Evidence Synthesis

Number 206

Screening for Chlamydial and Gonococcal Infections: A Systematic Review Update for the U.S. Preventive Services Task Force

Prepared for:
Agency for Healthcare Research and Quality
U.S. Department of Health and Human Services
5600 Fishers Lane
Rockville, MD 20857
www.ahrq.gov

Contract No. HHSA-290-2015-00009-I, Task Order No. 7

Prepared by:
Pacific Northwest Evidence-Based Practice Center
Oregon Health & Science University
Mail Code: BICC
3181 SW Sam Jackson Park Road
Portland, OR 97239
www.ohsu.edu/epc

Investigators:
Amy Cantor, MD, MPH
Tracy Dana, MLS
Jessica C. Griffin, MS
Heidi D. Nelson, MD, MPH
Chandler Weeks, MPH
Kevin L. Winthrop, MD
Roger Chou, MD

AHRQ Publication No. 21-05275-EF-1
March 2021

This report is based on research conducted by the Pacific Northwest Evidence-based Practice Center (EPC) under contract to the Agency for Healthcare Research and Quality (AHRQ), Rockville, MD (Contract No. HHSA-290-2015-00009-I, Task Order No. 7). The findings and conclusions in this document are those of the authors, who are responsible for its contents, and do not necessarily represent the views of AHRQ. Therefore, no statement in this report should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services.

The information in this report is intended to help health care decision makers—patients and clinicians, health system leaders, and policymakers, among others—make well-informed decisions and thereby improve the quality of healthcare services. This report is not intended to be a substitute for the application of clinical judgment. Anyone who makes decisions concerning the provision of clinical care should consider this report in the same way as any medical reference and in conjunction with all other pertinent information (i.e., in the context of available resources and circumstances presented by individual patients).

The final report may be used, in whole or in part, as the basis for development of clinical practice guidelines and other quality enhancement tools, or as a basis for reimbursement and coverage policies. AHRQ or U.S. Department of Health and Human Services endorsement of such derivative products may not be stated or implied.

None of the investigators have any affiliations or financial involvement that conflicts with the material presented in this report.

Acknowledgments

The authors thank AHRQ Medical Officers Kathleen Irwin, MD, MPH, Tina Fan, MD, MPH, and Brandy Peaker, MD, MPH; as well as the U.S. Preventive Services Task Force.

Structured Abstract

Background: In 2014, the U.S. Preventive Services Task Force (USPSTF) recommended screening for chlamydia and gonorrhea in asymptomatic, sexually active women, aged 24 years or younger and in older women who are at increased risk for infection. There was insufficient evidence to recommend for or against screening in men.

Purpose: To update the 2014 systematic review and synthesize evidence for the USPSTF on the effectiveness of screening for chlamydial and gonococcal infection in adults and adolescents, including those who are pregnant.

Data Sources: Cochrane Central Register of Controlled Trials (January 2014 through May 2020) and Cochrane Database of Systematic Reviews (January 2014 through May 2020), and MEDLINE (January 2014 through May 2020), and manually reviewed reference lists); with surveillance through November 20, 2020.

Study Selection: English-language trials and observational studies on screening effectiveness, accuracy of risk stratification and alternative screening methods, test accuracy, and screening harms.

Data Extraction: One investigator abstracted data and a second investigator checked data abstraction for accuracy. Two investigators independently assessed study quality using methods developed by the USPSTF.

Data Synthesis (Results): 20 studies met inclusion criteria (N=179,515); seven studies were carried forward from the prior report. Three previously included trials of women found chlamydia screening associated with decreased risk of PID versus no screening, though effects were not statistically significant in two trials. One new, good-quality trial of young women and men in primary care clinics found screening for chlamydia associated with decreased risk of hospital diagnosed primary pelvic inflammatory disease (PID) (Relative Risk [RR] 0.6; 95% Confidence Interval [CI], 0.4 to 1.0), though absolute effects were small (absolute difference -0.137%). Screening was not associated with decreased risk of clinic diagnosed PID (RR 1.1; 95% CI, 0.7 to 1.8) or epididymitis in men (RR 0.9; 95% CI, 0.6 to 1.4). Three studies on the accuracy of risk prediction instruments in asymptomatic persons reported an area under the receiver operating characteristic curve (AUC) that ranged from 0.64 to 0.73. Using age criteria alone (<22 years) to selectively screen women for chlamydial and gonococcal infection demonstrated higher accuracy (AUC 0.687, Standard Deviation [SD] 0.014) compared with more extensive risk criteria. Nine studies of diagnostic accuracy found high specificity across anatomic sites, including urine. Sensitivity was high for chlamydial testing in females for all anatomic sites including endocervical testing (range 89 to 100%) and vaginal testing (range 90 to 100%). Studies found high sensitivity of meatal (100%) urethral (99%) and rectal (92%) testing for chlamydia in males, but evidence was limited to one study each. Evidence on pharyngeal testing was limited to one study of MSM that demonstrated low sensitivity for chlamydial infection (69.2%) and higher sensitivity for gonococcal infection (89.1%). Gonococcal testing in females demonstrated highest sensitivity in vaginal samples (>98%) followed by endocervical (>96%) and urine samples (>89%). The sensitivity of urine testing for gonococcal infection in

males was 93 to 100 percent, while sensitivity ranged from 89 to 100 percent for other sites. Three studies demonstrated that self- and clinician-collected vaginal samples for chlamydia and gonorrhea diagnosis were highly sensitive (90 to 100%); no studies meeting inclusion criteria compared collection methods in males. False-positive and false-negative rates were low for testing across anatomic sites and for self- versus clinician- collection of samples. No studies evaluated screening intervals or accuracy of concurrent testing for other infections. Data was lacking for effects of screening on psychosocial harms or effect on risk behaviors or risk perception.

Limitations: English language articles only; methodological limitations in the trials; most studies conducted in higher risk populations or settings; meta-analysis not performed; unable to assess for publication bias; studies lacking for pregnant individuals.

Conclusions: Screening for chlamydial infection may reduce the incidence of PID in young women. Risk prediction criteria to identify persons with asymptomatic chlamydial or gonococcal infection are associated with limited accuracy and require further validation. Testing for asymptomatic chlamydial and gonococcal infections is accurate at most anatomic sites, using urine sampling, and using self-collected specimens. Research is needed to determine the effectiveness of screening in men, optimal screening intervals, and adverse effects of screening.

Table of Contents

Figures

Tables

Appendixes

Chapter 1. Introduction and Background

Purpose

This systematic review will be used by the U.S. Preventive Services Task Force (USPSTF) to update its 2014 recommendation on screening for chlamydia and gonorrhea infections in sexually active adolescents and adults, including pregnant women.[1]

In 2014, the USPSTF made two separate recommendations for screening for chlamydia (***B recommendation)*** and gonorrhea (***B recommendation)*** in sexually active women aged 24 years or younger and in older women who are at increased risk for infection. These recommendations were based on evidence that screening for chlamydia reduces risk of complications in women at increased risk; evidence that screening for gonorrhea identifies asymptomatic infections and treatment reduces complications associated with untreated asymptomatic infections; and evidence that age was a strong predictor of chlamydial and gonococcal infections, with the highest infection rates occurring in women under 24 years. The USPSTF concluded that the evidence was insufficient to assess the balance of benefits and harms of screening for chlamydia and gonorrhea in men ***(I statement)*** due to the absence of evidence that screening in men improves clinical outcomes or reduces disease transmission to sexual partners.

Prior to 2014, the USPSTF issued a separate recommendation on chlamydia and gonorrhea screening. The 2007 USPSTF recommendation on chlamydia screening was similar to the 2014 recommendation, except that it was graded an ***A recommendation***.[2] The USPSTF also recommended against screening for chlamydia in women aged 25 years or older not at increased risk and found insufficient evidence to recommend routine screening for chlamydia in men. In 2005, the USPSTF recommended screening for gonorrhea in all sexually active women at increased risk for infection, including pregnant women (***B recommendation)***.[3]

Condition Background

Condition Definition

Chlamydia is a sexually transmitted infection (STI) caused by the bacterium *Chlamydia trachomatis*. Most *Chlamydia trachomatis* strains infect the columnar epithelial cells of the genital tract, causing inflammation that may be asymptomatic or present as signs of infection such as erythema, edema, and mucopurulent discharge.[4] Infections of the rectum can cause proctitis, while infections of the oropharynx are typically asymptomatic. Inflammation can damage the epithelium and lead to scar formation. In women, scarring may ultimately lead to fallopian tube damage, which is irreversible, and can lead to infertility years after active infection. If left untreated, chlamydia can lead to the same long-term health effects as gonorrhea, including pelvic inflammatory disease (PID), which can lead to complications such as ectopic pregnancy, infertility, and chronic pelvic pain.[5,6] Infants born to infected mothers may contract chlamydial eye disease or pneumonia.[4,7]

Gonorrhea is a STI caused by the bacterium *Neisseria gonorrhoeae*, a gram-negative intracellular diplococcus that infects the mucosal epithelium of the genital tract.[8,9] Other sites of infection include the conjunctiva, oropharynx, and rectum. Infection often leads to local inflammation and, in women, *N. gonorrhoeae* can ascend the urogenital tract and can also cause PID.[9] Infants born to infected mothers may contract ophthalmia neonatorum in the first four weeks of life.[6,10]

Prevalence and Burden of Disease/Illness

Chlamydia is the most commonly reported STI in the United States (U.S.). In 2018, there were 1,758,668 cases of chlamydial infection reported to the Centers for Disease Control and Prevention (CDC), corresponding to a rate of 539.9 cases per 100,000 persons.[11,12] Due to under-reporting, the true incidence of chlamydial cases is difficult to accurately estimate. Since the 1980s, the rate of reported chlamydial infection has been rising. This increase is likely related to a combination of enhanced screening efforts, the use of more sensitive tests, and more complete reporting, although it may also reflect a true increase in incidence. In 2018, the rate of chlamydial infection among U.S. women (692.7 cases per 100,000 females) was nearly double the rate among men (380.6 cases per 100,000 males) with the majority of cases occurring among women aged 15 to 24 years. From 2017-18, increased rates were observed in females 15-19 year of age (1.3% increase) and 20-24 years of age (0.8% increase). The rate among males increased 5.7 percent between 2017-2018, possibly due to either increased transmission or improved case identification among men who have sex with men (MSM).[11] Males 15 to 44 years of age comprised 94 percent of male chlamydia cases in 2018.[11] Among men attending STD clinics, the positivity rates for chlamydia were 16.9% in MSM compared with 13.8% in men who have sex with women only. Within these populations, prevalence varies by geography, race/ethnicity, and HIV status.[11]

During 2013 to 2017, rates of reported chlamydia cases increased among all racial and Hispanic ethnicity groups. Chlamydia incidence varies by race, with rates 5.6 times higher in black compared with white persons.[11] In 2018, the rate of chlamydial infection reported among black persons was more than five times the rate among white persons (1,192.5 and 212.1 cases per 100,000 population, respectively) and the rate among Hispanic persons (392.5 cases per 100,000) was nearly two times the rate among white persons.[11] High rates were also reported for American Indians/Alaska Natives (784.8 per 100,000) and Native Hawaiians/Other Pacific Islanders (370.4 per 100,000), while lower rates were reported among those identifying as Asian (132.1 per 100,000) or multirace (184.9 per 100,000). Data from the 2007 to 2012 National Health and Nutrition Examination Survey also demonstrates disparities.[13]

Gonorrhea is the second most commonly reported STI in the U.S., though it is also underreported. In 2018, 583,405 cases were reported to the CDC, corresponding to a rate of 179.1 cases per 100,000 persons, a 5.0 percent increase during 2017-2018.[11] The rate of increase in gonorrhea cases was 6.0 percent for males during 2017-2018 (200.8 to 212.8 per 100,000) and 3.6 percent increase for females (140.7 to 145.8 cases per 100,000). In 2018, the highest rates of infection were among females aged 20 to 24 years (702.6 cases per 100,000), females 15-19 years (548.1 cases per 100,000), males aged 20 to 24 years (720.9 per 100,000) and males 25-29 years (674.0 per 100,000). Black and Hispanic persons also had higher rates of gonococcal

infection (548.1 and 113.7 per 100,000 population, respectively) than white persons (66.4 per 100,000 population). In 2018, rates of infection in black persons were 7.7 times the infection rate in whites.[11] From 2014-2018 the rate of gonorrhea among males increased 78.7 percent (119.0 to 212.8 cases per 100,000), possibly related to increased transmission and/or case ascertainment among MSM.

Pregnancy

Untreated chlamydial infection in pregnancy is associated with complications including preterm labor, premature rupture of membranes, and low birth weight.[14] Infants born to mothers infected with either chlamydial or gonococcal infection are at risk of neonatal conjunctivitis and in the case of chlamydial infection, neonatal pneumonia.[4,7,15] The risk of vertical transmission of gonorrhea is between 30 and 47 percent in the absence of ocular prophylaxis.[16] Rates of gonococcal ophthalmia neonatorum in the U.S. was an estimated 0.4 cases per 100,000 live births per year from 2013 to 2017.[6] Gonococcal ophthalmia neonatorum can cause corneal scarring, ocular perforation, and blindness as early as 24 hours after birth.[17] The USPSTF addresses ocular prophylaxis for gonococcal ophthalmia neonatorum in a separate recommendation and reaffirmed its recommendation for ocular prophylaxis in 2019 (***A recommendation).***[18]

Etiology and Natural History

In women, chlamydial infection is usually asymptomatic, but can result in transmission and can lead to cervicitis and urethritis.[5] Untreated chlamydial infections may progress to symptomatic PID, which can subsequently result in infertility, chronic pelvic pain, and ectopic pregnancy.[5,6] However, many women with PID have subtle signs and symptoms, leading to clinically silent spread of infection to the upper genital tract and subsequent subclinical pelvic inflammatory disease.[19,20] Chlamydial infection can also facilitate infection with HIV and may potentiate the risk for cervical cancer.[21,22]

In men, genital chlamydial infection is also likely to be asymptomatic but can cause non-gonococcal urethritis, epididymitis, and in rare instances if symptoms do appear, the most common presentation is urethritis.[23] In rare instances, reactive arthritis may occur.[24,25] Chlamydial infection in men also facilitates HIV transmission.[26,27]

As with chlamydial infection, women infected with gonorrhea are often asymptomatic, but infection can result in cervicitis and complications including PID, ectopic pregnancy, infertility, and chronic pelvic pain.[6] In men, gonorrhea can lead to symptomatic urethritis, epididymitis, and proctitis.[24,28] The majority of urethral infections among males are symptomatic, leading to timely treatment that prevents serious complications, but not transmission to others.[29] However, the overwhelming majority of extragenital (e.g., pharyngeal, rectal) infections in men are asymptomatic. Rarely, local gonococcal infection may disseminate and cause acute dermatitis tenosynovitis syndrome, monoarticular arthritis, meningitis, or endocarditis.[8,30] Gonococcal infection facilitates HIV transmission in both men and women.[21]

Risk Factors

Age is a strong risk factor for both chlamydia and gonorrhea. In 2018, the highest age-specific rates of chlamydial infection among women and men occurred in the 20 to 24 year age category (4,064.6 cases per 100,000 females; 1,784.5 cases per 100,000 males), followed by women aged 15 to 19 years (3,306.8 cases per 100,000 females).[11] In 2018, rates of gonococcal infection reported to the CDC were also highest among women and men aged 20 to 24 years (702.6 cases per 100,000 females; 720.9 cases per 100,000 males), followed by women aged 15 to 19 years (548.1 cases per 100,000 population).[11] During 2017 to 2018, the largest increase in gonococcal infection was among individuals aged 30 to 34 years (12.4 percent increase).

Other risk factors associated with chlamydial and gonococcal infection include having multiple sexual partners, having a new sexual partner or a sexual partner infected with an STI, inconsistently using barrier contraceptives, and having a history of previous or coexisting STIs.[11] In a 2018 study of STI clinic attendees, MSM had higher reported prevalence rates of chlamydial and gonococcal infections than other clinic attendees, with median prevalence rates of 16.9 and 20.5 percent.[11] A 2017 survey of MSM attending community clinics in five cities reported that approximately one in eight had an extragenital chlamydial or gonococcal infection.[12] Rectal gonorrhea prevalence was higher in MSM infected with HIV than in those not infected with HIV. Notably, chlamydia and gonorrhea at extragenital (rectal and pharyngeal) anatomic sites are often asymptomatic, and these anatomic sites may act as a reservoir of infection, thus affecting gonococcal antimicrobial resistance, and increased risk for HIV transmission and acquisition. A systematic review of prevalence studies conducted in MSM estimated rectal chlamydia and gonorrhea prevalence among MSM as 9.0% and 6.1%, respectively.[31] Epidemiologic data supports the prevalence of extragenital infection in women, which may also present an opportunity for ongoing transmission.[32-34]

Rationale for Screening/Screening Strategies

Both chlamydial and gonococcal infections are often asymptomatic in women and can lead to serious complications, including PID and associated sequelae.[11] Pregnant women infected with these infections are at risk of transmitting them to their infants. The risk of vertical transmission of gonorrhea during pregnancy is between 30 and 47 percent.[16] Specific populations of men, particularly young men and MSM, have a higher burden of infection with chlamydia and may be at higher risk for gonococcal infection, many of which are often asymptomatic.[35] Among MSM, rectal chlamydial and gonococcal infections, especially those that are recurrent, have been associated with increased risk for HIV infection.[36,37] Screening asymptomatic MSM for infection could help to identify those men at high risk for HIV acquisition and lead to consideration of PrEP.[38]

Identification of asymptomatic individuals with chlamydia or gonorrhea through screening could identify those who would benefit from earlier evaluation and management. Screening could also lead to interventions to decrease transmission, and identify close contacts who might benefit from testing.

Intervention/Treatment

The CDC recommends one dose of azithromycin or seven days of doxycycline as treatment for chlamydial infections in non-pregnant adolescents and adults.[39,40] For patients in whom compliance or loss to followup is a concern, direct observation of a single dose of azithromycin is the preferred choice. In recent years, treatment of gonococcal infection has been complicated by increasing drug resistance to *N. gonorrhoeae*. Consequently, the CDC now recommends a single 500mg intramuscular dose of ceftriaxone for uncomplicated urogenital, anorectal, and pharyngeal gonorrhea.[39] Treatment for chlamydial coinfection with oral doxycycline (100mg twice daily for 7 days) should occur when chlamydial infection cannot be excluded.[39]

The CDC recommends that all sex partners of patients with either gonococcal or chlamydial infection exposed in the preceding 60 days undergo evaluation and treatment for infection.[29] In the case of a heterosexual partner that cannot be linked to care, expedited partner therapy (EPT) given by the patient is suggested.[29] EPT is the clinical practice of treating sex partners of persons who receive gonorrhea or chlamydia diagnoses by providing medications or prescriptions to the patient, unless prohibited by law, and is recommended for heterosexual partners for both infections. Patients provide partners with these therapies without the examination of the partner by a health-care provider. Rescreening all patients diagnosed with chlamydial or gonococcal infection three months after treatment is recommended due to risk of re-infection, regardless of whether the index patient believes that sex partners were successfully treated.[29]

Pregnancy

The CDC recommends using azithromycin as the treatment of choice for pregnant women infected with chlamydia. The CDC also recommends repeat testing to document eradication of chlamydial infection three weeks post-treatment. Prevention of chlamydial neonatal pneumonia requires treating maternal chlamydial infection during pregnancy via prenatal detection and treatment. Gonorrhea is treated with ceftriaxone 250 mg intramuscularly and single-dose azithromycin.[29] The risk of neonatal ophthalmia due to maternal gonococcal infection can be reduced with routine topical prophylaxis at delivery. Pregnant women diagnosed with either infection should have repeat testing three months after treatment (or at the third trimester or within three months of delivery).[29]

Current Clinical Practice/Recommendations of Other Groups

Screening for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* is usually performed by testing urine or urogenital swab specimens from the endocervix, vagina, or male urethra.[41] Extragenital testing allows for test samples obtained from other sites, including the oropharynx and rectum, and has been cleared by the FDA.[41,42] Rectal swabs can be used to detect infection in persons who engage in receptive anal intercourse, and self-collected vaginal swabs are also available. Nucleic acid amplification test (NAAT) is the preferred diagnostic test for chlamydia because of its high sensitivity and specificity and its use on specimens obtained noninvasively (using vaginal or urine specimens).[43] The CDC and the USPSTF both support the use of NAAT to detect chlamydial and gonococcal infections and NAAT is FDA-approved for this purpose.[29,44]

The CDC recommends the use of NAAT to diagnose genitourinary gonococcal infection because NAAT permits testing on the widest variety of specimens, including endocervical, vaginal, rectal, oral, and male urethral swabs, as well as urine samples. NAATs are also FDA-approved for this purpose.[29] *Neisseria gonorrhoeae* can be diagnosed from a culture or Gram stain of the male urethra showing intracellular Gram-negative diplococci. However, a negative Gram stain does not rule out gonococcal infection, due to lower sensitivity than NAAT in asymptomatic males.[45]

The CDC recommends targeted screening for chlamydia and gonorrhea in young women.[29] Universal screening is not recommended. The CDC also recommends screening MSM for both chlamydia and gonorrhea at least annually at sites of sexual contact regardless of condom use.[29] Furthermore, the CDC recommends screening women up to age 35 years for chlamydia and gonorrhea at intake in juvenile and adult correctional facilities, as well as screening men up to age 30 years for chlamydia at intake into jails.[29] Recommendations from other medical organizations (**Table 1)** are consistent with the CDC or USPSTF recommendations.[29,46-53] The CDC also makes a recommendation to consider screening young men in high prevalence clinical settings or in populations with a high burden of infection (MSM).[29,54]

The CDC recommends screening all pregnant women up to age 25 years, and older women at increased risk for chlamydial and gonococcal infection at their first prenatal visit.[29] Third trimester screening for chlamydial and gonococcal infections is recommended for women who are at high risk for re-infection to prevent postnatal complications and infection of the neonate.

Despite current screening recommendations to screen high-risk persons for chlamydial and gonococcal infection, screening rates are suboptimal. In a review of the healthcare claims of patients presenting for general medical or gynecological examinations, rates of documentation for testing were minimal, regardless of high-risk sexual behavior status. Among patients claiming high-risk sexual behaviors, 21 to 60 percent were tested for chlamydial infection and 21 to 56 percent were tested for gonococcal infection.[55]

Chapter 2. Methods

Key Questions and Analytic Framework

Using methods developed by the USPSTF[56] the Evidence-based Practice Center (EPC) developed the scope and Key Questions in collaboration with the USPSTF and Agency for Healthcare Research and Quality (AHRQ). Investigators created an analytic framework with the key questions and the patient populations, interventions, outcomes, and adverse effects reviewed **(Figure 1)**.

Key differences between this report and the prior reviews are using one framework for all populations; evaluating accuracy of risk stratification and screening strategies for identifying persons at increased risk; diagnostic accuracy of anatomic site-specific testing and collection methods. We did not re-review the diagnostic accuracy of specific assays or tests, which the prior review found to be highly accurate.[57] This report addresses four Key Questions on the effectiveness of screening for chlamydial and gonococcal infections. The populations addressed were asymptomatic adults and adolescents, including those who are pregnant.

Key Questions

1. In asymptomatic, sexually active adults and adolescents, including those who are pregnant, what is the effectiveness of screening for chlamydial and gonococcal infections in reducing complications of infection and transmission or acquisition of disease, including gonorrhea, chlamydia, and HIV?
2. What is the accuracy of risk stratification methods or alternative screening strategies for identifying persons at increased risk of chlamydial and gonococcal infections (such as younger persons or men who have sex with men)? Screening strategies include testing for concurrent infections, including HIV, or using different screening intervals.
3. What is the diagnostic accuracy of anatomic site-specific testing and collection methods for identifying persons with chlamydial and gonococcal infections?
4. What are the harms of screening for chlamydial and gonococcal infections (such as labeling, anxiety, false-positive/alarm results, false-negative results/reassurance, or change in risk behaviors or risk perception)?

Key Question 1 focuses on the effectiveness of screening on clinical outcomes including complications of infection, transmission, or acquisition of disease. Key Question 2 evaluates the accuracy of risk stratification methods or alternative screening strategies for increased risk populations, including testing for concurrent sexually transmitted infections or using different screening intervals. Key Question 3 examines the diagnostic accuracy of anatomic site-specific testing and collection methods, including self-collected swabs. Key Question 4 addresses the harms of screening. The USPSTF previously determined that treatment is effective; therefore, there was no Key Question on the effectiveness of treatment.

Contextual Questions

The USPSTF also requested Contextual Questions to help inform the report. Contextual Questions are not reviewed using systematic review methodology.

1. What is the prevalence rate of chlamydial or gonococcal infections (and concurrent HIV infection) in partners of patients who test positive for chlamydial or gonococcal infections?
2. What is the effectiveness of partner services (such as traditional partner services or expedited partner therapy) in reducing rates of reinfection or acquisition of chlamydial and gonococcal infections in the index patient?

Search Strategies

We searched the Cochrane Database of Systematic Reviews (January 2014 through May 2020), Cochrane Central Register of Controlled Trials, PsycINFO, Ovid MEDLINE In-Process & Other Non-Indexed Citations (January 2014 through May 2020), and Ovid MEDLINE (January 2014 through May 2020) for relevant English-language studies and systematic reviews. Search strategies are available in **Appendix A1.** Electronic searches were supplemented by review of reference lists of relevant articles and studies meeting inclusion criteria. We also carried forward studies in the prior USPSTF report[57] that met inclusion criteria for this update. Ongoing surveillance was conducted to identify major studies published since May 2020 that may affect the conclusions or understanding of the evidence and the related USPSTF recommendation. The last surveillance was conducted on November 20, 2020, and identified no studies affecting review conclusions.

Study Selection

Two reviewers independently evaluated each study to determine inclusion based on predetermined eligibility criteria developed for each Key Question (**Appendix A2**). After an initial dual review of citations and abstracts, investigators retrieved full-text articles of potentially relevant material. Two reviewers conducted full-text review of articles; discrepancies were resolved through consensus or with input from a third reviewer. The selection of studies is summarized in the literature flow diagram (**Appendix A3**). **Appendix A4** lists included studies and **Appendix A5** lists studies excluded at the full-text level with reasons for exclusion.

The target population was asymptomatic, sexually active adults and adolescents, including those who are pregnant. For screening effectiveness and harms, we included randomized controlled trials (RCT) and controlled observational studies of screening versus no screening in asymptomatic individuals that evaluated health outcomes. Outcomes for KQ1 included reduced complications of chlamydial or gonococcal infections and reduced transmission or acquisition of disease, including gonorrhea, chlamydia, and HIV; and for pregnant individuals, reduced adverse maternal, fetal, or infant outcomes. Studies on risk stratification methods and screening strategies for chlamydia and gonorrhea that reported measures of diagnostic accuracy or discrimination

were included for KQ2. For KQ3, we included studies on the diagnostic accuracy (including measures of discrimination) of testing at various anatomic sites or using different collection methods (self- versus clinician- collected). Studies that did not report diagnostic accuracy but provided data to calculate them were also included. For studies of diagnostic accuracy, samples were reported as collected from male or female anatomic sites. This differs from the remainder of the included studies that reported outcomes according to populations of men and women. For KQ4, false alarm rates (the proportion of patients with a positive test who do not have the disease) and false reassurance rates (the proportion of patients with a negative test who actually have the disease) were calculated from the positive predictive value and negative predictive value, respectively, when population prevalence was reported.[58] False positive and false negative results were also reported. For KQ4, uncontrolled observational studies were also included for the adverse effects of screening.

Data Abstraction and Quality Rating

We constructed evidence tables summarizing the data from each study. One investigator abstracted details about the study design, patient population, setting, interventions, analysis, followup, and results. A second investigator reviewed data abstraction for accuracy. Two investigators independently applied predefined criteria developed by the USPSTF (**Appendix A6**) to rate the quality of individual controlled trials, systematic reviews, and observational studies and rate them as "good," "fair," or "poor," depending on the extent of methodological shortcomings.[56] We modified the cohort criteria for cross-sectional studies. Discrepancies were resolved through consensus. In accordance with USPSTF procedures, we excluded studies rated poor quality due to important methodological shortcomings that severely undermine their reliability.[56]

Data Synthesis

We assessed the aggregate internal validity (quality) of the body of evidence for each KQ ("good", "fair", "poor") using methods developed by the USPSTF, based on the number, quality and size of studies, consistency of results between studies, and directness of evidence in the Summary of Evidence.[56] We determined aggregate internal validity using the totality of evidence (new studies identified for the update plus studies carried forward from the prior USPSTF report).[59] Statistical meta-analysis was not performed because of methodological limitations of the studies and heterogeneity in study designs, interventions, populations, and other factors.

Expert Review and Public Comment

A draft research plan for this topic was posted on the USPSTF website for public comment from February 7, 2019 to March 6, 2019, and was revised in response to public comments prior to finalization. Revisions included clarification of the populations and risk behaviors addressed, the reference standard for diagnostic accuracy, and terminology regarding anatomic site-specific testing.

The draft report was reviewed by content experts (**Appendix A7**), USPSTF members, Agency for Healthcare Research and Quality (AHRQ) Medical Officers, and collaborative partners. Reviewer comments were presented to the USPSTF and subsequently addressed iteratively. Feedback included providing additional study and population characteristics, and to provide additional results for special populations, if available. Reviewers also asked for further clarification of terminology used to describe harms of interventions.

This version of the draft report will be posted for public comment and revised as appropriate prior to finalization.

Chapter 3. Results

Included Studies

Our literature search resulted in 2,059 unique citations. A total of 20 studies (reported in 20 publications) met inclusion criteria. Thirteen studies[60-72] were newly identified for this review and seven[73-79] were carried forward from the previous USPSTF report. Seven studies from the prior review were not carried forward because they evaluated key questions or outcomes not addressed in this review (e.g., effectiveness of screening strategies, accuracy of diagnostic testing assays, NAAT testing).[80-86]

Key Question 1. In Sexually Active, Asymptomatic Adolescents and Adults, Including Those Who Are Pregnant, What Is the Effectiveness of Screening for Chlamydial or Gonococcal Infections in Reducing Complications of Infection and Transmission or Acquisition of Disease, Including Gonorrhea, Chlamydia, and HIV?

Summary

- The prior USPSTF review included three trials of women at increased risk for chlamydia that found screening associated with reduced risk of PID versus no screening. While risk of PID was reduced with screening in all 3 trials, results were statistically significant in only one.
- One large new trial of men and women in primary care clinics found screening associated with a statistically significant reduction in risk of hospital diagnosed PID versus usual care, though absolute effects were small. Screening was not associated with reduced risk of clinic diagnosed PID in young women or epididymitis in young men.
- No study evaluated the effectiveness of screening for gonorrhea versus no screening.
- There were no studies reporting disease acquisition or transmission or clinical outcomes other than PID or epididymitis; there were no studies of pregnant populations.

Evidence

Chlamydia

Four randomized trials evaluated the effectiveness of screening for chlamydial infection for reducing complications of infection (**Table 2; Appendix B Tables 1 and 2**).[66,73,74,77] Three of the trials[73,74,77] were also included in the prior USPSTF review.[57] One trial was conducted in the United States,[77] two in Europe,[73,74] and one in rural Australia.[66] Sample sizes ranged from 1,700 to 63,338 (total N = 70,174). Three trials enrolled women,[73,74,77] and one trial enrolled both women and men.[66] One trial was conducted exclusively in adolescents (high school students,

mean age not reported).[74] The other trials enrolled adolescents and adults (16 to 34 years) from a rural primary care setting,[66] university setting,[73] and from a population of higher risk women.[77] Three trials compared screening versus usual care: one multi-faceted screening program,[66] one home sampling,[74] and one clinic-based testing.[77] One trial compared immediate versus deferred screening.[73] Three trials used self-collected vaginal[66,73,74] or male urine testing,[66] and one study used clinician-collected endocervical samples.[77] Two trials were rated good- quality[66,73] and two trials were rated fair- quality (**Appendix B Table 3**).[74,77] Methodological limitations of the fair-quality trials included unclear details regarding randomization methods and high loss to follow-up.

The three trials included in the prior USPSTF review reported results that favored screening for chlamydial infection versus no screening for reducing risk of PID, though only one trial reported a statistically significant difference. A good-quality RCT, the Prevention of Pelvic Infection (POPI), included 2,529 sexually active symptomatic (35%) or asymptomatic (65%) young women from universities and colleges in the United Kingdom (U.K., mean age 21 years; range: 16-27 years).[73] Among all participants, screening was associated with reduced risk of PID, though the difference was not statistically significant (relative risk [RR] 0.65; 95% confidence interval [CI], 0.34 to 1.22). However, 79 percent (30/38) of PID cases occurred in women who had tested negative at baseline. As described in the prior USPSTF review, among the subgroup of participants who reported no symptoms during the 6 months before the study (i.e., pelvic pain, dyspareunia, abnormal vaginal bleeding or discharge), the reduction in risk was larger, but also not statistically significant (0.6% [5/787] vs. 1.6% [14/861], RR 0.39; 95% CI, 0.14 to 1.08) (Sarah Kerry, personal communication). A fair-quality RCT of 2,607 women with increased risk for chlamydia in Washington state reported a statistically significant reduction in PID in the screened versus usual care group after 1 year of followup (0.89% [9/1,009] vs. 2.07% [33/1,598], RR 0.44; 95% CI, 0.20 to 0.90).[77] A fair-quality RCT of 1,761 female high school students in Denmark found one-time home-based screening to be associated with lower risk of chlamydia compared with usual care (opportunistic physician-based screening) after 1 year (2.9% [13/443] vs. 6.6% [32/487], RR 0.45; 95% CI, 0.24 to 0.84) and PID (2.1% [9/443] vs. 4.2% [20/487], RR 0.50; 95% CI, 0.23 to 1.08).[74] Since few participants were screened in the usual care group, they were considered to be similar to an unscreened comparison group.

A new, good-quality cluster-randomized trial (the ACCEPt trial) of screening for chlamydia evaluated screening effectiveness in 180,355 young men and women aged 16 to 29 (mean age not reported) in 130 rural Australian primary care clinics.[66] Participants were eligible for at least one chlamydia test per year, regardless of symptoms or contact history. Clusters were randomized to a multifaceted screening intervention tailored to the clinic (computer alert to test eligible patients, incentive payment for testing, patient recall and reminder system, education for general practitioners and nurses, patient information, partner notification, and feedback on testing performance) versus usual practice for chlamydial testing and management (mean follow-up 3.1 years). Demographics were reported for 63,338 clinic patients; approximately 49 percent (30,759/63,338) were women, 35 percent were 16 to 19 years old (22,212/63,338), 32 percent were 20 to 24 years old (20,319/63,338), and 33 percent were 25 to 29 years old (20,807/63,338).

Screening was associated with a statistically significant reduction in risk of a hospital diagnosed primary PID (RR 0.6; 95% CI, 0.4 to 1.0), but the absolute difference was small (0.24%

[57/23,527] vs. 0.38% [88/23,219]). There was no difference in the risk of a repeat chlamydia infection within six weeks to six months of a positive test (odds ratio [OR] 3.1; 95% CI, 0.7 to 13.8), or for PID diagnosed in clinics (0.45% [293/65,519] vs. 0.39% [237/60,384]; RR 1.1; 95% CI, 0.7 to 1.8). In men, there was no difference between screening versus usual care in risk of epididymitis diagnosed in clinics (0.26% [106/41,168] vs. 0.27% [106/38,717]; RR 0.9; 95% CI, 0.6 to 1.4).

Gonorrhea

As in prior USPSTF reviews, no study evaluated the effectiveness of screening for gonorrhea versus no screening.

Key Question 2. What Is the Accuracy of Risk Stratification Methods or Alternative Screening Strategies for Identifying Persons at Increased Risk for Chlamydial or Gonococcal Infections (Such as Younger Persons or Men Who Have Sex With Men)?

Summary

- The 2014 USPSTF review did not evaluate the diagnostic accuracy of risk criteria for chlamydial or gonococcal infections.
- In asymptomatic patients, two studies of the "Vancouver" risk tool and one study of a 3-item risk score for identifying persons with chlamydial or gonococcal infections reported AUCs that ranged from 0.64 to 0.73.
- One study of women attending family planning or STI clinics (not necessarily asymptomatic) found age ≤22 years was associated with similar discrimination for chlamydial and gonococcal infections (AUC 0.69) compared with multi-item screening criteria (AUC 0.72 to 0.73).
- Two studies of women in other settings (IUD insertion, surgical abortion) found risk prediction tools for chlamydial and gonococcal infections associated with poor accuracy.
- One study conducted in a narrowly-defined, high risk patient population used a survey that strongly correlated increasing numbers of oral sex partners in the preceding 3 month period with rates of pharyngeal gonorrhea.
- No study compared screening intervals or alternative screening strategies, such as testing for concurrent infection with HIV.

Evidence

The 2014 USPSTF review did not evaluate the accuracy of risk stratification methods or alternative screening strategies for chlamydial or gonococcal infections.[59] For this report, seven studies evaluated strategies for identifying persons at increased risk for chlamydial or gonococcal infections using different criteria to select patients for testing **(Table 3; Appendix B Tables 4**

and 5).[61-63,65,67-69] Enrollment ranged from 245 to 35,818 (total N = 93,137). Two studies enrolled only women,[68,69] and five included both men and women.[61-63,65,67] Participants were asymptomatic in 3 studies,[61-63] symptom status was not reported in three studies,[65,67,68] and one study included both asymptomatic (52%) and symptomatic (47%) populations.[69] Three studies were conducted in Canada,[61-63] three in the U.S.,[65,67,69] and one in Europe.[68] Settings included family planning clinics,[69] STI or sexual health clinics,[61-63,67,69] university or community clinics,[65] and a pregnancy termination clinic.[68] Six studies were cross-sectional[61-63,65,68,69] and one was a case-control study.[67] All studies were rated fair- quality (**Appendix B Table 6**). Methodological limitations included inadequate selection of patients and measurement of exposures or outcomes, including retrospective data collection; some studies reported between-group differences between intervention and control groups, rather than groups being similar at baseline.

Two cross-sectional studies conducted in Vancouver, British Columbia, evaluated the "Vancouver" risk estimation tool, an instrument for identifying asymptomatic women and heterosexual men at increased risk for chlamydial or gonococcal infection[61,62] Factors in the model included age, sex, race, number of partners, and other known STI risk factors. In the original study evaluating this tool, discrimination in a validation cohort of 14,956 asymptomatic patients attending STI clinics in Vancouver was fair (AUC 0.64; 95% CI, 0.61 to 0.67). A risk score cutoff of ≥6 points identified 83 percent of cases in the validation cohort, while screening 68 percent of the population.[61] A followup study[62] in 10,425 asymptomatic women and heterosexual men in seven sexual health clinics throughout British Columbia (prevalence 5.3%) reported similar discrimination (AUC 0.69; 95% CI, 0.67 to 0.71). A cutoff of ≥8 points detected 86 percent of cases while screening 63 percent of the population and a cutoff of ≥6 identified 95 percent of infections while screening 78 percent of the population.[62]

A cross-sectional study of 35,818 asymptomatic men and women attending clinics for STI testing in Canada evaluated discrimination of a clinical risk score based on 3 criteria (age, indicators of risk, and injection drug use) and criteria derived from population based screening guidelines based on 6 criteria (age, number of sexual partners, injection drug use by patient or partner, transactional sex, prior infection).[63] The clinical risk score was associated with higher discrimination (AUC 0.73; 95% CI, 0.71 to 0.74) than presence of any guideline risk factors (AUC 0.55; 95% CI, 0.54 to 0.56) or number of guideline risk factors (AUC 0.64; 95% CI, 0.63 to 0.66), though none of the criteria were associated with high discrimination.

A cross-sectional study of 6,672 women attending family planning and STI clinics in the United States compared nine sets of selective screening criteria for chlamydial infection.[69] In the family planning clinics (n=4,471) 69 percent of women were asymptomatic, while nearly 80 percent of women in STI clinics (n=2201) reported genitourinary symptoms.[69] Criteria were from the CDC and various states or provinces: Seattle (3 versions), California (2 versions), Wisconsin, and Ontario, in addition to age criteria (≤ 22 years) (see **Appendix C**). Points were assigned for age 24 or younger, African-American, nulliparous, 2 or more sex partners in the past year, and vaginal douche in the past year; while the Seattle-2 version also included unmarried status, and cervical ectopy. Among the nine multi-item criteria, the highest AUC values were for two versions of state specific criteria (Seattle 2 AUC 0.726, standard deviation [SD] 0.014, sensitivity 83 to 84%, specificity 35 to 51%; Seattle-3 AUC 0.723, SD 0.015, sensitivity 92%, specificity 19 to 31%). Age alone (≤ 22 years) performed nearly as well as multiple item criteria,

with similar sensitivity (74-77%) and specificity (51-56%), and AUC 0.687 (SD 0.014). Using an age cutoff of 22 or younger, nearly 80 percent of cases were identified while testing 50 percent of the population.

Two studies evaluated the accuracy of screening criteria in other settings. A cross-sectional study of 5,087 women age 14 to 45 years attending clinic for IUD insertion compared three screening criteria for chlamydial and gonococcal infections based on: age alone; age and having multiple partners; or age, having multiple partners, and other risk markers (history of STI, inconsistent condom use).[65] The risk-based criteria had the highest sensitivity, but very low specificity (sensitivity 99%, specificity 7.6%); age (sensitivity 80.7%; specificity 48.1%) and age plus partner (sensitivity 84.7%; specificity 44.8%) performed similarly. A fair- quality, cross-sectional study evaluated a model using data from women who underwent surgical abortion in France (326 women in the validation set).[68] The model assigned points for having 1 or no children (43 points); not using contraception (34 points); and gestational age of abortion more than 10 weeks (23 points). At a cutoff of 40 points, sensitivity was 100 percent and specificity 26.9 percent; and at a cutoff 60 points, sensitivity was 83.3 percent and specificity 58.8 percent.

A fair- quality case-control study evaluated the proportion of gonorrhea cases missed by testing only for urogenital gonorrhea. It was conducted among 12 STI clinics in Los Angeles County in 245 consecutive men or women aged 15 to 29 years presenting for chlamydia or gonorrhea testing with a history of oral intercourse in last the 3 months with a partner of the opposite sex.[67] The study population was largely Hispanic or African-American and symptom status was not reported. Among those with gonorrhea, 28 percent had pharyngeal gonorrhea only. Compared to those without pharyngeal gonorrhea, a higher proportion of those with pharyngeal gonorrhea reported being men who had sex with women and men (25% versus 3%), to have swallowed ejaculate or vaginal fluid in last 3 months (28.6% versus 14.9%), or to have a recently incarcerated sex partner (35.3% versus 19.4%). In a multivariate model, there was a strong association between higher number of oral sex partners in the last 3 months (adjusted odds ratio [aOR] 5.7; 95% CI, 1.3 to 25.6) and the presence of concurrent urogenital gonorrhea (aOR 6.2; 95% CI, 2.6-14.3) and risk of pharyngeal gonorrhea, after adjusting for age, sex, and number of sex partners.[67]

Key Question 3. What Is the Diagnostic Accuracy of Anatomic Site-Specific Testing and Collection Methods for Identifying Persons With Chlamydial or Gonococcal Infections?

Summary

- The 2014 USPSTF review included four studies of site-specific testing for chlamydia in females that reported sensitivities that ranged from 86 to 96 percent for endocervical testing, 89 to 100 percent for vaginal testing, and 72 to 98 percent for urine testing. Specificity was high across anatomic sites, ranging from 98 to 100 percent.

- Five studies of diagnostic accuracy of site- specific testing for chlamydial infection, including three studies in the prior USPSTF review, reported sensitivities that ranged from 89 to 100 percent for endocervical testing and 90 to 100 percent for vaginal testing, excluding one outlier study reporting lower sensitivities. Specificities were 99 to 100 percent for endocervical testing and 95 to 100 percent for vaginal testing, and 96 to 100 percent for urine testing.
- The sensitivity of meatal (100%), urethral (99%) and rectal (92%) testing for chlamydia in males was high, but evidence was limited to one study each. Specificities were not reported and data were not provided to calculate specificity for all sites.
- The sensitivity of pharyngeal testing for chlamydia was 69.2% in one study of men who have sex with men; specificity was not reported.
- Three studies of diagnostic accuracy of site- specific testing for gonococcal infections in females reported sensitivities of 98 percent to 100 percent for vaginal samples, 96 percent and 98 percent for endocervical samples, and 89 percent and 100 percent for urine samples. Specificity was high at all sites (95% to 100%).
- Three studies of diagnostic accuracy of gonococcal infections in males reported sensitivities of 93 to 100 percent for urine testing; sensitivity ranged from 89 to 100 percent at other sites.
- The sensitivity of pharyngeal testing for gonorrhea was 89 percent in one study of men who have sex with men; specificity was not reported.
- Three studies of self- and clinician-collected vaginal samples for chlamydia diagnosis and one study of self- and clinician-collected vaginal samples for gonorrhea diagnosis found both collection methods to be highly sensitive (90 to 100%, excluding one outlier study). There were no studies comparing self- versus clinician-collected samples in males.

Evidence

The prior 2014 USPSTF review[57] included 10 fair-quality studies on the accuracy of NAATs compared with culture or expanded reference standards in asymptomatic individuals in high prevalence settings. Six studies included in the prior review were excluded from this review, because they compared performance characteristics between different types of assays (assay versus assay). Four studies in the prior review compared the accuracy of testing at different anatomic sites and were carried forward for this review (**Table 4**; **Appendix B Tables 7, 8 and 9**).[75,76,78,79] In these studies, anatomic site-specific testing for chlamydial infection in females indicated sensitivity ranging from 89 to 96 percent for endocervical testing,[75,76] 89 to 100 percent for vaginal testing,[75,76] and 72 to 98 percent for urine testing.[75] One outlier study[78] reported lower sensitivities than the other studies (51.9%, 55.6%, 51.9%, and 44.4% for endocervical, clinician-collected vaginal, self-collected vaginal, and urine testing, respectively). Specificity ranged from 98 to 100 percent across all sites.[75,76,78] For gonorrhea, the sensitivity of testing in females was 90 percent (specificity 100%) for endocervical testing and 98 percent for vaginal testing (specificity 100%)[79] The prior review also found self- and clinician-collected vaginal samples for chlamydia testing equally sensitive (ranging from 98% to 100%) and specific (>99%) in two studies,[75,76] although one other study found self-collected vaginal samples had lower sensitivity (55%).[78] Self-collected vaginal specimens were highly sensitive and specific for gonorrhea (98% and 100%).[79] The 2014 report did not identify studies on the diagnostic accuracy of site-specific testing or collection methods in males.

The current review compared the accuracy of screening tests obtained from different anatomic sites or from urine samples, or obtained using different collection methods (self-collected versus clinician- collected). Nine studies[60,64,70-72,75,76,78,79] evaluated the diagnostic accuracy of anatomic site-specific testing and six studies[64,70,75,76,78,79] compared collection methods for identifying chlamydial or gonococcal infections (**Table 4**; **Appendix B Tables 7, 8 and 9**).[60,64,70-72,75,76,78,79]

All of the studies were conducted in the U.S.,[64,70,75,78] U.K.,[60,71,72,76,79] or Canada.[75] Sample sizes ranged from 133 to 3,974 (Total N = 16,204). Six studies enrolled only females,[64,71,75,76,78,79] two studies enrolled only males,[60,72] (including one study that enrolled MSM),[72] and one study[70] enrolled both male and female participants. One study was conducted exclusively in an adolescent population (mean age 16 years).[64] Five studies enrolled a mix of adolescents and adults (mean age 19 to 37 years).[70,72,76,78,79] Two studies did not report mean age but reported age ranges between 16 and 25 years,[71,75] and age was not reported in one study.[60] In four studies that reported race, the proportion of black participants ranged from 9 to 96 percent[64,70,76,79] Race was not reported in the other five studies. One study[78] reported that participants were asymptomatic for chlamydia or gonorrhea at baseline, and four did not report symptom status.[60,64,71,75] Three studies included a mix of asymptomatic and symptomatic participants, but stratified results according to presence or absence of symptoms.[70,76,79] In the remaining study of MSM attending a sexual health/HIV clinic, the proportion of participants with symptoms at baseline was 28 percent.[72] Prevalence of infection ranged from 1.5 to 26.6 percent for chlamydial infection and 1.5 to 11.7 percent for gonococcal infection. All studies were rated fair-quality (**Appendix B Table 10)**. Methodological limitations included unclear methods of enrolling patients for study inclusion and unclear description of whether index test results were interpreted independently of the reference standard.

Accuracy of Anatomic Site Tests

Chlamydia

Female population. Three new studies[64,70,71] and three studies[75,76,78] from the prior review evaluated the accuracy of anatomic site-specific testing for chlamydia in females (**Table 5; Figure 2**).[64,70,71,75,76,78] Prevalence of chlamydia ranged from 6 to 27 percent (**Table 4**). Accuracy of site-specific testing was high across all anatomic sites (sensitivity range 84 to 100%; specificity range 95 to 100%), other than one outlier study[78] that reported consistently lower sensitivity among all sites tested (range 44% to 56%). While this study was conducted in a high prevalence population of university students age 16 to 25 years (chlamydia prevalence 21.6 %), reasons for lower sensitivity are unclear but might be related to the use of a single test to identify chlamydial infection at a time when NAAT testing was not routinely employed.

The sensitivity and specificity of endocervical and vaginal testing was consistent in five of six studies.[64,70,71,75,76] For endocervical testing, sensitivity ranged from 89 to 100 and specificity ranged from 99 to 100 percent. Vaginal testing from both patient and clinician- collected samples showed similar sensitivities, ranging from 90 to 100 percent; specificity was also high (range 95% to 100%). The sixth study reported lower but similar sensitivity at both anatomic sites (endocervical 52% and vaginal 56%) but specificity remained high (100% for both sites).[78] Urethral testing was also highly sensitive, based on one study that used three different NAATs,

ranging from 88 to 97 percent (specificity range 98-100 percent).[75] The sensitivity of urine testing was more variable than anatomic site testing in five studies (range 44 to 100%; median 85%), with specificities ranging from 96 to 100 percent.[64,70,71,75,78]

Male population. Three studies reported on the diagnostic accuracy of anatomic site-specific testing for chlamydial infection in males **(Table 6; Figure 3)**.[60,70,72] Urine testing was highly sensitive in all three studies (89 to 100%). Meatal (92%),[60] urethral (99%),[72] and rectal (92%)[72] testing were also highly sensitive, while pharyngeal testing was associated with lower sensitivity (69%),[72] all based on one study each.

Gonorrhea

Female population. Three studies reported the sensitivity and specificity of site-specific testing for gonorrhea in females (**Table 7; Figure 4**).[64,70,79] Prevalence of gonorrhea infection was 2.5[79] and 2.6[70] percent in two of the studies and 12 percent in the other.[64] Reference standards were either clinician-collected samples or urine testing. Across sites, sensitivity and specificity ranged from 90 to 100 percent and 97 to 100 percent, respectively. Vaginal samples (both self- and clinician-collected) were associated with a sensitivity of 98 percent in one trial and 100 percent in three trials (specificity range 99 to 100%). In comparison, endocervical samples (sensitivity 90% and 98%) and urine samples (91% and 100%) were slightly less sensitive. Specificity was also high, ranging from 97 to 100 percent.

Male population. Three studies compared site-specific testing for gonorrhea in males (**Table 8; Figure 5**).[60,70,72] Gonorrhea infection prevalence was low in two of the studies (1.5 and 4.2%)[60,70] and was high in the third study (27%).[72] Urine testing was evaluated in two studies, with sensitivities of 93 percent and 100 percent; corresponding specificities were high (99.8 and 99.3%).[60,72] The diagnostic accuracy of other sites, based on one study each, was 89 percent sensitivity for pharyngeal testing,[72] 93 percent for rectal testing,[72] 98 percent for urethral testing[72] and 100 percent for meatal testing.[60]

Accuracy of Clinician and Self-Collected Tests

Chlamydia

Female population. Two new studies[62,65] and two studies[70,75,78] from the prior review compared the accuracy of clinician- and self-collected vaginal samples for diagnosis of chlamydial infection in females (**Table 5; Figure 2**), including one study that utilized three different NAATs.[75] Sensitivity was similarly high for both collection methods. Clinician-collected sample sensitivity was 90 to 100 percent in two studies,[70,75] and 56 percent in the other study.[78] Self-collected samples were also highly sensitive for chlamydia diagnosis, ranging from 90 to 98 percent in two studies[70,75] and was 52 percent in the remaining study.[78] The outlier study reporting lower sensitivities, also included in the 2014 USPSTF report, only reported results from study participants with complete sets of results from nine different testing strategies, and required two positive NAATs from two separate specimens as a reference standard. This method presumably reduced the number of false positive tests, although the overall prevalence of

chlamydia infection was high (22%).[78] There were no studies comparing clinician- and self-collected testing at other anatomic sites.

Male population. No studies meeting inclusion criteria reported on the accuracy of clinician- versus self-collected testing for chlamydia in males.

Gonorrhea

Female population. One study compared clinician- and self-collected vaginal samples for diagnosis of gonorrhea infection **(Table 7)**.[70] In this study, the accuracy of self-collected samples was nearly identical to those collected by clinicians; sensitivities were 100 percent for both sites, and specificities were 100 and 99.7 percent, respectively. There was no evidence comparing clinician- and self-collected testing for other anatomic sites.

Male population. There were no studies meeting inclusion criteria on the accuracy of clinician- versus self-collected testing for gonorrhea in males.

Key Question 4. What Are the Harms of Screening for Chlamydial or Gonococcal Infections (Such as Labeling, Anxiety, False-Positive/Alarm Results, False-Negative Results/Reassurance, or Changes in Risk Behaviors or Risk Perception)?

Summary

- The 2014 USPSTF review included four diagnostic accuracy studies of site-specific testing or collection methods that reported false-positive rates for gonorrhea and chlamydia of 3 percent or lower and false-negative rates ranging from 0 to 9 percent for gonorrhea and 0 to 14 percent for chlamydia across all NAATs and specimen types. False alarm rates (1 – positive predictive value) ranged from 0 to 16 percent and false reassurance rates (1 – negative predictive value) ranged from 0 to 2 percent in three studies, with one outlier study reported higher false reassurance rates (11 to 13%).
- False positive rates for chlamydia ranged from 0 to 2 percent in six studies (2 new studies) across all sites. False negative rates ranged from 0 to 28 percent in five studies; a sixth study reported higher false negative rates (44% to 56%).
- False positive rates for self-collected and clinician-collected tests ranged from 0 to 1.2 percent for chlamydia based on 3 studies in females (1 new study), and was 0 percent (for self-collected samples) and 0.3 percent (for clinician-collected samples) for gonorrhea in females based on one study. False positive rates ranged from 0 to 12 percent for chlamydia and gonorrhea self- and clinician-collected tests, excluding one outlier study.
- Evidence on false positive and false negative rates in males, according to anatomic site, was limited to two new studies for chlamydia and gonorrhea. False positive rates were consistently low (<1%), while false negative rates ranged from (0 to 8%).

- No studies reported on harms of collection methods for chlamydia or gonorrhea in males.
- No studies evaluated psychosocial harms, such as anxiety, related to screening or effects of screening on risk behaviors or risk perception.

Evidence

The 2014 USPSTF review included four diagnostic accuracy studies of site-specific testing or collection methods that reported false-positive rates (1 – specificity) for gonorrhea and chlamydia as 3 percent or lower and false-negative rates (1 – sensitivity) that ranged from 0 to 9 percent for gonorrhea and 0 to 14 percent for chlamydia across all NAATs and specimen types. In these studies, false alarm rates (1 – positive predictive value) for chlamydia and gonorrhea ranged from 0 to 16 percent,[75,76,78,79] and false reassurance rates (1 – negative predictive value) ranged from 0 to 2 percent in three studies; one outlier study (see Key Question 3) reported lower sensitivity across anatomic sites reported higher false reassurance rates (11 to 13%).[78] The false alarm rate refers to the proportion of persons with a positive test who do not have an infection and the false reassurance rate refers to the proportion of persons with a negative tests who do have an infection.

Of the nine diagnostic accuracy studies included in Key Question 3 (including four studies included in the prior review), eight reported rates of false positive and false negative rates (and corresponding false alarm and false reassurance rates) for anatomic site- specific testing and six studies reported these rates for collection methods (**Tables 9, 10, 11, and 12**).[60,64,70,71,75,76,78,79] Harms of chlamydia testing were reported in six studies of females[64,70,71,75,76,78] and two studies of males;[60,70] harms of gonorrhea testing were reported in three studies of females[64,70,79] and two studies of males.[60,70] In these studies, the prevalence of chlamydial infection ranged from 8 to 27 percent in females and 11 percent in males. The prevalence of gonococcal infection was 2 to 12 percent in females and 2 to 4 percent in males. As in prior USPSTF reviews, no study evaluated psychosocial harms (e.g., anxiety) related to screening and no study evaluated effects of screening on changes in risk behaviors or risk perceptions.

Site-Specific Testing

Across all anatomic sites, the false positive rates for chlamydia testing in females ranged from 0 to 2 percent in six studies and corresponding false alarm rates ranged from 0 to 16 percent (**Table 9**; **Appendix B Tables 7, 8 and 9**).[64,70,71,75,76] By anatomic site, false positive rates were 0 to 0.7 percent for endocervical testing (false alarm rates 0 to 9%), 0 to 1.2 percent for vaginal testing (false alarm rates 0 to 12%), 0.2 to 1.7 percent for urethral testing (false alarm rates 2 to 11%) and 0 to 2 percent for urine testing (false alarm rates 0 to 16%). False negative rates ranged from 0 to 28 percent across sites in five of the studies (corresponding false reassurance rates ranged from 0 to 5%). One outlier study included in the prior report (see Key Question 3) reported higher false negative (range 44 to 56%) and false reassurance (range 11 to 13%) rates across anatomic sites;[78] this study evaluated a high-prevalence population (22% chlamydia prevalence). Evidence of harms in males was limited to two studies that found false positive rates of 0.4 percent for meatal (false alarm rate 4%) and 0.3 to 0.7 percent for urine (false alarm rates

3 to 6%) testing, with false reassurance rates of <1 percent (**Table 10**; **Appendix B Tables 7, 8 and 9**).[60,70]

For gonorrhea testing, evidence was limited to three studies in females[64,70,79] and two in males.[60,70] (**Tables 11 and 12**; **Appendix B Tables 7, 8 and 9**). In females, false positive rates were <1 percent across sites (corresponding false alarm rates ranged from 0 to 20%); false negative rates ranged from 0 to 10 percent (false reassurance rates 0 to 5%).[64,70,79] In males, false positive rates were similarly low (<1% across sites). False alarm rates were 7 to 30 percent, but false reassurance rates were very low (0 to 0.2%).[60,70]

Collection Methods

One new study[70] and two studies from the prior report[75,78] reported false negative rates for clinician- and self-collected vaginal samples for diagnosis of chlamydial infection in females (**Table 9; Appendix B Tables 7, 8 and 9**). Clinician-collected vaginal sample testing was associated with false positive rates ranging from 0 to 1.2 percent and corresponding false alarm rates that ranged from 0 to 8 percent. Rates were similar for self-collected samples (false positive rates 0 to 1%; false alarm rate range 0 to 12%). False negative and false reassurance rates were low for both collection methods in two studies (range 0 to 12% and 0 to 5%, respectively).[70,75] The third, outlier study found higher false negative (44% for clinician- and 48% for self-collected specimens) and false reassurance rates (11% for clinician- and 12% for self-collected).[78] One study directly compared the accuracy of clinician versus self-collected vaginal samples for gonorrhea in females and found a 0.3 percent false positive rate (false alarm rate 14%) with clinician-collected samples and 0 percent false positive and false alarm rate for self-collected samples. (**Table 11; Appendix B Tables 7, 8 and 9**).[70] False reassurance rates were 0 percent for both collection methods in this study.

No studies reported the accuracy of clinician- versus self-collected methods for chlamydia or gonorrhea in males.

Other Harms of Screening

There were no studies of psychosocial harms, such as anxiety, related to testing that met criteria for this or the prior review, and no studies of risk behaviors or risk perception.

Contextual Questions

Contextual Question 1. What Is the Prevalence Rate of Chlamydial or Gonococcal Infections (and Concurrent HIV Infection) in Partners of Patients Who Test Positive for Chlamydial or Gonococcal Infections?

Three studies reported prevalence rates in partners of patients who test positive for infection. Two studies reported prevalence rates for chlamydia[87,88] and one study for gonorrhea.[89] Chlamydia rates ranged from 27 to 39 percent in male partners of infected women in a small study[87] that compared home sampling versus conventional contact tracing. The study did not report the percentage of asymptomatic patients, but aimed to assess whether the test rate of partners could be increased by having male contacts of infected women send a urine sample directly from home compared with a urethral swab obtained in a clinical setting. Contact tracing results were reported as the percentage of partners who were examined in each group.

A prospective study of cervical chlamydia positive heterosexual women who were asymptomatic or had mild symptoms were followed to assess concurrent rectal chlamydia also assessed partner prevalence.[88] The prevalence of infections in index cases was similar regardless of whether the partner had rectal chlamydia or not. An observational study conducted in Australia reported the prevalence of antibiotic resistant gonorrhea in partners of infected patients using pharyngeal and rectal swabs for asymptomatic MSM.[89] Thirty-four of 458 partners (7.4%) simultaneously tested from a large prospective cohort were positive for gonorrhea.

Contextual Question 2. What Is the Effectiveness of Partner Services (Such as Traditional Partner Services or Expedited Partner Therapy)?

Three studies addressed partner services, including expedited partner therapy, in reducing rates of reinfection or acquisition of chlamydial or gonococcal infections in the index patient.[90-92] Types of partner services addressed in the studies included partner notification, a process by which sexual partners of patients diagnosed with a sexually transmitted infection are informed or notified of their exposure and the need to receive treatment; expedited partner therapy (EPT), in which there is facilitated access to antibiotic treatment or a prescription for medication by the index patient to their partner(s) without the need for a medical exam or evaluation of the partner; and expedited partner notification, when a clinician provides the index patient with antibiotics or a prescription to give to the sex partner.

A systematic review commissioned by the Cochrane collaborative reviewed the effect of strategies of partner notification in persons with sexually transmitted infections.[92] Expedited partner therapy was compared with simple patient referral (control) with regard to effects on rates of re-infection of the index patient. When combining trials of STI causing urethritis or

cervicitis, expedited partner therapy was associated with decreased risk of re-infection of the index patient versus simple patient referral, but was not associated with decreased risk versus enhanced patient referral, in which additional support was given to enhance outcomes. In three trials, expedited partner therapy and enhanced patient referral were associated with similar levels of repeat infection (RR 0.96; 95% CI, 0.60 to 1.53).

Another systematic review evaluated different methods of partner notification on rates of reinfection of the index patient.[90] There were four randomized controlled trials of partner notification interventions that compared the effectiveness of expedited partner notification with simple patient referral that included verbal advice from the partner (attention-control) on the rate of index patient reinfection with gonorrhea or chlamydia. Expedited partner notification was defined as a doctor providing the index patient with antibiotics or a prescription to give to the sex partner for preventing index reinfection. Effects of expedited partner notification versus simple patient referral appeared smaller in trials that included only women with chlamydia (RR 0.90, 95% CI, 0.60 to 1.35) than in trials that included patients with either gonorrhea or chlamydia (RR 0.61, 95% CI, 0.39 to 0.94).

A pilot RCT of partner notification models in community settings evaluated the effect of accelerated partner therapy (APT), the U.K adaptation of EPT, for partner notification.[91] APT conforms to U.K. prescribing regulations but is otherwise identical to EPT. One hundred ninety-nine women reported 339 male partners, of whom 313 were contactable. The primary outcome was whether each contactable partner was treated within 6 weeks of the index partner's diagnosis. Rates of reinfection or persistence of infection in the index patient was reported as a secondary outcome. APT was offered using three different methods, implemented in three different arms of the intervention, as pharmacy notification (community pharmacist assessment of partners plus routine PN) or hotline (telephone assessment of partners plus standard partner notification) versus standard partner notification alone (control). Only 38/199 (19%) index patients returned a postal urine sample for reinfection or persistence and chlamydia positivity was 15 percent (2/13) in the standard arm, 0 percent in the hotline arm, and 10 percent (1/10) in the pharmacy arm.

Chapter 4. Discussion

Summary of Review Findings

The evidence reviewed in this report is summarized in **Table 13**. The USPSTF previously determined that treatment is effective for chlamydial and gonococcal infections. One new trial of screening was generally consistent with prior screening trials that reported decreased risk of PID associated with screening. New evidence on risk prediction tools indicate suboptimal accuracy and require validation in primary care populations in the U.S. Evidence largely confirmed prior findings regarding high accuracy of diagnostic testing at various anatomic sites and home-based testing, with low false-positive and false-alarm rates. Important gaps include lack of studies on psychosocial or other harms related to screening, studies comparing screening intervals or alternative screening strategies, and studies evaluating changes in risk behaviors or risk perception.

Results of four screening trials, including one new trial, found screening for chlamydia associated with decreased risk of PID, though effects were not statistically significant in most trials and the magnitude of benefit was relatively small. No studies reported on the effectiveness of screening in men, other than one study that reported rates of epididymitis,[66] and there were no studies of pregnant individuals for any outcome. One large, new, good- quality trial of young men and women in primary care clinics in rural Australia found screening for chlamydia associated with reduced risk of hospital diagnosed PID in hospital diagnosed patients, although absolute effects were small (absolute difference -13.7 per 100,000 women).[66] In contrast to the three trials included in the prior report, this trial enrolled both men and women in primary care practices. There was no difference in risk of clinic-based PID diagnosis in women, epididymitis in men, or prevalence of chlamydia infection in young men or women. The study did not report data on transmission of infection.

This report included studies on the accuracy of risk criteria that were not addressed in prior USPSTF reviews. Three studies in asymptomatic patients found fair discrimination, but require further validation in diverse clinical and geographic settings. One study in a mixed population of asymptomatic and symptomatic women found similar discrimination of age ≤22 alone versus multi-item risk criteria. In other populations (women presenting for IUD insertion or surgical abortion) risk criteria were not accurate. One study found a high rate of pharyngeal gonorrhea in a population of high risk persons attending STI clinics, with a strong correlation between increasing numbers of oral sex partners in the three month period and rates of pharyngeal gonorrhea. Screening both urogenital and pharyngeal sites in order to increase sensitivity of case detection in certain populations may have implications for extragenital testing in other higher risk populations.

Accuracy of diagnostic testing for chlamydia was highly accurate across all genitourinary anatomic sites with vaginal and endocervical testing demonstrating the highest accuracy,[64,70,71,75,76,78] followed by urine testing in females.[64,70,71,75,78] In males, meatal,[60] urethral[72] and urine[60,70] testing yielded similarly high sensitivity, as did rectal testing,[72] based on

one study. Gonococcal testing was also highly accurate across anatomic sites for females with endocervical and vaginal sites demonstrating the highest accuracy,[64,70,79] followed by urine samples.[70] Urine testing for gonococcal infections demonstrated the highest sensitivity in males compared with other anatomic sites.[60,70] One study of pharyngeal testing, conducted in MSM, demonstrated low sensitivity for chlamydial infection (69.2%) but higher sensitivity for gonococcal infection (89.1%).[72] In females, self- and clinician-collected vaginal samples for chlamydia and gonorrhea diagnosis were both highly sensitive,[70,75,78] but no studies meeting inclusion criteria compared collection methods in males. These results were largely based on asymptomatic patient populations, increasing relevance to screening populations in the U.S.

In addition to diagnostic accuracy, other factors that may inform testing at extragenital sites include higher prevalence of extragenital chlamydial and gonococcal infection in MSM and persons attending STI clinics, as well as persons engaging in sexual contact at those sites. A small observational study of MSM in Australia reported the prevalence of antibiotic resistant gonorrhea in partners of infected patients using pharyngeal and rectal swabs and demonstrated that asymptomatic MSM can transmit antibiotic resistant strains of gonorrhea directly to their partners.[89] In the U.S., prevalence data indicates that MSM are disproportionately affected by STIs, including HIV.[12] In a report of prevalence data from STI and HIV clinic attendees, approximately one in eight men had an extragenital chlamydial or gonococcal infection.[12] Given the reported rates of antibiotic resistant strains of gonococcal infection for MSM,[93] considerations to expand the range of specimen types for screening has the potential to increase identification of infected individuals, especially for asymptomatic MSM in whom nearly 90 percent of all gonorrhea infections are in non-genital sites.[94]

There are few harms to screening for infection based on findings from this review, including low rates of false positive or false negative findings, false alarm rates, and false reassurance rates. However, no studies provided data about other potential adverse effects of screening for any population groups, including anxiety, changes in risk behaviors or risk perception. Further research is needed to determine the effectiveness of screening in multiple populations and on various clinical outcomes; trials of gonorrhea screening, including screening high risk groups; effective screening strategies and intervals; and harms of screening.

Limitations

We restricted inclusion to English language studies and did not include studies published only as abstracts; however, we did not identify non-English language studies in our searches or unpublished studies that met inclusion criteria. The inclusion criteria for this review included settings and tests relevant to current U.S. practice and did not re-evaluate the accuracy of NAAT testing. Therefore, some studies included in the prior USPSTF review were excluded, reducing the potential evidence base. However, this approach improved the relevance of the evidence to the USPSTF screening recommendation. There was variation in the quality and applicability of studies. A number of studies were conducted in STI clinics or other high risk clinical settings or in persons at higher risk for infection, which may reduce applicability to primary care settings or persons at lower risk. Evidence on men was limited and there were no studies of pregnant individuals. Screening trials focused on PID and epididymitis as the main outcome, but other

health outcomes such as infertility, chronic pelvic pain and ectopic pregnancy are also relevant, but may be more challenging to correlate. Detection of PID and epididymitis in one trial may have been limited by relatively low screening rates (17% to 25%).[66] Differences in assay sensitivity may have contributed to differential impact on PID prevention given that less sensitive assays may detect only patients with higher bacterial load, which has previously been linked in some studies to greater likelihood of developing PID. There were no screening studies that reported disease acquisition or transmission. Meta-analysis was not performed due to relatively small number of studies and heterogeneity in populations, settings, comparisons, and outcomes. We were not able to do formal graphical or statistical assessments for publication bias due to small numbers of studies.

Emerging Issues/Next Steps

Despite many years of relatively consistent screening recommendations, rates of chlamydial and gonococcal infections continue to rise. This trend is likely due in part to changes in risk behaviors, though it may also be due other factors. Screening tests for chlamydial and gonococcal infection are accurate regardless of anatomic site or collection method. Further understanding of the clinical significance of asymptomatic infections at extragenital sites and the effectiveness of screening at those sites is needed. Additional screening studies that evaluate extragenital testing may also inform strategies for screening in various settings and among target groups. There were no studies of alternative screening strategies, including testing for concurrent infection, including HIV, and no studies that addressed screening intervals. Further evaluation of expanded screening strategies may provide opportunities to further evaluate testing, especially among those at increased risk.

Relevance for Priority Populations

Evaluating the effectiveness of testing and risk criteria among priority populations has the potential to increase identification of infected individuals. Evidence on this topic has previously focused on women, with evidence lacking for men in general, and MSM in particular. Since the prior review, additional studies among MSM have emerged that demonstrate disproportionate risk for this group despite the overwhelming lack of screening studies in this population.[12] For this review, two studies included populations of MSM in the study population (2 to 7%)[67,72] and no studies included transgender or non-binary populations. Two studies were exclusively of men,[60,72] of which one diagnostic accuracy study evaluated anatomic site- specific testing exclusively in MSM.[72] Two studies were exclusively of adolescents (under age 19)[64,74] and 17 studies included for this review included adolescents in the study population.[61-69,71-73,75-79,95] Two studies were primarily in Black and Hispanic populations which, based on population data, have a higher prevalence of chlamydial infection, but studies in other populations with high prevalence of infection (e.g., American Indians/Alaska Natives) are lacking.[64,67] While findings of this review may be applicable across age categories, additional evidence is needed to inform clinical practice for men, including MSM, populations with higher prevalence of infection, rural populations, and in pregnant individuals, for whom no studies were identified.

Future Research

Research is lacking on the effectiveness of screening for gonorrhea in all population groups and for chlamydia in men, pregnant individuals, and women without risk factors. Studies that evaluate risk assessment criteria require further validation in settings applicable to U.S. primary care practice. Future studies could compare the effectiveness of screening versus no screening in populations at different levels of risk, using specimens from different anatomical sites, screening that includes testing for concurrent STIs including HIV, and screening at different intervals. No studies provided data about potential adverse effects of screening other than those related to test performance for any asymptomatic population group. Studies are also needed to evaluate the effect of screening on risk behavior and risk perception. No study addressed screening in pregnant individuals.

Conclusions

Screening for chlamydial infection may reduce the incidence of PID in young women. Risk prediction criteria to identify persons with asymptomatic chlamydial or gonococcal infection are associated with limited accuracy and require further validation. Testing for asymptomatic chlamydial and gonococcal infections is accurate at most anatomic sites, using urine sampling, and using self-collected specimens. Research is needed to determine the effectiveness of screening in men, optimal screening intervals, and adverse effects of screening.

References

1. U.S. Preventive Services Task Force. Screening for Chlamydia and Gonorrhea: Recommendation Statement. Am Fam Physician. 2015;91(7):486A-D.
2. U.S. Preventive Services Task Force. Screening for chlamydial infection: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2007 Jul 17;147(2):128-34. doi: 10.7326/0003-4819-147-2-200707170-00172. PMID: 17576996.
3. U.S. Preventive Services Task Force. Screening for Gonorrhea: Recommendation Statement. Ann Fam Med. 2005;3(3):263-7. doi: 10.1370/afm.337. PMID: 15928231.
4. Stephens RS. The cellular paradigm of chlamydial pathogenesis. Trends in microbiology. 2003 Jan 16;11(1):44-51. doi: 10.1016/S0966-842X(02)00011-2. PMID: 12526854.
5. Centers for Disease Control and Prevention. CDC Grand Rounds: Chlamydia prevention: challenges and strategies for reducing disease burden and sequelae. MMWR Morb Mortal Wkly Rep. 2011 Apr 1;60(12):370-3. PMID: 21451447.
6. Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2017. Atlanta, GA: US Department of Health and Human Services; 2018. https://www.cdc.gov/std/stats17/default.htm.
7. Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2011. US Department of Health and Human Services. Atlanta, GA: 2012. http://www.cdc.gov/std/stats11/toc.htm.
8. Edwards JL, Apicella MA. The molecular mechanisms used by Neisseria gonorrhoeae to initiate infection differ between men and women. Clin Microbiol Rev. 2004 Oct 19;17(4):965-81. doi: 10.1128/cmr.17.4.965-981.2004. PMID: 15489357.
9. Merz AJ, So M. Interactions of pathogenic Neisseriae with epithelial cell membranes. Annual review of cell and developmental biology. 2000 Oct 14;16:423-57. doi: 10.1146/annurev.cellbio.16.1.423. PMID: 11031243.
10. American Academy of Pediatrics. Prevention of Neonatal Ophthalmia. In: Kimberlin DW, Brady MT, Jackson MA, eds. Red Book: 2018 Report of the Committee on Infectious Diseases. 31st ed.: American Academy of Pediatrics; 2018:1046.
11. Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2018. Atlanta, Ga: U.S. Department of Health and Human Services; 2019. https://www.cdc.gov/std/stats18/default.htm2019.
12. Johnson Jones ML, Chapin-Bardales J, Bizune D, et al. Extragenital chlamydia and gonorrhea among community venue-attending men who have sex with men - five cities, United States, 2017. MMWR. Morbidity and mortality weekly report. 2019;68(14):321-5. doi: 10.15585/mmwr.mm6814a1. PMID: 30973847.
13. Torrone E, Papp J, Weinstock H. Prevalence of Chlamydia trachomatis genital infection among persons aged 14-39 years--United States, 2007-2012. MMWR Morb Mortal Wkly Rep. 2014 Sep 26;63(38):834-8. PMID: 25254560.
14. Andrews WW, Goldenberg RL, Mercer B, et al. The Preterm Prediction Study: association of second-trimester genitourinary chlamydia infection with subsequent spontaneous preterm birth. Am J Obstet Gynecol. 2000 Sep;183(3):662-8. doi: 10.1067/mob.2000.106556. PMID: 10992190.

15. Kohlhoff SA, Hammerschlag MR. Gonococcal and chlamydial infections in infants and children. In: Holmes K, ed Sex Transm Dis. 4th ed. New York, NY: McGraw-Hill; 2008:1613-27.
16. Brocklehurst P. Antibiotics for gonorrhoea in pregnancy. Cochrane Database Syst Rev. 2002 Apr 22(2):CD000098. doi: 10.1002/14651858.Cd000098. PMID: 12076381.
17. Woods CR. Gonococcal infections in neonates and young children. Seminars in pediatric infectious diseases. 2005 Oct;16(4):258-70. doi: 10.1053/j.spid.2005.06.006. PMID: 16210106.
18. Curry SJ, Krist AH, Owens DK, et al. Ocular Prophylaxis for Gonococcal Ophthalmia Neonatorum: US Preventive Services Task Force Reaffirmation Recommendation Statement. JAMA. 2019 Jan 29;321(4):394-8. doi: 10.1001/jama.2018.21367. PMID: 30694327.
19. Brunham RC, Gottlieb SL, Paavonen J. Pelvic Inflammatory Disease. N Engl J Med. 2015;372(21):2039-48. doi: 10.1056/NEJMra1411426. PMID: 25992748.
20. Wiesenfeld HC, Hillier SL, Meyn LA, et al. Subclinical pelvic inflammatory disease and infertility. Obstet Gynecol. 2012 Jul;120(1):37-43. doi: 10.1097/AOG.0b013e31825a6bc9. PMID: 22678036.
21. Fleming DT, Wasserheit JN. From epidemiological synergy to public health policy and practice: the contribution of other sexually transmitted diseases to sexual transmission of HIV infection. Sex Transm Infect. 1999 Feb;75(1):3-17. doi: 10.1136/sti.75.1.3. PMID: 10448335.
22. Wallin KL, Wiklund F, Luostarinen T, et al. A population-based prospective study of Chlamydia trachomatis infection and cervical carcinoma. Int J Cancer. 2002 Oct 1;101(4):371-4. doi: 10.1002/ijc.10639. PMID: 12209962.
23. Stamm WE. Chlamydia trachomatis infections of the adult. In: Holmes K, ed Sex Transm Dis. 4th ed. New York, NY: McGraw-Hill; 2008:575-606.
24. Arya R, Mannion PT, Woodcock K, et al. Incidence of genital Chlamydia trachomatis infection in the male partners attending an infertility clinic. J Obstet Gynaecol. 2005 May;25(4):364-7. doi: 10.1080/01443610500118749. PMID: 16091321.
25. Hwang L, Shafer MA. Chlamydia trachomatis infection in adolescents. Adv. Pediatr. 2004;51:379-407. PMID: 15366781.
26. Baeten JM, Overbaugh J. Measuring the infectiousness of persons with HIV-1: opportunities for preventing sexual HIV-1 transmission. Current HIV research. 2003 Jan;1(1):69-86. doi: 10.2174/1570162033352110. PMID: 15043213.
27. Rottingen JA, Cameron DW, Garnett GP. A systematic review of the epidemiologic interactions between classic sexually transmitted diseases and HIV: how much really is known? Sex Transm Dis. 2001 Oct;28(10):579-97. PMID: 11689757.
28. Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveilance 2012. Atlanta, GA: National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention, Division of STD Prevention; 2013. https://www.cdc.gov/std/stats/archive/Surv2012.pdf. Accessed July 8, 2014.
29. Workowski KA, Bolan GA, Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2015. MMWR Recomm Rep. 2015 Jun 5;64(RR-03):1-137. PMID: 26042815.

30. Workowski KA, Berman SM, Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines, 2006. MMWR. Recommendations and reports : MMWR Recomm Rep. 2006;55(RR-11):1-94. PMID: 16888612.
31. Dewart CM, Bernstein KT, DeGroote NP, et al. Prevalence of rectal chlamydial and gonococcal infections: a systematic review. Sex Transm Dis. 2018;45(5):287-93. doi: 10.1097/OLQ.0000000000000754. PMID: 29465688.
32. Chan PA, Robinette A, Montgomery M, et al. Extragenital infections caused by Chlamydia trachomatis and Neisseria gonorrhoeae: a review of the literature. Infect Dis Obstet Gynecol. 2016;2016:5758387. doi: 10.1155/2016/5758387. PMID: 27366021.
33. Trebach JD, Chaulk CP, Page KR, et al. Neisseria gonorrhoeae and Chlamydia trachomatis among women reporting extragenital exposures. Sex Transm Dis. 2015 May;42(5):233-9. doi: 10.1097/OLQ.0000000000000248. PMID: 25868133.
34. Danby CS, Cosentino LA, Rabe LK, et al. Patterns of extragenital chlamydia and gonorrhea in women and men who have sex with men reporting a history of receptive anal intercourse. Sex Transm Dis. 2016 Feb;43(2):105-9. doi: 10.1097/OLQ.0000000000000384. PMID: 26766527.
35. Newman LM, Dowell D, Bernstein K, et al. A tale of two gonorrhea epidemics: results from the STD surveillance network. Public Health Rep. 2012 May-Jun;127(3):282-92. doi: 10.1177/003335491212700308. PMID: 22547859.
36. Pathela P, Braunstein SL, Blank S, et al. HIV incidence among men with and those without sexually transmitted rectal infections: estimates from matching against an HIV case registry. Clin Infect Dis. 2013 Oct;57(8):1203-9. doi: 10.1093/cid/cit437. PMID: 23800942.
37. Scott KC, Philip S, Ahrens K, et al. High prevalence of gonococcal and chlamydial infection in men who have sex with men with newly diagnosed HIV infection: an opportunity for same-day presumptive treatment. J Acquir Immune Defic Syndr. 2008 May 1;48(1):109-12. doi: 10.1097/QAI.0b013e318165dc0b. PMID: 18209679.
38. Llata E, Braxton J, Asbel L, et al. New human immunodeficiency virus diagnoses among men who have sex with men attending sexually transmitted disease clinics, STD Surveillance Network, January 2010 to June 2013. Sex Transm Dis. 2018 Sep;45(9):577-82. doi: 10.1097/OLQ.0000000000000802. PMID: 29465646.
39. St Cyr S, Barbee L, Workowski KA, et al. Update to CDC's Treatment Guidelines for Gonococcal Infection, 2020. MMWR Morb Mortal Wkly Rep. 2020 Dec 18;69(50):1911-6. doi: 10.15585/mmwr.mm6950a6. PMID: 33332296.
40. Barrow RY, Ahmed F, Bolan GA, et al. Recommendations for Providing Quality Sexually Transmitted Diseases Clinical Services, 2020. MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports. 2020;68(5):1-20. doi: 10.15585/mmwr.rr6805a1. PMID: 31899459.
41. U.S. Food and Drug Administration. FDA clears first diagnostic tests for extragenital testing for chlamydia and gonorrhea. 2019. https://www.fda.gov/news-events/press-announcements/fda-clears-first-diagnostic-tests-extragenital-testing-chlamydia-and-gonorrhea. Accessed April 30, 2020.
42. Centers for Disease Control and Prevention. Recommendations for the laboratory-based detection of Chlamydia trachomatis and Neisseria gonorrhoeae--2014. MMWR Recomm Rep. 2014 Mar 14;63(RR-02):1-19. PMID: 24622331.

43. Olshen E, Shrier LA. Diagnostic tests for chlamydial and gonorrheal infections. Seminars in pediatric infectious diseases. 2005 Jul 27;16(3):192-8. doi: 10.1053/j.spid.2005.04.008. PMID: 16044393.
44. LeFevre ML. Screening for Chlamydia and gonorrhea: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2014 Dec 16;161(12):902-10. doi: 10.7326/m14-1981. PMID: 25243785.
45. Papp J, Schachter J, Gaydos C, et al. Recommendations for the Laboratory-Based Detection of Chlamydia trachomatis and Neisseria gonorrhoeae — 2014. Morbidity and Mortality Weekly Report. Atlanta, GA: 2014. https://www.cdc.gov/std/laboratory/2014labrec/2014-lab-rec.pdf.
46. American College of Obstetricians and Gynecologists. Chlamydia, Gonorrhea and Syphilis. 2019. https://www.acog.org/womens-health/faqs/chlamydia-gonorrhea-and-syphilis#:~:text=around%20the%20cervix.-,A%20yearly%20screening%20test%20is%20recommended%20for%20women%20younger%20than,with%20risk%20factors%20for%20gonorrhea. Accessed January 4, 2021.
47. Moyer CS. STDs increasing among young women; more prevention urged. American Medical News; December 2009. http://www.amednews.com/article/20091207/profession/312079972/6/. Accessed Dec 5, 2012.
48. American Academy of Pediatrics. Adolescent Sexual Health: STI Screening Guidelines. https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/adolescent-sexual-health/Pages/STI-Screening-Guidelines.aspx. Accessed October 18, 2018.
49. Lee KC, Ngo-Metzger Q, Wolff T, et al. Sexually transmitted infections: recommendations from the U.S. Preventive Services Task Force. Am Fam Physician. 2016 Dec 1;94(11):907-15. PMID: 27929270.
50. American College of Physicians. Chlamydia Screening in Women. 2015. https://www.acponline.org/clinical-information/performance-measures/chlamydia-screening-in-women. Accessed October 15, 2020.
51. Public Health Agency of Canada. Canadian Guidelines on Sexually Transmitted Infections: Summary of Recommendations for Chlamydia trachomatis (CT), Neisseria gonorrhoeae (NG) and Syphilis. 2019. https://www.canada.ca/en/services/health/publications/diseases-conditions/guidelines-sti-recommendations-chlamydia-trachomatis-neisseria-gonorrhoeae-syphilis-2019.html. Accessed January 4, 2021.
52. Public Health Agency of Canada. Chlamydia and LGV: Key information and resources. 2020. https://www.canada.ca/en/public-health/services/infectious-diseases/sexual-health-sexually-transmitted-infections/canadian-guidelines/chlamydia-lgv.html#a1.2. Accessed January 4, 2021.
53. Public Health Agency of Canada. Section 6-4: Canadian Guidelines on Sexually Transmitted Infections – Specific populations – Pregnancy. 2017. https://www.canada.ca/en/public-health/services/infectious-diseases/sexual-health-sexually-transmitted-infections/canadian-guidelines/sexually-transmitted-infections/canadian-guidelines-sexually-transmitted-infections-41.html. Accessed January 4, 2021.

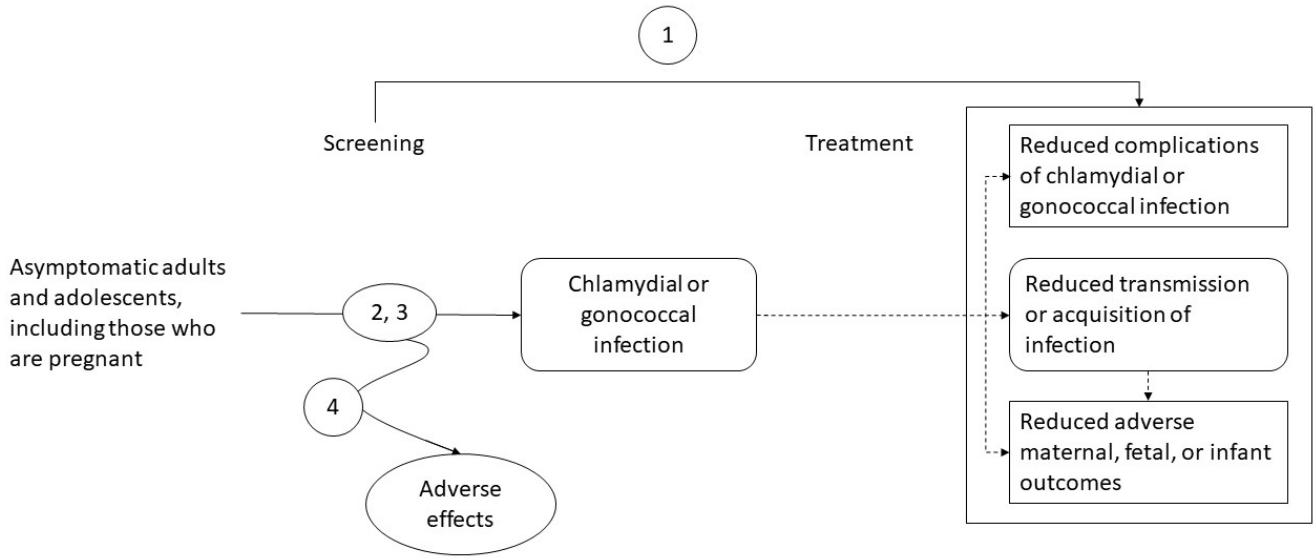
54. Workowski KA. Centers for Disease Control and Prevention Sexually Transmitted Diseases Treatment Guidelines. Clin Infect Dis. 2015 Dec 15;61 Suppl 8:S759-62. doi: 10.1093/cid/civ771. PMID: 26602614.
55. Tao G, Irwin KL. Receipt of HIV and STD testing services during routine general medical or gynecological examinations: variations by patient sexual risk behaviors. Sex Transm Dis. 2008 Feb;35(2):167-71. doi: 10.1097/OLQ.0b013e3181585be5. PMID: 18090177.
56. US Preventive Services Task Force. US Preventive Services Task Force Procedure Manual. Rockville, MD: Agency for Healthcare Research and Quality: 2015. https://www.uspreventiveservicestaskforce.org/Page/Name/procedure-manual Accessed April 29, 2020.
57. Nelson HD, Zakher B, Cantor A, et al. Screening for Gonorrhea and Chlamydia: Systematic Review to Update the U.S. Preventive Services Task Force Recommendations. Evidence Synthesis No. 115. AHRQ Publication No. 13-05184-EF-1. Rockville, MD: 09 2014. PMID: 25356451.
58. Mayer D. Essential Evidence-Based Medicine. 2nd ed. Cambridge, UK: Cambridge University Press; 2010.
59. Zakher B, Cantor AG, Pappas M, et al. Screening for gonorrhea and Chlamydia: a systematic review for the U.S. Preventive Services Task Force. Ann Intern Med. 2014 Dec 16;161(12):884-93. doi: 10.7326/M14-1022. PMID: 25244000.
60. Berry L, Stanley B. Comparison of self-collected meatal swabs with urine specimens for the diagnosis of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in men. J Med Microbiol. 2017 Feb;66(2):134-6. doi: 10.1099/jmm.0.000428. PMID: 28068218.
61. Falasinnu T, Gilbert M, Gustafson P, et al. Deriving and validating a risk estimation tool for screening asymptomatic chlamydia and gonorrhea. Sex Transm Dis. 2014 Dec;41(12):706-12. doi: 10.1097/OLQ.0000000000000205. PMID: 25581805.
62. Falasinnu T, Gilbert M, Gustafson P, et al. A validation study of a clinical prediction rule for screening asymptomatic chlamydia and gonorrhoea infections among heterosexuals in British Columbia. Sex Transm Infect. 2016a Feb;92(1):12-8. doi: 10.1136/sextrans-2014-051992. PMID: 25933609.
63. Falasinnu T, Gilbert M, Gustafson P, et al. An assessment of population-based screening guidelines versus clinical prediction rules for chlamydia and gonorrhea case finding. Prev Med. 2016b Aug;89:51-6. doi: 10.1016/j.ypmed.2016.04.001. PMID: 27143496.
64. Fang J, Husman C, DeSilva L, et al. Evaluation of self-collected vaginal swab, first void urine, and endocervical swab specimens for the detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in adolescent females. J Pediatr Adolesc Gynecol. 2008;21(6):355-60. doi: 10.1016/j.jpag.2008.03.010. PMID: 19064231.
65. Grentzer JM, Peipert JF, Zhao Q, et al. Risk-based screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* prior to intrauterine device insertion. Contracept. 2015 Oct;92(4):313-8. doi: 10.1016/j.contraception.2015.06.012. PMID: 26093189.
66. Hocking JS, Temple-Smith M, Guy R, et al. Population effectiveness of opportunistic chlamydia testing in primary care in Australia: a cluster-randomised controlled trial. Lancet. 2018 Oct 20;392(10156):1413-22. doi: 10.1016/S0140-6736(18)31816-6. PMID: 30343857.

67. Javanbakht M, Westmoreland D, Gorbach P. Factors associated with pharyngeal gonorrhea in young people: implications for prevention. Sex Transm Dis. 2018 Sep;45(9):588-93. doi: 10.1097/OLQ.0000000000000822. PMID: 29485543.
68. Lavoue V, Morcel K, Voltzenlogel MC, et al. Scoring system avoids *Chlamydia trachomatis* overscreening in women seeking surgical abortions. Sex Transm Dis. 2014 Aug;41(8):470-4. doi: 10.1097/OLQ.0000000000000153. PMID: 25013973.
69. Miller WC, Hoffman IF, Owen-O'Dowd J, et al. Selective screening for chlamydial infection: which criteria to use? Am J Prev Med. 2000 Feb;18(2):115-22. doi: 10.1016/s0749-3797(99)00146-4. PMID: 10698241.
70. Nye MB, Osiecki J, Lewinski M, et al. Detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* with the cobas CT/NG v2.0 test: performance compared with the BD probetec CT Q and GC Q amplified DNA and aptima AC2 assays. Sex Transm Infect. 2019 03;95(2):87-93. doi: 10.1136/sextrans-2018-053545. PMID: 30126947.
71. Skidmore S, Kaye M, Bayliss D, et al. Validation of COBAS Taqman CT for the detection of *Chlamydia trachomatis* in vulvo-vaginal swabs. Sex Transm Infect. 2008 Aug;84(4):277-8; discussion 8-9. doi: 10.1136/sti.2007.029587. PMID: 18305120.
72. Sultan B, White JA, Fish R, et al. The "3 in 1" study: pooling self-taken pharyngeal, urethral, and rectal samples into a single sample for analysis for detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* in men who have sex with men. J Clin Microbiol. 2016 Mar;54(3):650-6. doi: 10.1128/JCM.02460-15. PMID: 26719439.
73. Oakeshott P, Kerry S, Aghaizu A, et al. Randomised controlled trial of screening for *Chlamydia trachomatis* to prevent pelvic inflammatory disease: the POPI (prevention of pelvic infection) trial. BMJ (Clinical research ed.). 2010 Apr 8;340:c1642. doi: 10.1136/bmj.c1642. PMID: 20378636.
74. Østergaard L, Andersen B, Moller JK, et al. Home sampling versus conventional swab sampling for screening of *Chlamydia trachomatis* in women: a cluster-randomized 1-year follow-up study. Clin Infect Dis. 2000 Oct;31(4):951-7. doi: 10.1086/318139. PMID: 11049776.
75. Schachter J, McCormack WM, Chernesky MA, et al. Vaginal swabs are appropriate specimens for diagnosis of genital tract infection with *Chlamydia trachomatis*. J Clin Microbiol. 2003 Aug;41(8):3784-9. doi: 10.1128/jcm.41.8.3784-3789.2003. PMID: 12904390.
76. Schoeman SA, Stewart CM, Booth RA, et al. Assessment of best single sample for finding chlamydia in women with and without symptoms: a diagnostic test study. BMJ (Clinical research ed.). 2012 Dec 12;345:e8013. doi: 10.1136/bmj.e8013. PMID: 23236032.
77. Scholes D, Stergachis A, Heidrich FE, et al. Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. N Engl J Med. 1996 May 23;334(21):1362-6. doi: 10.1056/nejm199605233342103. PMID: 8614421.
78. Shrier LA, Dean D, Klein E, et al. Limitations of screening tests for the detection of *Chlamydia trachomatis* in asymptomatic adolescent and young adult women. Am J Obstet Gynecol. 2004 Mar;190(3):654-62. doi: 10.1016/j.ajog.2003.09.063. PMID: 15041995.
79. Stewart CM, Schoeman SA, Booth RA, et al. Assessment of self taken swabs versus clinician taken swab cultures for diagnosing gonorrhoea in women: single centre,

diagnostic accuracy study. BMJ (Clinical research ed.). 2012 Dec 12;345:e8107. doi: 10.1136/bmj.e8107. PMID: 23236033.
80. Chernesky MA, Martin DH, Hook EW, et al. Ability of new APTIMA CT and APTIMA GC assays to detect *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in male urine and urethral swabs. J Clin Microbiol. 2005 Jan;43(1):127-31. doi: 10.1128/jcm.43.1.127-131.2005. PMID: 15634960.
81. Gaydos CA, Van Der Pol B, Jett-Goheen M, et al. Performance of the cepheid CT/NG xpert rapid PCR test for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. J Clin Microbiol. 2013 Jun;51(6):1666-72. doi: 10.1128/jcm.03461-12. PMID: 23467600.
82. Gotz HM, Veldhuijzen IK, Habbema JD, et al. Prediction of *Chlamydia trachomatis* infection: application of a scoring rule to other populations. Sex Transm Dis. 2006 Jun;33(6):374-80. doi: 10.1097/01.olq.0000194585.82456.51. PMID: 16505746.
83. Taylor SN, Liesenfeld O, Lillis RA, et al. Evaluation of the roche cobas(R) CT/NG test for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in male urine. Sex Transm Dis. 2012 Jul;39(7):543-9. doi: 10.1097/OLQ.0b013e31824e26ff. PMID: 22706217.
84. Taylor SN, Van Der Pol B, Lillis R, et al. Clinical evaluation of the BD probetec *Chlamydia trachomatis* qx amplified DNA assay on the BD viper system with XTR technology. Sex Transm Dis. 2011 Jul;38(7):603-9. doi: 10.1097/OLQ.0b013e31820a94d2. PMID: 21301389.
85. Van Der Pol B, Liesenfeld O, Williams JA, et al. Performance of the cobas CT/NG test compared to the aptima AC2 and viper CTQ/GCQ assays for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. J Clin Microbiol. 2012 Jul;50(7):2244-9. doi: 10.1128/jcm.06481-11. PMID: 22518864.
86. Van Der Pol B, Taylor SN, Lebar W, et al. Clinical evaluation of the BD probetec *Neisseria gonorrhoeae* qx amplified DNA assay on the BD viper system with XTR technology. Sex Transm Dis. 2012 Feb;39(2):147-53. doi: 10.1097/OLQ.0b013e3182372fd8. PMID: 22249304.
87. Andersen B, Ostergaard L, Moller JK, et al. Home sampling versus conventional contact tracing for detecting *Chlamydia trachomatis* infection in male partners of infected women: randomised study. BMJ (Clinical research ed.). 1998 Jan 31;316(7128):350-1. doi: 10.1136/bmj.316.7128.350. PMID: 9487169.
88. Ding A, Challenor R. Rectal Chlamydia in heterosexual women: more questions than answers. Int J STD AIDS. 2014 Jul;25(8):587-92. doi: 10.1177/0956462413515637. PMID: 24352134.
89. Kwong JC, Chow EPF, Stevens K, et al. Whole-genome sequencing reveals transmission of gonococcal antibiotic resistance among men who have sex with men: an observational study. Sex Transm Infect. 2018 03;94(2):151-7. doi: 10.1136/sextrans-2017-053287. PMID: 29247013.
90. Althaus CL, Turner KM, Mercer CH, et al. Effectiveness and cost-effectiveness of traditional and new partner notification technologies for curable sexually transmitted infections: observational study, systematic reviews and mathematical modelling. Health Technol Assess. 2014 Jan;18(2):1-100, vii-viii. doi: 10.3310/hta18020. PMID: 24411488.
91. Estcourt CS, Sutcliffe LJ, Copas A, et al. Developing and testing accelerated partner therapy for partner notification for people with genital Chlamydia trachomatis diagnosed

in primary care: a pilot randomised controlled trial. Sex Transm Infect. 2015 Dec;91(8):548-54. doi: 10.1136/sextrans-2014-051994. PMID: 26019232.
92. Ferreira A, Young T, Mathews C, et al. Strategies for partner notification for sexually transmitted infections, including HIV. Cochrane Database Syst Rev. 2013 Oct 3(10):Cd002843. doi: 10.1002/14651858.CD002843.pub2. PMID: 24092529.
93. Unemo M, Shafer WM. Antimicrobial resistance in Neisseria gonorrhoeae in the 21st century: past, evolution, and future. Clin Microbiol Rev. 2014 Jul;27(3):587-613. doi: 10.1128/CMR.00010-14. PMID: 24982323.
94. Marcus JL, Bernstein KT, Kohn RP, et al. Infections missed by urethral-only screening for chlamydia or gonorrhea detection among men who have sex with men. Sex Transm Dis. 2011 Oct;38(10):922-4. doi: 10.1097/OLQ.0b013e31822a2b2e. PMID: 21934565.
95. Nyatsanza F, McSorley J, Murphy S, et al. 'It's all in the message': the utility of personalised short message service (SMS) texts to remind patients at higher risk of STIs and HIV to reattend for testing-a repeat before and after study. Sex Transm Infect. 2016 Aug;92(5):393-5. doi: 10.1136/sextrans-2015-052216. PMID: 26670912.

Figure 1. Analytic Framework

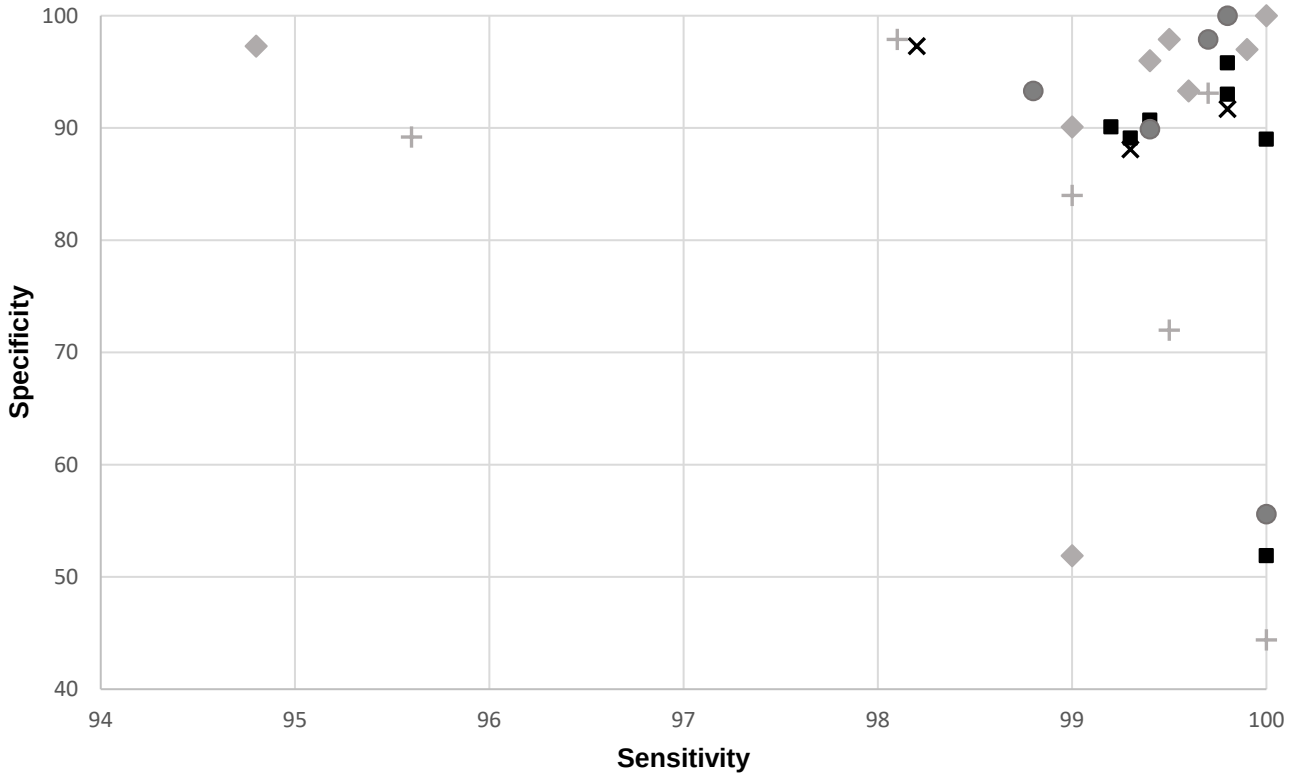


Note: Numbers in the figure correspond to the Key Question number.

Key Questions

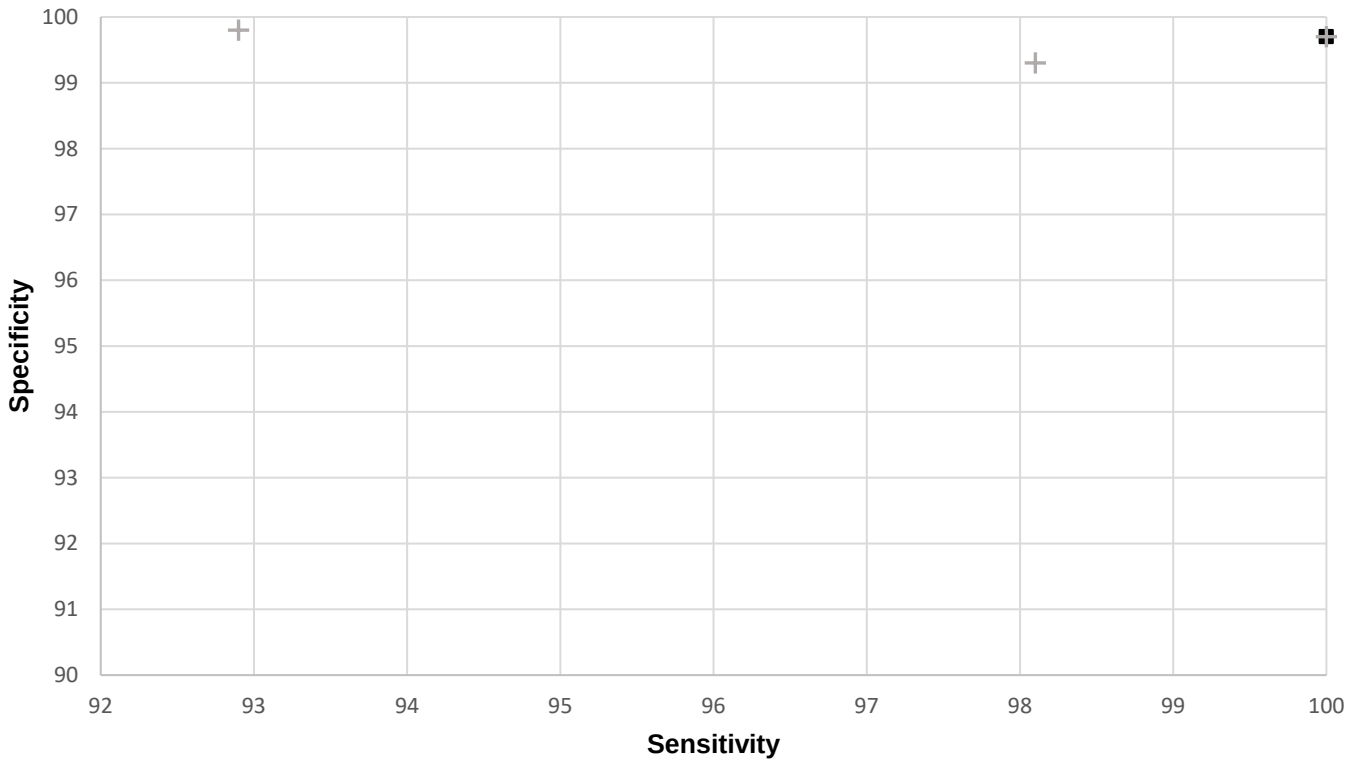
1. In asymptomatic, sexually active adults and adolescents, including those who are pregnant, what is the effectiveness of screening for chlamydial and gonococcal infections in reducing complications of infection and transmission or acquisition of disease, including gonorrhea, chlamydia, and HIV?
2. What is the accuracy of risk stratification methods or alternative screening strategies for identifying persons at increased risk of chlamydial and gonococcal infections (such as younger persons or men who have sex with men)? Screening strategies include testing for concurrent infections, including HIV, or using different screening intervals.
3. What is the diagnostic accuracy of anatomic site-specific testing and collection methods for identifying persons with chlamydial and gonococcal infections?
4. What are the harms of screening for chlamydial and gonococcal infections (such as labeling, anxiety, false-positive/alarm results, false-negative results/reassurance, or change in risk behaviors or risk perception)?

Figure 2. Diagnostic Accuracy of Site-Specific Testing for Female Chlamydial Infection



Legend
- ■ Endocervix
- ◆ Vagina, self-collected
- ● Vagina, clinician-collected
- × Urethra
- \+ Urine

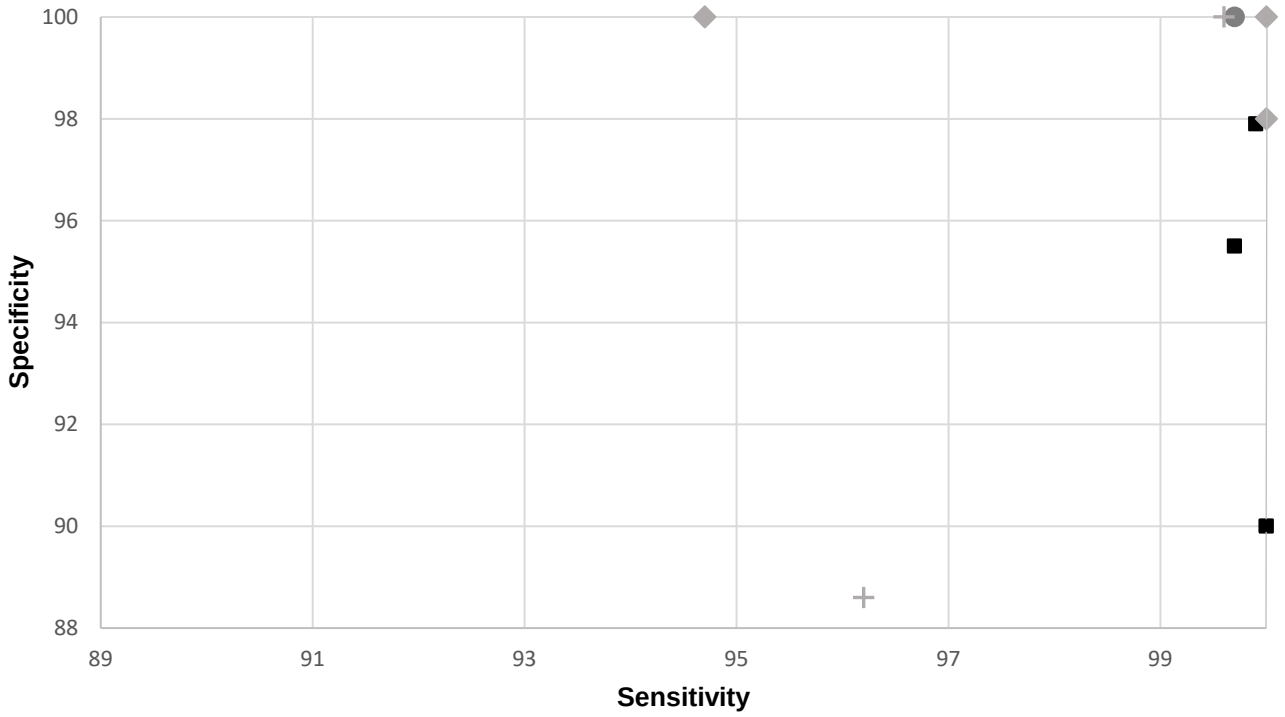
Figure 3. Diagnostic Accuracy of Site-Specific Testing for Male Chlamydial Infection*



Legend
■ Meatal
+ Urine

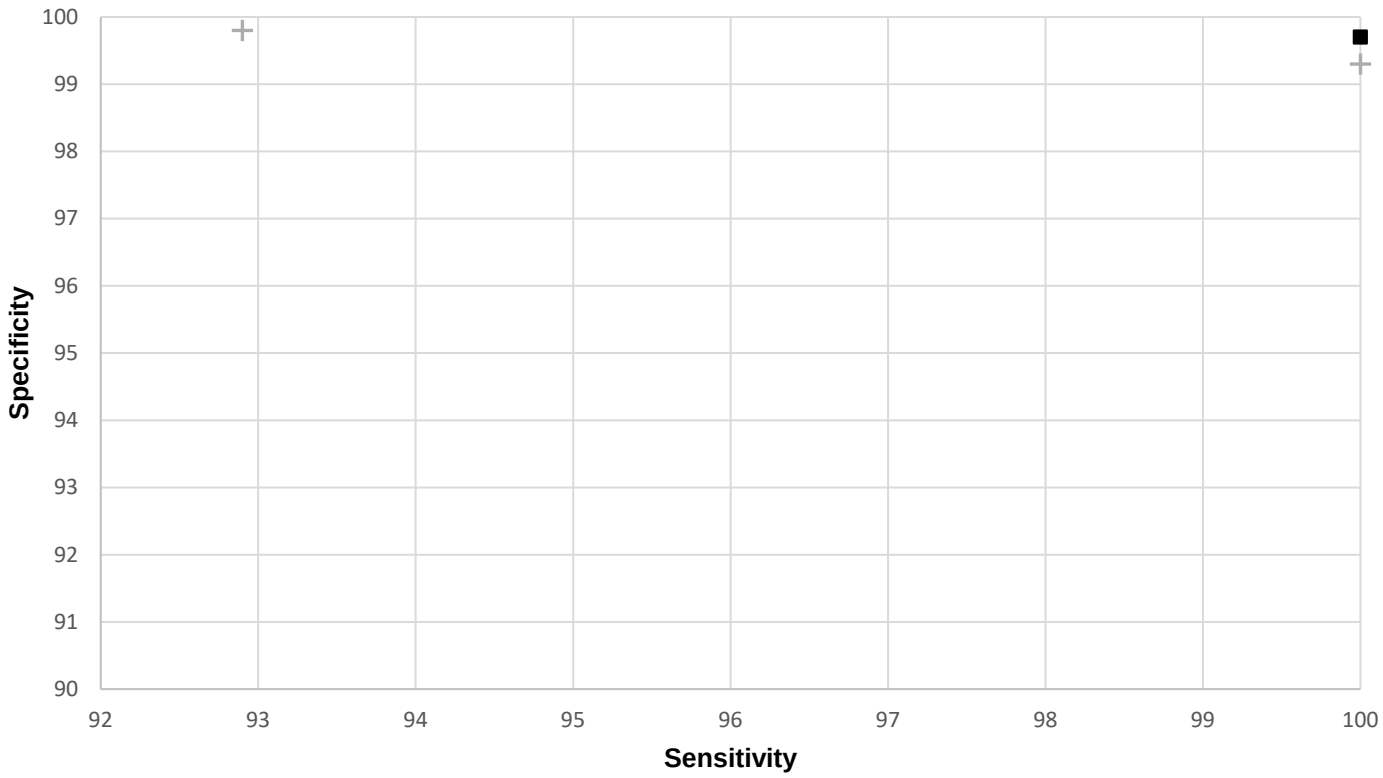
*Results from one study[72] are not included in Figure 3 as the study did not report specificity or include data to calculate specificity

Figure 4. Diagnostic Accuracy of Site-Specific Testing for Female Gonococcal Infection



Legend
- ■ Endocervix
- ◆ Vagina, self-collected
- ● Vagina, clinician-collected
- + Urine

Figure 5. Diagnostic Accuracy of Site-Specific Testing for Male Gonoccocal Infection*



Legend
■ Meatal
+ Urine

*Results from one study[72] are not included in Figure 5 as the study did not report specificity or include data to calculate specificity

Table 1. Screening Recommendations of Other Groups

Organization, year	Recommendations
Centers for Disease Control and Prevention, 2015[29]	Recommends annual screening for chlamydial and gonococcal infections in all sexually active women younger than 25 and in older women with specific risk factors (a new sex partner or multiple sex partners), per USPSTF. The CDC also recommends screening MSM at least annually, and recommends more frequent screening of MSM with multiple or anonymous partners. Clinical settings with a high prevalence of chlamydia should consider screening sexually active young men.
American College of Obstetricians and Gynecologists, 2016[46]	Recommends annual screening for *C. trachomatis* in all sexually active females aged 25 or younger and in older women with risk factors. Recommends chlamydial screening in all pregnant women in early pregnancy and repeat testing in the third trimester for women with risk factors. Recommends screening for gonorrhea in women younger than 25 years and for women 25 years and older with risk factors, and in pregnant females 25 years or younger or for those living in an area where gonorrhea is common.
American Medical Association, 2009[47]	Follow CDC recommendations.
American Academy of Pediatricians, 2011[48]	Follow CDC recommendations
American Academy of Family Physicians, 2016[49]	Follow USPSTF recommendations.
American College of Physicians, 2015[50]	Follows USPSTF screening recommendations for chlamydial infections.
Public Health Agency of Canada[51-53]	Recommends annual screening for *C. trachomatis* and *N. Gonorrhoeae* in all sexually active persons under the age of 25 with retesting after 3 months in infected patients or based on continued risk factors. Risk-based screening is recommended for those 25 years and older. Recommends screening for chlamydia and gonorrhea at the first prenatal visit and again during pregnancy based on risk factors.

Abbreviations: ACOG = American College of Obstetricians and Gynecologists; CDC = Centers for Disease Control and Prevention; MSM= men who have sex with men

Table 2. Randomized, Controlled Trials of Screening for Chlamydia to Reduce Adverse Outcomes

Author, Year	Population (*n*)	Interventions	Duration	Attrition	Outcomes	Quality
Hocking *et al.*, 2018[66]	Sexually active males and females age 16-29 years in 130 primary care clinics in Australia (n=63,338)	Multifaceted screening program vs. usual care (control)	Mean 3.1 years	Not reported	Incidence of PID in clinic‡: Screened: 0.45% (293/65,519) Control: 0.39% (237/60,384) RR 1.1 (95% CI 0.7 to 1.8) Incidence of PID in hospitals: Screened: 0.24% (57/23,527) Control: 0.38% (88/23,219) RR 0.6 (95% CI 0.4 to 1.0) Incidence of epididymitis§: Screened: 0.26% (106/41,168) Control: 0.27% (106/38,717) RR 0.9 (95% CI 0.6 to 1.4)	Good
Oakeshott *et al.*, 2010†[73]	Sexually active females age ≤27 years recruited from universities and colleges in the U.K. (n=2,529)	Immediate screening vs. deferred screening after 1 year (control)	1 year	Screened: 5% Control: 7%	Incidence of PID in asymptomatic women (n=1648): Screened: 0.6% (5/787) Control: 1.6% (14/861) RR 0.39 (95% CI 0.14 to 1.08) Incidence of PID in all women: Screened: 1.3% (15/1191) Control: 1.9% (23/1186) RR 0.65 (95% CI 0.34 to 1.22)	Good
Ostergaard *et al.*, 2000†[74]	Female students recruited from high schools in one county in Denmark (n=1,700)	Home screening vs. usual care opportunistic screening in a clinic (control)	1 year	Screened: 49% Control: 42%	Incidence of new chlamydia infections in all females: Screened: 2.9% (13/443) Control: 6.6% (32/487) RR 0.45 (95% CI 0.24 to 0.84) *p*= 0.026 Incidence of PID in all females: Screened: 2.1% (9/443) Control: 4.2% (20/487) RR 0.50 (95% CI 0.23 to 1.08) *p*= 0.045	Fair

Table 2. Randomized, Controlled Trials of Screening for Chlamydia to Reduce Adverse Outcomes

Author, Year	Population (*n*)	Interventions	Duration	Attrition	Outcomes	Quality
Scholes *et al.*, 1996[†77]	Women age 18 to 34 years recruited from a health maintenance organization in the U.S. selected by risk criteria (n=2,607)	Clinic screening vs. usual care (control)	1 year	24% of participants did not return final questionnaire	Incidence of PID in all women: Screened: 8 per 10,000 women-years (9 cases) Control: 18 per 10,000 women-years (33 cases) RR 0.44 (95% CI 0.20 to 0.90)	Fair

*Only includes participants with followup who were independently tested outside of study protocol.
[†]Included in prior USPSTF evidence review
[‡]Denominator is the number of females aged 16-33 years with at least one consultation during the intervention period
§Denominator is the number of men aged 16-29 with at least one consultation during the intervention period
Abbreviations: CI = confidence interval; PID = pelvic inflammatory disease; RR = relative risk; vs. = versus; U.K. = United Kingdom; U.S. = United States

Table 3. Studies Evaluating Strategies for Identifying Persons Who Are at Increased Risk for Chlamydial or Gonococcal Infections

Author, year	Strategy	Infection	Sex	Study design	Population, N	Results	Quality rating
Falasinnu *et al.*, 2014[61]	Risk estimation model	GC, CT	M, F	Cross-sectional	Asymptomatic men and women, attending clinic for STI testing; Canada (n=25,393)	Derivation population (n=10,437): AUC=0.75; 95% CI, 0.72 to 0.80 Validation population (n=14,956): AUC=0.64; 95% CI, 0.61 to 0.67	Fair
Falasinnu *et al.*, 2016[62]	Risk estimation model	GC, CT	M, F	Cross-sectional	Asymptomatic men and women, attending clinic for STI testing; Canada (n=20,862)	Derivation population (n=10,437):AUC= 0.74 (95% CI 0.70 to 0.77) Validation population (n=10,425): AUC=0.69 (95% CI 0.67 to 0.71)	Fair
Falasinnu *et al.*, 2016[63]	Population guideline vs. guideline + number of risk factors vs. clinical risk score[a]	STI	M, F	Cross-sectional	Asymptomatic men and women, attending clinic for STI testing; Canada (n=35,818)	Guideline (any vs. no risk factors): AUC 0.55 (95% CI 0.54 to 0.56) Guideline (numbers of risk factors): AUC 0.64 (95% CI 0.63 to 0.66) Risk score model: AUC 0.73 (95% CI 0.71 to 0.74)	Fair
Grentzer *et al.*, 2015[65]	Age vs. age + partner vs. risk-based screening[b]	GC, CT	F	Cross-sectional	Women age 14 to 45 years attending clinic for IUD insertion; U.S. (n=5087)	*Sensitivity; specificity; NPV; PPV; %* Age: 80.7; 48.1; 98.8; 4.5 Age + partner: 84.7; 44.8; 99.0; 4.5 Risk: 99.3; 7.6; 99.7; 3.2	Fair
Javanbakht *et al.*, 2018[67]	Risk estimation	GC	M, F	Case-Control	Men and women age 15 to 29 years reporting giving oral sex to partner of opposite sex in past 90 days; U.S. (n=245)	Risk of pharyngeal gonorrhea: Number of oral sex partners in 3 months: aOR 5.7; 95% CI 1.3 to 25.6 aOR 5.7; 95% CI 1.3 to 25.6 Presence of concurrent urogenital gonorrhea: aOR 6.2; 95% CI 2.6-14.3	Fair
Lavoue *et al.*, 2014[68]	Model to predict infection[c]	CT	F	Cross-sectional	Women with surgical abortion and CT test; France (n=652 derivation, n=326 validation)	*Sensitivity, %; specificity, %* Cutoff 40: 100; 26.9 Cutoff 60: 83.3; 58.8	Fair
Miller, *et al.,* 2000[69]	Compares 9 sets of screening criteria[d]	CT	F	Cross-sectional	Women in family planning clinics; U.S. (n=4754)	*Criteria; AUC (SD); sensitivity, %; specificity, %* CDC: NA, 85, 38 Seattle-1: 0.599 (0.017); 56; 54 Wisconsin: 0.604 (0.023); 50; 66 Ontario: 0.630 (0.017); 76; 41 California-1: 0.633 (0.016); 94; 20 Age ≤ 22: 0.687 (0.014); 77; 51 California-2: 0.701 (0.015); 97; 9 Seattle-3: 0.723 (0.015); 92; 31 Seattle-2: 0.726 (0.014); 84; 51	Fair

Abbreviations: aOR = adjusted odds ratio; AUC = area under the receiver operating characteristic curve; CDC = Centers for Disease Control and Prevention; CI = confidence interval; CT = chlamydia; F = female; GC = gonorrhea; IUD = intrauterine device; M = male; NA = not applicable; NPV = negative predictive value; OR = odds ratio; PID =

pelvic inflammatory disease; PPV = positive predictive value; RCT = randomized controlled trial; RR = relative risk; SD = standard deviation; STD = sexually transmitted disease; STI = sexually transmitted infection; U.K. = United Kingdom; U.S. = United States.

[a]Population guideline from the Public Health Agency of Canada (any vs. no risk factors including age <30, 2 or more sexual partners, injection drug use, sexual contact with injection drug user, sexual contact with commercial sex workers, previous STD); guideline (numbers of risk factors including age <30, 2 or more sexual partners, injection drug use, sexual contact with injection drug user, sexual contact with commercial sex workers, previous STD); clinical risk score model (age, race/ethnicity [white/nonwhite], number of sexual partners [0, 1-2, 3 or more], previous CT or GC diagnosis [yes/no], condom use [always, not always]; injection drug use [yes/no]).
[b]Age-based (≤25 years); age + partner-based (≤25 years + multiple partners); risk-based (≤25 years, multiple partners, history of STI, inconsistent condom use).
[c]Model includes: 0 or 1 child (43 points); not using contraception (34 points); gestational age of abortion >10 weeks (23 points). Low-risk of CT infection = 0-40 points; intermediate-risk = 40-60; high-risk = 60-100.
[d]Screening criteria listed in publication (Miller, 2000[69]).

Table 4. Characteristics of Diagnostic Accuracy Studies

Study, year	Assessment	Country, Setting	Eligibility Criteria	Population	Sample size, Proportion with condition	Study Quality
Berry *et al.*, 2017[60]	Site-specific testing	U.K. Sexual health clinic	Men attending sexual health clinic for sexual health screening	Age (mean): NR 100% male sex Race: NR Symptomatic: NR	1517 CT: 10.5% NG: 4.2%	Fair
Fang *et al.*, 2008[64]	Site-specific testing	U.S. Adolescent clinic	Sexually active adolescent women, age 12 to 18 years	Age (median): 16 years 100% female sex Race: 96% black Symptomatic: NR	342† CT: 26.6% NG: 11.7%	Fair
Nye *et al.*, 2019[70]	Site-specific testing Collection method	U.S. Family planning, obstetric/ gynecology, or STI clinic	Eligible for screening per clinical site's standard practice, age ≥14 years	Age (mean): 29 years 88% female sex Race: 45% black, 46% white Symptomatic: 38%	3749‡ CT: 6.8% (6.2% women, 11.3% men) NG: 1.5% (1.6% women, 1.5% male	Fair
Schachter *et al.*, 2003[75]*	Site-specific testing Collection method	U.S. and Canada Family planning, obstetric/ gynecology, or STI clinic	Women attending family planning, obstetrics/ gynecology, or STI clinics for routine care or birth control, Age 16 to 25 years	Age (mean): NR, range 16 to 25 years 100% female sex Race NR Symptomatic: NR	2,517 CT: 9.6%	Fair
Schoeman *et al.*, 2012[76]*	Site-specific testing	U.K. Sexual health clinic	Women, Age ≥16 years	Age (mean): 25 years 100% female sex Race: 80% white, 9% black, 7% mixed, 4% other Symptomatic: 34%	3974 CT: 10.3%	Fair
Shrier *et al.*, 2004[78]*	Site-specific testing Collection method	U.S.; University medical clinic for adolescents and young adults	Sexually experienced women attending clinic for routine gynecologic care, age 16 to 25 years	Age (mean): 19 years 100% female sex Race: NR Symptomatic: 0%	139 CT: 21.6%	Fair
Skidmore *et al.*, 2008[71]	Site-specific testing	U.K. Genitourinary medicine clinic	Women attending genitourinary clinic, age 18 to 24 years	Age (mean): NR; range 18 to 24 years 100% female sex Race: NR Symptomatic: NR	267 CT: 9.3%	Fair
Stewart *et al.*, 2012[79]*	Site-specific testing	U.K. Sexual health clinic	Women attending sexual health clinic, age ≥16 years	Age (mean): 25 years 100% female sex Race: 80% white, 9% black, 7% mixed, 4% other Symptomatic: 28%	3973 (2,234‡) NG: 2.5% (1.8%‡)	Fair
Sultan *et al.*, 2016[72]	Site-specific testing	U.K. Sexual health/ HIV clinic	Men who have sex with men, age ≥18 years	Age (median): 37 years 100% male sex Race: NR Symptomatic: 28%	1064 CT: 15% NG: 27%	Fair

Abbreviations: CT = Chlamydia trachomatis; NG = Neisseria gonorrhoeae; NR = not reported
* Study included in prior USPSTF review

Table 4. Characteristics of Diagnostic Accuracy Studies

† Participants were tested multiple times over a 5-year period. The total number of chlamydia tests administered was 1,080; the total number of gonorrhea tests was 1,079.
‡ Asymptomatic population only

Table 5. Diagnostic Accuracy of Anatomic Site-Specific Testing for Chlamydial Infection in Females

Author, year Sample size	Test	Reference standard	Endocervix, clinician-collected n=number tested	Vagina, clinician-collected n=number tested	Vagina, self-collected n=number tested	Urethra n=number tested	Urine n=number tested
Schachter *et al*., 2003[75] n=2,517 (n=609 tested using Amplicor PCR)	Amplicor CT/NG PCR	LCx Probe System, Amplicor PCR or Amplified CT Assay, clinician-collected cervical swab or urine sample	n=600 Sensitivity: 90.7 (95% CI 81.7-96.2) Specificity: 99.4 (95% CI 98.3-99.9)	n=579 Sensitivity: 93.3 (95% CI 85.1-97.8) Specificity: 98.8 (95% CI 98.4-99.7)	n=568 Sensitivity: 90.1 (95% CI 81.7-96.2) Specificity: 99.0 (95% CI 97.7-99.7)	n=602 Sensitivity: 97.3 (95% CI 90.7-99.8) Specificity: 98.2 (95% CI 96.8-99.2)	n=577 Sensitivity: 84.0 (95% CI 73.7-91.5) Specificity: 99.0 (95% CI 97.7-99.7)
Schachter *et al*., 2003[75] n=2,517 (n=1,408 tested using Amplified CT)	Amplified CT Assay	LCx Probe System, Amplicor PCR or Amplified CT Assay, clinician-collected cervical swab or urine sample	n=1,408 Sensitivity: 89.1 (95% CI 82.0-95.0) Specificity: 99.3 (95% CI 98.7-99.7)	n=1,408 Sensitivity: 89.9 (95% CI 83.1-94.7) Specificity: 99.4 (95%CI 98.8-99.7)	n=1,408 Sensitivity: 93.3 (95% CI 87.2-97.1) Specificity: 99.6 (95% CI 99.1-99.9)	n=1,407 Sensitivity: 88.1 (95% CI 81.1-93.4) Specificity: 99.3 (95% CI 98.7-99.7)	n=1,387 Sensitivity: 72.0 (95% CI 63.3-80.1) Specificity: 99.5 (95% CI 99.0-99.8)
Schoeman *et al*., 2012[76] n=2,233*	Aptima Combo-2	Aptima CT, clinician-collected endocervical swab	n=2,233 Sensitivity: 89.0 (95% CI 84.0-93.0) Specificity: 100.0 (95% CI 99.8-100)	-	n=2,233 Sensitivity: 97.0 (95% CI 94.0-99.0) Specificity: 99.9 (95% CI 99.7-100)	-	-
Fang *et al*., 2008[64] n=342 (1,080 tests)	BD ProbeTec ET	BD ProbeTec ET, clinician-collected endocervical swab and urine sample	n=1,076 Sensitivity: 90.1 (95% CI 82.9-95.9) Specificity: 99.2 (95% CI 98.9-99.9)	-	n=1,034 Sensitivity: 98.2 (95% CI 93.6-99.8) Specificity: 99.5 (95% CI 98.7-99.8)	-	n=1,042 Sensitivity: 89.2 (95% CI 81.8-94.3) Specificity: 99.5 (95% CI 98.8-99.8)
Shrier *et al*., 2004[78] n=139	Cobas Amplicor PCR	Cobas Amplicor and Abbot LCx assay, clinician-collected urethral, vaginal and endocervical swab	n=126 Sensitivity: 51.9 (95% CI 32.0-71.3) Specificity: 100.0 (95% CI 96.5-100)	n=126 Sensitivity: 55.6 (95% CI 36.4-73.1) Specificity: 100.0 (95% CI 96.5-100)	n=126 Sensitivity: 51.9 (95% CI 32.0-71.3) Specificity: 99.0 (95% CI 95.0-100)	-	n=126 Sensitivity: 44.4 (95% CI 26.9-63.6) Specificity: 100.0 (95% CI 96.5-100)
Nye *et al*., 2019[70] n=3,289*	Cobas CT/NG 2.0	Aptima Combo 2 Assay and BD ProbeTec CTQ/GCQ, clinician-collected endocervical (women) or urethral (men) swab, and/or urine sample	n=3,174 Sensitivity: 93.0 (95% CI 88.5-95.5) Specificity: 99.8 (95% CI 99.6-99.9)	n=2,241 Sensitivity: 97.9 (95% CI 94.0-99.3) Specificity: 99.7 (95% CI 99.4-99.9)	n=996 Sensitivity: 96.0 (95% CI 86.5-98.9) Specificity: 99.4 (95% CI 98.6-99.7)	-	n=3,190 Sensitivity: 93.1 (95% CI 88.7-95.8) Specificity: 99.7 (95% CI 99.4-99.8)

Table 5. Diagnostic Accuracy of Anatomic Site-Specific Testing for Chlamydial Infection in Females

Author, year Sample size	Test	Reference standard	Endocervix, clinician-collected n=number tested	Vagina, clinician-collected n=number tested	Vagina, self-collected n=number tested	Urethra n=number tested	Urine n=number tested
Skidmore *et al*., 2008[71]	Cobas Taqman 48 CT	Cobas Taqman 48 CT, clinician-collected endocervical swab	-	-	n=255 Sensitivity: 100.0 (95% CI 85.2-100) Specificity: 100.0 (95% CI 98.4-100)	-	-
Schachter *et al*., 2003[75] n=2,517 (n=500 tested using LCx Probe System)	LCx Probe System LCR	LCx Probe System, Amplicor PCR or Amplified CT Assay, clinician-collected cervical swab or urine sample	n=498 Sensitivity: 95.8 (95% CI 85.8-99.5) Specificity: 99.8 (95% CI 98.8-100)	n=497 Sensitivity: 100.0 (95% CI 92.6-100) Specificity: 99.8 (95% CI 98.8-100)	n=500 Sensitivity: 97.9 (95% CI 88.9-99.9) Specificity: 99.5 (95% CI 98.4-99.9)	n=500 Sensitivity: 91.7 (95% CI 80.0-97.7) Specificity: 99.8 (95% CI 98.8-100)	n=499 Sensitivity: 97.9 (95% CI 88.9-99.9) Specificity: 98.1 (95% CI 96.3-99.1)

*Asymptomatic population

Table 6. Diagnostic Accuracy of Anatomic Site-Specific Testing for Chlamydial Infection in Males

Author, year Sample size	Test	Reference standard	Meatal, self-collected n=number tested	Urine n=number tested	Urethra n=number tested	Rectum n=number tested	Pharynx n=number tested
Sultan *et al*., 2016[72] n=1,064	Aptima Combo-2	Standard of care testing at each anatomical site	-	n=NR Sensitivity: 89.0-95.0, depending on volume of urine Specificity: not calculable	n=NR Sensitivity: 98.6 (95% CI 92.6-100) Specificity: not calculable	n=NR Sensitivity: 92.1 (95% CI 85-96.5) Specificity: not calculable	n=NR Sensitivity: 69.2 (95% CI 38.6-90.9) Specificity: not calculable
Berry *et al*., 2017[60] n=1,517	BD ProbeTec ET	Abbott Real-Time CT/NG, urine sample	n=1,517 Sensitivity: 92.0 (95% CI 86.1-95.9) Specificity: 99.7 (95% CI 99.2-99.9)	n=1,517 Sensitivity: 100.0 (95% CI 97.3-100) Specificity: 99.7 (95% CI99.3-99.9)	-	-	-
Nye *et al*., 2019[70] n=460*	Cobas CT/NG 2.0	Aptima Combo 2 Assay and BD ProbeTec CTQ/GCQ, clinician-collected urethral swab, and/or urine sample	-	n=460 Sensitivity: 98.1 (95% CI 89.9-99.7) Specificity: 99.3 (95% CI 97.9-99.7)	-	-	-

*Asymptomatic population

Table 7. Diagnostic Accuracy of Anatomic Site-Specific Testing for Gonococcal Infection in Females

Author, year Sample size	Test	Reference standard	Endocervix n=number tested	Vagina, clinician-collected n=number tested	Vagina, self-collected n=number tested	Urine n=number tested
Stewart *et al*., 2012[79] n=2,234*	Aptima Combo-2	Aptima Combo-2, clinician-collected urethral and endocervical swab	n=2,234 Sensitivity: 90.0 (95% CI 77.0-96.0) Specificity: 100.0 (95% CI 99.8-100)	-	n=2,234 Sensitivity: 98.0 (95% CI 87.0-100) Specificity: 100.0 (95% CI 99.8-100)	-
Fang *et al*., 2008[64] n=342 (1,079 tests)	BD ProbeTec ET	BD ProbeTec ET, clinician-collected endocervical swab and urine sample	n=1,076 Sensitivity: 95.5 (95% CI 84.5-99.4) Specificity: 100.0 (95% CI 99.6-100)	-	n=1,030 Sensitivity: 100.0 (95% CI 92.0-100) Specificity: 99.4 (95% CI 98.7-99.8)	n=1,040 Sensitivity: 90.7 (95% CI 77.9-97.4) Specificity: 96.9 (95% CI 99.4-100)
Nye *et al*., 2019[70] n=3,289*	Cobas CT/NG 2.0	Aptima Combo 2 Assay and BD ProbeTec CTQ/GCQ, clinician-collected endocervical (women) and/or urine sample	n=3,174 Sensitivity: 97.9 (95% CI 88.9-99.6) Specificity: 99.9 (95% CI 99.7-100)	n=2,240 Sensitivity: 100.0 (95% CI 90.6-100) Specificity: 99.7 (99.4-99.9)	n=996 Sensitivity: 100.0 (95% CI 70.1-100) Specificity: 100.0 (95% CI 99.6-100)	n=3,190 Sensitivity: 100 (95% CI 92.6-100) Specificity: 99.6 (95% CI 99.3-99.8)

*Asymptomatic population

Table 8. Diagnostic Accuracy of Anatomic Site-Specific Testing for Gonococcal Infection in Males

Author, year Sample size	Test	Reference standard	Meatal, self-collected n=number tested	Urine n=number tested	Urethra n=number tested	Rectum	Pharynx
Sultan *et al*., 2016[72] n=1,064	Aptima Combo-2	Standard of care testing at each anatomical site	-	n=NR Sensitivity: 91.0-93.0, depending on volume of urine (95% CI NR) Specificity: not calculable	n=NR Sensitivity: 97.9 (95% CI 93.9-99.6) Specificity: not calculable	n=NR Sensitivity: 93.4 (95% CI 88.5-96.7) Specificity: not calculable	n=NR Sensitivity: 89.1 (95% CI 83.1-93.5) Specificity: not calculable
Berry *et al*., 2017[60] n=1,517	BD ProbeTec ET	Abbott Real-Time CT/NG, urine sample	n=1517 Sensitivity: 100.0 (95% CI 91.6-100) Specificity: 99.7 (95% CI 99.2-99.9)	n=1517 Sensitivity: 92.9 (95% CI 80.5-98.5) Specificity: 99.8 (95% CI 99.4-99.7)	-	-	-
Nye *et al*., 2019[70] n=460	Cobas CT/NG 2.0	Aptima Combo 2 Assay and BD ProbeTec CTQ/GCQ, clinician-collected urethral swab, and/or urine sample	-	n=460 Sensitivity: 100.0 (95% CI 64.6-100) Specificity: 99.3 (95% CI 98.1-99.8)	-	-	-

*Asymptomatic population

Table 9. False Positive, False Alarm, False Negative, and False Reassurance Rates of Testing for Chlamydial Infection in Females

Anatomic site	Number of studies	Prevalence	False positive rate range (1-specificity)	False alarm rate range (1-PPV)	False negative rate range (1-sensitivity)	False reassurance rate range (1-NPV)
Endocervix	6 studies[64,70,71,75,76,78]	6.2-26.6%	0%-0.7%	0%-8.6%	4.2%-48.1% (excluding outlier: 4.2%-11.9%)	0.4%-11.6% (excluding outlier: 0.4% to 1.5%)
Urethra	1 study*[75]	8.6%	0.2%-1.7%	2.2%-11%	2.7%-11.9%	0.4%-1.1%
Urine	5 studies[64,70,71,75,78]	6.2-26.6%	0%-2.0%	0%-16.1% (excluding outlier: 0%-7.5%)	2.1%-55.6% (excluding outlier: 2.1%-27.7%)	0.2%-13.2% (excluding outlier: 0.2%-5.1%)
Vagina, clinician-collected	3 studies[70,75,78]	6.2%-21.6%	0%-1.2%	0%-7.9%	0%-44.4% (excluding outlier: 0%-11.9%)	0%-10.8% (excluding outlier: 0%-1.0%)
Vagina, self-collected	6 studies[64,70,71,75,76,78]	6.2-26.6%	0%-1.0%	0%-12.0%	0%-48.1% (excluding outlier: 0%-9.3%)	0%-11.7% (excluding outlier: 0%-4.8%)

*This study[75] included results from three different tests
Abbreviations: NPV=negative predictive value; PPV=positive predictive value

Table 10. False Positive, False Alarm, False Negative, and False Reassurance Rates of Testing for Chlamydial Infection in Males

Anatomic site	Number of studies	Prevalence	False positive rate range (1-specificity)	False alarm rate range (1-PPV)	False negative rate range (1-sensitivity)	False reassurance rate range (1-NPV)
Meatal, self-collected	1 study[60]	10.5%	0.4%	3.8%	8.0%	0.8%
Urine	2 studies[60,70]	10.5% and 11.3%	0.3% and 0.7%	2.8% and 5.6%	0% and 1.9%	0% and 0.2%

Abbreviations: NPV=negative predictive value; PPV=positive predictive value

Table 11. False Positive, False Alarm, False Negative, and False Reassurance Rates of Testing for Gonococcal Infections in Females

Anatomic site	Number of studies	Prevalence	False positive rate range (1-specificity)	False alarm rate range (1-PPV)	False negative rate range (1-sensitivity)	False reassurance rate range (1-NPV)
Endocervix	3 studies[64,70,79]	1.6%-11.7%	0%-0.1%	0%-6.1%	2.1%-10.0%	0%-0.2%
Urine	1 study[70]	1.6%	0.4	20.0%	0	0%
Vagina, clinician-collected	1 study[70]	11.7%	0.3	14.0%	0	0%
Vagina, self-collected	3 studies[64,70,79]	1.6%-11.7%	0%-0.6%	0%-12%	0%-2.0%	0%-4.8%

Abbreviations: NPV=negative predictive value; PPV=positive predictive value

Table 12. False Positive, False Alarm, False Negative, and False Reassurance Rates of Testing for Gonococcal Infection in Males

Anatomic site	Number of studies	Prevalence	False positive rate range (1-specificity)	False alarm rate range (1-PPV)	False negative rate range (1-sensitivity)	False reassurance rate range (1-NPV)
Meatal, self-collected	1 study[60]	4.2%	0.3%	10.6%	0%	0%
Urine	2 studies[60,70]	1.5% and 4.2%	0.2% and 0.7%	7.1% and 30.0%	0% and 7.1%	0% and 0.2%

Abbreviations: NPV=negative predictive value; PPV=positive predictive value

Table 13. Summary of Evidence

Key Question	Population	Studies (k) Participants (n) Study Design	Summary of Findings	Consistency and Precision	Limitations	Strength of Evidence	Applicability
Key Question 1. Effectiveness of screening vs. no screening	Young women; young adults	Prior review: k=3 n=6,836 New evidence: k=1 n=63,338 RCTs	The prior review included 3 studies of screening women at increased risk for chlamydia that favored screening; only 1 study showed statistically significantly reduced rates of PID (RR 0.44; 95% CI 0.20 to 0.90). One new RCT of screening men and women age 16 to 29 for chlamydia found reduced rates of hospital diagnosed PID (RR 0.6; 95% CI, 0.4 to 1.0), though absolute effects were small. There was no difference in rates of PID or epididymitis diagnosed in clinics. No studies of gonorrhea screening were identified.	Consistent; imprecise	Prior trials were underpowered to address health outcomes; limited health outcomes reported in studies. No studies of gonorrhea screening. Limited studies of chlamydia screening in men or pregnant women.	Low	Moderate
Key Question 2. Accuracy of risk stratification methods for identifying persons at increased risk	Women, men, MSM, young adults	Prior review: k=0 New evidence: k=7 n=93,137	No diagnostic accuracy studies of risk stratification in prior review. Seven studies evaluated accuracy of risk criteria and demonstrated low to moderate accuracy. Two studies of the “Vancouver” risk tool and one study of a 3-item risk score for identifying persons with chlamydial or gonococcal infections reported AUCs that ranged from 0.64 to 0.73. Age criteria alone (≤ 22) performed nearly as well as multiple item criteria for predicting chlamydia infection in women (AUC 0.687, SD 0.014). No studies compared screening intervals or alternative screening strategies such as testing for concurrent infection, including HIV.	Consistent; precise	Studies were retrospective and cross-sectional; models were applied to patients in one geographic location or population; unclear performance in other geographic locations or other populations.	Moderate	Moderate; Most studies conducted in one geographic location or high prevalence setting.

Table 13. Summary of Evidence

Key Question	Population	Studies (k) Participants (n) Study Design	Summary of Findings	Consistency and Precision	Limitations	Strength of Evidence	Applicability
Key Question 3. Diagnostic accuracy of anatomic site-specific testing and collection methods	Men, Women, MSM; adolescents	Prior review: k=4 n=9,474 New evidence: k=5 n=6,730	Site-specific testing for chlamydia was highly accurate: Endocervical sensitivity range 89 to 100% (7 studies); vaginal sensitivity range 90 to 100% (7 studies); Specificities were 99 to 100% for endocervical testing, 95 to 100% for vaginal testing, and 96 to 100% for urinalysis. Sensitivities were high for Meatal (100%), urethral (99%) and rectal (92%), but low for pharyngeal (69%) testing in males based on one study each. Specificities were ≥99 percent at all sites; specificity was not reported for pharyngeal testing. Site-specific testing for gonorrhea was highly accurate: Endocervical sensitivity 96% to 98% (3 studies); vaginal sensitivity range 98% to 100% (3 studies); urinalysis, females: sensitivity 89% and 100% (2 studies); Specificity was high at all sites (95% to 100%). High sensitivity for urinalysis in males: 93% to 100% (1 study); Other sites, males: 89% to 100% (1 study, including rectal and pharyngeal sites). Collection methods for chlamydia were highly accurate: Self-collected, vaginal: sensitivity 90% and 98%, (8 studies, excluding one outlier study that reported 52%) Clinician-collected, vaginal: sensitivity 90% and 100%, (5 studies, excluding one outlier study that reported 56%) Collection methods for gonorrhea in women were highly accurate: Self-collected, vaginal: sensitivity 100% (3 studies) Clinician-collected, vaginal: sensitivity 100% (1 study) No studies compared collection methods in males for chlamydia or gonorrhea testing.	Consistent; precise, excluding one outlier study	Some studies included symptomatic participants; prevalence of chlamydial or gonococcal infection ranged up to 27%; limited evidence on collection methods.	Moderate for accuracy of chlamydial and gonococcal testing; low for collection methods	High for accuracy of testing; moderate for collection methods

Table 13. Summary of Evidence

Key Question	Population	Studies (k) Participants (n) Study Design	Summary of Findings	Consistency and Precision	Limitations	Strength of Evidence	Applicability
Key Question 4. Harms of screening vs. no screening	Men, Women, MSM; adolescents	Prior review: k=4 n=9,474 New evidence: k=4 n=5,666	False negative rates ranged from 0 to 28% and false positive rates were consistently low (range 0 to 2%) across all anatomic sites for female and male samples. For females, false positive rates for self- versus clinician collected methods ranged from 0 to 1.2%; false positive rates ranged from 0 to 12%. No studies reported harms of collection methods in males. No studies of psychosocial harms, such as anxiety related to testing, or studies of risk behaviors or risk perception.	Consistent for testing related harms; precise for testing related harms N/A for psychosocial or risk behavior related harms	Some studies included symptomatic participants; prevalence of chlamydial or gonococcal infection ranged up to 27%	Moderate for testing related harms.	Moderate for testing related harms.

Abbreviations: AUC = area under the receiving operator curve; HIV = human immunodeficiency virus; MSM = men who have sex with men; NA = not applicable; PID = pelvic inflammatory disease; SD = standard deviation; RR = relative risk.

Appendix A1. Search Strategy

Ovid MEDLINE® Database Searches for Key Questions 1, 2, and 4
Search Strategy:

1 exp Chlamydia Infections/ or exp Chlamydia
2 Neisseria gonorrhoeae
3 Gonorrhea
4 chlamydi*.ti,ab,kf.
5 (gonorrhe* or gonorrhoe*).ti,ab,kf.
6 or/1-5
7 *Mass Screening
8 (screen* or test*).ti,ab,kf.
9 7 or 8
10 6 and 9
11 (random* or control* or group* or cohort or placebo or sham or trial).ti,ab,kw
12 exp cohort studies
13 cohort$.tw.
14 controlled clinical trial.pt.
15 epidemiologic methods
16 limit 15 to yr=1966-1989
17 exp case-control studies
18 (case$ and control$).tw.
19 or/12-14,16-18
20 11 or 19
21 10 and 20
22 limit 21 to yr="2014 -Current"
23 limit 22 to english language

EBM Reviews - Cochrane Central Register of Controlled Trials for Key Questions 1, 2, and 4
Search Strategy:

1 exp Chlamydia Infections/ or exp Chlamydia
2 Neisseria gonorrhoeae
3 Gonorrhea
4 chlamydi*.ti,ab.
5 (gonorrhe* or gonorrhoe*).ti,ab.
6 or/1-5
7 (screen* or test*).ti,ab.
8 6 and 7
9 limit 8 to yr="2014 -Current"
10 limit 9 to english language

Appendix A1. Search Strategy

Ovid MEDLINE® Database Searches for Key Questions 3
Search Strategy:

1 exp Chlamydia Infections/ or exp Chlamydia/
2 Neisseria gonorrhoeae/
3 Gonorrhea/
4 chlamydi*.ti,ab,kf.
5 gonorrhe*.ti,ab,kf.
6 or/1-5
7 exp "Sensitivity and Specificity"/
8 (sensitiv* or "predictive value" or accuracy).ti,ab,kf.
9 7 or 8
10 6 and 9
11 limit 10 to yr="2014 - 2019"

EBM Reviews - Cochrane Central Register of Controlled Trials for Key Questions 3
Search Strategy:

1 exp Chlamydia Infections/ or exp Chlamydia/
2 Neisseria gonorrhoeae/
3 Gonorrhea/
4 chlamydi*.ti,ab,kf.
5 gonorrhe*.ti,ab,kf.
6 or/1-5
7 exp "Sensitivity and Specificity"/
8 (sensitiv* or "predictive value" or accuracy).ti,ab,kf.
9 7 or 8
10 6 and 9
11 limit 10 to yr="2014 - 2019"

EBM Reviews - Cochrane Database of Systematic Reviews
Search Strategy:

1 chlamydi*.ti,ab,kf.
2 gonorrhoe*.ti,ab.
3 1 or 2
4 limit 3 to full systematic reviews

Appendix A2. Inclusion and Exclusion Criteria

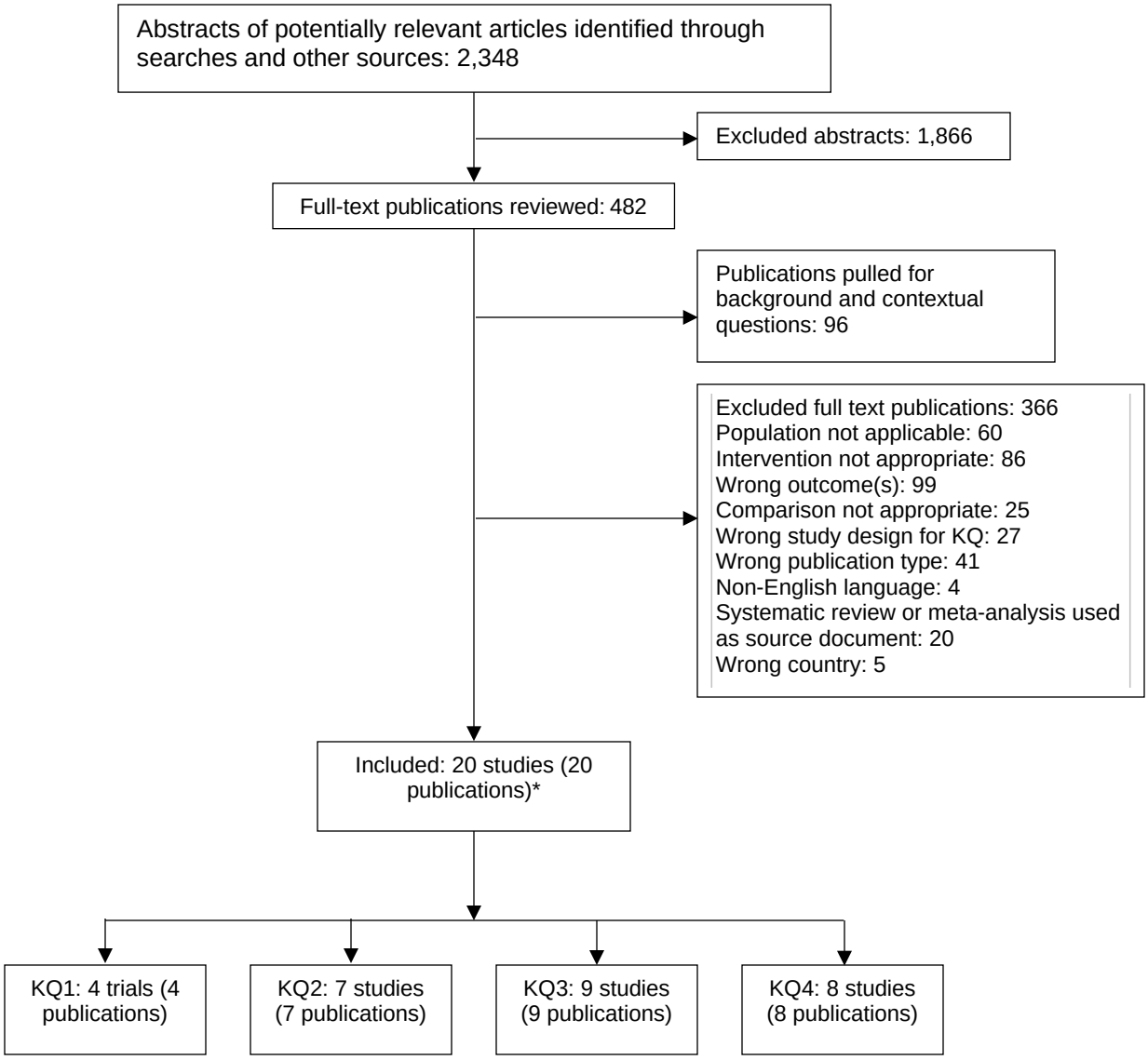
	Included	Excluded
Populations	Asymptomatic adults (age ≥18 years) and adolescents (ages 13 to <18 years); pregnant persons	Patients with symptoms of chlamydial or gonococcal infections; patients with current or recent diagnosis of any acute sexually transmitted infection; patients undergoing management for HIV infection; children (age <13 years); studies in which the majority of participants is comprised of persons infected with HIV or persons not infected with HIV and currently using pre-exposure prophylaxis
Interventions	**KQs 1, 4:** Screening for chlamydial or gonococcal infections **KQ 2:** Screening strategies to detect infection, including selective screening of high-risk groups (such as younger persons, men who have sex with men, persons with high-risk sexual behaviors, or persons with high-risk sexual partners); testing for concurrent sexually transmitted infections, including HIV; using defined screening intervals **KQ 3:** Test methods and approaches (such as self- vs. clinician-collected) to detect chlamydial or gonococcal infections in biological specimens from various anatomical sites (such as urine specimens and samples from the endocervix, urethra, vagina, anus, or pharynx)	No intervention; no screening
Comparisons	**KQs 1, 2:** Screening vs. no screening or alternate screening strategies or methods **KQ 3:** Gold standard (nucleic acid amplification testing) or other reference standard (if study does not use nucleic acid amplification testing), specific to anatomic site or sites where gold standard sample is collected, when reported	No comparison; testing methods not cleared or approved by the U.S. Food and Drug Administration
Outcomes	**KQ 1:** Complications of infection (such as pelvic inflammatory disease, ectopic pregnancy, infertility, chronic pelvic pain, or epididymitis); infection transmission or acquisition, including gonorrhea, chlamydia, and HIV; reproductive, pregnancy-related, and perinatal outcomes **KQ 2:** Accuracy of screening strategies **KQ 3:** Diagnostic accuracy of testing at a specific anatomic site; accuracy of self- vs. clinician-collected specimens **KQ 4:** Harms from screening or not screening (such as labeling, false-negative results, false-positive results, or changes in risk perception or risk behaviors)	Intermediate outcomes (outcomes that are not health outcomes, such as eradication of infection or laboratory studies)
Settings	U.S.-relevant primary care and primary care–referable settings (such as correctional settings, community care, schools, sexually transmitted infection clinics, and family planning settings); emergency departments; military or college intake or entrance settings	Other settings not relevant or referable to primary care in the United States

Appendix A2. Inclusion and Exclusion Criteria

	Included	Excluded
Study Design	**All KQs:** Good-quality systematic reviews **Benefits:** Randomized, controlled trials; controlled observational trials **Harms:** Randomized, controlled trials; controlled observational trials; uncontrolled observational trials	Uncontrolled observational trials (except for evidence on screening harms), case reports, small uncontrolled observational trials, and case studies
Study Quality	Fair- and good-quality studies based on USPSTF criteria	Poor-quality studies

Abbreviations: HIV = human immunodeficiency virus, KQ = key question, USPSTF = U.S. Preventive Services Task Force.

Appendix A3. Literature Flow Diagram



*Included publications may be included for multiple key questions.

Appendix A4. List of Included Studies

1. Berry L, Stanley B. Comparison of self-collected meatal swabs with urine specimens for the diagnosis of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in men. J Med Microbiol. 2017 Feb;66(2):134-6. doi: 10.1099/jmm.0.000428. PMID: 28068218.
2. Falasinnu T, Gilbert M, Gustafson P, et al. Deriving and validating a risk estimation tool for screening asymptomatic chlamydia and gonorrhea. Sex Transm Dis. 2014 Dec;41(12):706-12. doi: 10.1097/OLQ.0000000000000205. PMID: 25581805.
3. Falasinnu T, Gilbert M, Gustafson P, et al. A validation study of a clinical prediction rule for screening asymptomatic chlamydia and gonorrhoea infections among heterosexuals in British Columbia. Sex Transm Infect. 2016a Feb;92(1):12-8. doi: 10.1136/sextrans-2014-051992. PMID: 25933609.
4. Falasinnu T, Gilbert M, Gustafson P, et al. An assessment of population-based screening guidelines versus clinical prediction rules for chlamydia and gonorrhea case finding. Prev Med. 2016b Aug;89:51-6. doi: 10.1016/j.ypmed.2016.04.001. PMID: 27143496.
5. Fang J, Husman C, DeSilva L, et al. Evaluation of self-collected vaginal swab, first void urine, and endocervical swab specimens for the detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in adolescent females. J Pediatr Adolesc Gynecol. 2008;21(6):355-60. doi: 10.1016/j.jpag.2008.03.010. PMID: 19064231.
6. Grentzer JM, Peipert JF, Zhao Q, et al. Risk-based screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* prior to intrauterine device insertion. Contracept. 2015 Oct;92(4):313-8. doi: 10.1016/j.contraception.2015.06.012. PMID: 26093189.
7. Hocking JS, Temple-Smith M, Guy R, et al. Population effectiveness of opportunistic chlamydia testing in primary care in Australia: a cluster-randomised controlled trial. Lancet. 2018 Oct 20;392(10156):1413-22. doi: 10.1016/S0140-6736(18)31816-6. PMID: 30343857.
8. Javanbakht M, Westmoreland D, Gorbach P. Factors associated with pharyngeal gonorrhea in young people: implications for prevention. Sex Transm Dis. 2018 Sep;45(9):588-93. doi: 10.1097/OLQ.0000000000000822. PMID: 29485543.
9. Lavoue V, Morcel K, Voltzenlogel MC, et al. Scoring system avoids *Chlamydia trachomatis* overscreening in women seeking surgical abortions. Sex Transm Dis. 2014 Aug;41(8):470-4. doi: 10.1097/OLQ.0000000000000153. PMID: 25013973.
10. Miller WC, Hoffman IF, Owen-O'Dowd J, et al. Selective screening for chlamydial infection: which criteria to use? Am J Prev Med. 2000 Feb;18(2):115-22. doi: 10.1016/s0749-3797(99)00146-4. PMID: 10698241.
11. Nye MB, Osiecki J, Lewinski M, et al. Detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* with the cobas CT/NG v2.0 test: performance compared with the BD probetec CT Q and GC Q amplified DNA and aptima AC2 assays. Sex Transm Infect. 2019 03;95(2):87-93. doi: 10.1136/sextrans-2018-053545. PMID: 30126947.
12. Oakeshott P, Kerry S, Aghaizu A, et al. Randomised controlled trial of screening for *Chlamydia trachomatis* to prevent pelvic inflammatory disease: the POPI (prevention of pelvic infection) trial. BMJ (Clinical research ed.). 2010 Apr 8;340:c1642. doi: 10.1136/bmj.c1642. PMID: 20378636.
13. Østergaard L, Andersen B, Moller JK, et al. Home sampling versus conventional swab sampling for screening of *Chlamydia trachomatis* in women: a cluster-randomized 1-year follow-up study. Clin Infect Dis. 2000 Oct;31(4):951-7. doi: 10.1086/318139. PMID: 11049776.
14. Schachter J, McCormack WM, Chernesky MA, et al. Vaginal swabs are appropriate specimens for diagnosis of genital tract infection with *Chlamydia trachomatis*. J Clin Microbiol. 2003 Aug;41(8):3784-9. doi: 10.1128/jcm.41.8.3784-3789.2003. PMID: 12904390.
15. Schoeman SA, Stewart CM, Booth RA, et al. Assessment of best single sample for finding chlamydia in women with and without symptoms: a diagnostic test study. BMJ (Clinical research ed.). 2012 Dec 12;345:e8013. doi: 10.1136/bmj.e8013. PMID: 23236032.

16. Scholes D, Stergachis A, Heidrich FE, et al. Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. N Engl J Med. 1996 May 23;334(21):1362-6. doi: 10.1056/nejm199605233342103. PMID: 8614421.

17. Shrier LA, Dean D, Klein E, et al. Limitations of screening tests for the detection of *Chlamydia trachomatis* in asymptomatic adolescent and young adult women. Am J Obstet Gynecol. 2004 Mar;190(3):654-62. doi: 10.1016/j.ajog.2003.09.063. PMID: 15041995.

18. Skidmore S, Kaye M, Bayliss D, et al. Validation of COBAS Taqman CT for the detection of *Chlamydia trachomatis* in vulvo-vaginal swabs. Sex Transm Infect. 2008 Aug;84(4):277-8; discussion 8-9. doi: 10.1136/sti.2007.029587. PMID: 18305120.

19. Stewart CM, Schoeman SA, Booth RA, et al. Assessment of self taken swabs versus clinician taken swab cultures for diagnosing gonorrhoea in women: single centre, diagnostic accuracy study. BMJ (Clinical research ed.). 2012 Dec 12;345:e8107. doi: 10.1136/bmj.e8107. PMID: 23236033.

20. Sultan B, White JA, Fish R, et al. The "3 in 1" study: pooling self-taken pharyngeal, urethral, and rectal samples into a single sample for analysis for detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* in men who have sex with men. J Clin Microbiol. 2016 Mar;54(3):650-6. doi: 10.1128/JCM.02460-15. PMID: 26719439.

Appendix A5. List of Excluded Studies With Reasons for Exclusion

1. Abara WE, Llata EL, Schumacher C, et al. Extragenital gonorrhea and chlamydia positivity and the potential for missed extragenital gonorrhea with concurrent urethral chlamydia among men who have sex with men attending sexually transmitted disease clinics-Sexually Transmitted Disease Surveillance Network, 2015-2019. Sexually Transmitted Diseases. 2020;47(6):361-8. doi: 10.1097/OLQ.0000000000001170. PMID: 32413018. **Exclusion: Wrong outcome.**
2. Abbai NS, Moodley P, Reddy T, et al. Clinical evaluation of the OneStep Gonorrhea RapiCard InstaTest for detection of *Neisseria gonorrhoeae* in symptomatic patients from KwaZulu-Natal, South Africa. J Clin Microbiol. 2015;53(4):1348-50. doi: 10.1128/JCM.03603-14. PMID: 25609726. **Exclusion: Wrong population.**
3. Abbai-Shaik NS, Reddy T, Govender S, et al. Poor performance of the chlamydia rapid test device for the detection of asymptomatic infections in South African men: a pilot study. Sex Transm Dis. 2016;2016:8695146. doi: 10.1155/2016/8695146. PMID: 27195171. **Exclusion: Wrong country.**
4. Abou Tayoun AN, Burchard PR, Caliendo AM, et al. A multiplex PCR assay for the simultaneous detection of *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Trichomonas vaginalis*. Exp Mol Pathol. 2015;98(2):214-8. doi: 10.1016/j.yexmp.2015.01.011. PMID: 25595915. **Exclusion: Wrong intervention.**
5. Adachi K, Klausner JD, Bristow CC, et al. Chlamydia and gonorrhea in HIV-infected pregnant women and infant HIV transmission. Sex Transm Dis. 2015;42(10):554-65. doi: 10.1097/OLQ.0000000000000340. PMID: 26372927. **Exclusion: Wrong population.**
6. Adachi K, Klausner JD, Xu J, et al. *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in HIV-infected pregnant women and adverse infant outcomes. Pediatr Infect Dis J. 2016;35(8):894-900. doi: 10.1097/INF.0000000000001199. PMID: 27164464. **Exclusion: Wrong population.**
7. Adachi K, Xu J, Yeganeh N, et al. Combined evaluation of sexually transmitted infections in HIV-infected pregnant women and infant HIV transmission. PLoS One. 2018;13(1):e0189851. doi: 10.1371/journal.pone.0189851. PMID: 29304083. **Exclusion: Wrong population.**
8. Aghaizu A, Reid F, Kerry S, et al. Frequency and risk factors for incident and redetected *Chlamydia trachomatis* infection in sexually active, young, multi-ethnic women: a community based cohort study. Sexually Transmitted Infections. 2014;90(7):524-8. doi: 10.1136/sextrans-2014-051607. PMID: 25100744. **Exclusion: Wrong outcome.**
9. Ahmadi A, Khodabandehloo M, Ramazanzadeh R, et al. The relationship between *Chlamydia trachomatis* genital infection and spontaneous abortion. J Reprod Health Med 2016;17(2):110-6. PMID: 27141466. **Exclusion: Wrong outcome.**
10. Ahmadi MH, Mirsalehian A, Bahador A. Association of *Chlamydia trachomatis* with infertility and clinical manifestations: a systematic review and meta-analysis of case-control studies. Infect Dis. 2016;48(7):517-23. doi: 10.3109/23744235.2016.1160421. PMID: 27064452. **Exclusion: Wrong outcome.**
11. Ako MC, Lewis M, Peterson S, et al. The clinical impact of rapid diagnostics on improving appropriate treatment of STIs in women in the emergency department. Sex Transm Dis. 2016;43(10):S136-. **Exclusion: Wrong publication type.**
12. Akoh CC, Pressman EK, Cooper E, et al. Prevalence and risk factors for infections in a pregnant adolescent population. J Pediatr Adolesc Gynecol. 2017;30(1):71-5. doi: 10.1016/j.jpag.2016.08.001. PMID: 27521899. **Exclusion: Wrong study design for Key Question.**
13. Ampt FH, El Hayek C, Agius PA, et al. Anorectal swabs as a marker of male-to-male sexual exposure in STI surveillance systems. Epidemiol Infect. 2017;145(12):2530-5. doi: 10.1017/S095026881700098X. PMID: 28528588. **Exclusion: Wrong outcome.**
14. Anaene M, Soyemi K, Caskey R. Factors associated with the over-treatment and under-treatment of gonorrhea and chlamydia in adolescents presenting to a public hospital emergency department. Int J Infect Dis. 2016;53:34-8. doi: 10.1016/j.ijid.2016.10.009. PMID: 27771470. **Exclusion: Wrong outcome.**
15. Andreatos N, Grigoras C, Shehadeh F, et al. The impact of HIV infection and socioeconomic factors on the incidence of gonorrhea: a county-level, US-wide analysis. PLoS One. 2017;12(9):e0183938. doi: 10.1371/journal.pone.0183938. PMID: 28863154. **Exclusion: Wrong outcome.**

16. Atkinson LM, Vijeratnam D, Mani R, et al. 'The waiting game': are current chlamydia and gonorrhoea near-patient/point-of-care tests acceptable to service users and will they impact on treatment? Int J STD AIDS. 2016;27(8):650-5. doi: 10.1177/0956462415591414. PMID: 26092579. **Exclusion: Wrong intervention.**

17. August EM, Daley E, Kromrey J, et al. Age-related variation in sexual behaviours among heterosexual men residing in Brazil, Mexico and the USA. J Fam Plann Reprod Health Care. 2014;40(4):261-9. doi: 10.1136/jfprhc-2012-100564. PMID: 24099979. **Exclusion: Wrong comparator.**

18. Badman SG, Willie B, Narokobi R, et al. A diagnostic evaluation of a molecular assay used for testing and treating anorectal chlamydia and gonorrhoea infections at the point-of-care in Papua New Guinea. Clin Microbiol Infect. 2019;25(5):623-7. doi: 10.1016/j.cmi.2018.08.001. PMID: 30107282. **Exclusion: Wrong country.**

19. Badolato GM, Goyal MK. Refining a computerized sexual health screening tool among adolescents presenting to the emergency department. Journal of Adolescent Health. 2019;64(2):S41-. **Exclusion: Wrong publication type.**

20. Baird J, Merchant RC. A randomized controlled trial of the effects of a brief intervention to increase chlamydia and gonorrhea testing uptake among young adult female emergency department patients. Acad Emerg Med. 2014;21(12):1512-20. doi: 10.1111/acem.12539. PMID: 25491714. **Exclusion: Wrong outcome.**

21. Balendra A, Cousins E, Lamplough H, et al. Pilot study for the 'test n treat' trial of on-site rapid chlamydia/gonorrhoea tests and same day treatment. Sex Transm Infect. 2017;93(4):283. doi: 10.1136/sextrans-2016-053084. PMID: 28576786. **Exclusion: Wrong comparator.**

22. Banerjee P, Thorley N, Radcliffe K. A service evaluation comparing home-based testing to clinic-based testing for chlamydia and gonorrhoea in Birmingham and Solihull. International Journal of STD & AIDS. 2018;29(10):974-9. doi: 10.1177/0956462418767180. PMID: 29690825. **Exclusion: Wrong intervention.**

23. Barbee LA, Dombrowski JC, Kerani R, et al. Effect of nucleic acid amplification testing on detection of extragenital gonorrhea and chlamydial infections in men who have sex with men sexually transmitted disease clinic patients. Sex Transm Dis. 2014;41(3):168-72. doi: 10.1097/OLQ.0000000000000093. PMID: 24521722. **Exclusion: Wrong outcome.**

24. Barbee LA, Khosropour CM, Dombrowksi JC, et al. New Human Immunodeficiency Virus Diagnosis Independently Associated With Rectal Gonorrhea and Chlamydia in Men Who Have Sex With Men. Sexually Transmitted Diseases. 2017;44(7):385-9. doi: 10.1097/OLQ.0000000000000614. PMID: 28608786. **Exclusion: Wrong intervention.**

25. Barbee LA, Khosropour CM, Dombrowski JC, et al. An estimate of the proportion of symptomatic gonococcal, chlamydial and non-gonococcal non-chlamydial urethritis attributable to oral sex among men who have sex with men: a case-control study. Sex Transm Infect. 2016;92(2):155-60. doi: 10.1136/sextrans-2015-052214. PMID: 26297719. **Exclusion: Wrong population.**

26. Barnard S, Free C, Bakolis I, et al. Comparing the characteristics of users of an online service for STI self-sampling with clinic service users: a cross-sectional analysis. Sex Transm Infect. 2018;94(5):377-83. doi: 10.1136/sextrans-2017-053302. PMID: 29437985. **Exclusion: Wrong outcome.**

27. Bartelsman M, Straetemans M, Vaughan K, et al. Comparison of two gram stain point-of-care systems for urogenital gonorrhoea among high-risk patients: diagnostic accuracy and cost-effectiveness before and after changing the screening algorithm at an STI clinic in Amsterdam. Sex Transm Infect. 2014;90(5):358-62. doi: 10.1136/sextrans-2013-051500. PMID: 24860102. **Exclusion: Wrong comparator.**

28. Bartelsman M, van Rooijen MS, Alba S, et al. Point-of-care management of urogenital *Chlamydia trachomatis* via gram-stained smear analysis in male high-risk patients. Diagnostic accuracy and cost-effectiveness before and after changing the screening indication at the STI clinic in Amsterdam. Sex Transm Infect. 2015;91(7):479-84. doi: 10.1136/sextrans-2014-051941. PMID: 25855625. **Exclusion: Wrong study design for Key Question.**

29. Batteiger TA, Dixon BE, Wang J, et al. Where do people go for gonorrhea and chlamydia tests: a cross-sectional view of the central Indiana population, 2003-2014. Sex Transm Infect. 2019;46(2):132-6. doi: 10.1097/OLQ.0000000000000928. PMID: 30334869. **Exclusion: Wrong study design for Key Question.**

30. Baud D, Zufferey J, Hohlfeld P, et al. Performance of an automated multiplex immunofluorescence assay for detection of *Chlamydia trachomatis* immunoglobulin G. Diagn Microbiol Infect Dis. 2014;78(3):217-9. doi: 10.1016/j.diagmicrobio.2013.11.022. PMID: 24365033. **Exclusion: Wrong outcome.**

31. Bazan JA, Carr Reese P, Esber A, et al. High prevalence of rectal gonorrhea and chlamydia infection in women attending a sexually transmitted disease clinic. J Womens Health. 2015;24(3):182-9. doi: 10.1089/jwh.2014.4948. PMID: 25692800. **Exclusion: Wrong outcome.**

32. Beanland F, Schoeman S, Davis P, et al. A year of 'sex, steam and stis'. Sex Transm Infect. Conference: BASHH Spring Conference. 2015;91. **Exclusion: Wrong comparator.**

33. Bellaminutti S, Seraceni S, De Seta F, et al. HPV and *Chlamydia trachomatis* co-detection in young asymptomatic women from high incidence area for cervical cancer. J Med Virol. 2014;86(11):1920-5. doi: 10.1002/jmv.24041. PMID: 25132162. **Exclusion: Wrong comparator.**

34. Bercot B, Amarsy R, Goubard A, et al. Assessment of coinfection of sexually transmitted pathogen microbes by use of the anyplex II STI-7 molecular kit. J Clin Microbiol. 2015;53(3):991-3. doi: 10.1128/JCM.03370-14. PMID: 25540390. **Exclusion: Wrong intervention.**

35. Beymer MR, Bolan RK, Flynn RP, et al. Uptake and repeat use of postexposure prophylaxis in a community-based clinic in Los Angeles, California. AIDS Res Hum Retroviruses. 2014;30(9):848-55. doi: 10.1089/AID.2014.0017. PMID: 24970113. **Exclusion: Wrong outcome.**

36. Beymer MR, Llata E, Stirland AM, et al. Evaluation of gonorrhea test of cure at 1 week in a Los Angeles community-based clinic serving men who have sex with men. Sex Transm Dis. 2014;41(10):595-600. doi: 10.1097/OLQ.0000000000000190. PMID: 25211254. **Exclusion: Wrong population.**

37. Bilder CR, Tebbs JM, McMahan CS. Informative group testing for multiplex assays. Biometrics. 2019;75(1):278-88. doi: 10.1111/biom.12988. PMID: 30353548. **Exclusion: Wrong comparator.**

38. Booth AR, Norman P, Goyder E, et al. Pilot study of a brief intervention based on the theory of planned behaviour and self-identity to increase chlamydia testing among young people living in deprived areas. Br J Health Psychol. 2014;19(3):636-51. doi: 10.1111/bjhp.12065. PMID: 24103040. **Exclusion: Wrong outcome.**

39. Borchardt LN, Pickett ML, Tan KT, et al. Expedited partner therapy: pharmacist refusal of legal prescriptions. Sexually Transmitted Diseases. 2018;45(5):350-3. doi: 10.1097/OLQ.0000000000000751. PMID: 29465689. **Exclusion: Wrong outcome.**

40. Bosmans LJ. Conquering chlamydia. Creat Nurs. 2014;20(4):248-53. PMID: 26050420. **Exclusion: Wrong publication type.**

41. Bourgeois-Nicolaos N, Jaureguy F, Pozzi-Gaudin S, et al. Benefits of rapid molecular diagnosis of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections in women attending family planning clinics. Sex Transm Dis. 2015;42(11):652-3. doi: 10.1097/OLQ.0000000000000351. PMID: 26462191. **Exclusion: Wrong outcome.**

42. Boyajian AJ, Murray M, Tucker M, et al. Identifying variations in adherence to the CDC sexually transmitted disease treatment guidelines of *Neisseria gonorrhoeae*. Public Health. 2016;136:161-5. doi: 10.1016/j.puhe.2016.04.004. PMID: 27179879. **Exclusion: Wrong study design for Key Question.**

43. Breslin K, Tuchman L, Hayes KL, et al. Sensitivity and specificity of empiric treatment for sexually transmitted infections in a pediatric emergency department. J Pediatr. 2017;189:48-53. doi: 10.1016/j.jpeds.2017.05.050. PMID: 28629687. **Exclusion: Wrong study design for Key Question.**

44. Bristow CC, Mathelier P, Ocheretina O, et al. *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Trichomonas vaginalis* screening and treatment of pregnant women in Port-au-Prince, Haiti. Int J STD AIDS. 2017;28(11):1130-4. doi: 10.1177/0956462416689755. PMID: 28134005. **Exclusion: Wrong outcome.**

45. Brook G. The performance of non-NAAT point-of-care (POC) tests and rapid NAAT tests for chlamydia and gonorrhoea infections. An assessment of currently available assays. Sex Transm Infect. 2015;91(8):539-44. doi: 10.1136/sextrans-2014-051997. PMID: 25935930. **Exclusion: Wrong publication type.**

46. Brown B, Davtyan M, Leon SR, et al. A prospective cohort study characterising the role of anogenital warts in HIV acquisition among men who have sex with men: a study protocol. BMJ Open. 2014;4(9):e005687. doi: 10.1136/bmjopen-2014-005687. PMID: 25227629. **Exclusion: Wrong study design for Key Question.**

47. Brown S, Paterson C, Dougall N, et al. Understanding the attitudes and acceptability of extra-genital chlamydia testing in young women: evaluation of a feasibility study. BMC Public Health. 2019;19(1):992. doi: 10.1186/s12889-019-7313-0. PMID: 31340797. **Exclusion: Wrong intervention.**

48. Browne FA, Wechsberg WM, Kizakevich PN, et al. mHealth versus face-to-face: study protocol for a randomized trial to test a gender-focused intervention for young African American women at risk for HIV in North Carolina. BMC Public Health. 2018;18(1):982. doi: 10.1186/s12889-018-5796-8. PMID: 30081868. **Exclusion: Wrong study design for Key Question.**

49. Burchell AN, Grewal R, Allen VG, et al. Modest rise in chlamydia and gonorrhoea testing did not increase case detection in a clinical HIV cohort in Ontario, Canada. Sex Transm Infect. 2014;90(8):608-14. doi: 10.1136/sextrans-2014-051647. PMID: 25178285. **Exclusion: Wrong population.**

50. Burgess S, Beltrami J, Kearns L, et al. The Louisiana Wellness Centers Program for HIV/STD prevention among gay and bisexual men and transgender persons. J Public Health Manag Pract. 2019;22:22. doi: 10.1097/PHH.0000000000000959. PMID: 30807464. **Exclusion: Wrong outcome.**

51. Butzler MA, Reed JL, McFall SM. A simple and rapid DNA extraction method for *Chlamydia trachomatis* detection from urogenital swabs. Diagn Microbiol Infect Dis. 2017;89(3):182-4. doi: 10.1016/j.diagmicrobio.2017.08.007. PMID: 28918068. **Exclusion: Wrong intervention.**

52. Byrne R, Cooper F, Appleby T, et al. Can express treatment reduce onward transmission? Sexually Transmitted Infections. Conference: BASHH Spring Conference. 2015;91. **Exclusion: Wrong publication type.**

53. Callander D, Cook T, Read P, et al. Sexually transmissible infections among transgender men and women attending Australian sexual health clinics. Medical Journal of Australia. 2019;211(9):406-11. doi: 10.5694/mja2.50322. PMID: 31468530. **Exclusion: Wrong intervention.**

54. Callander D, Guy R, Fairley CK, et al. Gonorrhoea gone wild: rising incidence of gonorrhoea and associated risk factors among gay and bisexual men attending Australian sexual health clinics. Sex Health. 2018;09:09. doi: 10.1071/SH18097. PMID: 30409244. **Exclusion: Wrong outcome.**

55. Camporiondo MP, Farchi F, Ciccozzi M, et al. Detection of HPV and co-infecting pathogens in healthy Italian women by multiplex real-time PCR. Infez Med. 2016;24(1):12-7. PMID: 27031891. **Exclusion: Wrong outcome.**

56. Cassell JA, Dodds J, Estcourt C, et al. The relative clinical effectiveness and cost-effectiveness of three contrasting approaches to partner notification for curable sexually transmitted infections: a cluster randomised trial in primary care. Health Technol Assess. 2015;19(5):1-115, vii-viii. doi: 10.3310/hta19050. PMID: 25619445. **Exclusion: Wrong outcome.**

57. Castell S, Krause G, Schmitt M, et al. Feasibility and acceptance of cervicovaginal self-sampling within the German National Cohort (pretest 2). Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz. 2014;57(11):1270-6. doi: 10.1007/s00103-014-2054-9. PMID: 25303829. **Exclusion: Wrong outcome.**

58. Causer LM, Guy RJ, Tabrizi SN, et al. Molecular test for chlamydia and gonorrhoea used at point of care in remote primary healthcare settings: a diagnostic test evaluation. Sex Transm Infects. 2018;94(5):340-5. doi: 10.1136/sextrans-2017-053443. PMID: 29748180. **Exclusion: Wrong intervention.**

59. Chacko MR, Markham C, Thiel M, et al. Feasibility of providing sexually transmitted infection testing and treatment in off-campus, nonclinic settings for adolescents enrolled in a school-based research project. J Sch Health. 2014;84(6):379-86. doi: 10.1111/josh.12159. PMID: 24749920. **Exclusion: Wrong outcome.**

60. Chai SJ, Aumakhan B, Barnes M, et al. Internet-based screening for sexually transmitted infections to reach nonclinic populations in the community: risk factors for infection in men. Sex Transm Dis. 2010;37(12):756-63. doi: 10.1097/OLQ.0b013e3181e3d771. PMID: 20644498. **Exclusion: Wrong comparator.**

61. Chamberlain N, Crosby RA, Mena L, et al. Is patient-reported exposure a reliable indicator for anogenital gonorrhea and chlamydia screening in young black men who have sex with men? Sexually transmitted diseases. 2017;44(7):390-2. doi: 10.1097/OLQ.0000000000000619. PMID: 28608787 **Exclusion: Wrong comparator.**

62. Chambers R, Tingey L, Beach A, et al. Testing the efficacy of a brief sexual risk reduction intervention among high-risk American Indian adults: study protocol for a randomized controlled trial. BMC Public Health. 2016;16:366. doi: 10.1186/s12889-016-3040-y. PMID: 27129956. **Exclusion: Wrong publication type.**

63. Chandra NL, Broad C, Folkard K, et al. Detection of *Chlamydia trachomatis* in rectal specimens in women and its association with anal intercourse: a systematic review and meta-analysis. Sex Transm Infect. 2018;94(5):320-6. doi: 10.1136/sextrans-2017-053161. PMID: 29431148. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

64. Chernesky M, Jang D, Aries M, et al. Self-obtained vaginal swabs detected more *Chlamydia trachomatis, Neisseria gonorrhoeae* and *Mycoplasma genitalium* infections than first catch urine collected at home compared to a clinic. Sexually Transmitted Diseases. 2018;45doi: 10.1097/OLQ.0b013e31815d968d. **Exclusion: Wrong publication type.**

65. Chernesky M, Jang D, Gilchrist J, et al. Head-to-head comparison of second-generation nucleic acid amplification tests for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* on urine samples from female subjects and self-collected vaginal swabs. J Clin Microbiol. 2014;52(7):2305-10. doi: 10.1128/JCM.03552-13. PMID: 24696024. **Exclusion: Wrong intervention.**

66. Chernesky MA, Martin DH, Hook EW, et al. Ability of new APTIMA CT and APTIMA GC assays to detect *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in male urine and urethral swabs. J Clin Microbiol. 2005;43(1):127-31. doi: 10.1128/jcm.43.1.127-131.2005. PMID: 15634960. **Exclusion: Wrong intervention.**

67. Chow EP, Camilleri S, Ward C, et al. Duration of gonorrhoea and chlamydia infection at the pharynx and rectum among men who have sex with men: a systematic review. Sex Health. 2016;13(3):199-204. doi: 10.1071/SH15175. PMID: 26886136. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

68. Chow EP, Tomnay J, Fehler G, et al. Substantial increases in chlamydia and gonorrhea positivity unexplained by changes in individual-level sexual behaviors among men who have sex with men in an Australian sexual health service from 2007 to 2013. Sex Transm Dis. 2015;42(2):81-7. doi: 10.1097/OLQ.0000000000000232. PMID: 25585066. **Exclusion: Wrong outcome.**

69. Chow EPF, Walker S, Read TRH, et al. Self-reported use of mouthwash and pharyngeal gonorrhoea detection by nucleic acid amplification test. Sex Transm Dis. 2017;44(10):593-5. doi: 10.1097/OLQ.0000000000000654. PMID: 28876323. **Exclusion: Wrong outcome.**

70. Clark JL, Segura ER, Oldenburg CE, et al. Expedited Partner Therapy (EPT) increases the frequency of partner notification among MSM in Lima, Peru: a pilot randomized controlled trial. BMC Medicine. 2017;15(1):94. doi: 10.1186/s12916-017-0858-9. PMID: 28468648. **Exclusion: Wrong outcome.**

71. Clemenzi-Allen AA, Hartogensis W, Cohen SE, et al. Evaluating the impact of housing status on gonorrhea and chlamydia screening in an HIV primary care setting. Sex Transm Dis. 2019;46(3):153-8. doi: 10.1097/OLQ.0000000000000939. PMID: 30383619. **Exclusion: Wrong population.**

72. Clifton JM. Screening for chlamydia, gonorrhea, and high-risk sexual behaviors in Utah's juvenile justice population: results and implications for practice. J Pediatr Health Care. 2018;32(4):374-80. doi: 10.1016/j.pedhc.2017.12.008. PMID: 29551274. **Exclusion: Wrong outcome.**

73. Clifton S, Mercer C, Cassell J, et al. Does chlamydia testing in general practice mean missed opportunities for the diagnosis of other STIs?: a comparison of the population tested in general practice versus sexual health

clinics in Britain. Sex Transm Infect. Conference: BASHH Spring Conference. 2015;91. **Exclusion: Wrong publication type.**

74. Cole J, Hotton A, Zawitz C, et al. Opt-out screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in female detainees at Cook County jail in Chicago, IL. Sex Transm Dis. 2014;41(3):161-5. doi: 10.1097/OLQ.0000000000000106. PMID: 24521720. **Exclusion: Wrong study design for Key Question.**

75. Coll J, Videla S, Leon A, et al. Early detection of HIV infection and of asymptomatic sexually transmitted infections among men who have sex with men. Clin Microbiol Infect. 2018;24(5):540-5. doi: 10.1016/j.cmi.2017.08.012. PMID: 28843621. **Exclusion: Wrong comparator.**

76. Cook RL, Hutchison SL, Ostergaard L, et al. Systematic review: noninvasive testing for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Ann Intern Med. 2005;142(11):914-25. doi: 10.7326/0003-4819-142-11-200506070-00010. PMID: 15941699. **Exclusion: Wrong comparator.**

77. Cornelisse VJ, Walker S, Phillips T, et al. Risk factors for oropharyngeal gonorrhoea in men who have sex with men: an age-matched case-control study. Sex Transm Infect. 2018;94(5):359-64. doi: 10.1136/sextrans-2017-053381. PMID: 29358525. **Exclusion: Wrong outcome.**

78. Cosentino LA, Danby CS, Rabe LK, et al. Use of nucleic acid amplification testing for diagnosis of extragenital sexually transmitted infections. J Clin Microbiol. 2017;55(9):2801-7. doi: 10.1128/JCM.00616-17. PMID: 28679521. **Exclusion: Wrong intervention.**

79. Crichton J, Hickman M, Campbell R, et al. Socioeconomic factors and other sources of variation in the prevalence of genital chlamydia infections: a systematic review and meta-analysis. BMC Public Health. 2015;15:729. doi: 10.1186/s12889-015-2069-7. PMID: 26224062. **Exclusion: Wrong outcome.**

80. Cushman TA, Graves SK, Little SJ. Attitudes and preferences regarding the use of rapid self-testing for sexually transmitted infections and HIV in San Diego area men who have sex with men. Open Forum Infectious Diseases. 2019;6(3) doi: 10.1093/ofid/ofz043. PMID: 30906798. **Exclusion: Wrong outcome.**

81. Danby CS, Cosentino LA, Rabe LK, et al. Patterns of extragenital chlamydia and gonorrhea in women and men who have sex with men reporting a history of receptive anal intercourse. Sex Transm Dis. 2016;43(2):105-9. doi: 10.1097/OLQ.0000000000000384. PMID: 26766527. **Exclusion: Wrong comparator.**

82. Dangerfield DT, Farley JE, Holden J, et al. Acceptability of self-collecting oropharyngeal swabs for sexually transmissible infection testing among men and women. Sex Health. 2019;16(3):296-8. doi: 10.1071/sh18209. PMID: 30898197. **Exclusion: Wrong intervention.**

83. Dasarathan S, Kalaivani S. Study of prevalence of sexually transmitted infections/human immunodeficiency virus and condom use among male-to-female transgender: a retrospective analysis from a tertiary care hospital in Chennai. Indian J Sex Trasmitted Dis AIDS. 2017;38(1):43-6. doi: 10.4103/0253-7184.196889. PMID: 28442802. **Exclusion: Wrong outcome.**

84. Davies B, Turner KME, Frolund M, et al. Risk of reproductive complications following chlamydia testing: a population-based retrospective cohort study in Denmark. Lancet Infect Dis. 2016;16(9):1057-64. doi: 10.1016/S1473-3099(16)30092-5. PMID: 27289389. **Exclusion: Wrong outcome.**

85. Davies B, Ward H, Leung S, et al. Heterogeneity in risk of pelvic inflammatory diseases after chlamydia infection: a population-based study in Manitoba, Canada. J Infect Dis. 2014;210 Suppl 2:S549-55. doi: 10.1093/infdis/jiu483. PMID: 25381374. **Exclusion: Wrong outcome.**

86. Davis A, Goddard-Eckrich D, Dasgupta A, et al. Risk factors associated with sexually transmitted infections among women under community supervision in New York City. Int J STD AIDS. 2018;29(8):766-75. doi: 10.1177/0956462418755223. PMID: 29471763. **Exclusion: Wrong study design for Key Question.**

87. De Baetselier I, Smet H, Abdellati S, et al. Evaluation of the 'colli-pee', a first-void urine collection device for self-sampling at home for the detection of sexually transmitted infections, versus a routine clinic-based urine collection in a one-to-one comparison study design: efficacy and acceptability among MSM in Belgium. BMJ Open. 2019;9(4):e028145. doi: 10.1136/bmjopen-2018-028145. PMID: 30948618. **Exclusion: Wrong population.**

88. de Vries HJ. Sexually transmitted infections in men who have sex with men. Clin Dermatol. 2014;32(2):181-8. doi: 10.1016/j.clindermatol.2013.08.001. PMID: 24559552. **Exclusion: Wrong study design for Key Question.**

89. de Vrieze NH, van Rooijen MS, van de Loeff MS, et al. Additional gonorrhea and chlamydia infections found with rapid follow-up screening in men who have sex with men with an indication for HIV postexposure prophylaxis. Sex Transm Dis. 2014;41(8):515-7. doi: 10.1097/OLQ.0000000000000151. PMID: 25013982. **Exclusion: Wrong population.**

90. de Waaij DJ, Dubbink JH, Peters RP, et al. Comparison of GMT presto assay and roche cobas 4800 CT/NG assay for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in dry swabs. J Microbiol Methods. 2015;118:70-4. doi: 10.1016/j.mimet.2015.08.020. PMID: 26327539. **Exclusion: Wrong intervention.**

91. Desir FA, Ladd JH, Gaydos CA. Survey of partner notification practices for sexually transmissible infections in the United States. Sex Health. 2016;13(2):162-9. doi: 10.1071/SH15136. PMID: 26841251. **Exclusion: Wrong intervention.**

92. Dionne-Odom J, Westfall AO, Van Der Pol B, et al. Sexually transmitted infection prevalence in women with HIV: is there a role for targeted screening? Sex Transm Dis. 2018;45(11):762-9. doi: 10.1097/OLQ.0000000000000852. PMID: 29642121. **Exclusion: Wrong population.**

93. Dirks J, Hoebe C, van Liere G, et al. Standardisation is necessary in urogenital and extragenital *Chlamydia trachomatis* bacterial load determination by quantitative PCR: a review of literature and retrospective study. Sex Transm Infect. 2019;07:07. doi: 10.1136/sextrans-2018-053522. PMID: 30733424. **Exclusion: Wrong outcome.**

94. DiVasta AD, Trudell EK, Francis M, et al. Practice-based quality improvement collaborative to increase chlamydia screening in young women. Pediatrics. 2016;137(5):05. doi: 10.1542/peds.2015-1082. PMID: 27244777. **Exclusion: Wrong study design for Key Question.**

95. Dize L, Agreda P, Quinn N, et al. Comparison of self-obtained penile-meatal swabs to urine for the detection of C. trachomatis, N. gonorrhoeae and T. vaginalis. Sex Transm Infect. 2013;89(4):305-7. doi: 10.1136/sextrans-2012-050686. PMID: 23093735. **Exclusion: Wrong population.**

96. Dize L, Barnes P, Jr., Barnes M, et al. Performance of self-collected penile-meatal swabs compared to clinician-collected urethral swabs for the detection of *Chlamydia trachomatis, Neisseria gonorrhoeae, Trichomonas vaginalis,* and *Mycoplasma genitalium* by nucleic acid amplification assays. Diagn Microbiol Infect Dis. 2016;86(2):131-5. doi: 10.1016/j.diagmicrobio.2016.07.018. PMID: 27497595. **Exclusion: Wrong population.**

97. Domeika M, Bassiri M, Butrimiene I, et al. Evaluation of vaginal introital sampling as an alternative approach for the detection of genital *Chlamydia trachomatis* infection in women. Acta Obstet Gynecol Scand. 1999;78(2):131-6. PMID: 10023876. **Exclusion: Wrong country.**

98. Drinkard LN, Huxta RA, Halbritter A, et al. The case for extragenital screening of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in the college health setting. Sex Transm Dis. 2017;44(5):274-7. doi: 10.1097/OLQ.0000000000000593. PMID: 28407642. **Exclusion: Wrong comparator.**

99. Dukers-Muijrers N, van Rooijen MS, Hogewoning A, et al. Incidence of repeat testing and diagnoses of *Chlamydia trachomatis* and *Neisseria gonorrhoea* in swingers, homosexual and heterosexual men and women at two large Dutch STI clinics, 2006-2013. Sex Transm Infect. 2017;93(6):383-9. doi: 10.1136/sextrans-2016-052807. PMID: 28373241. **Exclusion: Wrong study design for Key Question.**

100. Dukers-Muijrers NH, Theunissen KA, Wolffs PT, et al. Acceptance of home-based chlamydia genital and anorectal testing using short message service (SMS) in previously tested young people and their social and sexual networks. PLoS One. 2015;10(7):e0133575. doi: 10.1371/journal.pone.0133575. PMID: 26230085. **Exclusion: Wrong intervention.**

101. Dukers-Muijrers NH, Wolffs PF, Eppings L, et al. Design of the FemCure study: prospective multicentre study on the transmission of genital and extra-genital *Chlamydia trachomatis* infections in women receiving routine care. BMC Infect Dis. 2016;16:381. doi: 10.1186/s12879-016-1721-x. PMID: 27502928. **Exclusion: Wrong publication type.**

102. Earnest R, Ronn MM, Bellerose M, et al. Population-level benefits of extragenital gonorrhea screening among men who have sex with men: an exploratory modeling analysis. Sexually Transmitted Diseases. 2020;29:29. doi: 10.1097/OLQ.0000000000001189. PMID: 32355108. **Exclusion: Wrong intervention.**

103. Eboigbodin KE, Hoser MJ. Multiplex strand invasion based amplification (mSIBA) assay for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Scientific Reports. 2016;6:20487. doi: 10.1038/srep20487. PMID: 26837460. **Exclusion: Wrong intervention.**

104. Edouard S, Tamalet C, Tissot-Dupont H, et al. Evaluation of self-collected rectal swabs for the detection of bacteria responsible for sexually transmitted infections in a cohort of HIV-1-infected patients. J Med Microbiol. 2017;08:08. doi: 10.1099/jmm.0.000481. PMID: 28590237. **Exclusion: Wrong population.**

105. Estcourt C, Sutcliffe L, Mercer CH, et al. The ballseye programme: a mixed-methods programme of research in traditional sexual health and alternative community settings to improve the sexual health of men in the UK. NIHR Journals Library. Programme Grants for Applied Research. 2016;12:12. doi: 10.3310/pgfar04200. PMID: 27997089. **Exclusion: Wrong outcome.**

106. Estcourt CS, Gibbs J, Sutcliffe LJ, et al. The esexual health clinic system for management, prevention, and control of sexually transmitted infections: exploratory studies in people testing for *Chlamydia trachomatis*. Lancet Public Health. 2017;2(4):e182-e90. doi: 10.1016/S2468-2667(17)30034-8. PMID: 29253450. **Exclusion: Wrong study design for Key Question.**

107. Fajardo-Bernal L, Angel-Muller E, Aponte-Gonzalez J, et al. Home-based specimen collection for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* testing does not improve clinical management outcomes: systematic review. Sex Transm Infect. 2015;91:A56-A7. doi: 10.1136/sextrans-2015-052270.156. **Exclusion: Wrong publication type.**

108. Fajardo-Bernal L, Aponte-Gonzalez J, Vigil P, et al. Home-based versus clinic-based specimen collection in the management of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections. Cochrane Database Syst Rev. 2015 (9):CD011317. doi: 10.1002/14651858.CD011317.pub2. PMID: 26418128. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

109. Falasinnu T, Gilbert M, Hottes TS, et al. Predictors identifying those at increased risk for STDs: a theory-guided review of empirical literature and clinical guidelines. Int J STD AIDS. 2015;26(12):839-51. doi: 10.1177/0956462414555930. PMID: 25324350. **Exclusion: Wrong outcome.**

110. Fernandez G, Martro E, Gonzalez V, et al. Usefulness of a novel multiplex real-time PCR assay for the diagnosis of sexually-transmitted infections. Enferm Infecc Microbiol Clin. 2016;34(8):471-6. doi: 10.1016/j.eimc.2015.10.014. PMID: 26706392. **Exclusion: Wrong intervention.**

111. Fernando KA, Fowler T, Harding J, et al. Detecting re-infection in patients after an initial diagnosis of gonorrhoea: is routine recall for re-screening useful? Int J STD AIDS. 2015;26(9):640-7. doi: 10.1177/0956462414548905. PMID: 25161175. **Exclusion: Wrong population.**

112. Ferrero DV, Meyers HN, Ferrero GM, et al. Self-collected glans/meatal 'dry' swab specimen and NAAT technology detects *Chlamydia trachomatis* and *Neisseria gonorrhoeae* - implications for public policy changes. Int J STD AIDS. 2017;28(10):985-90. doi: 10.1177/0956462416684693. PMID: 28632470. **Exclusion: Wrong population.**

113. Field N, Hughes G, Kennedy I, et al. Response letter to T Fowler and co-authors - estimating the positive predictive value of opportunistic population testing for gonorrhoea as part of the english chlamydia screening programme. Int J STD AIDS. 2014;25(9):692. doi: 10.1177/0956462414535205. PMID: 24810212. **Exclusion: Wrong publication type.**

114. Field N, Kennedy I, Folkard K, et al. Screening for gonorrhoea using samples collected through the english national chlamydia screening programme and risk of false positives: a national survey of local authorities. BMJ Open. 2014;4(10):e006067. doi: 10.1136/bmjopen-2014-006067. PMID: 25324326. **Exclusion: Wrong comparator.**

115. Footman A, Dionne-Odom J, Aaron KJ, et al. Performance of four molecular assays for detection of chlamydia and gonorrhea in a sample of HIV positive men who have sex with men. Sexually Transmitted

Diseases. 2019;47(3):158-61. doi: 10.1097/OLQ.0000000000001115. PMID: 31842087. **Exclusion: Wrong population.**

116. Forbes G, Drayton R. Testing for pharyngeal gonorrhoea in women: an important reservoir of infection, or excessive false positive diagnoses. Sex Transm Inf. Conference: BASHH Spring Conference. 2015;91:A20. doi: 10.1136/sextrans-2015-052126.58. **Exclusion: Wrong publication type.**

117. Foschi C, Gaspari V, Sgubbi P, et al. Sexually transmitted rectal infections in a cohort of 'men having sex with men'. J Med Microbiol. 2018;67(8):1050-7. doi: 10.1099/jmm.0.000781. PMID: 29927376. **Exclusion: Wrong study design for Key Question.**

118. Foschi C, Nardini P, Banzola N, et al. *Chlamydia trachomatis* infection prevalence and serovar distribution in a high-density urban area in the north of Italy. J Med Microbiol. 2016;65(6):510-20. doi: 10.1099/jmm.0.000261. PMID: 27046236. **Exclusion: Wrong intervention.**

119. Fouere S, Dimi S, Timsit J, et al. The DRIVER study: asymptomatic STI systematic screening versus targeted screening according to STI risk factors in a cohort of outpatients HIV-infected MSM seen in France-phase 1 results. J Int AIDS Soc. Conference: international congress of drug therapy in HIV infection. 2016;19:110. doi: 10.7448/IAS.19.8.21487. **Exclusion: Wrong publication type.**

120. Free C, McCarthy O, French RS, et al. Can text messages increase safer sex behaviours in young people? Intervention development and pilot randomised controlled trial. Health Technol Assess. 2016;20(57):1-82. doi: 10.3310/hta20570. PMID: 27483185. **Exclusion: Wrong intervention.**

121. Freeman AH, Bernstein KT, Kohn RP, et al. Evaluation of self-collected versus clinician-collected swabs for the detection of Chlamydia trachomatis and Neisseria gonorrhoeae pharyngeal infection among men who have sex with men. Sex Transm Dis. 2011;38(11):1036-9. doi: 10.1097/OLQ.0b013e318227713e. PMID: 21992980. **Exclusion: Wrong population.**

122. Frej-Madrzak M, Grybos A, Grybos M, et al. PCR diagnostics of *Chlamydia trachomatis* in asymptomatic infection by women. Ginekol Pol. 2018;89(3):115-9. doi: 10.5603/GP.a2018.0020. PMID: 29664545. **Exclusion: Wrong outcome.**

123. Fuller SS, Mercer CH, Copas AJ, et al. The SPORTSMART study: a pilot randomised controlled trial of sexually transmitted infection screening interventions targeting men in football club settings. Sex Transm Infect. 2015;91(2):106-10. doi: 10.1136/sextrans-2014-051719. PMID: 25512674. **Exclusion: Wrong outcome.**

124. Fung M, Scott KC, Kent CK, et al. Chlamydial and gonococcal reinfection among men: a systematic review of data to evaluate the need for retesting. Sex Transm Infect. 2007;83(4):304-9. doi: 10.1136/sti.2006.024059. PMID: 17166889. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

125. Galarraga O, Sosa-Rubi SG, Gonzalez A, et al. The disproportionate burden of HIV and STIs among male sex workers in Mexico City and the rationale for economic incentives to reduce risks. J Int AIDS Soc. 2014;17(19218) doi: 10.7448/IAS.17.1.19218. PMID: 25399543. **Exclusion: Wrong outcome.**

126. Garbers S, Friedman A, Martinez O, et al. Adapting the get yourself tested campaign to reach black and latino sexual-minority youth. Health Promot Pract. 2016;17(5):739-50. doi: 10.1177/1524839916647329. PMID: 27225216. **Exclusion: Wrong study design for Key Question.**

127. Garlock J, Lee L, Cucci M, et al. Suspected gonorrhea and chlamydia: incidence and utilization of empiric antibiotics in a health system emergency department. Am J Emerg Med. 2019;37(5):884-9. doi: 10.1016/j.ajem.2018.08.015. PMID: 30119987. **Exclusion: Wrong study design for Key Question.**

128. Garner AL, Schembri G, Cullen T, et al. Should we screen heterosexuals for extra-genital chlamydial and gonococcal infections? Int J STD AIDS. 2015;26(7):462-6. doi: 10.1177/0956462414543120. PMID: 25013220. **Exclusion: Wrong outcome.**

129. Garofalo R, Hotton AL, Kuhns LM, et al. Incidence of HIV infection and sexually transmitted infections and related risk factors among very young men who have sex with men. J Acquir Immune Defic Syndr. 2016;72(1):79-86. doi: 10.1097/QAI.0000000000000933. PMID: 26745827. **Exclusion: Wrong outcome.**

130. Gaydos C, Hardick J. Point of care diagnostics for sexually transmitted infections: perspectives and advances. Expert Rev Anti Infect Ther. 2014;12(6):657-72. doi: 10.1586/14787210.2014.880651. PMID: 24484215. **Exclusion: Wrong study design for Key Question.**

131. Gaydos C, Lewis M, Michele-Corinne AKO, et al. Use of rapid diagnostics for chlamydia and gonorrhoea for women in the emergency department can improve clinical management: report of a randomised clinical trial. Sex Transm Infect. 2017;93(Supplement 2):A107. doi: 10.1136/sextrans-2017-053264.275. **Exclusion: Wrong population.**

132. Gaydos CA. Review of use of a new rapid real-time PCR, the cepheid genexpert (Xpert) CT/NG assay, for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*: results for patients while in a clinical setting. Expert Rev Mol Diagn. 2014;14(2):135-7. doi: 10.1586/14737159.2014.871495. PMID: 24450867. **Exclusion: Wrong publication type.**

133. Gaydos CA. Let's take a "Selfie": self-collected samples for sexually transmitted infections. Sexually transmitted diseases. 2018b;45(4):278-9. doi: 10.1097/olq.0000000000000785. PMID: 29528988. **Exclusion: Wrong outcome.**

134. Gaydos CA, Ako MC, Lewis M, et al. Use of a rapid diagnostic for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* for women in the emergency department can improve clinical management: report of a randomized clinical trial. Ann Emerg Med. 2018;74(1):36-44. doi: 10.1016/j.annemergmed.2018.09.012. PMID: 30392736. **Exclusion: Wrong publication type.**

135. Gaydos CA, Jett-Goheen M, Barnes M, et al. Use of a risk quiz to predict infection for sexually transmitted infections: a retrospective analysis of acceptability and positivity. Sex Transm Infect. 2016;92(1):44-8. doi: 10.1136/sextrans-2015-052058. PMID: 26285773. **Exclusion: Wrong outcome.**

136. Gaydos CA, Van Der Pol B, Jett-Goheen M, et al. Performance of the cepheid CT/NG xpert rapid PCR test for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. J Clin Microbiol. 2013;51(6):1666-72. doi: 10.1128/jcm.03461-12. PMID: 23467600. **Exclusion: Wrong intervention.**

137. Geiger R, Smith DM, Little SJ, et al. Validation of the genexpert CT/NG assay for use with male pharyngeal and rectal swabs. Austin J HIV AIDS Res. 2016;3(1):pii. PMID: 27536736. **Exclusion: Wrong intervention.**

138. Giguere K, Alary M. Targeting core groups for gonorrhoea control: feasibility and impact. Sex Transm Infect. 2015;91(4):241-4. doi: 10.1136/sextrans-2014-051732. PMID: 25926404. **Exclusion: Wrong publication type.**

139. Gimenes F, Medina FS, Abreu AL, et al. Sensitive simultaneous detection of seven sexually transmitted agents in semen by multiplex-PCR and of HPV by single PCR. PLoS One. 2014;9(6):e98862. doi: 10.1371/journal.pone.0098862. PMID: 24921247. **Exclusion: Wrong intervention.**

140. Goddard SL, Poynten IM, Petoumenous K, et al. Prevalence, incidence and predictors of anal *Chlamydia trachomatis*, anal *Neisseria gonorrhoeae* and syphilis among older gay and bisexual men in the longitudinal study for the prevention of anal cancer (SPANC). Sex Transm Infect. 2019:pii. doi: 10.1136/sextrans-2019-054011. PMID: 31018992. **Exclusion: Wrong intervention.**

141. Gokhale P, Madrigal JM, Aparicio J, et al. Demographic and other characteristics, and rates of sexually transmitted infections among adolescents who underwent multiple abortions in 1 year. J Pediatr Adolesc Gynecol. 2018;31(6):610-3. doi: 10.1016/j.jpag.2018.07.011. PMID: 30081083. **Exclusion: Wrong intervention.**

142. Golden MR, Kerani RP, Stenger M, et al. Uptake and population-level impact of expedited partner therapy (EPT) on Chlamydia trachomatis and Neisseria gonorrhoeae: the Washington State community-level randomized trial of EPT. PLoS Medicine / Public Library of Science. 2015;12(1):e1001777. doi: 10.1371/journal.pmed.1001777. PMID: 25590331. **Exclusion: Wrong outcome.**

143. Golparian D, Borang S, Sundqvist M, et al. Evaluation of the new BD Max GC Real-Time PCR assay, analytically and clinically as a supplementary test for the BD ProbeTec GC Qx Amplified DNA assay, for molecular detection of *Neisseria gonorrhoeae*. J Clin Microbiol. 2015;53(12):3935-7. doi: 10.1128/JCM.01962-15. PMID: 26468501. **Exclusion: Wrong comparator.**

144. Golparian D, Hellmark B, Unemo M. Analytical specificity and sensitivity of the novel dual-target GeneProof *Neisseria gonorrhoeae* PCR kit for detection of *N. gonorrhoeae*. APMIS. 2015;123(11):955-8. doi: 10.1111/apm.12440. PMID: 26332192. **Exclusion: Wrong outcome.**

145. Gotz HM, Bom RJ, Wolfers ME, et al. Use of *Chlamydia trachomatis* high-resolution typing: an extended case study to distinguish recurrent or persistent infection from new infection. Sex Transm Infect. 2014;90(2):155-60. doi: 10.1136/sextrans-2013-051218. PMID: 24234071. **Exclusion: Wrong population.**

146. Gotz HM, Veldhuijzen IK, Habbema JD, et al. Prediction of *Chlamydia trachomatis* infection: application of a scoring rule to other populations. Sex Transm Dis. 2006;33(6):374-80. doi: 10.1097/01.olq.0000194585.82456.51. PMID: 16505746. **Exclusion: Wrong comparator.**

147. Goyal MK, Teach SJ, Badolato GM, et al. Universal screening for sexually transmitted infections among asymptomatic adolescents in an urban emergency department: high acceptance but low prevalence of infection. J Pediatr. 2016;171:128-32. doi: 10.1016/j.jpeds.2016.01.019. PMID: 26846572. **Exclusion: Wrong outcome.**

148. Goyal MK, Witt R, Hayes KL, et al. Clinician adherence to recommendations for screening of adolescents for sexual activity and sexually transmitted infection/human immunodeficiency virus. J Pediatr. 2014;165(2):343-7. doi: 10.1016/j.jpeds.2014.04.009. PMID: 24840761. **Exclusion: Wrong population.**

149. Grad AI, Vica ML, Matei HV, et al. Polymerase chain reaction as a diagnostic tool for six sexually transmitted infections - preliminary results. Clujul Med. 2015;88(1):33-7. doi: 10.15386/cjmed-373. PMID: 26528045. **Exclusion: Wrong population.**

150. Graham S, Guy RJ, Wand HC, et al. A sexual health quality improvement program (SHIMMER) triples chlamydia and gonorrhoea testing rates among young people attending aboriginal primary health care services in Australia. BMC Infect Dis. 2015;15:370. doi: 10.1186/s12879-015-1107-5. PMID: 26329123. **Exclusion: Wrong outcome.**

151. Grandcolin S, de Hauteclocque A, Lafoscade A, et al. Performance of a standardized interrogation to improve the screening of *Chlamydia trachomatis* infection. J Gynecol Obstet Biol Reprod 2015;44(8):685-91. doi: 10.1016/j.jgyn.2014.09.003. PMID: 25307616. **Exclusion: Not English language but possibly relevant.**

152. Graseck AS, Secura GM, Allsworth JE, et al. Home compared with clinic-based screening for sexually transmitted infections: a randomized controlled trial. Obstet Gynecol. 2010;116(6):1311-8. doi: 10.1097/AOG.0b013e3181fae60d. PMID: 21099596. **Exclusion: Wrong outcome.**

153. Gratrix J, Singh AE, Bergman J, et al. Evidence for increased chlamydia case finding after the introduction of rectal screening among women attending 2 Canadian sexually transmitted infection clinics. Clin Infect Dis. 2015;60(3):398-404. doi: 10.1093/cid/ciu831. PMID: 25336625. **Exclusion: Wrong outcome.**

154. Gray RT, Callander D, Hocking JS, et al. Population-level diagnosis and care cascade for chlamydia in Australia. Sex Transm Infect. 2019;96(2):131-6. doi: 10.1136/sextrans-2018-053801. PMID: 31167824. **Exclusion: Wrong publication type.**

155. Green A, Kerry-Barnard S, Fleming C, et al. Medical students' experiences optimising follow-up in ethnically diverse, sexually active 16-24 year olds participating in the 'test n treat' feasibility trial of rapid chlamydia tests. Educ Prim Care. 2018;29(4):242-3. doi: 10.1080/14739879.2018.1480425. PMID: 29869588. **Exclusion: Wrong publication type.**

156. Green A, Kerry-Barnard S, Fleming C, et al. Optimising follow-up at 7 months in ethnically diverse, sexually active 16-24 year olds taking part in the 'test n treat' feasibility trial of rapid chlamydia/gonorrhoea tests. HIV Med. 2018;19:S139. **Exclusion: Wrong publication type.**

157. Green N, Sherrard-Smith E, Tanton C, et al. Assessing local chlamydia screening performance by combining survey and administrative data to account for differences in local population characteristics. Sci Rep. 2019;9(7070) doi: 10.1038/s41598-019-43521-y. PMID: 31068656. **Exclusion: Wrong intervention.**

158. Greiner MV, Beal SJ, Nause K, et al. Laboratory screening for children entering foster care. Pediatr. 2017;140(6) doi: 10.1542/peds.2016-3778. PMID: 29141915. **Exclusion: Wrong outcome.**

159. GrilloArdila CF, Torres M, Gaitan HG, et al. Rapid point of care test for detecting urogenital *Chlamydia trachomatis* infection in nonpregnant women and men at reproductive age. Cochrane Database Syst Rev. 2015 (5) doi: 10.1002/14651858.CD011708. **Exclusion: Wrong publication type.**

160. Grov C, Cain D, Rendina HJ, et al. Characteristics associated with urethral and rectal gonorrhea and chlamydia diagnoses in a US national sample of gay and bisexual men: results from the one thousand strong panel. Sex Transm Dis. 2016;43(3):165-71. doi: 10.1097/OLQ.0000000000000410. PMID: 26859803. **Exclusion: Wrong outcome.**

161. Gueye SB, Diop-Ndiaye H, Gningue A, et al. Performance of the abbott real time CT/NG assay in urines and cervico-vaginal samples from Senegal. J Infect Dev Ctries. 2014;8(7):898-903. doi: 10.3855/jidc.4026. PMID: 25022301. **Exclusion: Wrong outcome.**

162. Guirguis-Blake JM, Henderson JT, Perdue LA. Periodic screening pelvic examination: evidence report and systematic review for the US preventive services task force. JAMA. 2017;317(9):954-66. doi: 10.1001/jama.2016.12819. PMID: 28267861. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

163. Gupta K, Brown L, Bakshi RK, et al. Performance of *Chlamydia trachomatis* OmcB enzyme-linked immunosorbent assay in serodiagnosis of *Chlamydia trachomatis* infection in women. J Clin Microbiol. 2018;56(9):e00275-18. doi: 10.1128/JCM.00275-18. PMID: 29899001. **Exclusion: Wrong population.**

164. Guy RJ, Causer LM, Klausner JD, et al. Performance and operational characteristics of point-of-care tests for the diagnosis of urogenital gonococcal infections. Sex Transm Infect. 2017;93(S4):S16-S21. doi: 10.1136/sextrans-2017-053192. PMID: 29223959. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

165. Guy RJ, Micallef JM, Mooney-Somers J, et al. Evaluation of chlamydia partner notification practices and use of the "let them know" website by family planning clinicians in Australia: cross-sectional study. J Med Internet Res. 2016;18(6):e173. doi: 10.2196/jmir.5441. PMID: 27342438. **Exclusion: Wrong population.**

166. Guy RJ, Ward J, Causer LM, et al. Molecular point-of-care testing for chlamydia and gonorrhoea in indigenous Australians attending remote primary health services (TTANGO): a cluster-randomised, controlled, crossover trial. Lancet Infect Dis. 2018;18(10):1117-26. doi: 10.1016/S1473-3099(18)30429-8. PMID: 30303108. **Exclusion: Wrong outcome.**

167. Gwyn S, Cooley G, Goodhew B, et al. Comparison of platforms for testing antibody responses against the *Chlamydia trachomatis* antigen pgp3. Am J Trop Med Hyg. 2017;97(6):1662-8. doi: 10.4269/ajtmh.17-0292. PMID: 29016320. **Exclusion: Wrong population.**

168. Hafner JW, Schaefer TJ. Sensitivity and specificity of the vaginal wet prep. J Emerg Med. 2014;46(1):83-4. doi: 10.1016/j.jemermed.2012.12.027. PMID: 24188598. **Exclusion: Wrong publication type.**

169. Hagemann CT, Nordbo SA, Myhre AK, et al. Sexually transmitted infections among women attending a Norwegian sexual assault centre. Sex Transm Infect. 2014;90(4):283-9. doi: 10.1136/sextrans-2013-051328. PMID: 24567522. **Exclusion: Wrong study design for Key Question.**

170. Hahn A, Schwarz NG, Meyer T, et al. PCR-based rapid diagnostic tests as a strategy for preventing infections with sexually transmitted diseases-a 'diagnostics-as-prevention' modelling approach. Lett Appl Microbiol. 2018;67(4):420-4. doi: 10.1111/lam.13059. PMID: 30074254. **Exclusion: Wrong study design for Key Question.**

171. Ham JY, Jung J, Hwang BG, et al. Highly sensitive and novel point-of-care system, aqcare chlamydia TRF kit for detecting *Chlamydia trachomatis* by using europium (Eu) (III) chelated nanoparticles. Ann Lab Med. 2015;35(1):50-6. doi: 10.3343/alm.2015.35.1.50. PMID: 25553280. **Exclusion: Wrong population.**

172. Han Y, Yin YP, Shi MQ, et al. Evaluation of abbott realtime CT/NG assay for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in cervical swabs from female sex workers in China. PLoS One. 2014;9(3):e89658. doi: 10.1371/journal.pone.0089658. PMID: 24599315. **Exclusion: Wrong comparator.**

173. Hananta IPY, van Dam AP, Bruisten SM, et al. Value of light microscopy to diagnose urogenital gonorrhoea: a diagnostic test study in Indonesian clinic-based and outreach sexually transmitted infections services. BMJ

Open. 2017;7(8):e016202. doi: 10.1136/bmjopen-2017-016202. PMID: 28801418. **Exclusion: Wrong comparator.**

174. Harding-Esch EM, Cousins EC, Chow SC, et al. A 30-min nucleic acid amplification point-of-care test for genital *Chlamydia trachomatis* infection in women: a prospective, multi-center study of diagnostic accuracy. EBioMedicine. 2018;28:120-7. doi: 10.1016/j.ebiom.2017.12.029. PMID: 29396306. **Exclusion: Wrong intervention.**

175. Harding-Esch EM, Fuller SS, Chow SC, et al. Diagnostic accuracy of a prototype rapid chlamydia and gonorrhoea recombinase polymerase amplification assay: a multicentre cross-sectional preclinical evaluation. Clin Microbiol Infect. 2019;25(3):380.e1-.e7. doi: 10.1016/j.cmi.2018.06.003. PMID: 29906594. **Exclusion: Wrong intervention.**

176. Hay PE, Kerry SR, Normansell R, et al. Which sexually active young female students are most at risk of pelvic inflammatory disease? A prospective study. Sex Transm Infect. 2016;92(1):63-6. doi: 10.1136/sextrans-2015-052063. PMID: 26082320. **Exclusion: Wrong outcome.**

177. Hengel B, Wand H, Ward J, et al. Patient, staffing and health centre factors associated with annual testing for sexually transmissible infections in remote primary health centres. Sex Health. 2017;14(3):274-81. doi: 10.1071/SH16123. PMID: 28445684. **Exclusion: Wrong outcome.**

178. Herbst de Cortina S, Bristow CC, Joseph Davey D, et al. A systematic review of point of care testing for *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Trichomonas vaginalis*. Infect Dis Obstet Gynecol. 2016;2016(4386127) doi: 10.1155/2016/4386127. PMID: 27313440. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

179. Hill MG, Menon S, Smith S, et al. Screening for chlamydia and gonorrhea cervicitis and implications for pregnancy outcome. Are we testing and treating at the right time? J Reprod Med. 2015;60(7-8):301-8. PMID: 26380488. **Exclusion: Wrong comparator.**

180. Hill-Tout R, Harding-Esch EM, Pacho A, et al. Health-related quality of life and psychosocial impacts of a diagnosis of non-specific genital infection in symptomatic heterosexual men attending UK sexual health clinics: a feasibility study. BMJ Open. 2018;8(6):e018213. doi: 10.1136/bmjopen-2017-018213. PMID: 29960999. **Exclusion: Wrong population.**

181. Hiransuthikul A, Janamnuaysook R, Sungsing T, et al. High burden of chlamydia and gonorrhoea in pharyngeal, rectal and urethral sites among Thai transgender women: implications for anatomical site selection for the screening of STI. Sex Transm Infect. 2019;0:1-6. doi: 10.1136/sextrans-2018-053835. PMID: 30982000. **Exclusion: Wrong population.**

182. Hiransuthikul A, Pattanachaiwit S, Teeratakulpisarn N, et al. High subsequent and recurrent sexually transmitted infection prevalence among newly diagnosed HIV-positive Thai men who have sex with men and transgender women in the test and treat cohort. Int J STD AIDS. 2019;30(2):140-6. doi: 10.1177/0956462418799213. PMID: 30296916. **Exclusion: Wrong comparator.**

183. Hocking J. Screening for chlamydia: does it work, results from accept. Sex Transm Infec. 2015;91:A3. **Exclusion: Wrong publication type.**

184. Hoenderboom BM, van Ess EF, van den Broek IVF, et al. *Chlamydia trachomatis* antibody detection in home-collected blood samples for use in epidemiological studies. J Microbiol Methods. 2018;144:164-7. doi: 10.1016/j.mimet.2017.11.022. PMID: 29196272. **Exclusion: Wrong outcome.**

185. Holland-Hall CM, Wiesenfeld HC, Murray PJ. Self-collected vaginal swabs for the detection of multiple sexually transmitted infections in adolescent girls. J Pediatr Adolesc Gynecol. 2002;15(5):307-13. PMID: 12547662. **Exclusion: Wrong outcome.**

186. Homsy J, King R, Bannink F, et al. Primary HIV prevention in pregnant and lactating Ugandan women: a randomized trial. PLoS One. 2019;14(2):e0212119. doi: 10.1371/journal.pone.0212119. PMID: 30802277. **Exclusion: Wrong intervention.**

187. Horner PJ, Wills GS, Righarts A, et al. Chlamydia trachomatis pgp3 antibody persists and correlates with self-reported infection and behavioural risks in a blinded cohort study. PLoS One. 2016;11(3):e0151497. doi: 10.1371/journal.pone.0151497. PMID: 26974653. **Exclusion: Wrong outcome.**

188. Horst AL, Rosenbohm JM, Kolluri N, et al. A paperfluidic platform to detect *Neisseria gonorrhoeae* in clinical samples. Biomed Microdevices. 2018;20(2):35. doi: 10.1007/s10544-018-0280-x. PMID: 29644437. **Exclusion: Wrong outcome.**

189. Hosenfeld CB, Workowski KA, Berman S, et al. Repeat infection with Chlamydia and gonorrhea among females: a systematic review of the literature. Sex Transm Dis. 2009;36(8):478-89. doi: 10.1097/OLQ.0b013e3181a2a933. PMID: 19617871. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

190. Hou P, Tebbs JM, Bilder CR, et al. Hierarchical group testing for multiple infections. Biometrics. 2017;73(2):656-65. doi: 10.1111/biom.12589. PMID: 27657666. **Exclusion: Wrong study design for Key Question.**

191. Hou P, Tebbs JM, Wang D, et al. Array testing for multiplex assays. Biostatistics. 2018;26:26. doi: 10.1093/biostatistics/kxy058. PMID: 30371749. **Exclusion: Wrong study design for Key Question.**

192. Hsieh HL, Huppert J, Patel CG, et al. The impact of the American College of Obstetricians and Gynecologists guideline changes in pap tests on annual chlamydia test rates. J Adolesc Health. 2017;61(4):440-5. doi: 10.1016/j.jadohealth.2017.05.012. PMID: 28754585. **Exclusion: Wrong study design for Key Question.**

193. Huang R, Ward J, Tangey A, et al. New molecular point-of-care test improves timeliness of treatment for *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoea* (Ng) in a remote aboriginal health clinic. Sex Transm Infect. 2015;91:A121-A2. **Exclusion: Wrong publication type.**

194. Huang SH, Huang ML, Shedden K, et al. Optimal group testing designs for estimating prevalence with uncertain testing errors. J R Stat Soc Series B Stat Methodol. 2017;79(5):1547-63. doi: 10.1111/rssb.12223. PMID: 29249898. **Exclusion: Wrong intervention.**

195. Huang SY, Hung JH, Hu LY, et al. Risk of sexually transmitted infections following depressive disorder: a nationwide population-based cohort study. Medicine. 2018;97(43):e12539. doi: 10.1097/MD.0000000000012539. PMID: 30412060. **Exclusion: Wrong comparator.**

196. Hunte T, Alcaide M, Castro J. Rectal infections with chlamydia and gonorrhoea in women attending a multiethnic sexually transmitted diseases urban clinic. Int J STD AIDS. 2010;21(12):819-22. doi: 10.1258/ijsa.2010.009279. PMID: 21297090. **Exclusion: Wrong outcome.**

197. Hurly DS, Buhrer-Skinner M, Badman SG, et al. Field evaluation of the CRT and ACON chlamydia point-of-care tests in a tropical, low-resource setting. Sex Transm Infect. 2014;90(3):179-84. doi: 10.1136/sextrans-2013-051246. PMID: 24337733. **Exclusion: Wrong intervention.**

198. Ito S, Horie K, Seike K, et al. Usefulness of quantifying leukocytes in first-voided urine to predict positivity for *Chlamydia trachomatis* in asymptomatic men at high risk for chlamydial infection. J Infect Chemother. 2014;20(12):748-51. doi: 10.1016/j.jiac.2014.08.002. PMID: 25156010. **Exclusion: Wrong comparator.**

199. Jackson JA, McNair TS, Coleman JS. Over-screening for chlamydia and gonorrhea among urban women age >=25 years. Am J Obstet Gynecol. 2015;212(1):40.e1-6. doi: 10.1016/j.ajog.2014.06.051. PMID: 24983680. **Exclusion: Wrong comparator.**

200. Jackson LJ, Roberts TE. Measuring health and quality of life for women undergoing testing and screening for chlamydia: a systematic review. Sex Transm Dis. 2016;43(3):152-64. doi: 10.1097/OLQ.0000000000000407. PMID: 26859802. **Exclusion: Wrong outcome.**

201. Jackson LJ, Roberts TE, Fuller SS, et al. Exploring the costs and outcomes of sexually transmitted infection (STI) screening interventions targeting men in football club settings: preliminary cost-consequence analysis of the SPORTSMART pilot randomised controlled trial. Sex Transm Infect. 2015;91(2):100-5. doi: 10.1136/sextrans-2014-051715. PMID: 25512670. **Exclusion: Wrong intervention.**

202. Jacobsson S, Boiko I, Golparian D, et al. WHO laboratory validation of xpert CT/NG and Xpert TV on the genexpert system verifies high performances. APMIS. 2018;126(12):907-12. doi: 10.1111/apm.12902. PMID: 30456870. **Exclusion: Wrong intervention.**

203. Jahan F, Shamsuzzaman SM, Akter S. Diagnosis of common bacterial causes of urethritis in men by gram stain, culture and multiplex PCR. Malays J Pathol. 2014;36(3):175-80. PMID: 25500516. **Exclusion: Wrong study design for Key Question.**

204. Jain A, Cole MJ, Planche T, et al. An evaluation of *Neisseria gonorrhoeae* antimicrobial susceptibility testing in the UK. J Clin Pathol. 2014;67(11):1013-6. doi: 10.1136/jclinpath-2014-202392. PMID: 25078330. **Exclusion: Wrong population.**

205. Jang D, Ratnam S, Gilchrist J, et al. Comparison of workflow, maintenance, and consumables in the genexpert infinity 80 and panther instruments while testing for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Sex Transm Dis. 2016;43(6):377-81. doi: 10.1097/OLQ.0000000000000444. PMID: 27196259. **Exclusion: Wrong population.**

206. Jaureguy F, Chariot P, Vessieres A, et al. Prevalence of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections detected by real-time PCR among individuals reporting sexual assaults in the Paris, France area. Forensic Sci Int. 2016;266:130-3. doi: 10.1016/j.forsciint.2016.04.031. PMID: 27261924. **Exclusion: Wrong population.**

207. Javaherian M, Sharifnia Z, Taheripanah R, et al. Using recombinant *Chlamydia trachomatis* OMP2 as antigen in diagnostic ELISA test. Iran J Microbiol. 2014;6(1):8-13. PMID: 25954485. **Exclusion: Wrong population.**

208. Jevtusevskaja J, Krolov K, Tulp I, et al. The effect of main urine inhibitors on the activity of different DNA polymerases in loop-mediated isothermal amplification. Expert Rev Mol Diagn. 2017;17(4):403-10. doi: 10.1080/14737159.2017.1283218. PMID: 28092481. **Exclusion: Wrong intervention.**

209. Jevtusevskaja J, Uusna J, Andresen L, et al. Combination with antimicrobial peptide lyses improves loop-mediated isothermal amplification based method for *Chlamydia trachomatis* detection directly in urine sample. BMC Infect Dis. 2016;16:329. doi: 10.1186/s12879-016-1674-0. PMID: 27412444. **Exclusion: Wrong comparator.**

210. Jonsson A, Jacobsson S, Foerster S, et al. Performance characteristics of newer MIC gradient strip tests compared with the etest for antimicrobial susceptibility testing of *Neisseria gonorrhoeae*. APMIS. 2018;126(10):822-7. doi: 10.1111/apm.12887. PMID: 30191618. **Exclusion: Wrong intervention.**

211. Jordan SJ, Schwebke JR, Aaron KJ, et al. Meatal swabs contain less cellular material and are associated with a decrease in gram stain smear quality compared to urethral swabs in men. J Clin Microbiol. 2017;55(7):2249-54. doi: 10.1128/JCM.00423-17. PMID: 28490486. **Exclusion: Wrong population.**

212. Joseph Davey DL, Shull HI, Billings JD, et al. Prevalence of curable sexually transmitted infections in pregnant women in low- and middle-income countries from 2010 to 2015: a systematic review. Sex Transm Dis. 2016;43(7):450-8. doi: 10.1097/OLQ.0000000000000460. PMID: 27322048. **Exclusion: Wrong outcome.**

213. Jue E, Schoepp NG, Witters D, et al. Evaluating 3D printing to solve the sample-to-device interface for LRS and POC diagnostics: example of an interlock meter-mix device for metering and lysing clinical urine samples. Lab Chip. 2016;16(10):1852-60. doi: 10.1039/c6lc00292g. PMID: 27122199. **Exclusion: Wrong intervention.**

214. Kampman C, Koedijk F, Driessen-Hulshof H, et al. Retesting young STI clinic visitors with urogenital *Chlamydia trachomatis* infection in the Netherlands; response to a text message reminder and reinfection rates: a prospective study with historical controls. Sex Transm Infect. 2016;92(2):124-9. doi: 10.1136/sextrans-2015-052115. PMID: 26404946. **Exclusion: Wrong population.**

215. Kapil R, Press CG, Hwang ML, et al. Investigating the epidemiology of repeat *Chlamydia trachomatis* detection after treatment by using *C. trachomatis* OmpA genotyping. J Clin Microbiol. 2015;53(2):546-9. doi: 10.1128/JCM.02483-14. PMID: 25472488. **Exclusion: Wrong population.**

216. Kasaie P, Schumacher CM, Jennings JM, et al. Gonorrhoea and chlamydia diagnosis as an entry point for HIV pre-exposure prophylaxis: a modelling study. BMJ Open. 2019;9(3):e023453. doi: 10.1136/bmjopen-2018-023453. PMID: 30837248. **Exclusion: Wrong study design for Key Question.**

217. Kaser T, Pasternak JA, Hamonic G, et al. Flow cytometry as an improved method for the titration of chlamydiaceae and other intracellular bacteria. Cytometry A. 2016;89(5):451-60. doi: 10.1002/cyto.a.22822. PMID: 26849001. **Exclusion: Wrong population.**

218. Keaveney S, Sadlier C, O'Dea S, et al. High prevalence of asymptomatic sexually transmitted infections in HIV-infected men who have sex with men: a stimulus to improve screening. Int J STD AIDS. 2014;25(10):758-61. doi: 10.1177/0956462414521165. PMID: 24480850. **Exclusion: Wrong population.**

219. Kellogg ND, Melville JD, Lukefahr JL, et al. Genital and extragenital gonorrhea and chlamydia in children and adolescents evaluated for sexual abuse. Pediatr Emerg Care. 2018;34(11):761-6. doi: 10.1097/PEC.0000000000001014. PMID: 28072668. **Exclusion: Wrong population.**

220. Kelly H, Coltart CEM, Pant Pai N, et al. Systematic reviews of point-of-care tests for the diagnosis of urogenital *Chlamydia trachomatis* infections. Sex Transm Infect. 2017;93(S4):S22-S30. doi: 10.1136/sextrans-2016-053067. PMID: 29223960. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

221. Kent CK, Chaw JK, Wong W, et al. Prevalence of rectal, urethral, and pharyngeal chlamydia and gonorrhea detected in 2 clinical settings among men who have sex with men: San Francisco, California, 2003. Clin Infect Dis. 2005;41(1):67-74. doi: 10.1086/430704. PMID: 15937765. **Exclusion: Wrong outcome.**

222. Kenyon C. Screening is not associated with reduced incidence of gonorrhoea or chlamydia in men who have sex with men (MSM); an ecological study of 23 European countries. F1000Research. 2019;8:160. doi: 10.12688/f1000research.17955.2. PMID: 31543953. **Exclusion: Wrong population.**

223. Kenyon C, Buyze J, Klebanoff M, et al. The role of sexual networks in studies of how BV and STIs increase the risk of subsequent reinfection. Epidemiol Infect. 2018;146(15):2003-9. doi: 10.1017/S0950268818002157. PMID: 30182860. **Exclusion: Wrong intervention.**

224. Kerry SR, Nightingale CM, Hay P, et al. Which sexually active female students get themselves tested for *Chlamydia trachomatis*? A cohort study. Int J STD AIDS. 2016;27(7):586-90. doi: 10.1177/0956462415587636. PMID: 25999170. **Exclusion: Wrong outcome.**

225. Kerry-Barnard S, Fleming C, Reid F, et al. 'Test n treat (TnT)'- rapid testing and same-day, on-site treatment to reduce rates of chlamydia in sexually active further education college students: study protocol for a cluster randomised feasibility trial. Trials 2018;19(1):311. doi: 10.1186/s13063-018-2674-8. PMID: 29871673. **Exclusion: Wrong publication type.**

226. Kersaudy-Rahib D, Lydie N, Leroy C, et al. Chlamyweb study II: a randomised controlled trial (RCT) of an online offer of home-based *Chlamydia trachomatis* sampling in France. Sex Transm Infect. 2017;93(3):188-95. doi: 10.1136/sextrans-2015-052510. PMID: 28377422. **Exclusion: Wrong outcome.**

227. Kerubo E, Laserson KF, Otecko N, et al. Prevalence of reproductive tract infections and the predictive value of girls' symptom-based reporting: findings from a cross-sectional survey in rural western Kenya. Sex Transm Infect. 2016;92(4):251-6. doi: 10.1136/sextrans-2015-052371. PMID: 26819339. **Exclusion: Wrong intervention.**

228. Keshinro B, Crowell TA, Nowak RG, et al. High prevalence of HIV, chlamydia and gonorrhoea among men who have sex with men and transgender women attending trusted community centres in Abuja and Lagos, Nigeria. J Int AIDS Soc. 2016;19(1):21270. doi: 10.7448/IAS.19.1.21270. PMID: 27931519. **Exclusion: Wrong country.**

229. Khan MR, Golin CE, Friedman SR, et al. STI/HIV sexual risk behavior and prevalent STI among incarcerated African American men in committed partnerships: the significance of poverty, mood disorders, and substance use. AIDS Behav. 2015;19(8):1478-90. doi: 10.1007/s10461-015-1062-6. PMID: 25863467. **Exclusion: Wrong intervention.**

230. Khoshakhlagh A, Salman Yazdi R, Navab-Akbar FT, et al. The prevalence of *Chlamydia trachomatis* infection in semen samples of both symptomatic and asymptomatic infertile men referring to royan institute, by using serological and molecular methods. Int J Fertil Steril. 2016;10(24). **Exclusion: Wrong intervention.**

231. Khoshakhlagh A, Salman Yazdi R, Navab-Akbar FT, et al. Comparison the diagnostic value of serological and molecular methods for screening and detecting *Chlamydia trachomatis* in semen of infertile men: a cross-sectional study. Int J Reprod Bio. 2017;15(12):763-70. PMID: 29492473. **Exclusion: Wrong intervention.**

232. Khosropour CM, Soge OO, Suchland R, et al. Recurrent/intermittent vaginal and rectal chlamydial infection following treatment: a prospective cohort study among female STD clinic patients. J Infect Dis. 2019;12:12. doi: 10.1093/infdis/jiz113. PMID: 30873541. **Exclusion: Wrong population.**

233. Kim HS, Kim TJ, Lee IH, et al. Associations between sexually transmitted infections, high-risk human papillomavirus infection, and abnormal cervical pap smear results in OB/GYN outpatients. J Gynecol Oncol. 2016;27(5):e49. doi: 10.3802/jgo.2016.27.e49. PMID: 27329197. **Exclusion: Wrong intervention.**

234. Kissinger PJ. The challenges of implementing and evaluating prescription expedited partner treatment. Sex Transm Dis. 2017;44(2):109-10. doi: 10.1097/olq.0000000000000577. PMID: 28081047. **Exclusion: Wrong publication type.**

235. Knight E, Morris M, Heaman M. A descriptive study of women presenting to an obstetric triage unit with no prenatal care. J Obstetr Gynaecol Can. 2014;36(3):216-22. doi: 10.1016/S1701-2163(15)30629-0. PMID: 24612890. **Exclusion: Wrong intervention.**

236. Koedijk FD, van Benthem BH, Vrolings EM, et al. Increasing sexually transmitted infection rates in young men having sex with men in the Netherlands, 2006-2012. Emerg Themes Epidemiol. 2014;11:12. doi: 10.1186/1742-7622-11-12. PMID: 25170341. **Exclusion: Wrong intervention.**

237. Kojima N, Park H, Konda KA, et al. The PICASSO cohort: baseline characteristics of a cohort of men who have sex with men and male-to-female transgender women at high risk for syphilis infection in Lima, Peru. BMC Infect Dis. 2017;17(1):255. doi: 10.1186/s12879-017-2332-x. PMID: 28399798. **Exclusion: Wrong outcome.**

238. Korenromp EL, Wi T, Resch S, et al. Costing of national STI program implementation for the global STI control strategy for the health sector, 2016-2021. PLoS One. 2017;12(1):e0170773. doi: 10.1371/journal.pone.0170773. PMID: 28129372. **Exclusion: Wrong intervention.**

239. Kumar P, Bhakuni DS, Rastogi S. Diagnosis of *Chlamydia trachomatis* in patients with reactive arthritis and undifferentiated spondyloarthropathy. J Infect Dev Ctries. 2014;8(5):648-54. doi: 10.3855/jidc.3644. PMID: 24820470. **Exclusion: Wrong population.**

240. Landovitz RJ, Gildner JL, Leibowitz AA. Sexually transmitted infection testing of HIV-positive medicare and medicaid enrollees falls short of guidelines. Sex Transm Dis. 2018;45(1):8-13. doi: 10.1097/OLQ.0000000000000695. PMID: 29240633. **Exclusion: Wrong population.**

241. Lang AS, An der Heiden M, Jansen K, et al. Not again! Effect of previous test results, age group and reason for testing on (re-)infection with *Chlamydia trachomatis* in Germany. BMC Infect Dis. 2018;18(1):424. doi: 10.1186/s12879-018-3323-2. PMID: 30144825. **Exclusion: Wrong intervention.**

242. Lanjouw E, Ouburg S, de Vries HJ, et al. Background review for the '2015 European guideline on the management of *Chlamydia trachomatis* infections'. Int J STD AIDS. 2015;24:24. PMID: 26608578. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

243. Lanjouw E, Ouburg S, de Vries HJ, et al. 2015 European guideline on the management of *Chlamydia trachomatis* infections. Int J STD AIDS. 2016;27(5):333-48. doi: 10.1177/0956462415618837. PMID: 26608577. **Exclusion: Wrong publication type.**

244. Lau A, Kong FYS, Huston W, et al. Factors associated with anorectal *Chlamydia trachomatis* or *Neisseria gonorrhoeae* test positivity in women: a systematic review and meta-analysis. Sex Transm Infect. 2019;16:16. doi: 10.1136/sextrans-2018-053950. PMID: 31097677. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

245. Lee S, Dowshen N, Matone M, et al. Variation in practice of expedited partner therapy for adolescents by state policy environment. J Adolesc Health. 2015;57(3):348-50. doi: 10.1016/j.jadohealth.2015.05.013. PMID: 26299562. **Exclusion: Wrong population.**

246. Lewis DA. Will targeting oropharyngeal gonorrhoea delay the further emergence of drug-resistant *Neisseria gonorrhoeae* strains? Sex Transm Infect. 2015;91(4):234-7. doi: 10.1136/sextrans-2014-051731. PMID: 25911525. **Exclusion: Wrong study design for Key Question.**

247. Lewis FM, Dittus P, Salmon ME, et al. School-based sexually transmitted disease screening: review and programmatic guidance. Sex Transm Dis. 2016;43(2 Suppl 1):S18-27. doi: 10.1097/OLQ.0000000000000283. PMID: 26779684. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

248. Li KT, Tang W, Wu D, et al. Pay-it-forward strategy to enhance uptake of dual gonorrhea and chlamydia testing among men who have sex with men in China: a pragmatic, quasi-experimental study. Lancet Infect Dis. 2019;19(1):76-82. doi: 10.1016/S1473-3099(18)30556-5. PMID: 30587296. **Exclusion: Wrong intervention.**

249. Libbus MK. Chlamydia rapid test was moderately accurate for diagnosing chlamydia infection in women. Evid Based Nurs. 2008;11(3):89. doi: 10.1136/ebn.11.3.89. PMID: 18583501. **Exclusion: Wrong outcome.**

250. Lippman SA, Jones HE, Luppi CG, et al. Home-based self-sampling and self-testing for sexually transmitted infections: acceptable and feasible alternatives to provider-based screening in low-income women in Sao Paulo, Brazil. Sex Transm Dis. 2007;34(7):421-8. doi: 10.1097/01.olq.0000245958.34961.27. PMID: 17091118. **Exclusion: Wrong outcome.**

251. Llata E, Braxton J, Asbel L, et al. Rectal *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections among women reporting anal intercourse. Obstet Gynecol. 2018;132(3):692-7. doi: 10.1097/aog.0000000000002804. PMID: 30095784. **Exclusion: Wrong outcome.**

252. Lolar SA, Sherwin RL, Robinson DM, et al. Effectiveness of an urban emergency department call-back system in the successful linkage to treatment of sexually transmitted infections. South Med J. 2015;108(5):268-73. doi: 10.14423/SMJ.0000000000000273. PMID: 25972212. **Exclusion: Wrong outcome.**

253. Loomba P, Knight V, McNulty A. What would be missed if we didn't screen men who have sex with men for oral *Chlamydia trachomatis*? A cross-sectional study. Sex Health. 2016;13(2):196-8. doi: 10.1071/SH15209. PMID: 26886379. **Exclusion: Wrong study design for Key Question.**

254. Low N, Redmond S, Uuskula A, et al. Screening for genital chlamydia infection. Cochrane Database Syst Rev. 2016;9:CD010866. doi: 10.1002/14651858.CD010866.pub2. PMID: 27623210. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

255. Lunny C, Taylor D, Hoang L, et al. Self-collected versus clinician-collected sampling for chlamydia and gonorrhea screening: a systemic review and meta-analysis. PLoS One. 2015;10(7):e0132776. doi: 10.1371/journal.pone.0132776. PMID: 26168051. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

256. Lutz AR. Screening for asymptomatic extragenital gonorrhea and chlamydia in men who have sex with men: significance, recommendations, and options for overcoming barriers to testing. LGBT Health. 2015;2(1):27-34. doi: 10.1089/lgbt.2014.0056. PMID: 26790015. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

257. Lydie N, de Barbeyrac B, Bluzat L, et al. Chlamyweb study I: rationale, design and acceptability of an internet-based chlamydia testing intervention. Sex Transm Infect 2017;93(3):179-87. doi: 10.1136/sextrans-2015-052511. PMID: 28258251. **Exclusion: Wrong outcome.**

258. Ma C, Du J, He W, et al. Rapid and accurate diagnosis of Chlamydia trachomatis in the urogenital tract by a dual-gene multiplex qPCR method. Journal of Medical Microbiology. 2019;68(12):1732-9. doi: 10.1099/jmm.0.001084. PMID: 31613208. **Exclusion: Wrong outcome.**

259. Mahilum-Tapay L, Laitila V, Wawrzyniak JJ, et al. New point of care chlamydia rapid test--bridging the gap between diagnosis and treatment: performance evaluation study. BMJ 2007;335(7631):1190-4. doi: 10.1136/bmj.39402.463854.AE. PMID: 18055487. **Exclusion: Wrong intervention.**

260. Marangoni A, Foschi C, Nardini P, et al. Evaluation of the versant CT/GC DNA 1.0 assay (kPCR) for the detection of extra-genital *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections. PLoS One.

2015;10(3):e0120979. doi: 10.1371/journal.pone.0120979. PMID: 25799263. **Exclusion: Wrong intervention.**

261. Marinelli T, Chow EP, Tomnay J, et al. Rate of repeat diagnoses in men who have sex with men for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*: a retrospective cohort study. Sex Health. 2015;12(5):418-24. doi: 10.1071/SH14234. PMID: 26117082. **Exclusion: Wrong intervention.**

262. Marlowe EM, Hardy D, Krevolin M, et al. High-throughput testing of urogenital and extragenital specimens for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* with cobas CT/NG. Eur J Microbiol Immunol. 2017;7(3):176-86. doi: 10.1556/1886.2017.00018. PMID: 29034107. **Exclusion: Wrong intervention.**

263. Martin EG, Feng W, Qian F, et al. Delivering partner services to reduce transmission and promote linkage to care: process outcomes varied for chlamydial infection, gonorrhea, HIV, and syphilis cases. J Public Health Manag Pract. 2017;23(3):242-6. doi: 10.1097/PHH.0000000000000351. PMID: 26480283. **Exclusion: Wrong outcome.**

264. Mattson CL, Bradley H, Beer L, et al. Increased sexually transmitted disease testing among sexually active persons receiving medical care for human immunodeficiency virus infection in the United States, 2009-2013. Clin Infect Dis. 2017;64(5):629-34. doi: 10.1093/cid/ciw834. PMID: 27940947. **Exclusion: Wrong population.**

265. May L, Ware CE, Jordan JA, et al. A randomized controlled trial comparing the treatment of patients tested for chlamydia and gonorrhea after a rapid polymerase chain reaction test versus standard of care testing. Sex Transm Dis. 2016;43(5):290-5. doi: 10.1097/OLQ.0000000000000438. PMID: 27100764. **Exclusion: Wrong population.**

266. McArdle BJ, Buser GL, Hedberg K, et al. Chlamydia retesting among safety-net clinic patients: infertility prevention project. J Womens Health. 2018;27(9):1135-41. doi: 10.1089/jwh.2017.6747. PMID: 29694796. **Exclusion: Wrong population.**

267. McNulty CA, Hogan AH, Ricketts EJ, et al. Increasing chlamydia screening tests in general practice: a modified zelen prospective cluster randomised controlled trial evaluating a complex intervention based on the theory of planned behaviour. Sex Transm Infect. 2014;90(3):188-94. doi: 10.1136/sextrans-2013-051029. PMID: 24005256. **Exclusion: Wrong outcome.**

268. McRee AL, Esber A, Reiter PL. Acceptability of home-based chlamydia and gonorrhea testing among a national sample of sexual minority young adults. Perspect Sex Reprod Health. 2015;47(1):3-10. doi: 10.1363/47e2715. PMID: 25776809. **Exclusion: Wrong outcome.**

269. Mensforth S, Thorley N, Radcliffe K. Auditing the use and assessing the clinical utility of microscopy as a point-of-care test for *Neisseria gonorrhoeae* in a sexual health clinic. Int J STD AIDS. 2018;29(2):157-63. doi: 10.1177/0956462417721062. PMID: 28705094. **Exclusion: Wrong intervention.**

270. Meyer T, Klos C, Kofler R, et al. Performance evaluation of the pelvocheck CT/NG test kit for the detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. BMJ Open. 2016;6(1):e009894. doi: 10.1136/bmjopen-2015-009894. PMID: 26729391. **Exclusion: Wrong intervention.**

271. Miyazaki N, Yamagishi Y, Izumi K, et al. Evaluation of rapid measurement of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* by using automatic gene analyzer "GENECUBE". Jpn J Antibiot. 2016;69(4):291-8. PMID: 30226955. **Exclusion: Not English language but possibly relevant.**

272. Mizushima D, Takano M, Uemura H, et al. High prevalence and incidence of rectal Chlamydia infection among men who have sex with men in Japan. PLoS ONE [Electronic Resource]. 2019;14(12):e0220072. doi: 10.1371/journal.pone.0220072. PMID: 31821348. **Exclusion: Wrong outcome.**

273. Mmeje O, Qin J, Wetmore M, et al. Breakdown in the expedited partner therapy treatment cascade: the role of community pharmacists. Sex Transm Dis. 2018;45. **Exclusion: Wrong publication type.**

274. Molina JM, Charreau I, Chidiac C, et al. Post-exposure prophylaxis with doxycycline to prevent sexually transmitted infections in men who have sex with men: an open-label randomised substudy of the ANRS IPERGAY trial. Lancet Infect Dis. 2018;18(3):308-17. doi: 10.1016/S1473-3099(17)30725-9. PMID: 29229440. **Exclusion: Wrong intervention.**

275. Moncada J, Schachter J, Liska S, et al. Evaluation of self-collected glans and rectal swabs from men who have sex with men for detection of Chlamydia trachomatis and Neisseria gonorrhoeae by use of nucleic acid amplification tests. J Clin Microbiol. 2009;47(6):1657-62. doi: 10.1128/jcm.02269-08. PMID: 19369445. **Exclusion: Wrong population.**

276. Mortimer NJ, Rhee J, Guy R, et al. A web-based personally controlled health management system increases sexually transmitted infection screening rates in young people: a randomized controlled trial. J Am Med Inform Assoc. 2015;22(4):805-14. doi: 10.1093/jamia/ocu052. PMID: 25773130. **Exclusion: Wrong outcome.**

277. Mushanski LM, Brandt K, Coffin N, et al. Comparison of the BD viper system with XTR technology to the gen-probe APTIMA COMBO 2 assay using the TIGRIS DTS system for the detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in urine specimens. Sex Transm Dis. 2012;39(7):514-7. doi: 10.1097/OLQ.0b013e31824f2f5b. PMID: 22706212. **Exclusion: Wrong intervention.**

278. Myers A, McCaskill SP, VanRavenstein K. Improving STD screening rates on a university campus. J Community Health. 2017;42(6):1247-54. doi: 10.1007/s10900-017-0377-9. PMID: 28589269. **Exclusion: Wrong outcome.**

279. Nadala E-C, Goh BT, Magbanua J-P, et al. Performance evaluation of a new rapid urine test for chlamydia in men: prospective cohort study. BMJ 2009;339:b2655-b. doi: 10.1136/bmj.b2655. PMID: 19638650. **Exclusion: Wrong intervention.**

280. Naldini G, Grisci C, Chiavarini M, et al. Association between human papillomavirus and chlamydia trachomatis infection risk in women: a systematic review and meta-analysis. International Journal of Public Health. 2019;64(6):943-55. doi: 10.1007/s00038-019-01261-w. PMID: 31175391. **Exclusion: Wrong outcome.**

281. Nanhoe AC, Visser M, Omlo JJ, et al. A pill for the partner via the chlamydia patient? Results from a mixed method study among sexual health care providers in the Netherlands. BMC Infect Dis. 2018;18(1):243. doi: 10.1186/s12879-018-3139-0. PMID: 29843643. **Exclusion: Wrong intervention.**

282. Nateghi Rostami M, Hossein Rashidi B, Aghsaghloo F, et al. Comparison of clinical performance of antigen based-enzyme immunoassay (EIA) and major outer membrane protein (MOMP)-PCR for detection of genital *Chlamydia trachomatis* infection. Int J Reprod Biomed. 2016;14(6):411-20. PMID: 27525325. **Exclusion: Wrong country.**

283. Nateghi Rostami M, Hossein Rashidi B, Nazari R, et al. A multiplex assay of *Trichomonas vaginalis*, *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections in genital specimens. Journal of Infection in Developing Countries. 2017;11(11):833-9. doi: 10.3855/jidc.8199. PMID: 31618181. **Exclusion: Wrong population.**

284. Nct. Adolescent sexually transmitted infection screening in the emergency department. Https://clinicaltrials.gov/show/nct03715335. 2018 PMID: 29298252 **Exclusion: Wrong publication type.**

285. Nielsen A, Marrone G, De Costa A. *Chlamydia trachomatis* among youth - testing behaviour and incidence of repeat testing in Stockholm county, Sweden 2010-2012. PLoS One. 2016;11(9):e0163597. doi: 10.1371/journal.pone.0163597. PMID: 27676175. **Exclusion: Wrong outcome.**

286. Niza C, Rudisill C, Dolan P. Vouchers versus lotteries: what works best in promoting chlamydia screening? A cluster randomised controlled trial. Appl Econ Perspect Policy. 2014;36(1):109-24. doi: 10.1093/aepp/ppt033. PMID: 25061507. **Exclusion: Wrong intervention.**

287. Nunez-Forero L, Moyano-Ariza L, Gaitan-Duarte H, et al. Diagnostic accuracy of rapid tests for sexually transmitted infections in symptomatic women. Sex Transm Infect. 2016;92(1):24-8. doi: 10.1136/sextrans-2014-051891. PMID: 26136508. **Exclusion: Wrong population.**

288. Nyatsanza F, McSorley J, Murphy S, et al. 'It's all in the message': the utility of personalised short message service (SMS) texts to remind patients at higher risk of STIs and HIV to reattend for testing-a repeat before and after study. Sex Transm Infect. 2016;92(5):393-5. doi: 10.1136/sextrans-2015-052216. PMID: 26670912. **Exclusion: Wrong outcome.**

289. Nyatsanza F, Trivedy A, Brook G. The effect of introducing routine self-taken extra-genital swabs in a genitourinary medicine clinic cohort: a before and after study. Int J STD AIDS. 2016;27(14):1330-3. PMID: 26672002. **Exclusion: Wrong population.**

290. Odesanmi TY, Wasti SP, Odesanmi OS, et al. Comparative effectiveness and acceptability of home-based and clinic-based sampling methods for sexually transmissible infections screening in females aged 14-50 years: a systematic review and meta-analysis. Sex Health. 2013;10(6):559-69. doi: 10.1071/sh13029. PMID: 24160747. **Exclusion: Wrong outcome.**

291. Ogale Y, Yeh PT, Kennedy CE, et al. Self-collection of samples as an additional approach to deliver testing services for sexually transmitted infections: a systematic review and meta-analysis. BMJ Glob Health. 2019;4(2):e001349. doi: 10.1136/bmjgh-2018-001349. PMID: 31139454. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

292. Ong JJ, Chow EPF, De Petra V, et al. Should asymptomatic men who have sex with men be screened for oropharyngeal chlamydia? Clinical outcomes from a cross-sectional study. Sex Transm Dis. 2018;45(2):103-6. doi: 10.1097/OLQ.0000000000000718. PMID: 29329179. **Exclusion: Wrong outcome.**

293. Østergaard L, Andersen B, Olesen F, et al. Efficacy of home sampling for screening of *Chlamydia trachomatis*: randomised study. BMJ (Clinical research ed.). 1998;317(7150):26-7. doi: 10.1136/bmj.317.7150.26. PMID: 9651263. **Exclusion: Wrong outcome.**

294. Parcell BJ, Ratnayake L, Kaminski G, et al. Value of repeat testing using cepheid genexpert CT/NG for indeterminate PCR results when diagnosing *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Int J STD AIDS. 2015;26(1):65-7. doi: 10.1177/0956462414531938. PMID: 24810211. **Exclusion: Wrong intervention.**

295. Parker RM, Bell A, Currie MJ, et al. 'Catching chlamydia': combining cash incentives and community pharmacy access for increased chlamydia screening, the view of young people. Aust J Prim Health. 2015;21(1):79-83. doi: 10.1071/PY12135. PMID: 24139788. **Exclusion: Wrong intervention.**

296. Parra-Sanchez M, Garcia-Rey S, Marcuello A, et al. Performance of the NG oligogen kit for the diagnosis of *Neisseria gonorrhoeae*: comparison with cobas 4800 assay. Diagn Microbiol Infect Dis. 2016;84(1):4-6. doi: 10.1016/j.diagmicrobio.2015.09.020. PMID: 26508106. **Exclusion: Wrong intervention.**

297. Parra-Sanchez M, Garcia-Rey S, Zakariya-Yousef Breval I, et al. Evaluation of a dilution method for non-evaluable results in the detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* with the cobas 4800 platform. Enferm Infecc Microbiol Clin. 2017;35(6):364-6. doi: 10.1016/j.eimc.2015.06.017. PMID: 26415750. **Exclusion: Wrong outcome.**

298. Parra-Sanchez M, Marcuello-Lopez A, Garcia-Rey S, et al. Comparison of the CT oligogen kit with cobas 4800 assay for detection of *Chlamydia trachomatis*. Enferm Infecc Microbiol Clin. 2015;33(10):642-5. doi: 10.1016/j.eimc.2015.02.017. PMID: 25858681. **Exclusion: Not English language but possibly relevant.**

299. Patel AV, Gaydos CA, Jett-Goheen M, et al. Assessing association between IWantTheKit risk quiz tool and sexually transmitted infection positivity in male users for sexually transmitted infection screening. Int J STD AIDS. 2018;29(2):122-7. doi: 10.1177/0956462417718758. PMID: 28669325. **Exclusion: Wrong outcome.**

300. Patton ME, Kidd S, Llata E, et al. Extragenital gonorrhea and chlamydia testing and infection among men who have sex with men-STD Surveillance Network, United States, 2010-2012. Clin Infect Dis. 2014;58(11):1564-70. doi: 10.1093/cid/ciu184. PMID: 24647015. **Exclusion: Wrong outcome.**

301. Pedrosa AF, Azevedo F, Lisboa C. Screening for chlamydia infection in a sexually transmitted infection clinic: a missed opportunity? Int J Dermatol. 2015;54(4):405-9. doi: 10.1111/ijd.12338. PMID: 25069382. **Exclusion: Wrong intervention.**

302. Perry MD, Jones RN, Corden SA. Is confirmatory testing of roche cobas 4800 CT/NG test *Neisseria gonorrhoeae* positive samples required? Comparison of the roche cobas 4800 CT/NG test with an opa/pap duplex assay for the detection of *N gonorrhoeae*. Sex Transm Infect. 2014;90(4):303-8. doi: 10.1136/sextrans-2013-051410. PMID: 24653040. **Exclusion: Wrong intervention.**

303. Peters RP, Nijsten N, Mutsaers J, et al. Screening of oropharynx and anorectum increases prevalence of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infection in female STD clinic visitors. Sex Transm Dis. 2011;38(9):783-7. doi: 10.1097/OLQ.0b013e31821890e9. PMID: 21844729. **Exclusion: Wrong outcome.**

304. Phillipson L, Gordon R, Telenta J, et al. A review of current practices to increase chlamydia screening in the community--a consumer-centred social marketing perspective. Health Expect. 2016;19(1):5-25. doi: 10.1111/hex.12337. PMID: 25580560. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

305. Pickett ML, Melzer-Lange MD, Miller MK, et al. Physician adherence to centers for disease control and prevention guidelines for sexually active adolescents in the pediatric emergency setting. Pediatr Emerg Care. 2018;34(11):767-73. doi: 10.1097/PEC.0000000000000873. PMID: 27749798. **Exclusion: Wrong population.**

306. Pimenta JM, Catchpole M, Rogers PA, et al. Opportunistic screening for genital chlamydial infection. II: prevalence among healthcare attenders, outcome, and evaluation of positive cases. Sex Transm Infect. 2003;79(1):22-7. doi: 10.1136/sti.79.1.22. PMID: 12576608. **Exclusion: Wrong outcome.**

307. Pittaras TE, Papaparaskevas J, Houhoula DP, et al. Comparison of penile skin swab with intra-urethral swab and first void urine for polymerase chain reaction-based diagnosis of *Chlamydia trachomatis* urethritis in male patients. Sex Transm Dis. 2008;35(12):999-1001. doi: 10.1097/OLQ.0b013e318182a586. PMID: 18665017. **Exclusion: Wrong population.**

308. Priest D, Read TRH, Chen MY, et al. Only recent sexual partners contribute to oropharyngeal gonorrhoea positivity: the number of sexual partners over different time periods as an indicator of gonorrhoea and chlamydia infection duration among men who have sex with men. Sexual Health. 2018;15(4):342-9. doi: 10.1071/SH17196. PMID: 29973330. **Exclusion: Wrong outcome.**

309. Priyadarshi K, Prakash P, Rani A, et al. Multiplex nested polymerase chain reaction targeting multiple genes for the detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* in genitourinary specimens. Indian Journal Of Sexually Transmitted Diseases And AIDS. 2019;40(2):152-8. doi: 10.4103/ijstd.IJSTD_73_18. PMID: 31922106. **Exclusion: Wrong population.**

310. Refugio ON, Klausner JD. Syphilis incidence in men who have sex with men with human immunodeficiency virus comorbidity and the importance of integrating sexually transmitted infection prevention into HIV care. Expert Rev Anti Infect Ther. 2018;16(4):321-31. doi: 10.1080/14787210.2018.1446828. PMID: 29489420. **Exclusion: Wrong population.**

311. Reisner SL, Jadwin-Cakmak L, Sava L, et al. Situated vulnerabilities, sexual risk, and sexually transmitted infections' diagnoses in a sample of transgender youth in the United States. AIDS Patient Care STDS. 2019;33(3):120-30. doi: 10.1089/apc.2018.0249. PMID: 30844303. **Exclusion: Wrong intervention.**

312. Ronn MM, Mc Grath-Lone L, Davies B, et al. Evaluation of the performance of nucleic acid amplification tests (NAATs) in detection of chlamydia and gonorrhoea infection in vaginal specimens relative to patient infection status: a systematic review. BMJ Open. 2019a;9(1):e022510. doi: 10.1136/bmjopen-2018-022510. PMID: 30659036. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

313. Rose SB, Garrett SM, Hutchings D, et al. Clinician education, advice and SMS/text reminders improve test of reinfection rates following diagnosis of *Chlamydia trachomatis* or *Neisseria gonorrhoeae*: before and after study in primary care. BMJ Sexual & Reproductive Health. 2019;46:32-7. doi: 10.1136/bmjsrh-2018-200185. PMID: 31628155. **Exclusion: Wrong population.**

314. Ross CE, Tao G, Patton M, et al. Screening for human immunodeficiency virus and other sexually transmitted diseases among U.S. women with prenatal care. Obstet Gynecol. 2015;125(5):1211-6. doi: 10.1097/AOG.0000000000000756. PMID: 25932850. **Exclusion: Wrong intervention.**

315. Rumyantseva T, Golparian D, Nilsson CS, et al. Evaluation of the new amplisens multiplex real-time PCR assay for simultaneous detection of *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, *Mycoplasma genitalium*, and *Trichomonas vaginalis*. APMIS. 2015;123(10):879-86. doi: 10.1111/apm.12430. PMID: 26299582. **Exclusion: Wrong intervention.**

316. Sachdev D, Patel AL, Sonkar SC, et al. Diagnosis of *Neisseria gonorrhoeae* using molecular beacon. Biomed Res Int. 2015;2015:597432. doi: 10.1155/2015/597432. PMID: 25802857. **Exclusion: Wrong intervention.**

317. Sachdev D, Wasnik K, Patel AL, et al. Multi-centric validation of an in-house-developed beacon-based PCR diagnostic assay kit for chlamydia and neisseria and portable fluorescence detector. J Med Microbiol. 2018;67(9):1287-93. doi: 10.1099/jmm.0.000803. PMID: 30051801. **Exclusion: Wrong intervention.**

318. Sahi SV, Rogozinska E, Sobhy S, et al. Accuracy of tests used to detect infection with *Chlamydia trachomatis* in asymptomatic pregnant women: a systematic review. Curr Opin Obstet Gynecol. 2017;29(6):375-82. doi: 10.1097/GCO.0000000000000411. PMID: 28914654. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

319. Sales JM, Smearman EL, Swartzendruber A, et al. Socioeconomic-related risk and sexually transmitted infection among African-American adolescent females. J Adolesc Health. 2014;55(5):698-704. doi: 10.1016/j.jadohealth.2014.05.005. PMID: 24974317. **Exclusion: Wrong intervention.**

320. Salomon SG, Torrone E, Nakatsukasa-Ono W, et al. Missed opportunities for chlamydia screening in title X family planning clinics. Sex Transm Dis. 2017;44(9):519-23. doi: 10.1097/OLQ.0000000000000641. PMID: 28809768. **Exclusion: Wrong intervention.**

321. Schillinger JA. Optimizing the Impact of Expedited Partner Therapy. Sex Transm Dis. 2018;45(5):358-60. doi: 10.1097/olq.0000000000000814. PMID: 29465636. **Exclusion: Wrong publication type.**

322. Schlueter R, Siu A, Shelton J, et al. Routine screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in first trimester abortion. J Infect Public Health. 2018;11(4):584-5. doi: 10.1016/j.jiph.2017.10.012. PMID: 29146429. **Exclusion: Wrong intervention.**

323. Secura GM, Allsworth JE, Madden T, et al. The Contraceptive CHOICE Project: reducing barriers to long-acting reversible contraception. Am J Obstet Gynecol. 2010;203(2):115.e1-7. doi: 10.1016/j.ajog.2010.04.017. PMID: 20541171. **Exclusion: Wrong publication type.**

324. Sexton ME, Baker JJ, Nakagawa K, et al. How reliable is self-testing for gonorrhea and chlamydia among men who have sex with men? J Fam Pract. 2013;62(2):70-8. PMID: 23405376. **Exclusion: Wrong population.**

325. Shannon CL, Keizur EM, Fehrenbacher A, et al. Sexually transmitted infection positivity among adolescents with or at high-risk for Human Immunodeficiency Virus infection in Los Angeles and New Orleans. Sexually Transmitted Diseases. 2019b;46(11):737-42. doi: 10.1097/OLQ.0000000000001056. PMID: 31453926. **Exclusion: Wrong intervention.**

326. Sirivongrangson P, Girdthep N, Sukwicha W, et al. The first year of the global enhanced gonococcal antimicrobial surveillance programme (EGASP) in Bangkok, Thailand, 2015-2016. PLoS One. 2018;13(11):e0206419. doi: 10.1371/journal.pone.0206419. PMID: 30412586. **Exclusion: Wrong population.**

327. Skulska E, Mlynarczyk-Bonikowska B, Walter de Walthoffen S, et al. [The comparison of real-time PCR and direct immunofluorescence in laboratory diagnostics of chlamydiosis in patients of department of dermatology and venereology medical university of Warsaw]. Med Dosw Mikrobiol. 2015;67(3-4):173-80. PMID: 27019911. **Exclusion: Not English language but possibly relevant.**

328. Slutsker JS, Tsang LB, Schillinger JA. Do prescriptions for expedited partner therapy for chlamydia get filled? Findings from a multi-jurisdictional evaluation, United States, 2017-2019. Sex Transm Dis. 2020;47(6):376-82. doi: 10.1097/olq.0000000000001163. PMID: 32149956. **Exclusion: Wrong intervention.**

329. Soetens LC, van Benthem BH, Op de Coul EL. Chlamydia test results were associated with sexual risk behavior change among participants of the chlamydia screening implementation in the Netherlands. Sex Transm Dis. 2015;42(3):109-14. doi: 10.1097/OLQ.0000000000000234. PMID: 25668640. **Exclusion: Wrong comparator.**

330. Speers DJ, Chua IJ, Manuel J, et al. Detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* from pooled rectal, pharyngeal and urine specimens in men who have sex with men. Sex Transm Infect. 2018;94(4):293-7. doi: 10.1136/sextrans-2017-053303. PMID: 29066627. **Exclusion: Wrong outcome.**

331. Sugunendran H, Birley HD, Mallinson H, et al. Comparison of urine, first and second endourethral swabs for PCR based detection of genital *Chlamydia trachomatis* infection in male patients. Sex Transm Infect. 2001;77(6):423-6. doi: 10.1136/sti.77.6.423. PMID: 11714940. **Exclusion: Wrong population.**

332. Swartzendruber A, Sales JM, Brown JL, et al. Correlates of incident *Trichomonas vaginalis* infections among African American female adolescents. Sex Transm Dis. 2014;41(4):240-5. doi: 10.1097/OLQ.0000000000000094. PMID: 24622635. **Exclusion: Wrong intervention.**

333. Sweet RL. Pelvic inflammatory disease: current concepts of diagnosis and management. Curr Infect Dis Rep. 2012;14:194-203. doi: 10.1007/s11908-012-0243-y. PMID: 22298157. **Exclusion: Wrong publication type.**

334. Tamarelle J, Thiebaut ACM, Sabin B, et al. Early screening for *Chlamydia trachomatis* in young women for primary prevention of pelvic inflammatory disease (i-Predict): study protocol for a randomised controlled trial. Trials 2017;18(1):534. doi: 10.1186/s13063-017-2211-1. PMID: 29132441. **Exclusion: Wrong publication type.**

335. Taylor MM, Frasure-Williams J, Burnett P, et al. Interventions to improve sexually transmitted disease screening in clinic-based settings. Sex Transm Dis. 2016;43(2 Suppl 1):S28-41. doi: 10.1097/OLQ.0000000000000294. PMID: 26779685. **Exclusion: Wrong outcome.**

336. Taylor SN, Liesenfeld O, Lillis RA, et al. Evaluation of the roche cobas(R) CT/NG test for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in male urine. Sex Transm Dis. 2012;39(7):543-9. doi: 10.1097/OLQ.0b013e31824e26ff. PMID: 22706217. **Exclusion: Wrong intervention.**

337. Taylor SN, Van Der Pol B, Lillis R, et al. Clinical evaluation of the BD probetec *Chlamydia trachomatis* qx amplified DNA assay on the BD viper system with XTR technology. Sex Transm Dis. 2011;38(7):603-9. doi: 10.1097/OLQ.0b013e31820a94d2. PMID: 21301389. **Exclusion: Wrong intervention.**

338. Ten Hoor G, Hoebe CJ, van Bergen JE, et al. The influence of two different invitation letters on chlamydia testing participation: randomized controlled trial. J Med Internet Res. 2014;16(1):e24. doi: 10.2196/jmir.2907. PMID: 24480721. **Exclusion: Wrong outcome.**

339. Thielemans E, Wyndham-Thomas C, Henrard S, et al. Screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections in men who have sex with men: diagnostic accuracy of nucleic acid amplification test on pooled urine, anorectal, and pharyngeal specimens. Sex Transm Dis. 2018;45(3):195-8. doi: 10.1097/OLQ.0000000000000722. PMID: 29419710. **Exclusion: Wrong population.**

340. Trebach JD, Chaulk CP, Page KR, et al. Neisseria gonorrhoeae and Chlamydia trachomatis among women reporting extragenital exposures. Sexually Transmitted Diseases. 2015;42(5):233-9. doi: 10.1097/OLQ.0000000000000248. PMID: 25868133. **Exclusion: Wrong outcome.**

341. Tsoumanis A, Hens N, Kenyon CR. Is screening for chlamydia and gonorrhea in men who have sex with men associated with reduction of the prevalence of these infections? A systematic review of observational studies. Sex Transm Dis. 2018;45(9):615-22. doi: 10.1097/OLQ.0000000000000824. PMID: 29485537. **Exclusion: Systematic review or meta-analysis used as source document only to identify individual studies.**

342. Valejo Coelho MM, Matos-Pires E, Serrao V, et al. Extragenital gonorrhoea in men who have sex with men: a retrospective study in a STI clinic in Lisbon, Portugal. Acta Medica Portuguesa. 2018;31(5):247-53. doi: 10.20344/amp.10146. PMID: 29916355. **Exclusion: Wrong outcome.**

343. van der Helm JJ, Hoebe CJ, van Rooijen MS, et al. High performance and acceptability of self-collected rectal swabs for diagnosis of Chlamydia trachomatis and Neisseria gonorrhoeae in men who have sex with men and women. Sex Transm Dis. 2009;36(8):493-7. doi: 10.1097/OLQ.0b013e3181a44b8c. PMID: 19617869. **Exclusion: Wrong population.**

344. Van Der Pol B, Daniel G, Williams J, et al. Performance of the BD MAXTM CT/GC/TV assay for detection of chlamydia, gonorrhoea and trichomonas. Sex Transm Infect. Conference: BASHH Spring Conference. 2015;91. **Exclusion: Wrong publication type.**

345. Van Der Pol B, Fife K, Taylor SN, et al. Evaluation of the performance of the cobas CT/NG test for use on the cobas 6800/8800 systems for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in male and female urogenital samples. J Clin Microbiol. 2019;57(4) doi: 10.1128/JCM.01996-18. PMID: 30651389. **Exclusion: Wrong intervention.**

346. Van Der Pol B, Liesenfeld O, Williams JA, et al. Performance of the cobas CT/NG test compared to the aptima AC2 and viper CTQ/GCQ assays for detection of *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. J Clin Microbiol. 2012;50(7):2244-9. doi: 10.1128/jcm.06481-11. PMID: 22518864. **Exclusion: Wrong intervention.**

347. Van Der Pol B, Taylor SN, Lebar W, et al. Clinical evaluation of the BD probetec *Neisseria gonorrhoeae* qx amplified DNA assay on the BD viper system with XTR technology. Sex Transm Dis. 2012;39(2):147-53. doi: 10.1097/OLQ.0b013e3182372fd8. PMID: 22249304. **Exclusion: Wrong intervention.**

348. Van Der Pol B, Taylor SN, Mena L, et al. Evaluation of the performance of a point-of-care test for chlamydia and gonorrhea. JAMA Network Open. 2020;3(5):e204819. doi: 10.1001/jamanetworkopen.2020.4819. PMID: 32407506. **Exclusion: Wrong comparator.**

349. Van Der Pol B, Williams JA, Fuller D, et al. Combined testing for chlamydia, gonorrhea, and trichomonas by use of the BD max CT/GC/TV assay with genitourinary specimen types. J Clin Microbiol. 2017;55(1):155-64. doi: 10.1128/JCM.01766-16. PMID: 27795343. **Exclusion: Wrong intervention.**

350. van Dommelen L, van Tiel FH, Ouburg S, et al. Alarmingly poor performance in *Chlamydia trachomatis* point-of-care testing. Sex Transm Infect. 2010;86(5):355-9. doi: 10.1136/sti.2010.042598. PMID: 20876754. **Exclusion: Wrong intervention.**

351. Verougstraete N, Verbeke V, De Canniere AS, et al. To pool or not to pool? Screening of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in female sex workers: pooled versus single-site testing. Sexually Transmitted Infections. 2020;0:1-5. doi: 10.1136/sextrans-2019-054357. PMID: 32404400. **Exclusion: Wrong intervention.**

352. Wijers J, van Liere G, Hoebe C, et al. Test of cure, retesting and extragenital testing practices for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* among general practitioners in different socioeconomic status areas: a retrospective cohort study, 2011-2016. PLoS One. 2018;13(3):e0194351. doi: 10.1371/journal.pone.0194351. PMID: 29538469. **Exclusion: Wrong study design for Key Question.**

353. Willis SJ, Elder H, Cocoros N, et al. More screening or more disease? Gonorrhea testing and positivity patterns among men in three large clinical practices in Massachusetts, 2010-2017. Clinical Infectious Diseases. 2020 doi: 10.1093/cid/ciaa066. PMID: 31967644. **Exclusion: Wrong intervention.**

354. Wilson E, Free C, Morris TP, et al. Can internet-based sexual health services increase diagnoses of sexually transmitted infections (STI)? Protocol for a randomized evaluation of an internet-based STI testing and results service. JMIR Res Protoc. 2016;5(1):e9. doi: 10.2196/resprot.4094. PMID: 26772143. **Exclusion: Wrong publication type.**

355. Wilson E, Free C, Morris TP, et al. Internet-accessed sexually transmitted infection (e-STI) testing and results service: a randomised, single-blind, controlled trial. PLoS Med. 2017;14(12):e1002479. doi: 10.1371/journal.pmed.1002479. PMID: 29281628. **Exclusion: Wrong outcome.**

356. Wilson E, Free C, Morris TP, et al. Effect of an internet-based sexually transmitted infection testing and results service on diagnoses and testing uptake: a single-blind, randomised controlled trial. Lancet. 2017;390(SPEC.ISS 1):S95-. **Exclusion: Wrong publication type.**

357. Wilson E, Free C, T PM, et al. E-sti testing and results service: a single blind randomised controlled trial. Sex Transm Infect. 2017;Conference:. 2017 STI and HIV world congress. Brazil 93(Supplement 2):A190. **Exclusion: Wrong publication type.**

358. Wilson J, Wallace H, Loftus-Keeling M, et al. Extra-genital samples for gonorrhoea and chlamydia in women and MSM: self-taken samples analysed separately compared with self-taken pooled samples. Sex Transm Infect. 2016;92. **Exclusion: Wrong publication type.**

359. Wilson J, Wallace H, Loftus-Keeling M, et al. Self-taken extra-genital samples compared with clinician-taken extra-genital samples for the diagnosis of gonorrhoea and chlamydia in women and MSM. Sex Transm Infect. 2016;92:A2-A3. **Exclusion: Wrong publication type.**

360. Wilson J, Wallace H, Loftus-Keeling M, et al. Clinician-taken extra-genital samples for gonorrhoea and chlamydia in women and msm compared with self-taken samples analysed separately and self-taken pooled

samples. Sex Transm Infect. 2017;Conference:. 2017 STI and HIV world congress. Brazil 93(Supplement 2):A26. **Exclusion: Wrong publication type.**

361. Wisniewski CA, White JA, Michel C-EC, et al. Optimal method of collection of first-void urine for diagnosis of *Chlamydia trachomatis* infection in men. J Clin Microbiol. 2008;46(4):1466-9. doi: 10.1128/JCM.02241-07. PMID: 18234860. **Exclusion: Wrong intervention.**

362. Wood M, Ellks R, Grobicki M. Outreach sexual infection screening and postal tests in men who have sex with men: are they comparable to clinic screening? Int J STD AIDS. 2015;26(6):428-31. doi: 10.1177/0956462414539668. PMID: 24912535. **Exclusion: Wrong outcome.**

363. Wood SM, McGeary A, Wilson M, et al. Effectiveness of a quality improvement intervention to improve rates of routine *Chlamydia trachomatis* screening in female adolescents seeking primary preventive care. J Pediatr Adolesc Gynecol. 2019;32(1):32-8. doi: 10.1016/j.jpag.2018.10.004. PMID: 30394335. **Exclusion: Wrong outcome.**

364. Yang TZT, Chen MY, Read TRH, et al. Sampling technique and detection rates of oropharyngeal and anorectal gonorrhoea using nucleic acid amplification tests in men who have sex with men. Sex Transm Infect. 2018;94(4):287-92. doi: 10.1136/sextrans-2017-053339. PMID: 29133523. **Exclusion: Wrong outcome.**

365. Yussman SM, Urbach K. Introduction of universal chlamydia and gonorrhea screening in an urban school-based health center. Journal of Adolescent Health. 2018;62(2):S80-S1. **Exclusion: Wrong publication type.**

366. Zou H, Meng X, Grulich A, et al. A randomised controlled trial to evaluate the impact of sexual health clinic based automated text message reminders on testing of HIV and other sexually transmitted infections in men who have sex with men in China: protocol for the T2T study. BMJ Open. 2017;7(7):e015787. doi: 10.1136/bmjopen-2016-015787. PMID: 28698334. **Exclusion: Wrong publication type.**

Appendix A6. Criteria for Assessing Internal Validity of Individual Studies

Randomized Controlled Trials (RCTs) and Cohort Studies
Criteria:
Initial assembly of comparable groups:
For RCTs: Adequate randomization, including first concealment and whether potential confounders were distributed equally among groups
For cohort studies: Consideration of potential confounders, with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts
Maintenance of comparable groups (includes attrition, cross-overs, adherence, contamination)
Important differential loss to followup or overall high loss to followup
Measurements: equal, reliable, and valid (includes masking of outcome assessment)
Clear definition of interventions
All important outcomes considered
Analysis: adjustment for potential confounders for cohort studies or intention-to treat analysis for RCTs

Definition of ratings based on above criteria:
Good: Meets all criteria: Comparable groups are assembled initially and maintained throughout the study (followup ≥80%); reliable and valid measurement instruments are used and applied equally to all groups; interventions are spelled out clearly; all important outcomes are considered; and appropriate attention to confounders in analysis. In addition, intention-to-treat analysis is used for RCTs.
Fair: Studies are graded "fair" if any or all of the following problems occur, without the fatal flaws noted in the "poor" category below: Generally comparable groups are assembled initially, but some question remains whether some (although not major) differences occurred with followup; measurement instruments are acceptable (although not the best) and generally applied equally; some but not all important outcomes are considered; and some but not all potential confounders are accounted for. Intention-to-treat analysis is used for RCTs.
Poor: Studies are graded "poor" if any of the following fatal flaws exists: Groups assembled initially are not close to being comparable or maintained throughout the study; unreliable or invalid measurement instruments are used or not applied equally among groups (including not masking outcome assessment); and key confounders are given little or no attention. Intention-to-treat analysis is lacking for RCTs

Source: U.S. Preventive Services Task Force. Procedure Manual. https://www.uspreventiveservicestaskforce.org/Page/Name/appendix-vi-criteria-for-assessing-internal-validity-of-individual-studies Accessed on 4/12/19.

Appendix A7. Expert Reviewers of the Draft Report

- Erin Abramsohn, MPH, DrPH, Centers for Disease Control and Prevention
- Andria Apostolou, PhD, MPH, Indian Health Service
- Jennifer Fuld, PhD, Centers for Disease Control and Prevention
- Charlotte A. Gaydos, DrPH, MPH, MS, Johns Hopkins University
- Dr. Elena Gorodetsky, MD, PhD, National Institutes of Health Office of Research on Women's Health
- Katherine K. Hsu, MD, MPH, Boston University School of Medicine
- Sonia Lee, PhD, National Institutes of Health Eunice Kennedy Shriver National Institute of Child Health and Human Development
- Susan Tuddenham, MD, MPH, Johns Hopkins University
- Sung Sug (Sarah) Yoon, PhD, RN, National Institutes of Health National Institute of Nursing Research

Note: Reviewers provided comments on a prior version of the draft report and may or may not agree with the report findings.

Appendix B Table 1. Evidence Table: Effectiveness of Screening to Reduce Complications and Transmission- Study Characteristics

Author, Year, Study name	Eligibility criteria	Number approached, eligible, enrolled, analyzed	Population characteristics (age, sex, race)	Country & setting	Duration of followup	Interventions
Hocking *et al*., 2018[66] ACCEPt Trial	Age: 16-29 years Sex: female and male Sexual risk practices: sexually active	*Cluster RCT, not reported by population* Approached: 165 clinics Eligible: 149 clinics Enrolled: 130 clinics Analyzed: 126 clinics	Mean age NR; 35% age 16-19, 32% age 20-24, 33% age 25-29 49% female, 51% male Race not reported	Australia Primary care	Mean 3.1 years	Multifaceted screening program (includes clinician education, EMR alert, patient reminder system, quarterly testing report for clinic, clinician payment incentive, partner notification; n=30,527) Usual care (n=32,811)
Oakeshott *et al*., 2010*[73] POPI Trial† **Includes personal communication data*	Age: ≤27 years Sex: female Sexual risk practices: sexually active	Approached: 3,528 Eligible: 2,563 Enrolled: 2,529 Analyzed: 2,377 (including 1,648 asymptomatic women)	Mean age 21 years 100% female 61% white; 27% black; 4% Asian; 8% other race	United Kingdom Community	1 year	Immediate screening (n=1,259) Deferred (1 year) screening (n=1,270)
Ostergaard *et al*., 2000†[74]	Age: high school students (age range not reported) Sex: female Sexual risk practices: sexually experienced	Approached: 5,487 Eligible: 1,761 Enrolled: 1,700 Analyzed: 930	*Population characteristics reported for followup population only (n=930)* Mean age not reported; 9% age 15 years, 27% age 16 years, 33% age 17 years, 22% age 18 years, 9% age ≥19 years 100% female >95% white; other races not reported	Denmark High school	1 year	Home screening (n=867) Usual care (opportunistic screening in a clinic; n=833)
Scholes *et al.,* 1996†[77]	Age: 18-34 years Sex: female Sexual risk practices: increased risk of infection based on scoring algorithm that included age ≤24 years, Black race, nulliparity, douching	Approached: 36,547 Eligible: 3,111 Enrolled: 2,607 Analyzed: 2,607	Mean age 22 years 100% female 71% white; 21% black; 2% Asian; 4% other race; 2% Hispanic	United States HMO	1 year	Immediate, clinic-based screening (n=1,009) Usual care (as-needed clinic visit) (n=1,598)

Appendix B Table 1. Evidence Table: Effectiveness of Screening to Reduce Complications and Transmission- Study Characteristics

Author, Year, Study name	Eligibility criteria	Number approached, eligible, enrolled, analyzed	Population characteristics (age, sex, race)	Country & setting	Duration of followup	Interventions
	in the preceding 12 months; ≥2 sexual partners in the preceding 12 months					

Abbreviations: ACCEPt = the Australian Chlamydia Control Effectiveness Pilot; EMR = electronic medical record; HMO = health maintenance organization; NR = not reported; POPI = prevention of pelvic infection; RCT = randomized controlled trial

† Included in prior USPSTF review

Appendix B Table 2. Evidence Table: Effectiveness of Screening to Reduce Complications and Transmission- Study Outcomes

Author, Year, Study Name	Attrition	Outcomes	Subgroups	Adverse events/harms	Sponsor	Quality rating
Hocking *et al*., 2018[66] ACCEPt Trial	A vs B Not reported	A vs B Repeat chlamydia infection: OR 3.1; 95% CI, 0.7 to 13.8 Incidence of PID* in clinics: 0.45% (293/65,519) vs 0.39% (237/60,384); RR 1.1 (95% CI 0.7 to 1.8) Incidence of PID in hospitals: 0.24% (57/23,527) vs 0.37% (88/23,219); RR 0.6; 95% CI, 0.4 to 1.0 Incidence of epididymitis in clinics**: 0.26% (106/41,168) vs 0.27% (106/38,717); RR 0.9 (95% CI 0.6 to 1.4) *denominator=number of women aged 16–33 years with at least one consultation during the intervention period **denominator=women age 15-34 **denominator=number of men aged 16–29 years with at least one consultation during the intervention period. <u>CT prevalence</u> 76/2,237 (3.4%) vs. 59/1,716 (3.4%) OR 0.9 (95% CI 0.5 to 1.5) aOR 0.9 (95% CI 0.5 to 1.6)	Not reported	None reported in any clinic	Australian Government Department of Health, National Health and Medical Research Council, Victorian Department of Health and Human Services, and New South Wales Ministry of Health.	Good
Oakeshott *et al.,* 2010*[73] POPI Trial† **Includes personal communication data*	A vs B 5% vs 7%	A vs B Incidence of PID: 1.3% (15/1191) vs 1.9% (23/1186); RR 0.65 (95% CI 0.34 to 1.22)	A vs B Incidence of PID, asymptomatic at baseline: 0.6% (5/787) vs 1.6% (14/861); RR 0.39 (95% CI 0.14 to 1.08)	Not reported	BUPA Foundation	Good

Appendix B Table 2. Evidence Table: Effectiveness of Screening to Reduce Complications and Transmission- Study Outcomes

Author, Year, Study Name	Attrition	Outcomes	Subgroups	Adverse events/harms	Sponsor	Quality rating
Ostergaard *et al.,* 2000†[74]	A vs B 49% vs 42%	A vs B Incidence of PID: 2.1% (9/443) vs 4.2% (20/487); RR 0.50 (95% CI, 0.23 to 1.08) Incidence of new chlamydia infection: 2.9% (13/443) vs 6.6% (32/487); RR 0.45 (95% CI, 0.24 to 0.84)	Not reported	Not reported	Danish National Board of Health; Løvens Kemiske Fabriks Research Foundation; Nycomed DAK; Jacob Madsen's & Hustru Olga Madsen's Foundation; Helga and Peter Kornings Foundation; Aarhus County Medical District Association	Fair
Scholes *et al.,* 1996†[77]	24% (not reported by intervention group)	A vs B Incidence of PID: 0.9% (9/1,009) vs 2.1% (33/1,598); RR 0.44 (95% CI, 0.20 to 0.90)	Not reported	Not reported	National Institute of Allergy and Infectious Diseases; Bristol-Myers Squibb.	Fair

Abbreviations: ACCEPt = the Australian Chlamydia Control Effectiveness Pilot; CI = confidence interval; CT = Chlamydia trachomatis; PID = pelvic inflammatory disease; POPI = prevention of pelvic infection; RR = relative risk.
† Included in prior USPSTF review

Appendix B Table 3. Quality Assessment of Studies of Effectiveness of Screening to Reduce Complications and Transmission

Author, year Study name	Randomization adequate?	Allocation concealment adequate?	Groups similar at baseline?	Eligibility criteria specified?	Outcome assessors masked?	Care provider masked?	Patient masked?	Attrition and withdrawals reported?	Loss to followup: differential (>10%)/ high (>20%)?	Analyze people in the groups in which they were randomized?	Quality
Hocking *et al*., 2018[66] ACCEPt Trial	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Differential: no High overall: no	Yes	Good
Oakeshott *et al*., 2010*[73] POPI Trial†	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Differential: no High overall: no	Yes	Good
Ostergaard *et al*., 2000*[74]	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Yes	Differential: no High overall: yes	Yes	Fair
Scholes *et al.,* 1996*[77]	Unclear	Unclear	Yes	Yes	Yes	Unclear	Unclear	Yes	Differential: unclear High overall: yes	Yes	Fair

* Included in prior USPSTF review

Appendix B Table 4. Evidence Table: Accuracy of Risk Stratification Methods or Screening Strategies- Study Characteristics

Author, year Study name	Study design	Country & setting	Comparison	Study duration Mean followup	Eligibility criteria	Number enrolled Number analyzed Withdrawals	Baseline demographics
Falasinnu *et al*., 2014[61]	Cross-sectional	Canada Specialty clinic (STI)	Derivation population for clinical risk prediction tool (n=10,437) Validation population for clinical risk prediction tool (n=14,956)	NA (cross sectional population)	Age criteria not reported; Female or heterosexual male; Asymptomatic; attending clinic for STI testing	Enrolled: 25,393 Analyzed: 25,393 Withdrawals: NA Loss to followup: NA	Age Mean age NR 14-19 years: 2% 20-24 years: 16% 25-29 years: 28% 30-39 years: 32% ≥ 40 years: 22% Sex Female: 35% Male: 65% Race/Ethnicity White: 71% Nonwhite: 29% Sexual partners in previous 6 months 0 partners: 5% 1-2 partners: 63% ≥ 3 partners: 31% Condom use Never: 22% Sometimes: 51% Always: 27% CT or NG positive: 2%
Falasinnu *et al*., 2016[62] (Sexually Transmitted Infections) Related publications: Falasinnu *et al*., 2014	Cross-sectional	Canada Specialty clinic (STI)	Derivation population for clinical risk prediction tool* (n=10,437) Validation population for clinical risk prediction tool (n=10,425) **Same derivation population as Falasinnu 2014*	NA (cross sectional population)	Age criteria not reported; Female or heterosexual male; Asymptomatic, attending clinic for STI testing	Enrolled: 20,862 Analyzed: 20,862 Withdrawals: NA Loss to followup: NA	NR

Appendix B Table 4. Evidence Table: Accuracy of Risk Stratification Methods or Screening Strategies- Study Characteristics

Author, year Study name	Study design	Country & setting	Comparison	Study duration Mean followup	Eligibility criteria	Number enrolled Number analyzed Withdrawals	Baseline demographics
Falasinnu *et al*., 2016[63] (Preventive Medicine)	Cross-sectional	Canada Specialty clinic (STI)	Population-based screening (according to published guidelines) Clinical prediction-based screening (according to risk score) Total n=35,818	NA (cross sectional population)	Age criteria not reported; Female or heterosexual male; Asymptomatic, attending clinic for STI testing	Enrolled: 35,818 Analyzed: 35,818 Withdrawals: NA Loss to followup: NA	Age Mean age: NR 14-19 years: 6% 20-24 years: 20% 25-29 years: 25% 30-39 years: 28% ≥40 years: 21% Sex Female: 37% Male: 63% Race/ethnicity White: 72% Nonwhite: 28% Sexual partners in previous 6 months 0 partners: 6% 1-2 partners: 64% ≥3 partners: 30% Condom use Never or sometimes: 71% Always: 29% CT or NG positive: 3%
Grentzer *et al*., 2015[65]	Cross-sectional	USA Specialty clinic (IUD placement)	Age-based screening (≤25 years) Age + partner-based screening (≤25 years + multiple partners) Risk-based screening (≤25 years, multiple partners, history of STI, inconsistent condom use)	NA (cross sectional population)	Age 14-45 years; Female; At risk for unwanted pregnancy; attending clinic for IUD insertion	Enrolled: 5,087 Analyzed: 5,087 Withdrawals: NA Loss to followup: NA	Age Mean age: NR 14-19 years: 10% 20-25 years: 43% 26-45 years: 47% 100% female Race/ethnicity White: 46% Black: 46% Other: 8%

Appendix B Table 4. Evidence Table: Accuracy of Risk Stratification Methods or Screening Strategies- Study Characteristics

Author, year Study name	Study design	Country & setting	Comparison	Study duration Mean followup	Eligibility criteria	Number enrolled Number analyzed Withdrawals	Baseline demographics
Javanbakht *et al*., 2018[67]	Case-control (positive NG=cases; negative NG=control)	USA Specialty clinic (STI)	*Single group* Association between self-reported risk factor and positive NG test Total n=245	2 years	Age 15 to 29 years; Female or male; Reported giving oral sex to a partner of the opposite sex in the past 90 days	Enrolled: 245 Analyzed: 245 Withdrawals: NA Loss to followup: NA	Age Mean age: NR 15-19 years: 21% 20-24 years: 48% 25-29 years: 31% Sex Female: 56% Male: 44% Race/ethnicity Black: 50% White: 9% Hispanic: 35% Other: 6% Pharyngeal NG infection 7%
Lavoue *et al*., 2014[68]	Cross-sectional	France; population based setting	A: Derivation data set, n=652 B: Validation data set, n=326	9 months; between January and September 2010	Women who had a surgical abortion with an interpretable CT test result	Eligible: 1277 Enrolled: 1000 Analyzed: 978 Withdrawals: NA	CT Result Positive: 48/652 (7.3%), 18/326 (5.6%) Sex Female: 100% Age <20: 162 20-24: 298 25-29: 207 30-34: 164 >34:164 Race NR

Appendix B Table 4. Evidence Table: Accuracy of Risk Stratification Methods or Screening Strategies- Study Characteristics

Author, year Study name	Study design	Country & setting	Comparison	Study duration Mean followup	Eligibility criteria	Number enrolled Number analyzed Withdrawals	Baseline demographics
Miller *et al*., 2000[69]	Cross-sectional	North Carolina, US; population based setting	Compare 8 sets of screening criteria (Table 1) for CT infections plus age alone	4 to 9 months in each county, depending on clinic volume; NR	Women undergoing pelvic examination in the study sites	Enrolled: 7150 (4754 women in family planning clinics and 2396 women in STD clinics) Analyzed: 6672 Withdrawals: NA Ineligible Resent testing or hysterectomy: 156 Missing questionnaires: 286 Women with unsatisfactory specimens: 36	CT Results Positive: 7.8% (95% CI 7.0-8.6%) vs. 11% (95% CI 9.7-12.4%) Sex Female: 100% Age ≤ 20: 183/1394 (13.1%) vs. 120/586 (20.5%) 21-24: 1345/4471 (30.1%) vs. 697/2201 (31.7%) ≥25: 1732/4471 (38.7%) vs. 918/2201 (41.7%) Race/Ethnicity White: 1999/4471 (44.7%) vs. 874/2201 (39.7%) Black: 2007/4471 (44.9%) vs. 1120/2201 (50.9%) Native American: 235/4471 (5.3%) vs. 96/2201 (4.4%) Latina: 146/4471 (3.3%) vs. 56/2201 (2.5%) Other: 84/4471 (1.9%) vs. 55/2201 (2.5%) Genitourinary symptoms No: 3064/4471 (68.5%) vs. 456/2201 (20.7) Yes: 1407/4471 (31.5%) vs. 1745/2201 (79.3%)

Abbreviations: CT = Chlamydia trachomatis; IUD = intrauterine device; NA = not applicable; NG = Neisseria gnorrhoeae; NR = not reported; STD = sexually transmitted disease; STI = sexually transmitted infection.

Appendix B Table 5. Evidence Table: Accuracy of Risk Stratification Methods- Study Outcomes

Author, year Study name	Adjusted variables for statistical analysis	Intermediate/Clinical health outcome results	Adverse events/ harms	Sponsor	Quality rating
Falasinnu *et al*., 2014[61]	Unadjusted	A vs. B Risk estimation model AUC (model includes age, nonwhite race/ethnicity, number of sexual partners, previous chlamydia diagnosis, and previous gonorrhea diagnosis) 0.74 (95% CI 0.70 to 0.77) vs. 0.64 (95% CI 0.61 to 0.67) Prevalence based on risk score category ≤0: 0/267 (0%) vs. 0/287 (0.1%) 1-5: 16/3,098 (0.5%) vs. 55/4,493 (1.2%) 6-10: 53/4,377 (1.2%) vs. 135/6,494 (2.1%) Prevalence according to risk score - sensitivity; specificity; PPV (see also Sheet 2) ≥-2: 100%; 0%; 1.8% vs. 100%; 0%; 2.2% ≥-1: 100%; 1.2%; 1.8% vs. 100%; 0.9%; 2.2% ≥0: 100%; 1.3%; 1.8% vs. 100%; 0.9%; 2.2% ≥1: 100%; 2.6%; 1.8% vs. 99.9%; 2.0%; 2.3% ≥2: 99.5%; 3.7%; 1.8% vs. 99.9%; 2.7%; 2.3% ≥3: 99.5%; 3.7%; 1.8% vs. 99.9%; 2.7%; 2.3% ≥4: 96.7%; 16.7%; 2.0% vs. 91.0%; 15.7%; 2.4% ≥5: 95.8%; 22.2%; 2.2% vs. 87.2%; 22.6%; 2.5% ≥6: 91.2%; 32.7%; 2.4% vs. 83.3%; 32.3%; 2.7%	NR	Canadian Institutes of Health Research	Fair

Appendix B Table 5. Evidence Table: Accuracy of Risk Stratification Methods- Study Outcomes

Author, year Study name	Adjusted variables for statistical analysis	Intermediate/Clinical health outcome results	Adverse events/ harms	Sponsor	Quality rating
Falasinnu *et al*., 2016[62] (Sexually Transmitted Infections) Related publications: Falasinnu, 2014	Unadjusted	A vs. B Risk estimation model AUC (model includes age, nonwhite race/ethnicity, number of sexual partners, previous chlamydia diagnosis, and previous gonorrhea diagnosis) 0.74 (95% CI 0.70 to 0.77) vs. 0.69 (95% CI 0.67 to 0.71) Prevalence according to risk score category ≤0: 0/267 (0%) vs. 0/169 (0.1%) 1-5: 16/3,098 (0.5%) vs. 30/2,084 (1.5%) 6-10: 53/4,377 (1.2%) vs. (181/4,173 (4.3%) Prevalence according to risk score - sensitivity; specificity; PPV (see also Sheet 2) ≥-2: 100%; 0%; 1.8% vs. 100%; 0%; 5.3% ≥-1: 100%; 1.2%; 1.8% vs. 100%; 0.7%; 5.4% ≥0: 100%; 1.3%; 1.8% vs. 100%; 0.7%; 5.4% ≥1: 100%; 2.6%; 1.8% vs. 99.9%; 1.7%; 5.4% ≥2: 99.5%; 3.7%; 1.8% vs. 99.9%; 2.5%; 5.5% ≥3: 99.5%; 3.7%; 1.8% vs. 99.9%; 2.5%; 5.5% ≥4: 96.7%; 16.7%; 2.0% vs. 97.1%; 10.8%; 5.8% ≥5: 95.8%; 22.2%; 2.2% vs. 96.2%; 13.7%; 5.9% ≥6: 91.2%; 32.7%; 2.4% vs. 94.5%; 22.5%; 6.4% ≥7: 84.9%; 47.7%; 2.8% vs. 90.1%; 34.1%; 7.2% ≥8: 82.2%; 53.0%; 3.0% vs. 86.0%; 37.9%; 7.2%	NR	Canadian Institutes of Health Research	Fair
Falasinnu *et al*., 2016[63] (Preventive Medicine)	Unadjusted	A vs. B AUC: population (guideline)-based screening including no risk factors, 0.55 (95% CI: 0.54 to 0.56); population (guideline)-based screening including risk factors, 0.64 (95% CI 0.63 to 0.66) vs. risk-based screening 0.73 (95% CI 0.71 to 0.74) Prevalence according to risk score - sensitivity; specificity; PPV (see also Sheet 2): ≥0: 100%; 0%; 3.0% vs. 100%; 0.1%; 3.0% ≥1: 94.5%; 15.4%; 3.3% vs. 99.9%; 0.2%; 3.0% ≥2: 68.0%; 54.9%; 4.4% vs. 99.9%; 0.6%; 3.0% ≥3: 23.9%; 89.8%; 6.7% vs. 99.8%; 2.0%; 3.0% ≥4: 2.8%; 98.4%; 5.2% vs. 99.8%; 2.0%; 3.0% ≥5: 0.2%; 99.8%; 3.2% vs. 99.7%; 3.4%; 3.1% ≥6: 0.0%; 100%; 0% vs. 98.2%; 5.8%; 3.1%	NR	Canadian Institutes of Health Research	Fair

Appendix B Table 5. Evidence Table: Accuracy of Risk Stratification Methods- Study Outcomes

Author, year Study name	Adjusted variables for statistical analysis	Intermediate/Clinical health outcome results	Adverse events/ harms	Sponsor	Quality rating
Grentzer *et al.*, 2015[65]	Unadjusted	A vs. B vs. C (see also Sheet 2) Sensitivity; specificity; NPV; PPV 80.7%; 48.1%; 98.8%; 4.5% vs. 84.7% vs. 44.8% vs. 99.0% vs. 4.5% vs. 99.3%; 7.6%; 99.7%; 3.2	NR	Susan Thompson Buffett Foundation, Eunice Kennedy Shriver National Institute of Child Health & Human Development, National Center for Advancing Translational Sciences	Fair

Appendix B Table 5. Evidence Table: Accuracy of Risk Stratification Methods- Study Outcomes

Author, year Study name	Adjusted variables for statistical analysis	Intermediate/Clinical health outcome results	Adverse events/ harms	Sponsor	Quality rating
Javanbakht *et al*., 2018[67]	Adjusted ORs included demographic characteristics, substance use, and other risk behaviors	Association between specific risk factors and pharyngeal NG infection Age (vs age 25-29 years) 15-19 years: OR 2.2 (95% CI 0.8 to 6.2); aOR 2.1 (95% CI 0.7 to 6.9) 20-24 years: OR 1.7 (95% CI 0.7 to 4.3); aOR 1.6 (95% CI 0.6 to 4.4) Female: OR 1.6 (95% CI 0.8 to 3.4); aOR1.2 (95% CI 0.6 to 2.8) Race/Ethnicity (vs. white race) African American: OR 1.8 (95% CI 0.4 to 8.5) Hispanic: OR 1.7 (95% CI 0.4 to 8.4) Other: OR 0.7 (95% CI 0.1 to 8.2) Homeless: OR 2.1 (95% CI 0.6 to 6.8) Sex of sex partners (vs. MSW) MSMW: OR 9.9 (95% CI 1.7 to 56.4) Sex of sex partners (vs. WSM) WSMW: OR 1.8 (95% CI 0.6 to 5.5) No. sex partners, past 3 months (vs. 1 partner) 2 to 4: OR 1.9 (95% CI 0.8 to 4.1) ≥5: OR 2.0 (95% CI 0.6 to 6.2) No. oral sex partners, past 3 months (vs. 1 partner) 2 to 4: OR 2.5 (95% CI 1.2 to 5.5); aOR 3.3 (95% CI 1.4 to 7.8) ≥5: OR 4.1 (95% CI 1.1 to 15.1); aOR 5.7 (95% CI 1.3 to 24.6) Partner ejaculates in mouth, all of the time, past 3 months OR 3.6 (95% CI 1.2 to 10.5); aOR 3.1 (95% CI 1.3 to 7.5) Swallows ejaculate/vaginal fluids, all of the time, past 3 months OR 2.3 (95% CI 1.0 to 5.3); aOR 2.5 (95% CI 1.1 to 6.3)	NR	National Institutes of Health/National Institutes of Allergy and Infectious Diseases	Fair

Appendix B Table 5. Evidence Table: Accuracy of Risk Stratification Methods- Study Outcomes

Author, year Study name	Adjusted variables for statistical analysis	Intermediate/Clinical health outcome results	Adverse events/ harms	Sponsor	Quality rating
Lavoue *et al*., 2014[68]	Unadjusted	Predictive factors associated with CT in the multiple logistic regression model (Table 3) Parity, aOR, 95% CI 0-1: 3.46, 1.34-9.93 >1: 1 Contraception No: 2.70, 1.41-5.16 Yes: 1 Gestational age at induced abortion, aOR, 95% CI ≤ 10 weeks:1 > 10 weeks: 1.96, 1.06-3.64	NR	University Hospital of Rennes, France	Fair
Miller *et al*., 2000[69]	Unadjusted	Table 3 Family Planning Clinics: ROC area (SD), Sensitivity, Specificity CDC N/A, 0.85, 0.38 Seattle-1 0.599 (0.017), 0.56, 0.54 Wisconsin 0.604 (0.023), 0.50, 0.66 Ontario 0.630 (0.017), 0.76, 0.41 California-1 0.633 (0.016), 0.94, 0.20 California-2 0.701 (0.015), 0.97, 0.09 Seattle-2 0.726 (0.014), 0.84, 0.51 Seattle-3 0.723 (0.015), 0.92, 0.31 Age ≤ 22 0.687 (0.014), 0.77, 0.51	NR	Centers for Disease Control and Prevention, UNC STD Clinical Research Center, Robert Wood Johnson Clinical Scholars Program, Clinical Associate Physician Program of the General Clinical Research Center	Fair

Abbreviations: aOR = adjusted odds ratio ; AUC = area under the receiver operating characteristic curve; CDC = Centers for disease control and prevention; CI = confidence interval; CT = Chlamydia trachomatis; NPV = negative predictive value; NG = Neisseria gonorrhoeae; NR = not reported; MSW = men who have sex with women; MSMW = men who have sex with men and women; OR = odds ratio; PPV = positive predictive value; ROC; receiver operating characteristic; SD = standard deviation; WSM = women who have sex with men; WSMW = women who have sex with men and women.

Appendix B Table 6. Quality Assessment of Studies of Risk Stratification Methods or Screening Strategies- Cohort Studies

Author, Year	Study Design	Did the study attempt to enroll all (or a random sample of) patients meeting inclusion criteria, or a random sample (inception cohort)?	Did the study use accurate methods for ascertaining exposures and potential confounders?	Were outcome assessors and/or data analysts blinded to the exposure being studied?	Did the article report attrition?	Is there high attrition?	Were outcomes pre- specified and defined, and ascertained using accurate methods?	Quality rating
Falasinnu *et al*., 2014[61]	Cross-sectional	Yes	Yes	No	N/A	N/A	Yes	Fair
Falasinnu *et al*., 2016[62] (Sexually Transmitted Infections) Related publications: Falasinnu *et al.,* 2014	Cross-sectional	Yes	Yes	No	N/A	N/A	Yes	Fair
Falasinnu *et al*., 2016[63] (Preventive Medicine)	Cross-sectional	Yes	Yes	No	N/A	N/A	Yes	Fair
Grentzer *et al*., 2015[65]	Cross-sectional	Yes	Yes	No	N/A	N/A	Yes	Fair
Javanbakht *et al*., 2018[67]	Case-control	Yes	Yes	Yes	No	N/A	Yes	Fair
Lavoue *et al*., 2014[68]	Cross-sectional	Yes	Yes	No	N/A	N/A	Yes	Fair
Miller *et al*., 2000[69]	Cross-sectional	Yes	Yes	No	N/A	N/A	Yes	Fair

Abbreviations: NA = not applicable.
Note: Standard cohort quality assessment criteria was modified in this table for cross-sectional studies

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: vaginal swab (self-collected)	Female	Positive result from at least two of the collection sites (urine, self-collected vaginal swab, clinician-collected endocervical swab)	Sites: endocervical (clinician-collected) and urine sample	USA Adolescent clinic Prevalence: 26.6%	Age, median: 16 years Sex: 100% female Race: African American: 96% Symptomatic: not reported	Age 12-18 Sexually active	133 26.6%	Not reported
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: urine sample	Female	Positive result from at least two of the collection sites (urine, self-collected vaginal swab, clinician-collected endocervical swab)	Site: Endocervical (clinician-collected) and vaginal swab (self-collected)	USA Adolescent clinic Prevalence: 26.6%	Age, median: 16 years Sex: 100% female Race: African American: 96% Symptomatic: not reported	Age 12-18 Sexually active	133 26.6%	Not reported
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: endocervical swab (clinician-collected)	Female	Positive result from at least two of the collection sites (urine, self-collected vaginal swab, clinician-collected endocervical	Sites: vaginal swab (self-collected) and urine sample	USA Adolescent clinic Prevalence: 26.6%	Age, median: 16 years Sex: 100% female Race: African American: 96% Symptomatic: not reported	Age 12-18 Sexually active	133 26.6%	Not reported
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: urine sample	Female	Positive result from at least two of the collection sites (urine, self-collected vaginal swab, clinician-collected endocervical	Site: endocervical (clinician-collected) and vaginal swab (self-collected)	USA Adolescent clinic Prevalence: 11.7%	Age, median: 16 years Sex: 100% female Race: African American: 96% Symptomatic: not reported	Age 12-18 Sexually active	133 11.7%	Not reported
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: endocervical swab	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or endocervical	USA Settings: 39% family planning clinics, 22% obstetrics/ gynecology, 38% STI	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard	3174 Prevalence: 5.9%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
						clinics (includes symptomatic patients)		practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only		
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: Female urine	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or endocervical	USA Settings: 39% family planning clinics, 22% obstetrics/ gynecology, 38% STI clinics (includes symptomatic patients)	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only	3190 Prevalence: 6.3%	31/6045 (0.04%), not reported for asymptomatic population
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: clinician-collected	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ	USA Settings: 39% family planning	Age, mean: 29 Female: 88% Race: African American: 45%	VENUS and VENUS II enrollment: ≥14 years old	2241 Prevalence: 6.4%	31/6045 (0.04%), not reported for asymptomatic

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
		vaginal swab			Site: Urine and/or endocervical	clinics, 22% obstetrics/ gynecology, 38% STI clinics (includes symptomatic patients)	White: 46.4% (includes symptomatic patients)	Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only		population
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: self-collected vaginal swab	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or endocervical	USA Settings: 39% family planning clinics, 22% obstetrics/ gynecology, 38% STI clinics (includes symptomatic patients)	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only	996 Prevalence: 5.0%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplified CT Assay Site: FCU	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	1388 Proportion with CT by culture of 1 specimen: 8.6%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplified CT Assay Site: cervix	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	1408 Proportion with CT by culture of 1 specimen: 8.5%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplified CT Assay Site: clinician-collected vaginal	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	1408 Proportion with CT by culture of 1 specimen: 8.5%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplified CT Assay Site: self-collected	Female	Agreement between positive results with vaginal swab and cervical swab or	Culture	U.S. and Canada Family planning,	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics	1408 Proportion with CT by culture of 1 specimen:	Not reported

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
		vaginal		FCU		obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture		within 30 days Excluded symptoms or partner with symptoms	8.5%	
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplified CT Assay Site: urethral swab	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	1407 Proportion with CT by culture of 1 specimen: 8.5%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplicor Site: FCU	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	577 Proportion with CT by culture of 1 specimen: 13.0%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplicor Site: cervix	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with	600 Proportion with CT by culture of 1 specimen: 12.5%	Not reported

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
						CT prevalence across sites: 5.4 to 10.2% by culture		symptoms		
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplicor Site: clinician-collected vaginal	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	579 Proportion with CT by culture of 1 specimen: 13.0%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplicor Site: self- collected vaginal	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	568 Proportion with CT by culture of 1 specimen: 13.2%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	Amplicor Site: urethral swab	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	602 Proportion with CT by culture of 1 specimen: 12.5%	Not reported

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	LCx Probe Site: FCU	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	499 Proportion with CT by culture of 1 specimen: 9.6%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	LCx Probe Site: cervix	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	498 Proportion with CT by culture of 1 specimen: 9.6%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	LCx Probe Site: clinician-collected vaginal	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	497 Proportion with CT by culture of 1 specimen: 9.7%	Not reported
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	LCx Probe Site: self-collected vaginal	Female	Agreement between positive results with vaginal swab and cervical swab or	Culture	U.S. and Canada Family planning,	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics	500 Proportion with CT by culture of 1 specimen:	Not reported

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
				FCU		obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture		within 30 days Excluded symptoms or partner with symptoms	9.6%	
Schachter *et al*., 2003[75]*	Chlamydia trachomatis	LCx Probe Site: urethral swab	Female	Agreement between positive results with vaginal swab and cervical swab or FCU	Culture	U.S. and Canada Family planning, obstetrics/ gynecology, and STI clinics CT prevalence across sites: 5.4 to 10.2% by culture	Age (range): 16 to 25 years 100% female Race: NR	Females Age 16 to 25 Excluded antibiotics within 30 days Excluded symptoms or partner with symptoms	500 Proportion with CT by culture of 1 specimen: 9.6%	Not reported
Schoeman *et al*., 2012[76]*	Chlamydia trachomatis	AC2 Site: endocervix	Female	Positive result from one NAAT confirmed by second NAAT	Aptima CT	United Kingdom Sexual health clinic Prevalence: NR	Age (mean): 25 years 100% female Ethnicity: 80% white, 9% black, 7% mixed, 4% other	Females ≥16 years Excluded if used antibiotics in the preceding 28 days	3974 enrolled 1347 asymptomati c 10.3% of enrolled with CT	0.7%
Schoeman *et al*., 2012[76]*	Chlamydia trachomatis	AC2 Site: self-collected vaginal	Female	Positive result from one NAAT confirmed by second NAAT	Aptima CT	United Kingdom Sexual health clinic Prevalence: NR	Age (mean): 25 years 100% female Ethnicity: 80% white, 9% black, 7% mixed, 4% other	Females ≥16 years Excluded if used antibiotics in the preceding 28 days	3974 enrolled 10.3% with CT	0.7%
Shrier *et al*., 2004[78]*	Chlamydia trachomatis	Amplicor Site: endocervix	Female	1 positive culture or 2 positive nonculture tests or 1 positive nonculture test confirmed by	Culture Amplicor Abbot LCx assay	United States; University medical center and children's hospital;	Age (mean): 19 years 100% female 22% history of CT Median time since previous CT	Females aged 16 to 25 years Excluded if symptoms Excluded if treated for CT in	139 eligible 126 analyzed 21.6% CT 2% NG or trichomonias is	1 participant excluded because no samples were collected by physician

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
				nested PCR		21.6% positive for CT at any site	infection: 539 days (range: 43 to 2738) 8% with history of other STI	previous 6 weeks Excluded if sexual contact with a partner diagnosed with an STI	(1 participant had CT and NG)	
Shrier *et al*., 2004[78]*	Chlamydia trachomatis	Amplicor Site: FCU	Female	1 positive culture or 2 positive nonculture tests or 1 positive nonculture test confirmed by nested PCR	Culture Amplicor Abbot LCx assay	United States; University medical center and children's hospital; 21.6% positive for CT at any site	Age (mean): 19 years 100% female 22% history of CT Median time since previous CT infection: 539 days (range: 43 to 2738) 8% with history of other STI	Females aged 16 to 25 years Excluded if symptoms Excluded if treated for CT in previous 6 weeks Excluded if sexual contact with a partner diagnosed with an STI	139 eligible 126 analyzed 21.6% CT 2% NG or trichomonias is (1 participant had CT and NG)	1 participant excluded because no samples were collected by physician
Shrier *et al*., 2004[78]*	Chlamydia trachomatis	Amplicor Site: clinician-collected vaginal	Female	1 positive culture or 2 positive nonculture tests or 1 positive nonculture test confirmed by nested PCR	Culture Amplicor Abbot LCx assay	United States; University medical center and children's hospital; 21.6% positive for CT at any site	Age (mean): 19 years 100% female 22% history of CT Median time since previous CT infection: 539 days (range: 43 to 2738) 8% with history of other STI	Females aged 16 to 25 years Excluded if symptoms Excluded if treated for CT in previous 6 weeks Excluded if sexual contact with a partner diagnosed with an STI	139 eligible 126 analyzed 21.6% CT 2% NG or trichomonias is (1 participant had CT and NG)	1 participant excluded because no samples were collected by physician
Shrier *et al*., 2004[78]*	Chlamydia trachomatis	Amplicor Site: self- collected vaginal	Female	1 positive culture or 2 positive nonculture tests or 1 positive nonculture test confirmed by nested PCR	Culture Amplicor Abbot LCx assay	United States; University medical center and children's hospital; 21.6% positive for CT at any site	Age (mean): 19 years 100% female 22% history of CT Median time since previous CT infection: 539 days (range: 43 to 2738) 8% with history of	Females aged 16 to 25 years Excluded if symptoms Excluded if treated for CT in previous 6 weeks Excluded if sexual contact with a partner	139 eligible 126 analyzed 21.6% CT 2% NG or trichomonias is (1 participant had CT and NG)	1 participant excluded because no samples were collected by physician

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
							other STI	diagnosed with an STI		
Skidmore et al., 2008[71]	Chlamydia trachomatis	Cobas Taqman 48 CT Site: ulvo-vaginal swab (self-collected)	Female	Not reported.	Cobas Taqman 48 CT Site: endocervical swab	United Kingdom Genitourinary medicine clinic Prevalence: 93%	Age: 18-24m mean not reported 100% female Race: not reported	Females age 18-24 years Additional criteria not reported	267 enrolled 9.3% with CT	Not reported
Berry *et al*., 2017[60]	Chlamydia trachomatis	BD Viper XTR Site: Meatal swab (self-collected)	Male	Agreement between both collection methods, or samples confirmed by Real-time CT/NG assay or positive GC culture	BC Viper XTR Site: Urine sample	United Kingdom Sexual health clinic Prevalence: 10.5%	Age: NR Sex: 100% male Race: NR	Men attending sexual health clinic for sexual health screening. Additional criteria NR.	1728 screened, 1517 analyzed 10.5%	12.20%
Berry *et al*., 2017[60]	Chlamydia trachomatis	BD Viper XTR Site: Urine sample	Male	Agreement between both collection methods, or samples confirmed by Real-time CT/NG assay or positive GC culture	BC Viper XTR Site: Meatal swab	United Kingdom Sexual health clinic Prevalence: 10.5%	Age: NR Sex: 100% male Race: NR	Men attending sexual health clinic for sexual health screening. Additional criteria NR.	1728 screened, 1517 analyzed 10.5%	12.20%
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: Male urine	Male	Two confirmatory NAATs from urethral and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or urethral swab	USA Settings: 39% family planning clinics, 22% obstetrics/ gyneacology, 38% STI clinics (includes symptomatic patients)	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or	460 Prevalence: 11.3%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
								CT VENUS II only: Asymptomatic women only		
Sultan et al., 2016[72]	Chlamydia trachomatis	AC2 Site: pooled sample of pharyngeal, urine/urethral, and rectal specimens	Male	Positive test, confirmed with Aptima single-analyte assay	Standard of care testing at each anatomical site	United Kingdom Sexual health clinic Prevalence: 16% (includes symptomatic patients)	Age: <35: 43% 35-45 years: 37% >45 years: 20% 100% male Sexual risk practices: men who have sex with men	Males ≥18 years Men who have sex with men Excluded if received antibiotics in previous 4 weeks	1064 enrolled 771 asymptomatic 16% of full sample with CT	Not reported
Fang *et al*., 2008[64]	Neisseria gonorrhoeae	BDProbeTec ET NAAT Site: vaginal swab (self-collected)	Female	Positive result from at least two of the collection sites (urine, self-collected vaginal swab, clinician-collected endocervical swab)	Sites: endocervical (clinician-collected) and urine sample	USA Adolescent clinic Prevalence: 11.7%	Age, median: 16 years Sex: 100% female Race: African American: 96% Symptomatic: not reported	Age 12-18 Sexually active	133 11.7%	Not reported
Fang *et al*., 2008[64]	Neisseria gonorrhoeae	BDProbeTec ET NAAT Site: endocervical swab (clinician-collected)	Female	Positive result from at least two of the collection sites (urine, self-collected vaginal swab, clinician-collected endocervical swab)	Sites: vaginal swab (self-collected) and urine sample	USA Adolescent clinic Prevalence: 11.7%	Age, median: 16 years Sex: 100% female Race: African American: 96% Symptomatic: not reported	Age 12-18 Sexually active	133 11.7%	Not reported
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: endocervical swab	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or endocervical	USA Settings: 39% family planning clinics, 22% obstetrics/ gyneacology, 38% STI clinics (includes	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of	3174 Prevalence: 1.5%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
						symptomatic patients)		Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only		
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: Female urine	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or endocervical	USA Settings: 39% family planning clinics, 22% obstetrics/ gyneacology, 38% STI clinics (includes symptomatic patients)	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only	3190 Prevalence: 1.5%	31/6045 (0.04%), not reported for asymptomatic population
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: clinician-collected vaginal swab	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or	USA Settings: 39% family planning clinics, 22% obstetrics/	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per	2240 Prevalence: 1.7%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
					endocervical	gyneacology, 38% STI clinics (includes symptomatic patients)	symptomatic patients)	clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only		
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: self-collected vaginal swab	Female	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or endocervical	USA Settings: 39% family planning clinics, 22% obstetrics/ gyneacology, 38% STI clinics (includes symptomatic patients)	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only	996 Prevalence: 0.9%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
Stewart *et al*., 2012[79]*	Neisseria gonorrhoeae	AC2 Site: self-collected vaginal	Female	Positive culture with biochemical confirmation or positive result from one NAAT confirmed by second NAAT	Culture Aptima GC	United Kingdom Sexual health clinic Prevalence: NR	Age (mean): 25 years 100% female Ethnicity: 80% white, 9% black, 7% mixed, 4% other	Women ≥16 years Excluded if used antibiotics in the preceding 28 days	3973 enrolled 2.5% with NG	0.8%
Stewart *et al*., 2012[79]*	Neisseria gonorrhoeae	AC2 Site: endocervical	Female	Positive culture with biochemical confirmation or positive result from one NAAT confirmed by second NAAT	Culture Aptima GC	United Kingdom Sexual health clinic Prevalence: NR	Age (mean): 25 years 100% female Ethnicity: 80% white, 9% black, 7% mixed, 4% other	Women ≥16 years Excluded if used antibiotics in the preceding 28 days	3973 enrolled 2.5% with NG	0.8%
Berry *et al.,* 2017[60]	Neisseria gonorrhoeae	BD Viper XTR Site: Meatal swab (self-collected)	Male	Agreement between both collection methods, or samples confirmed by Real-time CT/NG assay or positive GC culture	BC Viper XTR Site: Urine sample	United Kingdom Sexual health clinic Prevalence: 4.2%	Age: NR Sex: 100% male Race: NR	Men attending sexual health clinic for sexual health screening. Additional criteria NR.	1728 screened, 1517 analyzed 4.2%	12.20%
Berry *et al*., 2017[60]	Neisseria gonorrhoeae	BD Viper XTR Site: Urine sample	Male	Agreement between both collection methods, or samples confirmed by Real-time CT/NG assay or positive GC culture	BC Viper XTR Site: Meatal swab	United Kingdom Sexual health clinic Prevalence: 4.2%	Age: NR Sex: 100% male Race: NR	Men attending sexual health clinic for sexual health screening. Additional criteria NR.	1728 screened, 1517 analyzed 4.2%	12.20%
Nye *et al.,* 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: Male urine	Male	Two confirmatory NAATs from endocervical and/or urine specimens	Aptima Combo 2 Assay BD ProbeTec CTQ/GCQ Site: Urine and/or urethral swab	USA Settings: 39% family planning clinics, 22% obstetrics/ gyneacology, 38% STI clinics (includes symptomatic patients)	Age, mean: 29 Female: 88% Race: African American: 45% White: 46.4% (includes symptomatic patients)	VENUS and VENUS II enrollment: ≥14 years old Eligible for screening per clinical site's standard practice Excluded use of Replens vaginal lubricant	460 Prevalence: 1.5%	31/6045 (0.04%), not reported for asymptomatic population

Appendix B Table 7. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Characteristics

Study, year	Condition	Screening test(s)	Sex	Definition of a positive screening exam	Reference standard(s)	Country Setting Prevalence	Population Characteristics	Eligibility Criteria	Sample size Proportion with condition	Proportion unexaminable by screening test
								within 3 days Excluded antimicrobial use in past 21 days for GC or CT VENUS II only: Asymptomatic women only		
Sultan *et al*., 2016[72]	Neisseria gonorrhoeae	AC2 Site: pooled sample of pharyngeal, urine/urethral, and rectal specimens	Male	Positive test, confirmed with Aptima single-analyte assay	Standard of care testing at each anatomical site	United Kingdom Sexual health clinic Prevalence: 27% (includes symptomatic patients)	Age: <35: 43% 35-45 years: 37% >45 years: 20% 100% male Sexual risk practices: men who have sex with men	Males ≥18 years Men who have sex with men Excluded if received antibiotics in previous 4 weeks	1064 enrolled 771 asymptomatic 27% of full sample with NG	Not reported

Abbreviations: AC2 = Aptima Combo 2; CT = Chlamydia trachomatis; FCU = first-catch urines; GC = Neisseria gonorrhoeae; LCx = ligase chain reaction; NAATs = nucleic acid amplification tests; NG = Neisseria gonorrhoeae; NR = not reported; STI = sexually transmitted infection.
*Study included in prior USPSTF review.

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: vaginal swab (self-collected)	Female	5.5% (indeterminate results were included in calculations of sensitivity)	100%	108	5	2	919	98.2 (93.59-99.78)	99.46 (98.74-99.82)
Fang et al., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: urine sample	Female	3.90%	100%	99	5	12	926	89.2 (81.88-94.29)	99.46 (98.75-99.82)
Fang et al., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: endocervical swab (clinician-collected)	Female	0.40%	100%	100	4	11	961	90.1 (82.92-94.95)	99.6 (98.94-99.89)
Fang et al., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: urine sample	Female	6.00%	100%	39	1	4	996	90.70 (77.86-97.1)	99.9 (99.44-100)
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: endocervical swab	Female	Unclear	Unclear	174*	6*	13*	2981*	93.0 (88.5 to 95.5)	99.8 (99.6 to 99.9)
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: Female urine	Female	Unclear	Unclear	186	9	14	2981	93.1 (88.7 to 95.8)	99.7 (99.4 to 99.8)
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: clinician-collected vaginal swab	Female	Unclear	Unclear	140	6	3	2092	97.9 (94 to 99.3)	99.7 (99.4 to 99.9)

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: self-collected vaginal swab	Female	Unclear	Unclear	47	6	2	941	96.0 (86.5 to 98.9)	99.4 (98.6 to 99.7)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: FCU	Female	Not reported	Unclear	86*	6*	33*	1262*	72.27 (63.32-80.08)	99.53 (98.97-99.83)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: cervix	Female	Not reported	Unclear	106	9	13	1280	89.1% (82.04-94.05)	99.3% (98.68-99.68)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: clinician-collected vaginal	Female	Not reported	Unclear	107	8	12	1281	89.9 (83.05-94.68)	99.4 (98.78-99.73)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: self-collected vaginal	Female	Not reported	Unclear	111	5	8	1284	93.3 (87.18-97.05)	99.6 (99.10-99.87)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: urethral swab	Female	Not reported	Unclear	105	9	14	1279	88.1 (81.05-93.42)	99.3 (98.68-99.68)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: FCU	Female	Not reported	Unclear	63	5	12	497	84.0 (73.72-91.45)	99.0 (97.69-99.68)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: cervix	Female	Not reported	Unclear	68	3	7	522	90.7 (81.71-96.16)	99.4 (98.34-99.88)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: clinician-collected vaginal	Female	Not reported	Unclear	70	6	5	498	93.3 (85.12-97.80)	98.8 (98.38-99.73)

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: self-collected vaginal	Female	Not reported	Unclear	68	5	7	488	90.7 (81.71-96.16)	98.99 (97.65-99.67)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: urethral swab	Female	Not reported	Unclear	73	9	2	518	97.3 (90.70-99.68)	98.2 (96.78-99.22)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: FCU	Female	Not reported	Unclear	47	9	1	442	97.92 (88.93-99.95)	98 (96.25-99.08)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: cervix	Female	Not reported	Unclear	46	1	2	449	95.8 (85.75-99.49)	99.8 (98.77-99.99)
Schachter *et al* ., 2003[75]	Chlamydia trachomatis	LCx Probe Site: clinician-collected vaginal	Female	Not reported	Unclear	48	1	0	448	100 (92.6 100)	99.8 (98.77-99.99)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: self-collected vaginal	Female	Not reported	Unclear	47	2	1	450	97.92 (88.93-99.95)	99.5 (98.41-99.95)
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: urethral swab	Female	Not reported	Unclear	44	1	4	451	91.67 (80.02-97.68)	99.8 (98.77-99.99)
Schoeman *et al*., 2012[76]	Chlamydia trachomatis	AC2 Site: endocervix	Female	4	97.3%	163	0	20	2050	89.0% (84.0 to 93.0)	100% (99.8 to 100.0)
Schoeman *et al*., 2012[76]	Chlamydia trachomatis	AC2 Site: self-collected vaginal	Female	4	See above	178	1	5	2049	97.0% (94.0 to 99.0%)	99.9% (99.7 to 100.0%)
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: endocervix	Female	None reported; 8 participants had a single-positive result that	90.6% (analysis only included	14	0	13	99	51.9% (32.0 to 71.3%)	100% (96.5 to 100%)

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
				needed confirmation by nested PCR	eligible participants with results on all tests)						
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: FCU	Female	None reported; 8 participants had a single-positive result that needed confirmation by nested PCR	90.6% (analysis only included eligible participants with results on all tests)	12	0	15	99	44.4% (26.9 to 63.6%)	100% (96.5 to 100%)
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: clinician-collected vaginal	Female	None reported; 8 participants had a single-positive result that needed confirmation by nested PCR	90.6% (analysis only included eligible participants with results on all tests)	15	0	12	99	55.6% (36.4 to 73.1%)	100% (96.5 to 100%)
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: self-collected vaginal	Female	None reported; 8 participants had a single-positive result that needed confirmation by nested PCR	90.6% (analysis only included eligible participants with results on all tests)	14	1	13	98	51.9% (32.0 to 71.3%)	99.0% (95.0 to 100%)
Skidmore et al., 2008[71]	Chlamydia trachomatis	Cobas Taqman 48 CT Site: ulvo-vaginal swab (self- collected)	Female	4.5% (12/267)	95.5% (255/267)	23	0	0	232	100% (85.18 to 100)	100% (98.42 to 100)

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
Berry *et al*., 2017[60]	Chlamydia trachomatis	BD Viper XTR Site: Meatal swab (self-collected)	Male	0	87.80%	126	5	11	1375	91.97 (86.09-95.92)	99.64 (99.16-99.88)
Berry *et al*., 2017[60]	Chlamydia trachomatis	BD Viper XTR Site: Urine sample	Male	0	87.80%	137	4	0	1376	100 (97.34-100)	99.7 (99.26-99.92)
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: Male urine	Male	Unclear	Unclear	51	3	1	405	98.1 (89.9 to 99.7)	99.3 (97.9 to 99.7)
Sultan *et al*., 2016[72]	Chlamydia trachomatis	AC2 Site: pooled sample of pharyngeal, urine/urethral, and rectal specimens	Male	Not reported	Not reported	26	Unable to calculate	Unable to calculate	Unable to calculate	88.5% (69.8 to 97.6)	Unable to calculate
Fang *et al*., 2008[64]	Neisseria gonorrhoeae	BDProbeTec ET NAAT Site: vaginal swab (self-collected)	Female	4.70%	100%	44	6	0	980	100 (91.96-100)	99.4 (98.68-99.78)
Fang *et al*., 2008[64]	Neisseria gonorrhoeae	BDProbeTec ET NAAT Site: endocervical swab (clinician-collected)	Female	0.30%	100%	42	0	2	1032	94.5 (84.53-99.44)	100 (99.64-100)
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: endocervical swab	Female	Unclear	Unclear	47	3	1	3123	97.9 (88.9 to 99.6)	99.9 (99.7 to 100)

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: Female urine	Female	Unclear	Unclear	48	13	0	3129	100 (92.6 to 100)	99.6 (99.3 to 99.8)
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: clinician-collected vaginal swab	Female	Unclear	Unclear	38	7	0	2195	100 (90.6 to 100)	99.7 (99.4 to 99.9)
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: self-collected vaginal swab	Female	Unclear	Unclear	9	0	0	987	100 (70.1 to 100)	100 (99.6 to 100)
Stewart *et al*., 2012[79]	Neisseria gonorrhoeae	AC2 Site: self-collected vaginal	Female	None	97%	39	0	1	2194	98.0% (87.0 to 100.0%)	100.0% (99.8 to 100.0%)*
Stewart *et al*., 2012[79]	Neisseria gonorrhoeae	AC2 Site: endocervical	Female	None	97%	36	0	4	2194	90.0% (77.0 to 96.0)	100.00% (99.8 to 100.0)*
Berry *et al.,* 2017[60]	Neisseria gonorrhoeae	BD Viper XTR Site: Meatal swab (self-collected)	Male	0	87.80%	42	5	0	1470	100 (91.59-100)	99.7 (99.21-99.89)
Berry *et al*., 2017[60]	Neisseria gonorrhoeae	BD Viper XTR Site: Urine sample	Male	0	87.80%	39	3	3	1472	92.9 (80.52-98.50)	99.8 (99.41-99.96)
Nye *et al.,* 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: Male urine	Male	Unclear	Unclear	7	3	0	450	100 (64.6 to 100)	99.3 (98.1 to 99.8)
Sultan *et al*., 2016[72]	Neisseria gonorrhoeae	AC2 Site: pooled sample of pharyngeal, urine/urethral,	Male	Not reported	Not reported	49	Unable to calculate	Unable to calculate	Unable to calculate	81.6% (68.0 to 91.2)	Unable to calculate

Appendix B Table 8. Evidence Table: Diagnostic Accuracy of Anatomic Site-Specific Testing- Study Outcomes Part 1

Study, year	Condition	Screening test(s)	Sex	Number of indeterminate results	Proportion who under-went reference standard and included in analysis	True positives	False positives	False negatives	True negatives	Sensitivity (95% CI)	Specificity (95% CI)
		and rectal specimens									

Abbreviations: AC2 = Aptima Combo 2; CT = Chlamydia trachomatis; FCU = first- catch urines; GC = Neisseria gonorrhoeae; LCx = ligase chain reaction; NAATs = nucleic acid amplification tests; NG = Neisseria gonorrhoeae; NR = not reported; STI = sexually transmitted infection.

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: vaginal swab (self-collected)	Female	181.44 (75.67-435)	0.02 (0.00-0.07)	94.7	95.1	0.54	12	1.8	4.8	National Institute of Child Health and Human Development	Fair
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: urine sample	Female	166.07 (69.12-399)	0.11 (0.06-0.19)	95%	94.9	0.54	5	10.8	5.1	National Institute of Child Health and Human Development	Fair
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: endocervical swab (clinician-collected)	Female	217.34 (81.58-579.05)	0.10 (81.58-579.05)	96%	98.5	0.4	4	8.9	1.5	National Institute of Child Health and Human Development	Fair
Fang *et al*., 2008[64]	Chlamydia trachomatis	BDProbeTec ET NAAT Site: urine sample	Female	904.26 (127.20-6428)	0.09 (0.04-0.24)	95.1	96	0.1	4.9	9.3	4	National Institute of Child Health and Human Development	Fair
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: endocervical swab	Female	463.22 (208.07 to 1031.26)*	0.07 (0.04 to 0.12)*	96.70%	99.60%	0.20%	3.30%	7.00%	0.40%	Roche Molecular Systems	Fair
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: Female urine	Female	308.97 (160.74 to 593.89)	0.07 (0.04 to 0.12)	94.9	99.5	0.3	5.1	6.9	0.5	Roche Molecular Systems	Fair
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: clinician-collected vaginal swab	Female	342.33 (153.91 to 761.40)	0.02 (0.01 to 0.06)	95.9	99.9	0.3	4.1	2.1	0.1	Roche Molecular Systems	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: self-collected vaginal swab	Female	151.39 (68.04 to 336.83)	0.04 (0.01 to 0.16)	88.9	99.8	0.6	10.1	4	0.2	Roche Molecular Systems	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: FCU	Female	131.3 (62.2 to 277.2)*	0.28 (0.21 to 0.37)*	92.5% (85.1 to 96.9%)*	97.5% (96.5 to 98.2%)*	0.5	7.5	27.7	2.5	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: cervix	Female	113.3 (60.9 to 210.7)*	0.11 (0.07 to 0.18)*	91.4% (84.7 to 95.8%)*	99.0% (98.3 to 99.5%)*	0.7	8.6	11.9	1	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: clinician-collected vaginal	Female	127.1 (66.1 to 244.4)*	0.10 (0.06 to 0.17)*	92.2% (85.8 to 96.4%)*	99.1% (98.4 to 99.5%)*	0.6	7.8	11.9	0.9	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: self-collected vaginal	Female	197.8 (88.9 to 440.0)*	0.07 (0.03 to 0.13)*	94.9% (89.2 to 98.1%)	99.4% (98.8 to 99.7%)	0.4	5.1	6.7	0.6	Roche Molecular Systems; Abbott Laboratories; Gen-	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
												Probe, Inc.; Centers for Disease Control	
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplified CT Assay Site: urethral swab	Female	126.27 (65.64 to 242.94)	0.12 (0.07 to 0.19)	92.11% (85.84 to 95.73)	98.92% (98.24 to 99.34)	0.7	7.9	11.9	1.1	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: FCU	Female	85.0 (35.3 to 204.5)	0.16 (0.10 to 0.27)*	92.7% (83.7 to 97.5%)*	97.7% (96.0 to 98.8%)*	0.1	7.3	6	2.3	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: cervix	Female	152.9 (49.4 to 473.7)*	0.09 (0.05 to 0.19)*	95.8% (88.1 to 99.1%)*	98.6% (97.2 to 99.4%)*	0.6	4.2	9.3	1.4	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: clinician-collected vaginal	Female	78.7 (35.5 to 174.7)*	0.07 (0.03 to 0.16)*	92.1% (83.6 to 97.0%)*	99.0% (97.7 to 99.7%)*	1.2	7.9	6.7	1	Roche Molecular Systems; Abbott Laboratories; Gen-	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
												Probe, Inc.; Centers for Disease Control	
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: self- collected vaginal	Female	91.8 (38.2 to 220.2)*	0.09 (0.05 to 0.19)*	93.2% (84.7 to 97.7%)*	98.6% (97.2 to 99.4%)*	1	6.8	9.3	1.4	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	Amplicor Site: urethral swab	Female	56.99 (29.79 to 109.04)	0.03 (0.01 to 0.11)	89.02% (80.91 to 93.95)	99.62% (98.51 to 99.90)	1.8	11	2.7	0.4	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: FCU	Female	49.07 (25.66-93.81)	0.02 (0.00 to 0.15)	83.93% (73.20 to 90.90)	99.77% (98.45 to 99.97)	2	16.1	2.1	0.2	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: cervix	Female	431.25 (60.82 to 3057.64)	0.04 (0.01 0.16)	97.87% (86.65 to 99.69)	99.56% (98.30 to 99.89)	0.2	2.1	4.2	0.44	Roche Molecular Systems; Abbott Laboratories; Gen-	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
												Probe, Inc.; Centers for Disease Control	
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: clinician-collected vaginal	Female	449.00 (63.38 to 3180.64)	0	97.96% (87.14 to 99.71)	100	0.2	2	0	0	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: self-collected vaginal	Female	221.29 (55.48 to 882.67)	0.02 (0.00 to 0.15)	95.92% (85.49 to 98.94)	99.78% (98.48 to 99.97)	0.5	4.1	2.1	0.2	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schachter *et al*., 2003[75]	Chlamydia trachomatis	LCx Probe Site: urethral swab	Female	414.33 (58.38 to 2940.57)	0.08 (0.03 to 0.21)	97.78% (86.11 to 99.68)	99.12% (97.78 to 99.65)	0.2	2.2	8.3	0.9	Roche Molecular Systems; Abbott Laboratories; Gen-Probe, Inc.; Centers for Disease Control	Fair
Schoeman *et al*., 2012[76]	Chlamydia trachomatis	AC2 Site: endocervix	Female	Unable to calculate	0.11 (0.07 to 0.17)*	100.0% (97.7 to 100.0)*	99.0% (98.5 to 99.4)*	0	0	11	1	None reported (Gen- Probe provided supplies)	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
Schoeman *et al*., 2012[76]	Chlamydia trachomatis	AC2 Site: self-collected vaginal	Female	1994.0 (281.0 to 14151.3)*	0.03 (0.01 to 0.06)*	99.4% (96.9 to 99.9%)*	99.8% (99.4 to 99.9%)*	0.1	0.6	3	0.2	None reported (Gen- Probe provided supplies)	Fair
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: endocervix	Female	Unable to calculate	0.48 (0.33 to 0.71)*	100% (77.0 to 100%)	88.4% (81.1 to 93.6%)	0	0	48.1	11.6	Roche Molecular Systems, Inc.; Centers for Disease Control and Prevention ; National Institute of Mental Health, National Institutes of Health	Fair
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: FCU	Female	0.56 (0.40 to 0.78)	Unable to calculate	100% (76.4 to 100%)	86.8% (79.6 to 92.3%)	0	0	55.6	13.2	Roche Molecular Systems, Inc.; Centers for Disease Control and Prevention ; National Institute of Mental Health, National Institutes of Health	Fair
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: clinician-collected vaginal	Female	Unable to calculate	0.44 (0.29 to 0.68)*	100% (78.7 to 100%)	89.2% (82.4 to 94.0%)	0	0	44.4	10.8	Roche Molecular Systems, Inc.; Centers for Disease Control and Prevention	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
												; National Institute of Mental Health, National Institutes of Health	
Shrier *et al*., 2004[78]	Chlamydia trachomatis	Amplicor Site: self- collected vaginal	Female	51.3 (7.1 to 373.2)*	0.49 (0.33 to 0.72)*	93.3% (69.8 to 99.7%)	88.3% (81.0 to 93.5%)	1.0	6.7	48.1	11.7	Roche Molecular Systems, Inc.; Centers for Disease Control and Prevention ; National Institute of Mental Health, National Institutes of Health	Fair
Skidmore *et al*., 2008[71]	Chlamydia trachomatis	Cobas Taqman 48 CT Site: ulvo-vaginal swab (self-collected)	Female	Unable to calculate	0	100	100	0	0	0	0	Test kits provided by Roche Diagnostic s	
Berry *et al*., 2017[60]	Chlamydia trachomatis	BD Viper XTR Site: Meatal swab (self-collected)	Male	253.84 (105.67 to 609.75)	0.08 (0.05 to 0.14)	96.18 (91.3 to 98.37)	99.21 (98.61 to 99.55)	0.36	3.8	8.03	0.8	Becton Dickinson and Coventry and Warwicksh ire Partnershi p Trust	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
Berry *et al*., 2017[60]	Chlamydia trachomatis	BD Viper XTR Site: Urine sample	Male	345.00 (129.67 to 917.93)	0	97.2	100	0.3	2.8	0	0	Becton Dickinson and Coventry and Warwickshire Partnership Trust	Fair
Nye *et al*., 2019[70]	Chlamydia trachomatis	Cobas CT/NG 2.0 Site: Male urine	Male	133.38 (43.17 to 412.12)	0.02 (0.00 to 0.13)	94.4	99.8	0.7	5.6	1.9	0.2	Roche Molecular Systems	Fair
Sultan *et al*., 2016[72]	Chlamydia trachomatis	AC2 Site: pooled sample of pharyngeal, urine/urethral, and rectal specimens	Male	Unable to calculate	Unable to calculate	Unable to calculate	Unable to calculate	Unable to calculate	Unable to calculate	11.5	Unable to calculate	NHS bodies, Camden Provider Services, NHS Foundation Trust	
Fang *et al*., 2008[64]	Neisseria gonorrhoeae	BDProbeTec ET NAAT Site: vaginal swab (self-collected)	Female	164.22 (74.01-364.90)	0	88%	95.2	0.6	12	0	4.8	National Institute of Child Health and Human Development	Fair
Fang *et al*., 2008[64]	Neisseria gonorrhoeae	BDProbeTec ET NAAT Site: endocervical swab (clinician-collected)	Female			100	99.5	0	0	5.5	0.5	National Institute of Child Health and Human Development	Fair
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: endocervical swab	Female	1020.29 (328.99 to 3164.21)	0.02 (0.00 to 0.15)	93.9	100	0.1	6.1	2.1	0	Roche Molecular Systems	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: Female urine	Female	241.69 (140.50 to 415.78)	0	80	100	0.4	20	0	0	Roche Molecular Systems	Fair
Nye *et al*., 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: self-collected vaginal swab	Female	Not calculate d	0	100	100	0	0	0	0	Roche Molecular Systems	Fair
Stewart *et al*., 2012[79]	Neisseria gonorrhoeae	AC2 Site: self-collected vaginal	Female	Unable to calculate	0.03 (0.00 to 0.17)*	100.0% (90.9 to 100.0%)*	100.0 (99.8 to 100.0%)*	0	0	2	0	See above	See above
Stewart *et al*., 2012[79]	Neisseria gonorrhoeae	AC2 Site: endocervical	Female	Unable to calculate	0.10 (0.04 to 0.25)*	100.0% (90.2 to 100.0)*	99.8% (99.5 to 100.0)*	0	0	10	0.2	None reported (Gen- Probe provided supplies)	Good
Berry *et al.,* 2017[60]	Neisseria gonorrhoeae	BD Viper XTR Site: Meatal swab (self-collected)	Male	295.00 (122.97 to 707.70)	0	89.4 (77.78 to 95.27)	100	0.3	10.6	0	0	Becton Dickinson and Coventry and Warwicksh ire Partnershi p Trust	Fair
Berry *et al*., 2017[60]	Neisseria gonorrhoeae	BD Viper XTR Site: Urine sample	Male	465.55 (146.96 to 1418.36)	0.07 (0.02 to 0.21)	92.9	99.8	0.2	7.1	7.1	0.2	Becton Dickinson and Coventry and Warwickshir e Partnership Trust	Fair
Nye *et al.,* 2019[70]	Neisseria gonorrhoeae	Cobas CT/NG 2.0 Site: Male urine	Male	151.00 (48.88 to 466.44)	0	70	100	0.7	30	0	0	Roche Molecular Systems	Fair

Appendix B Table 9. Evidence Table: Diagnostic Accuracy Studies of Anatomic Site-Specific Testing- Study Outcomes, Part 2

Study, year	Condition	Screening test(s)	Sex	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	False positive rate	False alarm rate	False negative rate	False reassurance rate	Sponsor	Quality rating
Sultan *et al*., 2016[72]	Neisseria gonorrhoeae	AC2 Site: pooled sample of pharyngeal, urine/urethral, and rectal specimens	Male	Unable to calculate	Unable to calculate	Unable to calculate	Unable to calculate	Unable to calculate	Unable to calculate	18.4	Unable to calculate	NHS bodies, Camden Provider Services, NHS Foundation Trust	

Abbreviations: AC2 = Aptima Combo 2; CT = Chlamydia trachomatis; FCU = first- catch urines; GC = Neisseria gonorrhoeae; LCx = ligase chain reaction; NAATs = nucleic acid amplification tests; NG = Neisseria gonorrhoeae; NR = not reported; STI = sexually transmitted infection.

Appendix B Table 10. Quality Assessment of Diagnostic Accuracy Studies of Anatomic Site-Specific Testing

Author, year	Was a consecutive or random sample of patients enrolled?	Was a case-control design avoided?	Did the study avoid inappropriate exclusions?	Were the index test results interpreted without knowledge of the results of the reference standard?	If a threshold was used, was it pre-specified?	Is the reference standard likely to correctly classify the target condition?	Were the reference standard results interpreted without knowledge of the results of the index text?	Was there an appropriate interval between index test(s) and reference standard?	Did all patients receive a reference standard?	Did patients receive the same reference standard?	Were all patients included in the analysis?	Quality rating
Berry et al., 2017[60]	Unclear	Yes	Unclear	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	Yes, excluding those with only one sample (n=211)	Fair
Fang et al., 2008[64]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	Unclear	Fair
Nye et al., 2019[70]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	Yes	Fair
Schachter et al., 2003[75]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	Yes, at least one culture	Yes	Fair
Shoeman et al., 2012[76]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	Yes	Fair
Shrier et al., 2004[78]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	No, approximately 9% excluded	Fair
Skidmore et al., 2008[71]	Unclear	Yes	Unclear	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	Yes	Fair
Stewart et al., 2012[79]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	Yes	No, 97%	Fair
Sultan et al., 2016[72]	Unclear	Yes	Yes	Unclear	NA	Yes	Unclear	Yes	Yes	No, but similar. All were standard of care for each clinic	Unclear	Fair

Abbreviations: NA = not applicable.

Appendix C. Selective Screening Criteria for Chlamydial Infection as Described in Miller, 2000

Source: *Miller WC, Hoffman IF, Owen-O'Dowd J, et al. Selective screening for chlamydial infection: which criteria to use? Am J Prev Med. 2000 Feb;18(2):115-22. PMID: 10698241.*

CDC Recommendations
Indications for screening:
Mucopurulent discharge
Age < 20 years
Age 20–24 years with 1 risk marker
Age > 24 years with 2 risk markers
Risk markers:
No or inconsistent condom use
New sex partner or ≥ 2 sex partners in past 3 months

Seattle–1
Any 2 risk markers:
Age ≤ 24 years
No condom use
New sex partner in past 3 months
Cervical friability
Mucopurulent discharge

Wisconsin
Any 1 risk marker:
New sex partner in past 3 months
≥2 sex partners in past 3 months
Partner with STD
Cervical friability
Mucopurulent discharge
PID
Gonorrheal infection

Ontario
Any 1 risk marker:
New sex partner in past year
Urinary frequency
Bleeding
Cervical friability
Mucopurulent discharge
Genital warts

California–1
Any 2 risk markers:
Age ≤ 24 years
Unmarried
No condom use
New sex partner in past 3 months
Cervical friability

California–2
Any 1 risk marker:
Age ≤ 24 years
Unmarried
Cervicitis (mucopurulent discharge, cervical friability, PID)

Seattle–2
Sum≥4 points:
1 point – Age ≤ 24 years
2 points – Unmarried
1 point – African-American
1 point – Nulliparous
1 point – ≥ 2 sex partners in past year
1 point – Vaginal douche in past year
2 point – Cervical ectopy

Seattle–3
Sum ≥ 3 points:
1 point – Age ≤ 24 years
2 points – African-American
1 point – Nulliparous
1 point – ≥ 2 sex partners in past year
1 point – Vaginal douche in past year