12 Screening and Treatment of Chlamydia, Gonorrhea, and Syphilis in Correctional Settings

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Sexually transmitted infections (STI) include a broad category of bacterial, viral, protozoan, and fungal infections and ectoparasitic infestations. For three of these bacterial infections – chlamydia, gonorrhea, and syphilis – there is substantive evidence that screening and treatment in correctional settings can play a critical role in their control. We will describe the epidemiology of these infections, the appropriate populations to target for screening, methods to increase treatment of identified infections, evidence of the impact of detention screening in controlling them, and the cost-effectiveness of screening in detention. Correctional settings might also play a critical role in controlling HIV, another STI, among some populations.

Epidemiology of Chlamydia, Gonorrhea, Syphilis, and Corrections: Overlapping Populations

Chlamydia and Gonorrhea

Chlamydia and gonorrhea are the two most common infections reported to the Centers for Disease Control and Prevention (CDC) with 1.8 million and 583,405 cases reported in 2018 (CDC, 2019). Chlamydia and gonorrhea are most common in persons aged 25 years and younger, with peak rates among young people aged 15–24 (CDC, 2019). Disparities continue to persist in rates of STIs and a wide variety of health status indicators among some racial minority or Hispanic groups. Compared with White people, chlamydia rates are more than five times greater among Black people 3.7 times greater among American Indians/Alaskan Natives, and approximately two times greater among

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Hispanics (CDC, 2019). Similar disparities exist in gonorrhea rates, with the rates 7.7 times greater among Black people, 4.6 times greater among American Indian/Alaskan Natives, and 1.6 times greater among Hispanics compared with White people (CDC, 2019). In addition to demographic characteristics, other risk markers for STIs include: multiple sex partners, drug and alcohol misuse, lower educational attainment and socioeconomic status, and poor access to medical care (Aral & Holmes, 1999).

When symptomatic, chlamydia and gonorrhea are associated with urethritis, cervicitis, and proctitis syndromes, though the majority of infections are asymptomatic (Karnath, 2009). Lack of timely treatment can lead to complications and serious long-term sequelae in women, including pelvic inflammatory disease, chronic pelvic pain, infertility, and ectopic pregnancy (Hook & Handsfield, 1999; Stamm, 1999). Additionally, these infections increase the susceptibility and transmissibility of HIV infection (Fleming & Wasserheit, 1999). The US Preventive Services Task Force (USPSTF) recommends screening for gonorrhea and chlamydia among sexually active women 24 years of age and younger and among older women who are at increased risk (USPSTF, 2014). Routine screening for gonorrhea and chlamydia screening is not recommended by the USPSTF for men. However, the CDC does advise chlamydia screening for men in clinical settings with high prevalence such as adolescent and STD clinics (CDC, 2021). CDC also advises regular gonorrhea screening for men who have sex with men (MSM) (CDC, 2021). Because most chlamydial and gonococcal infections in both females and males are asymptomatic (Hook & Handsfield, 1999; Stamm, 1999), screening and treatment of asymptomatic infections is essential for disease prevention and control. Large-scale screening programs that have been in place for several years have decreased both community chlamydia prevalence and disease outcomes (Addiss et al., 1993; Mertz et al., 1997; Nelson & Helfand, 2001; Hodgins et al., 2002; Gottlieb et al., 2013). The most effective method to control chlamydia is routine screening in high-volume, high-prevalence settings (Farley et al., 2003).

Syphilis

Syphilis is a genital ulcerative disease that causes significant cardiovascular and neurological complications if untreated (Sparling, 1999). In pregnant women, 40% of untreated early syphilis results in perinatal death (Radolf et al., 1999). If syphilis was acquired during the 4 years preceding pregnancy, it could lead to infection of the fetus in over 70% of cases (Radolf et al., 1999). Like other STIs, syphilis also facilitates the transmission of HIV (Fleming & Wasserheit, 1999). Syphilis infection is staged by symptoms and likely duration of infection.[1] Infections of less than 1 year's duration are the most important from a public health perspective, because they represent recent infections among persons and sexual networks which should be targeted for intervention to prevent further ongoing transmission within a community. However, infection of any duration is also critically important to identify in pregnant women given the risk of vertical transmission.

Syphilis was extremely common until the introduction of penicillin in the 1940s, with up to 25% of persons of lower socioeconomic status infected (Sparling, 1999). During the late 1990s, syphilis elimination in the United States was considered plausible because of the historically low rates of infection, the limited geographic distribution of infection, and the availability of effective and inexpensive diagnostic tests and treatment (St Louis & Wasserheit, 1998). However, in 2001, syphilis rates began increasing nationally among MSM (CDC, 2019). Evidence of a growing heterosexual epidemic

[1]In January, 2018 CDC released new syphilis case definitions which include the following subtypes: primary, secondary, early non-primary non-secondary, unknown duration or late, congenital syphilis, and syphilitic stillbirth. Full details of these definitions can be found at: https://wwwn.cdc.gov/nndss/conditions/syphilis/case-definition/2018/

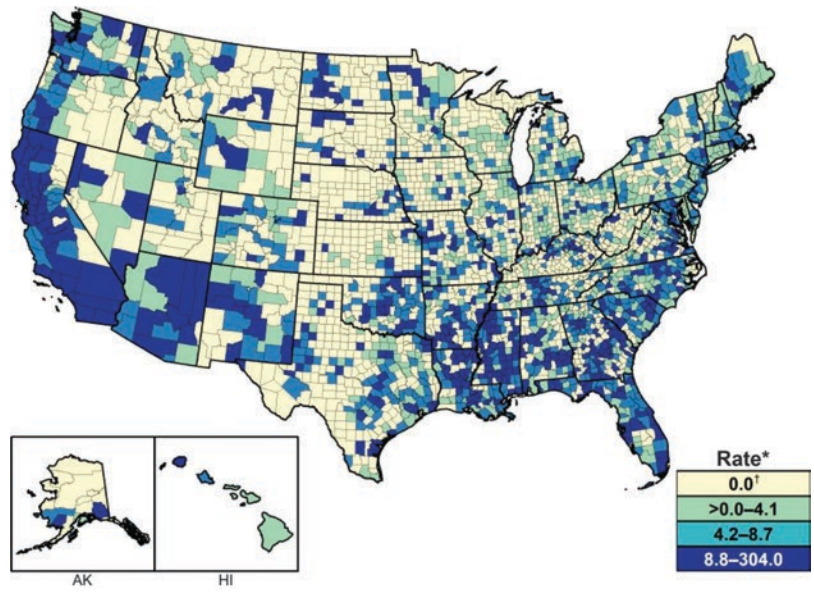

Fig. 12.1 Primary and secondary syphilis: rates of reported cases per 100,000 by county, United States, 2018 (CDC, 2019)

subsequently developed with rates among men who have sex with women only (MSW) and women increasing between 2014 and 2018 (CDC, 2019) in parallel with a 185.3% increase in congenital syphilis rates during this same time period.

During 2018, there were 115,045 reported cases of syphilis in the United States, 1/5 the number of gonorrhea cases and 1/15 the number of chlamydia cases (CDC, 2019). For reasons that are not totally clear, syphilis affects a slightly older population than chlamydia and gonorrhea; the peak age among women is 20–24, among heterosexual men is 25–29, and among MSM is 35–39 (CDC, 2019). Like chlamydia and gonorrhea, there are substantial differences in rates by race/ethnicity. In 2018, compared with White people, rates of primary and secondary syphilis were 4.7 times greater in Black people, 2.6 times greater in American Indian/Alaskan Native, and 2.2 times greater in Hispanics (CDC, 2019). There is also substantial asymmetry in the geographic distribution of syphilis (Fig. 12.1). In 2018, nearly half (47%) of all US counties reported no cases of primary or secondary syphilis, while 61.5% of all cases were reported in only 70 counties or independent cities (CDC, 2019).

Overlapping Populations: Corrections and STIs

The epidemiology of chlamydia, gonorrhea, and syphilis suggest that some of the persons at greatest risk for STIs are those who pass through the correctional system. Many incarcerated persons have risk factors for STIs: unprotected sex with multiple partners before incarceration, poor access to medical care, lack of education, a personal or family history of drug and alcohol use, a history of physical and sexual abuse, young age, and racial or ethnic minority status (Beltrami et al., 1997; Aral & Holmes, 1999; James, 2004; Bureau of Justice Statistics, 2004; Margolis et al., 2006). Additionally, incarceration rates are disproportionately higher among many of the same demographic groups as STIs including racial and ethnic minorities and young people. Black adults are imprisoned at rates among 5.7 times higher than their white peers, and Hispanic adults are imprisoned at rates 3.0 times higher

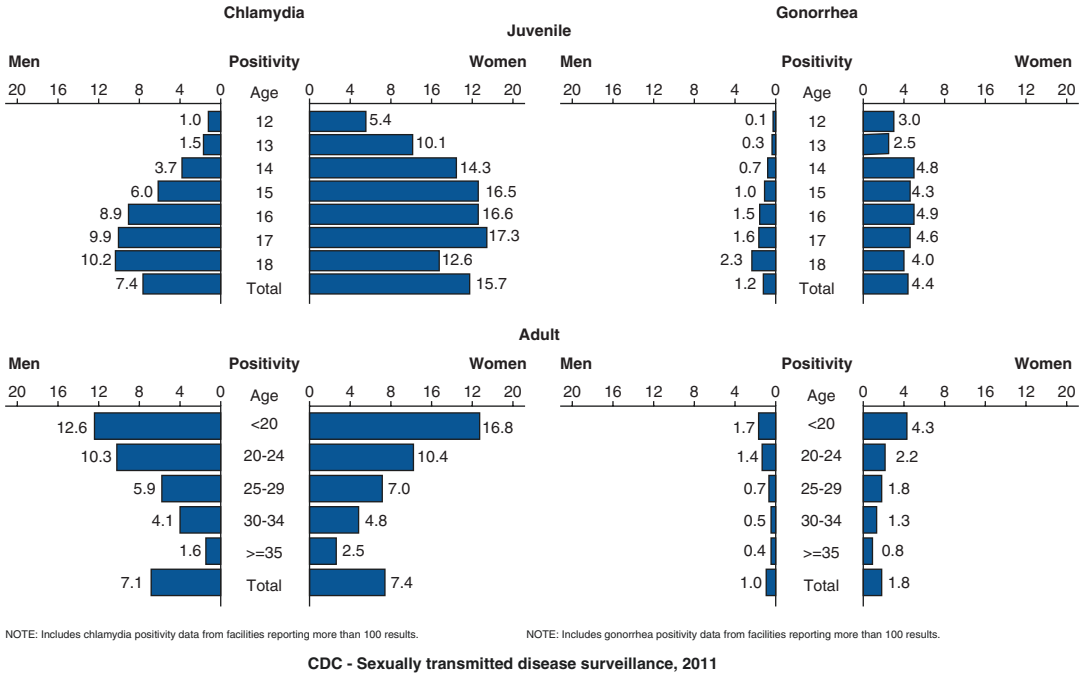

Fig. 12.2 Positivity of chlamydia and gonorrhea in juvenile vs adult correctional settings by age and sex, 2009 (CDC, 2011a)

(Bureau of Justice Statistics, 2019). Overall, nearly 70% of detained adults are racial or ethnic minorities, and more than 40% are younger than 35 (Bureau of Justice Statistics, 2019).

As with the general population, prevalence of STIs in correctional settings varies based on demographics, risk behaviors, and geography. In 2011, as part of the Infertility Prevention Program (IPP), screening data were reported to the CDC from correctional facilities in 33 states and Puerto Rico for chlamydia and 32 states and Puerto Rico for gonorrhea (CDC, 2012). These data (with some denominator variation across facilities) are illustrated by age, gender, and juvenile/adult facility in Fig. 12.2. Since 2011, comprehensive data from correctional facilities are no longer reported to the CDC, and literature reporting gonorrhea and chlamydia prevalence in these settings is highly limited. Among adult women in correctional settings, a small number of studies over the past decade have reported chlamydia positivity ranging from 6.1% to 11.4% and gonorrhea positivity from 1.7% to 3.0% (Parvez et al., 2013; Javanbakht et al., 2014; Cole et al., 2014). In adolescent females more recent studies have reported chlamydia test positivity ranging from 10.3% to 14.8% (Satterwhite et al., 2014; Burghardt et al., 2016; Torrone et al., 2016). Recent evidence of infection rates among men are even more limited, but one study based in 11 New York City jails reported 6.5% chlamydia positivity and 0.9% gonorrhea positivity in adult males (Franklin et al., 2012). Despite limitations in recent data, existing evidence continues to demonstrate that disease burden among detained individuals is higher among women compared to men, and among younger detainees compared to older individuals. Additionally, chlamydia and gonorrhea rates among incarcerated individuals who are 35 years of age or younger have been consistently found to be higher than those of the general population (Joesoef et al., 2009; Donaldson et al., 2013; Torrone et al., 2016; Burghardt et al., 2016).

Public Health Strategies for Controlling STIs

There are three determinants of the rate of spread (reproductive rate) of STIs: (1) the probability of exposure of infected persons to uninfected persons, which relates to the number of partners an infected person has, (2) the average probability of transmission per sexual contact, and (3) the average duration of infectiousness of an infected person (Anderson & May, 1991). The prevalence of STIs in a community is related to the reproductive rate of STIs. While the spread of STIs is based on these three determinants, an individual's risk of acquiring an STI is not based solely on their sexual behavior but is heavily influenced by the probability of having sex with someone who is infectious. Therefore, two individuals with the same sexual practices can have different risk of acquiring an STI. Therefore, to reduce disparities in STI rates among different populations it is critical to prioritize programs that screen and treat members of populations at highest risk of infection. Screening and treating these populations reduces the duration of infection in the community, which drives down the reproductive rate and the prevalence of infection in the community. This, in turn, lowers the probability of encountering an infected partner. Other strategies to decrease the prevalence of infection in a population include assuring that partners of infected persons are treated (partner services); health education about the importance of accessing care for STI screening, using condoms to prevent STIs (including HIV) and unintended pregnancy, and the risk of multiple partners; and surveillance of emerging STI trends to target intervention resources.

Community Impact of STI Screening in Corrections

Most detained individuals are released and return to their communities within only a few days or weeks, and many subsequently have unprotected sex (Skolnick, 1998; MacGowan et al., 2003). Because many detainees are drawn from high-prevalence communities, widespread, targeted screening and treatment programs in correctional facilities can serve as a public health structural intervention to reduce community rates of STIs. Although no national protocol currently exists for such programs, the potential for impact has previously been demonstrated in multiple localities where implementation of STI screening programs resulted in corrections-based screening surpassing all other screening venues in the number of reported cases and led to substantial increases in the number of STIs detected in jurisdictions overall (Broad et al., 2009; Pathela et al., 2009; CDC, 2011a; CDC, 2014).

A 2006 study based on the San Francisco jail chlamydia screening program demonstrated the potential impact STI screening in jails can have on the community (Barry et al., 2006). The prevalence of chlamydia detected among sexually active young women (aged 25 and younger) seen in a community clinic (Clinic S) located in a neighborhood with high jail testing density was compared to a community clinic located in a neighborhood with low jail testing density (Clinic O). The prevalence of infection in these two clinics was compared between 1997 and 2004. The initial prevalence at Clinic S was four times higher than at Clinic O. During the evaluation period, the prevalence of infection at Clinic S declined significantly from 16.1% in 1997 to 7.8% in 2004. The prevalence of infection remained stable at Clinic O at 4.7% during the same period with only minor vacillations. No other STI control programs, other than jail screening, explained the substantial decline in community rates of chlamydia in young women. This decline was seen despite the fact that only about 45% of the target population in the jails was screened and only about 80% of infected persons were treated.

STI Screening in Correctional Settings

In order to have the largest impact on the community, STI screening should occur at intake because a substantial proportion of detainees are released back to the community within 48 hours (Skolnick, 1998; Spaulding et al., 2011). A systematic review of literature examining active case finding approaches in the US and European prison settings found that screening programs that utilized opt-out approaches demonstrated increased screening uptake and detected more infections than opt-in strategies (Tavoschi et al., 2018). However, given the loss of autonomy and agency associated with correctional environments, careful attention should be paid to assuring adequate consent is obtained when applying opt-out approaches. Recent studies have found that when opt-out screening methods were used, although the right to decline consent was officially available, many detainees perceived participation to be compulsory (Rosen et al., 2015; Tavoschi et al., 2018).

Targeted Chlamydia and Gonorrhea Screening

Because resources for STI screening are limited, screening programs should focus on the highest risk persons in correctional environments. Currently, the CDC recommends that all women 35 years of age or younger and men under the age of 30 in correctional settings be screened on intake for chlamydia and gonorrhea using an opt-out approach (CDC, 2021). The availability of nucleic acid amplification tests (NAATs) for chlamydia and gonorrhea facilitates screening in nonclinical settings including correctional facilities. NAATs for gonorrhea and chlamydia are highly sensitive and specific, available in a variety of specimen types conducive to implementation of patient self-collection protocols, and require minimal staff training (CDC, 2002; CDC, 2021).

Targeted Syphilis Screening

CDC recommends universal syphilis screening in correctional facilities located in communities with a high syphilis prevalence (CDC, 2021). As was previously discussed, syphilis cases are heavily concentrated within a minority of US counties. In order to ensure that corrections-based syphilis programs are practical and cost-effective, local authorities should stay apprised of epidemiologic trends within their jurisdiction. Additionally, CDC currently recommends that all women be screened for syphilis at the first prenatal visit or as early in pregnancy as possible. However, because prenatal care access among pregnant detainees may be difficult to assess, and given recent increasing rates of congenital syphilis, screening all pregnant women in correctional facilities for syphilis, regardless of the stage of pregnancy, should be considered.

Current syphilis test technology requires the collection of serologies, which requires blood specimen collection by more highly trained staff than is necessary for chlamydia and gonorrhea screening. A presumptive diagnosis of syphilis requires two tests: nontreponemal tests [either rapid plasma reagin (RPR) or venereal disease research laboratory (VDRL)], which detect antibodies that are not specific to *T. pallidum*, and treponemal assays [such as *T. pallidum* particle agglutination (TP-PA) and enzyme immunoassay (EIA)], which detect specific antibodies to *Treponema* species. While nontreponemal tests may serorevert after treatment, treponemal assays may remain reactive indefinitely despite adequate therapy.

Traditionally, a non-treponemal test is used for screening purposes, while a treponemal test is used to confirm the diagnosis. However, a growing number of institutions have begun implementing a reverse screening algorithm in which a treponemal test is used first, followed by non-treponemal testing. Use of the reverse algorithm allows for automation of screening in the laboratory (in contrast to screening with non-treponemal tests, which require manual performance and interpretation). Automated screening may result in time and cost savings in the laboratory, particularly in high-volume settings. However, several studies have found that the reverse algorithm results in more false-positive results, increased follow-up, higher levels of over-treatment, and increased costs overall (CDC, 2011b; Owusu-Edusei Jr et al., 2011). Regardless of the algorithm employed, positive results should prompt a thorough review of the individual's medical, sexual, and treatment history to determine the likelihood and stage of untreated syphilis infection and ensure proper therapy is administered.

STI Screening in Correctional Facilities

CDC recommendations:

- *Chlamydia and gonorrhea*: Women ≤35 and men <30 years in correctional facilities should be screened for chlamydia and gonorrhea. Chlamydia and gonorrhea screening should be conducted at intake and use an opt-out approach.
- *Syphilis:* Universal, opt-out screening should be conducted on the basis of the local area and institutional prevalence of early (primary, secondary, and early latent) infectious syphilis. Correctional facilities should stay apprised of syphilis prevalence as it changes over time.

In addition to conducting screening at intake, *opt-out* approaches have been demonstrated to improve screening uptake.

Source: CDC, 2021

STI Treatment Recommendations

CDC published its most recent treatment guidelines for STIs in 2021 (CDC, 2021). Table 12.1 summarizes key recommendations with full guidelines available at: https://www.cdc.gov/std/treatment-guidelines/. Positive screening results should prompt follow-up to ensure no signs or symptoms of complicated disease or sequelae are present, and therapy should be tailored accordingly.

Methods to Improve Treatment of Persons Identified with STIs in Corrections

Identifying persons with STIs in corrections has little public health value unless a high proportion of those with infection are treated. Because intake is a standardized process that applies universally to all detainees, it provides an ideal opportunity to integrate STI screening. However, once an STI is diagnosed challenges may be encountered in locating individuals for treatment due to the potential for a detainee's release, transfer to another facility, or court appearances.

Table 12.1 Summary of key CDC STI treatment recommendations (CDC, 2021)

	Recommended treatment
Neisseria gonorrhea: uncomplicated infections of the cervix, urethra, or rectum	*Ceftriaxone* 500 mg IM in a single dose
Chlamydia trachomatis	1. *Doxycycline* 100 mg orally twice daily for 7 days - alternative regimen- *Azithromycin* 1 g orally in a single dose -or- *Levofloxacin* 500 mg orally once daily for 7 days
Chlamydia trachomatis: in pregnancy	*Azithromycin* 1 g orally in a single dose
Syphilis: Primary, secondary, or early non-primary non-secondary	*Benzathine penicillin* 2.4 million units IM in a single injection
Syphilis: unknown duration or late	*Benzathine penicillin* 2.4 million units IM for three doses at 1-week intervals
Neurosyphilis	Aqueous crystalline *penicillin G* 18–24 million units per day, administered as 3–4 million units IV every four hours or continuous infusion, for 10–14 days
Syphilis: in pregnancy	Penicillin regimen appropriate for stage of syphilis as above

Treatment of persons identified with STIs in corrections has varied substantially but can reach up to 95% (Silberstein et al., 2000; Kahn et al., 2002; Mertz et al., 2002; Hardick et al., 2003; Barry et al., 2006; Trick et al., 2006; Pathela et al., 2009; Cole et al., 2014). Factors that may improve corrections-based treatment rates include:

- Conducting screening as early as possible (i.e., during intake)
- Use of urine-based screening for gonorrhea and chlamydia to ease the burden of sample collection
- Assuring test results are available as quickly as possible
- Administering treatment as quickly as possible after results are obtained
- Use of single dose antibiotic therapy where appropriate

Any delay in these processes increases the probability that individuals will be released without treatment, which increases the chances they will not be treated at all because it is frequently difficult to locate people after release. Additionally, an electronic jail medical record that can receive test results may facilitate quick processes by speeding transmission and notification of results. In order to facilitate quick treatment after results are available, standing orders can be developed that allowed nursing staff to treat under the orders of the medical director. In the absence of standing orders, treatment in jails may be delayed based upon when a physician is available to see the patient.

Regardless of the systems implemented within the correctional setting, collaboration between correctional staff and public health authorities is essential. Even in the most efficient system, results may not be available prior to an individual's release in many cases. Therefore, a process that allows correctional staff to notify public health authorities who can then complete follow-up with those who have returned to the community is needed to fully maximize the public health impact of STI screening in correctional settings.

Cost-Effectiveness of STI Screening in Corrections

The cost-effectiveness of STI screening in corrections has been examined with somewhat mixed findings due to differences in modeling (Silberstein et al., 2000; Mrus et al., 2003; Blake et al., 2004; Kraut-Becher et al., 2004; Gift et al., 2006; Gopalappa et al., 2013; Tavoschi et al., 2018). Models

have generally shown that the cost-effectiveness improves as the treatment rate before release improves (Kraut-Becher et al., 2004) or as screening men is translated to treatment or aversion of cases in women (Blake et al., 2004; Gopalappa et al., 2013). Additionally, age-based screening is more cost-effective compared to universal screening (Gift et al., 2006; Gopalappa et al., 2013). Clearly, the higher the prevalence of infection in the population screened, the more cost-effective the screening program will be.

Summary

There is a heavy burden of STIs among select populations of incarcerated persons. Evidence suggests that targeted screening and treatment of STIs can reduce community rates of infection. Broad-based, national screening of key populations in corrections would allow public health programs an opportunity to leverage the alarming racial and ethnic disparities within the incarcerated population to address important subpopulations at greatest risk for STIs. The evidence for the public health benefit of STI screening targeted to correctional settings is strong.

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