

# Sexual health (excluding reproductive health, intimate partner violence and gender-based violence) and COVID-19: a scoping review

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## ABSTRACT

**Objectives** The COVID-19 pandemic has exposed and exacerbated existing socioeconomic and health disparities, including disparities in sexual health and well-being. While there have been several reviews published on COVID-19 and population health disparities generally—including some with attention to HIV—none has focused on sexual health (ie, STI care, female sexual health, sexual behaviour). We have conducted a scoping review focused on sexual health (excluding reproductive health (RH), intimate partner violence (IPV) and gender-based violence (GBV)) in the COVID-19 era, examining sexual behaviours and sexual health outcomes.

**Methods** A scoping review, compiling both peer-reviewed and grey literature, focused on sexual health (excluding RH, IPV and GBV) and COVID-19 was conducted on 15 September 2020. Multiple bibliographical databases were searched. Study selection conformed to Joanna Briggs Institute (JBI) Reviewers' Manual 2015 Methodology for JBI Scoping Reviews. We only included English-language original studies.

**Results** We found that men who have sex with men may be moving back toward pre-pandemic levels of sexual activity, and that STI and HIV testing rates seem to have decreased. There was minimal focus on outcomes such as the economic impact on sexual health (excluding RH, IPV and GBV) and STI care, especially STI care of marginalised populations. In terms of population groups, there was limited focus on sex workers or on women, especially women's sexual behaviour and mental health. We noticed limited use of qualitative techniques. Very few studies were in low/middle-income countries (LMICs).

**Conclusions** Sexual health research is critical during a global infectious disease pandemic and our review of studies suggested notable research gaps. Researchers can focus efforts on LMICs and under-researched topics within sexual health and explore the use of qualitative techniques and interventions where appropriate.

## INTRODUCTION

The COVID-19 pandemic disproportionately affects the sexual health of people of colour,<sup>1</sup> ethnic minority groups,<sup>2</sup> women,<sup>3</sup> and sexual and gender minority (SGM)<sup>4</sup> populations. Sexual health research, broadly defined, is the study of an individual's physical, emotional, mental and social

well-being in relation to sexuality; it goes beyond the absence of disease, dysfunction or infirmity.<sup>5</sup> In this respect sexual health has psychosocial dimensions, in addition to physical dimensions. Sexual health research includes studies that centre on sexual minorities as a population and comprises sexual behaviour and access to high-quality sexual healthcare. For the purposes of this review, due to a lack of research and that systematic reviews on these areas are currently being conducted, reproductive health (RH), intimate partner violence (IPV) and gender-based violence (GBV) were not considered components of sexual health.

Regulations restricting mobility or movement, the resulting economic impact on individuals and families, and the need to shift healthcare resources (including money, clinical space and staff) towards the COVID-19 response may have affected sexual health. Certain marginalised populations may be even more affected. For example, a decrease in economic opportunities may reduce access to sexual healthcare resulting in reduced STI/HIV testing and treatment. This may be especially pronounced among marginalised populations such as SGM. Similarly, sex workers worldwide may not seek medical care due to reduced healthcare provision. In some countries, such as the USA, SGM individuals are also less likely to have health insurance, possibly exacerbated by economic pressures due to the pandemic, increasing negative economic impacts if they acquire COVID-19. These factors may increase socioeconomic marginalisation and further decrease access to sexual health services.

While several reviews have sought to synthesise existing and fast-changing evidence on COVID-19 and health outcomes, little attention has been paid to the pandemic's effects on sexual health and well-being. There have been, however, several reviews focused on HIV specifically,<sup>6–8</sup> but not on sexual health more broadly. Sexual health is a central feature in overall health and well-being, and in the socioeconomic development of communities and countries<sup>9</sup>; understanding if and how the COVID-19 pandemic has affected sexual health is, therefore, critically important.

Drawing on the WHO's holistic definition of sexual health, this review sought to include a broad range of sociobehavioural factors and outcomes



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relative to sexual health,<sup>5</sup> excluding RH, IPV and GBV. This scoping review compiled peer-reviewed and grey literature in the field to identify gaps in current knowledge of sexual health (excluding RH, IPV and GBV) and COVID-19, support public health efforts, and guide intervention efforts and resource distribution. The broad research questions were, 'What has been reported on sexual health (excluding RH, IPV and GBV) in the COVID-19 era?' and 'What are the gaps in the current knowledge base on sexual health (excluding RH, IPV and GBV) and COVID-19 across marginalised populations?'

## METHODS

A scoping review of both peer-reviewed and grey literature was conducted by 14 individuals: 13 researchers from several universities worldwide, from a range of disciplines (eg, medicine, sociology, demography, public health, criminology, economics, psychology, epidemiology), and an informationist from the Harvey Cushing/John Hay Whitney Medical Library at Yale University. We chose to conduct a scoping review rather than use other methods of research synthesis because scoping reviews are appropriate for mapping an area of research<sup>10</sup>; we were not examining the effect of an intervention on an outcome of interest, as per a systematic review; and sexual health research outcomes (excluding RH, IPV and GBV) were not sufficiently similar to each other to warrant pooling or formal meta-analysis regarding a specific outcome. Research objectives, inclusion criteria and methodological techniques were determined before study commencement using the Joanna Briggs Institute (JBI) Reviewers' Manual 2015 Methodology for JBI Scoping Reviews.<sup>11</sup> Our process adhered to the JBI framework: (1) identifying research question; (2) identifying relevant studies; (3) developing comprehensive search strategy; (4) selecting studies; (5) charting data; and (6) collating, summarising and reporting results. The study team developed a search strategy as recommended by the 2015 Methodology for JBI Scoping Reviews.<sup>11</sup> Reporting of results conformed to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews.<sup>12</sup> We published a study protocol<sup>13</sup> and registered the study on the Open Science Framework (osf.io/PRX8E) to enhance methodological transparency and improve reproducibility of results and evidence synthesis.

### Study selection criteria

Published researches (peer reviewed and grey literature where primary data were collected such as reports, research letters and briefs) investigating sexual health (excluding RH, IPV and GBV) and COVID-19 in all populations, settings and study designs, for example, studies with small samples, quantitative and qualitative studies, were eligible for inclusion (see online supplemental file 1 for more detail).

### Study selection

Two independent reviewers (ASF, KJ) screened each title and abstract using the inclusion/exclusion criteria. Inter-rater reliability estimates were calculated and a third reviewer (NK) acted as a tie breaker when there was lack of consensus. We obtained full-text articles of all potential eligible studies and evaluated article eligibility, similar to the abstract screening phase. If only abstracts and not full texts were available, we contacted authors where necessary if the abstracts did not provide sufficient information.<sup>14</sup>

### Search method

Studies were reviewed across 12 databases focusing primarily on peer-reviewed literature. We searched the literature published

from January 2020, which was the month in which the first COVID-19 report was provided to the WHO,<sup>15</sup> until September 2020 (see online supplemental file 1 for more detail).

### Data extraction

Reviewers underwent practice exercises and then separately extracted study details from studies. Reviewers abstracted the study details using a pretested data extraction template (see online supplemental file 1 for more detail).

## RESULTS

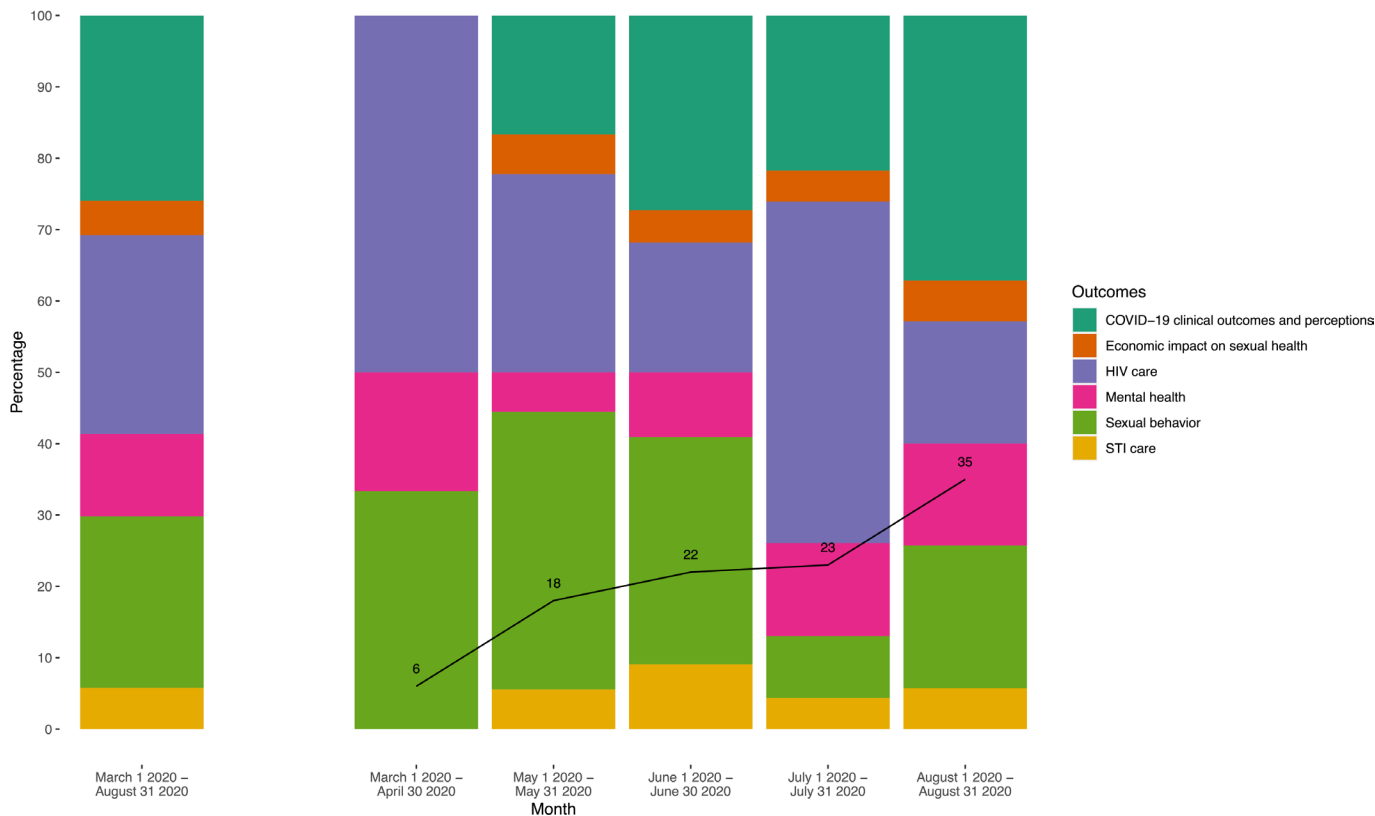
Our search yielded 7776 results (databases: 7684, grey literature: 92) with 1529 duplicates, resulting in 6247 articles that were subjected to title and abstract review. Of those, 5934 were excluded at the abstract screening phase as they did not meet our inclusion criteria, most were excluded as they were not relevant to our research questions. Three hundred and twenty-six full-text articles were then screened and 194 were removed because they were case reports (84) or not relevant to the research question (110). The remaining 119 articles were included in the scoping review (online supplemental figure 1). Online supplemental table 1 showed the distribution of study setting, methodology and sample size for the included studies across 71 countries. Studies were published from March 2020 to September 2020, with an increasing proportion published July 2020 onward. Thirty per cent (N=36) of studies were conducted in the USA, 10% (N=12) in Italy and 7% (N=8) each in China, South Africa and the UK.

Studies assessed a variety of outcomes, such as HIV care (27%, N=32), sexual behaviour (24%, N=29), COVID-19 clinical outcomes and perceptions (23%, N=29), mental health (16%, N=19), STI care (6%, N=7) and the economic impact on sexual health (excluding RH, IPV and GBV) (3%, N=4). These outcomes were mainly assessed among people living with HIV (PLHIV) (41%, N=49), SGM (27%, N=32), the general public (24%, N=28), sex workers (4%, N=5) or women (4%, N=5). Of the studies included, 39% (N=47) were cross-sectional observational quantitative studies, 25% (N=30) were prospective observational cohort quantitative studies, 18% (N=21) were retrospective observational cohort quantitative studies, 8% (N=9) were qualitative studies, 4% (N=5) were mixed methods and 5% (N=6) were modelling studies. No interventions were found, and some quantitative studies had small samples (<20), possibly affecting quality of results.

Online supplemental table 2 presented a synthesis of results organised by the six outcomes and the five populations. **Figure 1** indicated outcomes over time, and **figure 2** detailed populations over time. Studies at the beginning of the pandemic mostly concerned COVID-19 clinical outcomes and HIV care, but outcomes such as STI care and the economic impact on sexual health (excluding RH, IPV and GBV) became more prominent as the pandemic progressed. Research generally detailed the general public and PLHIV at the advent of COVID-19, but included other populations such as women and sex workers with pandemic progression.

### Overview of research by outcomes and populations

Overall, we found some notable themes. First, we found that after an initial decrease, men who have sex with men (MSM) may be moving back toward pre-pandemic levels of sexual activity.<sup>16</sup> Then, we noted that STI and HIV testing rates seemed to have decreased,<sup>17 18</sup> perhaps due to reduced test seeking but not necessarily reduced sexual activity.



**Figure 1** Outcome breakdown for all studies (1 March 2020–31 August 2020) and for each month. Each colour within a bar represents: N of studies representing a particular outcome/total N of studies in that time period. Studies with no date reported were not included. Total number of studies per month indicated by the black line. Studies after 31 August were not included in the above figure as our literature search did not cover the full month of September.

### COVID-19 clinical outcomes and perceptions

Twenty-eight studies addressed COVID-19 clinical outcomes and perceptions.<sup>15 19–44</sup> Most (75%, N=21) were retrospective observational quantitative studies exploring clinical outcomes of COVID-19 among PLHIV.

#### People with HIV

Twenty-five studies addressed PLHIV.<sup>15 19–41</sup> Most of these compared COVID-19 health outcomes between PLHIV and the general population. Ten studies found no difference in COVID-19 risk or outcomes between PLHIV and the general population,<sup>15 21 23 28 32 34 37 38 40 41</sup> while other studies found that PLHIV with COVID-19 were more likely to have comorbidities such as diabetes and hypertension.<sup>26 29 31 35 36</sup>

#### Sexual and gender minorities

Three studies centred on SGM.<sup>42–44</sup> A Taiwanese cross-sectional observational quantitative study found that sexual minorities were more likely to demonstrate health anxiety with regard to COVID-19 compared with heterosexual individuals.<sup>42</sup> A cross-sectional US study found that most MSM believed COVID-19 could be transmitted sexually.<sup>44</sup>

#### Economic impact on sexual health

Four studies evaluated the economic impact on sexual health (excluding RH, IPV and GBV), exploring the impact of the pandemic on sex workers.<sup>45–50</sup> A retrospective observational quantitative study with a global sample found a decrease in the number of active online sex worker profiles during the pandemic and an increase in risk-reduction strategies such as the cessation of in-person services

and enhanced sanitary practices.<sup>46</sup> A qualitative study conducted in Singapore also found a decline in sex work-related activities due to facility closures during the pandemic.<sup>48</sup>

#### HIV care

Thirty-four studies assessed outcomes related to HIV care.<sup>17 18 51–80</sup> Several (42%) were cross-sectional observational quantitative studies assessing the effect of the pandemic on HIV clinic attendance and procedures.

#### General public

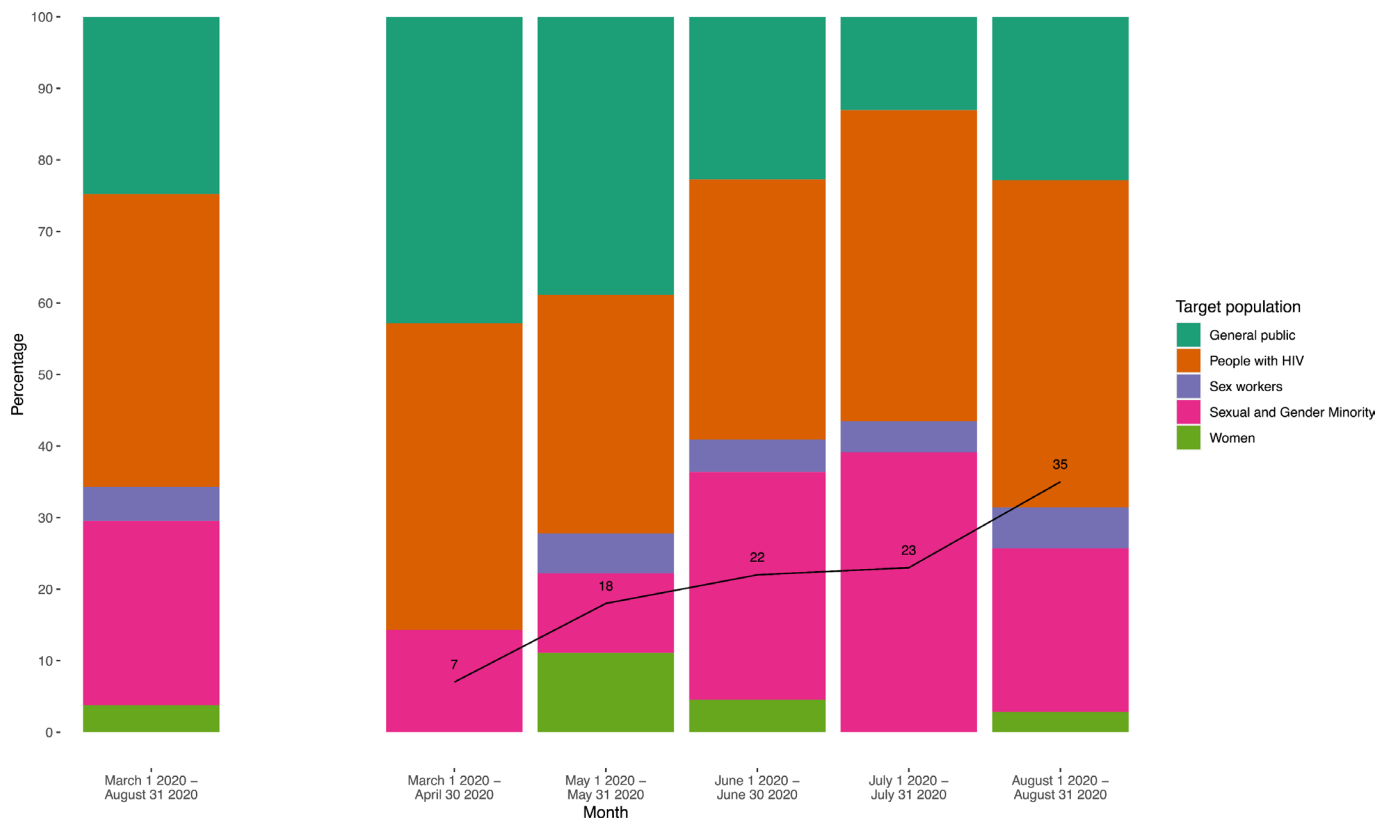
Five studies focused on the general public.<sup>17 18 51–53</sup> All reported a decline in interaction with HIV care services following the pandemic. Two retrospective observational quantitative studies, conducted in Belgium and China, respectively, reported a decrease in the number of HIV tests conducted with pandemic progression.<sup>18 52</sup>

#### People with HIV

Nineteen studies assessed PLHIV.<sup>54–72</sup> Three modelling studies predicted a significant increase in HIV-related deaths in African countries due to treatment disruption with the pandemic.<sup>61–63</sup> A US retrospective observational quantitative study found that shelter-in-place orders had a negative impact on antiretroviral therapy adherence, especially among homeless PLHIV.<sup>71</sup>

#### Sex workers

A qualitative study conducted in Kenya found that sex workers experienced greater HIV risk due to limited condom access during the pandemic.<sup>75</sup>



**Figure 2** Population breakdown for all studies (1 March 2020–31 August 2020) and for each month. Each colour within a bar represents: N of studies representing a particular population/total N of studies in that time period. Studies with no date reported were not included. Total number of studies per month indicated by the black line. Studies after 31 August were not included in the above figure as our literature search did not cover the full month of September.

### Sexual and gender minorities

Eight studies evaluated HIV care outcomes among SGM.<sup>76–80</sup> Two cross-sectional observational quantitative studies, one in Australia and the other global, reported a decline in pre-exposure prophylaxis (PrEP) use among sexual minority individuals during lockdown.<sup>77–80</sup> A global study found that MSM experienced greater difficulty in accessing condoms during lockdown.<sup>74</sup>

### Women

One prospective observational study conducted among women in South Africa reported an increase in missed PrEP appointments during lockdown.<sup>50</sup>

### Mental health

Fifteen studies evaluated mental health outcomes.<sup>81–85</sup> Most (67%) were cross-sectional observational quantitative studies detailing the mental health impact of the pandemic on SGM.

### People with HIV

Five studies detailed PLHIV.<sup>81–85</sup> A cross-sectional observational quantitative study conducted in Turkey found a relationship between generalised anxiety levels and COVID-19-related anxiety among clinical patients with HIV.<sup>85</sup> A US-based study found that the decision to social distance was associated with COVID-19-related stigma and fears.<sup>81</sup>

### Sexual and gender minorities

Ten studies detailed SGM.<sup>86–94</sup> Most reported an increase in anxiety or depression during the pandemic.<sup>86–92</sup> A cross-sectional observational quantitative study found an increase in

experiences of mental distress, anxiety or depression among American SGM college students.<sup>89</sup> A Brazilian cross-sectional quantitative study found an association between low psychological well-being and non-compliance with shelter-in-place orders.<sup>86</sup> A qualitative study of US lesbian, gay, bisexual and transgender youth reported an increase in distress from being confined at home with unsupportive parents.<sup>87</sup>

### Sexual behaviour

Thirty-one studies detailed sexual behaviour.<sup>16 95–125</sup> Most (65%) were cross-sectional observational quantitative studies detailing decreased sexual activity during the pandemic.

### General public

Seventeen studies assessed sexual activity and desire during the pandemic among the general public.<sup>95–111</sup> Ten studies indicated that the pandemic had affected participants' sexual lives.<sup>97–109</sup> A Chinese cross-sectional observational quantitative study found that the number of sexual partners decreased during the pandemic.<sup>108</sup> An Australian cross-sectional study reported decreased sexual activity during the pandemic.<sup>101</sup> A cross-sectional observational quantitative study conducted in the USA found that respondents (nationally representative US sample) experienced conflict with their romantic partners due to the pandemic.<sup>109</sup> This may have contributed to less frequent sex.<sup>109</sup> A US cross-sectional study found that a majority of respondents (Indian convenience sample) believed kissing could spread COVID-19, but that unprotected sexual intercourse could not.<sup>111</sup>



### Sexual and gender minorities

Ten studies evaluated SGM.<sup>16 112–121</sup> Few (30%, N=6) reported an increase in risky sexual behaviour during the pandemic.<sup>16 119 121</sup> One cross-sectional observational quantitative study found an increase in casual sexual encounters during the pandemic among Brazilian and Portuguese MSM.<sup>16</sup> The increase in casual sex encounters may be due to MSM feeling isolated due to the long sheltering period and then seeking a larger need for social contact.<sup>94</sup> A Welsh prospective observational quantitative study reported a decrease in the frequency of condomless sex among MSM.<sup>113</sup>

### Women

Four studies detailed sexual behaviour in women, generally centring on reduced sexual function.<sup>122–125</sup> A Polish prospective observational quantitative study reported an increase in female sexual dysfunction.<sup>122</sup>

### STI care

Seven studies addressed STI care outcomes.<sup>126–132</sup> Three of these were prospective observational quantitative studies.

### General public

Six studies assessed the general public.<sup>126–131</sup> A Ugandan cross-sectional observational quantitative study found reduced access to STI testing and treatment during lockdown<sup>128</sup> and two other studies (Italy, Spain) found a decline in the number of STI cases reported since the onset of the pandemic.<sup>126 127</sup>

### Sexual and gender minorities

One prospective observational quantitative study reported an increase in the number of syphilis diagnoses among MSM in Italy.<sup>132</sup>

## DISCUSSION

In this scoping review, we provided a comprehensive synthesis of the published literature on sexual health (excluding RH, IPV and GBV) in the COVID-19 era. This work builds on previous reviews on specific sexual health issues and COVID-19, which generally focused on the intersection of HIV and COVID-19 and did not examine sexual health more broadly.<sup>6–8</sup> We found that MSM may be moving back toward pre-pandemic levels of sexual activity. Abstinence-based strategies to limit HIV transmission are generally ineffective<sup>133</sup> and it is not reasonable to expect people to refrain from sexual activity amid a pandemic. Thus, strategies to manage STI and HIV transmission during COVID-19 transmission should hinge on safer sexual activities rather than abstinence, for example, engaging in sex after quarantine has been completed and all parties asymptomatic.<sup>134</sup> We noted that STI and HIV testing rates seem to have decreased, perhaps due to reduced test seeking but not necessarily reduced sexual activity. As the pandemic progresses, we suggest that self-testing for STIs and HIV may be a useful tool given reduced clinic attendance. However, we recognise the limitations of this approach, for example, where this requires accessing tests/services online, then for those with low digital literacy, this could potentially worsen health inequalities.

The bulk of included studies here centred on outcomes such as HIV care and COVID-19 clinical outcomes and perceptions, with minimal focus on outcomes such as the economic impact on sexual health (excluding RH, IPV and GBV) and STI care, especially STI care of marginalised populations, due to a lack of research. The limited focus of the economic impact on sexual health (excluding RH, IPV and GBV), in line with COVID-19, may be due to the

immediate focus on the purely health aspects of the pandemic and an economic focus may arise as COVID-19 progresses. In this vein, there have been calls to focus specifically on the economic aspects of COVID-19.<sup>135</sup> The minimal research on STI care is reflective of the limited research on STI care (eg, gonorrhoea and chlamydia) compared with HIV care.<sup>136</sup> Similarly, several nations, such as China, have well-supported testing provision for HIV, but lack similar infrastructure for STI testing.<sup>136</sup>

In terms of population groups, studies tended to focus on PLHIV and SGM; there was limited focus on sex workers or on women. There was a dearth of published studies on women's sexual behaviour and mental health. The limited focus on women may in part be due to the exclusion of RH, IPV and GBV in our selection criteria and also due to the male-as-norm bias prevalent in health research,<sup>137</sup> where men are the standard for research studies. There have been calls to reduce the male bias in COVID-19 research,<sup>138</sup> and our work provides evidence for a potential bias regarding the intersection of women and sexual health research (excluding RH, IPV and GBV). The limited research on sex workers and COVID-19 may be because most in-person sex work has largely stopped due to social distancing and lockdown measures, or continued as a 'black market', at least in the USA. However, the pandemic may increase stigma, discrimination and violence for sex workers, and thus research can focus on whether policing of sex workers has changed during the pandemic, and whether the number or characteristics of people involved in sex work has changed during the pandemic, so that adequate and appropriate health, economic and social services can be made available for persons involved in sex work.

A broad range of methods were applied to study sexual health (excluding RH, IPV and GBV) during the COVID-19 pandemic. However, we noticed limited use of qualitative techniques. The limited qualitative research may be due to the relatively limited funding for COVID-19-specific qualitative research, and the complexities of conducting qualitative research in a pandemic, usually involving face-to-face meetings. Limited qualitative work around sexual health (excluding RH, IPV and GBV) and COVID-19 may obscure understanding on how marginalisation and structural forces shape sexual health within the pandemic, as qualitative research can aid understanding of natural phenomena with an emphasis on the lived experiences around disease, care and pandemic responses.

None of the studies identified in our scoping review were interventions. The lack of intervention studies may be because the research was conducted in the early phases of the pandemic and interventions, especially randomised controlled trials, take time to design, conduct, analyse and disseminate; and that research resources are increasingly allocated to COVID-19. Randomised controlled trials are key to determining efficacy of interventions and are essential to improving sexual health during the pandemic. We propose that researchers incorporate more qualitative techniques and conduct interventions, to complement existing quantitative research on sexual health and COVID-19. We suggest community-based crowdsourcing interventions for augmenting sexual health during the pandemic. Crowdsourcing involves non-experts and experts collaborating to solve an issue and then sharing solutions publicly.<sup>139</sup> Crowdsourcing has been implemented in resource-scarce settings to improve sexually transmitted testing uptake,<sup>136</sup> among other uses.<sup>140</sup>

Studies were conducted in a large range of nations, aligned to regions where the impact of the pandemic was relatively severe, but the largest proportions were in high-income nations, with very few in low/middle-income countries (LMICs). The paucity of sexual health (excluding RH, IPV and GBV) research in LMICs

may be due to limited resources, lack of equitable research and funding partnerships, redistribution of resources amid COVID-19, among other factors. Recent work has expressed concerns regarding limited COVID-19 research centred in LMICs,<sup>141</sup> which could worsen pandemic progression when combined with LMICs' inadequate healthcare infrastructure potentially leading to long-term consequences such as increasing numbers of HIV-related deaths. We build on these findings, indicating the lack of COVID-19 research in the sexual health context within LMICs. We suggest that the limited work around sexual health (excluding RH, IPV and GBV) and COVID-19 in LMICs could reduce sexual healthcare provision in LMICs, such as HIV programmes,<sup>61</sup> and by not measuring changes in sexual health during the pandemic we may miss important shifts and lose prior achievements regarding sexual health in LMICs.

Our findings should be read in line with some limitations. Although we searched several databases and grey literature sources, we may have missed some studies. Not all authors we reached out to responded and we thus may have missed some unpublished work. Our definition of sexual health did not include RH, IPV and GBV, and we were unable to provide evidence on these areas of sexual health.

The main strengths of the study are that we synthesised the research on sexual health (excluding RH, IPV and GBV) during COVID-19 and used a reproducible and clear procedure for the scoping review. We indicated the outcome, location, methodology, sample characteristics, along with data extraction and search strategies. Moreover, we centred solely on the scope of sexual health (excluding RH, IPV and GBV) and COVID-19 research. Although we noted several limitations, our review has important implications for interventions around mitigating poor sexual health due to the pandemic.

## CONCLUSION

We found that after an initial decrease, MSM may be moving back toward pre-pandemic levels of sexual activity, and that STI and HIV testing rates seemed to have decreased. We found limited work on key outcomes such as the economic impact on sexual health (excluding RH, IPV and GBV) and STI care, and populations such as women (in part due to exclusion of RH, IPV and GBV) and sex workers. Sexual health research is critical during COVID-19, and we indicated that some areas were clearly understudied potentially limiting adequate treatment for patients. There were a range of methodologies applied within sexual health (excluding RH, IPV and GBV) and COVID-19 research, but qualitative techniques and interventions were not commonly used. There was also limited research within LMICs. Researchers can focus efforts on LMICs and under-researched topics within sexual health and explore the use of qualitative techniques and interventions where appropriate.

## Key messages

- ▶ The scope of sexual health (excluding reproductive health, intimate partner violence and gender-based violence) and COVID-19 research was broad, but there was limited work on outcomes such as the economic impact on sexual health and STI care.
- ▶ Research should focus on low/middle-income countries and research gaps within sexual health.
- ▶ Researchers should explore the use of qualitative techniques and interventions where appropriate.

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## Supplement

### Study selection

#### Inclusion criteria

Published research (peer reviewed and grey literature where primary data was collected such as reports, research letters and briefs) investigating sexual health (excluding reproductive health, intimate partner violence and gender-based violence) and COVID-19 in all populations, settings and study designs e.g. studies with small samples, quantitative and qualitative studies, were eligible for inclusion. We included studies focusing on sex workers, LBTQIA persons, and persons at risk for HIV, even if these studies did not examine sexual health specifically. Primary outcomes included how the COVID-19 pandemic affects sexual health (excluding reproductive health, intimate partner violence and gender-based violence), both effects of the lockdown and the biological impact of the virus on sexual health (excluding reproductive health, intimate partner violence and gender-based violence) and how the COVID-19 pandemic affects sexual minorities. Primary outcomes did not include reproductive health, intimate partner violence and gender-based violence alone.

There were no restrictions on age, region, or gender.

Studies reported only as conference abstracts were included, only if we did not have access to the full paper. Conference abstracts are often left out of systematic reviews as they may not contain adequate information to conduct quality assessment or a meta-analysis. Here, we included conference abstracts as they are often published earlier than full manuscripts [1], which is key to a thorough scoping review on an ongoing phenomenon.

#### Exclusion criteria

Commentaries, correspondences, case reports, case series, editorials, and opinion pieces were excluded. Case reports and case series are often excluded in rapid reviews, such as ours, as they often contain relatively limited evidence [2].

Governmental or other agency guidelines were excluded.

Reviews such as systematic reviews and scoping reviews were excluded, but we reviewed the references in these for inclusion, if applicable.

Non-English studies were excluded through the algorithm used for the search strategy. Past work indicated that excluding non-English language records from a review seemed to have a minimal impact on results and may be a viable methodological shortcut for rapid scoping reviews such as ours [3].

## **Search method**

Studies were reviewed across 12 databases focusing primarily on peer-reviewed literature: Cumulative Index to Nursing and Allied Health Literature, Africa-Wide Information, Web of Science Core Collection, Embase, Gender Studies Database, Gender Watch, Global Health, WHO Global Literature on Coronavirus Disease Database, WHO Global Index Medicus, PsycINFO, MEDLINE and Sociological Abstracts. These databases were selected as they would provide peer-reviewed literature from a range of nations and include studies on sexual health (excluding reproductive health, intimate partner violence and gender-based violence). Using similar techniques, we also searched preprint servers such as EuropePMC and PsyArXiv.

We searched the literature published from January 2020, which was the month in which the first COVID-19 report was provided to the World Health Organization [4]), until September 2020. We conducted a grey literature search using Disaster Lit, Google Scholar, governmental websites and clinical trials registries (e.g. ClinicalTrial.gov, World Health Organization International Clinical Trials Registry Platform and International Standard Randomized Controlled Trial Number registry). We used search terms similar to our main search to find articles for inclusion. All grey literature was compiled in a folder and reviewed similarly to articles obtained from our database searches. EndNote was used to store, organize, and manage all references. Covidence was used to manage the title/abstract and full-text screening



phases.

## Search strategy

- 1 exp Coronavirus
- 2 exp Coronavirus Infections
- 3 (coronavirus\* or corona virus\* or OC43 or NL63 or 229E or HKU1 or HCoV\* or nCoV\* or COVID\* or sars-cov\* or sarscov\* or Sars-coronavirus\* or Severe Acute Respiratory Syndrome Coronavirus\*).mp.
- 4 (or/1-3) and ((20191\* or 202\*).dp. or 20190101:20301231.(ep.)  
[this set is the sensitive/broad part of the search])
- 5 4 not (SARS or SARS-CoV or MERS or MERS-CoV or Middle East respiratory syndrome or camel\* or dromedar\* or equine or coronary or coronal or COVIDence\* or COVIDien or influenza virus or HIV or bovine or calves or TGEV or feline or porcine or BCoV or PED or PEDV or PDCoV or FIPV or FCoV or SADS-CoV or canine or CCov or zoonotic or avian influenza or H1N1 or H5N1 or H5N6 or IBV or murine corona\*).mp. [line 5 removes noise in the search results]
- 6 ((pneumonia or COVID\* or coronavirus\* or corona virus\* or nCoV\* or 2019-ncov or sars\*).mp. or exp pneumonia/) and Wuhan.mp.
- 7 (2019-ncov or nCoV19 or nCoV-19 or 2019-novel CoV or sars-cov2 or sars-cov-2 or sarscov2 or sarscov-2 or Sars-coronavirus2 or Sars-coronavirus-2 or SARS-like coronavirus\* or coronavirus-19 or COVID19 or COVID-19 or COVID 2019 or ((novel or new or nouveau) adj2 (CoV on nCoV or COVID or coronavirus\* or corona virus or Pandemi\*2)) or ((COVID or COVID19 or COVID-19) and pandemic\*2) or (coronavirus\* and pneumonia)).mp.

- 8 COVID-19.rx,px,ox. or severe acute respiratory syndrome coron-  
avirus 2.os.
- 9 ("32240632" or "32236488" or "32268021" or "32267941" or  
"32169616" or "32267649" or "32267499" or "32267344" or  
"32248853" or "32246156" or "32243118" or "32240583" or  
"32237674" or "32234725" or "32173381" or "32227595" or  
"32185863" or "32221979" or "32213260" or "32205350" or  
"32202721" or "32197097" or "32196032" or "32188729" or  
"32176889" or "32088947" or "32277065" or "32273472" or  
"32273444" or "32145185" or "31917786" or "32267384" or  
"32265186" or "32253187" or "32265567" or "32231286" or  
"32105468" or "32179788" or "32152361" or "32152148" or  
"32140676" or "32053580" or "32029604" or "32127714" or  
"32047315" or "32020111" or "32267950" or "32249952" or  
"32172715").ui. [Articles not captured by this search when created  
in April 2020, pending further indexing by NLM]
- 10 or/6-9 [Lines 6 to 9 are specific to COVID-19]
- 11 5 or 10
- 12 11 and 20191201:20301231.(dt).
- 13 (COVID\* or ncov\* or 2019-novel CoV or SARS-CoV2 or SARS-  
CoV-2 or SARSCoV2 or SARSCov-2 or "severe acute respiratory  
syndrome coronavirus 2").mp.
- 14 (coronavirus\* or corona virus\*).mp. and 2020\*.dp.
- 15 ((novel or new or "2019" or "19" or pandemic or crisis or outbreak  
or Wuhan or China) adj3 (coronavirus\* or corona virus\*)).mp.
- 16 COVID-19.rx.
- 17 coronavirus infections/ and 2020\*.dp.

- 18 Pneumonia, Viral/ and 2020\*.dp.  
19 or/13-18  
20 12 or 19  
21 [from the CADTH hedge]  
22 (coronavirus/ or betacoronavirus/ or coronavirus infections/) and  
(disease outbreaks/ or epidemics/ or pandemics/)  
23 (nCoV\* or 2019nCoV or 19nCoV or COVID19\* or COVID or  
SARS-COV-2 or SARSCOV-2 or SARSCOV2 or Severe Acute Res-  
piratory Syndrome Coronavirus 2 or Severe Acute Respiratory Syn-  
drome Corona Virus 2).ti,ab,kf,nm,ot,ox,rx,px.  
24 ((new or novel or "19" or "2019" or Wuhan or Hubei or China or  
Chinese) adj3 (coronavirus\* or corona virus\* or betacoronavirus\*  
or CoV or HCoV)).ti,ab,kf,ot.  
25 ((coronavirus\* or corona virus\* or betacoronavirus\*) adj3 (pan-  
demic\* or epidemic\* or outbreak\* or crisis)).ti,ab,kf,ot.  
26 ((Wuhan or Hubei) adj5 pneumonia).ti,ab,kf,ot.  
27 or/22-26  
28 limit 27 to yr="2019 -Current"  
29 [let's compare]  
30 20 [homegrown]  
31 27 [CADTH]  
32 [additional pandemic terms]  
33 (pandemic\* or quarantine\* or social\* distan\* or lockdown\*).mp.  
34 exp disease outbreaks/  
35 20 or 27 or 33 or 34  
36 limit 35 to yr="2019 -Current"  
37 [sexual health]



- 38 sexual health/  
39 exp sexually transmitted diseases/  
40 exp sexual behavior/  
41 sexual health.mp.  
42 ((sexually transmitted or venereal) adj1 (disease\* or infection\*)).mp.  
43 (std or stds or sti or stis).mp.  
44 (gonorrhoea or chlamydia or syphilis or herpes).mp.  
45 (HIV or human immunodeficiency virus).mp.  
46 (AIDS or acquired immunodeficiency syndrome).mp.  
47 sexual behavior\*.mp.  
48 (safe\* sex or courtship\* or masturbat\* or abstinen\* or unsafe sex).mp.  
49 sexualit\*.mp.  
50 (sex adj1 (work\* or industr\*)).mp.  
51 prostitut\*.mp.  
52 (sex and client\*).mp.  
53 escort\*.mp.  
54 (brothel\* or strip club\*).mp.  
55 exp sex offenses/  
56 domestic violence/ or spouse abuse/  
57 ((spouse\* or spousal or wife or wives or husband\* or partner\* or boyfriend\* or girlfriend\* or domestic) adj2 (abus\* or violen\*)).mp.  
58 (dv or ipv).mp.  
59 coercive control.mp.  
60 (rape\* or rapist\*).mp.  
61 (sex\* adj1 (offen\* or violen\* or abus\* or exploit\*)).mp.

- 62 traffick\*.mp.
- 63 (dating or romantic\* or intimate or sexual\* or sext\* or seksbudd\*  
or sex budd\*).mp.
- 64 sex\* partner\*.mp.
- 65 sexual partners/  
66 Pre-Exposure Prophylaxis/  
67 Post-Exposure Prophylaxis/  
68 (exposure prophylaxis or PrEP or PEP or truvada).mp.
- 69 Emtricitabine, Tenofovir Disoproxil Fumarate Drug Combination/  
71 (gender\* adj2 nonconform\*).mp.
- 72 (gender\* adj2 non-conform\*).mp.
- 73 (trans adj (female\* or male\* or man or men or women or woman  
or boy\* or girl\*)).mp.
- 74 (trans adj (population\* or patient\* or participant\* or subject\* or  
adolescent\* or teen\* or child\* or individual\* or people or person\*  
or youth\*)).mp.
- 75 agender\*.mp.
- 76 bicurious.mp.
- 77 bigender\*.mp.
- 78 bisexual\*.mp.
- 79 cross sex.mp.
- 80 crossgender.mp.
- 81 DSD.mp.
- 82 gay.mp.
- 83 gays.mp.
- 84 gender change.mp.
- 85 gender crossing.mp.

- 86 gender dysphori\*.mp.
- 87 gender fluid\*.mp.
- 88 gender identit\*.mp.
- 89 gender incongruen\*.mp.
- 90 gender minorit\*.mp.
- 91 gender neutral.mp.
- 92 gender queer.mp.
- 93 gender transition\*.mp.
- 94 gender varian\*.mp.
- 95 genderless.mp.
- 96 genderqueer\*.mp.
- 97 GLB.mp.
- 98 GLBQ.mp.
- 99 GLBs.mp.
- 100 GLBT.mp.
- 101 GLBTQ.mp.
- 102 heteroflexible.mp.
- 103 homosexual\*.mp.
- 104 intersex\*.mp.
- 105 lesbian\*.mp.
- 106 lesbigay\*.mp.
- 107 LGB.mp.
- 108 LGBQ.mp.
- 109 LGBS.mp.
- 110 LGBT\*.mp.
- 111 men who have sex with men.mp.
- 112 mostly-heterosexual.mp.



- 113 MSM.mp.
- 114 MSMW.mp.
- 115 nonbinary.mp.
- 116 non-binary.mp.
- 117 nonheterosexual\*.mp.
- 118 non-heterosexual\*.mp.
- 119 queer.mp.
- 120 queers.mp.
- 121 same gender loving.mp.
- 122 same sex couple\*.mp.
- 123 same sex relations\*.mp.
- 124 same-sex attract\*.mp.
- 125 sexual identit\*.mp.
- 126 sexual minorit\*.mp.
- 127 sexual orientation\*.mp.
- 128 sexual preference\*.mp.
- 129 SGM.mp.
- 130 third gender\*.mp.
- 131 transboy\*.mp.
- 132 transex\*.mp.
- 133 transfemale\*.mp.
- 134 transfeminine.mp.
- 135 transgender\*.mp.
- 136 transgirl\*.mp.
- 137 transmn.mp.
- 138 transmasculine.mp.
- 139 transmale\*.mp.

- 140 transsex\*.mp.
- 141 trans-sex\*.mp.
- 142 trans-spectrum.mp.
- 143 transwomn.mp.
- 144 two-spirit\*.mp.
- 145 women loving women.mp.
- 146 women who have sex with women.mp.
- 147 WSW.mp.
- 148 WSWM.mp.
- 149 exp "sexual and gender minorities"/
- 150 bisexuality/
- 151 transsexualism/
- 152 exp homosexuality/
- 153 gender identity/
- 154 health services for transgender persons/
- 155 gender dysphoria/
- 156 exp "Disorders of Sex Development"/
- 157 gender affirming.mp.
- 158 or/37-157
- 159 [summation]
- 160 36 and 159
- 161 limit 160 to yr="2020"
- 162 limit 161 to english language

### **Data extraction**

We used a standardized coding protocol to collect information such as: title of study; authors; date published; study setting; study design; description of study sample; main outcomes;

main findings. We first divided studies into the following outcome categories: COVID-19 clinical outcomes and perceptions; economic impact on sexual health (excluding reproductive health, intimate partner violence and gender-based violence); HIV care; mental health; sexual behavior; STI care. COVID-19 clinical outcomes and perceptions were studies that described the progression and severity of COVID-19 progression in a population or asked individuals their perceptions of COVID-19 pandemic severity. The economic impact on sexual health denoted studies exploring economic or work-related outcomes of the pandemic such as a reduction in income or online advertising posts by sex workers. HIV care indicated studies that focused on HIV care of a population, such as studies exploring changes in attendance at a HIV clinic. Mental health referred to studies that explored the mental health and well-being, including stigma and psychological well-being of a population in response to the pandemic. Sexual behavior referred to studies focused on the sexual activities of a population, such as frequency and quality of sex. STI care regarded studies which primarily focused on the testing, treatment, diagnosis and management of STIs in a population. If there were multiple outcomes in a study, we selected the main outcome of the study. We then organized studies into the following population categories: people with HIV (PLHIV); sexual and gender minority (SGM); sex workers; general public; women. PLHIV are those who have HIV. SGM populations include, but are not limited to, individuals who identify as lesbian, gay, bisexual, asexual, transgender, Two-Spirit, queer, and/or intersex. Individuals with same-sex or -gender attractions or behaviors and those with a difference in sex development are also included. Sex workers are individuals who exchange sexual services, performances, or products for material compensation. General public refers to studies that did not focus on a specific population e.g. a survey targeting the Italian public. If studies focused on more than one category, we assigned the category which represented the primary population category of interest e.g. studies exploring men who have sex with men (MSM) sex workers would generally be assigned sex workers rather than SGM.



Supplementary Figure 1: Breakdown of study selection process

Supplementary Table 1: Study characteristics related to design of study, setting, and sample size

<b>Author, Year</b>	<b>Study setting</b>	<b>Methodology</b>	<b>Sample size: N (% male)</b>
Abbas et al, 2020 [5]	Egypt	Cross-sectional observational study	N/A
Alfalfy et al, 2020 [6]	Egypt	Prospective observational study	N/A
Algarin et al, 2020 [7]	United States	Prospective observational study	16 (38%)
Alinaghi et al, 2020 [8]	Iran	Cross-sectional observational study	200 (60%)
Arafat et al, 2020 [9]	India, Bangladesh, Nepal	Cross-sectional observational study	120 (78%)
Bais et al, 2020 [10]	France	Prospective observational study	N/A
Ballester-Amal et al, 2020 [11]	Spain	Cross-sectional observational study	1448 (33%)
Ballivian et al, 2020 [12]	Argentina	Cross-sectional observational study	1336 (67%)
Belete et al, 2020 [13]	Ethiopia	Qualitative study	12 (0%)
Berman et al, 2020 [14]	United States	Cross-sectional observational study	149 (68%)
Bhaskaran et al, 2020 [15]	United Kingdom	Retrospective observational study	27480 (65%)

Brawley et al, 2020 [16]	United States	Cross-sectional observational study	409 (N/A)
Buckley et al, 2020 [17]	Spain	Retrospective observational study	N/A
Callander et al, 2020 (1) [18]	Global sample	Mixed-methods study	19388 (100%)
Callander et al, 2020 (2) [19]	Global sample	Mixed-methods study	19388 (100%)
Camargo et al, 2020 [20]	Brazil	Cross-sectional observational study	2646 (100%)
Charre et al, 2020 [21]	France	Retrospective observational study	HIV infected patients: 77 (68%) PrEP users: 27 (100%) Other patients: 19009 (41%)
Chow et al, 2020 (1) [22]	Australia	Cross-sectional observational study	204 (100%)
Chow et al, 2020 (2) [23]	Australia	Cross-sectional observational study	204 (100%)
Cito et al, 2020 [24]	Italy	Cross-sectional observational study	1576 (35%)

Cocci et al, Italy 2020 [25]	Cross-sectional observational study	1515 (N/A)
Coombe et al, Australia 2020 [26]	Cross-sectional observational study	962 (26%)
Cusini et al, Italy 2020 [27]	Prospective observational study	N/A
Darcis et al, Belgium 2020 [28]	Retrospective observational study	N/A
Davey et al, South Africa 2020 [29]	Prospective observational study	455 (0%)
Davies et al, South Africa 2020 [30]	Retrospective observational study	540552 (34%)
de Sousa et al, 2020 [31]	Brazil, Portugal Cross-sectional observational study	2361 (100%)
del Amo et al, Spain 2020 [32]	Prospective observational study	77,590 (75%)
di Biagio et al, Italy 2020 [33]	Prospective observational study	69 (73%)
Dyer et al, Kenya 2020 [34]	Prospective observational study	1386 (35%)
Etienne et al, France 2020 [35]	Prospective observational study	54 (N/A)
Fish et al, United States 2020 [36]	Qualitative study	159 (N/A)
Flentje et al, United States 2020 [37]	Cross-sectional observational study	2288 (37%)

Fodjo et al, Europe 2020 [38]	Cross-sectional observational study	317 (72%)
Fuchs et al, Poland 2020 [39]	Prospective observational study	764 (0%)
Geretti et al, United Kingdom 2020 [40]	Prospective observational study	115 (66%)
Gervasoni et al, Italy el, 2020 [41]	Retrospective observational study	6000 (74%)
Gichuna et al, Kenya 2020 [42]	Qualitative study	117 (0%)
Gillespie et al, Wales al, 2020 [43]	Prospective observational study	56 (100%)
Gonzales et al, United States al, 2020 [44]	Cross-sectional observational study	477 (16%)
Guo et al, China 2020 [45]	Retrospective observational study	1701 (87.2%)
Hadi et al, United States 2020 [46]	Retrospective observational study	404 (71%)
Hammoud et al, Australia al, 2020 [47]	Prospective observational study	940 (100%)
Hensel et al, United States 2020 [48]	Cross-sectional observational study	521 (48%)
Ho et al, 2020 [49]	Retrospective observational study	93 (72%)
Hochstatter et al, 2020 [50]	Prospective observational study	64 (75%)



Hogan et al, 2020 [51]	Low-to-Middle-Income Countries	Modeling study	N/A
Huang et al, 2020 [4]	China	Retrospective observational study	6001 (90%)
Inciarte et al, 202 [52]0	Spain	Prospective observational study	44 (85%)
Jacob et al, 2020 [53]	United Kingdom	Cross-sectional observational study	868 (37%)
Jarolimova et al, 2020 [54]	South Africa	Cross-sectional observational study	280 (34%)
Jewell et al, 2020 (1) [55]	South Africa, Malawi, Zimbabwe, and Uganda	Modeling study	N/A
Jewell et al, 2020 (2) [56]	Sub-saharan Africa	Modeling study	N/A
Jewell et al, 2020 (3 [57])	South Africa	Modeling study	N/A
Jianjun et al, 2020 [58]	China	Cross-sectional observational study	3219 (23%)
Junejo et al, 2020 [59]	United Kingdom	Prospective observational study	N/A
Kalichman et al, 2020 [60]	United States	Prospective observational study	162 (73%)
Karmen-Tuohy et al, 2020 [61]	United States	Retrospective observational study	21 (N/A)
Kneale et al, 2020 [62]	United Kingdom	Cross-sectional observational study	398 (N/A)

Ko et al, 2020 (1) [63]	Taiwan	Cross-sectional observational study	1954 (30%)
Ko et al, 2020 (2) [64]	Taiwan	Cross-sectional observational study	1954 (30%)
Kowalska et al, 2020[65]	Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Greece, Hungary, Lithuania, Macedonia, Poland, Republic of Moldova, Russia, Serbia, Turkey, and Ukraine	Cross-sectional observational study	19 countries (N/A)
Krakower et al, 2020 [66]	United States	Retrospective observational study	3520 (92%)
Krier et al, 2020 [67]	United States	Qualitative study	16 (94%)
Latini et al, 2020 [68]	Italy	Prospective observational study	N/A
Lehmiller et al, 2020 [69]	Unclear	Cross-sectional observational study	1599 (23%)
Li et al, 2020 (1) [70]	China	Cross-sectional observational study	541 (56%)
Li et al, 2020 (2) [71]	China	Cross-sectional observational study	459 (59%)

Linnemayr et al, 2020 (1) [72]	United States	Prospective observational study	50 (70%)
Linnemayr et al, 2020 (2) [73]	Uganda	Mixed-methods study	100 (40%)
Liu et al, 2020 [74]	China	Retrospective observational study	20 (25%)
Luetke et al, 2020 [75]	United States	Cross-sectional observational study	773 (51%)
Maggiolo et al, 2020 [76]	Italy	Prospective observational study	124 (76%)
Mambo et al, 2020 [77]	Uganda	Cross-sectional observational study	724 (56%)
Marbaniang et al, 2020 [78]	India	Cross-sectional observational study	167 (40%)
McKay et al, 2020 [79]	United States	Prospective observational study	728 (100%)
Meyerowitz et al, 2020 [80]	United States	Retrospective observational study	36 (58.3%)

Michielson et al, 2020 [81]	Argentina, Belgium, Botswana, Cambodia, Czech Republic, Canada, China, Colombia, Denmark, Ecuador, Egypt, Ethiopia, France, Germany, Italy, Kenya, Latvia, Lebanon, Malaysia, Mexico, Republic of Moldova, Mozambique, Nigeria, Panama, Portugal, Republic of Moldova, Singapore, South Africa, Spain, Sweden, Uganda, Uruguay, and the United States	Cross-sectional observational study	N/A
Millar et al, 2020 [82]	United States	Cross-sectional observational study	477 (100%)
Miyashita et al, 2020 [83]	United States	Prospective observational study	161 (78%)
Nagarakanti et al, 2020 [84]	United States	Retrospective observational study	23 (61%)
Nagendra et al, 2020 [85]	United States	Cross-sectional observational study	73 (N/A)
Odihambo et al, 2020 [86]	Kenya	Prospective observational study	60 clinics

Pandya et al, 2020 [87]	India	Cross-sectional observational study	12 transwomen, 4 hijra)	(8
Pierre et al, 2020 [88]	Rwanda	Cross-sectional observational study	382 (47%)	
Ponticiello et al, 2020 [89]	Uganda	Qualitative study	20 (50%)	
Qiao et al, 2020 [90]	United States	Mixed-methods study	27 clinics	
Quinn et al, 2020 [91]	United States	Qualitative study	437 (100%)	
Quiros-Roldan et al, 2020 [92]	Italy	Retrospective observational study	3875 (72%)	
Rao et al, 2020 [93]	Australia, Belarus, Belgium, Brazil, Canada, Egypt, France, Germany, Indonesia, Italy, Kazakhstan, Malaysia, Mexico, Russia, Taiwan, Thailand, Turkey, Ukraine, United Kingdom, United States	Cross-sectional observational study	1929 (100%)	
Rhodes et al, 2020 [94]	United States	Qualitative study	15 (100%)	
Rozanova et al, 2020 [95]	Ukraine	Qualitative study	120 (N/A)	



Sacchelli et al, 2020 [96]	Italy	Prospective observational study	200 (76%)
Sahoo et al, 2020 [97]	India	Cross-sectional observational study	1636 (67%)
Sanchez et al, 2020 [98]	United States	Prospective observational study	1051 (100%)
Sanchez-Rubio et al, 2020 [99]	Spain	Cross-sectional observational study	N/A
Santos et al, 2020 [100]	Brazil, France, Mexico, Taiwan, and Russia	Cross-sectional observational study	2732 (100%)
Schiavi et al, 2020 [101]	Italy	Prospective observational study	89 (0%)
Shalev et al, 2020 [102]	United States	Retrospective observational study	31 (77%)
Sharma et al, 2020 [103]	India	Mixed-methods study	282 (63%)
Shi et al, 2020 [104]	China	Retrospective observational study	N/A
Shilo et al, 2020 [105]	Israel	Cross-sectional observational study	2562 (100%)
Siedner et al, 2020 [106]	South Africa	Prospective observational study	36291 (N/A)
Sigel et al, 2020 [107]	United States	Retrospective observational study	88 (75%)
Simmons et al, 2020 [108]	United States	Unclear	Unclear

Spinelli et al, 2020 [109]	United States	Retrospective observational study	1766 (N/A)
Starks et al, 2020 [110]	United States	Prospective observational study	455 (100%)
Stephenson et al, 2020 (1) [111]	United States	Cross-sectional observational study	696 (100%)
Stephenson et al, 2020 (2) [112]	United States	Cross-sectional observational study	518 (100%)
Stoeckle et al, 2020 [113]	United States	Retrospective observational study	30 (80%)
Stover et al, 2020 [114]	Cameroon, Cote d'Ivoire, Eswatini, Kenya, Lesotho, Malawi, Mozambique, Nigeria, South Africa, Tanzania, Uganda, Zimbabwe	Modeling study	N/A
Suen et al, 2020 [115]	Hong Kong	Cross-sectional observational study	857 (44%)
Talmac et al, 2020 [116]	Turkey	Prospective observational study	N/A
Tan et al, 2020 [117]	Singapore	Qualitative study	17 (N/A)
Torres et al, 2020 [118]	Brazil	Cross-sectional observational study	3486 (98%)
Tuncel et al, 2020 [119]	Turkey	Cross-sectional observational study	307 (94.1%)

Vizcarra et al, Spain 2020 [120]	Prospective observational study	51 (84%)
Winston et al, Ireland 2020 [121]	Cross-sectional observa- tional study	699 (87.5%)
Yuksel et al, Turkey 2020 [122]	Observational ambidirec- tional study	58 (100%)

Note: N/A values detail samples for modeling studies or clinical trials.

Supplementary Table 2: Synthesis of results organized by outcome and population

<b>Author, Year</b>	<b>Main findings</b>	<b>Population</b>
<b>COVID-19 clinical outcomes and perceptions</b>		
Alinaghi et al, 2020	Existing infection with HIV or receiving ART might reduce the susceptibility to the infection with SARS-CoV-2 or decrease the severity of the infection acquired.	People with HIV
Bhaskaran et al, 2020	Estimated cumulative COVID-19 mortality was higher among PLHIV than people without HIV [(0.09%; 95% CI: 0.06, 0.13) vs (0.04%; 95% CI: 0.04, 0.04)]. There was some evidence that the association between HIV and COVID-19 death was larger in black individuals (HR = 3.80; 95% CI: 2.15 6.74, compared with HR = 1.64; 95% CI: 0.92-2.90 in other ethnic groups, p-interaction = 0.045).	People with HIV
Charre et al, 2020	The risk of symptomatic COVID-19 in France appeared similar in HIV-infected patients and in PrEP users compared with the general population. The positivity rate appeared similar in HIV-infected patients (15.60%), in PrEP users (14.80%) and in other patients (19.10%).	People with HIV
del Amo et al, 2020	The risks for PCR-confirmed COVID-19 diagnosis, hospitalization, ICU admission, and death among HIV positive persons receiving ART in Spain were greater in men and those older than 70 years. The risk for hospitalization varied by NRTI regimen and was lower in patients receiving TDF/FTC versus those receiving other regimens.	People with HIV

di Biagio et al, 2020	Patients' characteristics and median days between symptoms and diagnosis were similar by hospital admission, whereas admitted patients had lower nadir CD4 cells and current lymphocytes count. These values were also correlated to worse COVID-19 outcome. Antiretroviral drugs did not seem associated with disease severity.	People with HIV
Davies et al, 2020	There was an approximately two-fold increased risk of COVID-19 death in PLHIV, irrespective of viral suppression, and a similar increased risk for patients with current tuberculosis	People with HIV
Etienne et al, 2020	The severity of COVID-19 in PLHIV was associated with older age, male sex and metabolic disorders, such as obesity and diabetes. We also found that patients originated from Sub Saharan Africa possibly were at increased risk of disease severity.	People with HIV
Geretti et al, 2020	Evidence suggests a 63% increased risk of day-28 mortality among PLHIV hospitalised with COVID-19 compared to HIV-negative individuals in the same dataset, after adjustment for sex, ethnicity, age, baseline date, ten key comorbidities, and disease severity at presentation (adjusted HR 1.63; 95% CI: 1.07, 2.48; p = 0.02).	People with HIV



- Gervasoni et al, 2020 The risk of severe disease in our patients with HIV compared favorably with that observed in the general population of patients with COVID-19. Likewise, the risk of death or admission to an intensive care unit was lower than that observed in the patients without HIV treated at our hospital and in another cohort of HIV-negative patients with COVID-19 of a similar mean age. People with HIV
- Guo et al, 2020 PLHIV has comparable COVID-19 morbidity rates as the general population, and older age, low CD4 count, long length since HIV diagnosis, and treatment-naive were potential driving forces of COVID-19 occurrence among PLHIV. People with HIV
- Hadi et al, 2020 PLHIV patients with COVID-19 were more likely to be males, African American, obese, and have concurrent hypertension, diabetes, chronic kidney disease, and nicotine dependence compared to non-PLHIV cohort. People with HIV
- Ho et al, 2020 PLHIV, particularly those with prolonged duration of HIV infection and medical comorbidities remain at risk for severe manifestations of COVID-19 despite suppressive ART and immune reconstitution. Substantial inflammation and immune dysregulation occurred in a subset of individuals who experienced poor outcomes. People with HIV
- Huang et al, 2020 PLHIV have similar risk of COVID-19 compared to that in the general population during COVID-19 epidemic. People with HIV

Inciarte et al, 2020	PLHIV with COVID-19 did not differ from the rest of the HIV cohort. Clinical presentation, severity rate and mortality were not dependent on any HIV- or antiretroviral-related factor. COVID-19 standardized incidence rate was lower in PLHIV than in the general population.	People with HIV
Karmen-Tuohy et al, 2020	HIV-positive patients (N = 21) and matched non-HIV patients (N = 42) did not differ significantly in age, sex, race, tobacco use, or medical history. Our findings suggest that HIV status did not significantly impact clinical outcomes in patients with SARS-CoV-2 infection.	People with HIV
Liu et al, 2020	Compared with SARS-CoV-2 infected general population, patients with HIV co-infection mostly have milder clinical presentation.	People with HIV
Maggiolo et al, 2020	None of the classical variables linked to HIV infection such as nadir CD4 cell counts, time of HIV infection or current CD4 counts were predictive of the risk of acquiring SARS-CoV-2 infection, nor the use of specific antiretrovirals resulted having a protective effect.	People with HIV
Meyerowitz et al, 2020	Almost all (85%) PLHIV with COVID-19 in this ample had a comorbidity associated with severe disease.	People with HIV
Miyashita et al, 2020	Compared to COVID-19 patients without HIV infection, patients with HIV infection had higher prevalences of hypertension, diabetes mellitus, dyslipidaemia, heart failure, and chronic kidney disease.	People with HIV

Nagarakanti et al, 2020	There was no difference in mortality, ICU admission and the need for mechanical ventilation when compared to a matched control of COVID-19 patients with HIV.	People with HIV
Sigel et al, 2020	No differences in adverse outcomes associated with HIV infection for hospitalized COVID-19 patients compared with a similar comparison group.	People with HIV
Shalev et al, 2020	PLHIV hospitalized for COVID-19 share similar clinical characteristics and outcomes with other hospitalized cohorts.	People with HIV
Stoeckle et al, 2020	There were no significant differences between PLHIV and control patients in presenting symptoms, duration of symptoms before hospitalization, laboratory markers, or radiographic findings on chest x-ray. More patients without HIV required a higher level of supplemental oxygen on presentation than PLHIV. There were no differences in the need for invasive mechanical ventilation during hospitalization, length of stay, or in-hospital mortality.	People with HIV
Vizcarra et al, 2020	Clinical, analytical, and radiological presentation of COVID-19 in HIV-infected individuals was similar to that described in the general population.	People with HIV

Ko et al, 2020 (1)	Sexual minority participants had lower perceived susceptibility and greater self-confidence than did heterosexual participants, sexual minority participants were less likely to worry about COVID-19 than did heterosexual participants, sexual minority participants were less likely to perceive themselves as being susceptible to COVID-19.	Sexual and gender minority
Rhodes et al, 2020	Participants had high levels of knowledge about the transmission and prevention of COVID-19. While participants reported some confusion about conflicting and emerging information related to COVID-19, they utilized multiple and credible sources to obtain information about the pandemic and risk reduction.	
Stephenson et al, 2020 (2)	Approximately two thirds of respondents believed it was possible to contract COVID-19 through sex.	Sexual and gender minority
<b>Economic impact on sexual health</b>		
Belete et al, 2020	Sex workers reported job loss, difficulties covering basic expenses and engaging in unprotected sex due to financial hardship.	Sex workers

Callander et al, 2020 (1)	During the pandemic, the number of active sex worker profiles decreased by 26.3% (IRR = 0.90; 95% CI: 0.89, 0.91; $p < 0.001$ ) and the number of newly created profiles decreased by 59.4% (IRR = 0.71; 95% CI: 0.69, 0.74, $p < 0.001$ ). 211 unique profiles explicitly referenced COVID-19; 185 (85.80%) evoked risk reduction strategies, including discontinuation of in-person services (41.20%), pivoting to virtual services (38.90%), COVID-19 status disclosure (20.9%), enhanced sanitary and screening requirements (12.30%) and restricted travel (5.2%).	Sex workers
Callander et al, 2020 (2)	After a period of physical distancing, active sex work profiles increased by 9.40% ( $p < 0.001$ ) and newly created profiles increased by 35.60% ( $p < 0.001$ ).	Sex workers
Tan et al, 2020	While sex work-related activity has fallen due to the closure of entertainment establishments and other measures to curb the spread of COVID-19 in Singapore, some sex work is still taking place.	Sex workers
Torres et al, 2020	Non-white, low schooling, and low income MSM and TGNB had higher odds of unattainability in maintaining social distancing. Compared to MSM, TGNB individuals had more challenges to access food, hormones, health/mental care, medication refill, and higher frequency of unsafe housing ( $p < 0.010$ ).	Sex workers
Davey et al, 2020	During the nationwide lockdown, missed PrEP visits increased significantly to 63% at the 1-month visit and 55% at the 3-month visit.	Women

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**HIV care**

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|---------------------------|---|----------------|
| Darcis et al, 2020        | Since the beginning of the SARS-CoV-2 pandemic and the implementation of strict containment measures, the number of HIV screening tests and diagnoses dramatically decreased.   | General public |
| Ponticiello et al, 2020   | COVID-19 has negatively impacted engagement with HIV testing resources in two important ways: (1) COVID-restrictions prevent participants from accessing HIV testing services; and (2) COVID-related stigma discourages use of healthcare facilities where HIV testing services are located.                                      | General public |
| Sanchez-Rubio et al, 2020 | The number prescribed PEP overall fell from 556 in 2019 (100.8 cases/million population) to 348 in 2020 (63.1/million), a decrease of 37%. During the lockdown period, prescriptions decreased from 265 (48/ million) to 58 (10.5/million), a decrease of 78%.  | General public |
| Shi et al, 2020           | Overall, a 34.20% (898,936) decrease in testing rates was observed when real data was compared with the estimated number of recorded tests from the first quarter of 2020. Although an estimated 1610 confirmatory tests were expected to be recorded in 2020, only 749 (46.50%) of confirmed HIV cases in Jiangsu were recorded. | General public |
| Siedner et al, 2020       | There was a significant increase in HIV visits immediately after the lockdown (8.40 visits/clinic/day; 95% CI: 2.40, 14.40).  | General public |



Algarin et al, 2020	Most participants continue to receive HIV care in person. 83% kept HIV care appointments and kept in contact with their case manager, all received ART.	People with HIV
Dyer et al, 2020	23% of respondents reported no longer being able to go outside, 17% reported that they could no longer go to their regular clinic for medical care, and 3% reported that they could no longer get medication refills.	People with HIV
Ballivian et al, 2020	About one third of participants (n = 463; 34.70%) reported being unable to access medical care due to lack of access to telehealth technology; a few (n = 52; 3.90%) reported having problems obtaining HIV medication. Most participants (n = 886; 66%) described their adherence to antiretrovirals as excellent.	People with HIV
Fodjo et al, 2020	Lockdowns reduced access to HIV care. One hundred and thirty-eight (44.20%) respondents reported being less likely to interrupt ART during the lockdown period; meanwhile 11 (3.50%) were more likely to interrupt their treatment, and another 163 (52.20%) were as likely to stop ART as before the COVID-19 lockdown.	People with HIV
Hochstatter et al, 2020	Study found a significant increase in the proportion of people missing their ART medications 2 or more days per week and a significant decrease in individual's confidence to attend their next HIV appointment.	People with HIV

- Hogan et al, 2020 Direct deaths due to COVID-19 were predicted to occur mostly between June and August with an estimated 6000 deaths per million population. 30% of projected COVID-19 deaths would be due to lack of supportive care due to hospital capacity being exceeded (ie, 30% fewer deaths would occur if hospital capacity was not limited). In the mitigation scenario, we projected a lower number of COVID-19 deaths (around 4400 per million population), because the pandemic curve would be flatter, with a lower peak and lasting for longer than the no action scenario. People with HIV
- Jarolimova et al, 2020 Primary concerns regarding ART pick-up in the future were COVID-19 infection risk (n = 91, 33%), transportation availability (n = 63, 22%), and safety (n = 58, 21%). Twenty (7%) of 278 participants had recently delayed picking up their ART due to COVID-19. People with HIV
- Jewell et al, 2020 (1) A three-month interruption for 40% of those on ART could cause a similar number of additional deaths as those that might be saved from COVID-19 through social distancing. An interruption for more than 90% of individuals on ART could cause the number of deaths to exceed the number of COVID-19 deaths, depending on the COVID-19 projection. People with HIV

Jewell et al, 2020 (2)	A 6-month interruption of supply of ART drugs across 50% of the population of PLHIV who are on treatment would be expected to lead to a 1.63 times (median across models; range 1.39–1.87) increase in HIV-related deaths over a 1-year period compared with no disruption.	People with HIV
Jewell et al, 2020 (3)	An interruption in the supply of ART for 40% of those on ART for 3 months could cause a number of deaths on the same order of magnitude as the number that are anticipated to be saved from COVID-19 through social distancing measures.	People with HIV
Kalichman et al, 2020	Nearly 1 in 5 participants (n = 31, 19%) indicated that they had missed a scheduled HIV care appointment in the previous 30 days. ART adherence improved significantly in the month since the onset of COVID-19 protective actions [t (159) = 17.20; p = 0.01].	People with HIV
Kowalska et al, 2020	60% of responding countries reported that HIV physicians were at the same time directly involved in work related to COVID-19 patients. Only around 30% of the countries continued to have HIV clinics working normally.	People with HIV
Linnemayr et al, 2020 (2)	Most participants (76%) agreed or strongly agreed that COVID-19 impacts their ability to come to the clinic and slightly more than half (54%) agreed or strongly agreed that coming to the clinic increased their chances of getting COVID-19.	People with HIV

Odhiambo et al, 2020	Average attendance decreased from 1298 to 640 patients per day post-intervention, representing a 50.70% reduction. Daily HIV clinic attendance markedly declined in larger health facilities by 60.40% while clinic attendance in smaller facilities declined by 33.6%.	People with HIV
Pierre et al, 2020	Less than half (48%) of patients had attended scheduled ART collection clinic	People with HIV
Qiao et al, 2020	2 clinics (7.40%) were assessed as “no interruption”, three (11.10%) as “minimal interruption”, 15 clinics (55.60%) as “partial interruption”, and seven clinics (25.90%) as “complete interruption”.	People with HIV
Quiros-Roldan et al, 2020	Comparing the data from October-November 2019 and the bimester of the COVID-19 pandemic peak, periods, researchers observed a raise of missed visits from 5 to 8% ( $p < 0.010$ ), a reduction in the number of new HIV diagnosis from 6.4 in 2019 to 2.5 per month in 2020 ( $p = 0.01$ ), a drop in ART dispensation and an increase of hospitalized HIV patients due to COVID-19.	People with HIV
Spinelli et al, 2020	The odds of viral non-suppression were 31% higher post-shelter-in-place (95% CI: 1.08, 1.53) in spite of stable retention in care and visit volume, with disproportionate impact on homeless individuals.	People with HIV

- Stover et al, 2020, Countries with larger number of people on ART coverage will generally see more deaths than those with fewer people on ART, but high ART coverage will result in a lower mortality rate since many ART patients have high CD4 counts and, therefore, low mortality even without ART. People with HIV
- Winston et al, 2020, While Elixhauser Comorbidity Index, Charlson Comorbidity Index and Comorbidity Burden Index were significantly higher in PLHIV than in controls ( $p < 0.001$  for each), the magnitude of the differences between the two groups were small to medium, with effect sizes (95% confidence interval) of 0.21 (0.16, 0.27), 0.38 (0.32, 0.42) and 0.18 (0.11, 0.23), respectively. People with HIV
- Santos et al, 2020, Among the 2247 participants not living with HIV, 1459 (65%) felt they definitely still had access to condoms, though substantially fewer participants felt they had similar levels of access to onsite HIV testing (30%), HIV at home testing (19%), PrEP (21%) or PEP (17%). Gay men and other MSM from immigrant backgrounds reported less definite access to condoms when compared to participants with parents who were born in their current country of residence (61% vs. 67%;  $\chi^2 = 25.70$ ,  $p = 0.01$ ). Less definite access to condoms was also reported by respondents who had ever engaged in sex work when compared to those who hadn't (56% vs. 67%,  $\chi^2 = 15.60$ ,  $p = 0.048$ ). Sexual and gender minority

- Gichuna et al, 2020 There was a shortage of family planning options and even where available, some of the sex workers could not access them. As a result, some sex workers were already struggling to accept the harsh reality of carrying unwanted pregnancies. HIV infections could rise among the sex workers and their clients due to increased risk behaviours and lack of adherence to ART for those living with HIV. Sex workers
- Brawley et al, 2020 Of 189 prescribers, 95% reported being able to prescribe PrEP during shelter in place orders despite > 90% reporting practice-site restrictions. Sexual and gender minority
- Chow et al, 2020 (1) 1 in 4 MSM daily PrEP users stopped using PrEP during lockdown and about 5% of MSM switched from daily PrEP to on-demand PrEP; however, the majority of MSM daily PrEP users kept taking daily PrEP during lockdown during the COVID-19 pandemic. Sexual and gender minority
- Chow et al, 2020 (2) Compared to the 4 weeks before lockdown, PEP prescriptions decreased by 66% during the first four weeks of lockdown. Sexual and gender minority
- Junejo et al, 2020 Weekly prescriptions of PEPSE at the sexual health clinic decreased from a peak of 54 (from Feb 17–23, 2020) to four (from March 30–April 5, 2020) during lockdown.

Sexual and gen-  
der minority

Krakower et al, 2020 From January to April, PrEP initiations decreased by 72.1% (122/month to 34/month), refill lapses increased by 278% (140/month to 407/month), and the number of PrEP patients decreased by 17.9%. GC/CT and HIV tests each decreased by 85.1% (1058/month to 158/month for GC/CT and 1014/month to 151/month for HIV), while GC/CT test positivity rates increased slightly (12.30% to 15.80%).

Sexual and gen-  
der minority

Rao et al, 2020 For every ten-point increase in stringency of the government response to COVID-19, there was a 3% reduction in the prevalence of access to in-person testing (PR: 0.94; 95% CI: 0.93, 0.95); a four percent reduction in access to PrEP (PR: 0.96; 95% CI: 0.95, 0.97); and no significant reduction in access to condoms (PR: 0.99; 95% CI: 0.99, 1.00).

Sexual and gen-  
der minority

### **Mental health**

Berman et al, 2020 Choosing to socially distance to reduce COVID-19 exposure was associated with COVID-19 discriminatory attitudes ( $p < 0.050$ ), concerns of contracting COVID-19 ( $p < 0.010$ ), and identifying as transgender ( $p < 0.050$ ). People with HIV

- Krier et al, 2020 Many participants expressed concern and worry about COVID-19 with references to “the new virus.” Participants expressed fears of how the COVID-19 pandemic will disrupt HIV care services, like the loss of, or restricted access to healthcare services and HIV funding. Another common healthcare concern among participants was in navigating cancer care in the era of the COVID- 19 pandemic. People with HIV
- Marbaniang et al, 2020 A fourth of the participants had scores indicative of generalized anxiety disorder, which were not differential by age, gender, or socioeconomic background, underscoring the pervasiveness of anxiety symptoms in the current pandemic. People with HIV
- Rozanova et al, 2020 While OPWH with SUD maintained HIV and SUD therapy throughout the lockdown, there is great anxiety about the availability of treatment services. Providers reported concerns about the stability of clinical services given decreased billable patient volume, particularly among social workers, whose salaries are based on a per-patient fee. Simultaneously the amount of non-billable tasks to keep patients in care, increased (e.g., mailing ART to OPWH unable to visit the clinic to obtain refills). People with HIV
- Tuncel et al, 2020 Beck anxiety index scores were correlated with the patient-reported 19 anxiety levels about the spread of COVID-19 in Turkey. People with HIV



Camargo et al, 2020	Psychological well-being was associated with age ( $p < 0.001$ ), relationship status ( $p < 0.001$ ), and social isolation ( $p < 0.001$ ). Being 18 to 29 years old, in a polyamorous relationship, and not complying with shelter in place orders increased three, twice, and seven times, respectively, the prevalence of low psychological well-being.	Sexual and gender minority
Fish et al, 2020	Participants expressed concern for mental health owing to pandemic restrictions, loss of extracurricular activities, being confined to the home with unsupportive parents, reluctance to engage in telebehavioral health due to eavesdropping parents, and inhibited access to community-based LGBTQIA youth organizations and individuals who provided support (e.g., staff, mentors, “chosen family”).	Sexual and gender minority
Flentje et al, 2020	Found increases in anxiety and depression coinciding with the COVID-19 pandemic onset. Depression symptoms increased by a mean PHQ-9 score of 1.21 [ $t(2280) = 11.35$ ; $p < 0.001$ ; $d = 0.20$ ] from timepoint 1 to 2. Anxiety symptoms increased by a mean GAD-7 score of 3.11 [ $t(2282) = 27.95$ ; $p < 0.001$ ; $d = 0.54$ ].	Sexual and gender minority
Gonzales et al, 2020	More than 60% of the sampled LGBTQIA college students were experiencing frequent mental distress, anxiety, or depression. Compared to cisgender men, transgender students were much more likely to report frequent mental distress (aOR = 3.41; 95% CI: 1.31, 8.86).	Sexual and gender minority

Kneale et al, 2020	Around one-in-six respondents reported some form of harassment since the start of the pandemic, because they were LGBTQIA (16.7%); Bivariate analyses show that cis-female respondents who identify as gay or lesbian had the lowest scores for perceived stress or depressive symptoms.	Sexual and gender minority
Millar et al, 2020	Of the 477 participants, almost 75% endorsed some level of restless sleep in the past week on the CESD sleep item: 27.70% reported restless sleep some or a little of the time (1–2 days), 25.80% occasional or a moderate amount of the time (3–4 days), and 19.50% on most or all days (5–7 days). Only 27.00% reported no restless sleep at all.	Sexual and gender minority
Pandya et al, 2020	Key themes that emerged from interviews were low health literacy, experiencing stigma and discrimination, decreased access to healthcare, food insecurity and the prevalence of chronic conditions such as diabetes, asthma, TB and HIV.	Sexual and gender minority
Quinn et al, 2020	Respondents drew parallels between the COVID-19 pandemic and the HIV epidemic.	Sexual and gender minority
Sanchez et al, 2020	The majority of participants had decreased quality of life, increased anxiety, decreased connection to friends, fewer sex partners or opportunities to have sex, problems accessing HIV or STI testing and STI treatment due to COVID-19 or the plans to manage it. Few participants living with HIV infection had decreased access to their HIV medications or had trouble taking them.	Sexual and gender minority

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### Sexual behavior

Abbas et al, 2020	Assessing sexual dysfunction among healthcare staff.	General public
Alfaly et al, 2020	Assessing sexual and marital health problems among couples during the COVID-19 pandemic.	General public
Arafat et al, 2020	45% of the participants reported that the lockdown affected their sexual life. After the lockdown, more participants engaged in sexual activity with their partner more than 5 times a week, in comparison to before the lockdown (10% and 6.70% respectively).	General public
Ballester-Amal et al, 2020	Approximately one third, 35.90% stated that they had a higher sexual desire during confinement, 34.90% had a lower desire and 29.10% nearly the same. Women reported a significantly higher interest in sexual activity than usual (35.80% vs 29.10%; $p < 0.015$ ).	General public
Cito et al, 2020	The mean number of sexual intercourse decreased significantly during the quarantine, compared to before ( $p < 0.010$ ). Specifically, the number of respondents who had sexual intercourse $\geq 2$ a week during the pandemic reduced from 54.20% to 37.20% ( $p < 0.010$ ).	General public

- Cocci et al, 2020 Age (OR = 0.96;  $p < 0.010$ ) and BDI (OR = 1.07;  $p < 0.010$ ) in male and age (OR = 0.96;  $p < 0.010$ ), BDI (OR = 1.03;  $p < 0.010$ ) and “knowing people positive for COVID” (OR = 0.78;  $p < 0.050$ ) in women were significant predictors of sexual dissatisfaction. More than 40% of the respondents reported an increased sexual desire during the quarantine, compared to baseline. General public
- Coombe et al, 2020 Most participants (472/883; 53.50%) reported less sex during lockdown than during 2019 with a small proportion (126/883; 14.30%) reporting that they were having more sex. MSM were most likely to report less sex than in 2019 (56/80; 70.00%) and those in a cohabitating relationship were the most likely to report the same amount of sex (146/321; 45.50%), or more sex than in 2019 (62/321; 19.3%) General public
- Hensel et al, 2020 Overall, respondents reported a decrease in some kind of sexual activity following the pandemic. Greater COVID-19 knowledge was associated with a lower likelihood of increased (vs. stable) individual and partnered sexual activity in the past month (aOR = 0.49-0.80). General public
- Jacob et al, 2020 39.9% of the sample reported engaging in sexual activity at least once per week. Being male, a younger age, married, consuming alcohol, and a higher number of days in self-isolation/social distancing were all associated with greater sexual activity in comparison to their counterparts. General public

- Jianjin et al, 2020 The results showed that COVID-19 stress could significantly predict perceived social support ( $\beta = 0.13$ ;  $t = 7.189$ ;  $p < 0.001$ ; 95% CI: 0.09, 0.16), and the interaction could significantly predict perceived social support ( $\beta = -0.130$ ;  $t = -3.38$ ;  $p < 0.001$ ; 95% CI: -0.21, -0.06). gender was not a moderating role in the relationship between COVID-19 stress and sexual compulsivity symptom ( $\beta = 0.05$ ;  $t = 1.281$ ;  $p > 0.05$ ; 95% CI: -0.03, 0.12). General public
- Ko et al, 2020 (2) Significant association between being sexual minority and decreased frequency of sexual activity was only true for men (OR = 2.47; 95% CI: 1.57; 3.87;  $p < 0.001$ ) but not for women (OR = 1.10; 95% CI: 0.69; 1.75;  $p = 0.69$ ). Moreover, the significant association between being a sexual minority and decreased frequency of sex-seeking activity was only true for men (OR = 7.28; 95% CI: 3.98, 13.34;  $p < 0.001$ ) but not for women (OR = 1.98; 95% CI: 0.99, 3.98;  $p = 0.05$ ). General public

- Lehmiller et al, 2020 Many participants (43.50%) reported a decline in the quality of their sex life, with the remainder reporting that it either stayed the same (42.80%) or improved (13.60%). Approximately one in five participants (20.30%) reported making a new addition to their sex life since the pandemic began. Participants who made new additions were significantly more likely than those who did not to report that their sex life had improved since the pandemic began ( $\chi^2(2, N = 1539) = 81.97; p < 0.001$ ).
- Li et al, 2020 (1) At the height of the COVID-19 epidemic, we found that both sexual activities and sexual satisfaction of young men and women decreased (22% (n=212) reported a decrease in sexual desire, 41% (n=396) experienced a decrease in the frequency of sex). Low sexual desire and unsatisfying partner relationships were significant factors affecting sexual activities.
- Li et al, 2020 (2) The results showed that 44% of participants reported a decrease in the number of sexual partners, with men slightly more likely than women to report a decrease in the number of sexual partners (53% vs 30%). During the COVID-19 outbreak, 32% of men and 39% of women experienced a reduction in sexual satisfaction. The difference between men and women was statistically significant ( $F = 14.49; df = 2; p = 0.001$ ).

- Luetke et al, 2020 About one third of respondents in relationships (34%) reported some degree of conflict with their romantic partners due to the spread of COVID-19 and its related restrictions. We found that those experiencing frequent coronavirus-related conflict with their partner had greater odds of decreased frequency of several intimate and sexual behaviors compared to those not experiencing any such conflict. General public
- Michielson et al, 2020 Assessing the impact of shelter-in-place order on condomless sex, intimate partner violence, and access to essential reproductive health services. General public
- Sahoo et al, 2020 63% of the participants mentioned that kissing could spread the nCoV-SARS. Nearly one-fifth (22%) thought that unprotected sexual intercourse with unknown partners/persons could not spread the infection. General public
- Bais et al, 2020 Assessing the effect of social distancing and confinement on the incidence of deviant sexual fantasies among sex offenders. Sexual and gender minority

- de Sousa et al, 2020 Most of the sample (53.10% in Portugal and 53% in Brazil) had casual sex partners during sheltering. In Brazil, factors associated with increased odds of casual sex engagement were having group sex (aOR = 2.10; 95% CI: 1.30, 3.40), living in a urban area (aOR = 1.60; 95% CI: 1.10, 2.20), feeling that sheltering had high impact on daily life (aOR = 3.00, 95% CI: 1.10, 8.30), having casual instead of steady partners (aOR = 2.50; 95% CI: 1.80, 3.50), and not decreasing the number of partners (aOR = 6.50; 95% CI: 4.20, 10.00). In Portugal, odds of engaging in casual sex increased with using Facebook to find partners (aOR = 4.60; 95% CI: 3.00, 7.20), not decreasing the number of partners (aOR = 3.80; 95% CI: 2.90, 5.90), usually finding partners in physical venues (pre-COVID-19) (aOR = 5.40, 95% CI: 3.20, 8.90), feeling that the isolation had high impact on daily life (aOR = 3.00; 95% CI: 1.30, 6.70), and HIV-positive serostatus (aOR = 11.70; 95% CI = 4.70, 29.20).
- Gillespie et al, 2020 There was a statistically significant decrease in the proportion of participants reporting condomless sexual intercourse after the introduction of social distancing relative to the period prior (42.40% vs 19.50% [OR = 0.16, 95% CI: 0.07, 0.37;  $p < 0.001$ ]).



- Hammoud et al, 2020 The mean number of sexual partners among all participants decreased more than 12-fold from the before COVID-19 reporting period to the since COVID-19 reporting period. Adjusting for number of days in the reporting periods, men reported a mean of 0.09 partners per day in the period prior to COVID-19 and a mean of 0.03 partners per day since COVID-19, representing a reduction of 65.2% in average number of partners per day ( $p < 0.001$ ).
- McKay et al, 2020 In the first month of the COVID-19 pandemic in the US, more than half (59%) of the sample reported not having sex. For about half (47%) of these men, no sex was less sex than they were having before the pandemic.
- Linnemayr et al, 2020 (1) There was a decline in the porportion of people reporting condomless sex (36% to 19%;  $p = 0.006$ ). Among instances of condomless sex, the perceived risk of contracting HIV also decreased significantly, from 18% saying there was some risk of infection ('almost no risk' was classified as knowing that the partner either is HIV-negative or virally suppressed) prepandemic to 2% during the pandemic ( $p = 0.01$ ).

- Sharma et al, 2020 Study found greater symptoms of pornography usage, on average, in LGBTQIA adults ( $\beta = 2.72$ ; 95% CI: 0.09, 5.36) versus heterosexuals. Additionally, adjusted models showed that LGBTQIA adults ( $\beta = 1.39$ ; 95% CI: 0.94, 1.86) and participants in same-sex relationships ( $\beta = 2.07$ ; 95% CI: 0.50, 3.63) reported a higher frequency of masturbation during the lockdown compared to their heterosexual peers. Sexual and gender minority
- Suen et al, 2020 Female participants were more likely to reduce social contact with friends ( $t = -3.65$ ;  $p < 0.001$ ) during the COVID-19 pandemic than their male counterparts. Gay men and lesbians showed significantly lower levels of depressive symptoms than those who identified as bisexual, pansexual, and other sexual orientations [ $F(2, 854) = 6.73$ ;  $p = 0.001$ ]. Sexual and gender minority
- Shilo et al, 2020 1,012 (39.50%) MSM had met a new casual sex partner during that period. Most of these ( $N = 850$ , 84%) had had up to 3 sexual partners, while 21 (2.10%) met more than 10 sexual partners, and 24 (2.40%) reported taking part in in-house orgies. Men who engaged in casual sex despite the social-distancing regulations were more commonly younger, singles, and less educated compared with participants who abstained from casual sex. Sexual and gender minority

Starks et al, 2020	While the number of casual partners per month was stable, the proportion reporting condomless anal sex with casual partners declined significantly during COVID (26.40% versus 71.60% pre-COVID, $p < 0.001$ ). The odds of condomless anal sex (aOR = 2.00 pre-COVID versus 5.22; $p = 0.04$ ) were significantly greater in the COVID cohort.	Sexual and gender minority
Stephenson et al, 2020 (1)	Participants reported a mean increase of 2.3 sex partners during COVID-19. Approximately one-third reported that COVID-19 had prevented them testing for HIV (32.2%) or STIs (29.3%). Men who self-reported living with HIV were significantly less likely to report increases in the number of sex partners.	Sexual and gender minority
Fuchs et al, 2020	Overall FSFI score before the pandemic was $30.10 \pm 4.40$ and changed to $25.80 \pm 9.70$ during the pandemic. The proportion of women with sexual dysfunction increased from 15.30% before lockdown to 34.30% during lockdown ( $p < 0.001$ ).	Women
Schiavi et al, 2020	Overall, the mean FSFI scores decreased significantly after social distancing period ( $29.20 \pm 4.20$ vs $19.20 \pm 3.30$ ; mean difference: $9.70 \pm 2.60$ ).	Women
Talmac et al, 2020	Assessing the impact of COVID-19 on post-partum sexual life.	Women
Yuksel et al, 2020	Contraception use decreased during the pandemic (24 vs 10, $p = 0.004$ ). Participants had significantly better FSFI scores before the pandemic compared with scores during the pandemic ( $20.52$ vs $17.56$ ; $p = 0.001$ ).	Women

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**STI care**

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|-------------------------|--|----------------|
| Buckley et al,<br>2020  | Following the pandemic, the number of STI cases reported decreased. In 2019 there were 1056 gonococcal infections, 1212 diagnosis of Chlamydia trachomatis (excluding Lymphogranuloma venereum) and 425 of syphilis, compared to 196, 292 and 114 respectively in 2020.  | General public |
| Cusini et al,<br>2020   | The number of cases fell, but the fall was in the non-acute. The number of acute bacterial infections associated with MSM increased. acute infections seemed not to be affected by the pandemic and the lockdown measures; in fact we observed a light increase in secondary syphilis and gonorrhoea and no changes in primary syphilis. | General public |
| Mambo et al,<br>2020    | 26.50 % of respondents reported lack of access to STI testing and treatment during lockdown.   | General public |
| Nagendra et al,<br>2020 | Fourteen (19%) of the respondents stated that their clinics had been closed due to the COVID-19 outbreak, and 40 (56%) were functioning on an appointment only basis.  | General public |

Sacchelli et al, 2020	The percentage of visits for prophylaxis declined after the lockdown, while visits for syphilis, gonococcal pharyngitis and inflammatory genital diseases increased significantly. The percentage of patients requiring more than one provision increased from 2.1 to 6.5%, after the lockdown. Patients characteristics and medical provisions before.	General public
Simmons et al, 2020	Impact of COVID-19 on service changes and access to sexual and reproductive health services.	General public
Latini et al, 2020	From the start of lockdown, we observed a reduction in STI diagnoses, particularly of early syphilis. In the whole of March 2020, we diagnosed 15 cases of early syphilis, and all occurred in the first week, prior to the lockdown announcement. compared with the first quarter of 2019, in the first quarter of 2020, the number of syphilis diagnoses doubled among PLHIV and increased fourfold among MSM.	Sexual and gender minority

aOR: adjusted odds ratio; ART: Antiretroviral therapy; BDI: Beck Depression Inventory; CESD: Center for Epidemiologic Studies Depression Scale; FSFI: Female Sexual Function Index; GAD-7: Generalised Anxiety Disorder-7; GC/CT: Gonorrhoea/Chlamydia; OR: Odds ratio; PEP: Post-exposure Prophylaxis; PEPSE: Post-Exposure Prophylaxis following Sexual Exposure; PrEP: Pre-exposure Prophylaxis; TGNB: Transgender and Gender Non-binary

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