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doi: <https://doi.org/10.57709/14421940>

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Gonorrhea Screening Among U.S.- Bound Immigrants and Refugees, 2018

By

Kiara Roxas Butler

April 18, 2019

INTRODUCTION: Gonorrhea is the second most commonly reported notifiable disease in the United States, with approximately 820,000 cases reported in the U.S. each year. Since 2009, the rate of reported gonorrhea has increased in the U.S. population among non-foreign born persons. All immigrants and refugees applying for U.S. residency are required to undergo an overseas medical exam that requires screening for various conditions, including gonorrhea. CDC provides the guidelines for medical exam performed by panel physicians overseas.

OBJECTIVE: To describe the characteristics of gonorrhea in U.S.- bound immigrants and refugees and to evaluate compliance with CDC's *Technical Instructions for Gonorrhea for Panel Physicians*. Recommendations may be made to help inform any programmatic approaches in addressing STI screening and treatment for U.S.- bound immigrants and refugees.

METHODS: We used data from the CDC's Electronic Disease Notification (EDN) System. The study population includes all immigrants and refugees that arrived in the U.S. during 2018 that were screened by overseas panel physicians. All immigrants and refugees included in this analysis are ≥ 15 years old. The proportion of gonorrhea screening tests, positive test results, gonorrhea treatment, and proportion of gonorrhea screening among U.S. panel physician exam sites were calculated.

RESULTS: A total of 37,179 U.S. - bound immigrants and refugees were entered into CDC's EDN database in 2018. 27,284 (73%) were screened for gonorrhea. 25,799 (94%) of those who reported having a gonorrhea test were screened using a NAAT or PCR test. Among those screened, 163 (0.6%) tested positive for gonorrhea. Thirty-two (20%) of these positive cases were not documented as treated according to CDC's *Technical Instructions* and *STD Treatment Guidelines*.

DISCUSSION: Preliminary results of this analysis indicate that there is overall compliance with the current *Technical Instructions for Gonorrhea*. However, because the data were limited to only those entered into CDC's EDN database the results of this analysis are not representative of all U.S. - bound immigrants. This analysis may provide a preliminary justification for reassessing recommendations outlines by CDC's *Technical Instructions*; however, additional years of data collection and investigation will be required before any programmatic decisions can be made.

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Kiara Roxas Butler

B.S.H.P, University of Georgia

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment

of the

Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA

30303

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By

Kiara Roxas Butler

Approved:

Richard Rothenberg, MD, MPH

Committee Chair

Michelle Hollberg, MPH

Committee Member

Deborah Lee, MPH

Committee Member

April 18, 2019

Author's Statement

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Kiara Roxas Butler
Signature of Author

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Chapter I Introduction

Background

Sexually Transmitted Infections

Sexually transmitted infections (STI) are defined as infections that are passed through sexual contact between persons and can be caused by viruses, bacteria, or parasites. The World Health Organization (WHO) reports that more than 1 million STIs are acquired every day; they estimate that each year there are approximately 357 million new infections, with 78 million of those being attributed to gonorrhea [1, 2]. Currently, the United States is experiencing an increase in STI incidence. Since 2009, the rate of reported gonorrhea has increased by 75% [3]. STIs are very easily preventable but when left untreated they can lead to infertility, perinatal morbidity and mortality, and other diseases and complications.

Gonorrhea

According to the Centers for Disease Control and Prevention (CDC), gonorrhea is the second most commonly reported notifiable disease, with almost 820,000 new infections occurring every year within the United States [4]. Gonorrhea is caused by the bacterium *Neisseria gonorrhoeae*, and is generally transmitted via sexual contact or passed from mother to child. Gonorrhea is often asymptomatic, but generally infects the mucous membranes of the reproductive system in both men and women and can be characterized by unusual discharge or painful urination [4].

When untreated, gonorrhea can result in complications among men and women. In men, untreated gonorrhea may lead to epididymitis. In women it can cause pelvic inflammatory disease (PID), which can lead to abdominal and pelvic pain, fever, and, in some cases, infertility[4]. In addition to these conditions, gonorrhea can also spread through the blood stream and result in disseminated gonococcal infection (DGI) which is a condition that generally is characterized by both arthritis and dermatitis[4, 5].

Gonorrhea and STIs in mobile populations

While immigrants and refugees are generally healthy prior to resettling in a new location, mobile populations do experience a higher risk of disease [1, 6]. Factors contributing to this increased risk of disease in mobile populations may include inadequate or overcrowded living conditions and little or no access to health care. Sexual violence and exploitation is also very prevalent among mobile populations

and could contribute to the higher risk of STI transmission, particularly among women and children in these populations [6].

Gonorrhea remains one of the most common STIs on a global scale. The World Health Organization (WHO) has reported that the global prevalence and incidence rates of sexually transmitted infections have been increasing steadily in all regions. As of 2012, the highest prevalence and incidence rates of gonorrhea are found in the Western Pacific, followed closely by Africa and the Americas and then the Eastern Mediterranean [2, 7].

CDC's Regulatory Authority and Technical Instructions

Within the CDC the Division of Global Migration and Quarantine (DGMQ) works to reduce the overall morbidity and mortality of immigrants, refugees, and other mobile populations immigrating to the United States. One of DGMQ's roles in reducing morbidity and mortality is to oversee the medical screenings of U.S bound immigrants and refugees prior to resettlement, under the regulatory authority of the Immigration and Nationality Act (8 US Code 1522).

CDC/DGMQ provides the exam requirements, referred to as the *Technical Instructions*, which must be followed by the physicians who perform the medical exams overseas, also known as 'panel physicians'. U.S. panel physicians are medically trained, licensed, and experienced medical doctors who are appointed by the local U.S. embassy or consulate to conduct the medical exams of immigrants and refugees who are applying for permanent U.S. residency [8]. Historically, screening for gonorrhea was based primarily on a physical examination, during which the physician assessed applicants for signs and symptoms consistent with gonorrhea. However, in 2016, a requirement for laboratory testing to confirm a gonorrhea diagnosis was added to the *Technical Instructions*. The initial laboratory requirement gave panel physicians the option to perform a culture test or a nucleic acid amplification test (NAAT) to satisfy the screening requirement. In 2017, CDC/DGMQ updated the *Technical Instructions* to a NAAT only testing algorithm and discontinued culture-based testing due to the low sensitivity and specificity culture testing, as well as the invasive nature of sample collection.

Applicants who are diagnosed with gonorrhea during the overseas medical exam must be treated according to CDC's 2015 *Sexually Transmitted Diseases Treatment Guidelines* before their medical report can be completed and cleared by the panel physician [9]. Treatment for gonorrhea is directly observed, and often sex partners of applicants must be treated as well. In order to combat antimicrobial resistance,

CDC recommends a dual therapy of ceftriaxone and azithromycin as the most effective treatment for gonorrhea infections [10].

Purpose and Objectives

The purpose of this study is to describe the characteristics of gonorrhea in U.S. - bound immigrants and refugees, as well as to aid in the assessment of CDC's *Technical Instructions for Gonorrhea*. The primary research question that is addressed is whether U.S. - bound immigrants and refugees are being screened and treated for gonorrhea in compliance with the recently updated *Technical Instructions*. Data from CDC's Electronic Disease Notification System (EDN) was analyzed to determine which panel physician exam sites are performing gonorrhea screening according to CDC's *Technical Instructions*. Once the proportion of gonorrhea screening is determined, the proportion of those with positive test results will be identified. Of the positive gonorrhea cases, the proportion of those who were treated according to the *Technical Instructions* and CDC's *STD Treatment Guidelines* will be determined. In describing the countries that are not performing gonorrhea screening and treatment according to CDC's *Technical Instructions* and *STD Treatment Guidelines*, recommendations may be made to help inform programmatic approaches in addressing STI screening and treatment for U.S. bound immigrants and refugees.

Chapter II - Literature Review

STIs/Gonorrhea in Immigrants and Refugees

There are few studies that focus on sexually transmitted infections among immigrants and refugees. Generally, these studies report a low prevalence of STIs among both groups. There have been a few studies published regarding gonorrhea prevalence among Vietnamese refugees in Thailand, dating back to the early 1980s. In a Morbidity and Mortality Weekly Report (MMWR) from 1981, they described a population of Vietnamese refugee women in Thai refugee camps. All of the women tested were victims of sexual violence, and of the 138 culture specimens obtained from this group, 18 found to be positive for gonorrhea [11]. At the time of this report there were 1,100 cases of penicillin resistant gonorrhea in the U.S. and only three were reported from refugees [11, 12].

A cross-sectional study conducted by Mateelli et al. examined travel as a risk factor for sexually transmitted infections. Data were gathered from various clinics worldwide during the years 1996 and 2010, and participants were separated into three groups: those who went to a clinic after travel, those who went to a clinic during travel and those who were travelling for immigration. Gonorrhea was included among the STIs this analysis. Prevalence of gonorrhea was low among those in the immigration travel group (n=2; 1.24%) [13]. Immigrants who visited these clinics within the first 6 months were more likely to be diagnosed with an STI than those who visited after being in a country for a longer period of time. Likewise, immigrants from Sub-Saharan Africa (OR=2.48), North Africa (OR=3.26), Eastern Europe (OR=2.80), and Oceania (OR = 7.18) had a higher likelihood of being diagnosed with an STI [13]. Among the other two groups, factors that contributed to STIs among travels included longer travel duration, traveling for business, visiting friends or family, and being male, but overall the authors note that diagnosis of sexually transmitted infections varies greatly among all groups.

Stauffer et al. performed a descriptive study which assessed refugees arriving in Minnesota who were screened for STIs after arrival in the United States. This study may be the only other report of gonorrhea prevalence among U.S bound refugees. In the study, 18,516 refugees were screened for at least one STI, with 2,403 (12.98%) of those being gonorrhea screenings. Stauffer et al. reports that of those, only 5 (0.2%) were positive for gonorrhea [14]. It is noted in this study that the prevalence of asymptomatic patients may not have been determined because symptoms were not reported during the medical exam. Additionally the low prevalence of gonorrhea among refugees may result from refugees receiving antibiotics for other conditions that could also be effective in treating gonorrhea [14].

Laboratory Methods for Gonorrhea Screening

There are several types of diagnostic tests used for detecting gonorrhea. Historically, gonorrhea tests have involved performing a culture test to detect gonorrhea in patients, but more recently non-culture tests, specifically nucleic acid amplification tests (NAAT), are preferred for diagnosis. In culture testing, a sample is taken from a swab of the urethra, cervix, vagina, or rectum and then cultured to determine if the bacteria that causes gonorrhea grows within the sample. Gram stains are also utilized in gonorrhea screening. While they have a high specificity and sensitivity with male urethral samples, gram stains are not recommended as the primary diagnostic test for women [15]. Nucleic acid tests are used to target specific nucleic acid sequences in test samples to aid in the diagnosis of certain infections, and are preferred because of their higher sensitivity and specificity compared to culture tests [15].

A study done by Serra-Pladevall et al. analyzed 768 specimens from individuals with potential gonococcal infection in order to determine the sensitivity, specificity, and positive and negative predictive values (PPV and NPV) of conventional culture tests and NAATs. True positives were defined as culture positive for gonorrhea or when gonorrhea was identified by two NAAT methods. They identified 129 positives, three culture positive/PCR-negative, 21 PCR-positive/culture negative, and 615 cases that were negative for both culture and NAAT. The study found that that both the culture and NAAT had a high specificity, PPV, and NPV. In comparison, the culture test had a sensitivity of 86% while the NAAT had a sensitivity of 99%% [16].

In another study by Bachmann et al., 961 specimens were collected to determine whether culture tests were effective in diagnosing oropharyngeal gonorrhea infection. Researchers in the study compared the sensitivity and specificity of gonorrhea cultures with the sensitivity and specificity of three different NAAT methods. Specimens were divided into a group where two of the three comparator tests were positive and a group where all three of the comparator tests were positive. The culture test had a sensitivity of 50% and 65% in the second group, which was lower than the sensitivities of the other testing methods described in this paper. The PCR test had lower specificity of 73% in the first group and 72% in the second group, which were lower than the other testing methods [17]. The NAAT tests that were examined in this study proved to be the best for gonorrhea diagnosis because of its consistently high sensitivity and specificity. The highest sensitivities for the NAAT method were 93% in the first group and 100% in the second group; this is due to the NAAT method being able to target specific genetic markers [17]. A similar study was performed by the same researchers to examine the use of NAAT

methods in diagnosing rectal gonorrhea infections, which yielded similar results in regards to culture tests having low sensitivity [18].

Gonorrhea Treatment

Neisseria gonorrhoeae has been found to be resistant to nearly all types of antimicrobial treatments, this is due to the bacteria's ability to rapidly alter its genetic material to adapt to changes in its environment [19, 20]. This made it difficult to develop adequate treatment guidelines over time. In 1986, the Gonococcal Isolate Surveillance Project (GISP) was implemented to monitor antimicrobial susceptibility in gonococcal infections within the U.S. A GISP report summarized the changes in antimicrobial susceptibility of the different drugs previously used to treat gonorrhea infections. A total of 5,093 isolates were collected for this report, and of these 25.3% were resistant to tetracycline, 19% to ciprofloxacin, and 16% were resistant to penicillin. The prevalence of cefixime and ceftriaxone susceptibility in this study was relatively low (0.4% and 0.1% respectively) [21].

Starting in the mid-1980s fluoroquinolone antibiotics (ciprofloxacin and ofloxacin) were the most widely used antibiotics in treating gonorrhea [19]. Oral quinolone antibiotics were generally cheaper than other antibiotics which made them more accessible, especially in areas where gonorrhea is most prevalent [22]. However, because of the bacteria's ability to adapt so quickly the concern of quinolone resistance became more common. By 2006, quinolone resistant gonorrhea reached WHO and CDC's threshold for the prevalence of resistant strains which resulted in the removal of oral quinolones as the primary treatment method for gonococcal infections [20, 23]. As of 2007, cephalosporin drugs (ceftriaxone or cefixime) are the last class of antibiotics that are effective in treating gonorrhea [10, 24]. As a result, current CDC gonorrhea treatment guidelines recommend a dual therapy of ceftriaxone and azithromycin as the most effective treatment for gonorrhea infections in order to try to combat antimicrobial resistance; likewise, azithromycin is recommended in dual therapy because coinfection with *Chlamydia trachomatis* is common and azithromycin is an accepted treatment for chlamydia [10]. A dose of cefixime is in some cases accepted as a treatment for gonorrhea, but CDC does not recommend this as a primary treatment because treatment failure with Cefixime has been seen in Asia, Europe, South Africa and Canada [10, 25]. The efficacy of the treatment is also dependent on the type of gonococcal infection.

Because the prevalence of cephalosporin resistant strains of gonorrhea is not common, it is important that CDC's treatment guidelines are followed. The adherence to CDC's treatment recommendations was summarized in a report by Weston et al. This report summarized data collected

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from clinics participating in CDC's STD Surveillance Network and found that 81% of 91,719 gonorrhea cases had received the recommended dual therapy of ceftriaxone and azithromycin [26]. Currently there is no data in the scientific literature regarding these treatments among mobile populations immigrating to the United States.

Chapter III - Methods

Data Source/Collection

The data used in this study comes from the CDC's Electronic Disease Notification System (EDN). EDN is a database that collects information from the overseas medical exam of refugees and immigrants after entry into the United States. Within the EDN system, the primary information that is collected is whether an individual has a Class A or Class B public health condition; Class A is defined as a condition that is inadmissible under immigration law and requires a waiver for entry into the U.S. while Class B conditions are those that are admissible but require further follow-up after arrival in the U.S., which may include treatment [27]. For those arriving with an immigrant visa, only those with Class A or Class B conditions are entered into EDN. For refugee arrivals, the transmission of data occurs via an electronic database managed by the International Organization for Migration (IOM) and is not dependent on manual entry of data collected at the U.S. ports of entry. As a result, EDN contains data for all medical exams performed on refugees and includes all exam findings, regardless of TB classification. Other information collected by EDN includes demographic information, data on screening procedures, and data on treatment of Class A conditions that are inadmissible until treated to cure.

U.S panel physician exam site information was determined using the CDC's Immigrant, Refugee, and Migrant Health (IRMH) Branch's database of panel physicians and panel exam sites. This database is used to keep track of any additions or removals of panel physicians that are approved by the Department of State to perform the overseas medical exams. The database is dynamic, as the status of approved sites changes frequently; therefore, the panel sites reported in EDN over time may be different from the current roster of approved and active panel sites.

Study Population and Variables of Interest

All panel exam sites that screened immigrants and refugees who arrived in the United States between January 1, 2018 and December 31, 2018 were included in the analysis. The immigrants and refugees screened during this time period were 15 years of age or older, per CDC's screening requirements. Immigrants are defined as those who are not citizens of the United States, but live in the U.S. under legally recognized and lawfully permanent residence [27]. Refugees are defined as persons unable or unwilling to return to their country of nationality because of persecution or fear of persecution [27].

Demographic characteristics included age group, sex, visa type, exam country, and exam region. Age was calculated using the medical exam date and date of birth. Once age was calculated, age groups were defined based on the WHO standards for age classification (15-24, 25-44, 45-64, and 65+). Those younger than 15 years of age were excluded because CDC's *Technical Instructions* for gonorrhea do not require applicants <15 years of age to be screened for gonorrhea. Exam region was defined by the U.S. Department of State as Africa, East Asia and the Pacific, Europe and Eurasia, Near East, South and Central Asia, and the Western Hemisphere. Panel physicians are trained and licensed medical doctors who are approved by the U.S. Department of State's consular sections to perform the immigration medical exam for immigrant and refugee visa applicants [8]. Panel sites are defined as the clinics at which panel physicians performed the medical exams. Panel sites were reported based on region and the population that are typically screened. Only panel sites that had data entered into the EDN system were included in this analysis. U.S. panel sites conducting gonorrhea screening was considered "yes" if at least one applicant indicated having a gonorrhea-specific test at that site.

Variables for disease characteristic are based on the Department of State (DS) forms that are entered into the EDN system. The indicator that gonorrhea screening was performed by the panel physician was based on records where test name and screening results were documented on the DS-form under the 'Gonorrhea Laboratory Results and Testing' section. Gonorrhea screening tests were grouped into "PCR/NAAT," "Culture," "Unspecified Test," and "Missing" categories. A case of gonorrhea was defined as an applicant who had a current positive screening test at the time of the medical exam. Treatment status was based on whether the record showed treatment of a positive case that is consistent with CDC's *Technical Instructions* and *2015 STI Treatment Guidelines*, a dual therapy of ceftriaxone and azithromycin. A self-reported medical history of prior gonorrhea infection and treatment were also included in the analysis.

Data Analysis

All data analysis was conducted using SAS 9.4. Names of panel sites and exam countries were reviewed to determine the regions reported within the dataset. Panel sites in EDN were compared to panel sites in CDC/IRMH's Panel Physician database to determine the proportion of panel sites entered in both databases, as well as the proportion that are performing gonorrhea screening. Gonorrhea test methods and treatment regimens were reviewed to confirm consistency with CDC's *Technical Instructions*.

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The proportion of immigrants and refugees who had gonorrhea screening documented by the panel physician was determined by dividing the number of screening tests reported by the total number of medical exams recorded in EDN for each population (immigrants vs. refugees), arriving in the U.S. from January 1, to December 31, 2018. The proportion of positive screening results was determined by dividing the number of those with a positive screening test by the total number of those screened for gonorrhea, for both country and region of medical exam. The proportion of reported gonorrhea screening was determined by dividing the number of panel sites that reported gonorrhea screening by the total number of panel sites entered in EDN in 2018.

Chapter IV - Results

From January 1, 2018 to December 31, 2018, the total number of U.S.-bound persons, aged 15 years or older who were entered into CDC's EDN database, was 37,179; 18,459 (49.6%) were immigrants, and 18,720 (50.4%) were refugees. This number does not include all immigrant arrivals into the United States during 2018; only immigrants with a notifiable condition are entered into the EDN database. However, EDN does capture all refugees resettling in the U.S., regardless of whether a health condition was identified during the overseas medical exam. The majority of those with EDN records were from East Asia/Pacific (37%), followed by Africa (23%), and South/Central Asia (15%). Within this population, 27,284 (74%) had screening results for gonorrhea that were documented by the panel physician, suggesting that 26% of migrants were not screened according to CDC requirements. Ninety-four percent (n=25,799) of gonorrhea screenings reported in EDN during 2018 were conducted using a NAAT or PCR test, 39 (0.1%) were performed using a culture test, and 1,199 (4%) of the records indicated a screening test was performed but did not indicate a specific test method. Among those who received a gonorrhea screening test, 163 (0.6%) tested positive for current gonorrhea infection (*Figure 1, Table 1*).

Of the 163 gonorrhea cases, 96 (59%) were women and 106 (65%) were immigrants. Eighty cases (49%) were from the African region, followed by 47 (29%) cases reported in the East Asia/Pacific Region (*Table 2*). Only 8 (3%) of positive cases indicated a previous history of gonorrhea infection; of these cases only five indicated a history of treatment. Among the 163 total positive cases, 131 (80%) received a dual therapy treatment of ceftriaxone and azithromycin, per CDC's *Technical instructions* and *STD treatment guidelines*. Seven records indicated a dual therapy of cefixime and azithromycin. Although not recommended as a primary drug for gonorrhea treatment, cefixime is an accepted alternative for ceftriaxone in some instances, so these two records were included in the 131 cases that were treated according to CDC *Technical Instructions* and *STD Treatment Guidelines*. Thirty-two (20%) of the positive cases were reported as not receiving a treatment regimen according to the *Technical Instructions* and *STD Treatment Guidelines*; seven (5%) received a treatment other than dual therapy of ceftriaxone and azithromycin, and the remaining 25 (19%) indicated no treatment.

At the time the analysis was performed, a total of 401 panel sites were recorded in IRMH's panel physician database; of these panel sites 308 (77%) were also recorded in the EDN system. Of the panel sites included in both the IRMH and EDN databases, 42% of screened only immigrants only, 17% screened refugees only, and 35% screened applicants from both populations (*Figure 2*). Of the panel sites entered in EDN, 255 (83%) reported conducting any gonorrhea screening. North Africa/Middle East had the

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highest proportion of reported gonorrhea screenings (n=25, 93%), followed by East Asia/Pacific panel (n=48, 91%). The Western Hemisphere had the lowest proportion, with 48 (69%) of their panel sites reporting gonorrhea screening (*Table 3*).

Chapter V - Discussion

Discussion and Limitations

Based on this analysis, there is overall compliance with the current *Technical Instructions* by panel physicians who are performing the overseas medical exams for immigrant and refugee applicants; however, there are several limitations associated with the EDN dataset. Of all the applicants who were screened for gonorrhea, most were screened with a NAAT or PCR test; however, the type of gonorrhea testing was not reported consistently among each panel site. Tests were grouped as “PCR/NAAT”, “Culture”, “Unspecified Test”, and “Missing”. While this analysis was conducted to look at compliance with CDC’s *Technical Instructions*, which specifically identify NAAT tests as the required screening method, some of the test names could only be identified as PCR tests. Tests that were considered “Unspecified” were those that indicated some form of a screening test was performed, but no identifying name was provided.

An overall gonorrhea prevalence of 0.6% was found among immigrants and refugees entered into the EDN system (0.8% among immigrants and 0.4% among refugees). Compared to other conditions reported among these populations, the overall prevalence of gonorrhea is very low. Although the literature on gonorrhea among these populations is limited, these findings are consistent with other studies [13, 14]. Overall, there is low risk of gonorrhea transmission from immigrants and refugees entering the U.S. Of those with positive test results, 32 (20%) were found to be untreated. Seven (5%) were treated with medications not consistent with CDC’s *STD Treatment Guidelines* and 25 (19%) did not indicate any drug therapy. Further investigation of these 25 cases was conducted to determine if there were any data entry errors; however, it was found that these cases were in fact untreated. Follow up with panel physicians on these cases is recommended to determine the reasoning for or factors behind lack of treatment.

Another limitation of this analysis is that the EDN system contains the records of all refugees who entered the U.S. in 2018; however, for immigrant applicants, EDN only collects those with a Class A or B medical condition. Therefore, EDN data is not be representative of the entire population of U.S. bound immigrants and incidence cannot be determined because the true number of immigrants entering the U.S is not available in EDN. We were also unable to determine the true number of panel sites that are complying with CDC’s new gonorrhea requirements because only those sites that screened applicants

with notifiable conditions are entered into EDN. Therefore, our estimate of the proportion of 'immigrant only' sites conducting screening according to CDC's *Technical Instructions* may be an underestimate.

Recommendations

Some recommendations can be made to address the findings of this analysis. The primary research question in this study was to determine if panel physicians are following the screening and treatment requirements in CDC's recently updated *Technical Instructions for Gonorrhea*. Although most of the immigrants and refugees EDN were screened for gonorrhea, there is a small number that do not report screening data. We identified 52 panel sites that were entered into EDN that did not report screening data. Further follow up with these sites is recommended in order to determine why screening was either not reported or not performed. To address the number of unspecified gonorrhea testing methods and missing data, CDC/DGMQ should implement a plan for additional training and guidance for sites that may not be complying with CDC's *Technical Instructions for Gonorrhea*.

Preliminary analysis of this dataset found 181 positive cases reported in EDN; however, additional investigation and manual record review found that 18 of these cases were the result of data entry errors, resulting in a revised total of 163 positive cases within this cohort. 181 is a relatively small number of records to examine for data entry errors, it would be significantly more challenging to perform a similar review for more prevalent conditions, such as Tuberculosis. To address this, CDC/DGMQ would benefit from transitioning to a paperless, electronic system of collecting data for the immigrant and refugee medical exam.

Conclusion

The results of this analysis are consistent with previous studies regarding gonorrhea prevalence in immigrants and refugees, and these populations present a very low risk on the overall burden of gonorrhea in the United States. Because of this low risk, the removal of gonorrhea screening as a requirement in the overseas medical exam may be considered. This analysis is the first attempt to describe gonorrhea screening and treatment in immigrants and refugees based on the updated *Technical Instructions*. This may provide a preliminary justification for reassessing the screening requirement outlines be the *Technical Instructions*; however, one year of data collection may not be inclusive enough to make any long-term, evidence-based policy decisions concerning screening of immigrants and refugees for gonorrhea.

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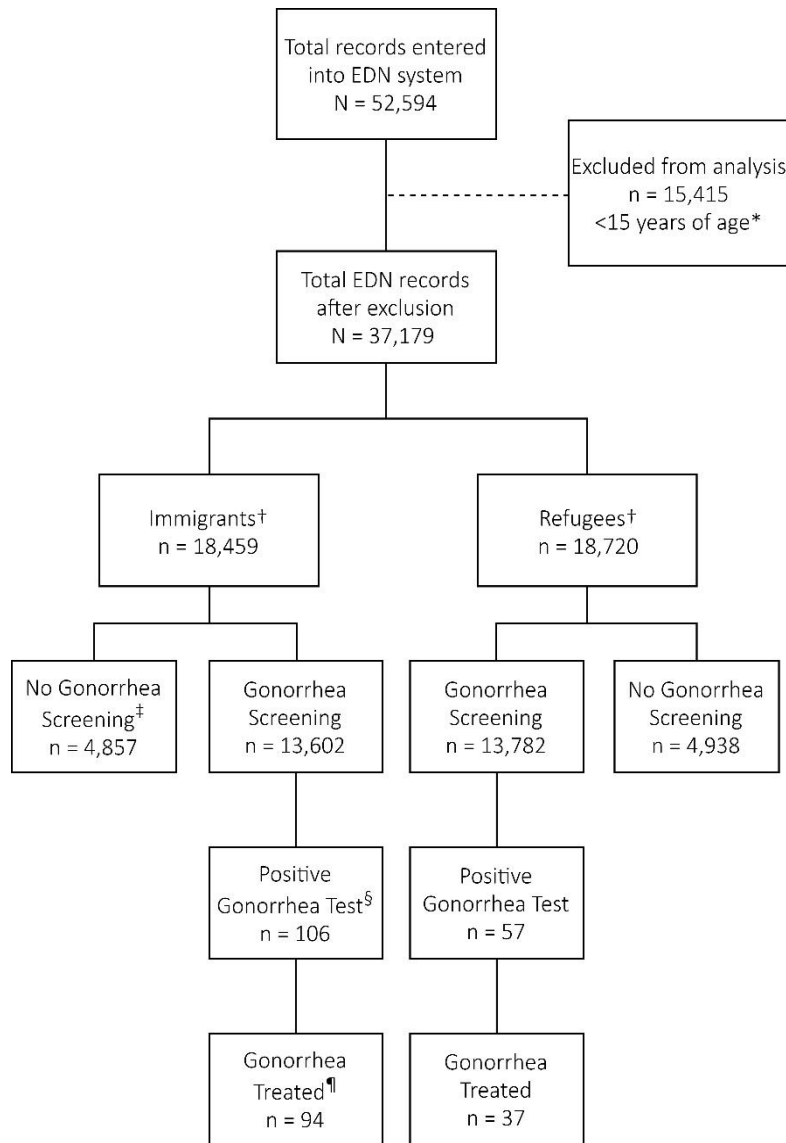


Figure 1. Flow chart of those included and excluded in analysis, 2018

* <15 age group excluded because those <15 years of age are not required have gonorrhea screening

† Immigrants defined as those who are not citizens of the United States, but live in the U.S. under legally recognized and lawfully permanent residence. Refugees are defined as persons unable or unwilling to return to their country of nationality because of persecution or fear of persecution

‡ No gonorrhea screening represents data that was missing or not entered

§ Positive gonorrhea screening defined as any positive gonorrhea test result. Gonorrhea tests were defined in this analysis as NAAT, PCR, culture tests, and tests with indeterminate test names

¶ Gonorrhea treated defined as those who were treated according to CDC *Technical Instructions*

Gonorrhea Screening Among U.S.- Bound Immigrants and Refugees, 2018

Table 1. Characteristics of immigrants and refugees who arrived in the U.S. from Jan. 1, 2018 - Dec. 31, 2018*			
	Immigrants	Refugees	Total
Total EDN Records	18,459 (49.6%)	18,720 (50.4 %)	37,179 (%)
Demographics			
Sex			
Female	9,857 (53.4)	9,303 (49.7)	19,160 (51.5)
Male	8,602 (46.6)	9,417 (50.3)	18,019 (48.5)
Age Group			
15-24	1,338 (7.3)	6,509 (34.8)	7,847 (21.1)
25-44	4,564 (24.7)	8,843 (47.2)	13,407 (36.1)
45-64	7,692 (41.7)	2,772 (14.8)	10,464 (28.1)
65+	4,865 (26.4)	596 (3.2)	5,461 (14.7)
Region [†]			
East Asia/Pacific	10,392 (56.3)	3,311 (17.7)	13,703 (36.9)
Africa	1,343 (7.3)	7,131 (38.1)	8,474 (22.8)
South/Central Asia	1,489 (8.1)	3,911 (20.9)	5,400 (14.5)
Western Hemisphere	4,070 (22.1)	949 (5.1)	5,019 (13.5)
Europe/Eurasia	1,047 (5.7)	2,746 (14.7)	3,793 (10.2)
North Africa/Middle East	118 (0.6)	672 (3.6)	790 (2.1)
Gonorrhea Measures			
DS Form Classification [‡]			
Class A	0 (0)	0 (0)	0 (0)
Class B			
Yes	128 (0.7)	55 (0.3)	183 (0.49)
No	18,250 (99.3)	18,600 (99.4)	38,850 (99.5)
Other Class B	81 (0.4)	65 (0.4)	146 (0.4)
Previous History of Gonorrhea [§]			
Yes	103 (99.4)	21 (99.9)	124 (0.3)
No	18,176 (0.6)	18,629 (0.1)	36,805 (99.7)
Missing ^{††}	180 (1.0)	70 (0.4)	250 (0.7)
Previous Treatment of Gonorrhea [¶]			
Yes	35 (0.2)	15 (0.1)	50 (0.1)
No	18,424 (99.8)	18,705 (99.9)	37,129 (99.9)
Gonorrhea Test Performed			
Yes	13,602 (73.7)	13,782 (73.6)	27,384 (73.7)
No screening data ^{††}	4,857 (26.3)	4,938 (26.4)	9,795 (26.3)
Total Gonorrhea Screening	13,602 (49.7)	13,782 (50.3)	27,384 (%)
Gonorrhea Test Type			
PCR/NAAT ^{**}	12,645 (93.0)	13,154 (95.4)	25,799 (94.2)
Culture	10 (0.1)	29 (0.2)	39 (0.1)
Unspecified Test ^{††}	934 (6.9)	265 (1.9)	1,199 (4.4)
Missing ^{††}	13 (0.1)	334 (2.4)	347 (1.3)
Gonorrhea Test Result			
Positive	106 (0.8)	57 (0.4)	163 (0.6)
Negative	13,449 (98.9)	13,715 (99.5)	27,167 (99.4)
Missing ^{††}	47 (0.3)	7 (0.1)	54 (0.1)

Gonorrhoea Screening Among U.S.- Bound Immigrants and Refugees, 2018

* Represents calendar 2018

† Regions are based on current Department of State regions. Countries represented in each region are as follows:

South/Central Asia: Afghanistan, Bangladesh, India, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan. *North Africa/Middle East:* Algeria, Bahrain, Egypt, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Qatar, Saudi Arabia, United Arab Emirates. *Europe/Eurasia:* Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Ireland, Italy, Lithuania, Malta, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom. *Western Hemisphere:* Argentina, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad And Tobago, Uruguay, Venezuela. *East Asia/Pacific:* Australia, Burma, Cambodia, China, Fiji, Hong Kong, Indonesia, Japan, Republic of Korea, Laos, Malaysia, Mongolia, Nauru, New Zealand, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, Tonga, Vietnam. *Africa:* Angola, Benin, Burkina Faso, Burundi, Cameroon, Chad, Congo, Djibouti, Ethiopia, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zaire (DRC), Zambia, Zimbabwe

‡ Class A cases are defined as cases that are found to be inadmissible under immigration law and may require a waiver for entry into the U.S. Class B conditions are defined as cases that are admissible but require follow-up after arrival in the U.S.

§ Previous history was self-reported on medical form at the time of overseas exam

¶ Previous treatment history self-reported on medical form at the time of overseas medical exam

** NAATs and PCR test were categorized together many of the screening tests indicated could only be identified as PCR

†† All “missing” categories indicated a blank response with in the medical record.

‡‡ Tests considered “unspecified” were those that indicated being screened for gonorrhoea but did not specify a type of gonorrhoea test.

Gonorrhea Screening Among U.S.- Bound Immigrants and Refugees, 2018

Table 2. Characteristics of newly arrived immigrants and refugees with positive gonorrhea results during overseas medical exam from Jan. 1, 2018 - Dec. 31, 2018*			
	Immigrants	Refugees	Total
TOTAL	106 (65%)	57 (35%)	163 (%)
Demographics			
Sex			
Female	63 (59.4)	33 (57.9)	96 (58.9)
Male	43 (40.5)	24 (42.1)	67 (41.1)
Age Group			
15-24	43 (40.6)	25 (43.9)	68 (41.7)
25-44	45 (42.4)	26 (45.6)	71 (43.6)
45-64	15 (14.2)	6 (10.5)	21 (12.9)
65+	3 (2.8)	0 (0)	3 (1.8)
Region [†]			
Africa	40 (37.7)	40 (70.2)	80 (49.1)
Europe/Eurasia	6 (5.7)	0 (0)	6 (3.7)
East Asia/Pacific	32 (30.2)	15 (26.3)	47 (28.8)
Western Hemisphere	27 (25.4)	0 (0)	27 (16.5)
South/Central Asia	0 (0)	2 (3.5)	2 (1.2)
North Africa/Middle East	1 (0.9)	0 (0)	1 (0.6)
Disease Characteristics			
Previous History [‡]			
Yes	4 (3.8)	4 (7.0)	8 (4.9)
No	102 (96.2)	53 (93.0)	155 (95.1)
Previous Treatment [§]			
Yes	2 (1.9)	3 (5.3)	5 (3.1)
No	119 (112.3)	54 (94.7)	158 (96.9)
Treated [¶]			
Yes	94 (88.7)	37 (64.9)	131 (80.4)
No	12 (11.3)	20 (35.1)	32 (19.6)

* Represents calendar year 2018

† Regions are based on current Department of State regions. Countries represented in each region are as follows:

South/Central Asia: Afghanistan, Bangladesh, India, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan. *North Africa/Middle East:* Algeria, Bahrain, Egypt, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Qatar, Saudi Arabia, United Arab Emirates. *Europe/Eurasia:* Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Ireland, Italy, Lithuania, Malta, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom. *Western Hemisphere:* Argentina, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad And Tobago, Uruguay, Venezuela. *East Asia/Pacific:* Australia, Burma, Cambodia, China, Fiji, Hong Kong, Indonesia, Japan, Republic of Korea, Laos, Malaysia, Mongolia, Nauru, New Zealand, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, Tonga, Vietnam. *Africa:* Angola, Benin, Burkina Faso, Burundi, Cameroon, Chad, Congo, Djibouti, Ethiopia, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zaire (DRC), Zambia, Zimbabwe

‡ Previous history was self-reported on medical form at the time of overseas exam

§ Previous treatment history self-reported on medical form at the time of overseas medical exam

¶ Treated according to CDC *Technical Instructions*

Gonorrhea Screening Among U.S.- Bound Immigrants and Refugees, 2018

Table 3. Panel site reporting of gonorrhea screening

Region*	U.S. Panel Physician Sites [†]	U.S. Panel Physician Sites Entered in EDN System [‡]	Gonorrhea Screening Among U.S. Panel Physician Sites in EDN	
			Count	Percentage
TOTAL	401	308	255	82.8%
North Africa/Middle East	49	27	25	92.6%
East Asia/Pacific	63	53	48	90.6%
South/Central Asia	38	34	30	88.2%
Europe/Eurasia	80	46	40	87.0%
Africa	92	78	64	82.1%
Western Hemisphere	79	70	48	68.6%

* Regions are based on current Department of State regions. Countries represented in each region are as follows:
South/Central Asia: Afghanistan, Bangladesh, India, Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan. *North Africa/Middle East:* Algeria, Bahrain, Egypt, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Qatar, Saudi Arabia, United Arab Emirates. *Europe/Eurasia:* Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Cyprus, Czech Republic, Finland, France, Georgia, Germany, Greece, Ireland, Italy, Lithuania, Malta, Moldova, Norway, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom. *Western Hemisphere:* Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Trinidad And Tobago, Venezuela. *East Asia/Pacific:* Australia, Burma, Cambodia, China, Fiji, Hong Kong, Indonesia, Japan, Republic of Korea, Malaysia, Mongolia, Nauru, New Zealand, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, Tonga, Vietnam. *Africa:* Angola, Burkina Faso, Burundi, Cameroon, Chad, Congo, Djibouti, Ethiopia, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zaire (DRC), Zambia, Zimbabwe

[†] Number of panel sites represents an the number of panel sites that CDC/IRMH partners with for overseas medical exams during calendar year 2018

[‡] Unknown panel sites were excluded from analysis. Countries with unknown panel sites were as follows: Albania, Benin, Cambodia, Cameroon, Canada, Cuba, El Salvador, Gambia, Ghana, Guinea, Liberia, Mongolia, Morocco, Rwanda, Senegal, Thailand, Turkey, Uruguay, Venezuela, Zaire (DRC)

Gonorrhea Screening Among U.S.- Bound Immigrants and Refugees, 2018

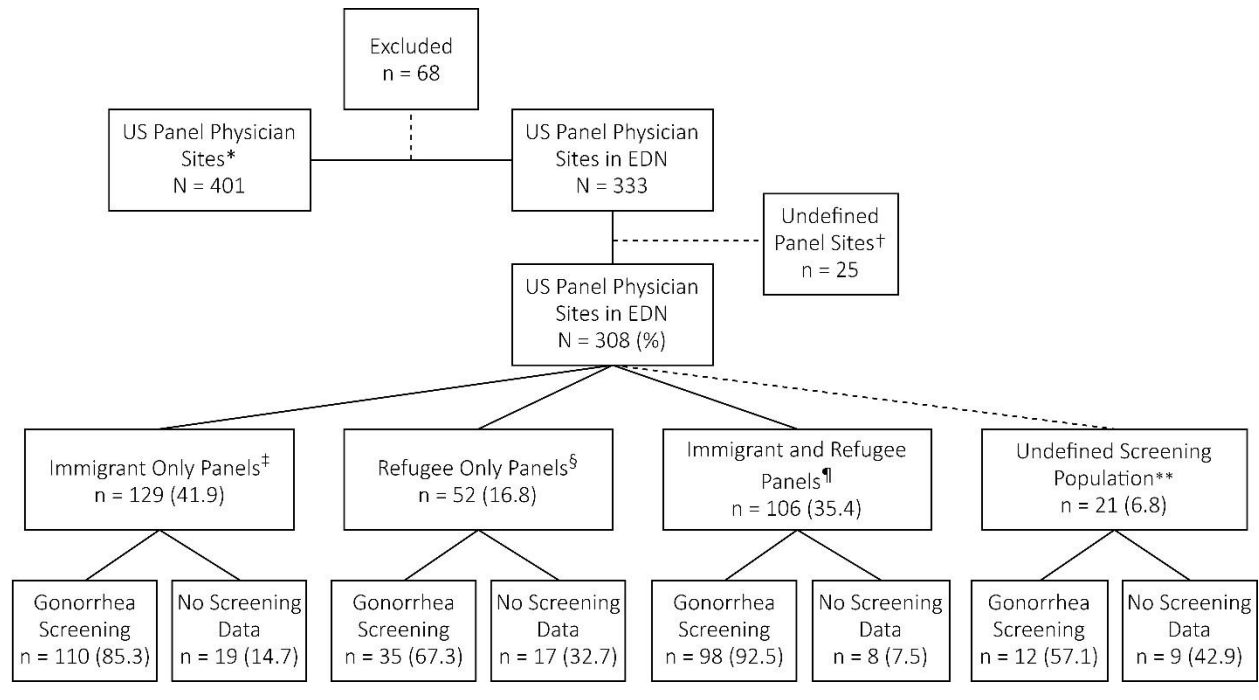


Figure 2. U.S. panel physician sites by population screened

* Total number of panel sites represents the number of sites that CDC/IRMH partners with for overseas medical exams during calendar year 2018

† Unknown panel sites were excluded from analysis. Countries with unknown panel sites were as follows: Albania, Benin, Cambodia, Cameroon, Canada, Cuba, El Salvador, Gambia, Ghana, Guinea, Liberia, Mongolia, Morocco, Rwanda, Senegal, Thailand, Turkey, Uruguay, Venezuela, Zaire (DRC)

‡ Immigrant only panels defined as panel sites that only perform medical exams for immigrant visa applications

§ Refugee only panels defined as panel sites that only perform medical exams for refugee visa applications

¶ Immigrant and refugee panels defined as panel sites that perform medical exams for both immigrant and refugee visa applications

** Undefined screening population defined as panel sites whose screening population was not defined within CDC/IRMH's panel physician database

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