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Incidence of STIs among justice-involved youth and use of point-of-care screening to improve health outcomes

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Thesis

INCIDENCE OF STIS AMONG JUSTICE-INVOLVED YOUTH AND USE OF POINT-OF-CARE SCREENING TO IMPROVE HEALTH OUTCOMES

by

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DEDICATION

I would like to dedicate this work, and all my work throughout my time as a PA student, to my dear mama Safeta Rizvancevic. I could not have made it through one day of PA school without your continuous, unconditional love and support. Ti si meni sve u zivotu.

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ABSTRACT

Background

Sexually transmitted infections (STIs) are becoming more prevalent among the US population. It is estimated that 20% of US residents are living with an STI at any given time, and over half of all newly diagnosed STIs are among youth aged 14-24 years old. Of these youth, justice-involved youth have the highest rates of STIs compared to their same-aged counterparts. These justice-involved youth also have unique health needs compared to their same-age counterparts, since they often lack access to healthcare which leaves them susceptible to untreated illnesses and infections including STIs. Furthermore, justice-involved youth are often released back to the community quickly after being detained, so they do not have the same healthcare access that arrested and detained youth are guaranteed by the constitution. Many barriers exist for STI testing and treatment for justice-involved youth, and the limited time between detainment and release of these youth may be a useful point of intervention for rapid STI testing and possibly treatment.

Literature Review

The literature review for this study is separated into two sections: an overview and an examination of existing literature. The overview explores the two most common STIs among justice-involved youth, as well as their health sequelae. It also explores the health needs of justice-involved youth when compared with the general youth population

and the healthcare inequality these youth face which creates barriers to them receiving preventative care. It discusses potential areas for intervention, including the use of detention facilities as places where youth receive healthcare or are connected to healthcare resources. It also discusses best practices for screening and treatment of STIs in detention facilities within an appropriate time span for justice-involved youth.

The examination of existing literature discusses articles about universal screening for STIs in youth detention facilities. It also discusses trends of chlamydia and gonorrhea infections and treatment rates in detained youth, use of point-of-care testing to improve screening and treatment, cost savings from STI testing and treatment, and the efficacy of point-of-care testing as a whole. Together, this examination of existing literature suggests of the demand for universal STI testing in detained youth, and the feasibility of using point-of-care testing to improve both screening and treatment outcomes.

Proposed Research

The proposed study is a multi-site, prospective interventional study in which half of all Massachusetts Department of Youth Services (DYS) facilities will provide universal opt-out STI screening to detained youth using standard testing, and half will provide universal opt-out STI screening to detained youth using rapid testing. The aim of this study is to explore the feasibility of universal rapid STI testing in detained youth, and to determine whether rapid testing will improve treatment rates compared to standard testing in detained youth.

Conclusion

The goal of this thesis is to explore the sexual health needs of justice-involved youth, and to understand the barriers to care that leave them susceptible to higher rates of STI infection than their same-age counterparts. The thesis also explores opportunities for interventions that will increase screening and treatment rates in this youth population. This thesis adds to a growing body of literature about reproductive health in adolescents, and highlights the importance of STI testing and treatment to medically underserved juvenile populations in non-traditional healthcare settings.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

CDC ……. Centers for Disease Control and Prevention

CINI ……. Court-involved, non-incarcerated

COACH ……. Creating Options and Choosing Health

CT ……. Chlamydia

DYS ……. Massachusetts Department of Youth Services

HBV ……. hepatitis B virus

HIV ……. human immunodeficiency virus

HPV ……. human papillomavirus

HSV-2 ……. herpes simplex virus type 2

IM ……. Intramuscular

IRB ……. Institutional review board

IV ……. Intravenous

LA ……. Los Angeles, California

LGBT ……. lesbian, gay, bisexual, and transgender

NAATs ……. Nucleic acid amplification tests

NG ……. Gonorrhea

NOLA ……. New Orleans, Louisiana

PCP ……. Primary care provider

PCR ……. Polymerase chain reaction

PID ……. Pelvic inflammatory disease

PIS ……. Patient infected status

POC …….……..……..……..……..……..……...……. Point-of-care

SRH …….……..……..……..……. Sexual and reproductive health

STIs …….……..……...……..……..……. Sexually Transmitted Infections

BACKGROUND

STIs and Long-term Health Sequelae

The incidence and prevalence of sexually transmitted infections (STIs) is continuing to rise in the United States.[1] The Centers for Disease Control and Prevention (CDC) estimated that on any given day in 2018, 20% of US residents were living with an STI.[2] The most common STIs include chlamydia, gonorrhea, hepatitis B virus (HBV), herpes simplex virus type 2 (HSV-2), human immunodeficiency virus (HIV), human papillomavirus (HPV), syphilis, and trichomoniasis with Chlamydia, trichomoniasis, genital herpes, and HPV accounting for 98% of all infections.[2] Of these common infections, four –chlamydia, gonorrhea, trichomoniasis, and syphilis– are curable, three – HBV, HSV-2, HIV– are viral infections which cannot be cured but can be treated with antiviral medications, and one –HPV– is a viral infection that cannot be treated with antivirals but can be prevented with vaccination and monitored for long-term sequelae.[3–8] The CDC also estimates that $16 billion in direct medical costs was spent on STIs.[2] Of these $16 billion, $1.1 billion are attributed to spending on chlamydia, gonorrhea, and syphilis, which are preventable and easily treatable infections.[2,8]

Many of these STIs are asymptomatic and rely on routine screening for detection and treatment with the goal of improving both individual and public health outcomes.[3,7,9] There are detrimental long-term health sequelae associated with these diseases, especially in females; thus, screening and treatment of these communicable infections is important to both individual and public health. Untreated bacterial and parasitic infections of the female genital tract can cause pelvic inflammatory disease, an ascending bacterial

infection that leads to inflammation of the upper female reproductive tract.[10] Long-term consequences of these untreated bacterial infections include chronic pelvic pain and scarring of fallopian tubes, which can result in infertility and increased risk of ectopic pregnancy.[10,11] Both of these sequelae are extremely harmful, and early detection and treatment of these easily curable infections can prevent their occurrence.[12]

STI Rates Among Youth in the USA

Almost half of all newly diagnosed STIs in the United States are among youth aged 14-24 years old, and this age group accounts for 26% of the $16 billion in direct medical costs spent on STI diagnosis and treatment.[2] The most common STIs for youth in this age group include chlamydia, gonorrhea, and HPV.[13] Increased rates of STI transmission among youth may be attributed to a few different factors. The CDC's Youth Risk Behavior Surveillance System reported that 30% of high school youth had ever had sexual intercourse, 20% were currently sexually active, 48% did not use a condom during their last sexual encounter, 94% were never tested for HIV, and 95% were never tested for an STD, other than HIV.[14] The high rates of sexual activity combined with low rates of condom use and testing leave youth susceptible to contracting and spreading STIs. Sexual minority youth (youth who are not exclusively heterosexual) are particularly susceptible to STIs and have higher rates of STI occurrence than heterosexual youth.[15] Likewise, justice-involved youth have higher rates of STIs compared to their same-age counterparts.[16]

Current research suggests that comprehensive sexual education in schools can decrease sexual activity and increase contraceptive use among youth, which can help mitigate the spread of STIs within this population.[17] However, sexual health education in the US varies widely depending on the state. Only 25 states mandate sex education in schools, 17 states require content taught to be medically accurate, 19 states require inclusion of material about condoms and contraception, and 27 states require material about sexual decision making.[18] The lack of standardized sex education in the United States leaves youth poorly equipped to engage in safe-sex practices. Of note, a significant portion of justice-involved youth do not attend school regularly, or were below their grade level in terms of education.[19] Poor school attendance in these youth results in poor sexual education obtained from schools. This leaves justice-involved youth at a disadvantage because they may not receive sexual education elsewhere due to the shame and taboo surrounding the topic, especially if it's being discussed between parents and children. As a result, they may have poor knowledge of sexual health and safe sex practices, increasing their risk of contracting and spreading an STI.

Contact with healthcare providers is another avenue through which youth receive information about sexual health. The CDC recommends routine annual screening for chlamydia and gonorrhea for all sexually active females less than 25 years old.[8] However, literature suggests suboptimal adherence to national STI testing guidelines; only 20% of sexually active youth reported being tested for STIs by their healthcare provider in the past year.[20] The CDC also recommends that medical providers caring for youth in their clinics integrate sex education into their clinical practices by counseling

patients on safe sex practices and other risk-reduction behaviors.[8] However, discussions among youth and their healthcare providers about sexual health only last about 40 seconds on average and are never initiated by young patients themselves, suggesting that the content of these conversations is quite limited and up to the discretion of the provider.[21] Furthermore, youth have difficulty discussing sexual behavior with providers openly due to shame, lack of trust/confidentiality, and fear of judgement.[22] Providers must be diligent in initiating informative and welcoming conversations about youth sexual health, risks, and practices. Currently, the USPSTF recommends behavioral counseling for all sexually active youth.[24] Unfortunately, justice-involved youth do not have consistent access to health providers to receive sexual health counseling. This lack of access removes yet another avenue of sexual health education and resources available to these youth, increasing their risk of STIs from unsafe sex.

Youth in all 50 states and DC can access STI screening and treatment without parental consent; this is often a barrier to sexual health care in youth, since there is concern surrounding confidentiality of testing and treatment.[18,23] Many of these youth gain knowledge about STI testing services from peers, and receive little information from their parents or guardians regarding testing.[23] According to some research, youth are receptive to annual asymptomatic STI screening but common barriers to care include cost and privacy concerns.[23,24] Lack of testing at doctors' appointments combined with barriers to testing via other avenues leaves many youth aware of their STI status, increasing risk of spread and development of long-term health sequelae.

STI Rates Among Justice-Involved Youth

For the purpose of this paper, the term "justice-involved youth" includes people ages 13-18 years old who have contact with the criminal justice system, either through being arrested and released, being detained in short- or long-term detention facilities, or being on probation or parole. The US Department of Justice Office of Juvenile Justice and Delinquency Prevention estimates that, in 2020, roughly 500,000 arrests occurring in the United States were of persons aged 18 and younger.[25] The juvenile justice system is structured differently than the adult correctional system, since not all youth arrests lead to detention.[26] When youth first come into contact with the justice system, it is through law enforcement, who then make the choice between sending the case further into the justice system or diverting after reviewing the youth's record and discussing with both the youth and parents.[27] Statistics show that black youth and youth of color are more likely than white youth to be arrested, referred to court, handled formally (adjudicated), and placed in a facility after being adjudicated.[28] Moreover, there is also prevalent lesbian, gay, bisexual, and transgender (LGBT) population among detained youth, with 11% of detained boys and 27% of detained girls identifying as LGBT.[29]

Some risk factors that increase the likelihood of youth engaging in delinquency and other problem behaviors that expose them to the justice system include poverty, maltreatment and abuse, exposure to family violence, low positive parental involvement, gang involvement, socializing with delinquent peers, poor academic performance, high crime neighborhoods, and social disorganization within their communities.[30] Some protective factors that prevent youth from becoming involved with the justice system

include participation in shared activities between youth and family, presence of a positive adult/mentor, availability of economic resources, engagement in safe and healthy leisure activities, and safe school and neighborhood environments.[30]

Court-involved, non-incarcerated youth (CINI) are youth who are arrested and involved in the court system but are not committed in detention facilities. These youth include those who are diverted to community-based programs and those who are on probation or parole.[31] Options for diversion include issuing a warning, referring youth to programs that promote positive behavior change, or offering release in exchange for an agreement that may include school attendance, drug testing, and a curfew.[26,27] Diversion can happen before (and in lieu of) making an arrest, by arresting youth but deciding not to refer the case to court intake, or by a judge during juvenile court in lieu of adjudicating the juvenile. Roughly one quarter of arrests in 2019 were handled in the police department and resulted in release of youth and the others resulted in referral to juvenile court, criminal prosecution, or were sent to other agencies.[27] If youth are referred to juvenile court for processing, their case can be dismissed, handled informally, or petitioned for formal intervention by the court; this is another chance for youth to be diverted and avoid the formal intervention by the juvenile court which may result in incarceration.[27]

The goal of the justice system is to divert as many youth as possible from formal court intervention and incarceration, since youth who are formally processed within juvenile court are more likely to be rearrested, incarcerated, engage in violence, and have poorer school attendance than youth who are diverted.[26] As a result, nearly half of all

cases referred to juvenile court are handled without a petition.[27] The number of CINI youth across the country is rising as more diversion programs are being created to minimize the number of youth in detention facilities, meaning that many youth who come into contact with the justice system are released fairly quickly.[32]

Along with having unique socio-economic needs, justice-involved youth have unique health needs compared to their non-justice involved counterparts. In one study, only ⅓ of adolescents admitted to a detention facility in Birmingham, Alabama reported having a regular source of medical care.[19] Another study found that 46% of newly detained youth had an urgent medical issue that needed treatment, and a majority of these issues were untreated infections.[29] Unfortunately, the quick re-release of many justice-involved following detainment or arrest means they do not have the same guaranteed healthcare access that detained youth do under the US constitution. It also means that any health interventions for youth who are arrested and released should consider the timeline available, as well as the social determinants of health these youth experience upon their release back into the community.

As noted previously, healthcare providers are an important resource to youth for receiving sexual education and in the maintenance of adolescent sexual health, as well as overall health.[8] Lack of access to regular medical care leaves justice-involved youth susceptible to undiagnosed and untreated physical and mental health conditions, including undiagnosed STIs. These youth are also particularly susceptible to STIs because they engage in high-risk behaviors, including high-risk sexual behaviors. Since justice-involved youth face unique health needs, have limited access to health resources,

and engage in risk behaviors, it is important to integrate health initiatives into the encounters these youth have with the justice system. These health initiatives may be one of the limited chances justice-involved youth have to utilize health resources. An important health issue to address currently within the juvenile justice population is the higher-than-average STI rates and the lack of access to screening within the community.

Statement of the Problem

Over half of all newly diagnosed STIs in the United States are among youth aged 14-24 years old and the most prevalent of these STIs include chlamydia and gonorrhea.[2,13] These STIs are easily treatable but many infections are asymptomatic and require testing for proper diagnosis and treatment.[5,33] Justice-involved youth have higher rates of STIs compared to their same-age counterparts and limited access to healthcare. Arrested youth are sometimes screened for chlamydia and gonorrhea when they are detained at juvenile detention facilities. However, many arrested youth are released back into the custody of their guardians instead of being sent to these facilities and many of those sent to detention facilities leave before they are able to receive STI screening.[34] These STIs can have detrimental effects on reproductive capability through long term health sequelae, such as pelvic inflammatory disease, so treating them is imperative. Justice involved youth have higher rates of chlamydia and gonorrhea infections compared to the general population, but have decreased access to healthcare resources for testing and treatment.[16,19,29,35] It is important to identify areas where the process for screening and treating chlamydia and gonorrhea infections in detained adolescents can be streamlined so that those with positive results can receive treatment while they are still at

a facility equipped with the resources to help them before they return to their often under-resourced community.

Hypothesis

Performing point-of-care testing for chlamydia and gonorrhea on arrested or detained youth during intake, and providing on-site treatment to those who test positive, will increase STI screening and treatment rates among arrested and detained justice-involved youth.

Objectives & Specific Aims

The objective of this study is to increase screening and treatment rates of chlamydia and gonorrhea in arrested and detained youth. We will achieve this objective through the following specific aims:

1. Perform point-of-care self-swab or clean catch urine chlamydia and gonorrhea screening on all detained youth in Massachusetts during the study period
2. Provide treatment for detained youth testing positive for chlamydia and/or gonorrhea during screening

REVIEW OF THE LITERATURE

Overview

Chlamydia (CT) is the most frequently reported bacterial communicable infection in the United States, and most commonly infects persons less than 24 years old.[8] Infection rates for women are approximately twice as high as for men and are highest for women ages 20-24 years old; this, however, may be due to increased screening efforts for women.[5] It is a curable STI caused by the pathogen *Chlamydia trachomatis* and transmitted through direct contact with infected tissue.[33] Infections are often asymptomatic, so providers must rely on screening to accurately diagnose and treat infections.[5,33] If symptomatic, clinical manifestations of chlamydia include urethritis, cervicitis and pelvic inflammatory disease (PID). If left untreated, chlamydia can cause inflammation of the upper female reproductive tract, scarring, tubal factor infertility, and increased risk of ectopic pregnancy.[36] Long term health sequelae of chlamydia are preventable with early detection and treatment. Annual screenings for sexually active females less than 25 years old are recommended. Screening for heterosexual young males in settings with higher clinical prevalence (such as primary care clinics, STI clinics, and correctional facilities) is also recommended.[36] Testing is performed via nucleic acid amplification tests (NAATs) either via vaginal/cervical swabs or first-catch urine, although first-catch urine is less sensitive in females.[36] Oral doxycycline or azithromycin are the current treatment recommendations for uncomplicated urogenital chlamydia infections.[36]

Gonorrhea (NG) is the second most frequently reported bacterial communicable infection in the United States and screening is recommended for all sexually active women aged <25 years old.[8] It is a curable STI caused by the pathogen *Neisseria Gonorrhoeae* and transmitted through direct contact of infected mucous membranes. Half of all females and nearly all (90%) males will manifest symptoms of their gonococcal infections.[37] Clinical manifestations of symptomatic infections include urethritis, epididymitis, cervicitis, and disseminated infections.[36] Infections that complicate pregnancy can cause adverse pregnancy outcomes, such as low birth weight and oropharyngeal or conjunctival infections in newborns.[37] Long term health sequelae of gonococcal infections, including tubal factor infertility and increased risk of ectopic pregnancy, are preventable with early detection and treatment.[8] Interestingly, antimicrobial resistance of *N. gonorrhoeae* is on the rise and it has evolved resistance to every single formerly used first-line antimicrobial therapy.[36] Testing is performed with NAATs and on samples collected via vaginal/cervical swabs in females and first-catch urine collection in males.[38] The current recommended treatment for uncomplicated urogenital gonococcal infections is a single dose of intravenous (IV) or intramuscular (IM) ceftriaxone and concurrent treatment with doxycycline, if chlamydia infection is also suspected.[8,37]

Justice-involved youth have higher rates of occurrence of STIs compared to their counterparts — the CDC estimates STI rates of less than 5% in youth, while some studies show STI rates as high as 14.6% for youth involved in the justice system.[16] Interestingly, justice-involved females have higher rates of STIs than males in their age group.[35] In one

study, females were 3x more likely to test positive for chlamydia, gonorrhea, and trichomonas than males.[38] Higher STI rates among justice-involved youth may be because these youth engage in more sexual risk behaviors than their counterparts, including early initiation of sexual activity, multiple partnerships, unprotected sex, and use of drugs and alcohol when engaging in sexual activity.[39–43] These behaviors all leave justice-involved youth susceptible to contracting and spreading STIs. Justice-involved youth also have other risk factors that increase their susceptibility to STIs, including lack of education, housing instability, and lack of access to healthcare for STI screening.[44–46]

When discussing the high rates of STIs among justice-involved youth, one must consider the unique health needs of this population and how they contribute to these statistics. One review by Griel et. al explored health issues faced by incarcerated adolescents reported higher rates of psychiatric disorders (up to 50%), personality disorders, and psychosocial problems such as aggression, anger, substance use, and disorientation.[47] It also reported higher rates of chronic illness in justice-involved youth, poorer health status when comparing both acute and chronic health conditions, high prevalence of disabling conditions, and higher STI rates.[47] The review found a need for increased screening in justice-involved youth, especially screening for obesity and risky behaviors such as sexual risk behaviors, non-professional tattooing (bloodborne pathogen transmission risk), substance use, interpersonal violence, and self-harm.[47]

Up to 30% of justice-involved youth do not have access to reliable health services outside of the justice system, which highlights the immense health needs of justice-involved youth and suggests they are a medically-underserved population when it comes

to preventative healthcare.[47] Detained youth had lower vaccine coverage than the general youth population.[48] Likewise, a majority of justice-involved youth surveyed in one study had Medicaid and 17% were completely uninsured.[49] Up to 80% of justice-involved youth do not have a primary care provider (PCP) in their home communities and most do not see a provider after being released from detention facilities due to a lack of insurance and transportation, despite wanting to do so.[29] Lack of access to preventative care can be detrimental to a youth's sexual health, since well-child visits are widely recommended as an opportunity for screening, detection, and treatment of STIs in adolescents as well as for the promotion of health education.[50]

One study, although dated, explored the medical status of youth detainees on their first admission to a juvenile detention facility in Birmingham, Alabama, to better understand the health status and medical needs of youth entering the justice system. A majority of the participants were African American males, and many participants were below their grade level for education with no significant racial differences in education level.[19] The study found that almost 11% of participants had a condition that required close medical follow up (mostly asthma) but more than half of detainees requiring medical management did not have the family support needed to receive further follow up by a healthcare provider.[19] The absence of family support makes these youth more susceptible to having untreated and poorly managed health conditions. It also makes it difficult for youth to receive treatment and services for positive STI test results if they are screened upon being detained. The study proposes solutions to this problem, such as

including medical recommendations in probation orders and allowing youth to return for outpatient services at the detention facility where they were held.[19]

All of the studies mentioned above highlight the health needs of justice-involved youth, especially surrounding their sexual health. They also highlight the need for increased access to preventative healthcare among justice-involved youth . The use of detention facilities to deliver healthcare for justice-involved youth has been identified as a potential bridge to fill the healthcare gap in this population. One review suggests that partnerships between juvenile detention systems and community outpatient facilities are needed to promote successful youth reentry, reduce repeat offending, and improve health access for justice-involved youth.[29] Whether health services are delivered at the detention facility or at an associated community clinic, using the justice system as a point of healthcare access is a common theme in this literature.

According to a review by Griel et. al, only 70% of juvenile detention centers across the US offer some form of reproductive health services, including STI screening, even though the CDC recommends that all justice-involved women aged < 35 years old and men aged < 30 years old be screened for an STI upon intake.[8,47] This highlights a method health access can be increased to improve the health of incarcerated youth, particularly regarding STI identification and reduction of transmission. Offering better reproductive health services at juvenile detention facilities may close some healthcare gaps for justice-involved youth, particularly those around limited access to regular screening and treatment of STIs.

A study by Tolou-Shams et al. explored the sexual and reproductive health (SRH) needs of justice-involved youth who are criminally involved but not incarcerated by performing a nationwide survey of stakeholders in both juvenile justice and public health to identify factors that influence sexual and reproductive healthcare received by this population.[31] The results from this study are important because court-involved, non-incarcerated (CINI) youth experience the same social determinants of health and participate in the same high-risk sexual behaviors as youth that are arrested and detained but are under-represented in research studies. The stakeholders participating in this study believed CINI youth to have largely unmet SRH needs, including lack of access to contraception and testing, lack of education, and early and accidental pregnancy. Stakeholders reported that CINI youth have a limited number of interventions related to SRH health compared to other behavioral health screening interventions. They also reported that it is more difficult to gather CINI youth's health information out of privacy concerns, since youth don't want it being reported back to their parents. Stakeholders agreed that helpful intervention strategies for addressing unmet SRH needs of CINI youth include establishing a SRH referral process between justice facilities and community partners, placing health staff in justice facilities to provide SRH services on site, training staff on unmet SRH needs, and placing a community health navigator in the justice setting to help youth access SRH health services. The findings of this study highlight that the SRH needs of CINI youth are vast and underserved, and highlight potential areas for intervention that are helpful and feasible according to stakeholders in both the juvenile

justice and public health systems. Potential areas for intervention proposed by the study include collaboration between juvenile justice and public health stakeholders.

STI screening for chlamydia, gonorrhea, and trichomoniasis infections traditionally involves either urethral swabs, provider-collected vaginal swabs, or urine samples sent to a laboratory for nucleic acid amplification testing (NAAT) and require 3-5 days for results to return.[51] This form of testing works in a clinical setting, where patients have the means to follow up on their test results, but it can be difficult to implement in a setting in which patients have shortened or limited contact with the provider or institution that is testing them. Some examples of settings where traditional STI testing may not yield results fast enough are urgent care clinics and emergency rooms where patients have one isolated encounter with a provider, and jails, where people are arrested, processed, and released with a turnover time shorter than it takes for STI test results to return.

Recently, there have been new advances in STI testing and point-of-care (POC) tests are being developed that can provide results in less than an hour.[51] POC testing can be performed with a simple, non-invasive test that involves either a vaginal self-swab or a first-catch urine sample; vaginal self-swabs are the preferred method of testing for females because they yield more accurate results compared to urine samples.[52] POC testing is beneficial because, in addition to receiving accurate, fast results, treatment appropriateness also increases; one study found that, when treatment was administered at the initial visit for STI testing, 52% of patients who had traditional testing were appropriately treated and 100% of patients who received POC testing were appropriately

treated. The study reported that 40% of the traditional testing group was overtreated and 8% was undertreated compared to 0% overtreatment and undertreatment in the POC testing group.[51] The high treatment appropriateness from the POC group was because providers knew which pathogen(s) the patient was infected with and could prescribe treatment accordingly. The high rate of overtreatment demonstrates that providers are giving patients prescriptions for their infections regularly at initial visits and highlights the usefulness of POC testing to ensure patients receive appropriate treatment.

The CDC recommends universal, opt-out screening for chlamydia and gonorrhea in all females <35 years old and males <30 years old who are entering both juvenile and adult correctional facilities. They also advise that POC testing should be considered if tests demonstrate sufficient sensitivity and specificity, since they provide rapid results and the potential for immediate, accurate treatment.[8,53] Currently, many jails and juvenile detention facilities are failing to meet these screening recommendations by not mandating testing for chlamydia, gonorrhea, and trichomoniasis infections. Only 20% of state/federal and 4% of city/county systems mandate chlamydia screening and only 17% of state/federal and 4% of city/county systems mandate gonorrhea screening. Trichomoniasis screening is not mandated.[54] One survey of the largest US jails, published in 2013, reported that only 4% of facilities had mandatory or routine chlamydia and gonorrhea screening and another national survey published in 2007 reported that only 18.5% of juvenile detention facilities tested all entrants for STIs.[54,55]

Even when inmates are being tested, it is sometimes difficult to treat them appropriately; 80% of people arrested are released from jail less than 48 hours later.[8] An

evaluation by the CDC in 2011 found that rapid release of some jail inmates can delay treatment of inmates who test positive for chlamydia infections. Of five states surveyed, only one had a treatment rate above 90% (95% in this case) for persons testing positive for an STI and it was the only state that screened all inmates for an STI on arrival instead of screening symptomatically or by request. Other states had treatment rates ranging from 62-80%, leaving a significant proportion of people untreated and susceptible to the long-term sequelae of their infections. The evaluation found that states with shorter turnaround times for STI results had higher treatment rates for inmates, further supporting the recommendation for using POC testing in correctional facilities. The evaluation also found that it was feasible for STI screening to be incorporated into the intake/booking process and opt-out testing was recommended over opt-in testing.[34] Another study recommended prioritizing screening for females in youth detention centers if using STI control programs with limited funds, based on positivity rates from one city's youth detention and adult jail facilities. They prioritize females in youth detention first, followed by adult women <30 in adult jails, men aged <25 in adult jails, and males in youth detention centers last.[56] Women are prioritized over men due to the harmful sequelae that happen as a result of these untreated infections.

In summary, chlamydia and gonorrhea, two of the most common STIs found in youth, are highly transmissible and have detrimental health sequelae if left untreated. Justice-involved youth have higher STI rates and greater reproductive health needs than their same-age counterparts. This increased need is attributable to the social determinants of health they experience, which often leave them without consistent access to

preventative healthcare. Some literature has suggested using correctional facilities and juvenile detention centers as an avenue to provide healthcare to justice-involved youth. Universal opt-out STI screening is recommended by the CDC for all arrested individuals due to high infection rates. However, individuals who are arrested are often released into the community before results from traditional testing are available. Rapid, point-of-care testing can yield fast and accurate test results, while juveniles are still detained. Here, we explore literature related to STI screening and STi treatment in detained youth to identify opportunities for improvement in testing and treatment outcomes.

Existing Literature

While there are many studies published about high STI rates among justice-involved youth and the importance of sexual health screening for this population, no research has been published about how the availability of rapid, opt-out, point of care STI testing at intake would improve treatment rates in arrested youth who are quickly returned to the community. However, studies have been published addressing the sexual health needs of justice-involved youth and the need for collaboration between justice systems and healthcare institutions to improve treatment outcomes for youth with STIs. Studies have also been published that address the feasibility of rapid point-of-care testing in community-based settings. In addition, there are also studies that explore some current interventions for improving STI treatment rates in youth populations with limited healthcare access, such as offering rapid treatment following a positive point-of-care test.

Taken together, these study results suggest how rapid, point-of-care STI screening and subsequent treatment for CINI youth may improve health outcomes for this population.

A retrospective study by Torrone et. al. aimed to identify effective screening criteria for CT testing by identifying factors predictive of infection among females with the hope that targeted screening would reduce costs of STI testing while still identifying almost all infections. Investigators chose the juvenile facility in San Diego for their study because it has high documentation of STI screening coverage, and a sexual risk assessment is performed on every individual booked into the facility. This study received health records for all females ages 12-18 entering the juvenile detention facility from January 2009 to June 2010. Screening coverage and chlamydia prevalence were calculated and demographic, health, and arrest data were gathered from the juvenile's paper records. The same information from a random sample of CT-negative intakes was also abstracted and used as a control group.

Risk factors known to be associated with STIs and those hypothesized to be associated with CT infections in a detention setting were abstracted as well. Demographic factors that were abstracted included race, age, and living situation (group home or not). Health-related data that was abstracted included current sexual activity, current birth control method, previous CT infection, and sexual risk factors, which were obtained from self-report by a nurse at intake. Arrest-related factors that were abstracted were reason of arrest, charge code, and gang affiliation. The study calculated bivariate associations between abstracted risk factors and prevalence of chlamydia infection using logistic regression, and different screening criteria were chosen based on combinations of

variables and their associations with infections. Researchers assessed screening criteria performance by comparing the proportion of infections detected to the proportion of females that would have been screened under the selection criteria.

The study reported that, of 1,890 females undergoing intake screening at the San Diego juvenile detention facility, 1,771 were tested for CT. This value represents a screening coverage of 93.7%. Overall, the amount of tests performed that resulted positive for CT was 10.3. Results showed that the prevalence of chlamydia varied by demographics, health behaviors, and arrest. Females ages 15-18 years old had a higher prevalence of infections compared to females aged 12-14 years old (11.1% vs 4.3%). Females who reported to be sexually active were more likely to be infected than those denying sexual activity (11.6% vs 4.2%). Furthermore, prevalence of CT was higher among females detainees who reported at least one STD risk factor (23.2% vs 7%). Overall, the variables most strongly associated with chlamydia infections were being 15-18 years old, being involved in sex work, being sexually active, having at least one STD risk factor (ex: multiple partners), and having a history of a past chlamydia infection.

Many screening criteria were created by the study; the most selective criteria only included screening if all five predictive characteristics were present, and the least selective criteria included screening if only one of the five predictive factors was present. According to the study report, many combinations of screening criteria had high efficiency but low sensitivity, meaning that, while not a lot of intakes would require screening, a large proportion of prevalent infections would not be identified either. They gave the example that only testing females engaging in sex work or with a documented

history of chlamydia would be efficient because only 7% of the population would require screening but would not be sensitive since only 25% of infections would be identified. Overall, the study reported that, to find 85% of all prevalent infections using combinations of factors associated with chlamydia, more than 70% of inmates would need to be screened. From these numbers, the study concluded that targeted screening is not feasible for juvenile justice populations because detecting an appropriate number of infections within this population requires almost universal screening.

This study had some limitations. The first limitation to the study is that it selected a facility which has a high screening coverage; this increases the probability of positive results and changes how applicable the screening criteria is. Also, not all females were screened, so the true prevalence of positive infections is not certain. The second limitation is that some patient charts were selected for review but were not available during the abstraction period. This lack of availability may have biased the findings if the charts were not missing at random. The third limitation is that the variable for "sexually active" did not specify a time period and a more nuanced question might more strongly predict chlamydia infection. Another limitation is that these findings may not be applicable to all detention facilities for juveniles since STI screening protocols and chlamydia prevalence in their justice populations may be different. One final limitation of the study is that it did not include any testing for male justice-involved youth, who also have disproportionately high STI rates and would benefit from better screening protocols. This is a limitation because males may have different risk factors than females associated with chlamydia infections, and targeted screening may be feasible in these populations

depending on the association between these variables and chlamydia rates. Additionally, males account for most justice-involved youth so analyzing the feasibility of target screening for them would be very informative.

The study by Torrone et. al. discussed that, while review of screening efforts can help appropriately allocate limited resources, a targeted screening approach for chlamydia infections in female juveniles could not be identified in this correctional facility because no screening criteria could identify more than 85% of prevalent infections without testing more than 70% of intakes. This conclusion implies that universal screening efforts are the most appropriate way to address the sexual health needs of justice-involved youth; STIs are prevalent among this population and too many infections would be missed with targeted screening. The study also discussed how high screening coverage in juvenile justice facilities is feasible, since the San Diego facility screened more than 94% of all intakes. The screening rate of 94% was compared to reported screening coverages in a sample of juvenile facilities nationwide, which only screened between 54.9-58% of all intakes. The low rates of screening nationwide can be improved with greater testing initiatives and this study demonstrated that testing almost every juvenile being admitted to a detention facility is possible. Together, this study highlighted the need for universal CT screening in female justice-involved youth- and, likely, all justice-involved youth, despite males not being included in the study. It also highlighted that near-universal screening rates are feasible in these correctional settings.[57]

A study by Neeki et. al. assessed trends of CT and NG infections and treatment within juvenile correctional facilities in a single county. They retrospectively reviewed

aggregate data of female adolescents aged 12-18 years were screened for chlamydia and gonorrhea at the time of booking in one of two juvenile correctional facilities in San Bernardino County. They chose the county of San Bernardino because it is the largest county geographically in the United States, and has two juvenile correctional facilities. They examined the rate of infections, screening coverage, and treatment coverage. Researchers defined rate of infection as the number of positive tests divided by the number screened. They defined screening coverage as the number of adolescents screened divided by the number booked. They defined treatment coverage as the number treated divided by the total number with infections in a given year. They included adolescents released prior to notification of a positive result as untreated, the adolescents who are the target population for our research.

Screening in this study was performed using urine nucleic acid amplification-based testing, which produced results seven to twelve days after screening was done. The study reported that screening coverage for both CT and NG infections was between 97.9% and 99.2% from 2009 to 2016. The rates of infection for both CT and NG increased during the study period; CT infection rates rose from 11.8% in 2009 to 17% in 2016, and NG rates rose from 1.3% in 2019 to 6% in 2016. Treatment rates for CT were relatively consistent but surprisingly low, with rates ranging from 66.7% in 2009 to 70.8% in 2016. NG treatment rates increased from 33.3% in 2009 to 78.3% in 2016. However, overall trends for CT and NG treatment were not statistically significant, but the percentages of adolescents treated is still important data because it reflects the gap in care between testing and treatment for this adolescent population. One interesting data

point was the very dramatic drop in percentage of NG infections that were treated in 2014 compared to 2015; in 2014, 75% of NG infections were treated, and that number dropped to 13.9% in 2015. There was also a slight decline in CT treatment rates at this time with rates dropping from 83.8% in 2014 to 75.9% in 2015. The study speculates this drop in CT and NG treatment rates is most likely due to early release programs, an important implication when investigating interventions to help arrested youth released back into the community before they have time to access health services within justice facilities. In their discussion, the study linked increasing CT and NG prevalence in adolescent female juveniles to rapid release from detention centers and lack of linkage programs that notify and treat infected adolescents after they are released. In this study, released adolescents were notified by a direct call from nursing staff and advised to independently seek treatment. The study recognized that county correctional facilities could benefit from partnerships that expand access to complimentary programs post release. They suggested utilizing partnerships with community women's health clinics, which could provide focused STI treatment and education on prevention.

One limitation of the study is that some positive screenings may have been repeats due to recidivism but they estimated this to be only 1.6% of positive results. Another limitation is the significant drop in NG screenings between 2014 and 2015, which the study attributed to various factors, such as changes in budget, reporting errors, early release of arrested juveniles, or delayed treatment notification. Another limitation is that the study collected its raw data in an aggregate format that did not allow for them to determine subject level differences in their sample population. Finally, one more

limitation to the study is that those who did not receive treatment before their release back into the community were counted as "untreated" regardless of whether they completed treatment after their release. Additional information about how many positive tests eventually received treatment and how long it took them to do so would have been helpful in understanding the need for improved screening and treatment efforts.

This study demonstrated the number of detained youth who do not receive treatment for their STIs before being released back into the community. It also demonstrated the need for continued care for justice-involved juveniles who are screened for STIs but released back into the community quickly, often before receiving appropriate treatment for their infections. It also called for collaboration between community health centers and juvenile detention facilities to provide continued sexual health care to justice involved youth in the community.[58]

A study published by Francisco-Natanauan et. al. examined CT and GC prevalence as well as treatment rates in detained youth in the state of Hawaii. The study recognized the gap in healthcare for justice-involved youth who are sent temporarily to detention facilities; nearly half were discharged within 48 hours and likely do not access medical care during this time. It highlighted prior recommendations that STI screening in correctional facilities be integrated into the intake process, since timely treatment is problematic. It was a retrospective analysis whose goal was to determine the prevalence of CT and GC in detained Hawaiian youth and the proportion of STI-positive youth treated before discharge. The researchers in this study performed a retrospective chart review of all youths 12-17 years old detained in the state of Hawaii from January 1, 2014

to June 30, 2017, a total of 2,208 charts. Adolescents entering the detention facility were examined by a nurse on admission. The correctional facility required them to have a separate initial medical assessment by a physician within 7 days of detention; this evaluation typically occurred within the first 72 hours of detention, but not always. The facility policy was to offer opt-in CT and GC screening and presumptive treatment during this initial medical evaluation. The study recognized that some youths were discharged from the facility before they were able to receive their initial medical evaluation or CT/GC screening. Extensive efforts were made by the State Department of Health STD reporting system to contact youth with positive results and early discharges.

STI screening was via urine collection and sent to an outside facility for detection; reports were mailed back to the justice facility within 1-2 weeks. Previously, the lab running the tests called positive results into the justice facility but financial restraints caused them to change their practices and all results during the study, regardless of positive result, were provided to the justice facility by mail. Youth who left the facility before receiving their test results were notified by phone and received counseling, as well as instructions to pick up a prescription of azithromycin from their local pharmacy and visit a local Federally Qualified Health Center or their PCP to get an intramuscular injection of ceftriaxone. Only 883 tests were obtained from a population of 2,208 eligible youth, which included 461 males (with a mean age of 15.7 years old) and 372 females (with a mean age of 15.8 years old); 67.4% of adolescent women elected to be screened compared to only 27.8% of adolescent males. According to the study, 23.7% of females and 9.5% of males who were screened tested positive for an STI and the prevalence did

not vary by age in either sex. Among those youth who tested positive, less than half were treated as documented with the exception of GC positive females. In females, treatment rates for chlamydia and gonorrhea were 47.6% and 55.6%, respectively, and the total STI treatment rate was 50%. In males, treatment rates for chlamydia and gonorrhea were 40.6% and 33.3%, respectively, and the total STI treatment rate was 38.6%. According to the study, few youth were detained long enough to receive their STI results and efforts made to contact youth with positive STI results who were released from detention were largely unsuccessful. The data for efforts made by the State Department of Health to contact and treat STI positive youth was unavailable. Adolescents were offered presumptive treatment and only 8.8% of males and 22.8% of females accepted this option.

The results of the study highlighted that, when STI screening and treatment was left to the decision of justice-involved youth, many infections went undetected, since 62% of eligible participants refused. They speculated that high refusal rates may be because many youth were asymptomatic, even though these infections frequently do not present with symptoms. A high prevalence of STIs in youth was documented by the study, although it is difficult to know the true prevalence because fewer than half of youth agreed to testing. The study reported their data as comparable to other literature about STI rates in justice-involved youth. The study also highlighted another similarity to other studies, that screening rates for STIs in detained youth are lower than they ideally should be. Something unique about this study is that it addressed the inadequacy in treatment of detained adolescents and adolescents released back to the community and

documented that over 50% of youth with STIs leave detention centers while they are infected and unaware of their positive result.

The study discussed that the greatest opportunity for addressing health needs of justice-involved youth is during their short stays in a detention center, because the number of youth incarcerated after detention is declining nationally. However, it was recognized by the study that health care is not the top priority of the juvenile justice system and other state agencies are responsible for the healthcare of detained or justice-involved youth. The study provided examples of successfully implementing change to improve STI screening and treatment rates in justice-involved youth. It highlighted California's administrative code, which requires medical evaluations and STI tests be performed within 96 hours of detention, and a project started by the California Department of Health to improve screening rates. It also highlighted quality improvement studies trying to improve adherence to guidelines for CT screening of sexually active adolescents. Discussion of these two improvements in screening policies suggested that screening rates can be improved when gaps in policy, care, and resources are identified and addressed. Finally, this study discussed that, for justice-involved youth, medical encounters while detained may be their only access to healthcare and should be utilized to empower them and address their health needs.

This study by Francisco-Natanauan et. al. had some limitations. The first limitation to the study is that the reported data only reflects STI prevalence in youth who consented to screening, less than 50% of those offered testing. Over 50% of youth being untested is a limitation because it does not allow the study to reflect the true STI

prevalence within this population, since youth consenting to screening may consider themselves higher risk and may cause overestimations in population prevalence. Another limitation is that data was not available to investigators on whether youth who were unable to be contacted by the justice department were later successfully contacted, made aware of their positive results, and provided treatment by any other organizations, including the State Department of Health. The absence of this data makes it difficult to determine actual treatment rates for CT and GC infections in justice-involved youth and to determine how large a barrier to care is created by delayed availability of results and treatment in this population. Overall, this study highlights the high infection rates and low treatment rates for CT and GC in justice-involved youth, especially those who are detained and released, demonstrating the need for a better screening and treatment system, which addresses justice-involved youth sexual health needs while they are still in detention.[59]

A study by Keizur et. al. published in 2021 investigated a point-of-care testing and same-day treatment model established by researchers in Los Angeles, California (LA) and New Orleans, Louisiana (NOLA). This study aimed to investigate the safety and effectiveness of same-day treatment for youth receiving positive results for CT and/or GC from point-of-care testing. The youth population that were the focus of this study were gay, bisexual, transgender, and homeless youth, since these groups have an increased risk of STIs. The study recognized that standard CT and NG screening does not provide health professionals or patients with immediate results, creating barriers to treatment and care. The study focused on point-of-care STI testing as an opportunity to

increase access to STI screening and treatment in high-risk adolescents who do not have access to health services. They investigated whether providing this same-day testing and treatment would increase the proportion of participants receiving treatment and whether it would reduce the overall time for subjects to receive treatment. The study recruited gay, bisexual, and transgender youth, as well as those with a history of mental illness or a history of incarceration, all aged 12-24 years old. Participants were recruited from May 2017 to June 2019 using social media, online dating apps, and organizations such as homeless shelters, LGBT organizations, and community health centers. Eligibility for participation was determined using a questionnaire measuring demographics and risk behaviors; participants were selected based on whether they scored above a certain number of points.

Participants were included in the study for 24 months and were scheduled for visits every 4 months at which they would self-collect oral, rectal, and genital samples for CT and GC testing. Tests were performed using real-time PCR with results available in 90 minutes. Before March 2018 in LA and November 2018 in NOLA, same-day positive results were available to participants but they were referred to local clinics or PCPs for STI treatment. After these dates, participants were offered same-day treatment and expedited partner therapy after receiving their positive same-day rapid PCR test results. However, not all participants stayed the 90 minutes to wait for their test results, and those who left before receiving their results were contacted via telephone to set up an appointment for treatment. Treatment included medication necessary for the patient as well as up to ten treatment packs for any recent sexual partners. The researchers

contacted participants to confirm they were treated if they followed up with their PCP, and obtained office records if they could not reach the participants. Demographics of study participants were compared, as was testing location, same day treatment vs delayed treatment, and number of partner treatment packs taken.

The study measured the proportion of participants receiving same-day treatment and treatment within 30 days for CT and GC before and after the initiation of same-day testing and treatment using a Chi-Square test for significance. Median days to treatment were also compared by each demographic characteristic using the Mann-Whitney test and median days were chosen due to skewed distribution. The study only included participants who tested positive once in the available data since the analyses they used did not account for repeated measures. A total of 235 participants were recruited who had positive CT or NG infections; 126 (53.6%) had CT only, 79 (33.6%) had GC only, and 30 (12.7%) had CT and NG coinfections. The study reported similar proportions of infections before and after offering same-day treatment. It also reported the proportion of participants with reinfections decreased from 20% to 12% after offering same-day treatment (prevalence ratio .60, 95% CI 0.33–1.09). The results of the study showed that the proportion of adolescents ages 14-24 years old receiving same-day treatment increased from 3.6% to 21.1% after the study offered same-day treatment to its participants. When broken down further, same-day treatment in LA increased from 0% to 23.2%, and same-day treatment in NOLA increased from 4.4% to 7.7%.

The study discussed that offering same-day treatment for CT and GC after point of care testing significantly increased the measure of participants in LA who were treated

the same day. It also discussed that the overall median days to treatment was reduced by at least half in both LA and NOLA. They speculated that NOLA did not see as great an increase in same-day treatment as LA, since same-day treatment was only available for 3 months due to limited supply and the geographic area of NOLA allowed for more referrals to accessible health clinics. The study also discussed the value of rapid testing in ensuring timely treatment of STIs in hard-to-reach populations and recognized the need for further research to expand the use of same-day STI testing and treatment in high-risk populations. One limitation to the study was the moderate sample size, specifically for those in NOLA who got same-day treatments. The study also used convenience sampling, which could lead to selection bias towards participants more inclined to utilize the health system or seek testing. Another limitation to the study was that it did not report the amount of participants who remained untreated for their CT or GC infections.

Overall, this study demonstrated the positive impact that same-day testing and treatment can have on successfully treating CT and GC infections in high-risk populations of youth who are difficult to reach and who may not have consistent access to health resources. This conclusion is applicable to the juvenile justice population, since they engage in high-risk sexual behaviors and often do not have access to STI testing, treatment, or other sexual health resources. Point-of-care testing and same-day treatment would be very beneficial in this population, especially since it has been found to be beneficial in similarly under-resourced populations.[60]

A study published by Kennedy et. al. investigated the financial savings from STI testing, treatment, and counseling among foster youth. The study recognized that within

the adolescent and young adult population, who account for over half of new STI infections annually, foster youth are especially vulnerable since they have limited access to sexual health information and resources compared to their peers. It also recognized that STIs in the United States have a significant economic impact, and investigated whether prevention and screening of STIs may alleviate some of the direct and indirect costs associated with STIs. The study used data from the Creating Options and Choosing Health (COACH) program in St. Louis, Missouri. This program ensures foster youth in St. Louis City and the surrounding county can access a variety of health services. The study ran from July 2017 to June 2020 and calculated averted direct and indirect medical costs using formulas developed by the CDC. The formulas they used calculated cost savings from 12 inputs, which came from data provided by the COACH program. The direct medical cost savings included 4 domains: averted sequelae costs from treating CT, GC, and syphilis, averted sequelae costs from reducing transmission of CT, GC, and syphilis: HIV costs averted by reducing HIV transmission through CT, GC, and syphilis treatment; and HIV costs averted by HIV counseling and testing. The indirect medical cost savings included 3 domains: costs averted by treating CT, GC, and syphilis; HIV costs averted by reducing HIV transmission through STI treatment; and costs averted by reducing HIV transmission through HIV counseling and treatment.

The study examined data from all 584 clients who were seen by the COACH program within the three-year time period of the study. Only 316/584 clients received medical services and, of these, 206 clients tested for STIs and/or HIV. All clients who received a positive STI test received treatment and all who received a positive HIV test

received HIV counseling and education. Of the participants, a majority seen in the COACH clinic were heterosexual Black females. More females received STI tests compared to males (70.4% vs 28.6%) and a majority of youth tested were Black (79.6%) and heterosexual (65%). The age range for youth being tested was 13-24 years old, with an average of 18.2 years old. Of the 206 youth reporting to be sexually active, 31.9% (n = 66) tested positive for at least one STI. A total of 1,049 tests for CT, GC, and syphilis were performed over the three-year period and 11.5% (n = 121) were positive. Among positive tests, 64.5% (n = 78) were positive for CT, 30.6% (n = 37) were positive for GC, and 5% (n = 6) were positive for syphilis. The study reported that, overall, $60,049.68 in direct medical costs and $73,956.36 in indirect costs were saved by treatment of positive STI tests and HIV testing and counseling, a total cost savings of $134,006.04.

The study discussed that STI testing in a community setting is one indicator of possible health cost savings. According to researchers, the data they provided supports comprehensive sexual healthcare for foster youth as they are an at-risk population with limited health access who would benefit from screening and prevention efforts to mitigate long term sequelae as well as health costs. This community-based comprehensive sexual healthcare was reported be a cost-effective way to identify, treat, and reduce harm in at-risk populations.

This study has several limitations. The first limitation to this study is that it was done in a metropolitan area, and may not be generalizable to other areas where community-based resources are less funded or more difficult for youth to access. The second limitation is that the study only represents adolescents and young adults in foster

care who are connecting with community-based organizations and does not encompass the entire population of adolescents and young adults in the area in foster care. Finally, the study was also unable to compare the cost savings from the COACH model to the regular cost savings from adolescents and young adults in foster care accessing their usual healthcare. They only have information about cost savings achieved through the COACH model.

Overall this study demonstrated that screening and treating high-risk populations, such as foster youth, in a community-based setting for STIs is an effective way to reduce direct and indirect healthcare costs and improve health outcomes for adolescents and young adults.[61] Since justice-involved youth are also a high-risk population like the foster youth used in the study, addressing their reproductive health needs in a community based setting may also reduce healthcare costs and improve healthcare outcomes.

There is new evidence of accurate and user-friendly point of care testing devices that yield positive results in under an hour and allow for non-invasive collection of test samples. A cross sectional study examining the performance of single-use, rapid point-of-care (POC) testing devices for detecting CT, NG, and TV infections was published in 2020. This study explored the accuracy and practicality of testing for CT, NG, and TV infections using the Visby Medical Sexual Health Test, an innovative single-use self-contained device which uses polymerase chain reaction (PCR) based testing to qualitatively detect and differentiate CT, NG, and TV infections in less than 30 minutes using a self-collected vaginal specimen. The device is intended for use in environments where off-board sample processing or instrumentation would interfere with appropriate

treatment times. A cross-sectional, single-visit study of women aged 14 years old or greater at 10 clinics across 7 U.S. states was conducted from February 2019 until January 2020; the clinics included STI clinics, primary care offices, student health clinics, and both academic and private research centers and organizations. Both symptomatic and asymptomatic women were enrolled in the study and were excluded if they had used antiperspirants, deodorants, or certain vaginal products in their genital area within 48 hours prior to enrollment in the study.

The Visby medical device kit includes the medical device, Quick Start Instructions, a vaginal self-swab collection kit, and all the reagents and instrumentation required to perform a single PCR test and a control to ensure the instrument is working properly. For this study, participants were provided the Visby self-collection kits and manufacturer's instructions to collect their own vaginal samples. Then, untrained operators received the specimens and ran the test using the Visby medical device and the provided Operator's Guide, which detailed how to use the device. The protocol stated that the test must be performed within 2 hours of collecting the vaginal sample. Meanwhile, a licensed healthcare provider collected three randomly ordered vaginal swabs and recorded any signs of infection the patient may have. Then, the provider-collected samples were stored and transported for testing in an outside laboratory, which how traditional STI testing is performed. Three comparator systems were used for testing of provider-collected samples and one reference laboratory processed all these tests using trained laboratory staff. Patient infected status (PIS) was determined using results from the comparator systems. If at least two comparator results did not match and report

positive findings, the patient was considered indeterminate of infection. If two comparator results matched, the patient was considered infected or positive. Participants were also classified as symptomatic or asymptomatic based on reported genitourinary symptoms.

A total of 1585 women were enrolled in the study, including pregnant and menstruating women, and ages ranged from 14-80 years old with 37% of the sample population being 25 years or younger. Diagnostic performance measurements were done by comparing test results from the Visby investigational device to PIS determined by comparator assays. For CT, sensitivity was 97.6% and specificity was 98.3%. For NG, sensitivity was 97.4% and specificity was 99.4%. For TV, sensitivity was 99.2% and specificity was 96.9%. The Visby Medical Sexual Health Test agreed with PIS determined by comparator assays in 98.3% of CT results, 99.4% of NG results, and 97.1% of TV results. Overall, the Visby device delivered a valid test result for 98.5% of provided samples. All operators of the Visby device responded that the device was easy to use with the given instructions.

The results of this study demonstrate that rapid point-of-care testing is a feasible and accurate method to determine STI infection status in women who self-collect vaginal swabs, and to make treatment decisions in real time. Strengths of this study include a diverse study population. Limitations of the study include moderate NG cases, which may impact precision of the sensitivity for NG infections; however, finding a high amount of NG cases in women is challenging. Another limitation is that the study did not test the accuracy of the device when using a urine sample; males who submit samples for

STI testing do so in the form of first-catch urine. Overall, this study highlights the practicality of point-of-care testing and the fast availability of results, which is extremely useful in a juvenile correctional setting where contact with juveniles may happen within a very short time frame.[62]

Together, these papers provide evidence that supports both the need and the efficacy of the proposed study: universal opt-out point of care STI testing for detained youth before their release back into the community as an effort to increase testing and treatment rates.

METHODS

Study Design

Researchers will conduct a multi-site, interventional cohort study at different Massachusetts Department of Youth Services (DYS) facilities across the state. Half of the DYS facilities participating in the project will offer opt-out standard STI testing to all juveniles being booked, and half will offer opt-out rapid point-of-care STI tests to all juveniles being booked. Participants will be justice-involved juveniles who were either arrested and brought to DYS as a courtesy hold, or detained by DYS following their juvenile court hearing. If positive, those in the rapid testing cohort will be treated at the DYS facility by medical staff and those in the standard testing cohort will receive treatment based on standard DYS protocol for treating STI positive juveniles. Infection rates for chlamydia, gonorrhea, and co-infections, as well as treatment rates for those testing positive, will be collected and compared between the groups.

Study Population and Sampling

Study participants will include juveniles aged 13-18, either arrested or detained, who are being booked through a DYS facility in Massachusetts. DYS facilities in Massachusetts encounter youth who are arrested (usually outside of court hours) and awaiting their juvenile court hearing, youth who were sentenced to detention either with or without bail and are awaiting trial following their juvenile court hearing, and youth who were adjudicated delinquent by the court and committed to a DYS facility. Both male and female participants will be recruited for this study. For the purpose of this

study, only youth who are being arrested or detained will be eligible to participate, since the study is exploring the benefits or point-of-care testing during a time sensitive period and committed youth fall outside of this time sensitive window due to having longer dispositions (sentences) than arrested or detained youth. This study will require 195 participants per arm, with a sample size of 390 participants total, to power the study appropriately. This sample size calculation was done assuming that approximately 10% of juveniles will test positive for STIs using standard screening, which is the percentage estimated in existing literature when standard screening methods are used.[35] It also assumes that approximately 20% will test positive using rapid screening, which is consistent with data published by studies using rapid screening and same day treatment on justice-involved youth.[57,59,60]

Study Variables and Measures

Demographic information will be collected from participants including age, sex, race, and ethnicity. Health information will also be collected from participants, including the last time they were tested for chlamydia or gonorrhea and the last time they received treatment for either chlamydia, gonorrhea, or both. The first outcome that is being measured in this study is the infection rate for chlamydia, gonorrhea, and co-infections of chlamydia and gonorrhea. The second outcome that is being measured is the treatment rate for chlamydia, gonorrhea, or co-infections of the two. The third outcome being measured is the percentage of participants who leave DYS custody after they test positive

for chlamydia or gonorrhea but before they receive treatment. The data from the rapid testing sites will be collected and compared to data from the standard testing sites.

Intervention

The intervention being applied in the study is the use of point-of-care rapid STI testing during the intake process for juvenile offenders in DYS custody. This intervention will be applied to half of the participating DYS sites which will be randomly selected, and standard nucleic acid amplification testing (NAAT) for STIs will be used for the remaining half of the participating DYS sites. Rapid point-of-care testing is being used at the intervention sites in lieu of NAAT, which can take days to yield results, because the goal of the study is to provide an effective intervention that screens and treats STIs in a short window of time. The testing will be performed during the intake process on all youth arrested or detained at both sites since this allows for the greatest number of youth to be screened. Opt-out testing will be used instead of opt-in testing for both groups since some literature shows that if left to the choice of youth, 50% of them do not elect to get tested for various reasons.[59] Giving them the option to opt-out of testing, but making testing the standard protocol, will ensure that the greatest number of juveniles are screened at both sites. Participants will be given the choice of providing samples either via urine or self-swab, and if they elect to self-swab, they will be instructed on how to properly collect a self-swab by test administrators. The rapid point-of-care testing allows participants to know their STI status within hours of being booked, so they can receive

treatment quickly before they return to the community from DYS custody. The standard STI testing yields results in 2-7 days depending on lab turnover times.

Recruitment and Data Collection

Participants will be recruited when they arrive at a DYS facility and undergo the booking and intake process during their transition into DYS custody by DYS employees overseeing the intake and booking process. Informed consent will also be obtained from all participants by DYS employees overseeing the intake and booking process. Even though some participants are not legal adults, according to Massachusetts law, minors can consent to STI testing and treatment. Opt-out testing will be offered to all juveniles being processed, which we hope will maximize the number of juveniles receiving screening. Participants will be instructed to either provide a urine sample or a self-collected swab to medical staff during intake. They will receive verbal instructions with illustrated examples by medical staff for how to properly perform self -swabs and urine collections. Participants will also provide health information to researchers including the last time they were tested for chlamydia or gonorrhea, where they were last tested, and when they last received treatment for either chlamydia, gonorrhea, or both. Participants who are still in DYS custody when they receive their positive results via rapid testing will be treated at the facility by on-site medical staff. Data that will be collected by research staff includes rapid test results for each participant and whether participants received treatment for the infection(s) they tested positive for. The number of participants leaving the facility without being tested will also be reported, as well as the number of participants leaving

the facility who tested positive but were not treated. Those who leave the facility before being treated for their STI will receive treatment through the standard DYS protocol already in place, but this data will not be reported in our study.

Data Analysis

The collected data will be analyzed using SPSS, a statistical software. The data will be dichotomous. Descriptive statistics will be used to compare demographics of the standard vs rapid testing groups. When comparing the two groups (standard testing and treatment vs rapid testing and treatment), a Chi-square test will be used, with the primary outcomes being rate of STIs detected and rate of juveniles treated for STI before release from detention. Secondary analyses may be performed via logistic regression to adjust STI detection and treatment rates by demographic variables and may identify possible confounders.

Timeline and Resources

In total, it is anticipated that this study will be conducted over a period of 18 months. Institutional Review Board (IRB) approval for this project is expected to be obtained in 2 months, since this is the average time for full board approval. The groundwork at different DYS sites, which includes screening and treating participants, is anticipated to last around 14 months. Data analysis is anticipated to last around 2 months. Overall, three investigators are needed and each will oversee data collection at two DYS sites. Participation is also required from DYS correctional staff and DYS medical staff.

At least one correctional officer at each location will be performing the booking process where the tests will be administered. A nurse will be required at each DYS site to oversee and provide instruction on self swabs, as well as to administer medications to those who test positive. Two staticians will be required to run analysis for the data collected.

Institutional Review Board

This project will be submitted for a Full Board review by the IRB since this research involves both minors and individuals involved with the justice system, both of which are vulnerable populations.

CONCLUSION

Discussion

Justice-involved youth have higher STI rates than their same-age counterparts due to a multitude of social determinants of health previously discussed in this essay . [16, 39-43] Previous literature has suggested using detention facilities to provide preventative health services to arrested youth who may not otherwise encounter these services within their communities.[29, 35] However, when arrested, these youth are often released into the community quickly afterwards, making their contact with detention facilities brief.[8, 58] Although STI testing efforts already exist for youth who are detained or arrested, no studies have been done which compare the efficacy of standard and rapid testing in identifying and treating STIs in justice-involved youth. The purpose of this study is to explore the use of juvenile detention facilities as an avenue to provide rapid STI testing for detained youth to improve screening and treatment rates with the hope that rapid testing will yield STI results while youth are still detained and can receive appropriate treatment in a timely manner. However, this study has some limitations.

The first limitation is that the DYS facilities that will be utilized for the study serve different geographic areas of the state. Therefore, some facilities may have higher rates of arrests than others since they are in more populated areas or areas where juvenile crimes are more prevalent. Some facilities may also have more diverse participants than other facilities given their proximity to urban or rural areas. Lastly, some facilities may have participants which have greater barriers to access healthcare than others due to their geographic location (i.e rural areas where health resources are typically more scarce than

urban areas), which may interfere with positivity rates and treatment rates between facilities.

Another limitation of the study is that it utilizes opt-out testing. The use of opt-out testing may create selection bias, since juveniles who opt out of testing at the facility may be less likely to test for STIs in general and, therefore, may be a missed group of positive results. A third limitation of the study is that it does not follow detained juveniles who are released into the community before receiving their positive results and appropriate therapy. Following these juveniles after release to see how long it takes for them to receive appropriate treatment for their STIs in their own community should be considered for future studies, because it may highlight other opportunities for intervention to make sure all juveniles testing positive are receiving appropriate treatment for their infections.

Summary

As STI rates continue to rise in the country, these infections are becoming more prevalent within the adolescent population. Justice-involved youth have higher STI rates than their same-age counterparts and many face barriers to healthcare access which limit the testing and treatment they receive. These juveniles receive some state-mandated healthcare through the detention facilities where they are held but many are released into the community before they have this opportunity. The CDC recommends screening all arrested individuals for STIs using opt-out testing, since they have high infection rates. Some published literature also recommends using detention facilities as an avenue to provide health services, particularly sexual reproductive health services, to detained

youth while they are in custody or after they are released. Literature has been published which explores the prevalence of STIs among arrested youth as well as the rate at which they are treated by detention facilities. However, no research has been published comparing the use of rapid to standard STI testing to improve testing and treatment rates in detained juveniles. This study aims to explore whether the use of rapid testing in juvenile detention facilities will increase the number of juveniles aware of their positive STI status and improve treatment rates of these STIs.

Public Health Significance

Using detention facilities as a point of medical intervention for detained youth who may not have regular access to healthcare is a concept that has been explored in past literature. Since there is a national effort to reduce incarceration rates for juveniles, youth often have brief encounters with these facilities when they are detained before they are released back into the community. Since encounters with facilities are brief, the window of time to provide an appropriate intervention is short. The proposed study is unique because it will investigate the use of rapid STI tests to improve treatment rates among detained youth at these facilities. STIs occur more among justice-involved youth than their same aged counterparts and they have devastating health sequelae which can interfere with reproductive capabilities. Finding a way to effectively test and treat justice-involved youth in the short window of time they are detained may improve reproductive health outcomes for this population by reducing the incidence of PID and the detrimental sequelae that follow. It may also reduce transmission of STIs within the juveniles' local

communities by allowing them to leave these facilities knowing their STI status and getting treated. Lastly, it may inspire the use of these detention facilities to provide other brief and beneficial medical interventions to this population.

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