Health Certification in Sex Markets: A Field Experiment in Dakar, Senegal

Shanthi Manian *

Washington State University

August 22, 2023

Abstract

"Legalization and regulation" is a common approach to sex work regulation that eliminates some criminal penalties if sex workers obtain government health certification. In theory, by allowing sex workers to credibly disclose their health status, certification should enable higher prices. Yet certification rates in developing countries are typically low. I explore barriers to certification in Dakar, Senegal. I randomly offered uncertified sex workers information and an incentive covering the monetary cost of certification. This incentive only marginally increased certification. Individual- and transaction-level analysis show no evidence for a certification price premium and reveal that internalized stigma deters certification.

1 Introduction

Female sex workers are disproportionately affected by sexually transmitted infections (STIs). In developing countries, estimates of STI prevalence among sex workers have ranged from 28 to 84 percent (Cwikel et al., 2008). Because of the central role of female sex work in STI epidemics, public health agencies have had renewed interest in the laws and regulations governing sex work. One common solution, used in 20 countries around the world, is known as "legalization with regulation" (Global Network of Sex Work Projects, 2022). Under this policy, which is akin to occupational licensing, sex workers can avoid some criminal penalties if they obtain certification by registering with a government clinic or agency, undergoing regular gynecological check-ups, and treating any diagnosed STIs. In this paper, I study the only legalization and regulation program in Africa, in Senegal, which has been discussed as a model for other countries on the continent (Mgbako and Smith, 2009).

Theoretically, legalization and regulation appears to be a promising approach to combating sexually transmitted infections among female sex workers. Sex markets have an asymmetric information problem: sex workers know more about their own health status than their clients do. Certification can mitigate asymmetric information by providing a credible mechanism for the sex worker to disclose her health status, since certified sex workers must undergo regular health check-ups. If clients are willing to pay more to transact with a sex worker who does not have an STI, certified providers should earn higher prices. This certification premium should act as an incentive for sex workers to participate in the program.

[*]I am eternally grateful to Prof. Souleymane Mboup, Marieme Soumare, and Dr. Ibrahima Traore, without whom this project would not have been possible. I thank Saly Amos Diatta, Fatou Gaye, and Ellen Kim for excellent research assistance, three peer educators, and staff at *Association AWA* and *Réseau Africain de Recherche sur le Sida*, especially Ndeye Astou Fall Cisse and Bintou Thiam Ndiaye, for administrative, financial, logistical and moral support. I am deeply grateful to my dissertation advisor, Joshua Graff Zivin, as well as Craig McIntosh, Prashant Bharadwaj, Eli Berman, Steffanie Strathdee, Stefan Baral, Manisha Shah, and various seminar and conference participants for feedback throughout the course of this project. Funding was provided by the Frontiers of Innovation Scholarship Program, the Policy Design and Evaluation Lab, the Economics department, and the Dean of Social Sciences, all at UC San Diego; and Captricity.org. This paper was a part of my dissertation at UC San Diego, and I am grateful for dissertation support from the National Institute on Drug Abuse (NIDA) grant 3T32DA023356-07S1. Data are provided through Dataverse at https://doi.org/10.7910/DVN/DUZUB1.

Once they are in the program, any STIs will be rapidly identified and treated.

However, legalization and regulation programs can only be effective if sex workers participate and obtain certification. Participation in legalization programs remains low in developing country settings. Senegal has had a legalization and regulation policy since 1969, but local estimates suggest that certified sex workers represent less than 25 percent of the sex worker population (Tucker, 2012; Global Network of Sex Work Projects, 2022). Similarly, for example, Sirotin et al. (2010) report a 44 percent certification rate in a sample of female sex workers in Tijuana, Mexico, and Gertler and Shah (2011) report a 55 percent certification rate in a sample in Ecuador. Despite the theoretical informational benefits of certification, these low certification rates suggest that the costs of participation, potentially including both monetary and non-monetary costs, exceed any benefits.

In this paper, I explore why certification rates are so low in the legalization and regulation program in Dakar, Senegal. I first study the role of information and monetary costs using a randomized experiment. In a sample of 291 uncertified sex workers, I randomly provided information about certification and an incentive that reduced the monetary cost of certification, including time and transportation costs, to zero. Take-up of this incentive was surprisingly low: only 7 percent of the treatment group got certified, relative to 2 percent of the control group.[1] This result rules out lack of information, monetary costs, and minor hassle costs as the primary barriers to certification.

I provide two major explanations for this low take-up of certification even when monetary costs are zero. The first is that the benefits of certification appear to be smaller than expected. Using both causal and descriptive analysis, I find that the price premium to certified sex workers is statistically and economically insignificant; hence, the incentive to obtain certification is limited. Using detailed transaction-level panel data, I show that the experimental intention-to-treat effect of certification on prices is near zero. Then, I study

[1]This low participation rate does not appear to be driven by an incorrect estimation of the time and transportation costs of certification: the incentive amount was equal to the reimbursement given for participation in surveys, which carried equivalent time and transportation costs. In contrast to certification rates, 93 percent of individuals randomized completed the endline survey.

within-individual price changes over time for participants who got certified versus those who did not. Certification is not significantly associated with higher prices in any specification, and with reasonable controls, the point estimate is negative.[2] On the other hand, I present new evidence that prices respond to an individual sex workers' STI status even in the absence of certification. Sex workers receive a 19 percent reduction in transaction prices when they have visible STI symptoms. Since Senegal's program primarily diagnoses STIs based on symptoms observable during a gynecological exam, these results suggest that the certification does not provide useful information about sex worker health.[3]

Second, certification carries important psychological costs for sex workers. Many women in my sample describe concerns that becoming certified may expose their status as as sex worker to the community. Moreover, many women describe *internalized* stigma, in which they say that they do not want to identify as a "sex worker." When asked to state their willingness to accept incentives, 44 percent of respondents said there was *no* incentive amount that could convince them to certify. Internalized stigma was the most significant predictor of this emphatic refusal to obtain certification. Moreover, among those who stated an incentive amount, the incentive required to induce certification was increasing in measures of internalized stigma.

This study makes three key contributions to the literature on the economics of sex work and sex worker certification programs. My primary contribution is to demonstrate substantial resistance to certification in a legalization and regulation program that has been discussed as a model for African countries. Senegal's program is similar to regimes prevalent in Latin America, Europe and Asia, where take-up is believed to be similarly low (Sirotin

[2]Clients asked about certification in just 11 percent of transactions, providing further support that certification is not valued in the market. I also find that the legal benefits of certification are small due to limited enforcement of prostitution laws. At baseline, only 3.4 percent of the sample reported recent detention or arrest, and fewer than 1 percent did jail time. Moreover, recent arrest and jail time do not predict take-up.

[3]This symptom-based approach to the STI diagnosis is known as syndromic case management, and it is common in low-income countries in lieu of expensive laboratory STI testing. This approach is considered effective in reducing STI prevalence in female sex workers, and is recommended by the World Health Organization when laboratory testing is not possible (Meda et al., 1999; Shahmanesh et al., 2008; World Health Organization, 2014).

et al., 2010; Gertler and Shah, 2011; Liu and So, 1996; Harcourt et al., 2010).[4] Yet, I show that many sex workers in Senegal are unwilling to certify even when there is no monetary cost to doing so, and I find no evidence for a price premium for certification. This finding aligns with Ito et al. (2018)'s similar finding that certified sex workers do not earn higher prices in Senegal, but it contrasts with previous work based on simple comparisons of certified and uncertified sex workers; for example, Sirotin et al. (2010) found that certified sex workers earn significantly higher prices in Tijuana, Mexico.

Instead, I find that resistance to certification is related to female sex workers' *internalized* stigma, which is likely to be an important and widespread phenomenon. Ghosal et al. (2022) show that an intervention to reduce internalized stigma among female sex workers in India increased both health-seeking behavior and savings behavior in the long run. The costs of this internalized stigma are highlighted when comparing my results to previous literature on small incentives for health behaviors. For example, Thornton (2008) offered incentives for individuals to pick up HIV test results in Malawi, and found that an incentive equal to one-tenth of a day's wage increased take-up by approximately 30 percentage points, while a day's wage increased take-up by nearly 50 percentage points. In India, in-kind incentives worth roughly as much as the opportunity cost of time to attend immunization camps increased immunization coverage by nearly 20 percentage points (Banerjee et al., 2010).[5] In contrast, the incentive of a day's wage in this study increased certification by only 5 percentage points, and I can rule out an effect larger than 10 percentage points. My results provide additional evidence on the importance of internalized stigma for economic decisions.

Second, this paper contributes to the literature on laws and regulations concerning sex work. There are three main approaches to regulating sex work: certification (i.e., legalization and regulation); decriminalization, in which sex markets are completely unregulated; and

[4]It is generally difficult to estimate take-up of these programs because uncertified sex workers are a hidden population that is difficult to count.

[5]Previous literature has also found effects of similarly sized incentives on health behaviors. For example, Packel et al. (2021) find that an incentive of one to two days' wages for negative STI test results reduced STI prevalence.

criminalization of either supply or demand, which is the prevalent approach globally.[6]

The literature on legalization and regulation suggests mixed impacts on sex markets and the wellbeing of female sex workers. Most closely related to my study, Ito et al. (2018) use propensity score matching to study the same certification program in Senegal, in work conducted concurrently with my experiment. They study the impacts of the program on wellbeing, while I focus on take-up of the program. They show that certification is associated with better physical health, but lower subjective wellbeing and self-esteem. They also find that certified sex workers tend to see more clients and engage in riskier sexual behaviors. In other contexts, Bisschop et al. (2017) find that legal street prostitution zones in the Netherlands reduced sexual assault of female sex workers. However, exploiting geographic variation in law enforcement prosecution of uncertified sex workers in Ecuador, Gertler and Shah (2011) find that enforcing certification can have negative effects. While enforcement reduced STI rates among riskier street workers, it increased STI rates when it moved women out of brothels and nightclubs into the streets. Enforcing certification also increased prices and lowered quantities exchanged.[7]

Generally, this literature on legalization and regulation has not addressed certification take-up rates or their implications for the optimal regulation regime. A key difference between decriminalization and legalization and regulation programs is the requirement that female sex workers actively participate in the latter. I show that certification take-up is likely to be low in many settings, as internalized stigma is a primary barrier to takeup,

[6]Several papers find that decriminalization can improve female sex workers' outcomes relative to criminalization. Specifically, decriminalization has been shown to reduce sexually transmitted infections and sexual assault, while criminalization can increase sexually transmitted infections and reduce female sex workers' earnings. Cunningham and Shah (2017) show that decriminalization of indoor prostitution in Rhode Island reduced sexually transmitted infections and sexual assault in the state. Cameron et al. (2021) show that when sex work was unexpectedly criminalized in Indonesia, sex workers experienced a sharp increase in STI prevalence, as well as reduced earnings. Ciacci (2021) finds that criminalizing the purchase of sex in Sweden increased rape. Lee and Persson (2022) provide a theoretical consideration of the optimal regulation of sex work in an environment where there is both voluntary and coerced participation in sex work (i.e., sex trafficking), and find that none of the existing policy approaches to sex work is optimal. Della Giusta (2010) considers policy makers' incentives in selecting a policy regime and points out that the stigma surrounding sex work creates an electoral incentive to uphold criminalization, regardless of its welfare effects.

[7]This could also be a supply effect rather than a certification effect, as enforcement of certification may push some women out of sex work.

and female sex workers are a stigmatized group in almost every setting globally (Scambler and Paoli, 2008). My findings suggest that a large criminalized sex market will continue to exist in countries with legalization and regulation programs, highlighting an important consideration in the policy debate.

Third, the paper offers new evidence on market responses to STI risk by showing that prices vary with STI status within-individual. Previous work has shown that some clients are willing to pay more for *unprotected* sex, and those who demand unprotected or anal sex will compensate sex workers for the increased STI risk associated with the transaction (e.g., Gertler et al. (2005); Arunachalam and Shah (2013)). However, other evidence suggests that some clients are willing to pay to lower their risk of acquiring an STI: Arunachalam and Shah (2013) show that sex workers in Ecuador earn lower prices where the local STI prevalence is higher.[8] Similarly, my results are consistent with the idea that clients are willing to pay more to transact with a sex worker who has no visible STI symptoms.

More broadly, this paper contributes to a large literature on information disclosure mechanisms that aim to alleviate asymmetric information problems (see Dranove and Jin (2010) for a review). It is a general prediction of this literature that certified providers should earn higher prices and, as long as certification costs are negligible, almost all suppliers choose to obtain certification. I present a new example of the failure of this prediction in the understudied market for sex work.[9]

In terms of policy implications, the results suggests that alternatives to certification may be needed for screening and treatment of STIs to achieve STI control. Such alternatives might include peer referral systems or mobile clinics, strategies that Senegalese non-governmental organizations are currently pursuing. It appears that these organizations have made signif-

[8]Robinson and Yeh (2011) also show that female sex workers in Kenya are less likely to exchange sex on days when they have STI symptoms. This could be a demand effect where clients reduce their demand when sex workers have an STI status. However, it could also be a supply effect–for example, supplying sex may be painful when the sex worker has an STI.

[9]Farmer and Horowitz (2013) theoretically analyze the role of intermediaries such as pimps and brothels in sex markets. Logan and Shah (2013) analyze informal solutions to asymmetric information problems in the online male sex work market in the United States, and highlight the importance of sex worker photos as a signaling mechanism. However, there is no third-party certification in the markets they analyze.

icant progress on this front: at baseline, nearly 30 percent of my sample of uncertified sex workers reported a well visit (i.e, seeing a health care provider for gynecological care even when they did not have symptoms) in the past month, in contrast to their resistance to certification.

The remainder of the paper proceeds as follows. Section 2 offers a simple conceptual framework to guide the discussion of the experimental design and empirical evidence. In Section 3, I provide background information on sex work in Senegal, the certification program, and the experimental design. Section 4 describes the data and estimation strategy. Section 5 presents the experimental results, price analysis, and evidence on non-monetary certification costs. Section 6 concludes.

2 Conceptual Framework

To fix ideas, I discuss a simple conceptual framework for understanding how health certification in legalization and regulation programs might affect sex markets. A key element of sex markets is asymmetric information about health. Specifically, a client who seeks to buy services from a sex worker is likely to care about whether she has a sexually transmitted infection. It is reasonable to assume that his willingness to pay will increase in the likelihood that the sex worker is healthy. But in the absence of certification or another source of information, he cannot observe her health status, so he will instead form a belief about her health status. His willingness to pay then depends on this belief.[10]

Sex workers, on the other hand, have information about their own health status.[11] A sex worker's health status is partly determined by chance, but she can also influence her health status by engaging in preventive behaviors such as avoiding risky clients, using condoms, or seeking regular preventive care from a clinic. Sex workers are heterogeneous in their

[10]I use "she/her" pronouns to refer to sex workers and "he/him" pronouns to refer to clients since my sample only includes sex workers who identify as female and clients they identified as male.

[11]Sex workers may not perfectly observe their own health status: many sexually transmitted infections are asymptomatic, so sex workers–and clients–may not always know if they are infected. However, this analysis is relevant as long as sex workers have more information about their health status than clients.

preventive behavior and resulting health outcomes in the absence of certification. [12] Hence, for the purposes of this conceptual framework, we can think of sex workers' health status as an attribute of the service they provide. I will refer to sex workers' health status before certification as their baseline health.

Legalization and regulation programs require that sex workers achieve a particular level of health in order to keep their health certificate up-to-date. There may be a cost associated with achieving that level of health, so certification will be less costly for sex workers who already have a higher baseline health (e.g., they do not need to pay for treatment of infections or return to the certification clinic for follow-up). In addition, there may be other certification costs that do not vary systematically with baseline health. Since sex work is highly stigmatized, psychological and social costs may be particularly important, such as the risk that a woman's status as a sex worker will be revealed.

Sex workers can use the certificate to signal their health status to clients. A standard signaling model (e.g., Leland (1979), Spence (1973)) has two implications in this market: (i) certified sex workers should earn a price premium; and (ii) if certification costs are low, most sex workers should choose to obtain certification. The first implication is straightforward from the fact that client willingness-to-pay increases in his belief about sex worker health. Once the sex worker is certified, the client updates his belief about her health and increases his willingness to pay accordingly.

For the second implication, consider the sex worker's decision to obtain certification. A sex worker should obtain certification if the price premium she expects to receive from certification is higher than the cost of certifying. Since certification is less costly for sex workers who already meet the health requirements, sex workers with a higher baseline health will be the first to obtain certification. Clients will then update their beliefs about the remaining uncertified sex workers (i.e., the uncertified pool must be less healthy). The

[12] Sex workers may differ in their preventive behavior because of the utility they derive from health and risk preferences, but also because of variation in the life circumstances and economic constraints that they face, which are often quite dire as shown in Table 1.

clients will in turn reduce how much they are willing to pay for services of uncertified sex workers, increasing the price premium for certification further. Depending on the exact shape of clients' beliefs on the distribution of sex worker health, a separating equilibrium with partial certification take-up can occur, where certified sex workers earn higher prices. If obtaining certification is not very costly, then the price premium for certification will act as an incentive and generate a pooling equilibrium in which almost all sex workers to obtain certification. This pooling equilibrium also achieves an important policy goal of reducing the prevalence of STIs among female sex workers, which has positive externalities for STI epidemics more broadly.

These predictions about take-up and effects of certification follow from asymmetric information (sex workers know more about their health status than clients). They also rely on the notion that there is no other credible way for sex workers to signal their health status to clients. However, many other mechanisms of information disclosure have been discussed in the literature, including seller reputation, branding, and voluntary disclosure (Dranove and Jin, 2010). Asymmetric information may also be partially observable. In the case of sex worker health, sexually transmitted infections can be symptomatic or asymptomatic. Visible symptoms can reveal a sex worker's health status, while the absence of symptoms is not informative about her health status. When information is disclosed through other mechanisms or an attribute is partially observable, certification will have less of an effect on clients' belief updating. Intuitively, there is less "new" information in the certificate. In this case the certification premium will be smaller, and partial certification take-up (i.e., a separating equilibrium) will be more likely.

The state's interest in providing health worker certification stems from the societal benefit of reducing the prevalence of sexually transmitted infections. Successful certification programs should reduce the prevalence of sexually transmitted infections among sex workers. Most directly, this happens because sex workers receive treatment whenever an infection is detected during the regular health checks. Additionally, if there is a benefit to keeping the

certification active, sex workers will have an incentive to improve their health and reduce risky behavior to avoid a suspension of their certification. Since sex workers are "core population" in the epidemiology of sexually transmitted infections, reduced prevalence among sex workers will reduce the spread of disease in the population as a whole (Aral, 2000).

In the remainder of the paper, I use this conceptual framework to guide the empirical analysis. The empirical results suggest that the certification program does not operate the way theory would suggest. I present experimental evidence that certification take-up is low even when there are no monetary costs to certifying, and I show in both causal and descriptive analyses that there is no evidence for a certification premium. I also show a price response to sex workers' STI symptoms, which is more consistent with a world where sex workers' health status is either partially observable, or information about their health status is transmitted through a mechanism other than certification. Lastly, I show that although the monetary costs of certification are small, the psychological costs of certification may be very high due to internalized stigma toward sex work.

3 Study Design

This paper is based on data from a randomized field experiment I conducted in Dakar, Senegal, from October 2015 to June 2016. The final sample (after attrition) consists of 291 female sex workers who were uncertified at baseline. Participants were individually randomized via public lottery into treatment or control, and members of the treatment group were offered an encouragement to get certified consisting of (i) a persuasive informational session and (ii) a cash incentive to get certified.

3.1 Context

The current version of the sex worker certification program in Senegal has been in place since 1969.[13] Sex workers can get certified at any public STI clinic in Senegal. Any person can receive treatment at STI clinics, but female sex workers must be over the age of 21 to get certified. Administrative requirements for certification include a one-time interview with a social worker, informed consent, a copy of the national identity card or passport, and 3 passport photos. Certified sex workers must also undergo regular health checks. Senegal has implemented syndromic case management of STIs, a diagnostic approach based on symptoms observable during a gynecological exam.[14] HIV testing is performed annually. After an HIV diagnosis, women are referred to the national HIV treatment program, which provides free medical care and antiretroviral therapy (ART). Women living with HIV may stay certified as long as they respect the monthly clinic visits. The monthly visits emphasize adherence to HIV treatment; women receiving ART have a very low risk of transmitting HIV to male sexual partners (Cohen et al., 2011).

To keep their certification current, sex workers must attend monthly visits, which carry a small fee (1,000 FCFA or $1.70). This correspondents to about one fifth of a day's wage for the sex workers in my sample. Additionally, if a clinic health care provider diagnoses a curable STI and recommends treatment, certification is suspended until the sex worker obtains any prescribed medications, typically low-cost antibiotics. There are no other certification fees.

[13]The program is a legacy of French colonial rule. France replicated its sex worker registration and certification program in its colonies. While most former French colonies eliminated the program during independence, Senegal codified the system in 1969 as a measure to curb sexually transmitted infections, and later HIV (Mgbako and Smith, 2009).

[14]This approach is considered effective in reducing STI prevalence in female sex workers, and is recommended by the World Health Organization when laboratory testing is not possible (Meda et al., 1999; Shahmanesh et al., 2008; World Health Organization, 2014). Syndromic management is somewhat less effective than laboratory testing, since many STIs are asymptomatic (World Health Organization, 2012; Bekker et al., 2014). However, there are no low-cost laboratory tests for most STIs, with the exception of HIV(World Health Organization, 2011)

3.2 Sampling and Surveys

I implemented the study in partnership with a community-based organization, *Association AWA*, that provides services to certified and uncertified sex workers. From October 2015 to February 2016, participants were recruited using respondent-driven sampling, a peer-referral recruitment method that is frequently used for hidden populations such as sex workers. Thirty one "seeds" were purposively selected among sex workers currently participating in HIV prevention projects with *AWA*. Of these, 21 were certified. These seeds were then asked to recruit three sex workers meeting eligibility criteria for the study. Those recruited were, in turn, be asked to recruit three more sex workers. Recruitment continued through this peer referral until the target sample size was obtained. Following standard practice, participants were compensated 5,000 FCFA ($8.50) for participation in the study and 2,500 FCFA ($4.25) for each recruited participant who was eligible and agreed to enroll in the study. In order to be eligible to participate, sex workers had to be uncertified and eligible for certification: 21 years of age or older and possessing a valid form of identification.[15]

I consider this the policy-relevant sample for two reasons.[16] Peer outreach is the primary method that service providers use to reach sex workers, and it is recommended by the World Health Organization (World Health Organization, 2011). Second, since severe stigma limits mass media promotion of policies affecting sex workers, this sample reflects the population most likely to be affected by policy changes. Consistent with this, in my sample, among those who had previously heard of the certification program at baseline, 86 percent heard about it from another sex worker. It is worth noting that the majority of the "seeds" were certified sex workers, suggesting that certified sex workers are part of the social network for most of my sample. This suggests that my sample may have had a somewhat higher

[15]Other eligibility criteria were: (i) Born female, (ii) Report exchanging sex for money, gifts or goods within the past 6 months, (iii) Declare an intention to stay in Dakar for a period of 3 months, (iv) Mentally sound and capable of giving consent, (v) Speak French, Wolof or both, (vi) Present to the study with a valid recruitment coupon, (vii) Provide informed consent to participate in the study.

[16]While respondent-driven sampling can generate a representative sample under certain assumptions, the project budget did not allow for the sample size required to meet these assumptions; hence, I do not claim that this sample is representative.

propensity to certify than other uncertified sex workers.

All study activities were conducted at the offices of *Association AWA* in Dakar, the capital and largest city in Senegal.[17] The site is in a discreet location close to a busy market, ensuring that participants could come and go without attracting attention. Notably, the site is also a short walking distance (500m) from the primary certification clinic in Dakar, so time and travel costs associated with study participation are roughly equivalent to time and travel costs associated with certification.

Following standard procedure for respondent-driven sampling, participants completed a baseline survey during their initial study visit, then had the opportunity to recruit up to three other study participants. They returned after this recruitment (two to four weeks later) for randomization. Finally they completed an endline survey, generally one to three months after randomization.[18] Female sex workers are a highly mobile population that is difficult to track, so we allowed participants to complete missed visits whenever possible. As a result, there is some variation in time between visits.

In total, from October 2015 to February 2016, we recruited and conducted baseline surveys for 400 female sex workers. Of these, 314 participants were eligible and randomized.[19] Between December 2015 and June 2016, 291 participants completed endline surveys, representing a 93 percent retention rate from randomization to follow-up. The target sample size was 300 female sex workers; thus, recruitment efforts came very close to the target.[20]

3.3 Randomization

There are two groups in the study, treatment and control. Randomization was implemented via public lottery in a series of randomization sessions. We scheduled randomization sessions

[17]The use of an established community-based organization follows World Health Organization recommendations for network-based sampling(World Health Organization, 2011).

[18]A small number of participants completed their endline surveys 4+ months after randomization after missing their initial appointments.

[19]85 participants did not return for randomization. One participant was determined to have been ineligible (under age 21) during data analysis.

[20]The minimum detectable effect size for certification takeup at the target sample size of 300, with 80 percent power and 5 percent significance, was 5.41 percentage points.

in groups of at least 10; however, in practice, due to missed appointments, randomization occurred in groups ranging from 3 to 25 participants.[21]

There were 33 randomization sessions over the course of approximately 4 months. The sessions were run by one member of the study staff and two trained peer educators. Participants drew their group assignment by drawing a colored ball from a sack. Overall, 164 participants were randomized to treatment and 151 to control.[22]

I conduct all analyses on the sample that completed the entire study (n=291). Appendix A shows that there is no differential attrition across treatment and control groups. Appendix B shows balance across treatment and control groups. I evaluate balance in both the baseline sample that was randomized (n=315) and the endline analysis sample (n=291) on 21 variables. At baseline, there is a significant difference between treatment and control on one variable (number of clients) and a marginally significant difference on another variable (whether any transactions were completed in a public place). Since the randomization was not stratified, this is consistent with chance. There are no significant differences between treatment and control in the endline analysis sample. Nevertheless, I conservatively control for the unbalanced variables in evaluating treatment effects.

3.4 Encouragement

An encouragement intervention was delivered at the randomization session to members of the treatment group. The encouragement intervention involved two components. The first component was a persuasive informational intervention. The treatment group participated in a 30-minute persuasive discussion with peer educators, who were certified sex workers. The peer educators shared their experience with the certification program, discussed the benefits

[21]The final participant to be randomized was randomized alone. She drew her group assignment in the presence of study staff and peer educators to preserve the concept of a public lottery.

[22]In general, we included an even number of balls in the sack to ensure that participants had a 50 percent probability of being selected for treatment. Thus, despite the varying sizes of the randomization sessions, the ex ante assignment probability was constant. There is one exception to this: due to a miscommunication with the implementer, on December 14, approximately 75 percent of participants (14 of 18) were randomized to treatment instead of 50 percent.

of certification, and answered questions raised by participants. The second component of the encouragement was a cash certification incentive. We offered a total of 6,000 FCFA ($10.20) to anyone who got certified within 15 days. This amount was designed to provide reimbursement of the 1,000 FCFA ($1.70) clinic visit fee and 5,000 FCFA ($8.50) to the sex worker to cover time and transportation costs.

Women who said they wished to get certified were given an appointment the same day or following day for a peer educator to accompany them to the certification clinic and answer any questions about the process. [23] In order to claim the incentive, participants had to return to the study offices after certifying and show their certification card to study staff. The study offices were open late and were a short walking distance (500m) from the primary certification clinic, so claiming the incentive did not require additional travel.

The randomization sessions proceeded as follows. First, prior to drawing their treatment assignment, all participants received basic, neutral information about the certification program, their legal rights in Senegal, and a brief education module on sexually transmitted infections.[24] Following the public lottery, participants were divided by treatment, and trained peer educators delivered the encouragement intervention to the treatment group. Control group participants were reminded about compensation for the follow-up survey, and then allowed to leave.

4 Data and Estimation strategy

The baseline and endline surveys collected individual-level data and transaction-level data. The individual-level data covered demographics, income and labor supply, sex work history including number of clients and transactions, legal history and knowledge of the certification

[23] Appointments were given the following day when the certification clinic was closed by the time participants finished their randomization session. In practice, only two participants completed their certification the same day or the following day; others came back later.

[24] It is possible that this information may have encouraged certification in the control group. However, 83 percent of the sample was already aware of the certification program at baseline, suggesting that this was not new information. This is also reflected in the fact that only 2.84 percent of the control group obtained certification during the study period.

program, self-reported STI symptoms and health-seeking behavior, and alcohol and drug use. In addition, I collected detailed data on the five most recent sex transactions, including type of sex acts exchanged, price, numerous client characteristics, risk expectations, substance use by the sex worker and the client, whether violence was perpetrated, how the transaction was arranged, and where the transaction took place. Two versions of the endline survey were used. The first version of the survey was very similar to the baseline survey (except time invariant questions). We completed 54 endline surveys using this version. After it became clear that take-up of the incentive was very low, I added 21 questions to the survey to help understand the mechanisms for low take-up of the incentive. The modified survey was implemented beginning in February 2016 and was used for 237 participants. Since the large majority of participants are illiterate and given the sensitive nature of the data collected, surveys were administered by female social workers with significant experience working with female sex workers in Senegal. We made significant efforts to ensure that participants felt comfortable during the surveys, allowing us to obtain reliable self-reports. All surveys were conducted in a private room with a closed door, enumerators used a low tone of voice, and participants were allowed to take breaks as needed.

4.1 Baseline characteristics

[Table 1 about here.]

Table 1 shows summary statistics for the sample. Although the sampling procedure was not designed to generate a representative sample, participants in the study were similar to other samples of female sex workers in Sub-Saharan Africa, which are also typically convenience samples (Scorgie et al., 2012). Mean age is 37, mean education is 3.14 years, the majority of women are divorced, and they have on average 2.11 children under 18, reflecting the circumstances that typically precipitate sex work in sub-Saharan Africa. The participants appear to be well established in sex work, with a mean 8.36 years in sex work. 91 percent consider sex work their "main job" over the past 6 months. Moreover, 83 percent

were aware of the certification program at baseline, suggesting that lack of knowledge about the program is unlikely to be a significant barrier.

At the median, income from sex work accounts for 83 percent of total monthly income. Median monthly income is 90,000 FCFA ($153.06). Thus, the 5,000 FCFA incentive I offered for certification is about a day's wage, while the 1,000 FCFA clinic visit fee associated with certification is about one fifth of a day's wage.

Finally, given that one of the stated benefits of the certification program is protection from prosecution, it is worth considering the implications of remaining uncertified for interactions with the legal system. It appears that even uncertified sex workers are largely able to operate without interference from police. At baseline, only 3.4 percent of the sample reported a recent arrest or detention, and less than 1 percent (two participants) reported recent jail time. Among those who were arrested or in jail, only 1 participant got certified, suggesting that the legal benefits of the program are nominal.

[Table 2 about here.]

Table 2 shows summary statistics for the transaction-level data. The market for sex work in Senegal can be divided into two broad sectors: a local market and a sex tourism market. In the latter market, sex workers typically solicit in expensive hotels, bars and clubs, and report earnings of more than 50,000 FCFA ($85.03) per day (Homaifar and Wasik, 2005; Agence Nationale de la Statistique et de la Demographie, 2013). In the local market, in contrast, earnings are lower, and transactions are typically arranged through street soliciting, illegal brothels, or mobile phones (Do Espirito Santo and Etheredge, 2004; Homaifar, 2006).

There is qualitative evidence that women participating in the local market are less likely to be certified (Homaifar and Wasik, 2005), and indeed my sample appears to operate almost exclusively in the local market. The median transaction price is 5,000 FCFA, and 72 percent of transactions reported were carried out with regular clients, while fewer than 1 percent of transactions were completed with foreign clients. Clients asked about certification in

just 11 percent of transactions. Some features of the transactions suggest a need for safer working conditions. Although anal sex is uncommon in this context, occurring in 6.7 percent of transactions, unprotected sex was reported in 17 percent of transactions. Participants report violence, which included violent threats, physical violence, sexual violence, and forced unprotected sex, in 5.1 percent of transactions.

[Table 3 about here.]

Finally, Table 3 reports summary statistics on STIs and health care use at baseline. The women in the sample appear to have a high level of access to health care outside the certification program. In the sample as a whole, 21 percent saw a doctor for recent STI symptoms, which represents 80 percent of those who had recent STI symptoms. 29.2 percent reported a well visit in the past month at baseline. Overall, 44 percent of the sample reported a doctor visit in the past month. This suggests that certification does not act as a gateway to treatment, and the health care costs associated with certification are similar to health care costs many sex workers were incurring anyway, adding to the puzzle of low take-up.

4.2 Estimation strategy and identification

I first estimate the first-stage effect of the certification incentive on take-up using the following estimating equation:

$$Certified_i = \beta_0 + \beta_1 T_i + \beta_2 X_i + v_i \tag{1}$$

where $Certified_i$ is certification since baseline, T_i is the treatment assignment, and X_i is a vector of variables with baseline imbalances (see Section 3.3).

I then examine evidence for a certification premium by studying differential price changes over time for individuals who got certified:

$$p_{tir} = \alpha_i + \beta_1 Certified_{tir} + \lambda_r + \lambda_r \times T + \epsilon_{tir} \tag{2}$$

where $Certified_{tir}$ is the certification status of individual i during transaction t and round r, where the round refers to the baseline or follow-up survey respectively. I include individual fixed effects α_i, round fixed effects λ_r, and differential trends for treatment status ($\lambda_r \times T$) in all specifications. In some specifications, I include month fixed effects to account for seasonality in the sex market, and controls for the type of sex act exchanged and client characteristics.[25] In this analysis, I pool individuals who got certified in the treatment and control groups in order to improve power. In other words, this analysis is akin to a difference-in-differences where individuals who got certified are the treatment group and those who did not are the control. Since the individuals who got certified are self-selected, the parallel trends assumption is not satisfied, and β_1 is not causally identified. Nevertheless, I analyze whether the results are consistent with the existence of a certification premium.

I then study the effect of recent STI symptoms on prices using the following estimating equation:

$$p_{tir} = \alpha_i + \beta_1 STI_{tir} + \lambda_r + \lambda_r \times T + \epsilon_{tir} \tag{3}$$

where p_{tir} is the price of transaction t, individual i, in round r and STI_{ir} is an indicator for having an STI episode during the past month in round r. I also present some specifications with month fixed effects and the sex act controls described above. Standard errors are clustered at the individual level. The sample is restricted to transactions conducted in the past month to match the observation period for STIs.

[25] These controls are: indicators for performing Kissing; Danced or stripped for client; Massage; Performed oral sex with a condom; Performed oral sex without a condom; Vaginal sex with a condom; Vaginal sex without a condom; Anal sex with a condom; Anal sex without a condom; Received oral sex; Talking/company; whether the client was a regular client; whether the client was handsome; client age; client wealth; whether the client was a tourist; client cleanliness; client alcohol use; client drug use; client STI risk; client HIV risk.

5 Results

5.1 Impact of certification incentive

Table 4 shows the first-stage treatment effect of the encouragement intervention (i.e., the persuasive information and certification incentive) on certification take-up. The intervention had a marginally significant, but very small effect on take-up. Controlling for baseline covariates, the intervention increased take-up by only 4.5 percentage points, relative to a 2.84 percent take-up rate in the control group (Column 3). The upper bound of the confidence interval is just 9.82 percentage points. Though it is true that the treatment doubles the take-up rate, this effect was much smaller than expected. Preparatory discussions with both the implementing partner and members of the sex worker community suggested that hassle costs were a key barrier to certification, and so we expected take-up above 50%. From a policy perspective, a much larger percentage-point increase would be needed to justify the creation of an incentive program.

[Table 4 about here.]

To understand this result, it is important to confirm that the certification incentive actually reduced monetary costs to zero, including time and transportation costs. We can look to participation in the surveys for evidence of this. The certification incentive amount of 5,000 FCFA was equal to the reimbursement given for participation in surveys. Transportation costs to the study site and certification site are essentially equivalent: the study site is located only 500m from the certification clinic. In practice, the time costs of surveys and certification were also similar. Certification takes about half a day, and most participants spent about half a day at the study offices to complete surveys. Thus, our ability to recruit the targeted sample size and retain 93% of the sample at endline suggests that the incentive was enough to compensate for time and transportation costs associated with certification. Study comprehension questions confirm that 98 percent of participants understood the certification incentive offer.

5.2 Certification premium

[Table 5 about here.]

The next set of results explores whether or not certified providers earn higher prices, as expected under asymmetric information. In Table 5, I study the sex workers who obtained certification during the study period. First, in Column 1, I show the causally identified intention-to-treat (ITT) effect, comparing prices in the treatment and control groups at follow-up. This difference is very small, indicating no causal impact of the treatment on prices. However, this is unsurprising: 93 percent of the treatment group is not certified.[26]

Therefore, I turn to a descriptive analysis of differential, within-individual price changes over time for those who got certified, at the transaction level. Again, there is no significant difference in prices for certified sex workers (Column 2), regardless of controls for time (Column 3).[27] The raw differential change in prices for certified sex workers is positive, but small in magnitude. Given a mean price of 10,342 FCFA ($17.59) in the sample, the point estimate in Column 2 indicates that certified sex workers earned 9 percent more than uncertified sex workers. When I control for month fixed effects, the estimate falls in magnitude (Column 3). In the preferred specification in Column 4, controlling for type of sex exchanged, client characteristics and month fixed effects, the estimate is actually negative. Results are similar when I account for outliers using winsorized prices or the inverse hyperbolic sine of prices (Appendix Table A6). Combined with the fact that clients asked about certification in only 11 percent of transactions (Table 1), these results are most consistent with the conclusion

[26] Clearly, the causal parameter of interest is the local average treatment effect (LATE) of certification on those who were induced to certify by the encouragement. In principle, this object can be estimated through two-stage least squares, where treatment assignment is used as an instrument for certification status. However, this estimate suffers from a weak instrument problem (Bound et al., 1995), because the compliance differential between treatment and control groups is just 4.5 percentage points, and it is significant only at the 10 percent level. The "first-stage" F-statistic is just 2.79, where a sufficiently strong instrument should have an F-statistic above 10 or higher (Stock and Yogo, 2005; Young, 2022). Because of the weak instrument, even very small direct effects that the encouragement may have had on prices, such as income effects, are amplified (Bound et al., 1995), and the estimate of the LATE is inconsistent. Therefore, I do not present LATE estimates.

[27] Results are also robust to the inclusion of transaction fixed effects to control for recall bias (not shown).

that there is, at best, a very small certification premium in this market.[28]

These results raise the question of whether certification affects female sex workers on the margin of quantity exchanged rather than prices. For example, certification might enable sex workers to reach clients that they could not reach before. In Appendix Table A7, I use the same empirical approach as Table 5 to study certification effects on quantity exchanged and number of clients. Column 1 shows that the intention-to-treat effect on the quantity exchanged (i.e., the number of sex transactions) is not statistically significant. However, in the descriptive analysis comparing sex workers who self-selected into certification versus those who did not, there is some evidence that sex workers increased their quantity exchanged after obtaining certification (Column 2). In Column 3, we see that they also increased the number of clients they saw, suggesting that they did obtain new clients after certifying. However, this does not translate into an increase in earnings from sex work (Column 4). These results are consistent with the possibility that certification enables sex workers to expand their client base; however, since sex workers self-selected into registration, these cannot be taken as causal effects. Sex workers planning to expand their client base may have been more likely to take up certification.

5.3 Prices and STI symptoms in Senegal

[Table 6 about here.]

As discussed in Section 2, it may be that the certification premium is low because information about health status is already transmitted in the market. Health status may be partially observable due to symptoms, or that health information may be disclosed by some other means than certification. A price response to sex worker health status would suggest

[28]It is reasonable to ask whether a certification premium exists for transactions where condoms were not used, which represent 17 percent of transactions. Unfortunately, my sample is too small to study heterogeneity by condom use. However, in regressions on condom use (not shown), there is no evidence that certification affects condom use. In addition, Column 4 of Table 5 controls for condom use, and finds no change in the estimate for the certification premium. Table 6 finds that prices respond to STI symptoms across all transactions, suggesting that condom use does not entirely mitigate concerns about STI risk.

this mechanism.

Table 6 shows the association of prices with STI symptoms in the past month. First, recent STI symptoms are negatively but insignificantly associated with prices (Column 1). In the remainder of the table, I disaggregate by recent STI episodes that included visible symptoms (i.e., the sex worker knows the symptoms may be observable by the client during the transaction), and those that included *only* invisible symptoms (i.e., the sex worker knows that her health status will remain hidden).[29] Recent *visible* episodes are significantly associated with a reduction in prices (Column 2). After controlling for type of sex act exchanged (Column 3), women earned, on average, 2048.6 FCFA less when they had a visible STI episode than when they did not. This corresponds to a 19 percent reduction relative to the mean price. Column 4 shows that invisible episodes are not significantly associated with prices. The result that prices respond to episodes that could be observable by the client, but do not respond to episodes that are observable only to the sex worker, is consistent with the notion that information transmission drives the association between prices and STI symptoms.[30]

In Column 5, I compare the effect of certification to the effect of a visible STI episode. When controlling for visible STI, the estimate on certification falls even further relative to Column 4 of Table 5, suggesting a roughly 8 percent price reduction for certified sex workers. The coefficient on visible STI episodes remains significant, and is over 2 times the magnitude of the coefficient on certification.

[29] Visible symptoms were unusual or foul-smelling vaginal discharge and warts or sores in the genital area. Invisible symptoms were genital irritation, lower abdominal pain, and burning during urination. An episode is classified as visible if it included any visible symptoms. It is classified as invisible if it had invisible symptoms only. I collected these data on up to 3 episodes occurring in the past month.

[30] An alternate story is that an STI is a health shock, and sex workers respond by reducing their willingness-to-accept or expanding their labor supply. This is known as the "income smoothing" hypothesis, and empirical support for this has been found in other African contexts (Robinson and Yeh, 2011; Gong et al., 2019; Jones and Gong, 2021). In Appendix C, I show that total quantity exchanged in a month is lower when sex workers have STI symptoms, which suggests that female sex workers in my sample did not expand labor supply in response to STI shocks. More importantly, in the case of income smoothing, prices should respond to any STI episode, not just visible episodes as we see here.

5.4 Non-monetary costs of certification

The analysis up to this point demonstrates empirical evidence consistent with the notion that certification does not add value in the market. In this section, I document substantial resistance to certification in my sample and show that certification carries high stigma costs for sex workers.

In a subset of participants at endline, I elicited stated willingness-to-accept using the question, "What is the minimum incentive you would accept to get certified?" The responses, summarized in Figure 1 indicate very significant resistance to certification in the sample. Nearly half (44 percent) of the sample said there was no incentive amount that would convince them to certify (i.e., their WTA is infinite). While the question was not incentivized and this response is not to be taken literally, the strength of this refusal to certify and the share of respondents who espouse it are notable. In addition to this, mean WTA among those who stated a finite WTA was 34,566 FCFA, which is nearly seven times the incentive I offered, and represents 31 percent of mean monthly income in the sample with WTA data.

[Figure 1 about here.]

Study comprehension questions provide further evidence that the incentive offer was successfully communicated. Nearly all (98%) of the treatment participants understood that the study offered them an incentive for certification. Approximately 52 percent were able to correctly state the incentive amount when asked. This is a bit lower than anticipated; however, incorrect responses were highly correlated with having an infinite WTA: among those who did not correctly state the incentive amount, 63% also stated an infinite WTA. This suggests that individuals who would never certify did not pay attention to the details of the incentive offer.

[Table 7 about here.]

Therefore, I explore substantive reasons for the resistance to certification in the sample. First, I present summary statistics on participants' stated reasons for remaining uncertified,

disaggregated by stating a finite or infinite WTA (Table 7). Each row shows the means and the number of participants stating each reason for not certifiying, for finite WTA in Column 1 and infinite WTA in Column 2. The responses were not mutually exclusive; participants could give more than one reason. The most common concerns are related to stigma and fear that their status as a sex worker will be revealed: respondents reported a fear that someone would find the certification card and fear of being seen at the clinic, which is known to serve vulnerable populations such as sex workers. However, the third most commonly cited reason in both groups is related to *internalized* stigma: not wanting to assume a "sex worker" identity. Column 3 shows the difference between Columns 1 and 2, along with p-values from a simple t-test of the difference. Fears that someone will find the card and internalized stigma are significantly more common among participants who state an infinite WTA.

It is clear from the summary statistics that concerns related to stigma and confidentiality are paramount, but it is also useful to understand the relative importance of different aspects of stigma. I divide stigma concerns into three categories: direct confidentiality concerns, community stigma and internalized stigma. I then construct summary indices of variables related to each type of stigma cost, following Anderson (2008).

Direct confidentiality concerns are related to the confidentiality of the information provided during certification and the certification list—i.e., it may be that sex workers do not trust the government clinic to safeguard certification records. Community stigma refers to the cost of community members learning the subject's status as a sex worker. Internalized stigma refers to the cost of the subject admitting to herself that she has a stigmatized identity. This index is constructed from two variables: the subject directly stating that she "does not want to assume 'sex worker' identity"; and agreement with the statement "Some women exchange sex for money but are not sex workers." This latter indicator is particularly important because it offers an explanation for why women might have participated in the study despite facing this internalized stigma. Study materials carefully avoided referring to participants as female sex workers, and the implementing organization *Association AWA* is known

locally as an organization for "vulnerable women," rather than sex workers specifically.[31]

I find that internalized stigma is the most important predictor of certification refusal. Table 8 shows regressions of infinite WTA on the three summary indices. Neither confidentiality concerns nor community stigma costs are significantly associated with infinite WTA (Columns 1-2). In contrast, internalized stigma is strongly and significantly associated with infinite WTA (Column 3). A one-σ increase in the internalized stigma index increases the probability of reporting infinite WTA by 24.1 percentage points.

[Table 8 about here.]

Table 9 shows regressions of stated WTA on the three stigma indices, among those who stated a finite WTA. Again, neither confidentiality concerns nor community stigma costs are significantly associated with WTA (Columns 1-2), while internalized stigma significantly predicts WTA (Column 3). A one-σ increase in the internalized stigma index is associated with an increase in WTA of \$8.88.

[Table 9 about here.]

It is worth noting that the requirement to self-identify as a sex worker is fundamental to the concept of a certification program. Improved program design could reduce community stigma and confidentiality costs (e.g., expanding certification sites beyond STI clinics, or redesigning the certification card). However, reducing internalized stigma would require significant intervention, if not dramatic changes in social norms.[32]

[31] The confidentiality index includes a direct measure of whether the subject believes information provided during certification is confidential, and two questions about who can access the certification list. The community stigma index includes two reasons for remaining uncertified: "Afraid someone will see me at the clinic" and "Afraid someone will find the health card"; whether the participant has ever been to the certification clinic for gynecological care (so the cost of going to the clinic to certify would be low); and whether the participants solicits or completes transactions in public (so certification increases risk of community stigma by a relatively smaller amount).

[32] For example, the stigma-reducing intervention in Ghosal et al. (2022) was an intensive 8-week intervention requiring one facilitator for each group of 20 sex workers.

6 Conclusion

This paper presents empirical evidence on participation in sex work legalization and regulation programs. Even after receiving information about the certification program and a certification incentive that reduces the monetary costs of initial certification to zero, take-up for certification is extremely low. This can be explained, in part, by the fact that there is no evidence that certified sex workers earn a price premium. In contrast, sex workers who experienced recent visible STI symptoms receive lower prices. Since the certification program diagnoses STIs based on visible symptoms, this suggests that the certification does not provide useful information in this market.

I also show that certification carries a substantial psychological cost for a large proportion of sex workers. The most significant cost is internalized stigma: in a context where sex work is highly stigmatized, it is costly for a woman to admit, even to herself, that she is a sex worker. This cost is fundamental to the structure of certification programs: in order to participate in a legalization and regulation program, and woman must acknowledge her status as a sex worker.

It is worth noting that certification includes both an initial certification visit, and a recurring fee for monthly health visits to keep the certification current. The certification incentive offered in this study eliminated the monetary costs of the initial certification visit only. In principle, there is no penalty for letting the certification lapse after only one visit. However, we might consider the psychological cost of internalized stigma to be a fixed cost of certification, and the costs associated with keeping certification current might further reduce the benefits of certification relative to that fixed cost.

More generally, the results of this study are relevant to the literature on formalization of informal firms in low-income countries. The female sex workers in my sample, for whom sex work is the main source of income, share similarities with other types of informal microentrepreneurs. Bruhn and McKenzie (2014) and Ulyssea (2020) survey the literature on attempts to encourage informal firms to officially register their businesses across many

low-income countries. Similar to my finding, most of these studies find that providing information about business registration, reducing the costs of registration, or even providing a positive incentive to formalize has modest or no impact on microentrepreneurs' willingness to register. Both surveys highlight the likely role of ongoing costs after formalizing, such as taxes and recurring administrative costs, in deterring formalization. My results provide an additional example of this phenomenon in a different context.

Taken together, my results shed new light on theoretical priors on the incentives to participate in certification programs, summarized in Table 10. The results suggest that while certification programs are valuable for sex workers who participate, they will tend to leave a significant number of sex workers operating in the uncertified, criminalized market. Health services directed at this population of uncertified sex workers will be important to achieving STI control.

[Table 10 about here.]

References

Agence Nationale de la Statistique et de la Demographie (2013). Situtation Economique et Sociale du Senegal en 2011. Technical report.

Anderson, M. L. (2008). Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects. *Journal of the American Statistical Association*, 103(484):1481–1495.

Aral, S. O. (2000). Behavioral aspects of sexually transmitted diseases: core groups and bridge populations. *Sexually transmitted diseases*, 27(6):327–8.

Arunachalam, R. and Shah, M. (2013). Compensated for Life: Sex Work and Disease Risk. *Journal of Human Resources*, 48(2):345–369.

Banerjee, A. V., Duflo, E., Glennerster, R., and Kothari, D. (2010). Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *BMJ*, 340.

Bekker, L.-G., Johnson, L., Cowan, F., Overs, C., Besada, D., Hillier, S., and Cates, W. (2014). Combination HIV prevention for female sex workers: what is the evidence? *The Lancet*.

Bisschop, P., Kastoryano, S., and van der Klaauw, B. (2017). Street Prostitution Zones and Crime. *American Economic Journal: Economic Policy*, 9(4):28–63.

Bound, J., Jaeger, D. A., and Baker, R. M. (1995). Problems with Instrumental Variables Estimation when the Correlation between the Instruments and the Endogenous Explanatory Variable is Weak. *Journal of the American Statistical Association*, 90(430):443–450.

Bruhn, M. and McKenzie, D. (2014). Entry Regulation and the Formalization of Microenterprises in Developing Countries. *The World Bank Research Observer*, 29(2):186–201.

Cameron, L., Seager, J., and Shah, M. (2021). Crimes Against Morality: Unintended Consequences of Criminalizing Sex Work*. *The Quarterly Journal of Economics*, 136(1):427–469.

Ciacci, R. (2021). Banning the purchase of prostitution increases rape: evidence from Sweden.

Cohen, M. S., Chen, Y. Q., McCauley, M., Gamble, T., Hosseinipour, M. C., Kumarasamy, N., Hakim, J. G., Kumwenda, J., Grinsztejn, B., Pilotto, J. H. S., Godbole, S. V., Mehendale, S., Chariyalertsak, S., Santos, B. R., Mayer, K. H., Hoffman, I. F., Eshleman, S. H., Piwowar-Manning, E., Wang, L., Makhema, J., Mills, L. A., de Bruyn, G., Sanne, I., Eron, J., Gallant, J., Havlir, D., Swindells, S., Ribaudo, H., Elharrar, V., Burns, D., Taha, T. E., Nielsen-Saines, K., Celentano, D., Essex, M., and Fleming, T. R. (2011). Prevention of HIV-1 infection with early antiretroviral therapy. *The New England journal of medicine*, 365(6):493–505.

Cunningham, S. and Shah, M. (2017). Decriminalizing Indoor Prostitution: Implications for Sexual Violence and Public Health. *Review of Economic Studies*.

Cwikel, J. G., Lazer, T., Press, F., and Lazer, S. (2008). Sexually transmissible infections among female sex workers: an international review with an emphasis on hard-to-access populations. *Sexual health*, 5(1):9–16.

Della Giusta, M. (2010). Simulating the impact of regulation changes on the market for prostitution services. *European Journal of Law and Economics*, 29(1):1–14.

Do Espirito Santo, M. E. G. and Etheredge, G. D. (2004). And then I became a prostitute ... Some aspects of prostitution and brothel prostitutes in Dakar, Senegal. *The Social Science Journal*, 41(1):137–146.

Dranove, D. and Jin, G. Z. (2010). Quality Disclosure and Certification: Theory and Practice. *Journal of Economic Literature*, 48(4):935–963.

Farmer, A. and Horowitz, A. W. (2013). Prostitutes, pimps, and brothels: Intermediaries, information, and market structure in prostitution markets. *Southern Economic Journal*, 79(3):513–528.

Gertler, P., Shah, M., and Bertozzi, S. (2005). Risky Business: The Market for Unprotected Commercial Sex. *Journal of Political Economy*, 113(3):518–550.

Gertler, P. J. and Shah, M. (2011). Sex Work and Infection: What's Law Enforcement Got to Do with It? *Journal of Law and Economics*, 54(4):811–840.

Ghosal, S., Jana, S., Mani, A., Mitra, S., and Roy, S. (2022). Sex Workers, Stigma, and Self-Image: Evidence from Kolkata Brothels. *The Review of Economics and Statistics*, 104(3):431–448.

Global Network of Sex Work Projects (2022). Global Mapping of Sex Work Laws. Technical report.

Gong, E., de Walque, D., and Dow, W. H. (2019). Coping with risk: Negative shocks, transactional sex, and the limitations of conditional cash transfers. *Journal of Health Economics*, 67:102219.

Harcourt, C., O'Connor, J., Egger, S., Fairley, C., Wand, H., Chen, M., Marshall, L., Kaldor, J., and Donovan, B. (2010). The decriminalization of prostitution is associated with better coverage of health promotion programs for sex workers. *Australian and New Zealand journal of public health*, 34(5):482–486.

Homaifar, N. (2006). Taking a step towards prevention: Senegal's policy of legalizing the sex trade. *Exchange on HIV and AIDS, Sexuality and Gender*, pages 14–15.

Homaifar, N. and Wasik, S. Z. (2005). Interviews with senegalese commercial sex trade workers and implications for social programming. *Health care for women international*, 26(2):118–33.

Ito, S., Lépine, A., and Treibich, C. (2018). The effect of sex work regulation on health and well-being of sex workers: Evidence from Senegal. *Health Economics*, 27(11):1627–1652.

Jones, K. and Gong, E. (2021). Precautionary savings and shock-coping behaviors: Effects of promoting mobile bank savings on transactional sex in Kenya. *Journal of Health Economics*, 78:102460.

Lee, S. and Persson, P. (2022). Human trafficking and regulating prostitution. *American Economic Journal: Economic Policy*, 14(3):87–127.

Leland, H. E. (1979). Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards. *Journal of Political Economy*, 87(6):1328.

Liu, T. I. and So, R. (1996). Knowledge, attitude, and preventive practice survey regarding AIDS comparing registered to freelance commercial sex workers in Iloilo City, Philippines. *The Southeast Asian journal of tropical medicine and public health*, 27(4):696–702.

Logan, T. D. and Shah, M. (2013). Face Value: Information and Signaling in an Illegal Market. *Southern Economic Journal*, 79(3):529–564.

Meda, N., Ndoye, I., M,Boup, S., Wade, A., Ndiayee, S., Niang, C., Sarr, F., Diop, I., and Caraël, M. (1999). Low and stable HIV infection rates in Senegal: natural course of the epidemic or evidence for success of prevention? *AIDS*, 13(11):1397–1405.

Mgbako, C. and Smith, L. A. (2009). Sex work and human rights in africa. *Fordham Int'l LJ*, 33:1178.

Packel, L. J., de Walque, D., Feeney, K. C., Balampama, M. P., Cooper, J. E., Kalolella, A., Wechsberg, W. M., and Dow, W. H. (2021). A randomized trial of cash incentives for sexual behavior change among female sex workers in Dar es Salaam. *Social Science & Medicine*, 272:111655.

Robinson, J. and Yeh, E. (2011). Transactional Sex as a Response to Risk in Western Kenya. *American Economic Journal: Applied Economics*, 3(1):35–64.

Scambler, G. and Paoli, F. (2008). Health work, female sex workers and hiv/aids: Global and local dimensions of stigma and deviance as barriers to effective interventions. *Social Science and Medicine*, 66(8):1848–1862.

Scorgie, F., Chersich, M. F., Ntaganira, I., Gerbase, A., Lule, F., and Lo, Y.-R. (2012). Socio-demographic characteristics and behavioral risk factors of female sex workers in sub-saharan Africa: a systematic review. *AIDS and behavior*, 16(4):920–33.

Shahmanesh, M., Patel, V., Mabey, D., and Cowan, F. (2008). Effectiveness of interventions for the prevention of HIV and other sexually transmitted infections in female sex workers in resource poor setting: a systematic review. *Tropical medicine & international health*, 13(5):659–79.

Sirotin, N., Strathdee, S. A., Lozada, R., Nguyen, L., Gallardo, M., Vera, A., and Patterson, T. L. (2010). A comparison of registered and unregistered female sex workers in Tijuana, Mexico. *Public health reports (Washington, D.C. : 1974)*, 125 Suppl:101–9.

Spence, M. (1973). Job Market Signaling. *The Quarterly Journal of Economics*, 87(3):355.

Stock, J. H. and Yogo, M. (2005). *Asymptotic Distributions of Instrumental Variables Statistics with Many Instruments*, pages 109–120. Cambridge University Press.

Thornton, R. L. (2008). The Demand for, and Impact of, Learning HIV Status. *The American economic review*, 98(5):1829–1863.

Tucker, G. M. (2012). The invisible challenge to hiv/aids prevention: clandestine prostitution in senegal. *Journal of International Women's Studies*, 13(1):19–31.

Ulyssea, G. (2020). Informality: Causes and consequences for development. *Annual Review of Economics*, 12:525–546.

World Health Organization (2011). Preventing HIV in sex work settings in sub-Saharan Africa. Technical report, Geneva.

World Health Organization (2012). Prevention and treatment of HIV and other sexually transmitted infections for sex workers in low- and middle-income countries: recommendations for a public health approach. Technical report.

World Health Organization (2014). Consolidated Guidelines on HIV prevention, diagnosis, treatment and care for key populations. Technical report, Geneva.

Young, A. (2022). Consistency without inference: Instrumental variables in practical application. *European Economic Review*, 147:104112.

Figure 1: Willingness to Accept Certification

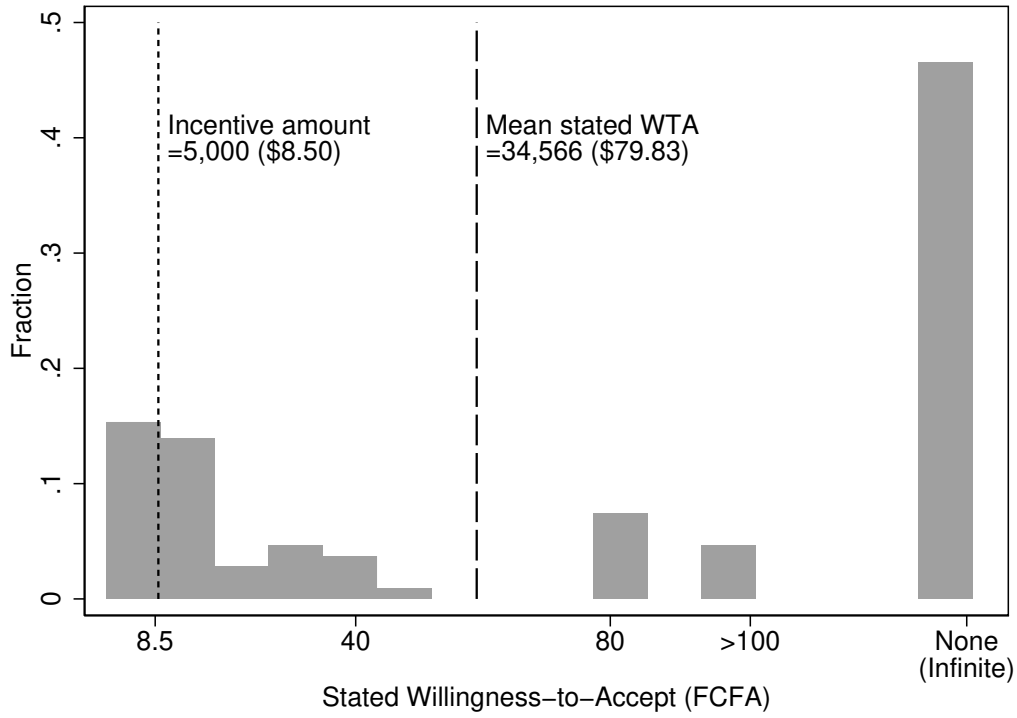

Table 1: Sample Demographics and Sex Work History (Senegal)

	Mean	S.D.	Med.	Min.	Max.	Obs.
Age	37.4	8.89	37	21	59	290
Divorced	0.63	0.48	1	0	1	291
Senegalese	1.00	0.059	1	0	1	291
Muslim	0.98	0.14	1	0	1	291
Years of education	3.11	3.55	2	0	14	291
Children under 18	2.12	1.72	2	0	10	288
Years in sex work	8.37	7.09	6	0	32	289
Main job is sex work	0.91	0.28	1	0	1	289
Ever heard of registration program	0.83	0.38	1	0	1	290
Hours in sex work, past week	6.92	8.77	5	0	84	291
Number of clients, past month	13.2	16.6	8	0	144	290
Income from sex work, past month (FCFA, thousands)	95.4	91.6	75	0	700	289
Total income, past month (FCFA, thousands)	109.9	93.0	90	0	700	289
Arrested, past month	0.034	0.18	0	0	1	290
Jail, past month	0.0069	0.083	0	0	1	290

This table presents summary statistics at baseline for 291 female sex workers comprising the analysis sample (participants who satisfied eligiblity criteria and completed the baseline survey, randomization, and endline survey). Responses of *Don't know* and refusals to respond are coded as missing. FCFA is the currency of Senegal. During the study period, the exchange rate was approximately 588 FCFA = $1.

Table 2: Transaction characteristics

	Mean	S.D.	Med.	Min.	Max.	Obs.
Transaction price (FCFA, thousands)	10.0	15.6	5	0	400	1453
Regular client	0.72	0.45	1	0	1	1440
Foreign client	0.0083	0.091	0	0	1	1438
Unprotected sex	0.17	0.37	0	0	1	1455
Anal sex	0.067	0.25	0	0	1	1455

This table presents summary statistics for transaction-level data collected during the baseline survey from 291 female sex workers comprising the analysis sample (participants who satisfied eligiblity criteria and completed the baseline survey, randomization, and endline survey). Each sex worker answered a series of questions about each of her last five sex transactions, generating a sample of 1,455 transactions. Responses of *Don't know* and refusals to respond are coded as missing. FCFA is the currency of Senegal. During the study period, the exchange rate was approximately 588 FCFA = $1. Client violence is equal to 1 if sex workers reported any of the following: threat of physical violence, physical violence, sexual violence, forced unprotected sex, threatened to report the sex worker to police.

Table 3: STIs and health care use

	Mean	S.D.	Min.	Max.	Obs.
Saw a doctor for STI symptoms, past month	0.21	0.41	0	1	291
If had STI symptoms, saw a doctor	0.81	0.40	0	1	77
Saw a doctor for a routine exam	0.29	0.46	0	1	290
Saw a doctor for any reason, past month	0.44	0.50	0	1	291

This table presents summary statistics at baseline for 291 female sex workers comprising the analysis sample (participants who satisfied eligiblity criteria and completed the baseline survey, randomization, and endline survey). Responses of *Don't know* and refusals to respond are coded as missing.

Table 4: Impact of certification incentive

Dependent Variable:	Certification Take-up		
	(1)	(2)	(3)
Treatment	0.0450*	0.0424	0.0453*
	(0.0256)	(0.0260)	(0.0269)
Constant	0.0284**	-0.0177	-0.0189
	(0.0140)	(0.0126)	(0.0131)
Block FE		X	X
Baseline controls			X
Observations	291	291	291

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses. The dependent variable is an indicator for obtaining certification between baseline and follow-up. *Treatment* is an indicator for assignment to the treatment group, which received (i) an informational intervention designed to be persuasive and (ii) an incentive to obtain certification *Block FE* indicates inclusion of fixed effects to account for the public randomization session. *Baseline controls* indicates inclusion of variables that were imbalanced at baseline due to chance.

Table 5: Prices and Certification

Dependent Variable:	Transaction Price (FCFA)			
	(1) ITT	(2) FE	(3) FE	(4) FE
Treatment	20.34			
	(919.6)			
Certified		985.4	175.3	-428.9
		(840.2)	(1042.7)	(1383.7)
Constant	9315.1***	9841.9***	11066.4***	9449.2***
	(606.6)	(291.8)	(807.6)	(1780.4)
Round FE		X	X	X
Treatment controls		X	X	X
Month fixed effects			X	X
Sex act and client controls				X
Observations	1224	2588	2588	2583

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses, clustered at individual level. Analysis is conducted at the transaction level. The sample is restricted to transactions in the month prior to survey to maintain a comparable sample with Table 6. *Treatment* is an indicator for assignment to the treatment group, which received (i) an informational intervention designed to be persuasive and (ii) an incentive to obtain certification. *Certified* is an indicator for the sex worker having a valid certification when the transaction was completed. The "sex act and client controls" included in the column 4 regression comprise types of sexual activities completed during the transaction, condom use, and a series of client characteristics reported by the sex worker. The column heading FE indicates individual fixed effects.

Table 6: Prices and recent STI symptoms

Dependent Variable:	Transaction Price				
	(1)	(2)	(3)	(4)	(5)
Any STI	-1101.2				
	(1404.8)				
Visible STI		-2149.1**	-2048.6**	-1828.5*	-2080.0**
		(974.7)	(1007.2)	(1023.2)	(1020.2)
Invisible STI				2276.1	
				(3991.1)	
Certified					-881.9
					(1476.6)
Constant	11350.8***	10291.8***	10164.3***	10083.4***	10207.1***
	(869.3)	(391.5)	(1763.7)	(1876.3)	(1743.1)
Month fixed effects	X		X	X	X
Sex act and client controls			X	X	X
Observations	2577	2588	2583	2583	2583

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses, clustered at individual level. Analysis is conducted at the transaction level using data collected at baseline and endline. The sample is restricted to transactions in the month prior to the survey. At baseline and endline, sex workers reported up to three recent STI episodes. *Any STI* is an indicator for reporting an episode of STI symptoms in the past month. STI episodes are classified as either visible or invisible. *Visible STI* is an indicator for an episode with visible symptoms, and *Invisible STI* is an indicator for an episode with no visible symtpoms. *Certified* is an indicator for the sex worker having a valid certification when the transaction was completed. Individual and round fixed effects and controls for treatment group are included in all regressions. The "sex act and client controls" included in the column 3-5 regressions comprise types of sexual activities completed during the transaction, condom use, and a series of client characteristics reported by the sex worker.

Table 7: Reasons for remaining uncertified at follow-up

	(1) WTA$< \infty$ mean(n)	(2) WTA$= \infty$ mean(n)	(3) Difference (1)-(2)	p-val.
Afraid someone will find the health card	0.55	0.74	-0.19	0.00***
	(70)	(73)		
Afraid someone will see me at the clinic	0.45	0.48	-0.040	0.55
	(57)	(48)		
Do not want to assume "sex worker" identity	0.11	0.39	-0.28	0.00***
	(14)	(39)		
Clinic personnel do not treat me with respect	0.062	0.10	-0.039	0.29
	(8)	(10)		
Do not know how to register	0.11	0.010	0.099	0.00***
	(14)	(1)		
Afraid of police harassment	0.047	0.081	-0.034	0.29
	(6)	(8)		
Clinic visits are too expensive	0.055	0.040	0.014	0.62
	(7)	(4)		
Clinic hours are not convenient	0.047	0.010	0.037	0.11
	(6)	(1)		
Clinic is too far away	0.031	0.010	0.021	0.28
	(4)	(1)		
Afraid of HIV test	0.016	0.020	-0.0046	0.79
	(2)	(2)		
Clinic visits take too long	0.016	0.010	0.0055	0.72
	(2)	(1)		
STI treatment is too expensive	0.0078	0	0.0078	0.38
	(1)	(0)		

Table 8: Stigma and refusal to certify

	(1) Inf. WTA	(2) Inf. WTA	(3) Inf. WTA	(4) Inf. WTA
Confidentiality index	-0.0148			-0.0639
	(0.0583)			(0.0540)
Community stigma index		0.108		0.0781
		(0.0780)		(0.0726)
Internalized stigma index			0.248***	0.252***
			(0.0301)	(0.0298)
Constant	0.429***	0.419***	0.421***	0.412***
	(0.0479)	(0.0487)	(0.0453)	(0.0461)
Observations	227	227	227	227

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses. Controls for treatment and certification status included in all regressions. Regressions are estimated on the subsample who were asked the willingness-to-accept question. refers to the statement that there is no incentive amount that would convince the participant to certify (i.e. willingness to accept is infinite). *Confidentiality index* includes: whether subject believes information provided during registration is confidential; who can access registration list. *Community stigma index* includes: *Afraid someone will see me at the clinic* and *Afraid someone will find the health card*; whether subject has ever been to registration clinic; and whether subject solicits or completes transactions in public. *Internalized stigma index* includes *Do not want to assume sex worker identity* and agreement with *Some women exchange sex for money but are not sex workers.*

Table 9: Stigma and Willingness to Accept Certification

	(1) WTA	(2) WTA	(3) WTA	(4) WTA
Confidentiality index	-1.133			-2.272
	(4.711)			(4.935)
Community stigma index		-4.100		-1.405
		(7.082)		(6.426)
Internalized stigma index			16.23***	16.21***
			(4.721)	(4.885)
Constant	35.92***	36.44***	40.80***	40.69***
	(4.149)	(4.256)	(4.521)	(4.443)
Observations	109	109	109	109

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses. Controls for treatment and certification status included in all regressions. Regressions are estimated on the subsample who were asked the willingness-to-accept question. is the response to the question, in USD. Responses that there is no incentive amount that would convince the participant to certify are excluded. *Confidentiality index* includes: whether subject believes information provided during registration is confidential; who can access registration list. *Community stigma index* includes: *Afraid someone will see me at the clinic* and *Afraid someone will find the health card*; whether subject has ever been to registration clinic; and whether subject solicits or completes transactions in public. *Internalized stigma index* includes *Do not want to assume sex worker identity* and agreement with *Some women exchange sex for money but are not sex workers.*

Table 10: Summary of findings

Prior expectation	**Results**
Benefits to sex workers	
Legal protection	Limited enforcement of certification laws
Certification price premium	No evidence for price premium
Health improvements	Regular check-ups are accessible without certification
Costs to sex workers	
Monetary costs of initial certification and health visits	Eliminating monetary costs does not affect certification take-up
Recurring monetary costs of regular health visits	–
Confidentiality concerns	Confidentiality concerns are not correlated with certification take-up
Community stigma	Internalized stigma is more important than community stigma

Online Appendix

A Attrition

Table A1 presents analysis of differential and selective of attrition. In column 1, I regress attrition status on treatment assignment. There is no differential attrition across experimental groups. In column 2, I regress attrition status on treatment status, sex worker characteristics, and their interactions. The main effects for sex worker characteristics are omitted from the table for brevity. There is some marginal evidence of selective attrition on women who report that their main job is sex work, and number of clients. However, an F-test of joint significance of the coefficients shown in the table is not significant, with p-value of 0.430.

B Balance

To account for the randomization sessions discussed in section 3.3, I test balance using separate regressions of the following form for each variable x_i:

$$x_i = \beta_0 + \beta_1 T_i + \epsilon_i \tag{4}$$

where T_i is the treatment assignment. Each regression also includes block fixed effects corresponding to the randomization session. I show balance on the baseline sample in Tables A2 and A3 and balance on the endline sample in Tables A4 and A5. Each row represents a separate regression.

C Additional Robustness Checks

Table A1: Attrition

	(1) Attrited	(2) Attrited
Treatment=1	0.0140	0.402**
	(0.0293)	(0.158)
Treatment=1 × Age		-0.00677
		(0.00439)
Treatment=1 × Divorced=1		-0.00801
		(0.0648)
Treatment=1 × Years of education		0.00523
		(0.0101)
Treatment=1 × Children under 18		0.00168
		(0.0183)
Treatment=1 × Years in sex work		0.00579
		(0.00567)
Treatment=1 × Main job is sex work=1		-0.184*
		(0.104)
Treatment=1 × Ever heard of registration program=1		0.0183
		(0.0620)
Treatment=1 × Hours in sex work, past week		-0.00171
		(0.00531)
Treatment=1 × Number of clients, past month		-0.00374*
		(0.00203)
Treatment=1 × Income from sex work, past month (FCFA, thsnds)		-0.000586
		(0.000749)
Treatment=1 × Total income, past month (FCFA, thsnds)		0.000587
		(0.000769)
Treatment=1 × Arrested, past month=1		0.394
		(0.282)
Constant	0.0658***	-0.126
	(0.0202)	(0.0872)
Observations	315	303
F test of joint significance (p-val)		0.430

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Randomization Balance: Baseline Sample (I)

Variable	(1) Control N	(1) Control Mean/SE	(2) Treatment N	(2) Treatment Mean/SE	T-test P-value (1)-(2)
Total income, past month	151	111.705	162	110.966	0.805
		(7.069)		(7.588)	
Registration knowledge index	152	3.158	163	3.074	0.797
		(0.166)		(0.163)	
Age	152	37.526	162	37.302	0.513
		(0.708)		(0.740)	
No. of arrests, past month	151	0.033	162	0.105	0.109
		(0.027)		(0.040)	
Jail time (hours), past month	151	0.000	163	0.276	0.203
		(0.000)		(0.205)	
No. of clients met in a public place	152	0.651	163	0.558	0.643
		(0.099)		(0.095)	
No. of transactions completed in a public place	152	0.033	163	0.172	0.071*
		(0.033)		(0.067)	
No. of recent STI episodes	151	0.291	161	0.323	0.640
		(0.044)		(0.058)	
Severity of recent STI episodes	152	0.496	163	0.412	0.432
		(0.075)		(0.062)	
No. of clients	151	15.682	163	11.166	0.019**
		(1.497)		(1.125)	
No. of unprotected sex acts, past month	151	3.629	163	2.589	0.334
		(0.691)		(0.751)	

Notes: Standard errors are robust. Block fixed effects included in all estimation regressions. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A3: Randomization Balance: Baseline Sample (II)

Variable	(1) Control N	(1) Control Mean/SE	(2) Treatment N	(2) Treatment Mean/SE	T-test P-value (1)-(2)
Frequency of condom use with clients	152	3.355	163	3.515	0.216
		(0.094)		(0.078)	
Exchanged unprot. sex, no. of last 5 trans.	152	0.967	163	0.706	0.129
		(0.126)		(0.104)	
HIV knowledge index	152	2.007	163	1.951	0.753
		(0.070)		(0.072)	
Saw a doctor for recent STI symptoms	152	1.664	163	1.724	0.520
		(0.049)		(0.040)	
No. of preventive medical visits, past month	151	0.358	163	0.436	0.464
		(0.058)		(0.054)	
Ever had an HIV test	152	0.908	163	0.914	0.830
		(0.024)		(0.022)	
Time since last HIV test	151	5.278	160	5.225	0.894
		(0.255)		(0.248)	
Can charge more if registered	152	0.618	163	0.675	0.274
		(0.040)		(0.037)	
No. of last 5 clients who asked if registered	152	0.507	163	0.577	0.557
		(0.095)		(0.100)	
No. of last 5 clients asked to see reg. card	152	0.283	163	0.301	0.680
		(0.081)		(0.080)	

Notes: Standard errors are robust. Block fixed effects included in all estimation regressions. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A4: Randomization Balance: Endline Sample (I)

Variable	(1) Control N	(1) Control Mean/SE	(2) Treatment N	(2) Treatment Mean/SE	T-test P-value (1)-(2)
Total income, past month	140	110.196	149	109.594	0.792
		(7.481)		(7.977)	
Registration knowledge index	141	3.106	150	3.033	0.859
		(0.172)		(0.172)	
Age	141	37.489	149	37.349	0.430
		(0.724)		(0.752)	
No. of arrests, past month	140	0.036	149	0.101	0.175
		(0.029)		(0.041)	
Jail time (hours), past month	140	0.000	150	0.300	0.207
		(0.000)		(0.223)	
No. of clients met in a public place	141	0.631	150	0.540	0.624
		(0.102)		(0.097)	
No. of transactions completed in a public place	141	0.035	150	0.120	0.161
		(0.035)		(0.056)	
No. of recent STI episodes	140	0.293	148	0.338	0.462
		(0.042)		(0.062)	
Severity of recent STI episodes	141	0.518	150	0.428	0.516
		(0.079)		(0.066)	
No. of clients	140	15.057	150	11.553	0.101
		(1.526)		(1.215)	
No. of unprotected sex acts, past month	140	3.493	150	2.740	0.456
		(0.700)		(0.813)	

Notes: Standard errors are robust. Block fixed effects included in all estimation regressions. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A5: Randomization Balance: Endline Sample (II)

Variable	(1) Control N	(1) Control Mean/SE	(2) Treatment N	(2) Treatment Mean/SE	T-test P-value (1)-(2)
Frequency of condom use with clients	141	3.362	150	3.500	0.288
		(0.097)		(0.083)	
Exchanged unprot. sex, no. of last 5 trans.	141	0.965	150	0.720	0.154
		(0.131)		(0.109)	
HIV knowledge index	141	2.007	150	1.953	0.867
		(0.074)		(0.073)	
Saw a doctor for recent STI symptoms	141	1.645	150	1.720	0.382
		(0.052)		(0.041)	
No. of preventive medical visits, past month	140	0.364	150	0.433	0.623
		(0.062)		(0.057)	
Ever had an HIV test	141	0.908	150	0.913	0.952
		(0.024)		(0.023)	
Time since last HIV test	140	5.271	147	5.218	0.929
		(0.265)		(0.259)	
Can charge more if registered	141	0.617	150	0.680	0.234
		(0.041)		(0.038)	
No. of last 5 clients who asked if registered	141	0.532	150	0.547	0.780
		(0.102)		(0.101)	
No. of last 5 clients asked to see reg. card	141	0.305	150	0.267	0.967
		(0.087)		(0.078)	

Notes: Standard errors are robust. Block fixed effects included in all estimation regressions. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A6: Prices and Certification: robustness

Dependent Variable:	Transaction Price (FCFA)		
	(1)	(2)	(3)
	99% Winsor Price	95% Winsor Price	IHS Price
Certified	675.1	675.1	0.175
	(664.9)	(664.9)	(0.147)
Constant	9200.4***	9200.4***	9.528***
	(176.1)	(176.1)	(0.0167)
Round FE	X	X	X
Treatment controls	X	X	X
Observations	2588	2588	2588

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses, clustered at individual level. Analysis is conducted at the transaction level. *Treatment* is an indicator for assignment to the treatment group, which received (i) an informational intervention designed to be persuasive and (ii) an incentive to obtain certification. *Certified* is an indicator for the sex worker having a valid certification when the transaction was completed. *99% Winsor Price* and *95% Winsor Price* are the transaction price winsorized at the 99th and 95th percentiles respectively. *IHS Price* is the inverse hyperbolic sine transformation of the transaction price. All regressions include individual fixed effects.

Table A7: Extensive margin effects of Certification

	(1)	(2)	(3)	(4)
	Quant. Exch.	Quant. Exch.	N. Clients	Ln(Earnings)
Treatment	-3.648			
	(2.248)			
Actively registered		34.38***	14.16**	0.106
		(11.55)	(5.981)	(1.333)
Constant	13.29***	21.54***	10.80***	3.567***
	(2.172)	(4.224)	(1.775)	(0.517)
Block FE	Yes	No	No	No
Month fixed effects	No	Yes	Yes	Yes
Unprotected sex control	No	Yes	Yes	Yes
Observations	290	580	581	579

Standard errors in parentheses, clustered at individual level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Individual and round fixed effects, treatment controls included in all regressions.

Table A8: Extensive margin effects of STIs

	(1) Quant. Exch.	(2) Quant. Exch.	(3) Quant. Exch.
STI_any	-8.700*		
	(4.878)		
Visible STI, past month		-7.721	-8.576
		(5.632)	(5.809)
Invisible STI, past month			-7.939*
			(4.697)
Constant	29.14***	28.30***	28.99***
	(2.524)	(2.345)	(2.533)
Observations	577	580	580

Standard errors in parentheses, clustered at individual level

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Individual and round fixed effects, treatment controls included in all regressions.