

**Epidemiology of reported HIV and other sexually transmitted infections during the COVID-19 pandemic, New York City**

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**40-word summary:** “PAUSE” severely restricted New Yorkers’ movement from March 23-June 7, 2020, to stem COVID-19 spread. Analysis of NYC surveillance data revealed substantial declines in positive HIV/STI tests and diagnoses of HIV/STI during PAUSE, with shifts in characteristics of reported cases.

## Footnotes

These data have not previously been presented or published elsewhere.

Conflict of interest: The authors declare no conflicts of interest.

Funding: Data for this analysis come from New York City's HIV and STI surveillance systems, which are supported by funding from the Centers for Disease Control and Prevention (HIV Surveillance, Grant no. 5 NU62PS924575-04-00; STI Surveillance, Grant no. 5 NH25PS005177-03-00).

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Disclaimer: The findings and conclusions of this manuscript are those of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

## **Abstract**

Early in the COVID-19 crisis, a statewide executive order (“PAUSE”) severely restricted the movement of New Yorkers from March 23-June 7, 2020. We used NYC surveillance data for HIV, chlamydia, gonorrhea, and syphilis to describe trends in diagnosis and reporting surrounding PAUSE. During PAUSE, the volume of positive HIV/STI tests, and diagnoses of HIV, chlamydia, gonorrhea, and syphilis declined substantially, reaching a nadir in April before rebounding. Some shifts in characteristics of reported cases were identified.

**Keywords:** SARS-CoV-2; COVID-19; HIV; sexually transmitted infections; surveillance

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## Introduction

New York City (NYC) experienced an early, explosive first wave of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, and its related disease syndrome, COVID-19[1]. To reduce spread of SARS-CoV-2 and mitigate its consequences, New York State (NYS) issued a “stay at home” order (“PAUSE”) closing non-essential businesses, banning non-essential gatherings, and restricting public transportation use during March 23-June 7, 2020, in NYC[2]; restrictions were lifted in a phased manner thereafter. PAUSE coincided with dramatic declines in population mobility and disruptions to the healthcare system, including limiting operations at NYC’s public Sexual Health Clinics (SHC).

The STI-HIV syndemic in NYC has been characterized using population-based data[3,4]. In recent years, HIV cases have declined in NYC while bacterial STI have increased. There are an estimated 92,000 people living with HIV (PWH) in NYC [5] (9% of PWH nationally)[6]. Among the 1,772 people newly diagnosed with HIV in NYC in 2019, the majority were aged <40, Black or Latino/Hispanic, and men who report sex with men (MSM)[5]. NYC rates of reported bacterial STI, including chlamydia (914.1 cases per 100,000 population in 2019), gonorrhea (347.5), and primary and secondary (P&S) syphilis (23.9), exceed national averages, and—like HIV—disproportionately affect people of color and MSM[7].

We used both case and laboratory test data from the NYC Department of Health and Mental Hygiene’s (DOHMH) HIV and STI surveillance systems to describe trends in diagnosis and reporting of these infections in NYC during the first wave of the COVID-19 pandemic and accompanying PAUSE. This analysis aims to elucidate the impact of COVID-19 on the observable epidemiology of reported HIV/STI in NYC and progress towards ending the HIV epidemic (EtE) in NYC[8], as well as to inform HIV/STI-focused programs, policies, and monitoring efforts during, and after, future COVID-19 waves.

## Methods

### *Data sources*

Laboratories accepting specimens from NYC residents are required to report all positive tests for HIV and reportable bacterial STI, including chlamydia, gonorrhea and syphilis, to the NYS Electronic Clinical Laboratory System (ECLRS). Providers are required to report new diagnoses of HIV and these bacterial STI directly to DOHMH[9,10]. Primary data sources for this analysis were NYC's HIV and STI surveillance registries, which include laboratory- and provider-reported data, and data gleaned from case investigation.

Case investigation protocols differ by pathogen. HIV surveillance staff conduct medical record review to verify new HIV/AIDS diagnoses and collect relevant clinical information. STI surveillance staff review reported positive syphilis test results, identify possible new diagnoses, and confirm new cases and treatment status via provider interview and medical chart review. Neither chlamydia nor gonorrhea cases are routinely investigated.

### *Reported laboratory test results*

To allow direct comparison between the number of tests reported to the HIV program and those reported to the STI program, test reports were drawn from ECLRS. Analysis was restricted to positive or reactive tests for HIV, chlamydia, gonorrhea, and syphilis received by DOHMH with specimen collection dates from January-July in 2019 and 2020. Reported laboratory tests for STI were deduplicated using the accession number for a submitted specimen (e.g., a single serum specimen with multiple different positive serologic tests for syphilis was a single testing event in the analytic dataset).

### *New diagnoses (cases)*

Laboratory-confirmed COVID-19 case counts were obtained from NYC's COVID-19 Surveillance system (February 29, 2020- July 2020)[11].

A new HIV diagnosis was defined by a positive HIV diagnostic test by an NYC provider for a previously unknown case in NYC. During PAUSE, in-person investigations of positive HIV diagnostic tests were curtailed; therefore, new diagnoses reflect only those investigations that could be completed remotely. HIV surveillance data in this analysis were reported to DOHMH by September 21, 2020.

New diagnoses of STI (cases) were defined using Council of State and Territorial Epidemiologists (CSTE) criteria[12]. Positive chlamydia or gonorrhea tests were counted as new diagnoses; detection of the same infection at multiple anatomic sites or repeated detection at the same site was counted as a single case if specimens were collected within 30 days. Possible new syphilis diagnoses were investigated throughout PAUSE. STI data in this analysis were reported to DOHMH by October 11, 2020.

Case characteristics in the HIV and STI registries were derived from provider and laboratory reports, medical records, and, for some infections, patient interview. They included: age at diagnosis, sex, race/ethnicity, and address. DOHMH guidelines were used to determine the area-based poverty level for each person[13].

Finally, reporting facility for each new diagnosis was based on the address and affiliation of the provider documented on the laboratory report. Facilities were categorized as: DOHMH SHC, urgent care center, correctional facility, and hospital. Facilities of other types (largely private medical practices), were classified as "other," and cases without a known reporting facility were classified as "unknown."

## *Analysis*

We aggregated reported positive HIV, chlamydia, gonorrhea, and syphilis test events by month to examine changes in positive test volume during PAUSE, compared with 2019. For context, we also aggregated confirmed COVID-19 cases in 2020 by month.

To explore changes in epidemiology during PAUSE, we compared distributions of 2020 and 2019 cases, stratified by characteristics of interest. Primary and secondary syphilis cases were the only stages of syphilis included.

This analysis of routinely collected public health surveillance data was not subject to IRB review.

## **Results**

Numbers of positive HIV, chlamydia, gonorrhea, and syphilis tests reported to DOHMH via the ECLRS system in early 2020 were comparable to those reported via the same system for the same months in 2019 (Figure 1). However, reported positive tests markedly declined in March 2020, reaching a nadir in April 2020, and rebounding gradually beginning in May 2020. By July 2020, positive test reports for HIV and gonorrhea nearly approximated July 2019 levels, and reports for chlamydia and syphilis exceeded numbers for July 2019. Peak COVID-19 case numbers corresponded to the nadir in HIV and STI tests.

There were substantially fewer new diagnoses of HIV, chlamydia, gonorrhea, and P&S syphilis in NYC during PAUSE compared to the same period in 2019; decreases ranged from 19% (P&S syphilis) to 66% (gonorrhea) (Table 1). Overall, the characteristics of cases reported during PAUSE and the same period in 2019 were similar; declines in new diagnoses were observed in nearly all demographic groups, with a few notable exceptions. Compared to the same period in 2019,

higher proportions of HIV and STI diagnosed during PAUSE were among Black individuals, and among people residing in very-high-poverty neighborhoods.

We also observed a decline in the number of new diagnoses for all pathogens across most reporting facility types during PAUSE. The most dramatic declines were in diagnoses made by DOHMH SHC. Conversely, a higher proportion of new STI diagnoses were made by urgent care centers. For HIV, a smaller proportion of diagnoses was made by hospitals and a larger portion by “other” facilities.

## **Discussion**

NYC surveillance data demonstrate substantial reductions in reports of positive tests and new diagnoses of HIV and STI during PAUSE. The impact of the COVID-19 pandemic’s first wave on HIV/STI diagnoses could have been exerted in myriad ways. Reduced population mobility or population out-migration during PAUSE may have disrupted or diminished active sexual networks, thereby lowering individual- and community-level risk for HIV/STI transmission. Reduced availability of health care services, and decreased care-seeking, along with City-issued recommendations to restrict healthcare utilization for non-urgent health issues, may also have resulted in less diagnosis and treatment of largely asymptomatic infections such as HIV and chlamydia, which are mainly detected by routine screening. Redirection of swabs and laboratory supplies to COVID-19 testing resulted in national shortages in gonorrhea and chlamydia test kits[14] and likely reduced detection of these infections. In addition, a reliance on telemedicine, syndromic (versus laboratory-confirmed) diagnosis and treatment for STI, reporting delays, and more limited surveillance and case investigation practices for HIV may all have played a role in lower numbers of diagnoses.

Despite decreased detection of HIV and STI overall, the characteristics of reported cases were relatively consistent during PAUSE, with a few notable epidemiologic shifts. The



overrepresentation of Black New Yorkers and New Yorkers living in the highest-poverty neighborhoods among those diagnosed with HIV/STI during PAUSE might be even more pronounced if the full burden of disease were measurable using surveillance data. These same groups were also overrepresented among COVID-19 hospitalizations and deaths in NYC[1], indicative of underlying social and structural inequities.

Given the profound societal impact of the first wave of the COVID-19 pandemic in NYC, we were not surprised to find a shift in the distribution of HIV/STI reporting facilities. Changes in settings where people receive sexual healthcare could have a cascading effect on the incidence of diagnosed HIV and STI, for example, if individuals sought care at facilities less likely to correctly diagnose, stage, treat and provide contact-tracing for syphilis infection, offer HIV testing, screen for STIs at non-genital sites, or prescribe HIV PrEP or PEP.

Our findings have implications for the City's ongoing EtE and STI programs. The lower volume of reported tests and diagnoses suggests HIV/STI cases were missed during PAUSE. Delays in diagnosis translate into missed opportunities for early linkage to care and initiation of antiretroviral therapy; this is especially problematic for the acute phase of HIV infection (AHI), which is characterized by increased risk for forward transmission[15]. The proportion of all HIV diagnoses citywide that were AHI declined to 4.7% during PAUSE in 2020 from 9.5% in the same period in 2019 (data not shown). DOHMH SHCs diagnose about 20% of reported AHI annually, and thus disruption to their services during PAUSE may have contributed to less timely detection of HIV. HIV/STI testing and care services should be maintained and made more widely accessible during future waves of the pandemic, so that individuals who needed but did not receive such services during earlier waves can be served as expeditiously as possible.

This analysis is subject to several limitations. Because surveillance data are limited to only positive test results, they cannot provide a comprehensive picture of trends in testing and healthcare access. Our data are preliminary, as the COVID-19 pandemic in NYC is ongoing and its

effects on surveillance and epidemiology of other infectious diseases are yet to be fully realized. This is particularly true for HIV-related data due to the extensive interruptions to case investigation processes, which are necessary to confirm new diagnoses. At the time of writing, an estimated 15-20% of positive HIV diagnostic tests reported to DOHMH in 2020 had not yet been investigated to confirm new diagnosis. Review of demographic characteristics (e.g., race/ethnicity, sex, NYC borough of residence) associated with uninvestigated versus investigated tests suggests potential bias, likely reflecting differences in the patient populations served by clinical institutions that could not be accessed remotely for medical record review during the COVID-19 crisis (data not shown). With additional data collection and investigation efforts, the demographic profile of confirmed cases for this period could shift. Additional observation and investigation will be required to understand whether the observed disease trends and patterns of sexual healthcare utilization are temporary or sustained. Because HIV diagnoses were trending downward and STI diagnoses were trending upward in the years leading up to the pandemic, the estimated impact of COVID-19 may be exaggerated (for HIV) or underestimated (for other STI).

Ongoing monitoring of the effects of the COVID-19 crisis on the local epidemiology of HIV and STI is critical for informing public health programs and policies. Surveillance data may be the sole data source that can be used to this end, highlighting the importance of establishing and maintaining robust surveillance systems, including electronic laboratory reporting, that can function even during organizational disruption accompanying a major public health crisis. Mandating report of both negative and positive tests can provide a fuller picture and should be considered for some notifiable diseases. HIV and STI programs will need to be responsive to the effects of the COVID-19 crisis, innovating and course-correcting as needed to maintain and restore access to HIV/STI screening, testing and treatment, and to address exacerbated racial and other inequities.

## **Acknowledgments**

The authors acknowledge staff of the HIV Epidemiology Program within the Bureau of HIV, staff of the Bureau of Sexually Transmitted Infections, including Tim Liao, Kimberly Johnson, and Susan Blank, and staff of the Surveillance and Epidemiology branch within the COVID-19 Incident Command System at the NYC DOHMH who contributed to the collection, management, and analysis of the HIV, STI and COVID-19 surveillance data that were used for this work. The authors also acknowledge DOHMH colleagues who passed during the COVID-19 pandemic.

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**TABLE 1. Characteristics of persons reported with new HIV, chlamydia, gonorrhea, and primary and secondary syphilis (P&S) infections during March 23-June 7, 2020 (PAUSE time period in New York City), versus March 23-June 7, 2019**

	HIV <sup>4-5</sup>					Chlamydia <sup>6</sup>					Gonorrhea <sup>6</sup>					P&S Syphilis <sup>6</sup>				
	2019		2020		% Decrease <sub>3</sub>	2019		2020		% Decrease <sub>3</sub>	2019		2020		% Decrease <sub>3</sub>	2019		2020		% Decrease <sub>3</sub>
	N	%	N	%		N	%	N	%		N	%	N	%		N	%	N	%	
<b>Total<sup>1</sup></b>	56	100	23	100	59%	15,588	100	5,302	100	66%	5,312	100	2,540	100	52%	40	100	32	100	19%
<b>Sex<sup>2</sup></b>																				
Female								2,943					1,220							
Male	99	17%	38	16%	62%	8,413	54%	3	56%	65%	1	23%	646	25%	47%	25	6%	18	6%	28%
	46		19					2,359					1,894					30		
	9	83%	5	84%	58%	7,172	46%	9	44%	67%	1	77%	4	75%	54%	7	94%	6	94%	19%
<b>Age at test (years)</b>																				
13-19	7	1%	6	3%	14%	3,382	22%	976	18%	71%	658	12%	362	14%	45%	7	2%	8	2%	Increase
20-29	17							2,893					1,144			13				
	8	31%	74	32%	58%	7,731	50%	3	55%	63%	1	46%	4	45%	53%	5	34%	98	30%	27%
30-39	17							1,039					1,504			15		13		
	9	32%	81	35%	55%	3,020	19%	4	20%	66%	4	28%	700	28%	53%	3	38%	0	40%	15%
40-49	96	17%	33	14%	66%	914	6%	264	5%	71%	457	9%	220	9%	52%	65	16%	53	16%	18%
50-59	75	13%	28	12%	63%	414	3%	105	2%	75%	222	4%	98	4%	56%	39	10%	26	8%	33%
60+	33	6%	11	5%	67%	102	1%	29	1%	72%	48	1%	15	1%	69%	3	1%	9	3%	Increase
<b>Borough of residence<sup>7</sup></b>																				
Bronx	13							1,448					1,070							
	4	24%	54	23%	60%	3,790	24%	8	27%	62%	0	20%	660	26%	38%	84	21%	53	16%	37%
Brooklyn	14							1,648					1,633							
	7	26%	71	30%	52%	4,741	30%	8	31%	65%	3	31%	786	31%	52%	90	22%	99	31%	Increase
Manhattan	13							1,088					1,721					12		
	5	24%	54	23%	60%	3,577	23%	8	21%	70%	1	32%	629	25%	63%	3	33%	1	37%	9%
Queens	86	15%	40	17%	53%	3,101	20%	957	18%	69%	807	15%	390	15%	52%	86	21%	47	15%	45%
Staten Island	11	2%	0	0%	100%	376	2%	161	3%	57%	81	2%	75	3%	7%	9	2%	4	1%	56%
Outside NYC	55	10%	14	6%	75%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Race/ethnicity<sup>8</sup></b>																				
Black	24		10					1,599					1,593					10		10
	4	43%	9	47%	55%	3,873	25%	9	30%	59%	3	30%	9	41%	35%	3	26%	6	33%	Increase
Hispanic/Latino	22																	11		
	0	39%	88	38%	60%	2,709	17%	850	16%	69%	926	17%	401	16%	57%	4	28%	59	18%	48%
White	68	12%	27	12%	60%	1,477	9%	377	7%	74%	891	17%	265	10%	70%	87	22%	63	19%	28%
Asian/Pacific	24	4%	6	3%	75%	508	3%	103	2%	80%	134	3%	34	1%	75%	9	2%	18	6%	Increase

Islander																				
Other	1	0%	0	0%	100%	659	4%	262	5%	60%	488	9%	201	8%	59%	75	19%	69	21%	8%
Unknown	9	2%	3	1%	67%	6,359	41%	2,111	40%	67%	1,280	24%	600	24%	53%	14	3%	9	3%	36%
<b>Area-based poverty level</b>																				
Low (<10% below FPL)	51	9%	21	9%	59%	1,634	10%	480	9%	71%	515	10%	207	8%	60%	43	11%	41	13%	5%
Medium (10 to <20% below FPL)	22							1,911			2,065					16		11		
High (20 to <30% below FPL)	6	40%	89	38%	61%	5,805	37%	4	36%	67%	5	39%	898	35%	57%	2	40%	9	37%	27%
Very high (30%+ below FPL)	13							1,526			1,574					11				
Area-based poverty level not available	8	24%	59	25%	57%	4,425	28%	6	29%	66%	4	30%	771	30%	51%	9	30%	99	31%	17%
Facility type	11							1,305			1,070									
DOHMH SHC	7	21%	56	24%	52%	3,388	22%	5	25%	61%	0	20%	629	25%	41%	75	19%	64	20%	15%
Urgent care center	36	6%	8	3%	78%	333	2%	77	1%	77%	88	2%	35	1%	60%	3	1%	1	0%	67%
Hospital	38	7%	6	3%	84%	1,214	8%	34	1%	97%	749	14%	38	2%	95%	61	15%	13	4%	79%
Correctional facility	20	4%	9	4%	55%	1,463	9%	1,077	20%	26%	646	12%	672	26%	Increase	49	12%	99	31%	Increase
Other facility	21							750	14%	70%	944	18%	486	19%	49%	73	18%	55	17%	25%
Unknown	4	38%	76	33%	64%	2,521	16%	100	2%	67%	71	1%	44	2%	38%	0	0%	0	0%	0%
	3	1%	1	0%	67%	302	2%	3,303			2,861		1,281			21		15		
	28		13					1	62%	67%	3	54%	9	51%	55%	5	53%	7	48%	27%
	2	50%	6	58%	52%	9,975	64%	40	1%	64%	39	1%	11	0%	72%	4	1%	0	0%	100%
	11	2%	5	2%	55%	110	1%													

DOHMH SHC=Department of Health and Mental Hygiene Sexual Health Clinic

<sup>1</sup>Numbers within a variable may not sum to the total value because of missing or unknown data.

<sup>2</sup>For HIV-related data, this variable represents sex assigned at birth with the following options: male and female. For Ct-, GC-, and syphilis-related data, this variable the reported sex for an index patient with the following options: male, female, and transgender. This variable is completed primarily based on provider- and laboratory-reports.

<sup>3</sup>Represents the percent decrease between the number of infections reported in 2019 compared with infections reported in 2020.

<sup>4</sup>Includes cases with a positive HIV diagnostic test that received a "new case" disposition. Includes HIV-Ag/Ab, HIV-Ab, HIV-Ag/Ab-BP, and Western Blot tests.

<sup>5</sup>Data as of September 21, 2020.

<sup>6</sup>Data as of October 11, 2020.

<sup>7</sup>The NYC Department of Health receives HIV reports for patients living both within and outside NYC. For Ct, GC, and syphilis, only new infections among residents of NYC are counted in surveillance data.

<sup>8</sup>Individuals with Hispanic/Latino ethnicity, regardless of racial identity, are included in the "Hispanic/Latino" category. All other categories exclude individuals with Hispanic/Latino ethnicity. The "Other" race/ethnicity category includes Native Americans and multiracial, non-Hispanic/Latino individuals.

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Figure 1

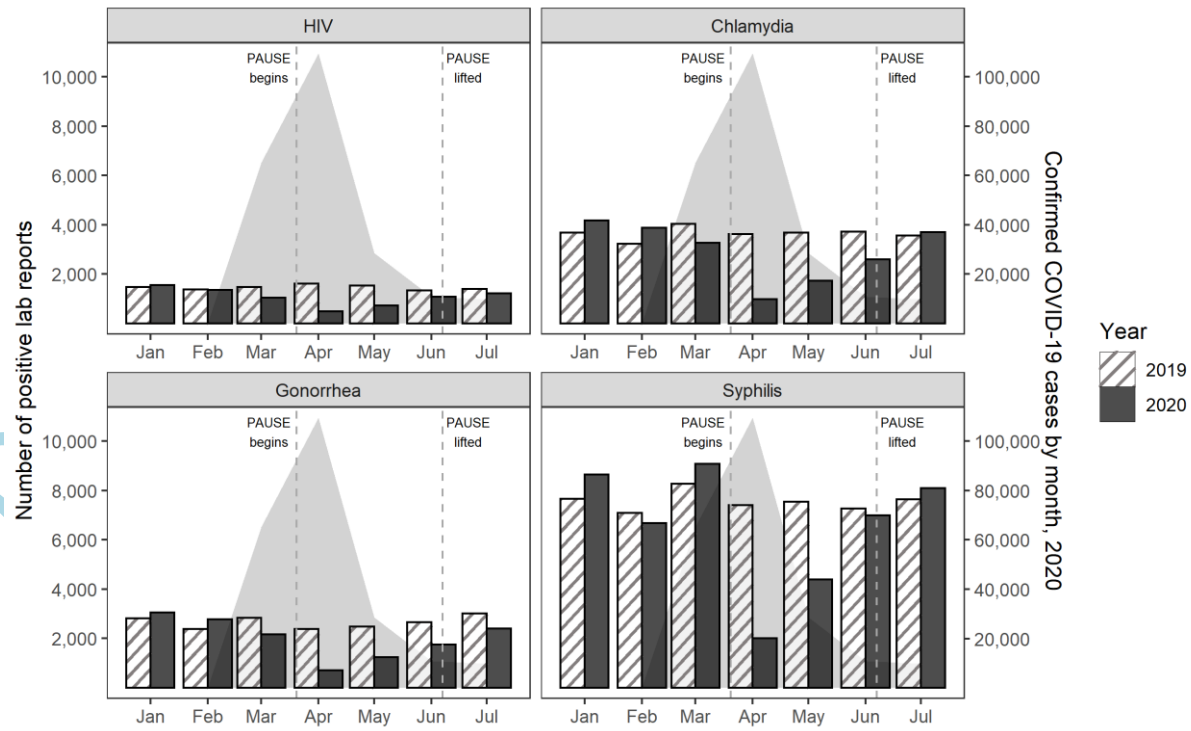


Figure 1. Positive lab reports of HIV, chlamydia, gonorrhea, and syphilis, January-July 2019 compared to January-July 2020