Sexual Behavior and Its Determinants During COVID-19 Restrictions Among Men Who Have Sex With Men in Amsterdam

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Objective: To investigate the impact of Dutch COVID-19 restrictions on sexual behavior and HIV/sexually transmitted infection (STI) acquisition among men who have sex with men (MSM) participating in the Amsterdam Cohort Studies (ACS) on HIV in Amsterdam.

Methods: ACS participants complete a questionnaire on sexual behavior and are tested for HIV/STI biannually. They may also be tested at the STI clinic in-between study visits. On May 29, 2020, ACS participants were invited to complete an online questionnaire on health, COVID-19 risk perceptions, and sexual behavior. Determinants of reporting casual sex partners (CSP) during COVID-19 restrictions were examined using logistic regression.

Results: Of 683 MSM, 353 (52%; median age, 47 years; interquartile range, 38–53 years) completed the questionnaire. Since COVID-19, 73% reported a reduction in the number of CSP. CSP during COVID-19 restrictions were reported by 133 MSM (38%) and, in multivariable analysis, was associated with not having a college/university degree, being single, lower perceived importance of avoiding COVID-19, number of CSP before COVID-19, and current preexposure prophylaxis use ($P < 0.05$ for all). During COVID-19 restrictions, no HIV infections were diagnosed, and the STI positivity rate was 8%.

Conclusion: Since COVID-19, the number of CSP decreased among MSM, and there may have been a temporary reduction in HIV/STI transmission. Some MSM were not fully compliant to social distancing regulations and reported CSP, which was related to prior sexual behavior and low perceived importance of avoiding COVID-19. For these men, it is important to maintain accessible HIV/STI-related testing and care during times of lockdown.

Key Words: COVID-19, social distancing, HIV, STI, sexual behavior, men who have sex with men

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INTRODUCTION

In the Netherlands, the first SARS-CoV-2 infection was notified on February 27, 2020. To contain transmission, far-reaching measures were gradually introduced. First, events were canceled, work from home was encouraged, and bars, public places, and schools were closed. On March 23, the Netherlands went into semilockdown: people were urgently advised to stay home, groups of more than 2 people in public space were prohibited, and it was not allowed to have more than 3 visitors in a household. All contacts outside the household, including sexual contacts, were to be limited, and it was mandatory to keep a minimal physical distance of 1.5 m between people from different households. The semilockdown lasted until May 11. From then on, measures were gradually relaxed, starting with the reopening of schools and outdoor sports. On June 1, bars and restaurants were reopened under certain conditions, but physical distancing and group size measures were maintained.

Before COVID-19, HIV incidence among men who have sex with men (MSM) in the Netherlands was significantly decreasing, even though there had been an increase in the incidence of bacterial sexually transmitted infections (STI) and condomless anal sex (CAS). Recreational drug use and drug use during sex were moreover common in this population. In
2015, 60% of MSM in the Amsterdam Cohort Study (ACS) reported drug use during sex, and drug use was associated with increased sexual behavior and STI acquisition.2 MSM with casual sex partners (CSP) are advised to semiannually test for HIV and STIs, which could be done free of charge at governmental STI clinics. Since 2015, the use of preexposure prophylaxis (PrEP) has been increasing, and since September 2019, PrEP is offered at STI clinics.3,4

Because of COVID-19, the STI clinic of the Public Health Service of Amsterdam (PHSA) was closed for free-of-charge routine HIV/STI testing on March 23, 2020. Routine care was limited to individuals with STI-related symptoms and others, mainly MSM, who needed a prescription for PrEP and did not temporarily discontinue PrEP use. At the time when routine HIV/STI screening was halted, the potential impact on HIV/STI transmission among MSM was unknown. Given the trends before COVID-19, closure of the STI clinic could have had adverse consequences for HIV and STI spread, especially when adherence to social distancing measures was low and sexual contacts continued. In this study, we examined health, mental well-being, substance use, risk perception, and psychosocial factors related to COVID-19 and social distancing among MSM participating in the ACS during COVID-19 restrictions. We additionally investigated whether these MSM had sexual contacts with casual partners while nonhousehold contacts were supposed to be limited and physical distancing measures were instated. We determined whether substance use, past sexual behavior, and current beliefs and attitudes towards COVID-19 were associated with engaging in casual sex. Finally, we compared HIV/STI positivity rates in the periods before and during COVID-19.

METHODS

Study Design and Population

The ACS is an open, prospective, cohort study among HIV-positive and HIV-negative MSM, initiated in 1984 to investigate the epidemiology, pathogenesis, and natural course of HIV, STI, and blood-borne infections and to evaluate the effect of interventions.1 Since 2019, PrEP and PrEP care are provided on request to eligible participants. PrEP eligibility criteria are recently being diagnosed with an anal STI or syphilis, use of postexposure prophylaxis, or having had CAS with partners who are HIV positive and have a detectable viral load or have an unknown HIV status. The ACS is approved by the Medical Ethics Committee of the Amsterdam University Medical Center of the Amsterdam University, the Netherlands (MEC-07/182). Participation is voluntary and without incentives. Written informed consent of each participant was obtained at enrollment. The ACS recruits men in the Amsterdam area who are ≥18 years old and have sex with other men in the 6 months before recruitment. MSM are recruited during outreach activities at MSM meeting venues, via advertisements on online gay dating sites/apps and via chain referral sampling.

Data Collection

Every 3 or 6 months, ACS participants are tested for HIV and bacterial STI. In addition, they complete an online 6-monthly questionnaire on sociodemographics, health, risk perception, sexual behavior, and alcohol/drug use. In-between study visits, MSM can visit the STI outpatient clinic of the PHSA for additional HIV/STI testing (eg, when they have STI-related symptoms, are notified by a sex partner, or have been at an increased risk for HIV/STI). From March 23 to June 1, 2020, routine study visits had to be cancelled; HIV/STI testing was only performed when participants had STI-related symptoms or urgently needed a PrEP prescription. For this study, researchers from different backgrounds (ie, medicine, epidemiology, and psychology) generated an extra online questionnaire on health, mental well-being, COVID-19 risk perception, beliefs and attitudes, social distancing, sexual behavior, and substance use during COVID-19 restrictions. For coherence and readability, the questionnaire was piloted among 3 HIV researchers at the PHSA. On May 29, 2020, the questionnaire was sent to all ACS participants who had at least one study visit after January 1, 2018 (n = 683). Participants were able to respond until June 28, 2020. Data on behavior before the COVID-19 pandemic were obtained from the most recent 6-monthly study visit in 2019. HIV and bacterial STI (ie, syphilis, urethral, rectal or pharyngeal gonorrhea or chlamydia) test results in the 6-month period preceding and during the most recent cohort visit in 2019 were obtained from the STI clinic. HIV and bacterial STI test results were also obtained for the period when COVID-19 restrictions were in place, that is, the period between March 23 and June 28, 2020.

Study Variables

Sociodemographics included in this analysis were age, country of birth, educational level, number of household contacts, being in a steady relationship, and having an occupation requiring close contact with other individuals (ie, within <1.5-m distance). Medical history included HIV-status and being at high risk for a poor COVID-19 clinical outcome (ie, being >60 years old, or have a chronic pulmonary disease, asthma, diabetes, chronic kidney or liver disease, immunocompromised state, serious heart conditions, neurological disease, hypertension, or obesity). Health-related variables included the occurrence of COVID-19 symptoms (ie, dry coughing, fever, fatigue, loss of smell/taste, sore throat, runny nose, wheezing, shortness of breath, chest pain, headache, muscle strain, joint pain, nausea, or diarrhea) since the start of the pandemic and being tested, diagnosed, and hospitalized with SARS-CoV-2 infection. Variables on mental health included self-reported changes in anxiety, depressive feelings, and stress since the start of the COVID-19 pandemic, measured on a 7-point Likert scale ranging from far less to far more occurrence of these emotions compared with the pre–COVID-19 period. Variables on substance use consisted of alcohol and drug use in the preceding 4 weeks during COVID-19 restrictions, and of 7-point Likert scale items on self-reported changes in use of alcohol, drug and sex-related drug use since the start of the
COVID-19 pandemic. COVID-19 risk perception, beliefs and attitudes consisted, among others, of 7-point Likert scale items on perceived risk of getting infected with SARS-CoV-2, the importance of not becoming infected, and worry about getting infected. Social distancing variables consisted of 7-point Likert scale items measuring the self-perceived adherence to social distancing by oneself and others, experienced difficulty and importance of adhering to social distancing regulations, and perceived effectiveness of social distancing. Two 7-point Likert scale items additionally explored self-perceived changes in the number of CSP and sex acts since the COVID-19 pandemic.

Variables on sexual behavior included having performed sexual acts with CSP, number of known and anonymous CSP, practicing anal sex without a condom with CSP, and having engaged in group sex and chemsex (ie, the use of gamma-hydroxybutyric acid, gamma-butyrolactone, amphetamine, methamphetamine, mephedrone, ketamine, cocaine, ecstasy, 2,5-dimethoxy-4-bromophenethylamine, or 4-fluoroamphetamine around sex) in the pre-COVID-19 period and during COVID-19 restrictions. The regular questionnaire at routine ACS visits had a 6-month recall period, whereas the recall period in the COVID-19 questionnaire at routine ACS visits had 4 weeks.

PrEP use was categorized in not having used PrEP before and during COVID-19 restrictions, continuous PrEP use before and during COVID-19 restrictions, and having stopped PrEP use during COVID-19 restrictions.

HIV/STI-related variables included being diagnosed with HIV in the 6 months preceding the cohort visit before COVID-19 and during COVID-19 restrictions and having at least one bacterial STI diagnosis during the same periods.

Statistical Analyses

Characteristics between respondents and nonrespondents were compared. Descriptive statistics were used to report on health, medical history, mental well-being, COVID-19 risk perceptions, beliefs and attitudes, social distancing, and sexual behavior, substance use, and STI before and during COVID-19. Seven-point Likert scale answers were categorized as negative (score 1–3), neutral/equal (score 4), or positive (score 4–7). The pre-COVID-19 STI positivity rate of having at least one bacterial STI was calculated by dividing the number of cohort visits and between study visits at which at least one bacterial STI was diagnosed by the total number of visits at which STI testing was performed. The pre-COVID-19 STI positivity rate was also calculated for between-study visits only, which corresponded to the method of calculation for the period during COVID-19 restrictions when routine study visits had to be cancelled.

Characteristics of MSM without CSP during COVID-19 restrictions were compared with those with at least one CSP using logistic regression. Variables with $P < 0.2$ were selected for further analysis. Latent class profile analysis (LCPA) was performed to identify patterns in social distancing perceptions. We included difficulty of practicing social distancing, perceived effectiveness of social distancing measures, and the perceived compliance to social distancing by others (all continuous) in the LCPA model, and after sequentially increasing the numbers of clusters, we selected the model with the lowest Bayesian Information Criterion. Class membership and other variables with $P < 0.2$ were included in multivariable analysis using a backward stepwise procedure. A $P$ value of $<0.05$ was considered statistically significant. STATA IC15 was used.

RESULTS

We included 353/683 MSM (52%) who had at least one cohort visit since January 2018 and who completed the online questionnaire between May 29 and June 28. Respondents were older ($P < 0.001$), less often HIV positive ($P < 0.001$), and less often diagnosed with an STI in the 6 months before their last cohort visit before COVID-19 ($P = 0.016$) compared with nonrespondents. These groups did not differ in terms of education level, country of birth, being in a steady relationship, or sexual behavior and PrEP use before COVID-19. Of the respondents, 3% (n = 11) was HIV positive at their most recent study visit (Table 1). Median age was 47 [interquartile range (IQR), 38–53] years. The majority was born in the Netherlands and had a college/university degree. The majority of MSM had a steady relationship (n = 236; 67%) and lived together with at least one household member (n = 215; 61%). One-fifth of participants reported to be at high risk for a severe COVID-19 clinical outcome (n = 73, 21%).

Health

More than one-third of participants experienced symptoms of COVID-19 since the start of the pandemic. Fatigue (n = 94, 27%) and coughing (n = 93, 26%) were most frequently reported. Eight percent reported having been tested for SARS-CoV-2 (n = 30), and 6 (2%) participants reported being diagnosed with SARS-CoV-2.

Mental Well-being and Substance Use

Half of MSM experienced increased feelings of anxiety (52%), depression (54%), and stress (47%) since the start of the COVID-19 pandemic (Table 1). Reductions in these feelings were reported by 14%, 18%, and 27%, respectively. Increased alcohol use during COVID-19 restrictions was reported by almost one-third of participants (n = 102, 29%), whereas a similar proportion decreased their alcohol consumption (n = 119, 34%). Increased drug use was reported by 12% (n = 41), whereas 39% (n = 139) decreased their drug use.

COVID-19 Risk Perceptions, Beliefs and Attitudes, and Social Distancing

Approximately one-fourth of participants perceived themselves at high risk of getting infected with SARS-CoV-2 (Table 1). The majority considered it important to avoid a SARS-CoV-2 infection (n = 224, 64%). Worries about becoming infected were reported by 133 participants (38%). Approximately three-
| Variable | Total (N = 353) | MSM with ≥1 CSP (n = 133) | P  | OR  | 95% CI |
|----------|----------------|---------------------------|----|-----|--------|
| **Sociodemographics** | | | | | |
| Age in years, median (IQR) | 47 | 38–53 | 46 | 37–53 | 0.418 | 0.99 | 0.97 to 1.01 |
| Born in the Netherlands | 304 | 86% | 118 | 89% | 0.271 | 1.44 | 0.75 to 2.75 |
| College degree or higher* | 275 | 78% | 99 | 74% | 0.166 | 0.69 | 0.42 to 1.16 |
| Profession with contact with others <1.5 m | 75 | 21% | 30 | 23% | 0.640 | 1.13 | 0.67 to 1.91 |
| Steady relationship | 236 | 67% | 73 | 55% | <0.001 | 0.42 | 0.27 to 0.67 |
| No. housemates | | | | | | | |
| 0 | 138 | 39% | 62 | 47% | 1.00 | | |
| 1 | 162 | 46% | 54 | 41% | 0.61 | 0.38 to 0.98 |
| ≥2 | 53 | 15% | 17 | 13% | 0.58 | 0.30 to 1.13 |
| **Physical health** | | | | | |
| HIV Infected | 11 | 3% | 3 | 2% | 0.469 | 0.61 | 0.16 to 2.35 |
| At high risk for severe COVID-19 | 73 | 21% | 22 | 17% | 0.136 | 0.66 | 0.38 to 1.14 |
| SARS-CoV-2 test | 30 | 9% | 14 | 11% | 0.288 | 1.5 | 0.71 to 3.18 |
| COVID-19 diagnosis | 6 | 2% | 3 | 2% | 0.530 | 1.7 | 0.33 to 8.39 |
| COVID-19 hospitalization | 1 | 0.3% | 0 | 0% | 0.436 | | |
| COVID-19 ICU admission | 1 | 0.3% | 0 | 0% | 0.439 | | |
| Symptoms of COVID-19† | 132 | 37% | 50 | 38% | 0.952 | 1.01 | 0.65 to 1.58 |
| **Mental well-being since COVID-19 epidemic†** | | | | | |
| Change in anxiety‡ | 0.997 | | | | |
| Less | 50 | 14% | 19 | 14% | 1.00 | | |
| Equal | 119 | 34% | 45 | 34% | 0.99 | 0.50 to 1.96 |
| More | 184 | 52% | 69 | 52% | 0.98 | 0.51 to 1.86 |
| Change in depressed‡ | 0.174 | | | | |
| Less | 64 | 18% | 21 | 16% | 1.00 | | |
| Equal | 97 | 27% | 44 | 33% | 1.70 | 0.88 to 3.28 |
| More | 192 | 54% | 68 | 51% | 1.12 | 0.62 to 2.05 |
| Change in stress‡ | 0.980 | | | | |
| Less | 96 | 27% | 36 | 27% | 1.00 | | |
| Equal | 92 | 26% | 34 | 26% | 0.98 | 0.54 to 1.77 |
| More | 165 | 47% | 63 | 47% | 1.03 | 0.61 to 1.73 |
| **Substance use during COVID-19 epidemic** | | | | | |
| Alcohol use in preceding 4 wk | 297 | 84% | 114 | 86% | 0.528 | 1.21 | 0.67 to 2.21 |
| Change in alcohol use (last week compared with before COVID-19) | 0.486 | | | | |
| Less | 119 | 34% | 50 | 38% | 1.00 | | |
| Equal | 132 | 37% | 47 | 35% | 0.76 | 0.46 to 1.27 |
| More | 102 | 29% | 36 | 27% | 0.75 | 0.44 to 1.30 |
| Drug use in preceding 4 wk | 118 | 33% | 62 | 47% | <0.001 | 2.56 | 1.62 to 4.04 |
| Change in drug use (last week compared with before COVID-19) | 0.691 | | | | |
| Less | 139 | 39% | 56 | 42% | 1.00 | | |
| Equal | 173 | 49% | 63 | 47% | 0.85 | 0.54 to 1.34 |
| More | 41 | 12% | 14 | 11% | 0.77 | 0.37 to 1.59 |
| **COVID-19 risk perception** | | | | | |
| Risk of getting infected | 0.011 | | | | |
| Small risk | 210 | 59% | 70 | 53% | 1.00 | | |
| Neutral | 52 | 15% | 29 | 22% | 2.52 | 1.36 to 4.68 |
| Large risk | 91 | 26% | 34 | 26% | 1.19 | 0.71 to 1.99 |
| Importance not become infected | | | | | |
| Not important (at all) | 84 | 24% | 41 | 31% | 0.009 | | |

(continued on next page)
quarters reported good adherence to social distancing (n = 257, 73%) and perceived social distancing measures as important (n = 281, 80%) and effective (n = 269, 76%) (Table 1). Nevertheless, 41% considered it difficult to abide by the rules (n = 144). The majority, 72%, thought that others adhered well to social distancing measures.

###Sexual Behavior and PrEP Use

Before the COVID-19 pandemic, sex with CSP in the preceding 6 months was reported by 266 participants (76%), with a median of 5 (IQR 1–12) CSP in 6 months (Table 2). Among MSM with CSP before COVID-19, 112/266 (42%) reported CAS with CSP, 116/266 (44%) group sex, and 92/266 (35%) chemsex in the pre–COVID-19 period.

During COVID-19 restrictions, a reduction in the number of CSP was reported by 259 (73%) MSM. Sexual contact with CSP during COVID-19 restrictions was reported by 133 MSM (38%). These 133 MSM reported a median number of 2 (IQR 1–4) CSP in the preceding 4 weeks during COVID-19. CAS was reported by 66/133 MSM (50%), group sex by 23%, and chemsex by 52%.

In total, 87 participants (25%) reported PrEP use before and during COVID-19 restrictions; of whom, 61/87 (70%) also reported CSP in this period. During COVID-19 restrictions, 38 participants (11%) stopped using PrEP; of whom, 84% did not have CSP in this period (Table 2).

###Determinants of Having CSP During COVID-19 Restrictions

In multivariable analysis, participants with a college/university degree were less likely to report CSP than MSM with a lower educational level [adjusted odds ratio (aOR) = 0.46; 95% confidence interval (95% CI) = 0.22 to 0.90]. Participants who reported a steady partner were also less likely to report CSP (aOR = 0.46; 95% CI = 0.26 to 0.83). Participants who did not consider preventing a SARS-CoV-2 infection important were more likely

###TABLE 1. (Continued) Descriptive and Logistic Regression Analysis of Sociodemographics, Health, Mental Well-being, Substance use, Compliance to Social Distancing and COVID-19 Risk Perception Related to Reporting CSPs in the Preceding 4 weeks During COVID-19 Restrictions (May–June 2020) Among 353 MSM Participating in the Amsterdam Cohort Study

| Variable                              | Total (N = 353) | MSM with ≥1 CSP (n = 133) | P      | OR    | 95% CI |
|---------------------------------------|-----------------|---------------------------|--------|-------|--------|
| Neutral                               | 45 (13%)        | 21 (16%)                  |        | 0.92  | 0.44 to 1.90 |
| (Very) important                      | 224 (63%)       | 71 (53%)                  |        | 0.49  | 0.29 to 0.81 |
| Worried to become infected            |                 |                           | 0.112  |       |         |
| Not worried (at all)                  | 167 (47%)       | 66 (50%)                  |        | 1.00  |         |
| Neutral                               | 53 (15%)        | 25 (19%)                  |        | 1.37  | 0.73 to 2.55 |
| (Very) worried                        | 133 (38%)       | 42 (32%)                  |        | 0.71  | 0.44 to 1.14 |

Practicing social distancing

Self-reported compliance§

|                       | Total (N = 353) | MSM with ≥1 CSP (n = 133) | P  | OR   | 95% CI |
|-----------------------|-----------------|---------------------------|----|------|--------|
| Poor                  | 61 (17%)        | 40 (30%)                  |    | 1.00 |        |
| Neutral               | 35 (10%)        | 15 (11%)                  |    | 0.39 | 0.17 to 0.92 |
| Good                  | 257 (73%)       | 78 (59%)                  |    | 0.23 | 0.13 to 0.41 |
| Difficulty            |                 |                           | 0.059 |     |         |
| Difficult or very difficult | 160 (45%)  | 50 (38%)                  |    | 1.00 |         |
| Neutral               | 49 (14%)        | 19 (14%)                  |    | 1.39 | 0.72 to 2.71 |
| Easy or very easy     | 144 (48%)       | 64 (48%)                  |    | 1.76 | 1.10 to 2.81 |
| Importance            |                 |                           | 0.274 |     |         |
| Not important (at all) | 32 (9%)       | 15 (11%)                  |    | 1.00 |         |
| Neutral               | 40 (11%)        | 18 (14%)                  |    | 0.93 | 0.36 to 2.36 |
| (Very) important      | 281 (80%)       | 100 (75%)                 |    | 0.63 | 0.30 to 1.31 |
| Perceived effectiveness|               |                           | 0.164 |     |         |
| Not effective (at all) | 53 (15%)       | 26 (20%)                  |    | 1.00 |         |
| Neutral               | 31 (9%)         | 10 (8%)                   |    | 0.49 | 0.20 to 1.25 |
| (Very) effective      | 269 (76%)       | 97 (73%)                  |    | 0.59 | 0.32 to 1.06 |
| Compliance by direct environment |         |                           | 0.167 |     |         |
| Poor                  | 56 (16%)        | 25 (19%)                  |    | 1.00 |         |
| Neutral               | 43 (12%)        | 20 (15%)                  |    | 1.08 | 0.49 to 2.39 |
| Good                  | 254 (72%)       | 88 (66%)                  |    | 0.66 | 0.37 to 1.18 |

N, sample size; n, subsample size; OR, odds ratio.

*Two missing values.

(Changes in mental well-being were explored by comparing the last week with the pre-COVID period.

*Since the start of the COVID-19 epidemic in the Netherlands in February 2020.

§Not included in logistic regression analysis because the response is a consequence of the outcome variable not a potential determinant.
TABLE 2. Descriptive and Logistic Regression Analysis of Sexual Behavior, STIs, and the Use of PrEP Related to Reporting CSPs in the Preceding 4 Weeks During COVID-19 Restrictions (May–June 2020) Among 353 MSM Participating in the Amsterdam Cohort Study

| Variable | Total (N = 353) | MSM with ≥1 CSP (n = 133) | P  | OR* | 95% CI |
|----------|----------------|----------------------------|----|-----|--------|
| Sexual behavior and STI before COVID-19 pandemic† | 266 76% 124 95% | 148 42% 25 19% | <0.001 | 3.13 2.45 to 4.00 |
| Sexual contact with CSP | | | | | |
| No. known CSP, categorized | 148 42% 25 19% | 46 13% 15 11% | 2.38 1.12 to 5.05 |
| 2–5 | 91 26% 51 39% | 62 34% 38 29% | 1.27 0.92 to 1.75 |
| ≥5 | 66 19% 40 31% | 20 3% 9 2% | 0.51 0.28 to 0.94 |
| No. anonymous CSP, categorized | 132 38% 26 20% | 14 4% 1 3% | 1.63 0.47 to 5.61 |
| 2–5 | 60 17% 24 18% | 22 7% 10 4% | 1.23 0.80 to 1.90 |
| ≥5 | 145 41% 77 59% | 47 32% 25 18% | 1.78 1.02 to 3.12 |
| No. CSP, median (IQR) | 5 1–12 9 4–25 | 1 1–3 3 1–5 | <0.001 | 1.19 1.10 to 1.27 |
| No. known CSP, median (IQR) | 3 0–10 6 2–20 | 0 0–1 2 1–4 | <0.001 | 1.03 1.01 to 1.05 |
| No. anonymous CSP, median (IQR) | 116 33% 61 47% | 92 26% 49 37% | <0.001 | 1.46 1.65 to 4.14 |
| Group sex | 92 26% 49 37% | 65 18% 65 49% | <0.001 | 1.25 1.54 to 3.90 |
| Chemsex | 58 16% 36 27% | 33 9% 25 19% | <0.001 | 1.34 1.86 to 5.99 |
| Sexual behavior and STI during COVID-19 restrictions | | | | | |
| Sexual contact with CSP | 133 38% 133 100% NA | 109 31% 109 82% NA | | | |
| With a known CSP | | | | | |
| No. CSP, median (IQR) | 0 0–1 2 1–4 NA | 0 0–1 1 1–2 NA | | | |
| No. anonymous CSP, median (IQR) | 0 0–0 0 0–2 NA | 31 9% 31 23% NA | | | |

*We did not perform logistic regression for variables related to measures of sexual behavior during COVID-19.
†Data before COVID-19 epidemic was missing for 2 participants.
‡As diagnosed during the last routine ACS study visit or in the 6 months preceding this visit.
§Two individuals without CSP in the preceding 4 weeks reported “more sexual partners during COVID-19.” This might be a mistake or is possibly explained by the fact that number of CSPs during lockdown was measured for the preceding 6 months; these 2 participants might have had CSP(s) during COVID-19 but earlier than the 4 weeks prior.

TABLE 2. (Continued) Descriptive and Logistic Regression Analysis of Sexual Behavior, STIs, and the Use of PrEP Related to Reporting CSPs in the Preceding 4 Weeks During COVID-19 Restrictions (May–June 2020) Among 353 MSM Participating in the Amsterdam Cohort Study

| Variable | Total (N = 353) | MSM with ≥1 CSP (n = 133) | P  | OR* | 95% CI |
|----------|----------------|----------------------------|----|-----|--------|
| Chemsex | 69 20% 69 52% | | | | |
| CAS | 66 19% 66 50% | | | | |
| HIV/STI test at STI clinic | 101 29% 57 43% | <0.001 | | |
| Any bacterial STI diagnosis | 9 3% 4 3% | 0.671 | | |
| Self-reported change in sexual behavior since start COVID-19 epidemic | | | | | |
| Change in number of sex partners | | | | | |
| Less | 259 73% 111 83% | 88 25% 18 14% | 0.34 0.19 to 0.61 |
| Equal | 6 2% 4 3% | 2.67 0.48 to 14.82 |
| More§ | | | | | |
| Change in number of sex acts | | | | | |
| Less | 237 67% 102 77% | 83 24% 18 14% | 0.37 0.20 to 0.66 |
| Equal | 33 9% 13 10% | 0.86 0.41 to 1.81 |
| More | | | | | |
| HIV prevention | | | | | |
| PrEP use | | | | | |
| No use before or during COVID-19 | 87 25% 61 46% | 5.76 3.35 to 9.89 |
| Before and during COVID-19 restrictions | 87 25% 61 46% | 5.76 3.35 to 9.89 |
| Stopped during COVID-19 restrictions | | | | | |
| 38 11% 6 5% | 0.46 0.18 to 1.15 |

*We did not perform logistic regression for variables related to measures of sexual behavior during COVID-19.
†Data before COVID-19 epidemic was missing for 2 participants.
‡As diagnosed during the last routine ACS study visit or in the 6 months preceding this visit.
§Two individuals without CSP in the preceding 4 weeks reported “more sexual partners during COVID-19.” This might be a mistake or is possibly explained by the fact that number of CSPs during lockdown was measured for the preceding 6 months; these 2 participants might have had CSP(s) during COVID-19 but earlier than the 4 weeks prior.

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PrEP use before and during COVID-19

No anonymous CSP before COVID-19 0.034
No known CSP before COVID-19 0.001

Importance not become infected
Important or very important 1.00
Neutral 1.46 (0.63 to 3.39)
Not important or not important at all 2.45 (1.22 to 4.92)

Social distancing class
1. “Easy to practice social distancing, positive about effectiveness, and compliance others” 1.00
2. “Difficult to practice social distancing, positive about effectiveness, and compliance others” 2.71 (1.41 to 5.21)
3. “Difficult to practice social distancing, negative about effectiveness, and compliance others” 3.36 (1.35 to 8.35)

Drug use in preceding 4 wk
2.39 (1.30 to 4.38) 0.005

No known CSP before COVID-19
0 1.00
1 1.57 (0.64 to 3.81)
2–5 6.43 (3.10 to 13.40)
≥5 3.63 (1.60 to 8.23)

No anonymous CSP before COVID-19
0 1.00
1 1.22 (0.23 to 6.36)
2–5 2.48 (1.09 to 5.66)
≥5 2.60 (1.32 to 5.13)

PrEP use before and during COVID-19
<0.001
No PrEP use 1.00
PrEP use before and during COVID-19 2.64 (1.34 to 5.19)
Stopped using PrEP during COVID-19 0.17 (0.06 to 0.48)

* Two missing values.

OR, odds ratio.

TABLE 3. Multivariable Logistic Regression Analyses on Reporting CSPs During COVID-19 Restrictions Among 353 MSM Participating in the Amsterdam Cohort Study

| Sociodemographics | aOR (95% CI) | P |
|-------------------|-------------|---|
| College/university degree or higher* | 0.46 (0.22 to 0.90) | 0.024 |
| Steady relationship | 0.46 (0.26 to 0.83) | 0.011 |
| Importance not become infected | 0.040 |
| Important or very important | 1.00 |
| Neutral | 1.46 (0.63 to 3.39) |
| Not important or not important at all | 2.45 (1.22 to 4.92) |
| Social distancing class | 0.005 |
| 1. “Easy to practice social distancing, positive about effectiveness, and compliance others” | 1.00 |
| 2. “Difficult to practice social distancing, positive about effectiveness, and compliance others” | 2.71 (1.41 to 5.21) |
| 3. “Difficult to practice social distancing, negative about effectiveness, and compliance others” | 3.36 (1.35 to 8.35) |
| Drug use in preceding 4 wk | 2.39 (1.30 to 4.38) | 0.005 |
| No known CSP before COVID-19 | <0.001 |
| 0 | 1.00 |
| 1 | 1.57 (0.64 to 3.81) |
| 2–5 | 6.43 (3.10 to 13.40) |
| ≥5 | 3.63 (1.60 to 8.23) |
| No anonymous CSP before COVID-19 | 0.034 |
| 0 | 1.00 |
| 1 | 1.22 (0.23 to 6.36) |
| 2–5 | 2.48 (1.09 to 5.66) |
| ≥5 | 2.60 (1.32 to 5.13) |
| PrEP use before and during COVID-19 | <0.001 |
| No PrEP use | 1.00 |
| PrEP use before and during COVID-19 | 2.64 (1.34 to 5.19) |
| Stopped using PrEP during COVID-19 | 0.17 (0.06 to 0.48) |

*Two missing values.

Oral, odds ratio.

Table 3. Multivariable Logistic Regression Analyses on Reporting CSPs During COVID-19 Restrictions Among 353 MSM Participating in the Amsterdam Cohort Study

Sexually Transmitted Infections

Before the COVID-19 pandemic, 350 MSM were tested for bacterial STIs during 541 routine study visits and 113 between study visits at the STI clinic in the 6 months preceding the most recent cohort visit in 2019. In total, 86 bacterial STIs were found. At least one bacterial STI was detected at 37 cohort visits and 21 between study visits, resulting in an overall positivity rate of 9% (58/654). When excluding routine cohort visits, the positivity rate was 19% (21/113). During COVID-19 restrictions, when the cohort was closed for routine visits, 11 bacterial STI were found at 11/141 clinic visits. The positivity rate was 8%, which was significantly lower than the positivity rate of STI before COVID-19 diagnosed during consultations in-between study visits (P = 0.01) and comparable with the positivity rate before COVID-19 when study visits and in-between consultations were pooled (P = 0.68). None of the MSM tested positive for HIV during the study periods.

DISCUSSION

In a survey among MSM participating in the Amsterdam Cohort Study, the majority reported a strong reduction in the number of CSPs during COVID-19 restrictions. Nevertheless, one-third reported one or more CSP in this period. Close to a third of pre–COVID-19 PrEP users indicated to have stopped using PrEP during COVID-19 restrictions. Our data regarding PrEP use during COVID-19 are reassuring in that PrEP discontinuation was strongly associated with not having CSP.

Similar patterns in behavior have been reported from the United States, Israel, Brazil, and Australia5–8: the number of CSP decreased and PrEP use was often discontinued in response to COVID-19. In contrast, 2 studies from the United States showed that MSM had a stable number or even increasing number of CSP during COVID-19.9,10 It must be noted, however, that recruitment of the latter studies occurred through networking apps for gay, bi, trans, and queer individuals seeking sexual partners, which might present a selection bias toward more sexually active participants. We furthermore found that a substantial proportion of MSM decreased their drug use during COVID-19. Current drug use was associated with reporting CSP, as reported by other studies9,10 and suggests that despite an overall decrease in drug use, some MSM who use drugs face an elevated risk of HIV or STI acquisition. Coupled with our findings on increased alcohol use and increased feelings of depression, anxiety, and stress, the need to closely monitor substance use and mental well-being among MSM during the COVID-19 pandemic is warranted.

Besides drug use, higher number of CSP pre–COVID-19 was also associated with having CSP during COVID-19 restrictions. This suggests that discontinue previous patterns of sexuality to achieve sexual abstinence with CSP might be difficult for a subgroup of MSM. Such findings have not been previously reported and certainly merit further examination. We additionally observed that reporting CSP was more likely among MSM with a lower educational level, as well as among a group of men who found it less important to...
avoid COVID-19 and rather difficult to practice social distancing and who were negative about the effectiveness of measures. COVID-19 severity perceptions were not measured in our study, but a study from the United States showed that they were low among MSM, especially compared with perceptions of HIV severity.\textsuperscript{11} Taken together, these findings emphasize the need to provide more effective information to facilitate better understanding of COVID-19, its implications, and the effectiveness of social distancing in a sexual context. The importance of changing such perceptions to increase compliance to COVID-19 measures has been well-established by the Health Belief Model,\textsuperscript{12} in which perceived barriers and benefits, as well as severity and susceptibility perceptions, are close determinants for uptake of health-related behavior. Over the past decades, the Health Belief Model has been one of the most commonly used theory used to increase HIV prevention uptake.\textsuperscript{13,14} Lessons learned in HIV prevention might therefore be successfully adopted in response to the COVID-19 pandemic. Conversely, the current pandemic might provide knowledge for HIV and STI prevention.

During COVID-19 restrictions, the positivity rate of bacterial STI was relatively low and presumably lower than the positivity rate before the COVID-19 pandemic. This is a remarkable finding considering only MSM at an increased risk of STI (ie, MSM with STI-related symptoms or MSM who urgently needed a PrEP consultation) were eligible to visit the STI clinic. This suggests a reduction in STI spread during this period and that downsampling HIV/STI testing and counseling during COVID-19 has not adversely affected the spread of these infections. However, selection bias might be present, for example, when MSM at the highest risk for STI did not visit the STI clinic. The ACS follow-up visits in the next months will provide further insight into the HIV/STI spread during COVID-19. However, our current data on the continuation of sexual contacts and STI acquisition among subgroups of MSM emphasize the need of ongoing and accessible HIV/STI testing at times of lockdown for MSM who remain sexually active with casual partners and at risk of HIV/STI.

The strength of this study is that it was conducted in an existing longitudinal cohort study, enabling the use of behavioral and STI-related data collected before and during the COVID-19 pandemic. Despite this strength, there were some limitations. First, differences in recall periods between the questionnaires (ie, 6 months versus 4 weeks) limited us to directly compare number of reported partners and sex acts before and during the COVID-19 pandemic. Second, the ACS is a convenience sample of which the majority is highly educated, born in the Netherlands and sexually active at the time of enrollment, and might therefore differ from the overall MSM population in the Netherlands or abroad. Only 52% of ACS participants completed the online COVID-19 questionnaire. In general, respondents were older, were less often HIV positive, and were less often diagnosed with an STI before COVID-19 but did not differ with respect to their sexual behavior as compared with nonrespondents, which suggests that the STI positivity rates before and during COVID-19 might be slightly underestimated. We do not expect bias regarding sexual behavior, nor do we expect any bias in the directions of the presented associations. Third, the number of COVID-19 cases substantially decreased during the period in which the questionnaire was active, which resulted in COVID-19 restrictions being relaxed (eg, schools partially reopened on May 11 and bars/restaurants on June 1). Although social distancing remained in place, this might have resulted in optimism and perhaps even a slight increase in sexual behavior in the period of COVID-19 restrictions.

In conclusion, the majority of MSM in Amsterdam reported that they had decreased the number of CSP during COVID-19 restrictions compared with the period before the pandemic, and, in view of the STI positivity rate, this may also have led to a decrease in HIV/STI spread. Further research is needed to study the short-term and long-term impact of COVID-19–related changes on HIV/STI infection dynamics. Furthermore, we have shown that approximately one-third of MSM had CSP during COVID-19 restrictions. Having CSP was associated with drug use, previous sexual behavioral patterns, and perceptions and attitudes toward COVID-19 and measures taken to control this virus. It is important that HIV/STI-related care remains accessible for MSM who are sexually active with CSP during periods of lockdown, as they may be at risk for HIV/STI infection.

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