Population Health Management

VOLUME 20

SUPPLEMENT 1

SEPTEMBER 2017

SEXUALLY TRANSMITTED INFECTIONS: COMPELLING CASE FOR AN IMPROVED SCREENING STRATEGY

Stephen Hull, MHS, Seán Kelley, MD, MSc, and Janice L. Clarke, RN, BBA

Editorial: Sexually Transmitted Infections—A Fixable Problem: <i>David B. Nash, MD, MBA</i>	S-3
Introduction	S-3
Rising Prevalence of Sexually Transmitted Diseases (STIs)	S-4
Current Screening Rates for Chlamydia and Gonorrhea	S-4
The Human Toll and Economic Burden of STI-Related Illness	S-5
Current Screening Guidelines for Chlamydia and Gonorrhea	S-5
Factors Contributing to Inadequate Screening, Diagnosis, and Treatment for STIs	S-6
Methods Used to Improve Screening Rates	S-7
Benefits of Opt-Out Screening Strategies for STIs	S-8
Cost-Effectiveness of Screening for STIs	S-8
Discussion	S-9
Conclusion	S-10

Population Health Management Supplement Policy

Population Health Management publishes supplements that (a) discuss new technologies, theories, and/or practice, and (b) serve as enduring materials to disseminate information from conferences and special meetings. Supplements that discuss new technologies, theories, and/or practices are subject to peer review.

Acknowledgment

Jefferson College of Population Health received funding from Mary Ann Liebert, Inc. to assist with the development of the manuscript. Hull Associates received funding from Hologic, Inc. to support the research and content development. This supplement was made possible by an educational grant to Mary Ann Liebert from Hologic.

Sexually Transmitted Infections: Compelling Case for an Improved Screening Strategy

Stephen Hull, MHS,¹ Seán Kelley, MD, MSc,¹ and Janice L. Clarke, RN, BBA²

Editorial

Sexually Transmitted Infections – A Fixable Problem

David B. Nash, MD, MBA

We are living in the 21st century in the most medically sophisticated, technologically proficient country in the world. Yet, incredibly, sexually transmitted infections (STIs) are *still* a major population health challenge. The recent surge in the incidence rates for common, largely preventable STIs in the United States has raised serious concerns and prompted discussions about the effectiveness of current prevention and screening strategies.

The Centers for Disease Control and Prevention currently recommends annual screening for chlamydia and gonorrhea in all sexually active women younger than the age of 25 and a “risk-based” screening approach for women outside of this age bracket, but this guideline has not been broadly translated into real-world clinical practice. For instance, statistics show that as many as 85% of eligible, commercially insured patients fail to be screened. There is ample historical evidence of the serious consequences of undiagnosed and untreated STIs, the profound effects on individuals, and the collective impact on the health of a population and its economy.

The unacceptably low screening rates for STIs can be explained, in part, by the social stigma that many teens and adults associate with these conditions, the reluctance of clinicians to discuss screening with eligible patients, and the unwillingness of some payers to cover STI screening. Admittedly, there is much work to be done with regard to educating consumers and health care providers, but a different approach to screening may play a key role in reversing current trends. As detailed in this supplement, the evidence supports universal or “opt-out” screening strategies as more effective – and potentially cost-saving – methods for improving screening rates as the prevalence of these diseases rises.

It will take effort on the part of all stakeholders, but the problem is fixable. We must:

- Reframe the dialogue around STIs and commit to being more proactive by practicing “upstream” care that includes prevention, education, improved screening, and early treatment.
- Move toward destigmatizing STIs and helping patients and providers to be more comfortable with screening throughout the sexually active years.
- Work collaboratively to refine and standardize opt-out screening methods for high-prevalence STIs (eg, chlamydia).

This supplement presents a comprehensive overview of this serious population health issue and suggests a well-constructed strategy for improving STI screening. I hope that it becomes required reading for my fellow clinicians (particularly those in primary care practices) and that they will pass it on to those in a position to influence professional guidelines and public policy.

Introduction

The incidence of sexually transmitted infections (STIs) remains unacceptably high in the United States despite advances in screening methodologies, diagnosis, and treatment. STIs continue to be the most common contagious diseases in the country, with estimates of new and existing infections totaling more than 110 million.¹ The Centers for Disease Control and Prevention (CDC) estimates that there are 20 million *new* STIs each year in the United States,¹ with annual costs to the health care system of \$16 billion (in 2010 USD).²

In 2016, the CDC published data showing dramatic increases in the incidence of certain STIs; specifically, 5.9% for chlamydia and 12.9% for gonorrhea in 2015 as compared to 2014 (Fig. 1). In addition to common STIs (including chlamydia, gonorrhea, syphilis, herpes, human immunodeficiency virus [HIV], human papillomavirus [HPV], trichomoniasis, and hepatitis), an emerging STI, mycoplasma genitalium (Mgen), has raised concerns that warrant further investigation and potential development of screening guidelines.³ Despite increases in screening rates for certain STIs by some payers, present STI screening rates continue to lag behind national public health targets.⁴

¹Hull Associates, LLC, Rockland, Massachusetts.

²Jefferson College of Population Health, Philadelphia, Pennsylvania.

FIG. 1. Annual percentage growth, incidence of chlamydia and gonorrhea, 2010 to 2015.

The striking increase in the incidence of several major STIs creates a new imperative to improve prevention in all STI categories. This supplement presents a survey of available literature and reported health statistics on STI screening with a focus on improving the diagnosis and prompt treatment of chlamydia and gonorrhea by means of an opt-out screening methodology.

Rising Prevalence of STIs

A shared concern among stakeholders, ranging from population health experts to primary care providers and specialists in obstetrics and gynecology, is a recent spike in cases of chlamydia and gonorrhea.

Chlamydia

According to 2015 surveillance data from the CDC, chlamydia remains the most common notifiable disease nationally, with a total of 1,526,658 cases reported (478.8 cases per 100,000), a rate that is 5.9% higher than the previous year.⁵ The disproportionate disease burden varies by age, sex, race, and geography, with the highest number of cases occurring among females aged 15–19 and 20–24 years old, Black Americans, and in the Southern states, as defined by census region⁵ (Table 1).

Gonorrhea

Gonorrhea is the second most commonly reported notifiable disease nationally. In 2015, there were 395,216 cases of gonorrhea reported (123.9 cases per 100,000), an increase of 12.9% since 2014.⁶ The burden of gonorrhea is most concentrated in the younger population bands (adolescents and young adults aged 15–29), with a peak incidence in males and females aged 20–24 and 25–29 years, Black Americans, and in the South⁶ (Table 2).

Current Screening Rates for Chlamydia and Gonorrhea

Although present screening rates for STIs lag behind national targets, yearly increases in screening for certain STIs have been realized by some payers in some populations. For instance:

- Among sexually active women aged 16–24 years in commercial managed care plans, chlamydia screening increased from 23.1% in 2001 to 47.9% in 2014.⁴
- Among sexually active women aged 16–24 years covered by Medicaid, chlamydia screening rates increased from 40.4% in 2001 to 58.6% in 2011, then decreased to 51.2% in 2014.⁴

TABLE 1. RATES OF REPORTED CASES OF CHLAMYDIA PER 100,000 POPULATION

Age	Total	Male	Female	Race		Geography	
0 to 4	2.6	1.9	3.3	Blacks	1097.6	Northeast	425.9
5 to 9	0.7	0.2	1.3	Whites	187.2	Midwest	464.8
10 to 14	51.5	11.5	92.8	Hispanics	372.7	South	520.5
15 to 19	1857.8	767.6	2994.4	Asians	114.1	West	464.4
20 to 24	2574.9	1467.8	3930.3	Multirace	125		
25 to 29	1275.4	937.9	1619.1	Native Americans	709.1		
30 to 34	575.4	481.3	668.4				
35 to 39	300.7	273.4	326.8	NHOPI	622.1		
40 to 44	147.5	148.8	145.8				
45 to 54	66.3	79.4	53.4				
55 to 64	19.4	25.4	13.7				
65+	3.5	5.1	2.1				

Source: Centers for Disease Control and Prevention 2015.⁵
NHOPI, Native Hawaiian/Other Pacific Islanders.

TABLE 2. RATES OF REPORTED CASES OF GONORRHEA PER 100,000 POPULATION

Age	Total	Male	Female	Race		Geography	
0 to 4	0.7	0.5	1.0	Blacks	424.9	Northeast	94.2
5 to 9	0.4	0.1	0.7	Whites	44.2	Midwest	115.7
10 to 14	11.2	3.6	19.0	Hispanics	80.5	South	146.3
15 to 19	341.8	244.8	442.2	Asians	22.9	West	118.0
20 to 24	543.8	539.1	546.9	Multirace	50.0		
25 to 29	376.9	448.8	301.7	Native Americans	192.8		
30 to 34	212.2	275.2	148.0				
35 to 39	131.2	183.1	79.1	NHOPI	123.0		
40 to 44	73.0	108.8	37.6				
45 to 54	43.2	71.8	15.3				
55 to 64	15.1	26.8	4.1				
65+	2.6	5.1	0.6				

Source: Centers for Disease Control and Prevention 2008.⁶
NHOPI, Native Hawaiian/Other Pacific Islanders.

In general, patients who participate in commercial managed care or Medicaid health plans are encouraged to take greater advantage of primary and preventive care services. This may translate into the observed higher screening rates.

Overall, commercial payers fall relatively short with respect to STI screening. A 2013 claims analysis of the rates of screening in commercially insured females aged 15 to 24 demonstrated much lower screening rates than managed care plan/Medicaid rates for chlamydia and gonorrhea:

- Chlamydia screening occurred in 16,382 per 100,000 (16%), and
- Gonorrhea screening occurred in 15,125 per 100,000 (15%).⁷

Ultimately, many women who are at risk are not being tested, suggesting a lack of awareness among some health care providers and limited resources to support appropriate screening.⁴

The Human Toll and Economic Burden of STI-Related Illness

In women, untreated STIs such as gonorrhea and chlamydia can lead to pelvic inflammatory disease (PID), an inflammation of the female reproductive tract that may result in chronic pelvic pain, ectopic pregnancy, or infertility. Approximately 75%-85% of PID cases are associated with chlamydia or gonorrhea infections that have spread to the reproductive organs. Overall, the CDC estimates that undiagnosed and untreated STIs cause at least 24,000 women in the United States to become infertile each year.⁶

Men exposed to STIs are at increased risk of testicular infections such as epididymitis and, in rare cases, infertility. STIs have been implicated in the development of several genital and oropharyngeal cancers, and vertical transmission during childbirth may result in neonatal eye infections, blindness, and pneumonia.

Costs associated with STIs can be divided into 3 distinct categories: direct, indirect, and intangible. Siegel et al suggest that in the context of STIs, direct costs refer to the cost of initial treatment of an STI during its acute phase as well as management of sequelae when the disease is untreated or undertreated. This category encompasses the cost of accessing care (eg, transport to a testing facility or clinic). Indirect costs of STIs relate to factors

such as lost wages arising from disease-related illness. STIs' intangible costs take into account the economic burden attributable to the emotional/psychosocial disruption generated by the disease.⁸

In 2004, researchers quantified the average cost per case of various STIs by examining the diagnostic and treatment costs of both the initial infection and the subsequent costs associated with disease sequelae. These costs varied depending on the type of diagnostic test performed (eg, urine vs. cervical smear), the setting in which the test was conducted (eg, private vs. public clinic), the prescribed treatment, and complications arising from untreated or improperly managed STIs. For chlamydia, the average cost per case was estimated at \$20 for men and \$244 for women. Gonorrhea triggered an estimated average cost of \$53 for men and \$266 for women.⁹ Using a similar model, a 2013 study estimated the average lifetime cost per case of chlamydia to be \$30 for men \$364 for women. The estimated average lifetime cost per case of gonorrhea is \$79 for men and \$354 for women.²

Although these studies do not produce identical cost numbers per case, they do yield a reasonably consistent cost estimate for each disease. On the whole, it is projected that the total national economic burden of chlamydia and gonorrhea together is \$679 million (Fig. 2).² Because of the significant underreporting associated with STIs, aggregate costs are likely to be much higher for all payers, including providers of uncompensated care. Many STIs are treated in federally funded low- or no-cost clinics.

Cost estimates related to infertility vary greatly. A 2003 study of infertility directly related to PID estimated average lifetime costs to be \$1270.¹⁰ A 2011 study examining the cost of infertility treatment for women attending reproductive endocrinology practices determined that the median per-person treatment costs ranged from \$1,182 to \$38,015 depending on whether women received medications only or underwent in vitro fertilization using a donor egg.¹¹

Current Screening Guidelines for Chlamydia and Gonorrhea

Screening for chlamydia, the most common bacterial STI in the United States, has been included as a Healthcare Effectiveness Data and Information Set (HEDIS) measure since

FIG. 2. Total US direct medical costs of selected sexually transmitted infections, 2010 (\$USD Mil).

2000. The indicator measures the proportion of sexually active females between the ages of 15 and 24 who were screened for chlamydial infection annually. HEDIS guidelines for STI screening are limited to just 2 conditions: chlamydia and HPV.

Screening guidelines for both chlamydia and gonorrhea are available from multiple organizations, including the United States Preventive Services Task Force (USPSTF), the American College of Obstetricians and Gynecologists, the CDC, and the American Academy of Family Physicians. Although all guidelines are generally in agreement, several differences are apparent (Table 3). The USPSTF recommends STI screening for chlamydia and gonorrhea in all high-risk nonpregnant women, and sexually active nonpregnant women aged 25 years and younger, regardless of behavioral risk status. In low-risk behavior women aged 25 years and older, the USPSTF currently does not recommend screening. Regarding screening in men, the USPSTF concludes that current evidence is insufficient to assess the balance of benefits and harms of screening for chlamydia and gonorrhea.

The USPSTF has not made an evidence-based recommendation about the age at which STI screening should begin; however, persons as young as 12 years may be at risk of acquiring an STI. Federal law protects minors' access to confidential screening and treatment for certain STIs in fed-

erally funded low- or no-cost clinics. Although all 50 states and the District of Columbia explicitly permit minors to consent to STI services, some states have minimum age requirements (generally 12–14 years of age). Eighteen of these states (Alabama, Arkansas, Delaware, Georgia, Hawaii, Illinois, Iowa, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, New Jersey, Oklahoma, and Texas) allow, but do not require, a physician to inform a minor's parents that he or she is seeking or receiving STI services when the doctor deems it in the minor's best interests.¹²

The clinical implications of untreated asymptomatic infections (eg, infertility, ectopic pregnancy) are different in women of post-reproductive age; for sexually active women who are at increased risk solely because of demographic reasons (eg, race, ethnicity, geographic location), it may be reasonable for some physicians to consider discontinuing routine screening at menopause or at 55 years of age.

Factors Contributing to Inadequate Screening, Diagnosis, and Treatment for STIs

Common, easily curable STIs such as chlamydia and gonorrhea increase a woman's risk of PID and ectopic pregnancy and can lead to infertility. The evidence suggests

TABLE 3. COMPARISON OF SEXUALLY TRANSMITTED INFECTION SCREENING RECOMMENDATIONS FOR SEXUALLY ACTIVE NONPREGNANT WOMEN, CHLAMYDIA AND GONORRHEA

STI	USPSTF	CDC	AAFP	ACOG
Chlamydia & Gonorrhea	Screen sexually active women age 24 years and younger and older women who are at increased risk for infection.	Annual screening of all sexually active women aged <25 years and older women at increased risk for infection.	Screen sexually active women age 24 years and younger and older women who are at increased risk of infection.	Sexually active women aged 25 years and younger should be screened annually. Screening is also recommended for women older than 25 years with risk factors.

AAFP, American Academy of Family Physicians; ACOG, American College of Obstetricians and Gynecologists; CDC, Centers for Disease Control and Prevention; STIs, sexually transmitted infections; USPSTF, U.S. Preventive Services Task Force.

that if the chlamydia screening rate for sexually active young women could be increased to 90%, thousands of cases of PID could be prevented each year.¹³

There are numerous reasons for less-than-optimal screening rates, including: inadequate patient understanding of the need for STI screening, few incentives for physicians to conduct interviews on patient sexual histories, and provider discomfort with discussion of patient sexual history. However, some studies suggest that the standard method of risk-based screening (via patient interviews) can itself create barriers to successful screening programs. Numerous factors that contribute to these low rates have been discussed in the literature. Focus group and survey research published by the National Committee for Quality Assurance (NCQA) suggest several common barriers to STI screening among patients, physicians, and health plans, particularly in the context of chlamydia (Table 4).

A renewed focus on the rate of STI screening in the youngest patient age group (women ages 15 to 21) is critical. Data from the National Ambulatory Medical Care Survey (2005) revealed that obstetrician-gynecologists did not perform screening at 69% of visits during which pelvic exams were performed, and at 71% of visits involving Pap smears for women aged 15 to 25.¹⁴ Primary care physicians did not perform urine screening tests at 99% of visits when urinalysis was performed for other reasons. The authors of this analysis concluded that pairing chlamydia testing with Pap smear and with urinalysis, respectively, offered untapped opportunities to increase screening rates.

Methods Used to Improve Screening Rates

Researchers have explored various options to help improve screening rates.

Risk-based screening

A current standard practice involves taking a patient's sexual history to identify higher risk women who should be tested for chlamydia; however, this approach has not been particularly effective.¹⁵ For instance, a 2006 survey of 416 physicians across 4 specialties found that only 55% asked about sexual histories as part of regular examinations.¹⁶

Financial and nonfinancial incentives

A systematic review found 3 US-based studies measuring outcomes related to screening incentive programs. These studies found a higher uptake of testing (2%-15% improvement in patient screening behavior).¹⁷

Concurrent screening and Pap testing

Analysis of screening rates suggests that chlamydia screening conducted concurrent with Pap testing for women 3 years after first intercourse or by age 21 (whichever occurs first) can help support more frequent testing. A study by Ursa et al suggested that failure to conduct concurrent screening and Pap testing for females aged 15–21 was associated with a significant decrease in chlamydia screening

TABLE 4. BARRIERS TO SEXUALLY TRANSMITTED INFECTION SCREENING

<i>Patient barriers</i>	<i>Clinician barriers</i>	<i>Insurance barriers</i>
Patient concerns about confidentiality	Low willingness to take the time to discuss chlamydia screening with patients unless they are specifically paid to do so, or generally concerns that the payment is insufficient	Though STI screening is covered by commercial plans, some employer groups are reluctant to pay for this service, and are less interested in improving screening rates
The social stigma associated with STIs made some members unwilling to be screened for chlamydia	Concerns that an open discussion of STIs and sexual behavior would not be acceptable to the community — especially for adolescents	Payment and data capture for chlamydia screening may not be recorded consistently because health plan reimbursement bundles several gynecological services
Younger members, in particular, are concerned about information being given to their parents.	Insufficient time in an average office visit to perform screening and discuss additional testing	Insurance information (eg, an explanation of benefits) may be mailed to patients when these tests are requested. In many instances, these are parent primaries who may intercept these notices when screening tests are administered to their children, compromising confidentiality and dissuading testing
Lack of knowledge of STIs	Practitioners were concerned about confidentiality regarding sexual activity, and generally felt uncomfortable discussing sexual activity with younger patients	Screening for chlamydia in a commercial population was a low priority in comparison to other preventive services or may not be a significant part of their long-term quality improvement strategies
Cost of related services is perceived as a barrier.	Screening guidelines have been found to be confusing	Other data collection issues include incomplete capture of laboratory tests ordered Providers may be confused concerning screening coverage

STIs, sexually transmitted infections.

for females aged 15 to 21, without any corresponding decreases in office visits.¹⁸

Partner identification programs

Partner services programs are a mainstay of state and local public health programs.¹⁹ Standard STI partner services practices include the identification, location, and notification of sex partners (and drug-using partners for HIV and some hepatitis infections) of infected persons, and the referral of those partners to evaluation, treatment, and care.

Patient outreach and education

Patient-centered research has revealed several key misperceptions among younger patients: poor understanding of the asymptomatic nature of many STIs (hence the need for asymptomatic screening), misunderstanding of the term “sexually active” during their physician interviews and confusion as to whether or not screening had occurred routinely, during “wellness” exams.²⁰ There is consensus that patient awareness of the risks of STIs and the need for regular screening is a critical element in successful screening campaigns. Focus group evidence suggests that television or radio advertising is an effective method for reaching target patient groups. School education programs can be effective as well.²¹

Physician outreach and education

Activities that focus on changing physician behaviors and beliefs include: clarifying clinical practice guidelines, educating physicians about the importance of chlamydia screening for their patients, providing tools to remind physicians to include chlamydia screening in routine examinations, and providing feedback to physicians linked to patient contact information for those who were not tested. Some health plans provide guidance to physicians about initiating discussions about STI prevention with patients.⁵

Opt-out methodologies

Opt-out testing protocols involve offering all patients in a target group an STI-related test. The patient must choose not to proceed with the test if they do not wish to do so. These methods have been found to increase the number of tests conducted for HIV testing, and are generally well suited to higher prevalence diseases.²²

Benefits of Opt-Out Screening Strategies for STIs

The observed increase in STI prevalence, coupled with the potential for severe and costly sequelae, highlights the need for improved screening programs to help curb rates and avoid adverse health outcomes. The success of mass screening for selected high-prevalence patient cohorts, as well as the recommendations generated from such initiatives, raises the possibility of introducing an opt-out system of testing for certain STIs.

Universal screening is a process whereby all eligible or at-risk populations are screened for a certain condition. An opt-out methodology is a nuanced version of this approach. The opt-out process assumes consent by everyone in an eligible or at-risk population. The appropriate test is ad-

ministered to an informed patient unless she/he specifically requests that it not be performed. Testing outreach can be either proactive (eg, letters/brochures mailed to eligible patients) or opportunistic (ie, screening when patient presents at a clinic with symptoms of STI or unrelated issues.)

Various clinics and health plans participating in the Minnesota Chlamydia Partnership²³ provide examples of effective opt-out programs for chlamydia screening.

- In an effort to normalize screening and increase rates, the NorthPoint Health and Wellness Center offers “Teen Screen” at 6-month intervals for all sexually active adolescents as part of any routine appointment. This normalizes the practice and, as a result, few patients decide to opt out of screening. The offer of screening to all patients extends to clinic patients undergoing pregnancy testing; their urine sample is automatically tested for chlamydia and gonorrhea unless the patient declines.
- The Open Cities Health Center also employs an opt-out testing program for chlamydia; there is a standing order to test all urine samples during routine physicals unless the patient declines. The center credits this approach for their ranking as the center with the third highest screening rate in the state of Minnesota.²⁴ Because all patients are offered screening, the process is desensitized and part of standard practice.
- The transition of screening from risk/symptom-based to a standard opt-out approach also is occurring at the Western OB/GYN clinic, where all sexually active adolescent and young women are screened for chlamydia unless the patient declines. Reminders to perform screening are built into each patient’s electronic medical record, prompting staff to conduct screening whenever the records are accessed or edited.

One epidemiologic model found that an opt-out approach could reduce the incidence of sequelae by 37%, and outperform risk-based screening strategies in terms of cost and effectiveness in heterosexual populations.²⁵ The opt-out model estimated a net health care savings of 35% (\$38.2 million per 100,000) for a population aged 15 to 24 versus no screening. Compared with traditional risk-based screening, the opt-out model would save 20% of overall costs (\$18.1 million) for the same population.

Cost-Effectiveness of Screening for STIs

There is a robust body of evidence indicating the cost-effectiveness of appropriate STI screening.²⁶ Although the following analyses are based on data from 2000–2010, and therefore preclude direct comparisons, they provide insight and direction for current screening methods, rates, and recommendations.

- Estimates using data from 2008 translated to 2010 dollars suggest a total spending on STI screening methods of \$403.1 million for the commercial payer insured population aged 15 to 24 years with average screening costs of \$43 for chlamydia and \$42 for gonorrhea.¹ Another analysis projected that, for a population of 100,000, annual screening would prevent 864 cases of chronic pelvic pain, 967 cases of tubal infertility, and 435 cases of ectopic pregnancy compared with no annual screening.²⁶

- A report from the Agency for Healthcare Research and Quality suggests that screening programs for detecting and treating chlamydia in nonpregnant women provide cost savings in populations with moderate-to-high prevalence of chlamydial infection.²⁷ Although selective screening is more cost-effective than universal screening under certain assumptions, universal screening may be cost-effective in populations for whom the prevalence of chlamydia is high or sensitivity of selective screening criteria is low. The most consistent evidence available supports cost-effectiveness for age-based screening in women in settings with low-to-moderate prevalence rates (3% to 6%). Universal screening has been shown to be valuable in settings with higher prevalence (above 6%).²⁸
- HEDIS chlamydia screening guidelines established in 1999 were later found to be cost-effective.²⁹ Investigating 5 screening strategies for both chlamydia and gonorrhea in the emergency department setting, Mehta et al found that mass screening of women for chlamydia and gonorrhea was the most cost-effective strategy.³⁰
- Bernstein et al evaluated 6 potential screening strategies for commercial payer female cases of gonorrhea that varied based on age of screening and presence of high-risk behaviors. Although not screening saved costs irrespective of population variables, a univariate sensitivity analysis projected that, once the population prevalence of gonorrhea increases beyond 4.75%, a screening strategy aimed at high-risk women aged 25 years or younger would prove to be cost-saving over not screening.³¹

Cost-effectiveness of opt-out methodologies

A US-based study examined the cost-effectiveness of universal screening compared to selective screening for chlamydia. In a cross-sectional analysis of patients at STI and family planning clinics in 4 states, the authors determined that, although age and behavioral history were sensitive in predicting chlamydial infection and aided in selective screening, universal screening would be cost saving compared to selective screening in high-prevalence populations (6.6%).³² These findings were corroborated by a Canadian study that examined more than 1000 women across 2 family planning clinics and confirmed that selective screening was only cost-effective when chlamydia rates were low in a population (ie, universal screening strategies would be cost-effective at high disease prevalence).³³

A 2016 model using core assumptions about health insurance coverage (80%), health care utilization (83%), and test acceptance (75%) examined opt-out testing for chlamydia in high-risk young women in the United States. Using an opt-out strategy under a variety of assumptions and scenarios, this model projected an increase in screening rates to 50% and presented a cost-saving solution as compared to current screening guidelines (\$70,843,300 vs. \$88,951,100, respectively) because it did not require additional costs beyond testing and treatment.²⁵ Although the opt-out strategy modeled in this study would not increase screening rates to 100% for myriad reasons (eg, limited access to health care, lack of insurance, unwillingness to be screened), it represents a significant improvement in health outcomes and is projected to decrease overall chlamydia prevalence by more than 55%.

In the context of high disease prevalence, these studies support the implementation of some form of universal/opt-out screening (eg, screening of all patients within a predetermined high-risk category such as age, sex, or geography). In these circumstances, screening for chlamydia has been shown in several studies to be cost-effective.

Studies examining the economic benefits of gonorrhea screening are scant. A small US trial investigated the cost-effectiveness of dual screening for chlamydia and gonorrhea because these frequently present as coinfections. The authors sought to determine the cost-effectiveness of independent testing for each STI instead of presumptive treatment for asymptomatic chlamydia coinfection in confirmed cases of gonorrhea. The authors found that testing for both infections was more cost-effective than routine treatment of presumed gonorrhea and chlamydia coinfection.³⁴

Discussion

Despite their associated health and economic burdens, the rising prevalence of STIs has gone unrecognized by the general public, policy makers, and many health care professionals. Largely preventable, STIs present a substantial threat to population health because of their harmful – often irreversible – and costly complications including reproductive health issues, fetal and perinatal health problems, cancers, and facilitation of viral infections (eg, HIV).

Chlamydia and gonorrhea are only 2 of more than 25 known STIs. The CDC is considering guidelines for emerging and less familiar STIs such as Mgen. First identified in the early 1980s, Mgen is a recognized cause of various male and female genitourinary pathologies. Mgen is implicated in male urethritis and has been detected in up to 30% of women with cervicitis and up to 22% with pelvic inflammatory disease.³⁵ The definitive linkage of Mgen with the pathogenesis of these conditions remains controversial; however, the evidence suggests that Mgen can cause PID at rates lower than those associated with chlamydia. Further, studies have demonstrated higher rates of Mgen antibodies in women with tubal factor infertility as compared to fertile women, suggesting a link between Mgen and female infertility.³⁶ A prospective United Kingdom study identified several risk factors including age younger than 21 years, black ethnicity, smoking, 2 or more sexual partners in the previous year, and concurrent infection with bacterial vaginosis.³⁷ A 2011 literature review (48 published reports worldwide) estimated Mgen prevalence at 7.3% in high-risk groups and 2.0% in low-risk populations.³⁸ Results of a recent analysis of STIs and coinfection in a population-based sample of women showed Mgen prevalence at its highest point (4.6%) in the group aged 21–24; 15.3% of those who tested positive for chlamydia were coinfecting with Mgen and 12.6% of those who tested positive for Mgen were coinfecting with chlamydia. Although coinfections were relatively uncommon, they were statistically higher than expected assuming independence.³⁹

Given that Mgen is potentially associated with PID, infertility, congenital infections and sequelae in newborns, and refractory cases of urethritis and cervicitis, it is clear that testing may be clinically beneficial. The CDC recognizes nucleic acid amplification testing (NAAT) as the preferred method of detection; however, there is currently no Food and Drug Administration-approved test for diagnosing Mgen.^{35,40}

and, consequently, no recommendations regarding the efficacy of screening.^{40,41} The absence of validated diagnostics places the weight of diagnosis on clinical suspicion in cases of persistent or recurrent urethritis in men and persistent or recurrent cervicitis or PID in women.

Statistics show that incidence of various STIs is increasing significantly, with a disproportionate number affecting young people and racial minorities. Preventing the acute effects of these often asymptomatic infections, and averting their long-term sequelae, will require a more effective screening strategy. Currently, a variety of barriers impedes access to screening (eg, confidentiality and privacy issues, discomfort or lack of adequate time to question, difficulty in identifying high-risk patients, confusion over multiple screening guidelines). Even for providers who take sexual histories, obtaining accurate results is difficult, with 1% of respondents who reported zero lifetime sexual partners testing positive for chlamydia.⁴¹

Recent evidence shows that commercial payers lag significantly behind Medicaid in STI screening rates. NCQA reports that less than 42% of commercially insured, sexually active women between ages 16–20 years have undergone screening compared with 51% of those covered by a Medicaid health maintenance organization (HMO).⁵ Opt-out methodologies have been shown to be cost-effective means for improving screening rates for STIs. Opt-out screening appears to reduce many commonly perceived barriers in the patient-physician diagnostic episode. In effect, it alters the clinical dynamic from a case-by-case approach that relies on the clinician obtaining an accurate sexual history to a universal screening method that potentially ameliorates or eliminates physician and patient concerns. Outcomes from the Minnesota Chlamydia Partnership demonstrate that opt-out screening for chlamydia can effectively increase screening rates in real-world settings. The cost-effectiveness of opt-out screening also may hold true for lower prevalence conditions, such as gonorrhea, when targeted specifically to higher risk populations.

Conclusion

There has been a surge in the incidence rates for common, largely preventable STIs in the United States. Undiagnosed and untreated STIs can have serious consequences with profound effects on individuals – and, collectively, on population health and the national economy. Healthy People 2020⁴² set a goal to promote healthy sexual behaviors, strengthen community capacity, and increase access to quality services to prevent STIs. This will require a broad-ranging effort to raise awareness among all stakeholders – from policy makers to the health care industry to the general public.

Medicaid and HMO health plans have made STI prevention a priority. In the context of dramatic increases in the incidence of STIs in commercially insured populations, the authors believe that US commercial insurers should focus on this important population health issue. Recommended actions for payers include:

- Renew patient and physician education efforts regarding STI prevention and screening.
- Consider development and promotion of opt-out screening methodologies to providers who treat their

beneficiaries as a means to improve screening rates and reduce the burden of high-prevalence STIs.

- Consider adopting targeted opt-out methods and related patient education materials to increase screening rates among young women aged 15 to 21 years.
- Incentivize providers to rely on opt-out STI screening to increase rates and help drive positive change in the primary care setting.

Acknowledgment

The authors wish to acknowledge Deborah Arrindell, Vice President, Health Policy at the American Sexual Health Association (ASHA) and express their gratitude for her thoughtful contributions toward this project.

Author Disclosure Statement

The authors declare that there are no conflicts of interest. Funding disclosures appear on the Table of Contents of this supplement.

References

1. Satterwhite CL, Torrone E, Meites E, et al. Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2008. *Sex Transm Dis* 2013; 40:187–193.
2. Owusu-Edusei K Jr, Chesson HW, Gift TL, et al. The estimated direct medical cost of selected sexually transmitted infections in the United States, 2008. *Sex Transm Dis* 2013; 40:197–201.
3. Centers for Disease Control and Prevention. 2015 Sexually Transmitted Diseases Treatment Guidelines: Diseases Characterized by Urethritis and Cervicitis. www.cdc.gov/std/tg2015/urethritis-and-cervicitis.htm Accessed May 26, 2017.
4. National Committee for Quality Assurance. The State of Health Care Quality 2016: Chlamydia Screening in Women. www.ncqa.org/report-cards/health-plans/state-of-health-care-quality/2016-table-of-contents/chlamydia-screening Accessed August 15, 2017.
5. Centers for Disease Control and Prevention. Chlamydia Statistics. 2016. www.cdc.gov/std/chlamydia/stats.htm Accessed May 24, 2017.
6. Centers for Disease Control and Prevention. 2008 Sexually Transmitted Diseases Surveillance. Sexually Transmitted Diseases in the United States, 2008. 2009. www.cdc.gov/std/stats08/trends.htm Accessed May 24, 2017.
7. Owusu-Edusei K Jr, Nguyen HT, Gift TL. Utilization and cost of diagnostic methods for sexually transmitted infection screening among insured American youth, 2008. *Sex Transm Dis* 2013;40:354–361.
8. Siegel JE. Estimates of the economic burden of STDs: review of the literature with updates. In: Eng TR, Butler WT, eds. *The hidden epidemic: confronting sexually transmitted diseases*. Washington, DC: National Academy Press, 1997:330–356.
9. Chesson HW, Blandford JM, Gift TL, Tao G, Irwin KL. The estimated direct medical cost of sexually transmitted diseases among American youth, 2000. *Perspect Sex Reprod Health* 2004;36:11–19.
10. Das BB, Ronda J, Trent M. Pelvic inflammatory disease: improving awareness, prevention, and treatment. *Infect Drug Resist* 2016;9:191–197.

11. Katz P, Showstack J, Smith JF, et al. Costs of infertility treatment: results from an 18 month prospective cohort study. *Fertil Steril* 2011;95:915–921.
12. Guttmacher Institute. An Overview of Minors' Consent Law. 2016. www.guttmacher.org/state-policy/explore/overview-minors-consent-law Accessed August 15, 2017.
13. Partnership for Prevention. Preventive Care: a National Profile on Use, Disparities, and Health Benefits. 2007. www.prevent.org/data/files/initiatives/ncpppreventivecarereport.pdf Accessed June 26, 2017.
14. Cooksey CM, Berggren EK, Lee J. Chlamydia trachomatis infection in minority adolescent women: a public health challenge. *Obstet Gynecol Surv* 2011;65:729–732.
15. Owusu-Edusei K Jr, Hoover KW, Gift TL. Cost-effectiveness of opt-out chlamydia testing for high-risk young women in the U.S. *Am J Prev Med* 2016;51:216–224.
16. Wimberley Y, Hogben M, Moore-Ruffin J, Moore SE, Fry-Johnson Y. Sexual history taking among primary care physicians. *J Natl Med Assoc* 2006;98:1924–1929.
17. Lee R, Cui RR, Muessig KG, Thirumurthy H, Tucker JD. Incentivising HIV/STI testing: a systematic review of the literature. *AIDS Behav* 2014;18:905–912.
18. Ursa A, Sen A, Ruffin M. Impact of cervical cancer screening guidelines on screening for chlamydia. *Ann Fam Med* 2015;13:361–363.
19. Hogben M, Collins D, Hoots B, O'Connor K. Partner services in STD prevention programs: a review. *Sex Transm Dis* 2016;43:S53–S62.
20. Backonja U, Royer HR, Lauver DR. Young women's reasons to seek sexually transmitted infection screening. *Public Health Nurs* 2014;5:395–494.
21. Tilson EC, Sanchez B, Ford CL, et al. Barriers to asymptomatic screening and other STD services for adolescents and young adults: focus group discussion. *BMC Public Health* 2004;4:21.
22. Pollard A, Llewellyn C, Smith H, Richardson D, Fisher M. Opt-out testing for HIV: perspectives from a high prevalence community in south-east England, UK. *Int J STD AIDS* 2013;24:307–312.
23. Minnesota Department of Health. The Minnesota Chlamydia Partnership (MCP). www.health.state.mn.us/mcp Accessed June 5, 2017.
24. MN Community Measurement. 2011 Health care quality report: comparative data on clinic, medical group, and hospital performance. http://mncm.org/wp-content/uploads/2013/04/Book_6_21_2012.pdf Accessed June 5, 2017.
25. Owusu-Edusei K, Hoover KW, Gift TL. Cost-effectiveness of opt-out chlamydia testing for high risk young females in the US. *Am J Prev Med* 2016;51:216–224.
26. Hu D. Screening for chlamydia trachomatis in women 15 to 29 years of age: a cost-effectiveness analysis. *Ann Intern Med* 2004;141:501–513.
27. Agency for Healthcare Research and Quality. Screening for chlamydial infection. <https://archive.ahrq.gov/clinic/ajpmsuppl/nelson2.htm#section11> Accessed October 20, 2016.
28. Centers for Disease Control and Prevention. Sexually transmitted diseases (STDs). www.cdc.gov/std/default.htm Accessed October 20, 2016.
29. Mangione-Smith R, O'Leary J, McGlynn EA. Health and cost-benefits of chlamydia screening in young women. *Sex Transm Dis* 1999;26:309–316.
30. Mehta SD, Bishai D, Howell MR, Rothman RE, Quinn TC, Zenilman JM. Cost-effectiveness of five strategies for gonorrhea and chlamydia control among female and male emergency department patients. *Sex Transm Dis* 2002;29:83–91.
31. Bernstein KT, Mehta SD, Rompalo AM, Erbeling EJ. Cost-effectiveness of screening strategies for gonorrhea among females in private sector care. *Obstet Gynecol* 2006;107:813–821.
32. Marrazzo JM, Celum CL, Hillis SD, Fine D, DeLisle S, Handsfield HH. Performance and cost-effectiveness of selective screening criteria for chlamydia trachomatis infection in women: implications for a national chlamydia control strategy. *Sex Transm Dis* 1997;24:131–141.
33. Sellors JW, Pickard L, Gafni A, et al. Effectiveness and efficiency of selective vs universal screening for chlamydial infection in sexually active young women. *Arch Intern Med* 1992;152:1837–1844.
34. Gift T, Walsh C, Haddix A, Irwin KL. A cost-effectiveness evaluation of testing and treatment of chlamydia trachomatis infection among asymptomatic women infected with neisseria gonorrhoeae. *Sex Transm Dis* 2002;29:542–551.
35. Workowski KA, Bolan GA. Sexually transmitted diseases treatment guidelines, 2015. *MMWR Recomm Rep* 2015; 64:1–137.
36. Ona S, Molina RL, Diouf K. *Mycoplasma genitalium*: an overlooked sexually transmitted pathogen in women? *Infect Dis Obstet Gynecol* 2016;2016:4513089.
37. Oakeshott P, Aghaizu A, Hay P, et al. Is mycoplasma genitalium in women the new chlamydia? A community-based prospective cohort study. *Clin Infect Dis* 2010;51:1160–1166.
38. McGowin, CL. *Mycoplasma genitalium*: an emerging cause of sexually transmitted disease in women. *PLoS Pathog* 2011;7:e1001324.
39. Gravitt P, Patterson N, Stanislawski E, et al. Prevalence of sexually transmitted infections and coinfection in a population-based sample of women attending cervical cancer screening in New Mexico, United States of America. *Open Forum Infect Dis* 2016;3(Suppl 1):1300.
40. Manhart LE. *Mycoplasma genitalium*: an emergent sexually transmitted disease? *Infect Dis Clin North Am* 2013; 27:779–792.
41. Datta SD, Sternberg M, Johnson RE, et al. Gonorrhea and chlamydia in the United States among persons 14 to 39 years of age, 1999 to 2002. *Ann Intern Med* 2007;147:89–96.
42. Office of Disease Prevention and Health Promotion. Sexually transmitted diseases. www.healthypeople.gov/2020/topics-objectives/topic/sexually-transmitted-diseases Accessed June 16, 2017.

Address correspondence to:
 Janice L. Clarke, RN, BBA
 Jefferson College of Population Health
 901 Walnut Street, 10th Floor
 Philadelphia, PA 19107

E-mail: janice.clarke@jefferson.edu