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# Recent changes in the reporting of STIs in Japan during the COVID-19 pandemic

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## ABSTRACT

**Objectives** The COVID-19 pandemic has had variable effects on the rates of STIs reported across the globe. This study sought to assess how the number of STI reports changed during the pandemic in Japan.

**Methods** We used national infectious disease surveillance data from the National Institute of Infectious Diseases (Tokyo, Japan) for the period between January 2013 and December 2021. We compared reported rates of chlamydia, gonorrhoea, condyloma acuminata and genital herpes, as well as total notifications for HIV/AIDS and syphilis during the pandemic versus previous years in Japan. We used a quasi-Poisson regression to determine whether any given week or month between January 2018 and December 2021 had a significant excess or deficit of STIs. Notification values above or below the 95% upper and lower prediction thresholds were considered as statistically significant. The start of the pandemic was defined as January 2020.

**Results** Chlamydia generally remained within predicted range during the pandemic period. Reporting of gonorrhoea was significantly higher than expected throughout early-to-mid 2021 but otherwise generally remained within predicted range prior to 2021. Condyloma, herpes and HIV/AIDS reporting were transiently significantly lower than expected throughout the pandemic period, but no significant periods of higher-than-expected reporting were detected. Syphilis showed widespread evidence of significantly lower-than-predicted reporting throughout 2020 but eventually reversed, showing significantly higher-than-predicted reporting in mid-to-late 2021.

**Conclusions** The COVID-19 pandemic was associated with variable changes in the reporting of STIs in Japan. Higher-than-predicted reporting was more likely to be observed in the later phases of the pandemic. These changes may have been attributable to pandemic-related changes in sexual behaviour and decreased STI clinic attendance and testing, but further research on the long-term impact of the pandemic on STIs is necessary.

## INTRODUCTION

The COVID-19 pandemic has been characterised by impaired access to STI testing and decreasing testing globally.<sup>1</sup> Country-level studies found that STI diagnoses generally decreased, raising concern for unchecked community spread<sup>2</sup> as well as deferrals of symptomatic infection. Generally, case numbers rebounded after lockdowns ended, but ultimately it remains unclear whether the incidence

of STIs truly decreased or if diagnoses were simply foregone.<sup>2,3</sup>

In Japan, social distancing measures were encouraged throughout the pandemic, and up to four states of emergency (SOE) were announced in its varying prefectures between 2020 and 2021 (online supplemental table 1). The effects of these non-pharmaceutical interventions (NPIs) on STI reporting have not been investigated. We use national infectious disease surveillance data from January 2013 to December 2021 to assess changes in the reported number of STIs, including genital chlamydia, gonorrhoea, condyloma acuminata, genital herpes, HIV/AIDS and syphilis in Japan during the pandemic compared with previous years.

## METHODS

### Data

National infectious disease surveillance data were obtained from the National Institute of Infectious Diseases (NIID, Tokyo). Under the *Infectious Disease Control Law*, there are two types of STIs that are subject to infectious disease surveillance: those for which some designated medical institutions must report cases (sentinel surveillance) and those for which all medical institutions must report cases (notifiable diseases) (online supplemental table 2). Genital chlamydia, gonorrhoea, condyloma acuminata and genital herpes are sentinel surveillance diseases (hereafter ‘sentinel STIs’), and we obtained monthly data on case notifications per sentinel site from January 2000 to December 2021 (approximately 900–1000 sentinels per month). The sentinel surveillance of STDs in Japan is explained further in the online supplemental methods and elsewhere.<sup>4</sup>

HIV/AIDS and syphilis are nationally notifiable diseases (hereafter ‘notifiable STIs’), and we obtained weekly notification data from 2012 week 37 to 2021 week 52 (week start dates are shown in online supplemental table 3). As these are nationally notifiable illnesses, weekly case numbers reflect the total number of cases documented nationally.

We defined the start of the pandemic as January 2020, when the first case of COVID-19 was identified in Japan.

### Regression analyses: Farrington approach

We used the Farrington algorithm, a quasi-Poisson regression-based procedure, to estimate the expected number of STIs for any given week/month.



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To assess trends between 2018 and 2021, we used surveillance data from 2013 to 2021 such that predictions for any given year were made using a 5-year moving window (eg, predictions for 2020 were made using data from 2015 to 2019). We estimated two one-sided 95% prediction intervals. Any weeks/months for which reporting exceeded the upper or lower prediction intervals were statistically significant excesses and deficits, respectively. The approach and sensitivity analyses are explained further in the online supplemental methods.

## RESULTS

The results of the quasi-Poisson regression and associated prediction intervals for 2018–2021 are shown in [figure 1](#) and online supplemental tables 4–9. Results below are specific to the period after the start of the pandemic. The results of the sensitivity analysis are detailed in the online supplemental material.

### Genital chlamydia and gonorrhoea

There was one instance of a marginal excess in chlamydia during January 2020. There were five instances of excess gonorrhoea reporting: January, April, May, June and July 2021. No deficits in either chlamydia or gonorrhoea reporting were detected during the assessed time period. Sex-stratified analyses are shown in online supplemental efigures 1,2; trends reflect those of the non-stratified analyses. Reporting rates of both chlamydia and gonorrhoea were higher for men than women, and monthly excesses during 2020–21 were only observed among men.

### Condyloma acuminata and genital herpes

There was one instance of a marginal deficit in condyloma reporting during November 2020. There were two instances of deficits in herpes reporting: May 2020 and February 2021. No excesses in either condyloma or herpes reporting were detected during the assessed time period. Sex-stratified analyses are shown in online supplemental efigures 1,2; trends reflect those of the non-stratified analyses. Reporting rates of condyloma were generally higher for men, though monthly deficits were only observed among men. Reporting rates of herpes were higher among women.

### HIV/AIDS

There were three instances of consecutive, weekly deficits in HIV/AIDS reporting: 2020 weeks 7–8, 2020 week 52 to 2021 week 1 and 2021 weeks 7–9. No excesses were detected during the assessed time period. Sexual orientation-stratified analyses are shown in online supplemental efigure 3; scattered deficits were also noted among those who have sex with the same or both sexes. Reporting rates of HIV/AIDS were higher among those who have sex with the same or both sexes than they were for those who have sex with the opposite sex. Week 51 of 2021 was found to have excess reporting among those who have sex with the same or both sexes.

### Syphilis

There were multiple and prolonged instances of consecutive, weekly deficits in syphilis reporting: 2020 weeks 5–18, 20–23, 25–34, 36–38 and 2020 week 52 to 2021 week 1. There were also three instances of consecutive, weekly excesses in syphilis notifications during 2021: weeks 35–37, 39–46 and 48–51. Stage-stratified analyses are shown in online supplemental efigure 4; trends for each stratification largely reflect those of the non-stratified analyses. Reporting for primary syphilis showed the

greatest number of excesses in 2021; reporting for asymptomatic syphilis showed the fewest number of excesses.

### States of emergency

During the first SOE, herpes and syphilis notifications decreased. HIV/AIDS and herpes reports decreased during the second SOE, but gonorrhoea and syphilis increased during the third and fourth SOEs, respectively.

## DISCUSSION

Using Japanese national infectious disease surveillance data, we assessed how the number of reported STIs changed during the COVID-19 pandemic. We found evidence for relatively stable chlamydia diagnoses, slight increases in gonorrhoea diagnoses during the first half of 2021, scattered decreases in the diagnoses of condyloma acuminata, herpes and HIV/AIDS, and broad deficits in syphilis until late 2021, which were then offset by excess reporting.

New notifications of chlamydia largely fell within prediction thresholds, and gonorrhoea experienced a few months of higher-than-expected reporting. Though there is ample evidence for decreased testing and STI services in other countries during the pandemic,<sup>1 5</sup> the number of tests performed in Japan was unavailable. If testing also decreased in Japan, the excesses in chlamydia and gonorrhoea may have been due to increased positivity among the tests that were conducted, as observed in the USA.<sup>5</sup> Alternatively, testing in Japan may have increased despite the pandemic due to increased risky sexual behaviour during a time when other daily activities were inaccessible. Given that monthly excesses were exclusively observed among men, the propensity to engage in high-risk sexual practices or undergo testing may have varied between the sexes. Other countries saw an almost universal decline in chlamydia and gonorrhoea,<sup>2 3 5</sup> except Taiwan,<sup>6</sup> because both STIs may be asymptomatic and require regular screening to be diagnosed.<sup>3 5</sup>

The remaining four STIs experienced reporting deficits. These results are consistent with reports of decreased syphilis<sup>2 3</sup> and HIV/AIDS<sup>6</sup> elsewhere. With respect to HIV/AIDS, published nationwide testing data suggest that the number of tests and HIV/AIDS-related consultations decreased by approximately half from 2019 to 2020.<sup>7</sup> However, the proportion of newly diagnosed AIDS:HIV cases rose during 2020 for the first time in 3 years, suggesting that care delays led to the progression of untreated HIV and that the drop in case notifications was the result of decreased testing.<sup>8</sup> There is rationale to support a true decrease in the incidence of certain STIs: a Japanese survey<sup>9</sup> found evidence of decreased sexual frequency during the COVID-19 pandemic.

Though the concomitant reporting of chlamydia and gonorrhoea would suggest that STI clinics were still well attended by patients throughout the pandemic, prior research has found that chlamydia and gonorrhoea have different transmission dynamics than other STIs.<sup>10</sup> Furthermore, chlamydia and gonorrhoea, when symptomatic (eg, dysuria and purulent discharge), may result in more care seeking than primary syphilis because of the shorter latency period and persistent symptoms. Paradoxically, condyloma and genital herpes are also often symptomatic and comprise clinical diagnoses, though genital warts are typically painless and herpes often resolves spontaneously. Reduced in-person clinic visits may have disproportionately affected clinically diagnosed STIs. If decreased testing is responsible for the deficits observed in this study, then excess diagnoses can be expected later because of transmission from undiagnosed individuals who remained

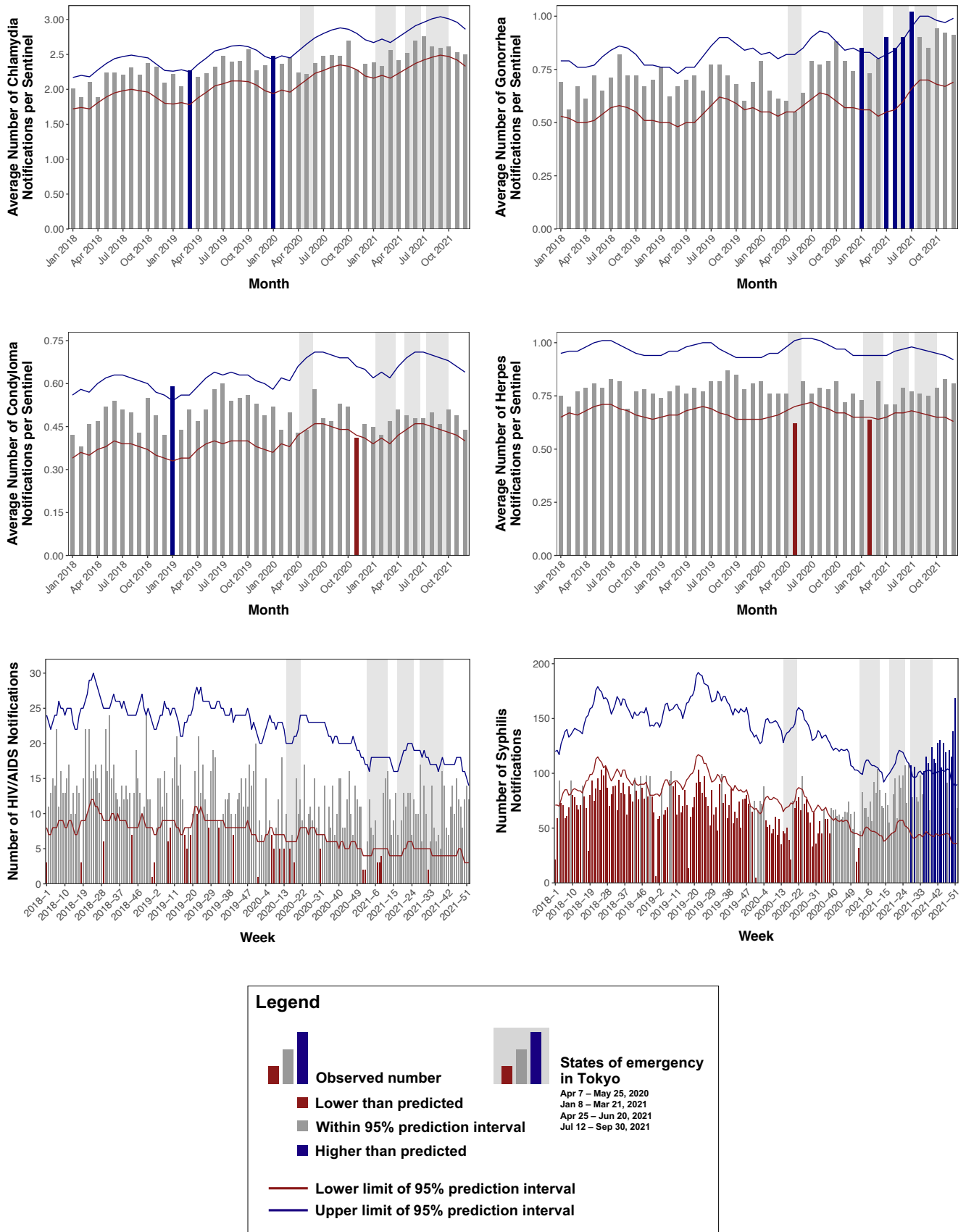


Figure 1 Observed and expected number of STI diagnoses with 95% prediction intervals, 2018–2021.

sexually active. Public health campaigns targeting STI awareness should be implemented to encourage increased clinic attendance and routine testing once activity restrictions are lifted.

The decreasing trend in syphilis diagnoses reversed in late 2020, ultimately culminating in several weeks of excess in September–December 2021. The reasons behind the jump in syphilis diagnoses remain unclear but may be due to increased test seeking after delaying care for the greater portion of 2020. Notably, increases in syphilis have also been observed in the USA and UK. That primary syphilis showed more weeks of excess than asymptomatic syphilis likely reflects a drop in routine/asymptomatic screening during the pandemic.

This study has limitations. First, we were unable to perform subgroup analyses by gender and sexual orientation for all STIs due to data unavailability. Second, we did not have access to the number of tests performed per week/month and thus could not make definitive conclusions regarding decreases in incidence versus foregone testing.

### Key messages

#### What is already known?

- ▶ The COVID-19 pandemic and associated non-pharmaceutical interventions have had variable effects on STI diagnoses and testing around the world, though the changes vary by country.

#### What are the new findings?

- ▶ During the pandemic in Japan, rates of chlamydia remained relatively stable, gonorrhoea increased slightly and condyloma and herpes showed evidence of scattered deficits.
- ▶ Notifications of HIV/AIDS showed evidence of scattered deficits during the pandemic period.
- ▶ Syphilis initially showed evidence of broad deficits in 2020 but ultimately showed excess reporting in mid-to-late 2021.

#### What do the new findings imply?

- ▶ The COVID-19 pandemic may have been associated with altered sexual behaviour, sexual health clinic attendance and STI testing in Japan.

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