for a more comprehensive approach to STD prevention and control that required collaborative partnerships among state and local governments, nongovernmental organizations, providers, and communities. The IOM committee used the word *system* to describe "an interacting or independent group of services and organizations that function as a whole," a system that would be "coherent, comprehensive, and coordinated."[22]

Based on more than 70 years of STD prevention and control one lesson is clear, to increase effectiveness prevention and control strategies should be comprehensive and multidisciplinary. Such work requires collaborative relationships among providers public and private, as well as with affected populations burdened by these diseases. The work requires resources that are sustained overtime, even if and as the disease rates fall.[23]

Although the most recent syphilis elimination campaign was a movement away from a more comprehensive approach to sexual health envisioned by the IOM report, it was intended to be a multidisciplinary, multifaceted effort that would address structural, community, and individual levels factors that continue to contribute to the persistence of infectious syphilis in the United States. Although the elimination campaign focused on a single organism, it was believed that the initiative would ultimately provide an opportunity to put into place a coordinated comprehensive method that could be applied to the prevention and control of all STDs, advancing the personal health of American citizens.

LESSONS LEARNED

The national syphilis elimination effort did achieve some successes in the initially targeted populations. Between 1999 and 2005, there was a 95% reduction in P&S syphilis in women, and a 92% reduction in congenital syphilis. Disparities were reduced. The black-white rate ratio went from 28.6:1 to 5.4:1. However these early successes have since eroded. For example, in 2009, more than 50% of all P&S syphilis cases reported to CDC were among black Americans. At that time, for some black Americans, particularly black men 15 to 19 years old, the P&S rates in 2009 increased 167%.[24] By 2016, 36.6 of reported P&S syphilis occurred among Blacks, for a disparity rate of 4.7 times the rate for whites. The P&S rates were highest among black men aged 20 to 24 years and 25 to 29 years.[25]

Addressing a broader array of determinants of sexual health may be a more effective strategy for reducing health disparities but implementing such an approach is challenging. What then were the key lessons learned from this latest effort to eliminate syphilis from the United States? Five fundamental components emerged as being key: (1) access to care is essential, (2) expanded partnerships are critical, (3) diverse epidemics require tailored interventions, (4) effective program evaluation is critical, and (5) it takes more than money.[26]

Access to Care Is Essential

Access to quality clinical care is paramount for early diagnosis, timely treatment, and patient counseling for syphilis. Health care providers must actively assess their patients' needs for screening for all STDs, including syphilis. Patients with STD-related symptoms or who are sexual contacts to individuals with infectious syphilis need accurate diagnoses and presumptive treatment. Financial, structural, personal, and interpersonal barriers can limit access to these vital STD health care services.

Expanded Partnerships Are Critical

One key to addressing the barriers to STD health care is collaborative partnership. New conceptual frameworks, like health equity and sexual health, require the engagement of new partners to improve STD prevention within a wellness context. To prevent and control syphilis, as well as other STDs, programs will need to partner with other service providers in a manner that respects their differing expertise and priorities. There will be times when syphilis, and STD prevention and control writ large, will ride in the car but it will not steer it. Building and maintaining partnerships can be resource-intensive but the payoff can be great. To obtain these rewards may mean implementing strategies that are not only not *bug-*

specific, and will at times have to go beyond STD prevention and control to achieve more well-rounded definitions of wellness. At their core, most STD prevention messages are similar (e.g., use of condoms, limiting number of sex partners, the value of knowing infection status), but public health workers who deliver these messages may have expertise in one disease but not in others. It can often be necessary for these workers to even make social service referrals.

Diverse Epidemics Require Tailored Approaches

As the trajectory of the P&S syphilis epidemic changed governmental programs frequently struggled to rapidly adapt and respond. Unfortunately, most public health programs do not evolve as swiftly as sexually transmitted epidemics; and too often, the delay between outbreak detection and programmatic response allows syphilis and other STDs to establish a substantial foothold. Traditional methods of case finding initiated by STD programs, such as increased screening in correctional settings, or outreach screening in external venues often had limited disease-detection value.[27] Partnering with other service providers to build on established systems that are otherwise outside of the STD prevention sphere, as well as proactively engaging with the affected populations can lead to more informed interventions.[28]

Effective Program Evaluation Is Critical

Effective and informative program evaluation can be challenging but it is essential to the success of a program.[29] The syphilis elimination campaign clearly would have benefitted from more robust and rigorous program evaluation, assuming the resulting data were used for program improvement. Evaluating the effectiveness of program activities and interventions helps to ensure the best use of what can be limited resources. Despite CDC's attempts to assess syphilis elimination program effectiveness by using performance measures, structured program assessments, and ultimately the evidence-based action plans,[30–32] evaluation of the syphilis elimination effort was less than optimal. The very diversity of the syphilis high morbidity areas made a national evaluation impractical, and many state and local programs were unwilling to put resources into evaluation, choosing instead to put them into direct individual services despite a paucity of evidence of population impact. Because they were so highly invested in these particular services, situations where assessments revealed dubious intervention outcomes, programs, local, state, and federal were often unwilling to forgo their usual approaches.

It Takes More Than Money

Generally speaking, many public health programs are often underfunded.[33] The 1999 to 2010 syphilis elimination campaign was no exception, even though the early impact of federal funds on syphilis elimination activities was found to be beneficial.[34] The campaign was never funded to the level officially requested in a 1998 Report to Congress,[35] and in many cases, federal funding levels changed. However, successful programs are often able to adapt to limited resources, creating mutually supportive partnerships with other organizations to accomplish their respective missions. Staff who might otherwise be content to work separately in their individual silos are compelled to work together, so that they interact together to function as a whole system. In the latest syphilis elimination effort, local

outcomes could have been improved if more local STD programs had pursued the benefits of integrated evidence-based agendas that linked surveillance data to program relevant questions.

THE WAY FORWARD

In December 2015, Naomi Sharp, a journalist writing for The Atlantic, described the resurgence of syphilis in the United States. She wrote,

> "Researchers are still trying to work out why these increases are happening now, but the CDC's report offers a few clues. For one, syphilis isn't the only sexually transmitted disease becoming more common. Syphilis, chlamydia, and gonorrhea—the three STDs that comprised the focus of the report—rose simultaneously for the first time on record, which suggests an underlying cause that isn't syphilis-specific."[36]

As far back as 1963, Bernard F. Rosenblum, speaking at the 68th Annual Convention of the National Medical Association asking a similar question pointed to a similar finding. "Of the five venereal diseases found in the United States today," he observed, "two syphilis and gonorrhea are occurring with enough frequency to be causing considerable alarm among public health officials."[37] The context about which Rosenblum spoke more than 50 years ago is a context not unlike today. To successfully prevent and control STDs, including syphilis, requires a commitment to collaborative partnership with other agencies and institutions, and with the populations affected by these diseases. In the recent syphilis elimination campaign effective partnerships maximized limited resources in some instances providing opportunities to develop innovative ways to accomplish STD prevention and improve public health. Expanded partnerships were fundamental to improving health care accessibility, but also enhancing its acceptability, increasing sustainability.[26] Some state and local programs were able to implement more comprehensive interventions by partnering with a range of social welfare and health care providers, which expanded the scope of their efforts and increased the availability of services. These successful programs not only ceased to be bug-specific, they became health facilitators in their communities, not only for STD prevention but for wellness in general.[38] Such partnerships usually require a broader framework than the singular focus on syphilis provides.

However, collaborative partnerships are not easy enterprises. The World Health Organization defines partnership as a voluntary agreement between two or more entities to work collaboratively toward a set of shared outcomes. It is not merely a transfer of funds from one organization to another.[39] Partnerships can be multisectorial and intersectorial, and at times bound by rules made by others completely external to the partnership itself. They usually entail additional resources, beyond money, such as time and patience, and arguably the most important resource—power, power to set the agenda, to define the methods, to measure the success. By collaboratively working with other organizations, as well as with the affected communities, STD programs can reach the lower levels of the Health Impact Pyramid for greater impact, or as others have called it, they can work on "upstream solutions" that reduce the burden of STDs, including syphilis.[40]

Syphilis has long cast a *shadow on the land*, but it is not unique in this regard. In 1998, as consultations were underway to develop the 1999 plan, gonorrhea cases were rising. Between 1997 and 1998, the gonorrhea rates for 15- to 19-year-old adolescents had increased from 521.6 per 100,000 to 560.6, and for 20- to 24-year-old young adults increased from 548.4 to 609.6. During 1998, 607,602 chlamydial infections were reported to CDC, exceeding the reported cases of gonorrhea which by then had reached a total of 355,642.[41] Moreover, by 2001, according to published data, there were more than 45 million cases of HSV, genital herpes, and it was estimated that up to 70% of STD clinic patients had the infection.[42] These infections are commonly transmitted by intimate interpersonal behavior, and individual immunity is not likely. Risks for these infections are associated with a range of individual, community, and societal determinants over which many of the most affected populations, and the providers that seek to serve them, may have little to no control. Nearly 20 years ago, Edward W. Hook III, in his paper, "Is Elimination of Endemic Syphilis Transmission a Realistic Goal for the USA?" advised:

> "Although at no time in the past 30 years have the prospects for effective US syphilis control been greater, the success of efforts to eliminate syphilis transmission will hinge on the way that larger inequities in health care are addressed. As recently articulated by Gunn et al,[43] only by adopting a new paradigm for STD control can public health agencies, working together at national and local levels with the public they serve, finally succeed in removing this singularly American 'shadow on the land.'"[44]

Although the National Campaign to Eliminate Syphilis was aimed at reducing a long-standing health disparity, to achieve health equity the more effective approach is less likely to be *bug-specific*. Even if syphilis elimination were to be accomplished, what might that mean to the communities still disproportionately burdened by the other STDs and the associated costs and consequences? There was a time when the scourge of syphilis was everywhere, but today despite the rising rates, infectious syphilis is relatively rare compared with the epidemics of other diseases, including other STDs. Recognizing the broader impact of STDs in the United States and in their communities, affected populations, and some providers, are baffled by the singular emphasis on syphilis. The most frequent concern expressed in calls to the STD Hotline, for example, is about HSV.[45] A comprehensive approach to promoting sexual health and wellness may be a more effective way forward to improving the health status of Americans. Yet, the lure of *making history*[46] by eliminating infectious syphilis maintains its fixating appeal.

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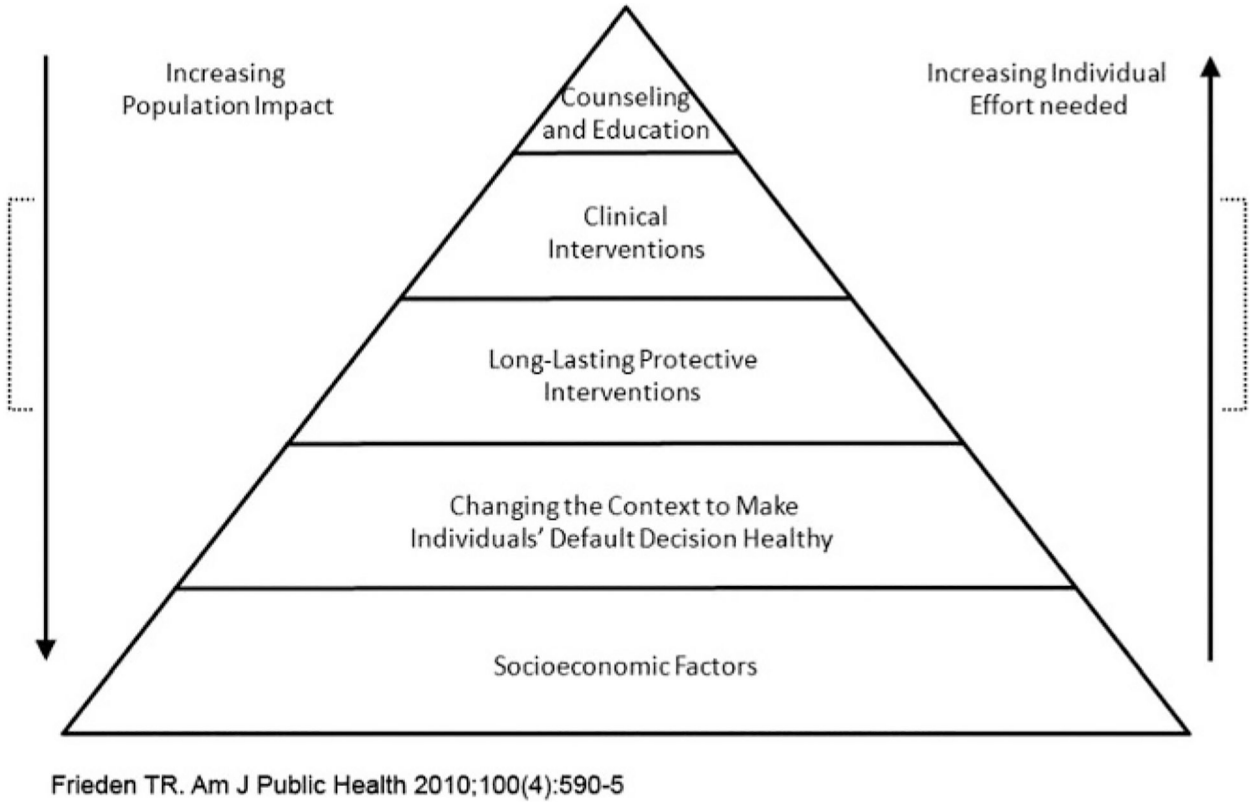

Figure 1.
Health impact pyramid.

TABLE 1.

The 3-By-3 Approach to Syphilis Elimination in the United States

Syphilis Elimination Goal	Syphilis Elimination Strategies
Investment in, and enhancement of, public health services and interventions	(1) Improve and enhance syphilis surveillance and outbreak response.
	(2) Improve and quality assure clinical and partner services.
	(3) Improve and quality assure laboratory services.
Prioritization of evidence-based, culturally competent interventions	(1) Mobilization of affected communities.
	(2) Tailoring intervention strategies for affected populations.
	(3) Mobilization of, and creating alliances with health care providers.
Accountable services and interventions	(1) Training and staff development.
	(2) Evidence-based action planning, monitoring, and evaluation.
	(3) Research and development.

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