

# Increasing Incidence of Gonorrhea at an Urban STI Clinic in the United States

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## ABSTRACT

Medical record data was extracted from a sexually transmitted infection (STI) clinic in Providence, Rhode Island to characterize trends in *Neisseria gonorrhoeae* (GC) infection and explore risk factors. Of 16,601 clinical encounters, 6% (n=991) tested GC positive: 5.28 GC case rate (per 100 encounters) in the first two years of data collection (2015–2016) and 7.04 in the last two years (2020–2021). Analysis suggested a single linear trend line over time ( $p < .05$ ). Overall, in more recent years, patients were older and more like to identify as male, Black, and Hispanic/Latino, as well as to have reported a previous STI, current symptoms, and specific risk behaviors. GC-positive patients in 2020–2021 were older and more like to identify as female and Black compared to 2015–2016. Lower rates of condom use were especially salient among female patients. These findings may reflect GC trends in the community.

**KEYWORDS:** sexually transmitted diseases; gonorrhea; health status disparities

## INTRODUCTION

The rate of *Neisseria gonorrhoeae* (GC) has been on the rise for many years in the United States (US).<sup>1</sup> When left untreated, GC can lead to severe complications including pelvic inflammatory disease, ectopic pregnancy, female and male infertility, and potentially life-threatening disseminated gonococcal infection.<sup>2</sup> The Centers for Disease Control and Prevention (CDC) estimates that GC accounts for \$271 million in direct medical costs annually.<sup>3</sup> Additionally, over the last 100 years, GC has rapidly developed resistance to most antibiotics limiting effective treatment.<sup>4</sup> Swift identification and treatment of GC are critical to preventing long-term complications and transmission, as well as reducing medical expenditures.

There are an estimated 1.6 million new cases of GC each year in the US.<sup>1</sup> GC disproportionately affects males, adolescents, young adults, and Black or African American individuals.<sup>5,6</sup> Beyond basic demographics (i.e., age, sex, race, and ethnicity), there has been limited in-depth behavioral data to better understand these trends and increased annual

infection rates in recent years. We examined rates of GC diagnoses, as well as demographic and behavioral trends in infections, over seven years (2015–2021) at an urban STI clinic in Providence, Rhode Island. The goal was to identify local trends and identify targets for future public health intervention.

## METHODS

Data were reviewed for clinical encounters at an outpatient STI clinic from January 2015 to December 2021, including both patient-reported demographic and behavior intake forms as well as clinical data collected from their medical record. Those who were confirmed positive for GC based on laboratory testing and documented in the medical record were considered infected for the current analysis. Data collection and management procedures were approved by the local institutional review board. Descriptives were calculated for the entire clinical population by year for key demographic and sexual history variables: age, gender identity, ethnicity, race, HIV and STI history and whether they tested positive for GC. Joinpoint analysis<sup>7</sup> was conducted to examine whether trends in GC infection were linear or segmented (e.g., multiple sequential trends) over time. Analyses were conducted using Joinpoint software<sup>8</sup> developed by the National Cancer Institute. Among those who had confirmed (tested positive) GC, chi squares and analysis of variance were used to determine trends in demographics and sexual risk behaviors between the two years with the lowest rates of GC infection (2015–2016) and the highest rates of GC infection (2020–2021) among clinical encounters. Further, demographics and sexual risk behaviors were compared between 2015–2016 and 2020–2021 among the subset of encounters with a confirmed positive GC test.

## RESULTS

### Annual Clinic Profile

A total of N=16,601 clinical encounters occurred at the STI clinic from 2015–2021 (Table 1). The number of encounters increased from 2015 to 2019 and dropped precipitously in 2020 and 2021 due to the COVID-19 pandemic. The mean age increased slightly over time from 31.34 in 2015 to 33.58 in 2021. The percentage of patients who identified as male

**Table 1.** Annual Clinic Profile (valid percentages of all available data >16,000 cases minimum)

Year	2015	2016	2017	2018	2019	2020	2021
Encounters	2155	2635	3014	3144	3155	1296	1202
Mean Age [in years] (range)	31.34 (13–76)	31.02 (14–81)	32.29 (15–87)	32.69 (15–89)	33.37 (15–81)	33.32 (16–79)	33.58 (17–82)
Gender Identity							
Male	74%	75%	73%	74%	74%	76%	75%
Female	26%	25%	26%	26%	25%	23%	23%
Other	<1%	1%	1%	1%	1%	1%	2%
Hispanic/Latino	22%	25%	26%	26%	29%	28%	27%
Race							
White	53%	49%	47%	47%	46%	46%	44%
Black	17%	17%	22%	22%	24%	24%	26%
Asian	3%	4%	4%	4%	4%	3%	3%
AI/AN	1%	1%	<1%	1%	1%	1%	2%
NH/OPI	<1%	<1%	<1%	<1%	<1%	<1%	<1%
More Than One	4%	2%	3%	3%	3%	2%	3%
Other	20%	26%	21%	21%	9%	9%	8%
HIV+	2%	2%	3%	4%	4%	2%	2%
STI+							
Ever	35%	37%	38%	41%	42%	48%	48%
Last 12 Mos	17%	18%	20%	22%	21%	24%	24%
Symptomatic at Encounter	10%	22%	22%	25%	25%	19%	23%
Gonorrhea [GC]+ Rate per 100 Encounters (cases)	5.80 (125)	4.86 (128)	5.87 (177)	6.30 (198)	5.93 (187)	6.64 (86)	7.49 (90)
Percent Genital GC+	2.3% (49)	1.8% (46)	2.0% (59)	2.7% (86)	2.4% (76)	3.3% (43)	3.7% (44)
Percent Oral GC+	3.4% (73)	2.9% (75)	3.4% (102)	3.5% (110)	3.4% (106)	3.6% (47)	5.0% (60)
Percent Rectal GC+	2.8% (60)	1.8% (47)	2.4% (71)	2.6% (81)	2.6% (83)	2.6% (33)	3.2% (39)

stayed relatively constant, while the percent identifying as female decreased slightly over time from 26% in 2015 to 23% in 2021. During this time, the percentage of those who provided another gender identity increased slightly. The percent of those identifying as Hispanic/Latino and Black increased over time (from 22% to 27% and 17% to 26%, respectively), while the percent identifying as White decreased (from 53% to 44%;  $p<0.01$ ). The percentage of patients who are HIV positive stayed relatively consistent, peaking in 2018 and 2019. Those who have had an STI ever or in the past year increased steadily over time from 35% to 48% and 17% to 24%, respectively. Rates of confirmed GC infection rose over time from 5.8% in 2013 to 7.5% in 2021 including increases in GC infection at all sites: genital, oral, and rectal.

From 2015 to 2021, the annual rate of positive GC tests ranged from 4.86 per 100 encounters in 2016 to 7.49 per 100 encounters in 2021. When the joinpoint model was set to identify a single joinpoint, two segments were identified: an annual percent change (APC) of 3.05 from 2015–2019 and an APC of 10.30 from 2019–2021. However, when allowed

to select 0 or 1 joinpoints, the model with 0 joinpoints was selected using the permutation test selection criteria with 4499 permutations; thus the difference between the two segments (i.e., 2015–2019 and 2019 to 2021) was not statistically significant. The model with 0 joinpoints had a significant increase in slope from 2015–2021 ( $p<0.05$ ) and an overall APC of 4.77.

### Demographic Trends by Time Period

Overall, patients with encounters during 2020–2021 (compared to 2015–2016) were, on average, older and more likely to identify as male, Hispanic/Latino, and Black (**Table 2**). Among only those patients who had a confirmed GC diagnosis, individuals with encounters during 2020–2021 were more likely to be older and identify as female or another gender and Black (**Table 3**).

### Behavioral Trends by Time Period

We also examined risk history and sexual behaviors (**Table 4**). Overall, patients with encounters during 2020–2021 (compared to 2015–2016) were more likely to have been

**Table 2.** Demographics and STI History Among Encounters from 2015–2016 versus 2020–2021

	2015–2016 n=4790	2020–2021 n=2498	
Mean Age (SD)	31.16 (11.27)	33.45 (12.07)	F(1,7276)=64.03 p<.001
Gender Identity			
Male	74%	76%	$\chi^2(2) = 23.91$ p<.001
Female	25%	23%	
Other	1%	1%	
Hispanic/Latino	24%	27%	$\chi^2(1) = 10.11$ p=.001
Race			
White	51%	53%	$\chi^2(3) = 199.49$ p<.001
Black	17%	29%	
Asian	4%	3%	
Other	28%	15%	
HIV+ (cases)	2% (83)	2% (45)	$\chi^2(1) = 0.40$ non-significant
STI+			
Ever (cases)	36% (1727)	48% (1083)	$\chi^2(1) = 91.87$ p<.001
Last 12 Mos (cases)	18% (858)	24% (537)	$\chi^2(1) = 33.41$ p<.001
Symptomatic at Encounter	17% (807)	21% (532)	$\chi^2(1) = 21.74$ p<.001

**Table 3.** Demographics and STI History Among Encounters with Patients with a Confirmed Gonorrhea (GC)+ Diagnosis from 2015–2016 versus 2020–2021

	2015–2016 n=253	2020–2021 n=176	
Mean Age (SD)	29.57 (9.52)	31.49 (10.30)	F(1,426)=3.90 p<.005
Gender Identity			
Male	91%	83%	$\chi^2(2) = 7.83$ p=.02
Female	8%	13%	
Other	1%	4%	
Hispanic/Latino	23%	29%	$\chi^2(1) = 2.4$ non-significant
Race			
White	54%	49%	$\chi^2(3) = 25.13$ p<.001
Black	14%	34%	
Asian	5%	3%	
Other	27%	14%	
HIV+ (cases)	8% (19)	6% (10)	$\chi^2(1) = 0.33$ non-significant
STI+			
Ever (cases)	46% (117)	59% (95)	$\chi^2(1) = 6.76$ p<.01
Last 12 Mos (cases)	27% (69)	34% (55)	$\chi^2(1) = 2.35$ non-significant
Symptomatic at Encounter	41% (104)	51% (90)	$\chi^2(1) = 4.22$ p=.04

**Table 4.** Health-Risking Sexual Behaviors Among Encounters from 2015–2016 versus 2020–2021

	2015–2016 n=4790	2020–2021 n=2498	
Oral Sex Partners (of all patients) No condom (n=5957)			
0	6% (282)	13% (204)	$\chi^2(4) = 82.16$ p<.001
1	30% (1310)	31% (501)	
2	38% (1646)	36% (580)	
3	14% (614)	12% (193)	
4	12% (509)	7% (118)	
Female Sex Partners (of male and transgender patients) No condom (n=2897)			
0	12% (241)	12% (103)	$\chi^2(4) = 1.20$ non-significant
1	41% (856)	41% (339)	
2	40% (826)	40% (329)	
3	5% (111)	5% (44)	
4	2% (37)	1% (11)	
Male Sex Partners (of male and transgender patients) No condom (n=2129)			
0	20% (309)	14% (85)	$\chi^2(4) = 37.47$ P<.001
1	35% (523)	29% (176)	
2	33% (497)	38% (231)	
3	6% (99)	10% (63)	
4	6% (85)	10% (61)	
Male Sex Partners (of female and transgender patients) No condom (n=1572)			
0	6% (72)	12% (49)	$\chi^2(4) = 17.41$ P<.01
1	46% (530)	47% (193)	
2	44% (506)	37% (151)	
3	4% (48)	3% (13)	
4	1% (8)	1% (2)	
Other Risk Behaviors			
Sex with Anonymous Partner	40% (1895)	41% (929)	$\chi^2(1) = 1.10$ non-significant
Sex with Unknown HIV Status	36% (1721)	30% (679)	$\chi^2(1) = 24.73$ p<.001
Sex While Intoxicated	34% (1611)	28% (627)	$\chi^2(1) = 25.82$ p<.001
Exchanges Sex	2% (85)	2% (34)	$\chi^2(1) = 0.73$ non-significant
Sex with Partner Who Exchanges Sex	4% (212)	3% (72)	$\chi^2(1) = 6.36$ p<.02

**Table 5.** Health-Risking Sexual Behaviors Among Encounters with Patients with a Confirmed Gonorrhea (GC)+ Diagnosis from 2015–2016 versus 2020–2021

	2015–2016 n=253	2020–2021 n=176	
Oral Sex Partners (of all patients) No condom (n=349)			$\chi^2(4) = 9.85$ $p < .05$
0	9% (22)	14% (16)	
1	10% (24)	18% (20)	
2	31% (74)	34% (39)	
3	23% (54)	18% (20)	
4	26% (62)	16% (18)	
Female Sex Partners (of male and transgender patients) No condom (n=104)			$\chi^2(4) = 6.32$ non-significant
0	24% (14)	11% (5)	
1	27% (16)	47% (21)	
2	46% (27)	36% (16)	
3	2% (1)	4% (2)	
4	2% (1)	2% (1)	
Male Sex Partners (of male and transgender patients) No condom (n=262)			$\chi^2(4) = 6.69$ non-significant
0	13% (24)	9% (7)	
1	26% (49)	15% (11)	
2	41% (77)	45% (34)	
3	9% (17)	13% (10)	
4	11% (20)	17% (13)	
Male Sex Partners (of female and transgender patients) No condom (n=39)			$\chi^2(3) = 5.10$ non-significant
0	15% (3)	0% (0)	
1	30% (6)	37% (7)	
2	55% (11)	53% (10)	
3	0% (0)	10% (2)	
4	0% (0)	0% (0)	
Other Risk Behaviors			
Sex with Anonymous Partner	60% (153)	55% (89)	$\chi^2(1) = 1.09$ non-significant
Sex with Unknown HIV Status	43% (108)	40% (64)	$\chi^2(1) = 0.39$ non-significant
Sex While Intoxicated	45% (114)	38% (62)	$\chi^2(1) = 1.73$ non-significant
Exchanges Sex	4% (9)	6% (10)	$\chi^2(1) = 1.58$ non-significant
Sex With Partner Who Exchanges Sex	7% (17)	8% (12)	$\chi^2(1) = 0.08$ non-significant

diagnosed with a STI ever or in the last 12 months. They were also more likely to be symptomatic at the encounter. Patients who identified as male reported a higher number of male partners with whom a condom had not been used, while patients who identified as female reported fewer male partners with whom a condom had not been used. Additionally, those with encounters during 2020–2021 were less likely to report having sex while intoxicated and having sex with partners of unknown HIV status and with partners who exchange sex for money or other goods.

Among only those patients with confirmed GC diagnosis, those with encounters during 2020–2021 (compared to 2015–2016) were more likely to have ever been diagnosed with a STI and to be symptomatic at the encounter (Table 5). Similar to the overall group, patients who identified as male reported a higher number of male partners with whom a condom had not been used, but, unlike the overall group, patients who identified as female also reported a higher number of male partners with whom a condom had not been used.

## DISCUSSION

Rates of many STIs are on the rise nationally in the United States, with especially pronounced increases in GC incidence.<sup>1</sup> Individuals who are younger and people of color bear a disproportionate burden of STI infections<sup>5,6</sup> and GC differentially impacts those who identify as male.<sup>5</sup> In this sample of over 16,000 clinical encounters at outpatient STI clinic in Providence, Rhode Island from 2015–2021, we explored changes in demographics, risk history, and sexual behaviors over time among the entire patient population and those who were diagnosed with GC infection. Overall, in more recent years, patients were older and more like to identify as male, Black, and Hispanic/Latino, as well as to have reported a previous STI, symptoms at the encounter, and specific risk behaviors (e.g., less condom use). Among only those who were GC positive, patients in 2020–2021 were older and identified as female and Black in 2021–2022 compared to 2015–2016. Behavioral trends among GC positive were similar to the overall population, with less condom use being especially salient among female patients. This retrospective study has a large sample size and draws from a clinical population engaged in high-risk behaviors with a high rate of patients (>30% in most years of data collection) with a prior STI diagnosis. While data was collected from nearly all encounters – and the general trends did mirror those at the local and national level – attention should be paid to generalizability of the results when considering how these findings may apply in other regions or settings.

Years with higher rates of GC infection also saw changes in the demographic profile of the patient population. Specifically, when examining all 16,601 encounters, there were more encounters with Black patients over time. Black

patients were also disproportionately represented among those with a positive GC test. This mirrors national trends in greater disease burden for people of color, specifically Black individuals and suggests the need for tailored intervention approaches in communities with historically limited access to health care and greater disease burden. In terms of gender identity, in the overall patient population, there was a trend toward a greater percentage of patients who identified as male over time. However, when examining just those who had a positive GC test, there was a disproportionate number of patients who identified as female or another gender in the later years (2020–2021). Nationally, we have seen higher rates of GC infection among males<sup>5</sup> and, thus, intensive efforts to track GC trends and antibiotic resistance (e.g., the Gonococcal Isolate Surveillance Project, or GISP) have focused on males.<sup>9</sup> However, observations from this sample suggest that – at least among women attending an urban STI clinic – women have been taking on an increasingly large disease burden in recent years. It will be critical to continue to monitor these trends and examine whether they are replicated at the local and state level to inform both individual health care and larger public health surveillance, education, and interventions.

In terms of sexual history and behaviors that might help inform our understanding of these changes in rates and demographics, there are several noteworthy findings. Lack of condom use emerged as a key sexual behavior in terms of increased GC risk. When looking at the overall sample, patients who identified as female reported fewer partners with whom a condom was not used for vaginal or anal sex. However, among those who tested positive for GC infection, female patients reported more partners with whom a condom was not used. Additionally, men in both the overall sample and GC positive subgroup reported more sexual partners with whom a condom had not been used over time (2020–2021 versus 2015–2016). Other risk behaviors, including having sex with anonymous partners or partners of unknown HIV status either stayed roughly static over time or improved – that is, patients were less likely to report engaging in these specific sexual risk behaviors. Taken together, this suggests that as rates of GC rise, infections are more common outside of individuals and sexual networks that would traditionally be considered higher risk (e.g., sex with anonymous partner, sex while intoxicated, sex workers). Thus, intervention approaches will need to penetrate groups that may not perceive themselves to be at high risk and may want to focus on more universal precautions (i.e., wearing condoms with all partners).

The effects of the COVID-19 pandemic are evident in the annual clinic profiles including steep drop-off in clinical encounters in 2020 and 2021 after a period of expansion of the clinic from 2015 to 2019. While the difference in the annual percent change (APC) in GC infection rate between 2015–2019 and 2019–2021 was determined to be

non-significant, Joinpoint analysis revealed an observable difference in APC between 3.05 from 2015–2019 and 10.30 from 2019–2021 that mirror overall trends in clinical encounters as well as nationwide trends in primary and secondary preventive care during COVID-19. Nationally in the US, it has been estimated that in the first three months of the COVID-19 pandemic nearly 6,000 cases of GC were missed due to reductions in asymptomatic routine STI testing.<sup>10</sup> This is consistent with our data that show higher rates of symptomatic patients presenting for care and testing GC positive in 2020 and 2021. Further, the percent of patients who were HIV positive dropped in 2020 and 2021 after several years where the percent increased. Fewer people were tested for HIV or prescribed pre-exposure prophylaxis during the pandemic,<sup>11</sup> and some who were HIV positive had difficulty accessing in person or remote care during the height of the pandemic due to concerns related to secondary infections and immunosuppression.<sup>12</sup> Given the overlap between being HIV positive and infection, it is not clear if HIV-positive patients missed or delayed STI testing during the pandemic or sought care at other clinics. The COVID-19 pandemic shed light on the complexity of delivering care – especially among those who are immunocompromised – during an infectious disease outbreak and highlighted disparities in access to services such as telehealth.

At this urban STI clinic, we found alarming trends in increased GC infections from 2015–2021, especially among people of color, similar to what has been documented locally and nationally. Our in-depth exploration of risk histories and behaviors generate new findings related to these documented trends, specifically, the uptick in cases among women and the salience of condom use, that warrant greater focus at the local and national level. If these findings are replicated and further elucidated in future work, they can be used to inform and target interventions aimed to reduce the spread of GC infection. Ongoing national and local studies are needed for public health and healthcare to stay agile in the face of changing trends.

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