How COVID-19 impacted risky sexual behaviours of female sex workers in Senegal and its wider implications: Evidence from a cohort study

Wen Qiang Toh[1], Carole Treibich[2], Sandie Szawlowski[3], Henry Cust[4], El Hadj Alioune Mbaye[5], Khady Gueye[5], Cheikh Tidiane Ndour[5], Aurélia Lépine[3]

Affiliations:

1. Erasmus University Rotterdam, Erasmus School of Economics

2. Univ. Grenoble Alpes, CNRS, INRAE, Grenoble INP, GAEL, 38000 Grenoble, France

3. University College London, Institute for Global Health

4. London School of Hygiene & Tropical Medicine, Global Health and Development Department

5. Ministry of Health and Social Action of Senegal, HIV/STI Division

Full addresses:

1. Burgemeester Oudlaan 50, 3062 PA, Zuid-Holland, The Netherlands

2. 1241 rue des Résidences, 38400 Saint Martin d'Hères, France

3. 3rd floor, Institute of Child Health, 30 Guilford Street, London WC1N 1EH, United Kingdom

4. Keppel St, Bloomsbury, London WC1E 7HT, United Kingdom

5. Rue 1 x Blaise Diagne (ex-Polyclinique) Médina- Dakar

Preferred degree:

Wen Qiang Toh: MPhil

Carole Treibich: PhD

Sandie Szawlowski: MSc

Henry Cust: MSc

El Hadj Alioune Mbaye

Khady Gueye

Cheikh Tidiane Ndour, PhD

Aurélia Lépine: PhD

Corresponding author:

Wen Qiang Toh

Burgemeester Oudlaan 50, 3062 PA, Zuid-Holland, The Netherlands

toh@ese.eur.nl

+31-0104088936

Abstract

Background

The COVID-19 pandemic has the potential to be the most severe and long-lasting economic shock experienced by female sex workers (FSWs) globally due to the high and close contact nature of the profession. Given that there is a positive income premium attached to unprotected sex, FSWs may resort to adopting risky sexual behaviours as a means to cope with the decreased earnings resulting from COVID-19.

Methods

We used data from a cohort study of around 600 Senegalese FSWs in Dakar, Senegal. During the COVID-19 pandemic in June-July 2020, we elicited respondents' perceptions of how COVID-19 has affected them. We also compared FSWs' income and sexual behaviours in 2020 with that of previous survey waves in 2015 and 2017. For continuous variables, the mean, median, interquartile range (IQR), 10th and 90th percentiles were reported. A t-test was also carried out to test the differences between the means in 2017 and 2020. For categorical variables, bar charts were shown. Condom use was elicited via the list experiment method to overcome social desirability bias. Heterogeneity analyses were carried out to identify the channels through which COVID-19 affected condom use.

Findings

COVID-19 led to a 70·0% reduction in the number of clients seen in a week from 2017 levels. The steep fall in the number of clients led to a reduction in sex work earnings by 50·3%. Estimated condom use prevalence with the last client was similar in 2015 and 2017, but decreased by 13·1%-pts during the COVID-19 pandemic (p=0·014), corresponding to a drop of 16·8% compared to 2017. Condom use decline was concentrated amongst asset-poor FSWs (22·7%-pts drop (p=0·004); 27·0% reduction in condom use from 2017 levels). However, self-reported STI symptoms did not increase. Furthermore, a substantial proportion of FSWs reported that they have reduced visits to health facilities because of COVID-19, but there was no evidence that this was associated with decreased condom use. Mental health of FSWs has deteriorated, while experience of violence from clients or the police has remained largely unchanged.

Interpretation

Condom use has likely to have fallen to alleviate the economic shock brought about by COVID-19. While the plunge in the number of clients may have offset the transmission of HIV and

other STIs for now, it remains to be seen whether condom use would resume once business improves, especially if the crisis were to be prolonged. Given the potential public health issue this may create, policies targeting FSWs to dampen the adverse economic impact of the COVID-19 crisis should urgently be considered as a strategy to prevent the transmission of HIV and other STIs.

Funding

MRC Public Health Intervention Development Scheme (MR/T00262X/1)

Research in context

Evidence before this study

While it is widely known that COVID-19 and measures to control its transmission have severely affected those working in high contact professions, the impact on female sex workers (FSWs), particularly in resource-constrained countries, has not been quantified yet. A systemic review by Cust and colleagues using public health and economics sources, such as 3ie review and impact evaluation databases, Medline, EMBASE, EconLit, Web of Science, IDEAS/RePEc, has found that economic shocks- such as drought, political crisis and illness of a family member- increased risky sexual behaviours. Evidence on whether the COVID-19 crisis has the potential to increase the transmission of HIV and other STIs is crucial, but is currently lacking.

Added value of this study

To our knowledge, this is the first study to shed light on the effects of COVID-19 on FSWs in Africa. We exploit an existing cohort study carried out in Dakar, Senegal in 2015, 2017 and during the COVID-19 crisis in June-July 2020. Our findings indicate that FSWs have suffered a huge decline in sex work earnings and suggest that FSWs partly deal with the economic shock brought about by COVID-19 by reducing their condom use, as unprotected sex typically yields a price premium over protected sex.

Implications of all the available evidence

Using unprotected sex as a way to cope with the adverse effects of COVID-19 on FSWs' earnings could have dramatic impact on the HIV epidemic in Senegal, especially as HIV incidence is concentrated amongst sex workers, and transactional sex is known to be a major contributor to HIV transmission in Western Africa. Urgent action is needed in order to limit the negative impact of COVID-19 and the ensuing prevention measures on the spread of STIs and HIV/AIDS among FSWs and in the general population. Additional evidence is required to assess the effectiveness and value for money of economic interventions (e.g. food vouchers, cash assistance, microfinance) to negate the effect of COVID-19 on risky sexual behaviours of FSWs.

Introduction

The COVID-19 pandemic has pushed governments and communities globally to their limits. Key public health measures recommended by WHO to slow the transmission of COVID-19, such as household self-isolation and social distancing, have been adopted internationally.

Whilst recorded cases of and deaths due to COVID-19 infection across Asia, Europe and the USA have soared, they have been surprisingly low in Africa. According to WHO, Africa only accounts for a small proportion of global COVID-19 deaths (2·6%) as of 31 August 2020.[1] The low rate of recorded infections may be due to the quick response of African governments to the pandemic. Harsh countermeasures to curtail the spread of COVID-19 were implemented relatively quicker than in high-income countries. Despite the obvious benefits of a low infection rate, there are likely to be extensive long-term unintended consequences from these harsh measures. With widespread poverty and non-existent safety nets, the burden of these restrictions is likely to disproportionately fall on the most vulnerable groups.

Senegal was one of the first African countries to detect a COVID-19 case on 2 March 2020.[1] The Senegalese government responded rapidly by introducing a night curfew, enforcing self-isolation measures, banning public gatherings, closing borders and prohibiting inter-regional travel. On 23 March 2020- within three weeks of the first known case- a national state of health emergency was announced and night curfew from 8pm to 6am was implemented. An emergency plan of CFAF 1000 billion (1·6 billion USD, 7 percent of GDP), within which CFAF 69 billion was allocated for urgent food aid, was put into action.[2]

Vulnerable groups already suffering from poverty will be amongst those hardest hit, especially female sex workers (FSWs) who are often marginalised by society and neglected in government provision. The high and close contact nature of sex work, the night curfew and closure of entertainment venues where FSWs solicit business suggest that FSWs are likely to be severely impacted by loss of work and income.

Under these circumstances, existing evidence suggests that there are strong economic incentives for FSWs globally to engage in unprotected sex since they are able to charge a higher price for unprotected sex acts.[3,4,5,6,7,8,9,10,11] A systemic review by Cust and colleagues found that economic shocks increased risky sex behaviours,[12] potentially constituting one of the key drivers of HIV/AIDS. In times of political crisis or when faced with an illness of a family member, FSWs in Kenya increased unprotected sex by 19 percent.[6] HIV prevalence in drought-stricken African villages increased by 11 percent.[13] Responding to the hardship caused by the COVID-19 pandemic in this manner may cause increased downstream transmission of HIV and other sexually transmitted infections (STIs).

Methods

Study design

Sex work in Senegal is legal and regulated. FSWs must register with the authorities and attend monthly health visits to practise legally.[14] During these visits FSWs are tested for STIs and received free condoms. To analyse the impact of COVID-19 on FSWs, we exploit a longitudinal data set of FSWs in Dakar, Senegal. The first wave of data was collected in 2015. An additional two waves of data collection (2017 and 2020) have since been conducted.

The first wave in 2015 recruited 654 FSWs 18 years old and over and living in Dakar (appendix pp 1). This represented 15% of the estimated total number of FSWs in Dakar at the time.[15] The sample included both registered and unregistered FSWs in equal proportions. Registered FSWs were recruited at STI health centres, whilst unregistered FSWs were recruited by leaders of FSW groups.

In 2017 and 2020, we sought to survey the same respondents as in 2015. Attrition rate was around 30% for each wave (appendix pp 2). In each wave the sample was replenished with new respondents to maintain a cohort of roughly 600 FSWs.

For the 2015 and 2017 waves, surveys were conducted in private rooms in four out of the five STI health centres in Dakar (Pikine, Rufisque, Mbao, and Sebikotane). However, to minimise the risk of COVID-19 infection to staff and participants, the survey in 2020 took place at external venues near the health centres and preventive measures were taken (appendix pp 3). On average, each survey lasted 1·5 hours. Survey participants were reimbursed for their transport costs and the time spent at the health facility.

The third wave of data collection was carried out from 29 June to 28 July 2020. A night curfew implemented on 23 March 2020 was progressively relaxed prior to the beginning of the survey period. On 30 June 2020 - on the second day of the survey - the curfew was completely lifted. (appendix pp 4). Nonetheless, bars and nightclubs remained closed for the entire duration of the survey. [16]

Statistical analyses

The analyses were constrained to respondents who were active FSWs in each survey year.

In 2020, respondents were asked to self-report how COVID-19 has affected their sex work activities, health-seeking behaviours, mental health, and violence from police and clients. We juxtaposed these perceived self-reports with the comparison of these outcomes with that reported in previous years, whenever available. Categorical outcomes were reported in bar

charts. For continuous outcomes, the mean, median, interquartile range, 10th and 90th percentile were shown. In addition, we performed a t-test to test the differences between the means in outcomes between 2017 and 2020. Standard errors were clustered at the respondent level. Regardless of COVID-19, time trends may be present in the outcome variables. Hence, this method of analysis may be unsuitable for outcomes that vary greatly between 2015 and 2017. Therefore, we provided diagrams describing the level of the outcomes of all three survey waves, whenever available. For the sake of brevity, we focused on describing the changes between 2017 and 2020 in the main text.

Unprotected sex is greatly admonished in Senegal. Consequently, the use of direct self-reports in condom use in a face-to-face interview leads to a severe over-estimation of condom use prevalence because of social desirability bias.[17] A list experiment was implemented in all survey waves to elicit more honest responses about condom use (appendix pp 5). In 2017 and 2020, a double list experiment method was used to reduce the large standard errors in the estimation of prevalence rates via the single list experiment method. [18]

Subgroups analyses were conducted (details on the construction of the subgroups and the number of observations in each subgroup are provided in appendix pp 6-7) to provide additional evidence on the channels through which COVID-19 affected risky sexual behaviours. If it worked through the economic shock channel, it gives further credence to policies that may alleviate economic hardship among FSWs to prevent HIV and other STIs. Those who were poorer (as measured by asset ownership) or already had debt might have a lower ability to safeguard themselves against any economic shocks. Therefore, we expected condom use to fall more among the above-mentioned subgroups.

We also investigated whether changes in condom use could have been explained through a reduced access to free condoms. Registered FSWs attend monthly health centre visits as part of their registration obligations and receive free condoms during these visits. All STI centres were, however, also treating COVID-19 patients, which could have discouraged FSWs from going for their monthly visits. To investigate how important this channel is relative to the economic shock channel among registered FSWs, we tabulate the change in condom use by asset ownership and by whether registered FSWs reported a decrease in their monthly health centre visits due to COVID-19.

Role of the funding source

Nil

Results

Descriptive statistics of the working FSWs are provided in appendix pp 8-9. FSWs in the sample were generally middle-aged. The sample consisted of equal proportions of registered and non-registered FSWs. Sex work earnings constituted a substantial proportion of total household expenses and around half of working FSWs were indebted.

Drastic drop in earnings from sex work

65·4% of the respondents reported that their income from sex work has strongly decreased because of COVID-19 (Figure 1). Comparing across the three survey waves, sex work earnings have plunged across the board in 2020 (Figure 1). Median sex work earnings in a month was 100,000 CFAF (IQR 50,000-150,000) in 2017, but was only 40,000 CFAF (IQR 0-90,000) in 2020. The respective means have approximately halved from 127,550 CFAF to 63,448 CFAF (50·3% drop), and this change of 64,102 CFAF (95% CI: 52,230-75,974) was statistically significant at the 1% significance level (p<0·0001).

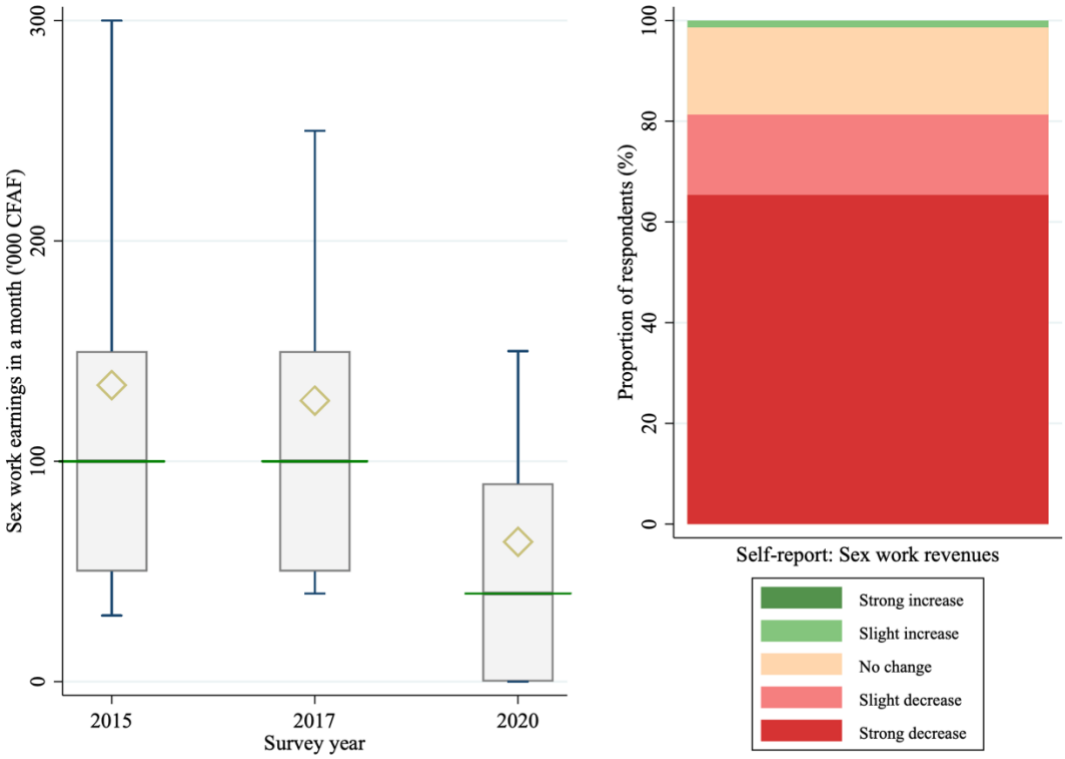


***Figure 1*: Sex work earnings of FSWs in Dakar, Senegal**

(LHS) The green line represents the median. The box represents the interquartile range. The top and bottom whiskers represent the 10th and 90th percentiles respectively. The diamond represents the mean. Data for 2015 and 2017 reflects average monthly earnings of the FSWs, data for 2020 reflects sex work

earnings in the last 30 days before the interview. (RHS) FSWs were asked to self-report the effect of COVID-19 on sex work revenues.

Mirroring the severe fall in sex work earnings, mean total household expenses of respondents in the last 30 days shrunk by 41·6% (97,535 CFAF; 95% CI 72,385-122,685) (p<0·0001) from 331,874 CFAF in 2017 to 234,339 CFAF (Figure 2). These averages were likely to be driven by observations nearer the extremities, as 2020 figures from more middling percentiles (10th: 90,000; 90th: 406,000 median: 199,350 IQR:127,500-295,250) presented a decline of between 24·8-29·9% relative to 2017 levels (10th: 125,000; 90th: 579,000 median: 268,000 IQR:175,000-392,740). Nonetheless, the proportion of indebted respondents across the three waves was relatively stable (appendix pp 10).

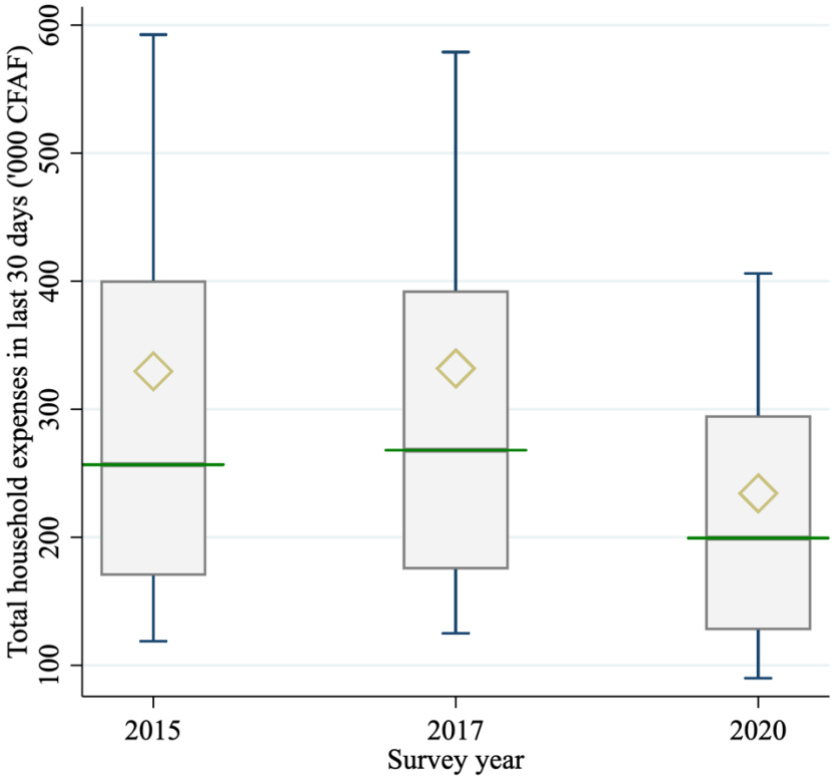


***Figure 2*: Total household expenses in last 30 days of FSWs in Dakar, Senegal**

(LHS) The green line represents the median. The box represents the interquartile range. The top and bottom whiskers represent the 10th and 90th percentiles respectively. The diamond represents the mean.

The collapse in sex work earnings was attributable to the steep reduction in the number of clients, with 68·9% of respondents reflecting that COVID-19 has strongly reduced the number of clients (Figure 3). The median number of clients in a week in 2017 was 6 (IQR 3-10), while

during the COVID-19 crisis, this figure was 1 (IQR 0-4) (Figure 3). The mean number of clients in the last seven days before the 2020 interview plummeted by 5·8 clients (p<0·0001) from a level of 8·4 clients in a typical week in 2017, representing a drop of 70·0%. The number of days between a FSW's last client and their participation in the survey also markedly increased in 2020, further indicating that the frequency of which FSWs worked at fell during this time (appendix pp 10). FSWs reported an increased reliance on regular clients due to COVID-19 (appendix pp 11) and sex work has moved indoors (appendix pp 11). While the night curfew was lifted near the start of the survey period in 2020, closed-doors entertainment venues remained closed throughout the survey period. The removal of the night curfew did not seem to have any noticeable effect on client numbers over the weeks (appendix pp 12).

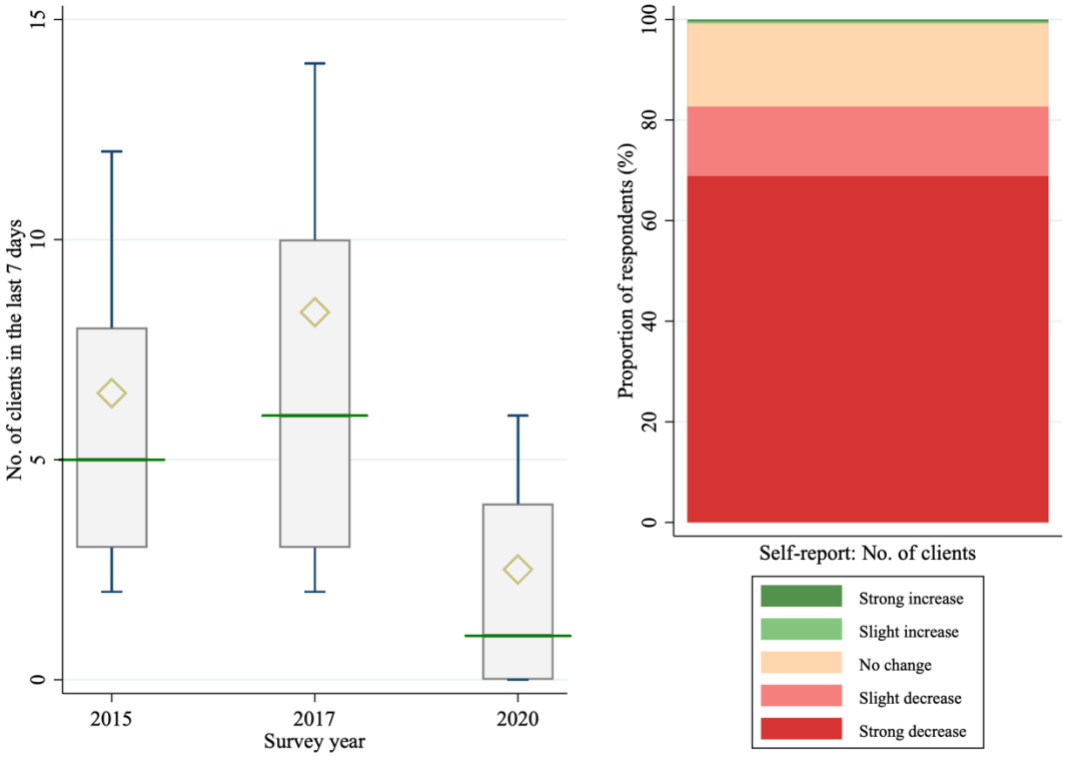


***Figure 3*: Number of clients of FSWs in Dakar, Senegal**

(LHS) The green line represents the median. The box represents the interquartile range. The top and bottom whiskers represent the 10th and 90th percentiles respectively. The diamond represents the mean. Data for 2015 and 2017 reflects usual number of clients FSWs have in a typical week, data for 2020 reflects sex work earnings in the last 7 days before the interview. (RHS) FSWs were asked to self-report the effect of COVID-19.

Compared to client numbers, the changes in sex act price were less drastic. 29·8% of respondents expressed that COVID-19 caused a strong decrease in prices (Figure 4). Median

average price charged for the last two clients stayed the same at 10,000 CFAF in both 2017 (IQR 6,000-17,500) and 2020 (IQR 5,500-17,500) (Figure 4). However, a 16·8% drop in mean (2,788 CFAF; 95% CI: -140-5,717), which was statistically significant at 10% (p=0·062), suggested that prices at the extremes could have fallen considerably and hence, implying that there might have still been downward pressure on prices in the market.

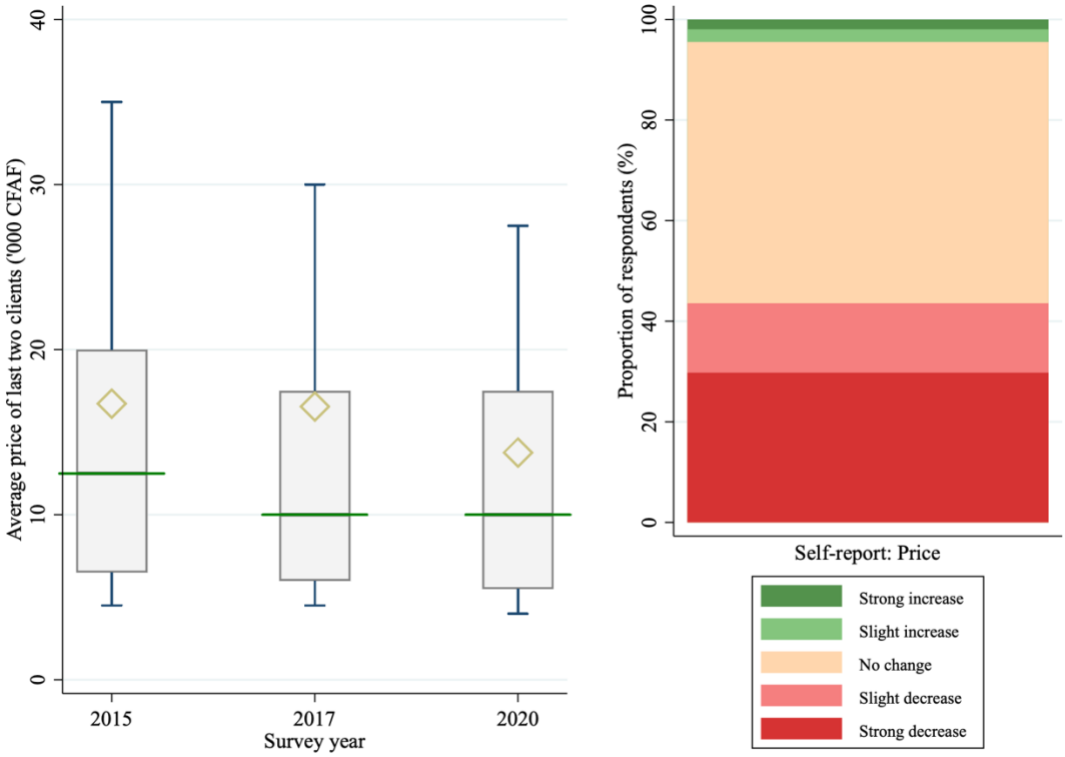


***Figure 4*: Average price of last two clients of FSWs in Dakar, Senegal**

(LHS) The green line represents the median. The box represents the interquartile range. The top and bottom whiskers represent the 10th and 90th percentiles respectively. The diamond represents the mean. (RHS) FSWs were asked to self-report the effect of COVID-19 on the price charged.

Evidence of lower condom use

In Senegal, condom use is often grossly misreported due to social desirability bias and stigma associated with unprotected sex.[16] Therefore, list experiment estimates provide a more accurate picture of condom use.

The list experiment method was implemented in all three survey waves. Only one list was used in 2015, while an additional list was added in the later two waves.

Analysing just one list (single list experiment design) versus jointly analysing both lists (double list experiment design) should produce similar mean condom use prevalence estimates. However, the latter would be more suitable for inference as it significantly reduces the large standard errors associated with the list experiment method. The former will enable us to check whether condom use estimates remained stable between 2015 and 2017. If there were to be huge fluctuations in condom use across survey years, using comparing condom use across waves to detect the effect of COVID-19 may not be a suitable approach.

Analysing just one list versus analysing both lists jointly produced very similar condom use prevalence estimates in 2017 and 2020 (Figure 5).

Mean estimates from the single list experiment showed that estimates of condom use prevalence with the last client were very similar in 2015 (79·6%) and 2017 (78·0%), but decreased by 10·1%-pts in 2020 (67·9%) (Figure 5). However, due to the large standard errors from the single list method, this change was not statistically significant.

Mean prevalence from the double list experiment showed a statistically significant decrease in condom use of about 13·1%-pts (p-value=0·014) from 78·2% (95% CI 70·9%-85·5%) in 2017 to 65·1% (95% CI: 57·6%-72·7%) in 2020 (Figure 5), which represents a drop of 16·8% in condom use from 2017 levels.

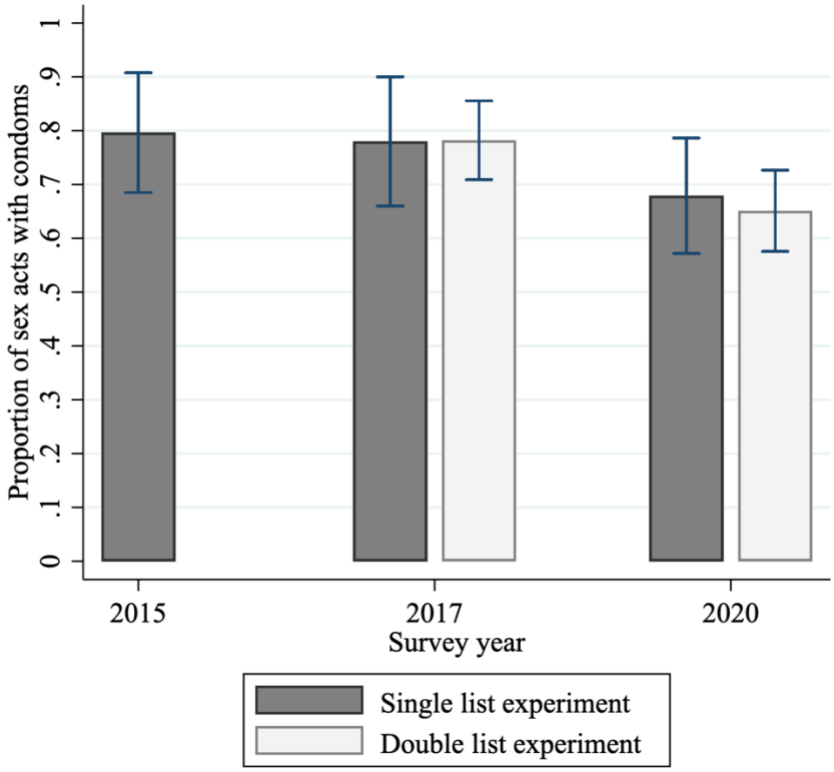


***Figure 5*: Condom use with last client estimates of FSWs in Dakar, Senegal**

The bars represent the mean estimate of the prevalence of condom use. The whiskers represent the 95% CI of this estimate.

Despite the fall in condom use, there has been no accompanying increase in the proportion of respondents reporting STI symptoms during the sex act with at least one of their last two clients (appendix pp 12). Moreover, FSWs reported a shift from casual to regular clients (appendix pp 11), who are typically considered as less risky.[19]

Mental health and safety

The mental health of FSWs has deteriorated. 12·8% of FSWs reported a sharp deterioration on their overall mental health due to COVID-19, with another 16·5% reporting a slight deterioration (Figure 6). PHQ-9 items were elicited in 2017 and 2020. Using a cut-off of 10 and above for PHQ-9 score to proxy for depression, the proportion of respondents with depression rose significantly by 7·4%-pts, from 21·1% in 2017 to 28·4% in 2020 (Figure 6).

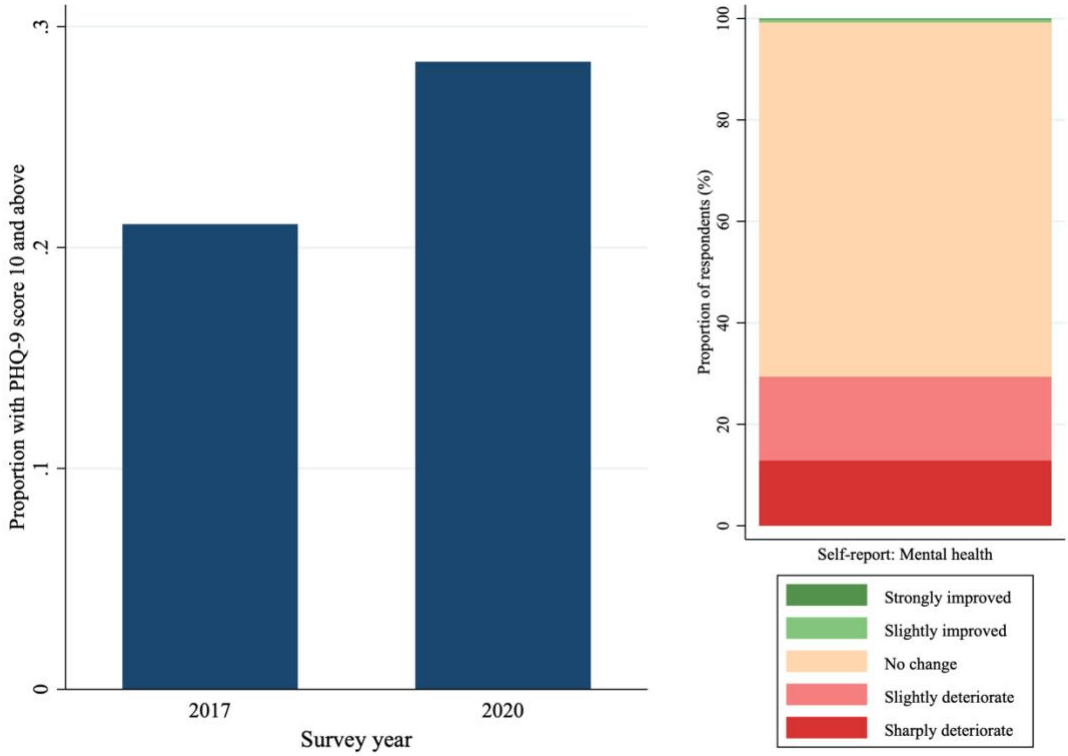


***Figure 6*: Mental health of FSWs**

(LHS) PHQ-9 items were elicited only in 2017 and 2020. (RHS) FSWs were asked to self-report the effect of COVID-19 on their mental health.

An overwhelming majority of respondents reported no change in client (91·8%) and police violence (83·2%) (Figure 7). On net, more respondents perceived that COVID-19 had reduced client violence (6·8% versus 1·4%). For police violence, 7·2% of respondents noted an increase, while a similar proportion reported a decrease (9·5%) as a consequence of COVID-19.

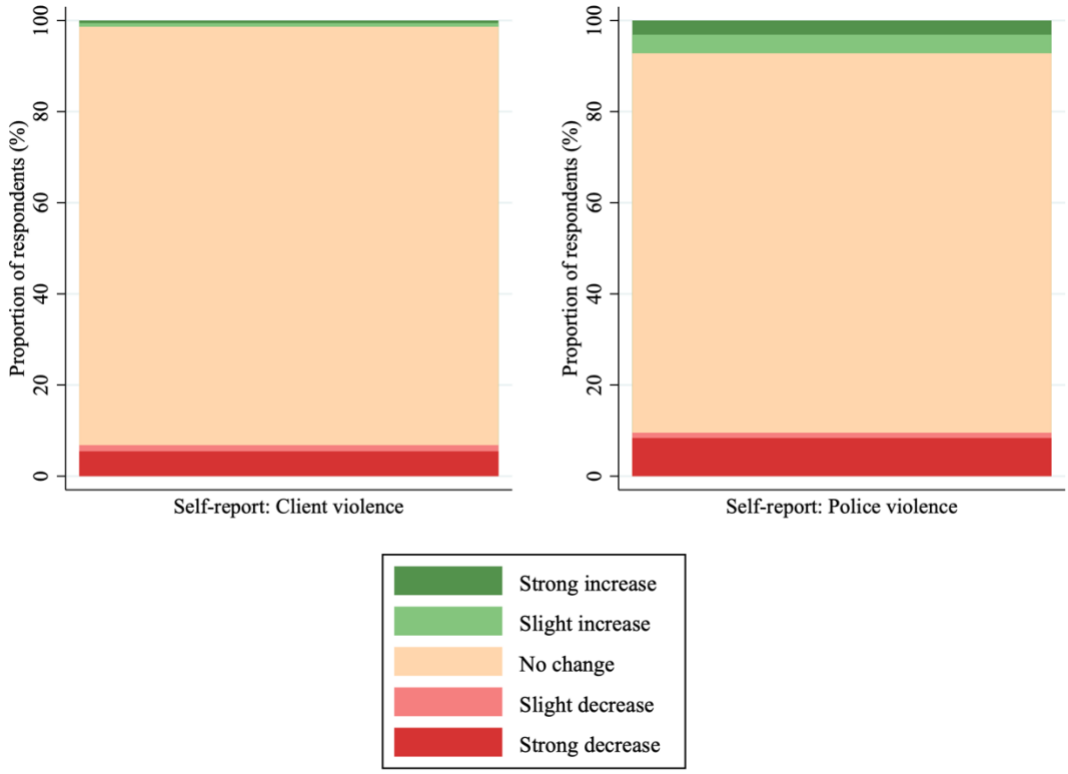


***Figure 7*: Self-reported changes in violence due to COVID-19**

Subgroup heterogeneity: investigation of the channels through which COVID-19 affected condom use

The decrease in condom use was concentrated amongst asset-poor FSWs (22·7%-pts drop; p=0·0037) and FSWs who were indebted in 2017 (13·1%-pts drop; p=0·20), corresponding to a 27·0% and 16·3% decline in condom use from 2017 estimates (Table 1). Asset-rich FSWs and FSWs who were not indebted in 2017 saw much lower changes in their condom use. Even with the large standard errors involved in the estimation of prevalence via the list experiment, the difference in the drop in condom use between asset-poor and asset-rich FSWs (18·5%-pts) was statistically significant at the 10% level (p=0·094). However, while the difference in condom use decline between FSWs who were indebted versus those who had no debt in 2017 was numerically large (14·3%-pts), it was not statistically significant (p=0·29).

Categorising by contemporaneous debt status uncovered new insights. Respondents who had no debt in 2020 had a condom use prevalence estimate that was 19·9%-pts (p=0·0085) lower than those who had no debt in 2017, representing an increase of 26·3% in unprotected sex among those who are debt-free. While respondents who were indebted in 2020 also saw a

decline in condom use prevalence compared to those who were indebted in 2017, this was much smaller in magnitude, and also statistically insignificant (7·8%-pts; p=0·29).

	Mean prevalence estimate from double list experiment (%)		Fall in condom use (%-pts)		Fall in condom use wrt 2017 (%)
	2017	2020			
Asset status (2015/2020)					
Status by wave*					
Asset poor	84·3	61·6	22·7	(p=0·0037)	27·0
Asset rich	73·7	69·5	4·3	(p=0·58)	5·8
Difference			18·5	(p=0·094)	
Debt status					
Initial status (2017)**					
Indebted	80·5	67·4	13·1	(p=0·20)	16·3
Not indebted	73·2	74·4	-1·2	(p=0·89)	-1·7
Difference			14·3	(p=0·29)	
Status by wave***					
Indebted	80·9	73·1	7·8	(p=0·29)	9·7
Not indebted	75·4	55·6	19·9	(p=0·0085)	26·3
Difference			-12·0	(p=0·25)	
Registration status					
Registered	83·8	66·6	17·2	(p=0·027)	20·5
Unregistered	72·5	64·1	8·4	(p=0·25)	11·6
Difference			8·8	(p=0·41)	

***Table 1*: Condom use with last client estimate from double list experiment by FSW economic status and registration status**

Notes:

** Assets were elicited only in 2015 and 2020. Therefore, asset status in 2017 was filled in with a respondent's asset status in 2015 or 2020, with the latter taking precedence if both were available. As such, we were unable to do a similar analysis on initial asset status as we could for debt.*

*** Respondents were grouped according to their initial debt status in 2017. Their condom use in 2017 and 2020 were then compared. Therefore, this analysis was done only on respondents who participated in both survey waves.*

**** Respondents were categorised according to whether they had debt in each survey wave.*

There were considerable differences in the fall in condom use by registration status. Registered FSWs saw a statistically significant 17·2%-pts drop in condom use (p=0·027), while that of unregistered FSWs was statistically insignificant at 8·4%-pts (p=0·25). This corresponded with a percentage drop was almost doubled among registered FSWs (20·5%) than non-registered

FSWs (11·6%) (Table 2). Such a result may be consistent with the fact that registered FSWs have lower access to condoms. Registered FSWs have to attend monthly health visits, and they can obtain free condoms during these visits. Due to COVID-19, 27·0% of registered FSWs reported that they have strongly decreased attendance to these monthly visits, with a further 9·1% reporting a slight decrease in these visits (Figure 8).

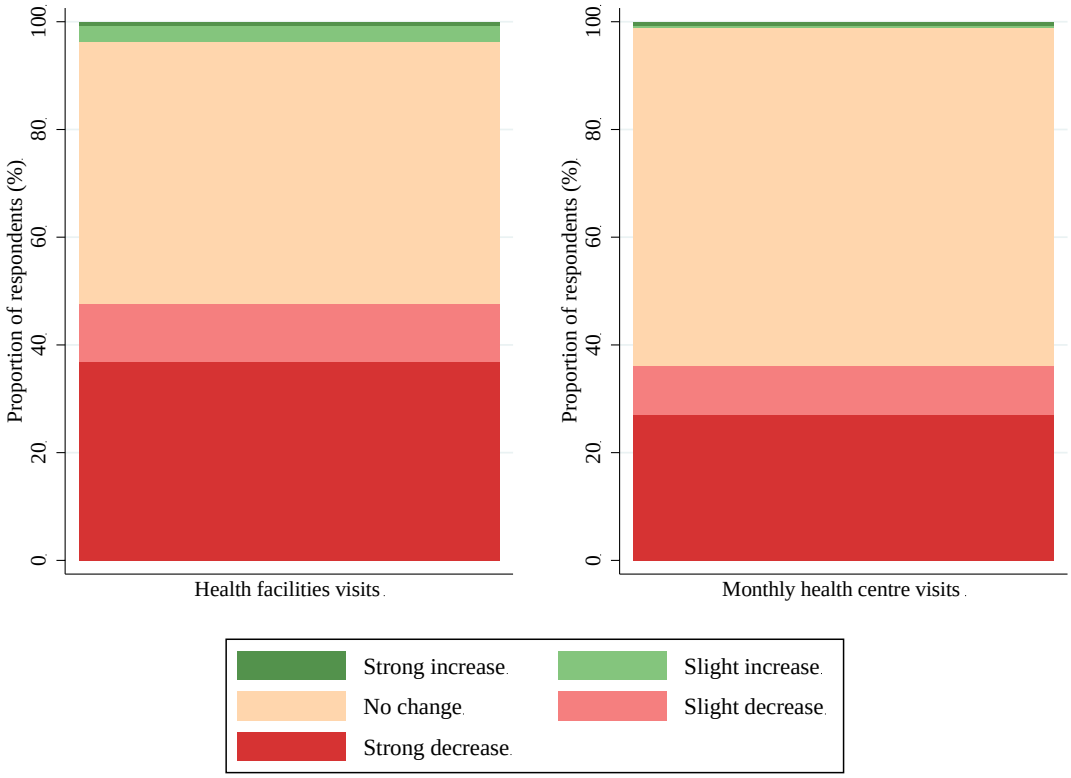


***Figure 8*: Self-reported changes in access to health facilities due to COVID-19**

Note:

** The question on health facilities visits was posed to all FSWs, but the question on monthly health centre visits was posed to only registered FSWs as registered FSWs are required to attend these visits as part of their registration obligations*

To investigate this possibility further, we looked at how condom use prevalence differed among registered FSWs across asset ownership and whether they reported reducing monthly clinic visits due to COVID-19 in 2020 (Table 2). Contrary to expectations, condom use decline was concentrated among registered FSWs who did not reduce monthly clinic visits, while there was almost no change in condom use among those who mentioned that they have decreased their monthly clinic visits due to COVID-19 (Table 2). Therefore, it is improbable that condom use decline was driven by reduced monthly clinic visits among registered FSWs. In contrast, condom use declines were concentrated among the asset poor, regardless of

registration status (Table 2), reinforcing the assumption that the reduction in condom use operated through the economic channel.

	Mean prevalence estimate from double list experiment (%)		Fall in condom use (%-pt)		Fall in condom use wrt 2017 (%)
	2017	2020			
Subsample: Registered					
Did not reduce monthly clinic visits*	90·1	72·2	17·9	(p= 0·19)	19·9
Reduced monthly clinic visits	90·8	90·6	0·3	(p=0·98)	0·3
Difference			17·7	(p=0·36)	
Subsample: Registered					
Asset poor	97·7	62·2	35·5	(p=0·0026)	36·4
Asset rich	77·0	70·3	6·7	(p=0·53)	8·7
Difference			28·9	(p=0·069)	
Subsample: Unregistered					
Asset poor	72·4	61·8	10·6	(p=0·31)	14·6
Asset rich	69·8	68·4	1·4	(p=0·90)	2·0
Difference			9·2	(p=0·55)	

***Table 2*: Condom use with last client estimate from double list experiment among registered and unregistered FSWs**

Notes:

** Only registered FSWs were asked in 2020 whether about the effect of COVID-19 on their monthly clinic visits. These monthly visits are part of the requirements for registration, and registered FSWs can obtain free condoms during these visits. This analysis only included registered FSWs who participated in both surveys in 2017 and 2020. This comprised 138 registered FSWs, around half of the 255 and 241 registered FSWs who participated in 2017 and 2020 separately.*

Discussion

FSWs faced a huge income shock during the COVID-19 crisis due to plummeting client numbers. Prices have also seen a decline, but not to the same degree as client numbers. In typical times, unprotected sex garners a premium over protected sex. While we were unable to ascertain how much this price premium has changed during the COVID-19 crisis, it is still reasonable to expect that prices would have fallen further if not for decrease in condom use.

The substantial reduction in condom use suggested that a significant proportion of FSWs have turned to unprotected sex as a coping mechanism to regain some revenue at the expense of the increased health risks this might subject them to. The heterogeneity analyses provided further evidence for this. The fall in condom use was strongly concentrated among asset-poor FSWs

and those who were indebted in 2017, although the difference in condom use decline was statistically significant at the 10% significance level only for asset ownership.

The drop in condom use could also have been due to decreased access to free condoms, in particular among registered FSWs, who are able to obtain free condoms when attending their obligatory monthly health centre visits. However, evidence did not support this as an important driver, as condom use decline was in fact concentrated among registered FSWs who reported that they have not reduced their monthly clinic visits.

Surprisingly, when considering contemporaneous debt status, it was the FSWs who were debt-free who saw a much steeper drop in condom use during the COVID-19 crisis. One explanation for this finding may be that FSWs who were unable to borrow might have been the ones who had to use unprotected sex as a last resort to counteract the reduction in sex work earnings brought about by the COVID-19 pandemic. Another possibility could be that some FSWs may prefer not to incur any debt, and instead manage the reduction in income by adopting riskier sexual behaviours. All evidence taken together, it seems likely that the COVID-19 crisis has influenced condom use via economic channels, implying that alleviating economic hardship may be an effective way to prevent unprotected sex. Nonetheless, even with this coping mechanism, sex work earnings of FSWs, and consequently, their total household expenditures, remained severely affected.

There is no evidence of an increase in the self-reported presence of STI symptoms at the time of the last two sex acts. This result may be due to the fact that there are fewer clients, acting a counterbalance to the increase in risk per client. What would be of importance is whether this reduction in condom use would persist after client numbers increase. If incurring debt was indeed a way for FSWs to deal with the economic shock, it hints at the possibility that if the economic shock were to be further prolonged, condom use would further decline as more FSWs might hit a borrowing limit. In addition, it implies that even after client numbers recover, there could still be persistence in risky sex behaviours if FSWs had to pay off the debt they incurred during the crisis. If this were to happen, this has the potential to create a grave public health issue, as HIV incidence is concentrated amongst sex workers,[20] and transactional sex is a key driver of HIV transmission. In West Africa, more than three-quarters of HIV infections among men is attributable to sexual intercourse with FSWs.[21,22,23] This underscores the importance of looking into economic and public health policies to target vulnerable FSWs who are particularly reliant on sex work earnings and are severely impacted by COVID-19.

Our study has several limitations. First, there are other factors that could have already resulted in differences in the variables across the years. There could be time trends or other policies

unrelated to COVID-19 that might have an influence on the various outcomes. Therefore, there will be more confidence in interpreting changes as attributable to the COVID-19 pandemic for outcomes that were stable between the first two survey waves but saw a sharp change in 2020. Otherwise, perceived self-reports might be a better measure to evaluate the effects of COVID-19. In addition, respondents who leave the survey or join the survey in a later wave are not similar in all aspects to repeat participants (appendix pp 13-16). While some of the characteristics of the inflow and outflow of participants seem to offset each other to some degree, such as in sex work earnings, there are other characteristics that do not. For example, without survey inflow and outflow, the average price charged for the last two clients in 2020 may be higher than currently observed and the number of clients in a week in 2020 may be lower than currently observed. Furthermore, while the surveys in 2017 and 2020 were carried out just before Tabaski - an important religious festival that typically requires huge expenditures from the respondents - the survey in 2015 was not. Second, the survey has an overrepresentation of registered FSWs due to the recruitment method (appendix pp 1), and only involved FSWs in Dakar. Therefore, the estimates may not be representative of Dakar or Senegal. Third, we were unable to fully investigate all the potential mechanisms behind the fall in condom use. We provided some evidence that the lack of buffers against the economic shock caused by COVID-19 were likely to have contributed to the fall in condom use, and decreased access to free condoms among registered FSWs was unlikely to be a key driver of condom use decline. However, there could be other reasons driving the fall in condom use. With fewer customers, clients may have greater bargaining power, and therefore, there may be more pressure from clients on FSWs to forgo protection. Furthermore, given that more FSWs have stopped using condoms, there may be less social pressure to use a condom, especially in an environment where everyone is aware of the acute economic hardship caused by the COVID-19 pandemic.

In summary, our analyses quantified the impact of COVID-19 on the economic, health and safety aspects of sex work, as well as the health-seeking behaviour and mental health of FSWs in Dakar, Senegal. We showed that FSWs have been severely impacted financially by the COVID-19 pandemic, and have seen a reduction in their use of condoms. To prevent a future increase in the transmission of HIV and other STIs, economic and public health policies targeting this vulnerable population should be considered as soon as possible.

Funding

MRC Public Health Intervention Development Scheme (MR/T00262X/1)

Declaration of interests

There are no conflicts of interest.

Contributors

WT participated in survey programming, developed the analysis plan, undertook the data analysis and wrote the manuscript. CT co-conceived the study, programmed the survey, supervised data collection and data cleaning, contributed to data analysis and manuscript writing. SS participated in survey programming, conducted the data cleaning and contributed to manuscript writing. HC participated in survey programming and assisted data cleaning and data analysis. EAM and KG supervised data collection. CTN co-conceived the study and managed fieldwork. AL conceived the study, participated in survey programming, supervised data collection and data cleaning, supervised the study analysis plan, contributed to data interpretation and contributed to manuscript writing. WT and AL have verified the underlying data.

Ethics committee approval

Ethical clearances from University College London and the National Ethics Committee in Senegal were obtained.

Data sharing

Data collected included individual participant data. De-identified data used in the paper will be made available alongside with data dictionary and do-files to allow replication of the results. Information letters provided to obtain participant consent were developed in compliance to GDPR and will also be made available. These materials will be made available with publication and will be downloadable as online supplementary files.

References

1 WHO. *Situation by Country, Territory & Area*. Available from: https://covid19.who.int/table?tableDay=yesterday [Accessed 31 August 2020].

2 Xinhua. *Senegal launches food aid program for 1 mln families affected by COVID-19*. Available from : http://www.xinhuanet.com/english/2020-04/29/c_139016363.htm [Accessed 24/09/2020]

3 Rao V, Gupta I, Lokshin M, Jana S. Sex workers and the cost of safe sex: the compensating differential for condom use among Calcutta prostitutes. Journal of Development Economics. 2003 Aug 1;71(2):585-603.

4 Gertler P, Shah M, Bertozzi SM. Risky business: the market for unprotected commercial sex. Journal of political Economy. 2005 Jun;113(3):518-50.

5 de la Torre A, Havenner A, Adams K, Ng J. Premium sex: Factors influencing the negotiated price of unprotected sex by FSWs in Mexico. Journal of Applied Economics. 2010 May 1;13(1):67-90.

6 Robinson J, Yeh E. Transactional sex as a response to risk in Western Kenya. American Economic Journal: Applied Economics. 2011 Jan;3(1):35-64.

7 Arunachalam R, Shah M. The prostitute's allure: the return to beauty in commercial sex work. The BE Journal of Economic Analysis & Policy. 2012 Dec 13;12(1).

8 Muravyev A, Talavera O. Unsafe sex in the city: Risk pricing in the London area. Scottish Journal of Political Economy. 2018 Nov;65(5):528-49.

9 Cunningham S, Kendall TD. Prostitution, education, and moonlighting: A demonstration of the importance of fixed and variable costs in sex worker labor supply. Review of Economics of the Household. 2014 Jun.

10 Egger PH, Lindenblatt A. Endogenous risk-taking and physical appearance of sex workers. The European Journal of Health Economics. 2015 Dec 1;16(9):941-9.

11 Quaife M, Lépine A, Deering K, Terris-Prestholt F, Beattie T, Isac S, Paranjape RS, Vickerman P. The cost of safe sex: estimating the price premium for unprotected sex during the Avahan HIV prevention programme in India. Health policy and planning. 2019 Dec 1;34(10):784-91.

12 Cust H, Jones H, Powell-Jackson T, Lépine A, Radice R. Economic shocks and risky sexual behaviours: a systematic review. Working paper. 2020.

13 Burke M, Gong E, Jones K. Income shocks and HIV in Africa. The Economic Journal. 2015 Jun 1;125(585):1157-89.

14 Mackintosh E. *Sex work is legal here. But only if you register with the police.* Available from: https://edition.cnn.com/2019/09/20/health/senegal-sex-work-asequals-intl/index.html [Accessed 31 August 2020].

15 APAPS. 2014. Etude pour l'estimation du nombre de travailleuses du sexe et des hommes qui ont des rapports sexuels avec des hommes dans la région de Dakar. Rapport commandité par la DLSI, le CNLS et FHI.

16 Sall M. *Message à la Nation de SEM le Président Macky SALL: Levée de l'état d'urgence instauré dans le cadre de la lutte contre la maladie à coronavirus COVID-19*. Available from: https://www.sec.gouv.sn/actualité/message-à-la-nation-de-sem-le-président-macky-sall-levée-de-l'état-d'urgence-instauré-dans [Accessed 31 August 2020].

17 Treibich C, Lépine A. Estimating misreporting in condom use and its determinants among sex workers: Evidence from the list randomisation method. Health Economics. 2019 Jan;28(1):144-60.

18 Lépine A, Treibich C, d'Exelle B. Nothing but the truth: Consistency and efficiency of the list experiment method for the measurement of sensitive health behaviours. Social Science & Medicine. 2020 Aug 29:113326.

19 Ito S, Lépine A, Treibich C. The effect of sex work regulation on health and well-being of sex workers: Evidence from Senegal. Health economics. 2018 Nov;27(11):1627-52.

20 Lépine A, Treibich C. Risk aversion and HIV/AIDS: Evidence from Senegalese female sex workers. Social Science & Medicine. 2020 May 13:113020.

21 Lowndes CM, Alary M, Meda H, Gnintoungbe CA, Mukenge-Tshibaka L, Adjovi C, Buve A, Morison L, Laourou M, Kanhonou L, Anagonou S. Role of core and bridging groups in the transmission dynamics of HIV and STIs in Cotonou, Benin, West Africa. Sexually transmitted infections. 2002 Apr 1;78(suppl 1):i69-77.

22 Côté AM, Sobela F, Dzokoto A, Nzambi K, Asamoah-Adu C, Labbé AC, Mâsse B, Mensah J, Frost E, Pépin J. Transactional sex is the driving force in the dynamics of HIV in Accra, Ghana. Aids. 2004 Apr 9;18(6):917-25.

23 Alary M, Lowndes CM. The central role of clients of female sex workers in the dynamics of heterosexual HIV transmission in sub-Saharan Africa. Aids. 2004 Apr 9;18(6):945-7.

Appendix

S1: Recruitment and follow-up method

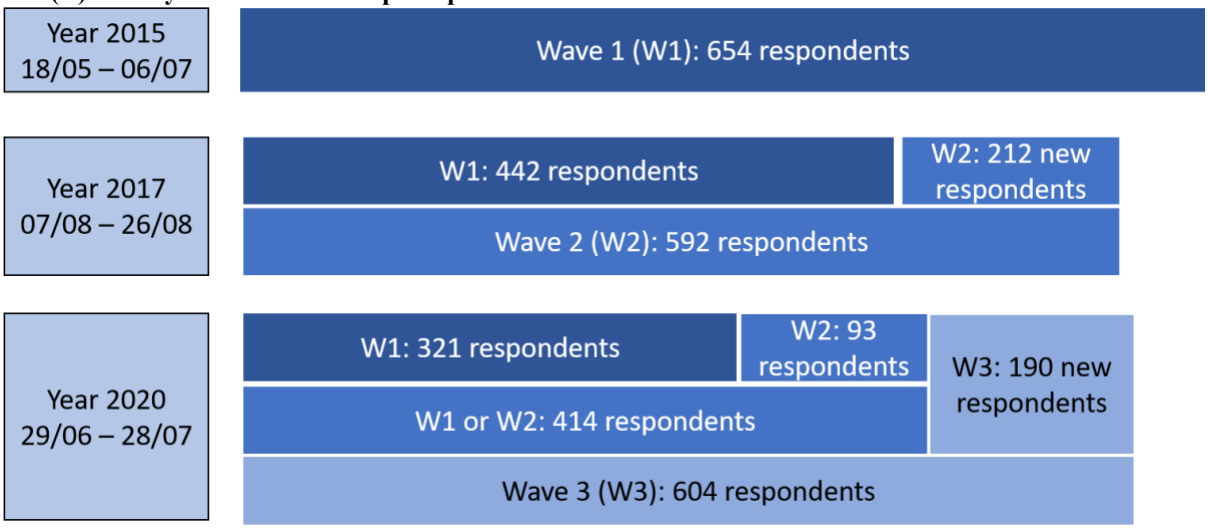
In Senegal, sex work is legal and regulated by a public health policy. FSWs who are at least 21 years old are required to register with a health centre and to attend monthly health checks (Ito et al., 2017).

For the first wave in 2015, registered FSWs were recruited by the midwife in charge of their monthly health check. All active registered FSWs from four (Pikine, Rufisque, Mbao, and Sebikotane) out of the five STI health centres located in Dakar, Senegal, were contacted to participate in our study. Non-registered FSWs were recruited by leaders of FSW groups. The sample included a similar proportion of registered and non-registered FSWs. The pilot survey took place in May 2015, and the real survey was carried out in June 2015.

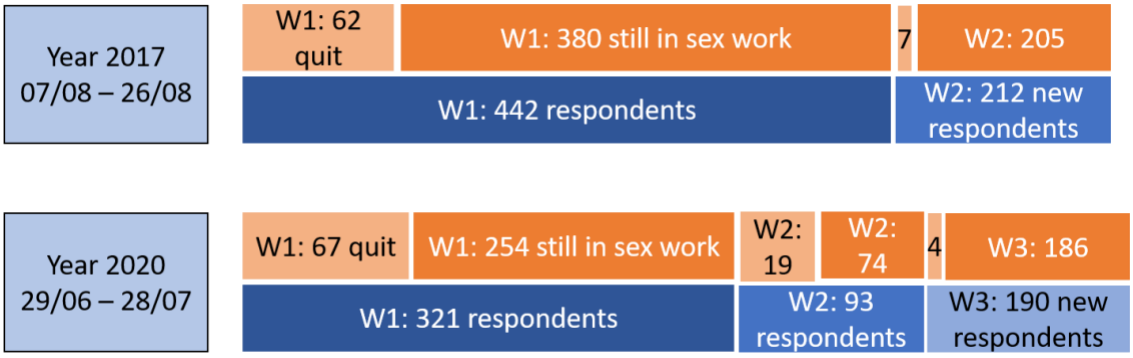
We used the same methodology to recruit participants in wave 2 (2017) and wave 3 (2020). For wave 2 we attempted to recruit wave 1 participants. For wave 3 we attempted to recruit all participants in wave 2 and also participants from wave 1 who did not participant in wave 2. To recruit participants we attempted to contact all previous participants using the telephone number the participant declared in their first wave. They all gave us their consent to recontact them for further research. If we could not contact them via telephone, we relied on peer FSWs to find and contact non-registered sex workers and on midwives to find registered FSWs.

S2: Survey attrition and sex work status

(A) Survey attrition and sample replenishment



(B) Sex work status of respondents



Legend: Respondents not in sex work Respondents in sex work

Table: Working FSWs in each wave

	No. of observations still working as FSW
2015	654
2017	513
2020	514
Total	1681

Table: Number of unique respondents in survey

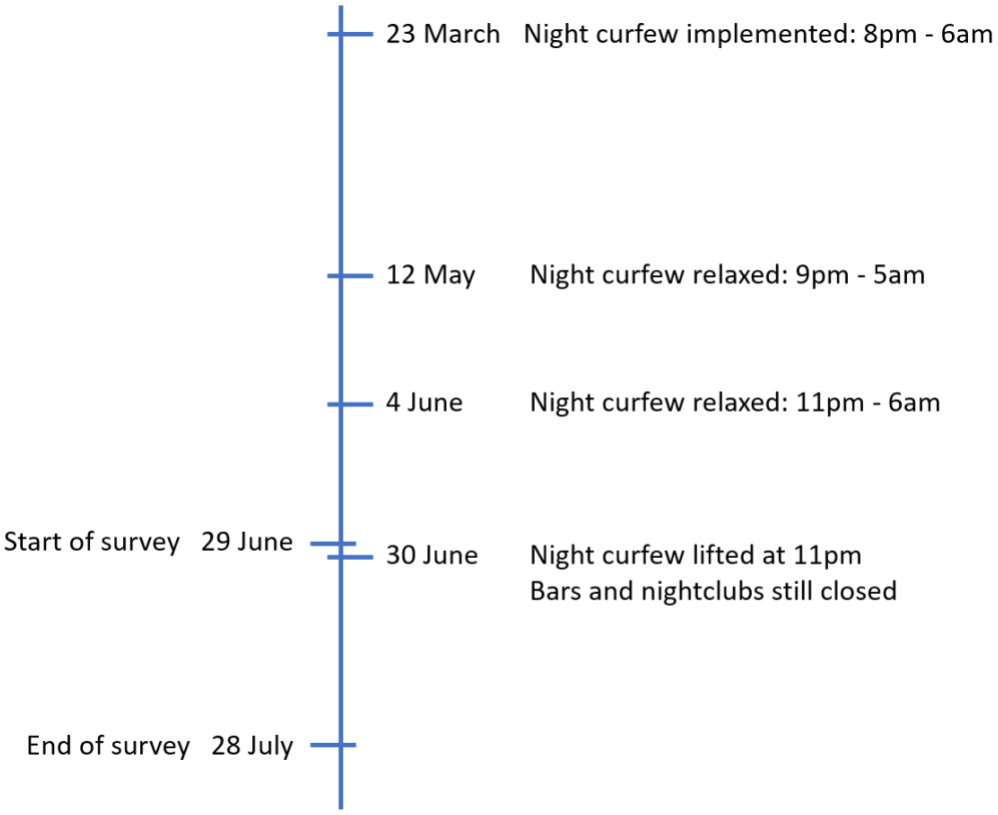
Total no. of unique respondents in survey
978

S3: COVID-19 protocol in 2020 survey

We were committed to guarantee safety and health of participants and of our team during data collection. When we conducted the survey, there were no published COVID-19 protocols available from the relevant ethics committees. As a result, we develop a strict COVID-19 protocol and added a "staying healthy" module, outlining the COVID-19 regulations, in the trainings of data collectors and supervisors to minimise risks of infection. In addition, interviews were not held in locations where COVID-19 patients were being treated. Two out of four hospitals were treating COVID-19 patients. These survey locations were moved to nearby secure offices.
The protocol enforced is as follows:

- Assessment of any COVID-19 symptoms over the phone before inviting the participant on site
- Provision and mandatory use of facial masks to all participants and members of our team on the survey sites and use of facial masks for members of staff in public places (public transport, market and religious sites) during the whole period of the survey
- Provision and use of hand sanitiser at the beginning and end of the survey by participants and enumerators
- Tablets, used for collecting data, will be cleaned and disinfected after every interview
- Everyone onsite must maintain a six-foot distance
- Daily cleaning and disinfecting of interview rooms
- Establishment of a 14-day quarantine after a known exposure, and isolation and testing before returning to work. Note this was not applied, since no COVID-19 case was reported by participants or the survey team.

S4: Night curfew in Senegal from March to July 2020



S5: Description of list experiment

(A) Procedure

Respondents were randomized into two groups. Group 1 (G1) saw three non-sensitive statements in the first list and four statements (including the sensitive statement) in the second list. Group 2 (G2) saw four statements (including the sensitive statement) in the first list and three non-sensitive statements in the second list.

(B) Instructions repeated before each list

I [The interviewer] am going to read you three (four) sentences. Please count how many of those sentences you agree with. You do not have to tell me which sentences you agree with, just how many sentences you agree with.

To help you count the number of sentences you agree with, I am going to give you three (four) marbles. Please place these marbles in your right hand and keep your hands behind your back. If you agree with the sentence I am reading, please transfer one marble from your right hand to your left hand. If you do not agree with this sentence, please do nothing. Once all the sentences have been read, you will tell me how many sentences you agree with. This number should correspond to the number of marbles you have in your left hand. I will now read those sentences.

(C) Lists

List #1

1. It is safer to bring a client home than going to a hotel.
2. *(I used a condom during my last intercourse with a client.)*
3. I prefer that the client pays me before intercourse.
4. Monday is the day I have the greatest number of clients.

List #2

1. The majority of my clients are Senegalese.
2. *(I used a condom during my last intercourse with a client)*
3. I usually spend the whole night with my client
4. I usually solicit clients by phone

(D) Analysis of single list experiment

List #1 was used for the analysis of the single list experiment. The following OLS regression with robust standard errors was carried out estimate condom use prevalence and its confidence interval.

$$n_i = \alpha + \beta G_i + \varepsilon_i$$

where n_i is the number of statements in the list the respondent agrees with, α is the intercept term and captures the mean number of statements respondents agree with, G_i takes the value 1 if the respondent is shown the list with the sensitive statement, 0 otherwise, and ε_i is the error term. β estimates the proportion of respondents who used a condom in their last intercourse with a client.

(E) Analysis of double list experiment

Both lists were used in the analysis of the double list experiment. List #2 was implemented only in 2017 and 2020. The following OLS regression with standard errors clustered by at the respondent level was carried out estimate condom use prevalence and its confidence interval. Standard errors were clustered by respondents.

$$n_{i,l} = \alpha_l + \beta G_{i,l} + \varepsilon_{i,l}$$

where $n_{i,l}$ is the number of statements in list $\#l$ the respondent agrees with, α_l takes the value 1 for list #2, 0 otherwise. $G_{i,l}$ takes the value 1 if the respondent is shown list $\#l$ with the sensitive statement, 0 otherwise, and ε_i is the error term. β estimates the proportion of respondents who used a condom in their last intercourse with a client.

S6: Definition of subgroups

(A) Subgroup heterogeneity: Table 1

Asset status (2015/2020)
The respondents were asked whether they owned any of the following assets: “tv”, “radio”, “dvd”, “stove”, “oven”, “fridge”, “ac”, “computer”, “landline”, “mobile”, “washing machine”, “internet”, and “car”. These assets were summarised into a wealth index via multiple correspondence analysis. “mobile” was omitted due to contradictory signs with the wealth index.

- **Status by wave**
  Ownership of assets was elicited only in 2015 and 2020. A single median wealth index was calculated by pooling both 2015 and 2020 data. In each survey wave, a respondent was classified as “asset poor” if their wealth was below median wealth, and as “asset rich” if their wealth was at least median wealth in that survey wave. The respondent’s asset status in 2017 was filled in with her asset status in 2015 and 2020, with the latter taking precedence if both were available.

Debt status in 2017
A respondent was asked whether she had debt in 2017 and 2020.

- **Initial status (2017)**
  Respondents were classified as being initially “indebted” if they were in debt in 2017, and were classified as “not indebted” if they had no debt in 2017.
- **Status by wave**
  In each survey wave, respondents were classified as being “indebted” if they had debt, and were classified as “not indebted” if they had no debt in that survey year.

Registration status
In each survey wave, respondents were categorised as being “registered” or “unregistered” according to their self-reported registration status with the authorities.

Table: Number of observations in subgroups

	Number of observations in subgroup		
	2015	**2017**	**2020**
Asset status (2015/2020)			
Status by wave			
Asset poor	301	210	279
Asset rich	353	239	235
Debt status			
Initial status (2017)			
Indebted	n.a.	145	
Not indebted	n.a.	141	
Status by wave			
Indebted	n.a.	263	280
Not indebted	n.a.	250	234
Registration status			
Registered	326	255	241
Unregistered	327	257	273

(B) Subgroup heterogeneity: Table 2

Reduction of clinic visits

Only registered FSWs were asked in 2020 whether about the effect of COVID-19 on their monthly clinic visits. These monthly visits are part of the requirements for registration, and registered FSWs can obtain free condoms during these visits. This analysis only included registered FSWs who participated in both surveys in 2017 and 2020. This comprised 138 registered FSWs, around half of the 255 and 241 registered FSWs who participated in 2017 and 2020 separately.

Table: Number of observations in subgroups

	Number of observations in subgroup	
	2017	**2020**
Subsample: Registered		
Did not reduce monthly clinic visits	60	
Reduced monthly clinic visits	78	
Subsample: Registered		
Asset poor	96	110
Asset rich	133	131
Subsample: Unregistered		
Asset poor	113	169
Asset rich	106	104

S7: Summary statistics of variables of interest

(A) Table: Summary statistics of self-reported effects of COVID-19

	N	Nmiss	p10	p50	p90	min	max	mean	sd
Effect of COVID-19: Sex work revenues	514	0	3	5	5	2	5	4·45	0·82
Effect of COVID-19: Other revenues	227	287	3	4	5	1	5	4·11	0·93
Effect of COVID-19: No· of clients	514	0	3	5	5	1	5	4·50	0·81
Effect of COVID-19: Price	514	0	3	3	5	1	5	3·67	0·99
Effect of COVID-19: Frequency of condom use	514	0	3	3	3	1	5	3·02	0·48
Effect of COVID-19: Client mix*	514	0	1	2	2	1	3	1·66	0·58
Effect of COVID-19: Health facilities attendance	514	0	3	3	5	1	5	3·80	1·00
Effect of COVID-19: Health centre visits	514	0	3	3	5	1	5	3·80	0·98
Effect of COVID-19: Monthly health centre visits***	241	273	3	3	5	1	5	3·61	0·92
Effect of COVID-19: Mental health**	514	0	3	3	5	1	5	3·41	0·72
Effect of COVID-19: Client violence	514	0	3	3	3	1	5	3·10	0·50
Effect of COVID-19: Police violence	514	0	3	3	3	1	5	3·08	0·71

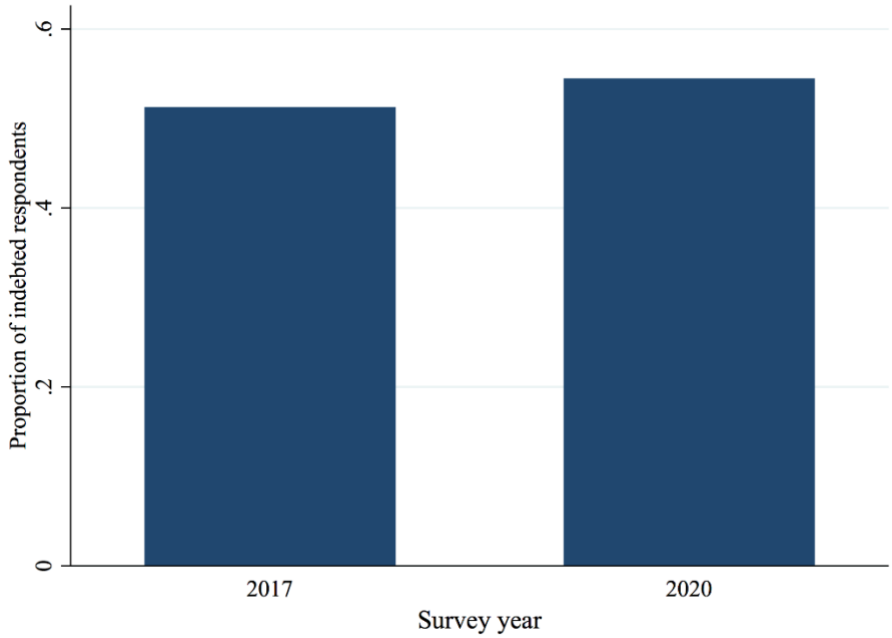
Notes:
For all variables, except the ones listed with exceptions: 1 “Strong increase”, 2 “Slight increase”, 3 “No change”, 4 “Slight decrease”, 5 “Strong decrease”
* For client mix: 1 “I see more regular clients”, 2 “No change”, 3 “I see more casual clients”
** For mental health: 1 “Strong improvement”, 2 “Slight improvement”, 3 “No change”, 4 “Slight deterioration”, 5 “Sharp deterioration”
*** The question on monthly health centre visits was only posed to registered FSWs as registered FSWs are required to go for monthly clinic visits

(B) Table: Summary statistics of other variables of interest

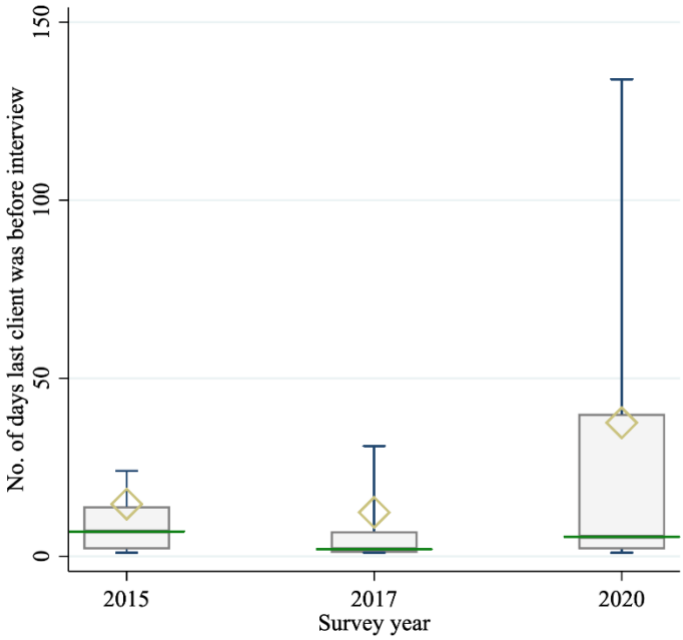
	N	Nmiss	p10	p50	p90	min	max	mean	sd
Age	1681	0	25	37	50	16	89	37·56	9·54
Registered FSW (Prop.)	1679	2	0	0	1	0	1	0·49	0·50
Sex work earnings in a month ('000 CFAF)	1670	11	12	80	208	0	1000	110·66	114·93
Clients in 7 days (No.)	1680	1	0	4	11	0	72	5·85	7·08
Last client (No. of days before interview)	1628	53	1	5	55	0	573	21·10	48·05
Average price of last two clients ('000 CFAF)	1648	33	4	11	30	0	600	15·75	21·92
Total household expenses in last 30 days ('000 CFAF)	1681	0	106	237	531	9	4914	301·17	260·33
Total savings in last 30 days ('000 CFAF)	1675	6	0	0	50	0	1000	17·26	64·29
Indebted (Prop.)	1027	0	0	1	1	0	1	0·53	0·50
Statements agreed with in list #1 (No.)	1681	0	1	2	3	0	4	2·07	0·78
Statements agreed with in list #2 (No.)	1027	0	1	2	3	0	4	2·34	0·75
Share of occasional clients (Prop.)	1653	28	0	0	1	0	1	0·34	0·32
Had STI symptoms with any of the last two clients (Prop.)	1009	18	0	0	0	0	1	0·05	0·21
PHQ-9 score	1027	0	0	8	15	0	27	7·76	4·95
PHQ-9 score of 10 and above (Prop.)	1027	0	0	0	1	0	1	0·25	0·43
At least one outdoor solicitation method (Prop.)	1677	4	0	1	1	0	1	0·57	0·50
At least one outdoor place of sex (Prop.)	1676	5	0	0	1	0	1	0·49	0·50

*p<0·1, **p<0·05, ***p<0·01

S8: Supplementary diagrams

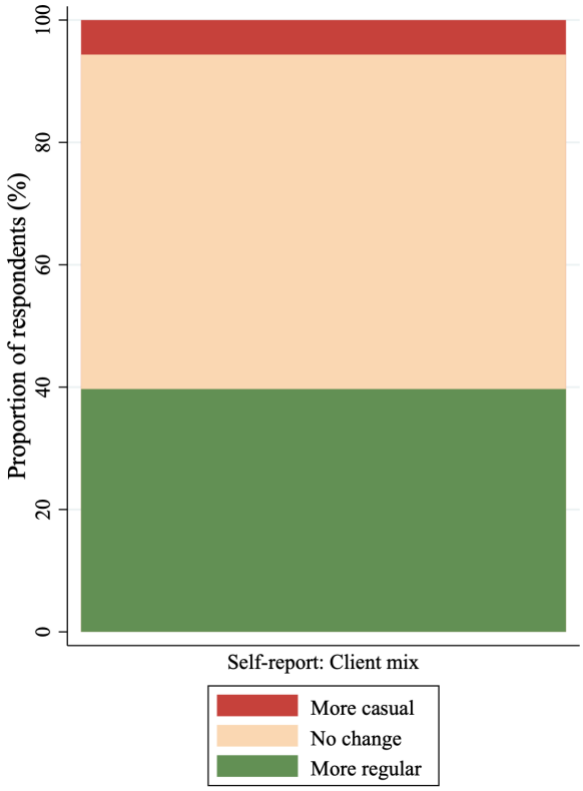


(Whole sample) Proportion of indebted respondents

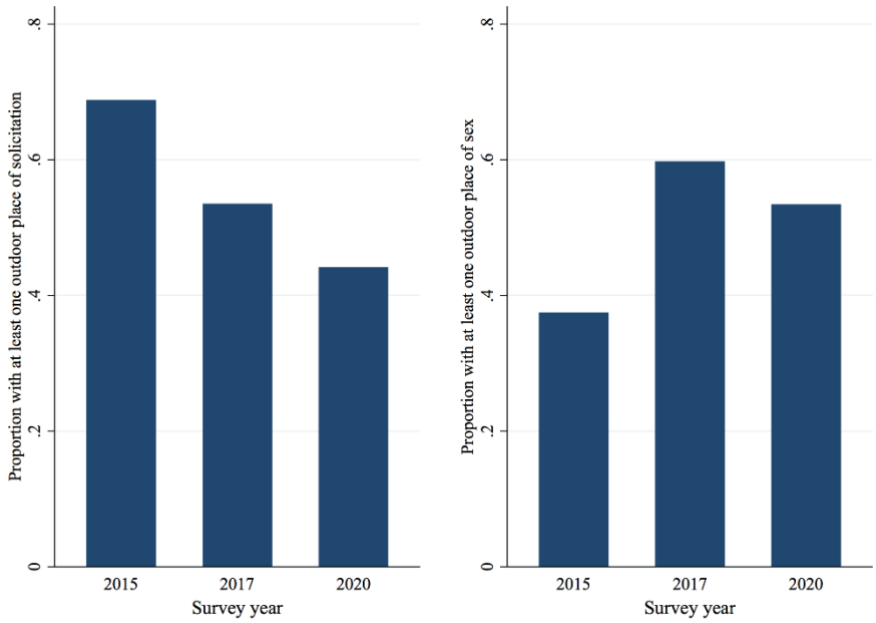


(Whole sample) Number of days last client was before the interview date

The green line represents the median. The box represents the interquartile range. The top and bottom whiskers represent the 10th and 90th percentiles respectively. The diamond represents the mean.

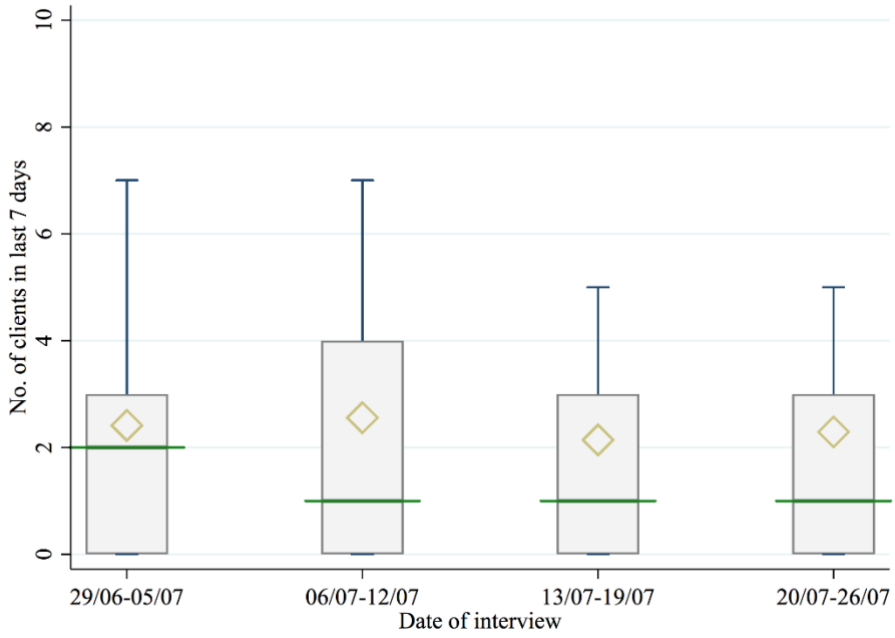


(Whole sample) Effect of COVID-19 on client mix



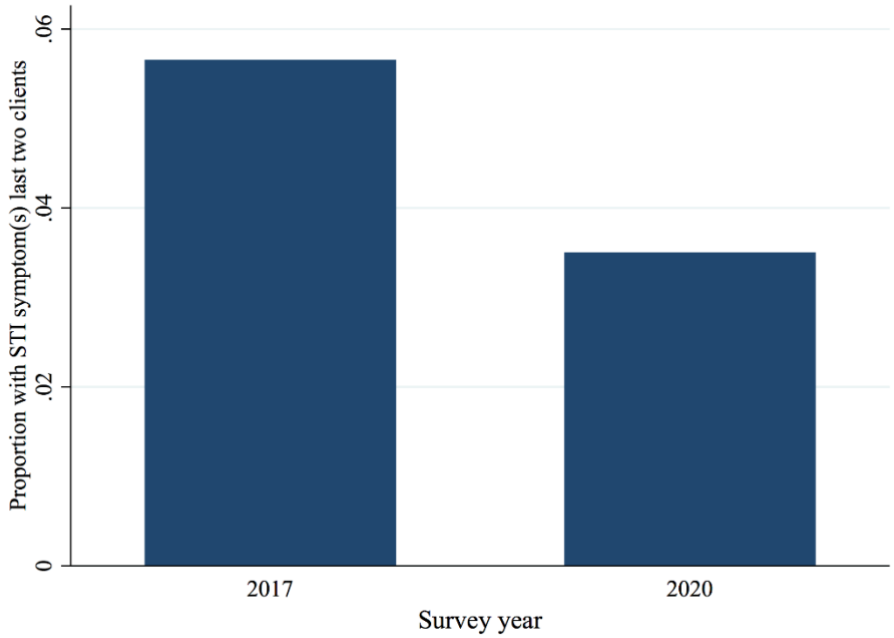
(Whole sample) Place of solicitation and place of sex

"Bars or nightclubs", "brothel", "hotel", or "somewhere public" were categorised as outdoors, while "at home", "at the client's home", "rented room", "phone", "internet" and "others" were not categorised as outdoors.



(Whole sample) Effect of lifting of night curfew

The green line represents the median. The box represents the interquartile range. The top and bottom whiskers represent the 10th and 90th percentiles respectively. The diamond represents the mean. The night curfew was lifted on 30 June 11pm. However, some- but not all- of the effect of the night curfew can still be captured as FSWs were asked to report the number of clients they had in the last 7 days.



(Whole sample) Proportion reporting STI symptom(s) with any of the last two clients

S9: Comparing survey inflow and outflow

(A) Survey inflow and outflow in 2017

t-tests were done to test whether the mean is different between both groups.

Table: Inflow in 2017

Variables	Former participant		New participant in 2017		Mean Diff
	N	mean	N	mean	
Age	442	39·77	150	35·41	4·354***
Registered FSW (Prop.)	379	0·512	133	0·459	0·0530
Sex work earnings in a month ('000 CFAF)	376	121·9	131	143·7	-21·779*
Clients in a week (No.)	380	8·145	133	8·947	-0·803
Average price of last two clients ('000 CFAF)	379	17·57	133	13·65	3·923
Total household expenses in last 30 days ('000 CFAF)	442	339·3	150	285·7	53·574**
Savings in last 30 days ('000 CFAF)	442	19·52	150	21·84	-2·315
Statements agreed with in list #1 (No.)	380	2·058	133	1·940	0·118
Share of occasional clients (Prop.)	374	0·299	131	0·376	-0·077**
At least one outdoor solicitation method (Prop.)	379	0·549	133	0·496	0·0530
At least one outdoor place of sex (Prop.)	379	0·612	133	0·556	0·0560

*p<0·1, **p<0·05, ***p<0·01

Table: Outflow in 2017

Variables	Participant stayed		Participant left in 2017		Mean Diff
	N	mean	N	mean	
Age	442	36·89	212	33·61	3·285***
Registered FSW (Prop.)	441	0·494	212	0·509	-0·0150
Sex work earnings in a month ('000 CFAF)	442	131·8	210	140·3	-8·501
Clients in a week (No.)	442	6·468	211	6·602	-0·134
Average price of last two clients ('000 CFAF)	419	17·20	204	15·74	1·461
Total household expenses in last 30 days ('000 CFAF)	442	339·7	212	308·5	31·18
Savings in last 30 days ('000 CFAF)	438	15·52	210	17·09	-1·574
Statements agreed with in list #1 (No.)	442	2·118	212	2·071	0·0470
Share of occasional clients (Prop.)	433	0·371	205	0·445	-0·074**
At least one outdoor solicitation method (Prop.)	440	0·700	211	0·664	0·0360
At least one outdoor place of sex (Prop.)	440	0·375	211	0·374	0·00100

*p<0·1, **p<0·05, ***p<0·01

(B) Survey inflow and outflow in 2020

t-tests were done to test whether the mean is different between both groups.
*p<0.1, **p<0·05, ***p<0·01

Table: Inflow in 2017

Variables	Participant stayed		Participant left in 2020		Mean Diff
	N	mean	N	mean	
Age	404	39·09	188	37·75	1·339
Registered FSW (Prop.)	351	0·496	161	0·503	-0·00700
Sex work earnings in a month ('000 CFAF)	348	121·7	159	140·5	-18·798*
Clients in a week (No.)	352	8·713	161	7·565	1·148
Average price of last two clients ('000 CFAF)	351	15·19	161	19·52	-4·326
Total household expenses in last 30 days ('000 CFAF)	404	311·8	188	355·7	-43·955*
Savings in last 30 days ('000 CFAF)	404	17·85	188	24·97	-7·120
Indebted (Prop.)	404	0·530	188	0·516	0·0140
Statements agreed with in list #1 (No.)	352	2·034	161	2·012	0·0220
Statements agreed with in list #2 (No.)	352	2·253	161	2·354	-0·101
Share of occasional clients (Prop.)	345	0·310	160	0·339	-0·0290
Had STI symptoms with any of the last two clients (Prop.)	341	0·0650	154	0·0390	0·0260
PHQ-9 score	404	6·916	188	6·755	0·161
PHQ-9 score of 10 and above (Prop.)	404	0·205	188	0·176	0·0300
At least one outdoor solicitation method (Prop.)	351	0·530	161	0·547	-0·0170
At least one outdoor place of sex (Prop.)	351	0·613	161	0·565	0·0470

*p<0·1, **p<0·05, ***p<0·01

Table: Outflow in 2020

Variables	Former participant		New participant in 2020		Mean Diff
	N	mean	N	mean	
Age	404	41·80	200	35·41	6·380***
Registered FSW (Prop.)	319	0·458	195	0·487	-0·0290
Sex work earnings in a month ('000 CFAF)	316	53·56	195	79·47	-25·907***
Clients in a week (No.)	319	2·107	195	3·159	-1·052***
Average price of last two clients ('000 CFAF)	318	14·65	195	12·32	2·333**
Total household expenses in last 30 days ('000 CFAF)	404	233·3	200	225·1	8·223
Savings in last 30 days ('000 CFAF)	404	13·24	200	15·49	-2·249
Indebted (Prop.)	404	0·527	200	0·545	-0·0180
Statements agreed with in list #1 (No.)	319	2·041	195	2·113	-0·0720
Statements agreed with in list #2 (No.)	319	2·398	195	2·379	0·0190
Share of occasional clients (Prop.)	316	0·247	194	0·352	-0·105***
Had STI symptoms with any of the last two clients (Prop.)	332	0·0780	195	0·0260	0·053**
PHQ-9 score	404	7·938	200	8·730	-0·792*
PHQ-9 score of 10 and above (Prop.)	404	0·260	200	0·310	-0·0500
At least one outdoor solicitation method (Prop.)	319	0·395	195	0·518	-0·123***
At least one outdoor place of sex (Prop.)	319	0·527	194	0·546	-0·0200

*p<0·1, **p<0·05, ***p<0·01