

# The impact of physical restriction measures imposed during the two waves of COVID-19 on chlamydia and gonorrhoea diagnoses in Belgium. Results of an sexually transmitted infection clinic

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## Abstract

**Background:** During the first two waves of COVID-19, several physical restriction measurements were imposed in Belgium. Our aim was to explore the impact of these restriction measures on the number of tests and positivity rate of *Chlamydia trachomatis* (CT)/*Neisseria gonorrhoeae* (NG) before, during, and after the two lockdowns in Belgium. **Methods:** *Chlamydia trachomatis*/*Neisseria gonorrhoeae* molecular data of a Belgian STI clinic were extracted for 2019 and 2020, and both years were divided into four periods (pre-lockdown 1, lockdown 1, after lockdown 1, and lockdown 2). Weekly testing rates and positivity rate for both STIs were estimated, and mixed-effects logistic regression was used to explore statistical significant changes between both years, and the different periods were compared with the corresponding time period in 2019. The same analysis was done for pre-exposure prophylaxis (PrEP) users only. **Results:** No overall significant changes in positivity rate were found for either CT (8.0% in 2019 and 7.8% in 2020) or NG (4.5% in 2019 and 5.5% in 2020). Besides a significant drop in the number of CT/NG tests during lockdown 1 (decrease of 87%) and a subsequent increase in NG positivity rate ( $p > 0.05$ ), no changes in CT/NG positivity rate were found in the other periods. The highest positivity rate for either CT or NG was found in lockdown 2 (15.1% vs 12.4% in 2019). The number of CT/NG tests in lockdown 2 was still 25% lower than 2019 levels. Subanalysis of only PrEP users revealed the same trend; however, the number of CT/NG tests in lockdown 2 was exactly the same as in 2019. **Conclusion:** Despite a significant decline in absolute CT or NG cases in lockdown 1, which was most likely a consequence of both physical distancing and reduced testing, CT/NG testing and positivity rates returned to pre-corona levels in lockdown 2, which may depict physical distancing fatigue.

## Keywords

Sexually transmitted infections, COVID-19, *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, pre-exposure prophylaxis

## Introduction

Due to the global COVID-19 pandemic, the Belgian government imposed several physical distancing and mitigation measures in 2020 in an attempt to control the spread of SARS-CoV-2 virus. During the first wave of COVID-19 infections (18 March to 11 May), Belgian citizens were recommended to stay at home (telework was mandatory, only essential travel was allowed, and only food stores remained open) and to avoid any social contact beyond the

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household. It has been suggested that these social restrictions would translate in reduced incidence of sexually transmitted infections (STIs).<sup>1</sup>

Furthermore, nonessential healthcare services were halted. This meant that all booked consultations for the HIV, STI, and PrEP (pre-exposure prophylaxis) clinics were abruptly cancelled, including STI screening in the low-threshold clinics. The only patients that were still allowed were patients with a request for postexposure prophylaxis, patients with STI symptoms, and “vulnerable” HIV patients, whereby the treating physician considered that a face-to-face contact with the patient was necessary.

The first wave of the COVID-19 epidemic ended in May and was followed by relaxing measures. All healthcare clinics could be accessed again. Measures that could influence sexual behavior included an increased number of allowed physical contacts. Commercial sex clubs and saunas remained closed, but sex work was allowed under strict circumstances. From September onward, Belgium, as the whole of Europe, experienced a second wave of COVID-19 cases. This forced the government to reimpose strict measures on November 2. Singles were allowed to have one close contact and one regular extra contact but with physical distancing. Henceforth, close contact with nonsteady sexual partners or anonymous sexual contacts through dating applications, nor commercial sex work were allowed. A major difference between the first and second lockdowns was the accessibility of services, which was limited during the first lockdown, but fully accessible during the second one including the provision of PrEP. In Belgium, PrEP is almost exclusively taken by men who have sex with men (MSM) at high risk for acquiring HIV. Therefore, physical distancing measurements are expected to cause a reduction in the number of STIs found among PrEP users.<sup>2</sup>

Several publications investigated the impact of physical restrictions and closure of sexual health services of the first lockdown on the number of STI cases, with varying results. For example, a reduction in the number of STI cases was reported by several countries during the first lockdown period.<sup>3–5</sup> In Italy, however, a slight increase in secondary syphilis and gonorrhoea was reported.<sup>6</sup> Furthermore, a reduction in casual sex was noted in several countries, including Belgium, during the first lockdown.<sup>5,7–9</sup>

However, few studies are available which investigate the trend of STIs after a lockdown period, and to our knowledge, none of them explored the effect of the mitigating efforts of the second COVID-19 wave in Europe.

Therefore, our aim was to explore whether the different restriction measures had an impact on the trends of number of tests and diagnoses of *Chlamydia trachomatis* (CT)/*Neisseria gonorrhoeae* (NG) before, during, and after the two lockdowns in Belgium in 2020 by comparing them with the same period in 2019. We looked at the trends for all STI patients and PrEP users separately.

## Methods

### Study setting

The STI clinic, located at the Institute of Tropical Medicine (ITM), Antwerp, follows a large cohort of PrEP users ( $n =$  almost 1000) and HIV positive individuals ( $n = 3000$ ). Pre-exposure prophylaxis users are typically screened for CT/NG every four to 6 months and HIV-positive individuals once or twice a year if deemed necessary. Depending on the sexual risk behavior and clinical picture, CT/NG testing was performed in more than one anatomical site (i.e., anorectum, pharynx, and urethra). Any positive result in one of the sites was classified as one CT or NG diagnosis. Furthermore, our STI clinic also includes a low-threshold center that offers free-of-charge HIV and STI screening, and in 2019, over 2500 CT/NG tests were requested in that framework (Table 1).

For this analysis, all CT/NG molecular data were collected for the period 2019 until the end of 2020. Data were extracted for two cohorts. The “whole clinic” cohort comprised all tests from individuals attending the STI clinic. The “PrEP-only” cohort was limited to tests from PrEP users.

Testing for CT/NG was performed using molecular amplification assays. Samples were tested with the Abbott RealTime (RT) CT/NG assay (Abbott Molecular Inc. Des Plaines, IL, USA) according to the manufacturer’s instructions. In case a positive NG result was obtained in an extragenital site, confirmation was performed by an in-house real-time PCR assay based on previously published primer sets.<sup>10</sup>

### Statistical procedures

Duplicate CT/NG results within 30 days were removed from the database to exclude treatment failure. Descriptive analyses of the number of CT/NG tests, number of positive CT or NG cases, and the positivity rate for both STIs were performed for 2019 and 2020 for both cohorts. Specifically, we divided both years into four different periods: 1) pre-lockdown (pre-LD): 01 January to 17 March (11 weeks); 2) lockdown 1 (LD1): 18 March to 10 May (8 weeks); 3) after lockdown 1 (after LD1): 11 May to 01 November (25 weeks); and 4) lockdown 2 (LD2): 02 November to 31 December (8 weeks). All clinical services at ITM restarted after the end of lockdown 1. We estimated weekly testing rates for each period, and we used mixed-effects logistic regression with the individual as random intercept to explore statistical significant changes between CT/NG diagnosis rates in both years and between the corresponding time periods of 2019 and 2020.  $p$ -values less than 0.05 were considered to be significant. All statistical tests were performed using Stata 15.1 (StataCorp).

**Table 1.** Number of CT/NG tests done at ITM in year 2019 and 2020 including demographic information of the patients and the reason of visit.

	ITM 2019	2020	PrEP 2019	2020
Number of patients	5029	3885	912	905
Age (Interquartile range)	36 (27–47)	35 (27–46)	39 (32–48)	39 (32–47)
Gender				
Male	4010 (79.7%)	3176 (81.7%)	910 (99.8%)	902 (99.7%)
Female	1019 (20.3%)	709 (18.3%)	2 (0.2%)	3 (0.3)
Number of tests	7171	5183	1804	1472
Reason of visit				
HIV+ follow-up	1506	1116		
HelpCenter	2570	1585		
PrEP	1804	1472		
STI clinic other than above	1291	1010		

CT: *chlamydia trachomatis*; ITM: institute of tropical medicine; NG: *neisseria gonorrhoeae*.

**Table 2.** Weekly number of tests and positivity rate for CT, NG, or both for the whole years and for the different time periods in both years for the ITM cohort. The OR and 95% CIs of period 2020 were calculated using mixed-effects logistic regression.

	Weekly tests 2019	Weekly tests 2020	Positivity rate 2019 (%)	Positivity rate 2020 (%)	OR	95% CI	p-value
<b>CT</b>							
Overall	138	100	8.0	7.8	0.95	0.83–1.09	0.453
Pre-LDI	132	146	9.1	7.0	0.73	0.55–0.97	<b>0.028</b>
LD1	147	18	8.2	7.8	0.95	0.47–1.89	0.875
After LD1	137	103	7.5	7.5	0.98	0.80–1.21	0.883
LD2	140	108	8.2	9.9	1.23	0.88–1.71	0.221
<b>NG</b>							
Overall	137	100	4.7	5.5	1.16	0.98–1.39	0.088
Pre-LDI	131	145	4.4	5.3	1.24	0.87–1.77	0.241
LD1	147	18	5.3	9.3	1.66	0.82–3.34	0.160
After LD1	136	102	4.5	5.2	1.15	0.89–1.49	0.268
LD2	140	108	5.1	6.1	1.18	0.78–1.79	0.433
<b>CT or NG</b>							
Overall	138	100	11.5	12.2	1.04	0.92–1.17	0.505
Pre-LDI	132	146	12.4	11.4	0.88	0.69–1.11	0.286
LD1	148	18	11.9	14.2	1.15	0.66–2.02	0.615
After LD1	137	103	10.8	11.6	1.07	0.89–1.27	0.481
LD2	140	108	12.4	15.1	1.25	0.95–1.66	0.116

CIs: confidence intervals; ITM: institute of tropical medicine; LD: lockdown; OR: odds ratio; CT: *chlamydia trachomatis*; NG: *neisseria gonorrhoeae*.

### Ethical clearance

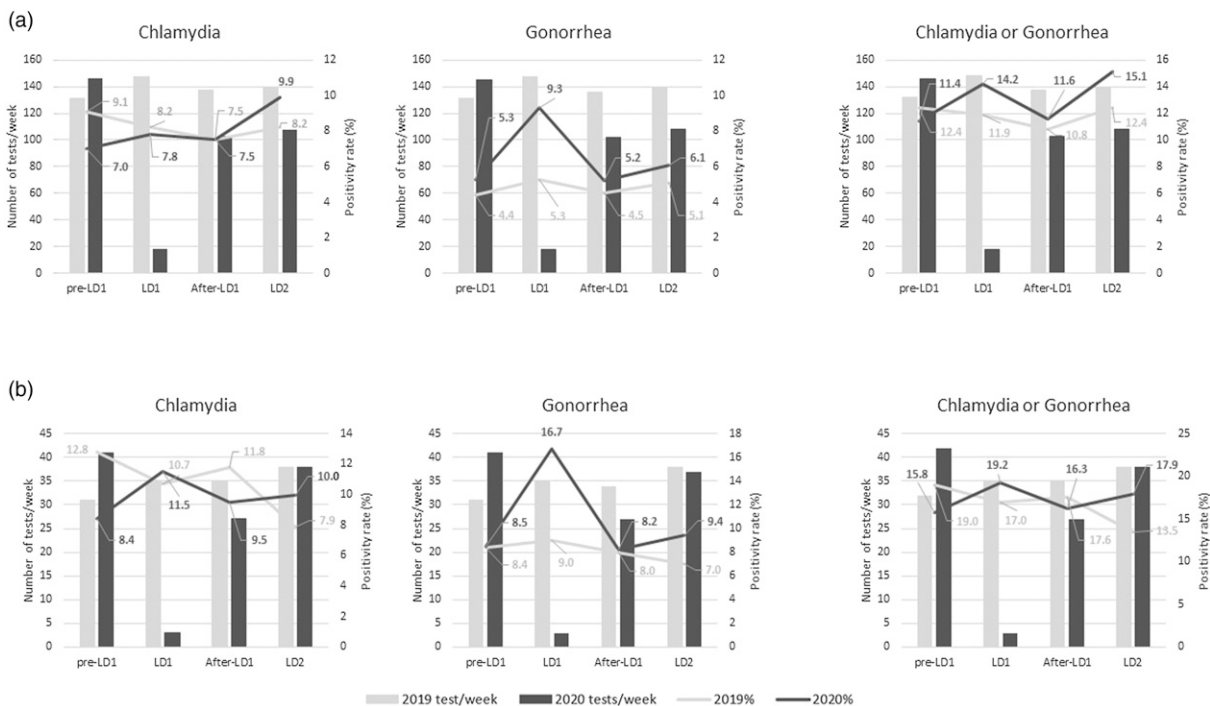
According to ITM's Institutional Review Board, laboratory data of patients can be used for research if the patients' identity is not disclosed to third parties and the patient does not explicitly state his/her objection. No additional ethical approval or informed consent was necessary.

### Results

Table 1 tabulates the number of CT/NG tests including demographic data and the reason why the patient visited the clinic in the years 2019 and 2020.

### Whole clinic analysis

**Overall STI trends.** The overall number of CT/NG tests dropped with 27.7%: from 7171 in 2019 to 5183 in 2020. The overall positivity rate of CT (8.0% in 2019 and 7.8% in 2020) and NG (4.7% in 2019 and 5.5% in 2020) was similar in both years ( $p \geq 0.05$ ) (Table 2). While the number of weekly CT/NG tests remained similar throughout the four periods of 2019 (mean = 138), large fluctuations were evident in the year 2020 (Figure 1 and Table 2). During LD1 2020, a severe drop in the number of CT/NG tests was found (from 146 in pre-LD to 18). This drop coincided with the closure of nonessential STI



**Figure 1.** Number of weekly requests (bars) and positivity rate (line) of chlamydia and gonorrhea for the different periods of 2019 and 2020 for the whole clinic cohort (a) and for PrEP users only (b). LD = lockdown. PrEP: pre-exposure prophylaxis

services. As soon as these services reopened, the number of CT/NG tests went up to an average of 103 per week (after LD1, Figure 1(a), Table 2). This was still 27% below the mean 2019 level. Further exploration of the data showed that this was mostly due to a decrease of CT/NG tests requested by the low-threshold center in both periods after lockdown 1.

### Trends between different time periods of 2020 compared to 2019

Although the positivity rate of CT of pre-LD1 was lower compared to the period in 2019 ( $p = 0.028$ ), the highest positivity rate was detected during LD2 (9.9%). For NG, a sharp increase in the positivity rate was found during LD1 (9.3%); however, this was not found to be statistically significant (Table 2). During the other periods, no differences were found between 2019 and 2020. Noteworthy, the highest positivity rate for CT and/or NG was found during LD2 in 2020 (15.1%).

### PrEP users only analysis

**Overall STI trends.** Analysis of the trends of STIs of PrEP users only, showed the same trends (Figure 1(b) and Table 3). The overall positivity rate of CT (11.2% in 2019 and 9.3% in 2020) and NG (8.1% and 8.7%, respectively) did not differ ( $p \geq 0.05$ ).

**Trends between different time periods of 2020 compared to 2019.** Although that the positivity rate of NG almost doubled in period LD1 (from 9.0% in 2019 to 16.7% in 2020), only a decrease in positivity rate of CT between 2019 and 2020 in pre-LD1 period was found to be statistically significant ( $p = 0.033$ ) (Table 3). In LD2, the highest positivity rate of CT and/or NG was reported, and the number of weekly CT/NG tests was very similar to the commensurate period in 2019. This illustrates the fact that the number of follow-up PrEP visits went back to normal. In fact, approximately the same number of PrEP users was seen in 2020 ( $n = 905$ ) compared to 2019 ( $n = 912$ ). However, participants visited the clinic less frequently in 2020 as compared to 2019. For example, the number of PrEP users that visited the clinic more than twice was only half of the number observed in 2020 (17.1% (155/905) versus 34.2% (312/912) in 2020).

## Discussion

In this Belgian study, we documented an extreme reduction in the number of weekly CT/NG tests and an increase in positivity rate of NG during LD1. This was however anticipated as only urgent STI consultations were permitted during that period. After LD1, all services of the ITM clinic including follow-up of PrEP users and HIV-positive individuals and the low-threshold clinic restarted and remained open. No other significant change in CT/NG trends

**Table 3.** Weekly number of tests and positivity rate for *Chlamydia trachomatis*, *Neisseria gonorrhoeae* or both for the whole years and for the different time periods in both years for the PrEP cohort. The OR and 95% CI of period 2020 was calculated using mixed-effects logistic regression.

	Weekly tests 2019	Weekly tests 2020	Positivity rate 2019 (%)	Positivity rate 2020 (%)	OR	95% CI	p-value
<b>CT</b>							
Overall	35	28	11.2	9.3	0.78	0.61-1.00	0.050
Pre-LD1	31	41	12.8	8.4	0.58	0.36-0.96	<b>0.033</b>
LD1	35	3	10.7	11.5	1.12	0.28-4.45	0.872
After-LD1	35	27	11.8	9.5	0.74	0.52-1.05	0.091
LD2	38	38	7.9	10.0	1.29	0.70-2.35	0.413
<b>NG</b>							
Overall	34	28	8.1	8.7	1.08	0.83-1.41	0.577
Pre-LD1	31	41	8.4	8.5	1.02	0.60-1.74	0.940
LD1	35	3	9.0	16.7	1.78	0.50-6.33	0.374
After-LD1	34	27	8.0	8.2	1.01	0.68-1.49	0.962
LD2	38	37	7.0	9.4	1.42	0.76-2.65	0.265
<b>CT or NG</b>							
Overall	35	28	17.1	16.5	0.94	0.77-1.15	0.534
Pre-LD1	32	42	19.0	15.8	0.77	0.52-1.14	0.194
LD1	35	3	17.0	19.2	1.04	0.34-3.20	0.945
After-LD1	35	27	17.6	16.3	0.88	0.66-1.17	0.384
LD2	38	38	13.5	17.9	1.44	0.90-2.31	0.131

CI: confidence intervals; ITM: institute of tropical medicine; LD: lockdown; OR: odds ratio; CT: *chlamydia trachomatis*; NG: *neisseria gonorrhoeae*.

was found in our STI clinic during the other time periods. During LD2, we reported the highest CT/NG positivity rate at our center for the whole cohort and PrEP users only since 2019. This suggests that the requested physical distancing measures were not stringently followed during LD2. This is in strong contrast with LD1. Indeed, in LD1, an online survey indicated that Belgian MSM reduced their sexual activity with nonsteady partners with 85%.<sup>7</sup> Although no Belgian sexual activity data are available for LD2, personal communication with patients indicate regular sexual activity through internet dating and in private encounters during this period, despite the social measures and the threat of being fined by the authorities.

Our study has several limitations. First, we do not have any information concerning the presence of symptoms which could improve our understanding why individuals visited the clinic in the different time periods. Moreover, due to the fact that our population is mainly male and MSM, the results of our clinic may not be generalizable to the Belgium population.

Our data are in line with other studies investigating the impact of COVID-19 on STI trends. Most of the studies do report a drop in STI infections during the first lockdown followed by a rebound in STI infections.<sup>11-13</sup> There are few reports that include results from subsequent lockdowns. Taken in conjunction with other types of evidence such as those detailed above, our results suggest that the decline in the number of diagnoses of CT/NG in LD1 was a result of both reduced testing and changes in behavior. When testing practice returned to normal, the number of

positive CT/NG tests and positivity rates rapidly returned to baseline 2019 levels. There was no drop in number of tests or positivity rate during LD2. This finding is compatible with less of a decline in casual sexual contacts than during the first lockdown. There is evidence of physical distancing fatigue in the society as a whole.<sup>14</sup> Although it is possible that part of the differences in CT/NG diagnoses between the two lockdowns could be explained by differences in testing strategy, further behavioral research is needed to compare the compliance with physical distancing measures and sexual activity during the two lockdown periods.

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