

The Public Health Response to Epidemic Syphilis, San Francisco, 1999–2004

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In 1999, the Centers for Disease Control and Prevention launched the National Plan to Eliminate Syphilis. From 1999 to 2003 in San Francisco, early syphilis was epidemic, increasing from 44 cases to 522 cases a year. Syphilis cases were more likely to be in gay or bisexual men, those with human immunodeficiency virus (HIV) infection, those who had anonymous partners, and those who met sex partners on the Internet. Increases in sexual activity and sexual risk behavior in men who have sex with men during this period have been attributed to the improved physical health of HIV-infected men on highly active antiretroviral therapy, HIV treatment optimism, increases in methamphetamine use, and the use of Viagra.

The San Francisco Department of Public Health's response to the epidemic included enhanced surveillance, expanded clinical and testing services, provider and community mobilization and sexual health education, and risk factor identification and abatement through investigations, public health advocacy, and treatment. Collaborations with community-based organizations and local businesses were key to the successful implementation of disease-control efforts. A multitude of converging risk factors and new environments contributed to the syphilis epidemic, requiring a comprehensive, innovative, and flexible disease-control strategy.

ALTHOUGH READILY CONFIRMED WITH a simple blood test and easily treated with penicillin, syphilis is known for its protean clinical manifestations, making diagnosis challenging even for the most astute physicians.¹ Syphilis increases the transmission of the human immunodeficiency virus (HIV) between two- and fivefold² and, if untreated, can lead to serious neurologic and other physiological complications, including death. Syphilis outbreaks represent a failure in disease control and are sentinel events in community health.³

Syphilis is theoretically amenable to eradication.⁴ Because re-

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ported syphilis cases were reaching a record low in the United States, in 1999 the Centers for Disease Control and Prevention (CDC) launched a national campaign to eliminate syphilis.^{4–6} In San Francisco, syphilis had declined from a peak of 2200 cases of early syphilis in 1983 to 41 cases in 1998.⁷ In the summer of 1999, an outbreak of syphilis in gay men associated with meeting partners in a single Internet chat room hosted by America Online⁸ presaged a rapidly expanding epidemic. From 1999 to 2003, early syphilis cases increased in San Francisco residents from 44 to 522.⁹ Since the late 1990s, syphilis outbreaks have occurred in gay men in major urban areas throughout the United States, Canada, and Europe.^{10–17}

Historically, successful prevention and control strategies for syphilis focused on secondary prevention through increased screening, rapid identification and treatment of cases, and partner notification.¹⁸ Building on those strategies in the current epidemic of syphilis in men who have sex with men, STD Prevention and Control Services, San Francisco Department of Public Health (SFDPH), created new prevention and control activities for the 21st century. In this report, we review our response to the epidemic of early syphilis through increased disease surveillance, enhanced clinical and testing services, enhanced health promotion and education, modification of high-risk environments, risk-factor reduction, expanded treatment of sexual contacts, and evaluation of the local syphilis epidemic's impact on HIV transmission.

Epidemiology

During 1999 to September 2004, a total of 1730 cases of early syphilis were reported in San Francisco residents. Figure 1 shows the epidemic curve of early syphilis cases by gender and sexual orientation. Disease control investigators were able to interview 1470 (85%) of reported cases to confirm treatment and collect additional epidemiologic information.

Table 1 shows demographic and behavioral characteristics of early syphilis cases. Compared to the general population of San Francisco, case patients were more likely to be male, gay, or bisexual and HIV infected. Almost 75% of patients reported anonymous sex partners. Table 1 shows during the epidemic period that there was a significant increase in patients meeting new sex partners on the Internet and reporting recent methamphetamine use

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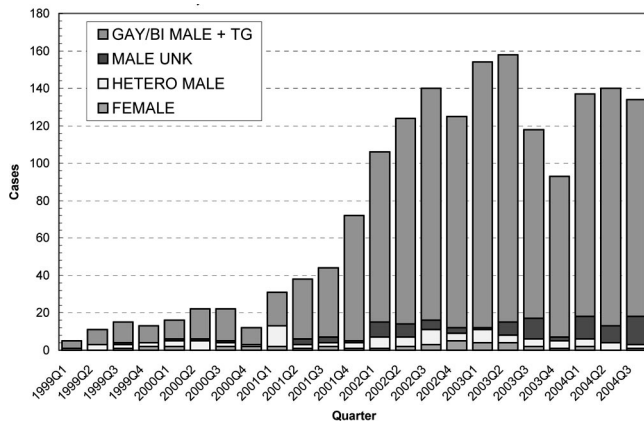


Fig. 1. Epidemic curve of early syphilis by gender and sexual orientation, San Francisco, 1999–2004. Gay/Bi + TG = gay, bisexual, and transgender. Unk = unknown. Hetero = heterosexual.

($P < 0.01$ for both), as well as the frequent use of Viagra. The proportion of cases reporting meeting partners at sex clubs or bathhouses was stable or declined, whereas those meeting at bars or clubs increased ($P < 0.01$).

Response

Enhanced Surveillance and Risk Factor Investigation. In order to identify new trends or social-sexual networks associated with syphilis transmission, we increased syphilis surveillance to include weekly review of characteristics of all reported early syphilis cases; monthly review of syphilis test positivity at SFDPH clinical sites, including detention facilities; and initiated syphilis testing on masked, unlinked serum specimens collected from persons undergoing HIV testing at anonymous HIV testing sites.

Because the initial outbreak of syphilis in the summer of 1999 was related to meeting partners on the Internet,⁸ from August 1999 to May 2000, we surveyed patients attending the municipal sexually transmitted disease (STD) clinic to learn more about sex partnering patterns and risk behavior associated with Internet use. We found that the proportion of patients who reported meeting sex

TABLE 1. Select Characteristics of Early Syphilis Cases, San Francisco, 1999 to September 2004

Characteristic	1999		2000		2001		2002		2003		2004*	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
All cases	44	(100)	72	(100)	185	(100)	495	(100)	522	(100)	391	(100)
Repeat in last 12 months	0	(0.0)	1	(1.4)	2	(1.1)	26	(5.3)	42	(8.0)	27	(6.9)
Stage of disease												
Primary	4	(9.1)	17	(23.6)	53	(28.6)	106	(21.4)	109	(20.9)	93	(23.8)
Secondary	25	(56.8)	37	(51.4)	85	(45.9)	212	(42.8)	222	(42.5)	158	(40.4)
Early latent	15	(34.1)	18	(25.0)	47	(25.4)	177	(35.8)	191	(36.6)	140	(35.8)
Gender												
Male	40	(90.9)	65	(90.3)	179	(96.8)	483	(97.6)	507	(97.3)	383	(98.2)
Female	4	(9.1)	6	(8.3)	6	(3.2)	11	(2.2)	11	(2.1)	4	(1.0)
Transgender	0	(0.0)	1	(1.4)	0	(0.0)	1	(0.2)	3	(0.6)	3	(0.8)
Sexual orientation												
Gay/bisexual	33	(76.7)	52	(74.3)	154	(86.5)	437	(93.0)	471	(94.4)	336	(96.6)
Lesbian	0	(0.0)	1	(1.4)	0	(0.0)	1	(0.2)	0	(0.0)	0	(0.0)
Heterosexual	10	(23.3)	17	(24.3)	24	(13.5)	32	(6.8)	28	(5.6)	12	(3.4)
Age in years												
Median (range)	38	(21–58)	35	(17–67)	38	(16–59)	38	(16–66)	37	(14–70)	38	(19–77)
Race/ethnicity												
White	24	(54.5)	43	(60.6)	111	(60.6)	304	(63.1)	323	(63.3)	216	(57.9)
Black	10	(22.7)	8	(11.3)	27	(14.8)	43	(8.9)	31	(6.1)	37	(9.9)
Asian/Pacific	3	(6.8)	6	(8.5)	11	(6.0)	38	(7.9)	41	(8.0)	31	(8.3)
Islander												
Hispanic	7	(15.9)	14	(19.7)	33	(18.0)	94	(19.5)	113	(22.2)	87	(23.3)
Native American	0	(0.0)	0	(0.0)	1	(0.5)	3	(0.6)	2	(0.4)	2	(0.5)
HIV status												
Positive	10	(47.6)	24	(39.3)	102	(60.4)	293	(67.2)	300	(62.2)	194	(59.9)
Negative	11	(52.4)	37	(60.7)	67	(39.6)	143	(32.8)	182	(37.8)	130	(40.1)
Unknown	23	NA	11	NA	16	NA	59	NA	40	NA	67	NA
Partner venues												
Internet	NA		13	(19.4)	34	(20.0)	131	(32.8)	183	(40.3)	115	(38.5)
Sex clubs	NA		11	(16.4)	34	(20.0)	49	(12.3)	57	(12.6)	36	(12.0)
Bathhouse	NA		NA		24	(14.1)	49	(12.3)	51	(11.2)	21	(7.0)
Adult bookstore	NA		7	(10.4)	22	(12.9)	21	(5.3)	18	(4.0)	16	(5.4)
Bar/club	NA		6	(9.0)	38	(22.4)	83	(20.8)	106	(23.3)	82	(27.4)
Drugs used												
Methamphetamine	NA		4	(6.0)	27	(15.9)	109	(27.3)	133	(29.3)	90	(30.1)
Viagra	NA		NA		NA		39	(38.8)	144	(34.4)	81	(33.5)
Marijuana	NA		6	(9.0)	24	(14.1)	81	(20.3)	106	(23.3)	63	(21.1)
Ecstasy	NA		NA		7	(4.1)	28	(7.0)	41	(9.0)	25	(8.4)

*Only through September 2004.

partners on the Internet was significantly more common among gay/bisexual men (32%) than heterosexual men (13%) or women (6%) and that gay/bisexual men who met partners online were younger, more likely to have HIV-infected sex partners (regardless of their own serostatus), and to have received money or drugs for sex.¹⁹

Personal observations in sex clubs revealed that Viagra use was common. Interviews with syphilis patients confirmed that some patients had used Viagra without a prescription, obtaining the medication from friends. To understand correlates of this recreational Viagra use, we surveyed male municipal STD clinic patients between December 2000 and February 2001.²⁰ The proportion of gay/bisexual men who reported Viagra use in the past year (31%) was significantly higher than heterosexual men (7%).²⁰ Viagra use among gay/bisexual men was associated with a higher number of recent sex partners, unprotected anal sex with sex partners of unknown or serodiscordant HIV status, illicit drug use (especially methamphetamine), and the belief that combining Viagra with other drugs enhanced the sexual experience.²⁰

We also had observed increases in sexual risk behavior and STDs with the advent of highly active antiretroviral therapy (HAART) and direct-to-consumer advertising (DTC).^{21,22} From February to July 2001, we surveyed male municipal STD clinic patients about DTC and its relationship to attitudes about HIV and sexual behaviors. Men surveyed believed that those advertisements influenced an individual's decision to have unprotected sex.²³ In addition, there appeared to be a dose response between advertising exposure and sexual risk behavior: HIV-infected men with greater advertisement exposure believed HIV infection was a less serious disease and were more likely to have unprotected anal intercourse.²³

To better understand risk factors for syphilis infection from November 2002 to March 2003, we surveyed gay and bisexual men seen at the municipal STD clinic and linked survey data with syphilis test results. In multivariate analysis, the results confirmed that being HIV infected, using both methamphetamine and Viagra, and meeting partners on the Internet were risk factors for syphilis.²⁴ We also found nonwhite race and stronger affiliation with the gay community were associated with syphilis.²⁴

We performed analyses of existing STD clinic data about sex partners. Between 1995 and 2002, there was a doubling of the mean number of reported partners in the last 2 months among gay and bisexual men seen at the municipal STD clinic, from 3.8 to 7.9 sex partners.²⁵ That increase in sex partners occurred while there was a tripling in the number of gay and bisexual men visiting the clinic.²⁵ Thus, there were more men with greater risk. Analyses of partner management data from persons with early syphilis infection also found that the mean number of sex partners of syphilis patients during the interview period increased significantly from 9.7 to 14.1 sex partners between 2001 to 2002.²⁶ Because most sex partners of persons with syphilis were anonymous, the proportion of sex partners who were known to be evaluated and treated for syphilis decreased from 13.3% in 2001 to 9.4% in 2002.²⁶

Increased Testing and Clinical Management Services. We enhanced clinical and testing services for syphilis by increasing clinical staffing at the municipal STD clinic, educating community providers, expanding screening in nonclinical settings, supporting 2 new community-based clinical sites for syphilis testing, and through a partnership with an Internet-focused sex education and sexual health promotion organization (Internet Sexual Information Services (ISIS), Inc, San Francisco, CA) initiating an innovative on-line syphilis testing service, www.stdtest.org.

At the municipal STD clinic, we created a dedicated, full-time

medical director position to provide additional STD care and continue quality assurance activities (1.0 full-time equivalent [FTE]), increased clinician time by 0.5 FTE, and provided numerous training sessions to all program staff about syphilis. Between 1999 and 2003, visits to the STD clinic by gay/bisexual men increased 82%, from 5514 to 10,032.⁹

Using 0.25 FTEs per year, between 1999 and 2003, we screened 1593 men in nonclinical settings that targeted gay/bisexual men, but only 0.2% had early syphilis infection.²⁷ While that was a low rate, the presence of STD program staff conducting screening activities at nonclinical sites like street fairs, bars, and clubs likely enhanced community awareness.

We supported 2 new clinical sites for syphilis screening. One venue was located at an HIV clinical research site, had limited hours, few visitors, and limited support from frontline staff. We established the site in only a few months, providing \$1000 per month for the use of the facility and staff to draw blood. Between July 2003 and May 2004, only 26 persons were screened at the site, and no new syphilis infections were detected. We discontinued screening there in June 2004. The other screening site was the new gay men's health center, Magnet. Its inception and realization were the result of the SFDPH and collaborations with gay community leaders and the University of California, San Francisco. It took more than 2 years to establish Magnet due to delays in leasing and administration. Magnet has a storefront location in the heart of the gay community and provides services during evenings and weekends. During 2003–2004, STD Prevention provided \$271,000 to Magnet, 63% of which supported salary and benefits. In addition, the STD program covered the laboratory costs of STD testing. Between July 2003 and May 2004, Magnet screened 1739 men for syphilis, and 37 (2%) new early syphilis infections were identified and treated. Half of the men screened at the center had never been to the municipal STD clinic, suggesting that Magnet provided sexual health services to men who otherwise may not have come into contact with SFDPH STD screening services.

With ISIS, Inc, we created an online syphilis testing service that allowed persons to request and print a laboratory requisition slip on-line and then take it to one of several locations in San Francisco to have their blood drawn.²⁸ The STD controller is the physician of record ordering the test. Specimens are processed by a commercial laboratory, the results reported to SFDPH and then posted on a secure SFDPH website with a unique personal identification number.²⁸ All persons with reactive specimens are followed up by SFDPH staff.²⁸ The project was established in about 6 months, and most costs were incurred in the startup: \$20,000 for the initial development. Current costs include \$31 per specimen collected and tested and less than 1 hour a week of monitoring and maintenance.²⁸ During the first 11 months (June 2003 to May 2004), we performed 217 tests and identified and treated all of the 7 (3%) new cases of syphilis.

We used several strategies to increase awareness and clinical acumen about syphilis among medical providers. Through mailings, faxes, and postings in clinical areas and on the SFDPH website (www.sfcityclinic.org/providers), we educated providers, particularly HIV care providers, about the syphilis epidemic and its diagnosis and treatment. We published a monthly STD report that was sent to all providers in related fields, as well as the media, key community members and local political leaders (www.sfdph.org/Reports/HlthAssess.htm). We lectured regularly at medical grand rounds and noontime conferences at all major medical centers in San Francisco. We issued recommendations strongly urging HIV care providers to perform syphilis screening every 3 months simultaneous with the routine determinations of plasma HIV viral load or CD4 cell count for their sexually active gay/bisexual male

HIV-infected patients. We encouraged community emergency departments to offer syphilis screening to any male patient reporting sex in the past year with men. In addition, biannually, staff visited medical providers who reported syphilis cases and gave these medical providers prevention and management recommendations for syphilis. To treat syphilis patients and exposed contacts, we offered any provider who had reported at least 1 case of syphilis a supply of penicillin benzathine G-LA (long acting). For a limited time, penicillin benzathine G-LA was available to us for \$0.01 per dose. Providing this antibiotic preparation to physicians also assured that providers were using the recommended therapy.

From 1999 through 2003, the proportion of early syphilis cases diagnosed outside of the STD clinic remained stable at about 65%⁹ as a result of an increasing number of providers diagnosing syphilis as the epidemic expanded. Over the 5 years, the number of syphilis tests conducted by the SFDPH Laboratory increased 19% from 15,186 to 18,114, and at the San Francisco County hospital, the number of syphilis tests increased 32%, from 12,088 to 16,013. In addition, in the second half of 2003 an ongoing monthly community street-intercept survey in gay neighborhoods of San Francisco showed that 71% of HIV-infected gay/bisexual men reported having received a syphilis test in the past 6 months, a significant increase from 51% during the first half of 2003 ($P < 0.05$). A similar increase in syphilis testing was observed in HIV-uninfected men: 43% reported being tested in the second half of 2003 compared to 33% in the first half of 2003 ($P < 0.05$). Importantly, there was a direct and strong correlation between the number of sex partners in the past 6 months and the likelihood of syphilis testing, such that 75% of persons with more than 10 recent sex partners reported being tested compared to 39% of persons with only 1 partner.²⁹

Health Promotion and Education

We conducted health promotion and community education by collaborating with key community leaders and community-based organizations. Because meeting sex partners on the Internet was a risk factor for syphilis infection, we funded ISIS, Inc, to do sex education and sexual health promotion on the Internet. ISIS, Inc, revised our website (www.SFCityClinic.org) at a cost of \$20,000 and created an electronic coalition (Syphilis_Action_Coalition@yahoo.com) of local providers, public health staff, concerned community members and members of the media who received updates about the syphilis epidemic. In collaboration with ISIS, Inc, we also worked with Internet Service Providers^{30,31} of specific gay sex partner seeking sites to provide educational ma-

terials online through message boards,³¹ hosted chats,³¹ animated banner advertisements with links to syphilis education pages and our online testing program,^{31,32} and one-on-one outreach.^{31,33} During 2003–2004, we spent about \$90,000 on Internet-based banner advertisements and \$40,000 on Internet-based one-on-one outreach. In addition, with ISIS, Inc, we started an interactive sexual health forum called “Ask Dr. K” on Gay.com, which requires about 5 hours of clinician time per week.³¹ Measures of use of the banner advertisements varied: a campaign with a 1970s theme had only a 0.05% click-through rate, a campaign with images of syphilis had a 0.14% click-through rate,³¹ and a campaign for “Ask Dr. K” had a click-through rate of 0.43%. Hosted chats and message boards had lower participation than anticipated.³¹

To increase syphilis awareness, education, and testing, we funded a social marketing firm, Better World Advertising (San Francisco, CA), who developed the Healthy Penis campaign. Recognizing the value of community input and approval to create effective educational materials, we held focus groups coordinated by Better World Advertising to review and provide feedback on campaign materials. We also pilot tested all materials at local bars, clubs, and community fairs. Based on that community input and expert opinion, the campaign focused on the secondary prevention of syphilis, “get tested,” rather than primary prevention. Humor was selected as a key tool for conveying messages. The campaign included small media such as palm cards, T-shirts, comic books, and squeeze toys in the shape of Healthy Penis and Phil the Sore; posters in social venues and advertisements in community newspapers; and large advertisements on sides of buses, bus shelters, and in train stations; as well as news coverage in local and national print and broadcast media (Fig. 2). The campaign was launched in June 2002. Evaluations in 2003 demonstrated that 80% of gay/bisexual men surveyed in a variety of places, including the municipal STD clinic, street fairs, coffee shops, Laundromats, sex clubs, and bars, were aware of the epidemic.^{29,34} Persons aware of the Healthy Penis campaign were significantly more likely to know the signs and symptoms of syphilis, routes of transmission, and to have been tested in the past 6 months for syphilis.^{29,34} Given the strong associations between the Healthy Penis campaign and syphilis awareness, education, and testing behavior, we have continued the campaign through 2004 (www.healthypenis2004.org).

The Healthy Penis campaign was developed in collaboration with the syphilis social marketing campaign in Los Angeles, Stop the Sores (www.stopthesores.org). Because these campaigns were very similar, we were able to leverage our initial campaign resources of \$75,000 with resources from Los Angeles, making the

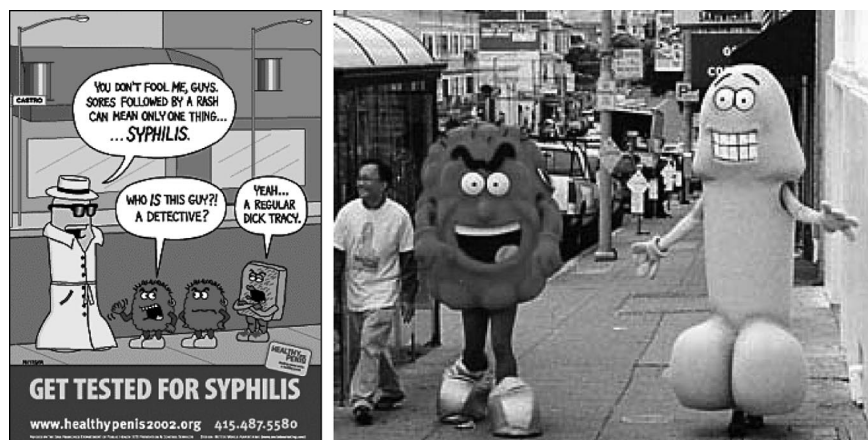


Fig. 2. Healthy Penis campaign materials.

initial development of the campaign more cost-efficient. During 2003 and 2004, we continued the campaign at a cost of \$115,000 and \$120,000, respectively. The 2004 campaign included the development of a 30-second commercial for television. Elements of the Healthy Penis campaign have been used by other cities including Palm Springs, Philadelphia, and Seattle.

In the spring of 2003, the Community STD Partners Group launched a community plan for syphilis control through a press conference, news coverage, our Internet e-coalition, and mailings to providers and key partners. The plan called for increased sexual health promotion; expanded syphilis testing and monitoring activities; enhanced clinical services, including patient-delivered partner therapy; enhanced education of medical providers; policy initiatives that result in improved sexual health for gay and bisexual men; and evaluation of syphilis prevention and control activities (available at www.healthypenis2003.org/news/execPlan.pdf).³⁵

Finally, over the course of the epidemic, we have performed intensive media advocacy. We reached out and built relationships with health reporters from local and national media, including local radio and television news stations and local and national print and Internet news organizations (*Bay Area Reporter*, *San Francisco Chronicle*, *Los Angeles Times*, *New York Times*, *Wall Street Journal*, *Wired News*, NPR, etc.). We worked with the media to promote our agenda through press releases and personal communications. To build relations, we always provided a timely response to every media call. Between 1999 and mid-2004, the media interviewed STD program staff more than 200 times. Aggressive media advocacy was possible because, as a local health department, the STD controller and his designees had the authority to have direct media contact.

Modification of the Environment in High-Risk Venues

Because of the anonymous nature of the many sex contacts among syphilis cases, the number of exposed persons identified and treated through traditional methods of case interview, contact elicitation and partner notification were limited. Using the information, however, about where syphilis patients met sex partners, we notified business owners of sex clubs, adult bookstores, and Internet service providers that recent syphilis patients had met sex partners at or via their venue or business. We strongly encouraged them to reduce the risk of their patrons through venue-based sexual health promotion, syphilis education, and by providing access to syphilis testing services.

We developed several strategies for sexual health promotion at high-risk venues. We requested and provided incentives for sex club staff to attend semiannual trainings about STDs, HIV, city-wide testing, referral services, and substance use (total cost of \$8000). Digital images and information about STDs and HIV were provided to sex clubs and adult bookstores so that they could create their own health education materials. In 1993, SFDPH, in collaboration with commercial sex venues and community leaders, developed Guidelines for the Operations of Commercial Sex Venues. With the advent of the syphilis epidemic, the guidelines were revisited, posted at commercial sex venues, and enforced by venue staff. These guidelines restricted anal or vaginal intercourse without the use of a condom. Because the guidelines were meant to reduce HIV transmission, no such restrictions were placed on oral sex, a known means of syphilis transmission. We also conducted monthly assessments of sex clubs to review compliance with the guidelines. The majority of sex clubs cooperated and actively promoted a safer environment. Clubs increased lighting and monitoring for unsafe sex, increased availability of condoms and lubricant, increased health promotion through materials available on site and on their websites, and promoted syphilis screening at

their venues. A comprehensive awareness and education effort developed by local adult bookstores included informing every new patron about the syphilis epidemic and posting large, bright, syphilis warning signs throughout the facilities. These local efforts may have resulted in greater promotion of safer sex and less risky sexual environments, as evidenced by the decreasing proportion of persons with syphilis who met partners at these venues over time (Table 1). While some public health authorities have recently argued for the closure of such sex venues,³⁶ other data support that sex club policies that prohibit unprotected intercourse are associated with decreased sexual risk behavior compared to venues without such policies.³⁷

The response of Internet service providers to our requests for risk environment modification varied from no effort or change in the environment at America Online to active health promotion at Manhunt.net and Gay.com. Manhunt.net offered access to SFDPH staff at no cost, modified personal profiles to include information on safer sex and provided lower cost online banner ads. Craigslist.com posted a warning on their site next to the section where men go to meet other men. In general, we found that venues that were more responsive to modifying the risk environment for meeting partners were locally owned or gay-owned.

Risk Factor Reduction

We sought to reduce additional risk behaviors for syphilis infection through public health advocacy and community coalition building. Because of our finding of the association between exposure to HIV DTC medication advertising and increased sexual risk behavior,²³ we requested the US Food and Drug Administration (FDA) to mitigate the effects of this advertising. In Spring 2001, the FDA issued an advisory letter to 9 pharmaceutical manufacturers requesting that the misleading advertisements promoting unrealistic benefits of antiretroviral medications be modified. Since that letter, such advertisements have been removed from public view in San Francisco. Recent DTC advertisements for antiretroviral medications in targeted print media have been more consistent with realistic expectations.

After finding an association between Viagra use, increased sexual risk behavior, and incident STDs,²⁰ we requested the FDA and the manufacturer to educate users about this risk and encourage risk reduction. Deliberations with the FDA and the manufacturer of Viagra are ongoing. Locally, Viagra use is seen as a marker for potential increased sexual risk behavior, and medical providers perform more frequent risk assessment, risk-reduction counseling, and screening for STDs, including syphilis in persons who use Viagra (Stephen Follansbee, MD, personal communication).

Finally, one of the greatest remaining challenges is the increasing abuse of methamphetamine in the gay male population in San Francisco. Surveys of gay/bisexual men in San Francisco demonstrated between 15% and 30% of men were using methamphetamine and 25% of persons with incident HIV infections had recently used methamphetamine.³⁸⁻⁴⁰ Annual HIV incidence in methamphetamine users seeking HIV testing in San Francisco is threefold higher than in nonusers: 6% versus 2%.⁴¹ Methamphetamine use has been associated with increased sexual risk behavior, rectal gonorrhea, and incident HIV infection in other studies.^{42,43} The STD program recently provided STD and HIV educational training and additional funding at 2 methamphetamine treatment programs at a total cost of \$99,000 to increase their treatment capacity and perform outreach, education, and testing for syphilis in new and current clients. However, what interventions are most effective at reducing the widespread use of methamphetamine and the increases in sexual risk behavior remain unknown.

Online Partner Management and Expanded Prophylactic Treatment

During the sentinel outbreak of syphilis linked to meeting sex partners on the Internet in 1999, we developed interim guidelines for performing partner management online when the only available locating information about a sex partner was an e-mail address.⁴⁴ We have contacted and confirmed treatment for about one third of sex partners that had only an e-mail address.⁴⁴ Online partner management provided a small increase in the number of contacts evaluated.

Given that the proportion of sex partners contacted, identified, and treated through partner management efforts (both traditional and online) was still low, in July 2002 the SFPDPH instituted a novel program whereby patients were offered preventive oral therapy for syphilis—azithromycin 1 g—to give to recent sex partners and friends known to have been exposed or at high risk for syphilis exposure. In small studies, azithromycin had been shown to be effective in treating sex contacts to syphilis.^{45,46} In addition, patient-delivered partner therapy had been shown to be safe and effective in preventing reinfection with other STDs.^{47,48} The strategy of patient-delivered partner therapy used the natural social-sexual network of high-risk individuals and promoted personal responsibility for the prevention of syphilis transmission. In order to gain community acceptance of azithromycin prophylaxis, we conducted focus groups to determine the most effective way to promote this intervention.⁴⁹ One suggestion was the importance of professional packaging.⁴⁹ Thus, we developed professional packaging that linked with motifs in the community plan (view at www.healthypenis2003.org/campaign/preventionPack/preventionPack.htm).³⁵ Each partner pack cost \$28. In 2003, 147 partner packets were given to patients (0.28 packets per patient), 145 to sex partners (0.28 packets patient), 27 to persons at high risk for syphilis (0.07 packets per patient); totaling 329 packets (0.63 packets per patients).

However, relatively soon after the implementation of the partner pack program, we observed cases of azithromycin treatment failure and documented the occurrence of azithromycin-resistant syphilis infection in San Francisco.^{50,51} In September 2004, due to the continued low uptake of partner packs relative to the reported number of sex partners per patient and the concerns about azithromycin resistance, we discontinued patient-delivered azithromycin partner treatment as a public health intervention.

Recognizing the continued need to reach possibly exposed partners, as a supplement to program staff performing partner management, in October 2004 we launched an online peer-to-peer partner notification system, InSpot (www.inspot.org). The site was developed to assist persons with syphilis and other STDs to notify their partners of the need for evaluation and treatment. Patients use InSpot to send an electronic postcard to their sex partners informing them that they have been exposed to an STD and where they can go for STD evaluation and treatment. In addition, the electronic postcards provide links to other online STD resources. Persons may send the postcards anonymously or using their own e-mail address. The e-card notification program was developed by ISIS, Inc, in collaboration with the STD Community Partners Group at a cost of about \$25,000. Evaluation of this program is in progress.

Evaluation of the Syphilis Epidemic on Local HIV Transmission

A major concern for public health officials is the impact that the syphilis epidemic may have on HIV transmission. We found that syphilis infection within HIV-infected patients was associated with an increased plasma HIV viral load and decreased CD4 cell count.⁵² A cross-sectional analysis of incident HIV infection and

recent or concurrent STDs in STD clinic patients found an elevated but nonsignificant risk associated with early syphilis infection and incident HIV infection.⁵³ A review of HIV incidence data at 2 HIV testing sites in San Francisco, however, failed to show an increase in HIV incidence between 2000 and 2002.⁴⁰ One explanation may be that syphilis, while epidemic, is still relatively uncommon, affecting less than 5% of the overall gay male population in San Francisco. A second explanation may be that most sex partnering is between men with similar HIV status. Another possibility is that the increased use of antiretroviral therapy has decreased the transmissibility of HIV and served to balance increases in risk behaviors and other cofactors for HIV incidence.²²

Discussion

The syphilis epidemic in San Francisco began with a cluster of new infections linked to an America Online chat room in the summer of 1999.⁸ Along with increases in sexual risk behavior, the syphilis case rate doubled every 6 months until 2002.^{22,42,54} The primary strategy for controlling the epidemic was secondary prevention through increased screening, rapid case identification, treatment, and partner notification. We successfully increased awareness about the epidemic among gay and bisexual men and health care providers, increased the community level of syphilis knowledge, and expanded clinical services for the diagnosis and treatment for syphilis. These activities resulted in a substantial increase in the number and proportion of MSM tested and treated for syphilis. In 2003, it appeared that the syphilis incidence rate leveled off but at an increased rate that continues in 2004.^{9,55} Whether the increase in syphilis awareness, education, testing, and early treatment was associated with the leveling off of cases is unknown. Given the low proportion of contacts notified by the health department (<10%), it is unlikely that partner notification activities had significant impact.²⁶

While we had a strong infrastructure before the epidemic began and then received additional resources from our local government and the CDC, our available resources were not sufficient to reduce the epidemic quickly and required the support of new entities like ISIS, Inc, (San Francisco, CA) for the development and implementation of Internet-based prevention interventions and the subcontracting of health promotion and social-marketing to Better World Advertising. Case interviewing and epidemiologic studies were critical in identifying new and increasing risk venues or risk factors—Internet use, Viagra use, and methamphetamine use—and exculpating concerns about commercial sex environments. Current levels of syphilis testing among HIV-infected men and men with multiple partners are high, and syphilis treatment services are readily available.

To further control the epidemic, primary prevention efforts may need greater emphasis. Examples of interventions that could be intensified include increased health promotion efforts on Internet-based sex partnering sites, more frequent outreach at bars and clubs, expanded provider education to promote sexual history taking, risk-reduction counseling, and the routine assessment and treatment of substance abuse, in particular methamphetamine use. It is also appropriate to promote consistent and correct condom use and the reduction of sex partners.⁵⁶ Unfortunately, policies that could support reduction of sex partners, including mutual monogamy among gay men such as the legalization of same-sex marriage, is highly controversial and opposed by many mainstream political leaders.⁵⁷

We recommend that other jurisdictions with increasing syphilis rates focus on 3 general areas: community mobilization to increase awareness and education about syphilis among persons at risk and

among medical providers, increasing the provision of syphilis testing services, and increasing the skills and resources for the clinical management of syphilis. While the media can facilitate increased awareness of the problem in the target population and media advocacy is less costly than social marketing campaigns, media coverage is less sustainable. Existing educational materials developed by local health departments such as SFDPH, the STD/HIV Prevention Training Centers, and CDC can be used to educate community members and providers in mailings, presentations, and site visits. Assuring the availability of penicillin benzathine G-LA to all clinicians that see syphilis patients can be a useful tool in initiating education and dialogue with providers. It also ensures that providers have an adequate supply of medication on hand to treat syphilis patients and their sex partners. Finally, our experience supported the value of increasing testing resources in a sustainable manner such as through the gay men's health center or online rather than through blitzes or intermittent community screening events, which had very low rates of case identification.

If other jurisdictions find that a large number of persons with syphilis infections are meeting partners through the Internet, interventions on the Internet are justified. Because of the nonspecific geographic targeting of many Internet-based interventions and the limited experience or resources available to most jurisdictions, partnering and pooling of resources, and working with expert groups like ISIS, Inc, are critical. Policies that distribute the cost and responsibility of health promotion among Internet sex partnering sites, departments of public health, and patrons should be actively pursued.

Methamphetamine use and its use with other illicit and prescription drugs like Viagra is a significant causal factor in the risk for syphilis infection, increasing the number of sex partners and the frequency of unprotected sexual intercourse. Methamphetamine directly increases sexual interest, sexual drive, and the desire for sexual intercourse.⁵⁸ The current methamphetamine epidemic among gay/bisexual men in the United States requires a response similar to other public health problems: surveillance, epidemiologic studies, community mobilization, and expanded treatment services. Prevention efforts for methamphetamine use are limited and few have been evaluated, but increasingly new treatment models are being studied and implemented.⁵⁹ The methamphetamine epidemic, called by some "the crack of the gay community," will likely undermine STD and HIV control efforts for some time.

Historically, syphilis has affected disenfranchised and medically underserved populations. Syphilis, like HIV infection, is an opportunistic disease with social determinants that affects vulnerable populations that have been stigmatized, marginalized, and discriminated against.⁶⁰ While advances may have been made in the control of this current local epidemic, it is likely that unless certain social and political factors that deeply affect at-risk populations can be addressed, the United States will fail to realize its goal of syphilis elimination.

References

1. Golden MR, Marra CM, Holmes KK. Update on syphilis: resurgence of an old problem. *JAMA* 2003; 290:1510–1514.
2. Fleming DT, Wasserheit JN. From epidemiological synergy to public health practice: the contribution of sexually transmitted disease to sexual transmission of HIV infection. *Sex Transm Infect* 1999; 75:3–17.
3. Wasserheit JN. Syphilis: a barometer of community health. *Sex Transm Dis* 2000; 27:311–312.
4. St Louis ME, Wasserheit JN. Elimination of syphilis in the United States. *Science* 1998; 281:353–354.
5. CDC. The National Plan to Eliminate Syphilis from the United States. Atlanta, GA: US Department of Health and Human Services, CDC, National Center of HIV, STD, and TB Prevention, 1999.
6. CDC. Sexually Transmitted Disease Surveillance, 2000. Atlanta, GA: US Department of Health and Human Services, CDC, 2001.
7. San Francisco STD Prevention and Control Services. San Francisco Sexually Transmitted Disease Annual Summary, 2002. San Francisco, CA: San Francisco Department of Public Health; 2003.
8. Klausner J, Wolf W, Fischer-Ponce L, Zolt I, Katz M. Tracing a syphilis epidemic through cyberspace. *JAMA* 2000; 284:485–487.
9. San Francisco STD Prevention and Control Services. San Francisco Sexually Transmitted Disease Annual Summary, 2003. San Francisco, CA: San Francisco Department of Public Health; 2005.
10. Centers for Disease Control and Prevention. Outbreak of syphilis among men who have sex with men: Southern California, 2000. *MMWR Morb Mortal Wkly Rep* 2001; 50:117–120.
11. Centers for Disease Control and Prevention. Primary and secondary syphilis among men who have sex with men: New York City, 2001. *MMWR Morb Mortal Wkly Rep* 2002; 51:853–856.
12. D'Souza G, Lee JH, Paffel JM. Outbreak of syphilis among men who have sex with men in Houston, Texas. *Sex Transm Dis* 2003; 30:872–873.
13. Fenton KA. Sexual health and HIV positive individuals: emerging lessons from the recent outbreaks of infectious syphilis in England. *Commun Dis Public Health* 2002; 5:4–6.
14. Stolte IG, Dukers NH, de Wit JB, Fennema JS, Coutinho RA. Increase in sexually transmitted infections among homosexual men in Amsterdam in relation to HAART. *Sex Transm Infect* 2001; 77:184–186.
15. Dupin N, Couturier E. [Syphilis, new epidemiologic features]. *Rev Prat* 2004; 54:371–375.
16. Sarwal S, Shahin R, Ackery J, Wong T. Infectious syphilis in MSM, Toronto, 2002: outbreak investigation. Paper presented at: 2003 International Society for Sexually Transmitted Diseases Research Congress; July 27–30, 2003; Ottawa, Canada.
17. Williams L, Klausner JD, Whittington WLH, Handsfield HH, Celum C, Holmes KK. Elimination and reintroduction of primary and secondary syphilis. *Am J Public Health* 1999; 89:1093–1097.
18. Parran T. *Shadow on the Land: Syphilis*. New York: American Social Hygiene Association, 1937.
19. Kim A, Kent CK, McFarland W, Klausner JD. Cruising on the Internet highway. *J Acquir Immun Defic Syndr* 2001; 28:89–93.
20. Kim AA, Kent CK, Klausner JD. Increased risk of HIV and sexually transmitted disease transmission among gay or bisexual men who use Viagra, San Francisco 2000–2001. *AIDS* 2002; 16:1425–1428.
21. Scheer S, Chu P, Klausner JD, Katz M, Schwarcz SK. Effect of highly active antiretroviral therapy on diagnoses of sexually transmitted diseases in people with AIDS. *Lancet* 2001; 357:432–453.
22. Katz M, Schwarcz SK, Kellogg T, et al. Impact of highly active antiretroviral treatment on HIV seroincidence among men who have sex with men: San Francisco. *Am J Public Health* 2002; 92:388–394.
23. Klausner JD, Kim A, Kent C. Are HIV drug advertisements contributing to increases in risk behavior among men in San Francisco, 2001? *AIDS* 2002; 16:2349–2350.
24. Wong W, Chaw JK, Kent CK, Klausner JD. Risk factors for early syphilis among gay and bisexual men seen in an STD clinic: San Francisco, 2002–2003. *Sex Transm Dis* 2005; 32:458–463.
25. Kent C, Chaw J, Chen Y, Wohlfeiler D, Klausner JD. Doubling of mean number of reported sex partners among men who have sex with men seeking STD services: San Francisco, 1995–2002. Poster presented at: 2003 International Society for Sexually Transmitted Diseases Research Congress; July 27–30, 2003; Ottawa, Canada.
26. Kent C, Stockman J, Klausner JD. Traditional partner management for syphilis among men who have sex with men provided little intervention: San Francisco, 2001–2002. Poster presented at: 2003 International Society for Sexually Transmitted Diseases Research Congress; July 27–30, 2003; Ottawa, Canada.
27. Ciesielski C, Kahn R, Taylor M, Gallagher K, Prescott L, Arrowsmith S. Control of syphilis outbreaks in men who have sex with men: the role of screening in non-medical settings. *Sex Transm Dis* 2005; 32(10)supplement:S37–S42.

28. Levine DK, Scott KC, Klausner JD. Online syphilis testing: confidential and convenient. *Sex Transm Dis* 2005; 32:139–141.
29. Steiner K, Kent C, Siller J, Herman J, Pappas L, Klausner JD. Healthy Penis 2002: evaluation of a social marketing syphilis prevention campaign, San Francisco, CA. Paper presented at: 2003 National HIV prevention conference; July 27–30, 2003; Atlanta, GA.
30. Levine D, Klausner JD. Working with Internet service providers (ISPs). Paper presented at: STD/HIV prevention and the Internet; August 25–27, 2003; Washington, DC.
31. Klausner JD, Levine DK, Kent CK. Internet-based site-specific interventions for syphilis prevention among gay and bisexual men. *AIDS Care* 2004; 16:964–970.
32. Levine D, Klausner JD. How to launch successful on-line banner campaigns. Paper presented at: STD/HIV prevention and the Internet; August 25–27, 2003; Washington, DC.
33. Levine D, Klausner JD. How to do online one-on-one outreach and program evaluation. Paper presented at: STD/HIV prevention and the Internet; August 25–27, 2003; Washington, DC.
34. Montoya JA, Kent CK, Rotblatt H, McCright J, Kerndt PR, Klausner JD. Social marketing campaign significantly associated with increases in syphilis testing among gay and bisexual men: San Francisco. *Sex Transm Dis* 2005; 32:395–399.
35. Community Partners Group, San Francisco Department of Public Health. Stopping Syphilis among Gay and Bisexual Men in San Francisco: A Community Plan. San Francisco, CA: San Francisco Department of Public Health, 2003.
36. Farley T. Cruise control: bathhouses are reigniting the AIDS crisis. *Washington Monthly* November; 2002:37–41.
37. Woods WJ, Binson D, Pollack LM, Wohlfeiler D, Stall RD, Catania JA. Public policy regulating private and public space in gay bathhouses. *J Acquir Immun Defic Syndr* 2003; 32:417–423.
38. Mitchell SJ, Wong W, Kent CK, Chaw J, Klausner JD. Methamphetamine use, sexual behavior, and sexually transmitted diseases among men who have sex with men seen in an STD clinic, San Francisco 2002–2003. Paper presented at: 2004 National STD prevention conference; March 8–11, 2004; Philadelphia, PA.
39. Colfax GN, Mansergh G, Guzman R, et al. Drug use and sexual risk behavior among gay and bisexual men who attend circuit parties: a venue-based comparison. *J Acquir Immun Defic Syndr* 2001; 28:373–379.
40. Dilley JW, Klausner JD, McFarland W, et al. Trends in primary and secondary syphilis and HIV infections in men who have sex with men: San Francisco and Los Angeles, California, 1998–2002. *MMWR Morb Mortal Wkly Rep* 2004; 53:575–578.
41. Buchacz K, McFarland W, Kellogg TA, Loeb L, Holmberg SD, Dilley J, Klausner JD. Amphetamine use is associated with increased HIV incidence among men who have sex with men (MSM) in San Francisco. *AIDS* 2005, Sep 2; 19(13):1423–1424.
42. Kim AA, Kent CK, Klausner JD. Risk factors for rectal gonococcal infection amidst resurgence in HIV transmission. *Sex Transm Dis* 2003; 30:813–817.
43. Golden MR, Brewer DB, Wood RW, Holmes KK, Handsfield HH. Association of methamphetamine use with HIV among MSM tested for HIV in an STD clinic. Paper presented at: 2003 International Society for Sexually Transmitted Diseases Research Congress; July 27–30, 2003; Ottawa, Canada.
44. Kent CK, Wolf W, Nieri G, Wong W, Klausner J, Peterman T. Internet use and early syphilis infection among men who have sex with men: San Francisco, California, 1999–2003. *MMWR Morb Mortal Wkly Rep* 2003; 52:1229–1232.
45. Hook EW 3rd, Martin DH, Stephens J, Smith BS, Smith K. A randomized, comparative pilot study of azithromycin versus benzathine penicillin G for treatment of early syphilis. *Sex Transm Dis* 2002; 29:486–490.
46. Farley TA, Cohen DA, Kahn RH, Lolis S, Johnson G, Martin DH. The acceptability and behavioral effects of antibiotic prophylaxis for syphilis prevention. *Sex Transm Dis* 2003; 30:844–849.
47. Kissinger P, Brown R, Reed K, Salifou J, Drake A, Farley TA, Martin DH. Effectiveness of patient delivered partner medication for preventing recurrent chlamydia trachomatis. *Sex Transm Inf* 1998; 74:331–333.
48. Schillinger JA, Kissinger P, Calvet H, et al. Patient-delivered partner treatment with azithromycin to prevent repeated *Chlamydia trachomatis* infection among women: a randomized, controlled trial. *Sex Transm Dis* 2003; 30:49–56.
49. Tun W, Walsh C, Siller J, Apt B, Wolf W, Klausner JD. Acceptance of patient-delivered partner-therapy for syphilis among men who have sex with men, San Francisco, CA. Paper presented at: 2004 National STD prevention conference; March 8–11, 2004; Philadelphia, PA.
50. Klausner JD, Engelman J, Lukehart SA, Berman S, Mitchell SJ. Azithromycin treatment failures in syphilis infections: San Francisco, California, 2002–2003. *MMWR Morb Mortal Wkly Rep* 2004; 53:197–198.
51. Lukehart SA, Godorones C, Molini BJ, et al. Macrolide resistance in *Treponema pallidum* in the United States and Ireland. *N Engl J Med* 2004; 351:154–158.
52. Buchacz K, Patel P, Taylor M, et al. Syphilis increases HIV viral load and decreases CD4 cell counts in HIV-infected patients with new syphilis infections. *AIDS* 2004; 18:2075–2079.
53. King JB, Samuel M, Kent CK, Klausner JD. Recent early syphilis, gonorrhea, and chlamydia among men who have sex with men increase risk for recent HIV sero-conversion—San Francisco, 2002–2003. Paper presented at National HIV Prevention Conference; July 27–30, 2003; Atlanta, GA.
54. Chen S, Gibson S, Katz M, et al. Continuing increases in sexual risk behavior and sexually transmitted diseases among men who have sex with men: San Francisco, 1999–2001. *Am J Public Health* 2002; 92:1387–1388.
55. STD Prevention and Control Services. San Francisco Sexually Transmitted Disease Monthly Report, June 2004. San Francisco, CA: San Francisco Department of Public Health, 2004.
56. Shelton J, Halperin D, Nantulya V, Potts M, Gayle H, Holmes KK. Partner reduction is crucial for balanced “ABC” approach to HIV prevention. *BMJ* 2004; 328:891–893.
57. Klausner JD, Pollack L, Wong W, Katz MH. Same-sex domestic partnerships and lower risk behaviors for STDs, including HIV infection. *J Homosexuality* 2005, in press.
58. Reback CJ, Larkins S, Shoptaw S. Changes in the meaning of sexual risk behaviors among gay and bisexual male methamphetamine abusers before and after drug treatment. *AIDS Behav* 2004; 8:87–98.
59. Rawson RA, Gonzales R, Brethen P. Treatment of methamphetamine use disorders: an update. *J Subst Abuse Treat* 2002; 23:145–150.
60. Brandt AM. No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880. 2nd ed. New York: Oxford University Press, 1987.