

ABRIENDO PUERTAS:
FEASIBILITY AND INITIAL EFFECTS
OF A MULTI-LEVEL INTERVENTION
AMONG FEMALE SEX WORKERS
LIVING WITH HIV IN THE
DOMINICAN REPUBLIC

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ACRONYMS

AOR	Adjusted odds ratio
ART	Antiretroviral therapy
CLIA	Clinical Laboratory Improvement Amendments
COIN	Centro de Orientacion e Investigacion Integral
ELISA	Enzyme-linked immunosorbent assay (test)
DR	Dominican Republic
FSW	Female Sex Workers
HIV	Human immunodeficiency virus
IDCP	Instituto Dermatologico y Cirugia de la Piel
MODEMU	Movimiento de Mujeres Unidas
NGO	Non-governmental organization
OR	Odds ratio
PHDP	Positive Health Dignity and Prevention
R2P	Research to Prevention
STI	Sexually transmitted infections
UNAIDS	Joint United Nations Programme on HIV/AIDS
USAID	United States Agency for International Development
VL	Viral load
WHO	World Health Organization

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EXECUTIVE SUMMARY

Background

The heightened burden of HIV among female sex workers (FSW) has been well documented, making FSW a target population for primary HIV prevention efforts. However, little attention has been paid to the prevention, treatment, and care needs of FSW living with HIV. This population often faces multiple levels of stigma and discrimination related not only to their HIV status, but also to their occupation, socio-economic position, and gender. FSW may therefore require additional support systems to address the psychosocial and structural barriers they face in accessing quality HIV prevention and care services and adherence to antiretroviral therapy (ART), in addition to policy- and social-level changes. Multi-level HIV prevention efforts have been shown to be effective among FSW in the Dominican Republic (DR). However, research and programs have yet to address the experiences of FSW living with HIV in the DR and globally. To address these gaps, this study aimed to (1) assess the feasibility and initial effects of an integrated prevention and care model for FSW living with HIV called *Abriendo Puertas* and (2) assess the feasibility of engaging the male regular partners of FSW living with HIV in prevention and care services.

Methods

This research was designed in response to the aforementioned gaps and findings from formative research on the Positive Health Dignity and Prevention (PHDP) needs of key populations conducted in the DR under the Research to Prevention (R2P) project. We partnered with research, clinical care, non-governmental organization (NGO), and community groups to design an integrated intervention to improve HIV outcomes and overall well-being among FSW living with HIV in the DR. We used a mixed-methods longitudinal design with a cohort of 268 FSW living with HIV and 64 of their steady male partners including socio-behavioral surveys, biological testing for sexually transmitted infections (STI), and viral load (VL) assessments. Additionally, we conducted 42 qualitative in-depth interviews and 2 focus groups (n=11) with a subset of intervention participants. This report presents findings from both the baseline and follow-up assessments of the FSW cohort over a period of 10 months of intervention implementation.

Survey data were analyzed using SPSS version 21. Univariate analyses were conducted to establish a baseline level of study biological and behavioral outcomes of interest (i.e., viral load, prevalent STI, consistent condom use, adherence to HIV care and ART), as well as independent variables (e.g., alcohol and drug use, HIV testing and care experiences, stigma and discrimination). We then developed a multivariate logistic regression model to identify independent variables associated with primary study outcomes at baseline. Bivariate tests of association were used to detect changes in behavioral and biological outcomes pre- to post-intervention.

The IDIs and FGDs were analyzed using thematic coding procedures to better understand how FSW and male regular partners negotiated condom use and engaged with medical services. All interview transcripts were coded using the Atlas.ti© qualitative analysis software. Outputs of these coding exercises were used to prepare matrices around each theme for comparative analysis of patterns across

participants. Memo writing was integrated throughout the analysis process to facilitate the interpretation of the data.

Key Findings

Behavioral characteristics at baseline

Among FSW in our sample, the median number of reported sexual partners in the last month was 12.0 (range 1-51), with most women having at least one intimate partner and several regular clients in addition to new clients. Condom use varied per these partner types, with consistent use being over 90 percent for new and regular clients and 68.9% with steady partners. Nearly one-quarter of the cohort (23.1%) had one or more STI; trichomoniasis was the most commonly diagnosed STI (20.6%). The median length of time since HIV diagnosis was 5 years (range <1-31). While the majority had been engaged in care over the last 6 months, importantly, almost 15% had no contact with HIV-related care. Approximately 72% were on ART at baseline. While adherence to ART in the last 4 days was relatively high (73.8%), 36.4% had interrupted ART at some point in the past. Additionally, 51.9% had a detectable VL at baseline.

Associations with detectable viral load

Among all participants, younger age (18-35 years) (Adjusted Odds Ratio [AOR] 2.45, 95% CI 1.31-4.60), being single compared to having a non-cohabitating partner (AOR 0.45, 95% CI 0.20-0.98), having ever used drugs (AOR 2.34, 95% CI 1.14-4.79), and currently taking ART (AOR 0.17, 95% CI 0.07-0.41) were significantly associated with having a detectable VL. Among only women who had ever been on ART, younger participants had a 2.60 greater odds of having a detectable VL (95% CI 1.29-5.24) compared to older participants, and women who had ever used drugs had a 2.82 greater odds of having a detectable VL (95% CI 1.21-6.58) than women who did not report any drug use. We also found that those who had interrupted ART at any point had a 3.09 greater odds of having a detectable VL than those who had not interrupted treatment (95% CI 1.44-6.59).

Associations with having an STI

Drug use and currently taking ART were found to be significantly associated with having an STI at baseline in multivariate analyses. Participants who reported drug use in the last 6 months had 3.54 greater odds of having an STI as compared to those who had not used (95% CI 1.32-9.45). Being on ART had a protective effect on STIs, such that those on ART had a 0.51 lower odds of having an STI (95% CI 0.26-1.00) than those who were not on treatment. While not significant in bivariate analysis, civil status became significant in the multivariate model, whereas women who reported being single had a 3.21 times greater odds of having an STI at baseline than those who lived with a steady partner (95% CI 1.27-8.11).

Intervention effects

Consistent condom use was the primary outcome variable around which this feasibility and initial effects study was powered to detect significant changes over a 10-month period. We saw statistically significant changes in condom use with all partners in the last 30 days, with this indicator increasing from 71.5% at

baseline to 82.5% at follow-up ($p < 0.001$). Limited change was possible with new and regular clients in terms of consistent condom use, which was already high at baseline.

While not a goal of the study to promote changes in the number of sexual partners among FSW, we documented significant changes in this behavioral outcome during the course of the study. The total number of all sexual partners declined from a mean of 13.0 at baseline to 4.0 at follow-up ($p < 0.001$). We also observed a positive trend in terms of a reduced prevalence of STI at follow-up, with the percent having any STI declining from 23.1% at baseline to 19.2% at follow-up.

We observed significant positive changes in key behaviors such as having interrupted treatment, which declined from 35.6% to 17.2% ($p < 0.001$) (ever vs. last 12 months), as well as adherence to ART, which improved from 72.5% to 88.8% ($p < 0.001$). VL suppression remained relatively stable during the 10-month intervention period, hovering around 50% at both the < 50 and < 400 copies/mL levels.

The intervention also achieved relatively high levels of engagement across the different intervention components: Almost all participants (92.4%) received all 6 of the scheduled individual counseling and health education sessions and 61.7% had contact with the study peer navigator in the last 6 months.

Approximately one-quarter (25.6%) of participants referred their male partner for HIV counseling and testing during the study. Among the 64 male partners engaged, the majority had already been tested for HIV (76.6%) and 27 (42.2%) already had a positive HIV diagnosis. Seven new cases were identified and 9 individuals were linked to HIV care for the first time through the *Abriendo Puertas* intervention.

Qualitative findings

In IDIs and FGDs, women relayed that the intervention had a positive impact on their lives, their ability to manage living with HIV, and their health. Participants described the importance of different components of the intervention including the role of the individual counseling and health education, peer service navigation, and community mobilization through the support and income-generation skills that they learned. Male partners of FSW also reported that they had a positive experience with the intervention, interacting with study staff and the services received.

Conclusions

The *Abriendo Puertas* intervention merits expansion and further evaluation based on study findings. In particular, determining how to best integrate the model into the larger HIV clinical care system in the DR is a key priority for future intervention research. Formative research also indicates that an adapted version of this multi-level model maybe be appropriate and effective for other key populations in this context including transgender women and men who have sex with men. The model may also serve as base for programmatic efforts to address the needs of FSW living with HIV in other geographic settings.

INTRODUCTION

Treatment as Prevention with Key Populations

Recent research linking the use of antiretroviral therapy (ART) to declines in the sexual transmission of HIV in sero-discordant couples has reinvigorated the international dialogue on expanded access to ART and its importance for both individual health and curbing HIV at a population-level (Montaner et al., 2006, 2010; Cohen & Gay, 2010; Cohen et al., 2011). These studies and the debate around expanding treatment as prevention and care and support to people living with HIV have focused primarily on couples with relatively low levels of sexual activity (Cohen et al., 2011). Questions remain, however, regarding the feasibility and potential impact of earlier linkages to care and treatment efforts among vulnerable population groups with larger sexual networks, such as female sex workers (FSW) and their male regular partners.

FSW are a key population at significantly higher risk for HIV infection compared to women overall across diverse settings (Baral et al., 2012). Among women aged 15-49, the prevalence of HIV globally among FSW is 13.5 times that of women who do not engage in sex work (Kerrigan et al., 2013). Recent mathematical modeling analyses have found that targeted interventions among FSW can substantially reduce HIV incidence in both FSW and the population as a whole (Delva et al., 2012).⁷ Indeed, HIV prevalence among FSW has been found to be the strongest predictor of a country's overall HIV prevalence (Talbot, 2007).⁸

To date, limited attention has been paid to the HIV prevention benefits of ART in curbing ongoing sexual transmission among FSW. While research among FSW living with HIV has been limited, several studies have shown that they experience significant barriers to treatment and care. Stigma and discrimination towards FSW living with HIV inhibit access to care (Scambler & Paoli, 2008; Ghimire & Teijlingen, 2009; Chakrapani et al., 2009; Beyrer et al., 2011; Beattie et al., 2012; Mtetwa et al., 2013; Scorgie et al., 2013; Kennedy et al., 2013) while drug use (Shannon et al., 2005) and financial insecurity (Mtetwa et al., 2013; Kennedy et al., 2013) may impede retention in care. This population often faces multiple levels of stigma and discrimination related not only to their HIV status, but also to their occupation, socio-economic position and gender. Additionally, FSW living with HIV have been found to have lower adherence to ART and a slower response to treatment compared to individuals living with HIV not involved in sex work (Diabaté et al., 2011; Huet et al., 2011). FSW may, therefore, require additional support systems to address the psychosocial and structural barriers they face in accessing quality HIV care services and adhering to ART, in addition to policy- and social-level changes.

These findings indicate that in order to achieve viral load (VL) suppression to improve their health and limit ongoing HIV transmission, FSW living with HIV need tailored, multi-level interventions to ensure engagement and retention in quality clinical care services and adherence to ART. Ensuring that FSW living with HIV have access to HIV prevention, treatment, and care services is a fundamental human right (UNAIDS, 2009). Further, strengthening access and adherence to ART to achieve viral suppression among FSW living with HIV will yield additional population-level public health gains by reducing HIV transmission overall given their extensive sexual networks (Kerrigan et al., 2013).

Burden and response to HIV among FSW in the Dominican Republic

FSW are disproportionately affected by HIV in the Dominican Republic (DR) (Halperin et al., 2009; COPRESIDA et al., 2008). Despite its relatively small overall population size, the DR has a large female sex industry, with tens of thousands of Dominican FSW working in the DR and abroad. Sex work is not illegal in the DR, however significant stigma and discrimination does persist (Kerrigan et al., 2001). In Santo Domingo, the capital city, there are approximately 20,000 FSW (Rosario, 2010), with national estimates ranging between 60,000-100,000. Sex work in the DR takes on a diversity of modalities including venue- and non venue-based sex work. Bars and discos are common sex work settings in the DR (Kerrigan et al. 2001), and increasingly independent sex work, where clients are identified and contacted through the Internet and cell phones. The most recent estimates of HIV prevalence among FSW in the DR indicate that prevalence varies across cities, ranging from 3.3% in Santo Domingo, to 8.4% in the Southwestern city of Barahona, where there have been no significant prevention interventions COPRESIDA et al., 2008. The DR has a history of effective primary HIV prevention among FSW (Kerrigan et al., 2006). Yet, the prevention, treatment, and care needs of FSW living with HIV in the DR have received limited attention.

In preparation for the current intervention research, we conducted formative qualitative research with FSW living with HIV in the DR, as well as their male regular partners. FSW participants in this formative work identified poor mental health, layered stigma and discrimination, poor quality HIV care and treatment services, transportation costs, and the costs of medicines beyond ART as barriers to retention in HIV care and adherence to ART (Kennedy et al., 2013). Female participants indicated the feasibility of engaging their male partners in future prevention and care activities, as well as strong sense of HIV/STI-related vulnerability with their regular partners due to the fact that they are less likely to use condoms, in particular with cohabitating partners (Murray et al., 2007). Further, the steady male partners of FSW interviewed reported a strong desire to receive HIV services.

Abriendo Puertas: a multi-level intervention with FSW and their regular partners

The Abriendo Puertas (Opening Doors) intervention was designed based on our findings that FSWs confront individual, relational, environmental, and structural barriers to both HIV prevention (e.g., consistent condom use) and treatment and care outcomes (e.g., engagement in HIV care, treatment continuity, adherence to ART) that ultimately impact viral suppression. The intervention consists of five key components simultaneously implemented during the 10-month follow-up period. These include:

1. Six sessions of individual counseling and health education for FSW participants, focusing on acceptance of HIV, stigma reduction, adherence to care and ART, and condom use;
2. Continuous peer service navigation to ensure access and retention in HIV clinical care services and social support for FSW participants, provided by trained peer navigators;
3. Sensitivity trainings for HIV clinical care providers, focusing on the experiences and needs of FSW living with HIV including how to reduce stigma and discrimination;
4. Community mobilization activities among FSW, to generate solidarity among sex workers and develop practical skills that may create income-generating opportunities.

5. Engagement with the steady male partners of participating FSW, offering them voluntary HIV counseling testing and counseling, and linkages to treatment and care as needed.

As seen in **Figure 1** on the following page, intervention components provided a multi-level response to the socio-structural context and stigma and discrimination experienced by FSW living with HIV in the DR.

Figure 1: Intervention components of *Abriendo Puertas*

Level	Component	Description	Key Elements
Individual	Individual counseling and education	Women from the cohort participate in six sessions at the HVRU throughout the course of the intervention, focusing on counseling, reflective exercises, and health education. The content of the sessions was developed based on formative research and three existing curricula that were adapted for the study population: (1) a globally-established model of peer support networks for women living with HIV in Europe and the UK (the SHE Programme); (2) a locally developed model, <i>Podemos</i> (We Can), developed for people living with HIV in the DR; and (3) the HIV Vaccine Trials HIV testing and counseling protocol for risk reduction.	<p>Counselors follow a predetermined but flexible curriculum that includes the following topics:</p> <ul style="list-style-type: none"> • Adherence to care and ARTs • Prevention (including condom use with clients and regular partners) • Reproductive and sexual health • Disclosure <p>Other topics such as substance use, family planning and partner violence are covered when relevant.</p>
Interpersonal	Peer navigation and support	Trained FSW peer navigators accompany women as they enroll, re-engage with and/or attend HIV-related care and treatment services. Navigators maintain regular contact with study participants, which is critical to support sustained retention over time. While focused on HIV services, navigators have broadened their role at times offering social support and logistical assistance to make connections with other health, human rights, and social services.	<p>Examples of peer navigator activities include:</p> <ul style="list-style-type: none"> • Accompanying a participant to an appointment • Serving as a patient advocate • Visit study participant’s homes • Help women with disclosure to friends, family members or partners
Institutional	Healthcare provider training	Sensitivity trainings are conducted with governmental HIV health care providers on the experiences and needs of FSW living with HIV. The trainings were developed in light of formative research findings that FSW often felt stigmatized or discriminated in HIV clinics. Trainings are conducted with groups of HIV health care providers including both physicians and nurses from several different clinics known to provide care to significant numbers of FSWs, which allows for the exchange of experiences between the clinics.	<p>The sensitivity trainings are meant to:</p> <ul style="list-style-type: none"> • Raise awareness about FSW living with HIV • Identify and improve current clinic attitudes and practices that may be stigmatizing or discriminatory • Improve provider communication skills on topics such as sexual behavior, violence, substance use, and barriers and strategies to treatment adherence.
Community	FSW community solidarity and mobilization	MODEMU is facilitating a series of “ <i>casas abiertas</i> ”—or open houses—where women from the cohort come together throughout the intervention. These gatherings were instituted in response to formative research findings that FSW living with HIV felt socially isolated. At the open houses, women join together as a group and talk about a topics of interest and/or learn practical skills that may ultimately create income-generating opportunities, such as making cleaning products and decorative sandals that they can sell.	<p><i>Casas abiertas</i> aim to:</p> <ul style="list-style-type: none"> • Strengthen the social cohesion and solidarity among sex workers living with HIV. • Address stigma within the sex worker community • Help to address financial barriers to engagement in HIV care and adherence to treatment.

Study aims

The feasibility and initial effects of the multi-level intervention, *Abriendo Puertas*, were assessed utilizing a mixed-methods longitudinal research design with socio-behavioral surveys, biological testing for STI and HIV VL, and qualitative in-depth interviews and focus group discussions. The two study aims were:

1. To assess the feasibility and initial effects of an integrated prevention and care model for FSW living with HIV.

To meet this aim, we recruited FSW living with HIV to participate in an integrated model of HIV care and prevention addressing the multiple layers of stigma and discrimination they face, barriers to access to ART, and ongoing HIV transmission. Of these, a subgroup of FSW participated in qualitative in-depth interviews and focus groups at the end of the intervention.

2. To assess the feasibility of engaging the male regular partners of FSW living with HIV in HIV prevention and care services.

To meet this aim, we survey the male regular partners of FSW to better understand their HIV-related risk behaviors and engage them in HIV prevention efforts and care and treatment, as appropriate. Of these, a subgroup of men also participated in qualitative in-depth interviews.

METHODS

This report presents findings from both the baseline and follow-up assessments of the FSW cohort over a period of 10 months of intervention implementation and from the cross-sectional assessment of male regular partners. This study was implemented in partnership with several groups in the DR, including a local research center, the Instituto Dermatológico y Cirugía de la Piel (IDCP), the Movimiento de Mujeres Unidas (MODEMU), a sex worker rights organization in Santo Domingo, as well as the Centro de Orientación e Investigación Integral (COIN), a non-governmental organization (NGO) that pioneered HIV prevention efforts with FSW across the DR.

Study participants

From November 2012 to February 2014, 268 FSW participants were enrolled into a cohort, with 250 participants successfully engaged in the *Abriendo Puertas* intervention over a 10-month period and 226 completing the entire intervention, which represents over 90% retention. All participants were at least 18 years of age at the time of consent, spoke Spanish, were HIV-positive, and had exchanged sex for money in the month preceding enrollment. Participants were recruited to the cohort through a hybrid sampling approach including recruitment by peer navigators and referral through HIV clinics and other participants in the study.

Women participating in *Abriendo Puertas* were invited to refer their male regular partner(s) to participate in the study. Due to the potentially sensitive nature of HIV testing within couples, the participation of male regular partners was not a requirement for FSWs' participation in the study. A male regular partner was defined as someone over the age of 18 who was considered to be an ongoing or steady partner who had sex with a participating FSW at least 4 times in the last 3 months. All male regular partners were required to be conversant in Spanish. From November 2012 to February 2014, 64 male regular partners of FSW were recruited into the study.

Study Procedures

To assess the feasibility and initial effects of the *Abriendo Puertas* intervention, we conducted an interviewer-administered socio-behavioral survey with FSW participants at baseline and 10-month follow-up. Key variables in the survey included: numbers of and consistent condom use with new and regular clients and steady partners in the last 30 days, initial linkages to and engagement in HIV care services including whether they had attended or missed any clinic visits over the last 6 months, initiation of ART and breakages in care (ever and last 12 months), adherence to ART in the last 4 days using an established ACTG measure (Chesney, 2000), alcohol and drug use in prior month, and internalized and experienced HIV stigma and discrimination based on validated measures (Berger, 2001; Zelaya et al, 2008; Baral et al, 2011), which were then adapted to assess sex work-related stigma and discrimination. All data collection occurred in private offices at the IDCP/HVRU research site in Santo Domingo.

Primary biologic outcomes (i.e., undetectable HIV VL and any prevalent STI) of FSW were measured through samples obtained during a clinical exam by a physician at baseline and follow-up. Biological specimens were tested for STI at a laboratory at the Johns Hopkins School of Medicine using the Gen-

Probe Inc. Aptima assays for Gonorrhea and Chlamydia (Combo), and Genprobe assay for Trichomoniasis, respectively. The laboratory was certified under the Clinical Laboratory Improvement Amendments (CLIA). All participants who tested positive for Gonorrhea, Chlamydia, and Trichomoniasis received treatment free of charge based on national standards of care. HIV VL was assessed at the Dominican National Reference Laboratory in Santo Domingo. FSW were provided their HIV VL results and given the option to provide authorization for the study to share their HIV VL results with their health care provider.

To assess the feasibility of engaging the male regular partners of FSW living with HIV in HIV prevention and care, we conducted an interviewer-administered, cross-sectional socio-behavioral survey. Key independent variables in the survey included: consistent condom use with sexual partners, HIV testing experiences, and alcohol and drug use. Additionally, primary biologic outcomes such as HIV status and any prevalent STI were measured via samples obtained during a clinical exam by a physician. HIV testing for men included two rapid tests (Determine and Retrocheck), followed by an enzyme-linked immunosorbent assay (ELISA) test in the case of discordance. All male partners who tested positive for HIV were linked to care and treatment. HIV-negative men received individual-level HIV risk reduction counseling. Urine specimens were processed for STI testing at the Johns Hopkins School of Medicine. All men who tested positive for Gonorrhea, Chlamydia, and Trichomoniasis received treatment free of charge based on national standards of care.

A subset of study participants participated in qualitative, in-depth interviews (IDIs) and focus group discussions (FGDs) in January 2014. Semi-structured IDIs were conducted with 24 FSW living with HIV who were in the *Abriendo Puertas* cohort. Additionally, a total of 11 cohort members participated in 2 FGDs. Semi-structured IDIs were conducted with 18 regular male partners of participating FSW. These interviews and discussions explored participants' experiences with each component of the *Abriendo Puertas* intervention model.

Data analysis

Survey data were analyzed using SPSS version 21. We conducted univariate analysis to describe the population and to establish a baseline level of study biological and behavioral outcomes of interest (i.e., viral load, prevalent STI, consistent condom use, adherence to HIV care and ART), as well as independent variables (e.g., alcohol and drug use, HIV testing and care experiences, stigma and discrimination). We developed a multivariate logistic regression model to identify independent variables associated with our primary study outcomes at baseline. We then conducted bivariate tests of association to detect changes in behavioral and biological outcomes pre- to post-intervention. Analysis of male regular partner survey data focused on descriptive analyses, including factors associated with higher risk behaviors and health seeking behavior.

The IDIs and FGDs were analyzed using thematic coding procedures to better understand how FSW and male regular partners negotiated condom use and engaged with medical services. More specifically, we first prepared an analytic summary of the main story of each interview. We then developed a list of analytic codes to represent the key themes that emerged from the interview transcripts. Key codes

included engagement and experiences with the different intervention components (e.g., individual counseling, peer navigation, and community-based open houses or *casas abiertas*). All interview transcripts were coded using the Atlas.ti© qualitative analysis software. Outputs of these coding exercises were used to prepare matrices around each theme for comparative analysis of patterns across participants. Memo writing was integrated throughout the analysis process to facilitate the interpretation of the data.

Human Subjects (IRB) approval

All study protocols and consent procedures were approved by the Institutional Review Boards of the Johns Hopkins Bloomberg School of Public Health, the University of North Carolina, and the IDCP.

RESULTS

Socio-demographic, behavioral, and biological characteristics of the baseline sample

As seen in **Table 1**, the median age of participants was 35.5 years (range 18-61), with the large majority (81%) being in some form of steady intimate partnership. Formal education was low and over one-third (35.4%) of participants had no secondary education. Almost all participants (93.7%) had at least one child with a median of 3 children (range 1-8). While most lived in Santo Domingo, 21.6% lived in other cities in the DR, but came to Santo Domingo for their HIV care.

Participants worked in a range of sex work settings including the street, establishments, and independently via cell phone. Most had been in sex work for many years (median 15 years, range 0-45). Of interest, 18.8% of participants first became involved in sex work after their HIV diagnosis (data not shown), echoing findings from our formative work. While there was a wide range in the price that the women charged per date (5-100 \$US dollars), the median charge per date was 800 pesos (or \$US 20 dollars). Alcohol use was common among the sample and almost half (46.8%) of participants reporting using alcohol sometimes or always before having sex. Nearly one-quarter of women (24.3%) reported ever having used drugs (marijuana, cocaine, crack, heroin) and 8.2% reported drug use in the last 6 months. The median score for internalized stigma was 18.0 (range 8-32). For experienced stigma, the median score was 1.0 (range 0-10). However, 61.8% of participants reported one or more forms of experienced stigma at some point.

Table 1: Socio-demographic characteristics of Female Sex Workers Living with HIV at Baseline of the *Abriendo Puertas* Intervention in Santo Domingo (n=268)¹

Variables	Percentage (frequency) in each category or median (range)
Age in years	35.5 (18-61)
Civil status	
Single, no steady partner	19.0% (51)
Lives with a spouse/steady partner	38.4% (103)
Non-cohabitating steady partner	42.5% (114)
Education in years	7.0 (0-16)
0-8 th grade	64.6% (173)
9 th grade to university graduate	35.4%
Has any children	93.7% (251)
Number of children	3.0 (1-8)
Current residence	
Santo Domingo	78.4% (210)
Another city/town/rural area	21.6% (58)
Type of sex work venue	
Works in the street	56.6% (152)
Works in a sex establishment or independently	43.3% (116)
Years in sex work	15.0 (0-45)
Average price per date (in US dollars)	20 (5-100)
Alcohol use in last 30 days	
At least once a week	35.4% (125)
Less than weekly	64.6% (173)
Alcohol use before sex	
Sometimes/always	46.8% (125)
Never	53.2% (142)
Drug use ever	24.3% (65)
Drug use in last 6 months	8.2% (22)
Score for internalized HIV stigma	18.0 (8-32)
Score for experienced HIV stigma	1.0 (0-10)

¹ Table 1 has been adapted from Donastorg et al, 2014

In **Table 2** we present the HIV-related behavioral and biological characteristics of our sample. The median number of reported sexual partners in the last month was 12.0 (range 1-51), with most women having at least one intimate partner and several regular clients in addition to new clients. Condom use varied per these partner types, with consistent use being over 90 percent for new and regular clients and 68.9% with steady partners. Nearly one-quarter of the cohort (23.1%) had one or more STI; trichomoniasis was the most commonly diagnosed STI (20.6%).

The median length of time since HIV diagnosis was 5 years (range <1-31). While the majority had been engaged in care over the last 6 months, importantly, almost 15% had no contact with HIV-related care. Additionally, more than one-third (36.1%) of the sample that was engaged in care had missed a care appointment in the last 6 months. Approximately 72% were on ART at baseline. While adherence to ART in the last 4 days was relatively high (73.8%), 36.4% had interrupted ART at some point in the past. Additionally, 51.9% had a detectable VL at baseline.

Table 2: Behavioral and Biological Characteristics of Female Sex Workers Living With HIV at Baseline of the *Abriendo Puertas* Intervention in Santo Domingo, Dominican Republic (n=268)¹

Variables	Median (range) or percent (N) per category
<i>Sexual risk behaviors and outcomes</i>	
New clients in last 30 days	3.0 (0-49)
Regular clients in last 30 days	7.0 (0-46)
Steady partners in last 30 days	1.0 (0-9)
All sexual partners in last 30 days	12 (1-51)
Consistent condom use with new clients in last month	94.4 (201)
Consistent condom use with regular clients last month	93.1 (230)
Consistent condom use with steady partners last month	68.9 (153)
Consistent condom use with all partners last month	72.0 (190)
Presence of STIs	23.1 (57)
Chlamydia	3.2 (8)
Gonorrhea	0.8 (2)
Trichomoniasis	20.6 (51)
<i>HIV care and treatment behaviors and outcomes</i>	
Time since HIV diagnosis (in years)	5.0 (0-31)
Received HIV care in the last 6 months	85.1 (228)
Missed appointment in last 6 months (n=228)	36.1% (82)
Ever taken ART	78.4 (210)
Currently taking ART	72.4 (194)
Ever interrupted ART	36.4 (76)
Adherence to ART last 4 days	
Missed at least 1 day	26.2 (55)
Never missed	73.8 (155)
Detectable viral load (≥ 50 copies/mL)	51.9% (138)

¹Table 2 has been adapted from Donastorg et al, 2014

Associations with detectable viral load at baseline

Two models were developed to examine factors associated with detectable VL among study participants (Table 3). The first model included all participants whereas the second included only women who had ever been on ART. In multivariate analysis, younger age (18-35 years) (Adjusted Odds Ratio [AOR] 2.45, 95% CI 1.31-4.60), being single compared to having a non-cohabitating partner (AOR 0.45, 95% CI 0.20-0.98), having ever used drugs (AOR 2.34, 95% CI 1.14-4.79), and currently taking ART (AOR 0.17, 95% CI 0.07-0.41) remained significantly associated with having a detectable VL. While engagement in care did not remain significant in the multivariate model, it was significantly associated with currently being on ART and in turn, on the critical behavioral pathway to VL suppression.

In the multivariate analysis among study participants who had ever been on ART, we saw the importance of age and again drug use. Younger participants had a 2.60 greater odds of having a detectable VL (95% CI 1.29-5.24) compared to older participants, and women who had ever used drugs had a 2.82 greater odds of having a detectable VL (95% CI 1.21-6.58) than women who did not report any drug use. We also found that those who had interrupted ART at any point had a 3.09 greater odds of having a detectable VL than those who had not interrupted treatment (95% CI 1.44-6.59).

Table 3: Unadjusted and Adjusted Odds of Having a Detectable Viral Load among Female Sex Workers Living with HIV at Baseline of the *Abriendo Puertas* Intervention in Santo Domingo, Dominican Republic¹

	Among all women (n=266) [^]				Among women who have ever taken ART (n=207) [^]			
	UOR	95% CI	AOR	95% CI	UOR	95% CI	AOR	95% CI
Socio-demographics								
18-35 years old	3.71***	2.23-6.16	2.46**	1.31-4.60	3.53***	1.96-6.27	2.60**	1.29-5.24
Marital status								
- Single vs. lives with a partner	0.41**	0.20-0.82	0.50	0.25-1.47	0.43*	0.19-0.97	0.50	0.20-1.30
- Single vs. has a non-cohabitating partner	0.40**	0.20-0.80	0.45*	0.20-0.98	0.48*	0.17-0.86	0.45	0.18-1.09
Behaviors								
Ever used drugs	3.48***	1.88-6.47	2.34*	1.14-4.79	4.03***	1.99-8.15	2.82*	1.21-6.58
Currently taking ART	0.15***	0.08-0.29	0.17***	0.07-0.41	0.16**	0.04-0.57	0.48	0.11-2.19
Ever interrupted ART	--	--	--	--	3.55***	1.96-6.41	3.09**	1.44-6.59

*p<0.05 **p<0.01 ***p<0.001; ¹Table 3 has been adapted from Donastorg et al., 2014

[^]Controlling for: education level, number of children, city of residence, time in sex work, alcohol consumption, time since HIV diagnosis, engagement in HIV care in the last 6 months.

Associations with having an STI at baseline

As reported in **Table 4**, drug use and currently taking ART were found to be significantly associated with having an STI at baseline in multivariate analyses. Participants who reported drug use in the last 6 months had 3.54 greater odds of having an STI as compared to those who had not used (95% CI 1.32-9.45). Being on ART had a protective effect on STIs, such that those on ART had a 0.51 lower odds of having an STI (95% CI 0.26-1.00) than those who were not on treatment. While not significant in bivariate analysis, civil status became significant in the multivariate model, whereas women who reported being single had a 3.21 times greater odds of having an STI at baseline than those who lived with a steady partner (95% CI 1.27-8.11).

Table 4: Unadjusted and Adjusted Odds of Having an STI among Female Sex Workers Living with HIV at Baseline of the *Abriendo Puertas* Intervention in Santo Domingo, Dominican Republic (n=257)¹

	Female Sex Workers Living with HIV [^]			
	UOR	95% CI	AOR	95% CI
<i>Socio-demographics</i>				
Single vs. lives with a steady partner	1.83	0.81-4.09	3.21**	1.27-8.11
<i>Behaviors</i>				
Used drugs in the last 6 months	4.27**	1.73-10.62	3.54**	1.32-9.45
Currently on ART	0.51*	0.26-0.99	0.51*	0.26-1.00

*p<0.05 **p<0.01; ¹Table 4 has been adapted from Donastorg et al, 2014

[^]Controlling for: age, education level, number of children, alcohol consumption, and consistent condom use

Pre to post intervention changes in consistent condom use

Consistent condom use was the primary outcome variable around which this feasibility and initial effects study was powered to detect significant changes over a 10-month period. As seen in **Table 5**, we saw statistically significant changes in condom use with all partners in the last 30 days, with this indicator increasing from 71.5% at baseline to 82.5% at follow-up (p<0.001). Limited change was possible with new and regular clients in terms of consistent condom use, which was already quite high at baseline. Important changes were observed with steady partners, though this was not statistically significant.

Table 5: Changes in consistent condom use among FSW living with HIV participating in the *Abriendo Puertas* intervention in Santo Domingo, Dominican Republic (n=228)

Variables	Baseline % (N)	Follow-up % (N)	p-value
Consistent condom use with new clients in last 30 days (n=83)	93.5 (172)	96.7 (89)	0.688
Consistent condom use with regular clients in last 30 days (n=122)	92.3 (193)	95.4 (124)	0.774
Consistent condom use with steady partners in last 30 days (n=127)	67.7 (126)	73.0 (103)	0.392
Consistent condom use with all partners in last 30 days (n=228)	71.5 (162)	82.5 (188)	0.002

Pre to post intervention changes in the number of sexual partners

While not a goal of the study, we did document changes in the number of sexual partners among FSW (Table 6). Interestingly, we observed statistically significant reductions in the number of all of the different sexual partner types assessed, including new clients, regular clients, steady partners, and all sexual partners during the last 30 days. The total number of all sexual partners declined from a mean of 13.0 at baseline to 4.0 at follow-up ($p < 0.001$).

Table 6: Changes in the Mean Number of Sexual Partners among FSW living with HIV participating in the *Abriendo Puertas* intervention in Santo Domingo, Dominican Republic (n=228)

Variables	Baseline Mean (Range)	Follow-up Mean (Range)	p-value
New clients in last 30 days	4.5 (0-37)	1.5 (0-16)	0.000
Regular clients in last 30 days	7.3 (0-46)	2.5 (0-59)	0.000
Steady partners in last 30 days	1.3 (0-9)	0.68 (0-3)	0.000
All sexual partners in last 30 days	13.0 (1-51)	4.6 (0-60)	0.000

Pre to post intervention changes in the prevalence of STI

Table 7 documents the baseline and follow-up prevalence of STI among FSW living with HIV participating in the intervention. While the study was not powered to detect changes in this outcome, we did observe a positive trend in terms of a reduced prevalence of STI at follow-up, with the percent having any STI declining from 23.1% at baseline to 19.2% at follow-up. Most of the STI observed were cases of trichomoniasis, which declined from 20.8% to 15.5% during the study ($p < 0.080$).

Table 7: Changes in the prevalence of STI among FSW living with HIV participating in the *Abriendo Puertas* intervention in Santo Domingo, Dominican Republic (n=209)

Variables	Baseline % (N)	Follow-up % (N)	p-value
Any STI	23.1 (50)	19.1 (42)	0.211
Chlamydia	2.8 (6)	4.1 (9)	0.727
Gonorrhea	0.9 (2)	0.9 (2)	1.000
Trichomoniasis	20.8 (45)	15.5 (34)	0.080

Pre to post intervention changes in treatment and care outcomes

In Table 8 we compare baseline and follow-up treatment and care behaviors among FSW living with HIV participating in the intervention. We observed significant positive changes in key behaviors such as having interrupted treatment, which declined from 35.6% to 17.2% ($p < 0.001$) (ever vs. last 12 months), as well as adherence to ART, which improved from 72.5% to 88.8% ($p < 0.001$). VL suppression remained relatively stable during the 10-month intervention period, hovering around 50% at both the < 50 and < 400 copies/mL levels.

Table 8: Changes in treatment and care outcomes among FSW living with HIV participating in the *Abriendo Puertas* intervention in Santo Domingo, Dominican Republic¹

Variables	Baseline	Follow-up	p-value
Received HIV care in the last 6 months	85.5 (195)	94.5 (208)	0.001
Missed appointment in last 6 months	36.4 (71)	31.0 (66)	0.155
Currently taking ART	72.4 (165)	74.6 (170)	0.542
Interrupted ART	35.6 (63)	17.2 (32)	0.002
Never missed an ART dose in last 4 days	72.5 (129)	88.8 (166)	0.001
Detectable viral load (n=227)			
≥50 copies/mL	49.8 (113)	49.1 (112)	0.856
≥400 copies/mL	48.5 (108)	47.4 (106)	0.411

¹N=228 for behavioral outcomes and 233 for biological treatment and care outcomes

Engagement with the *Abriendo Puertas* intervention components

As shown in **Table 9**, the intervention achieved relatively high levels of engagement across the different intervention components. Almost all participants (92.4%) received all 6 of the scheduled individual counseling and health education sessions. Approximately 60 percent (61.7%) had contact with the peer navigator in the last 6 months, and one-quarter (25.6%) of participants referred their male partner for HIV counseling and testing during the study period. Approximately half (50.4%) participated in one or more community mobilization activity. Additionally, the project trained 40 HIV clinical care providers from 9 different HIV clinics in Santo Domingo. The training took place during a three-day workshop in which a needs assessment was conducted with providers and problem solving activities took place to develop plans and practices to better serve the needs of FSW living with HIV within their clinical care facilities.

Table 9: Engagement with the *Abriendo Puertas* intervention components at 10-month follow-up among FSW living with HIV in Santo Domingo, Dominican Republic

Level	Variables	Percent (%)	N
Individual	Received all 6 individual counseling sessions	92.4%	231/250
Relational	Had contact with an HIV peer service navigator	61.7%	140/227
	Referred steady male partner for HIV counseling and testing	25.6%	64/250
Environmental	Number of HIV clinical care providers sensitized	40 providers	9 clinics
Structural	Participated in community mobilization activities	50.4%	115/228

Socio-demographic and behavioral characteristics of male partners

Table 10 presents the socio-demographic and behavioral characteristics of the male partners engaged in the study by their FSW partner. The median age of male participants was 39.0 and most had a primary

school education. Their median monthly income varied greatly (\$US45-4000). The majority of these men were living with the FSW partner who referred them, although only approximately half had disclosed their HIV status to that partner (55.4%). Most had children and lived in Santo Domingo. Their median number of sexual partners in the last month was 1.0, and consistent condom use with all partners was 61.9%. Alcohol and drug use was common in the sample, with 39.7% reporting drinking at least once a week and 42.9% reporting prior drug use.

Most had been tested for HIV previously (76.6%). Among the 64 male steady partners engaged in the study, 27 already had a positive HIV diagnosis. Seven new cases were identified and 9 individuals were linked to HIV care for the first time through the *Abriendo Puertas* intervention.

Among those who already knew they were living with HIV, 92.6% had received HIV care in the past 6 months, and nearly all said they received care more frequently than every 3 months. The large majority (84.0%) was currently on ART. Of those currently on ART, 90.4% said they followed their prescribed doses 'perfectly', 4.8% said 'closely' and 4.8% said 'not very closely'.

Table 10: Socio-demographic characteristics and HIV-related behaviors of male regular partners of FSW living with HIV participating in the *Abriendo Puertas* intervention in Santo Domingo, Dominican Republic (n=64)

Variables	Percentage (frequency) in each category or median (range)
Age in years	39.0 (20-67)
Monthly income	\$US 237.50 (45-4,000)
Education in years	8.0 (0-13)
0-8 th grade	70.9% (45)
9 th grade to university graduate	29.0% (19)
Civil status	
Legally married	4.7% (3)
Live together	65.6% (42)
Has a regular non-cohabitating partner	28.1% (18)
Single (including widow, divorced, separated)	1.6% (1)
Has any children	82.8% (53)
Number of children	3.0 (1-8)
Current residence	
Santo Domingo	89.1% (57)
Another city/town/rural area	10.9% (97)
Currently employed/works	82.8% (53)
Alcohol use in last 30 days	
At least once a week	39.7% (25)
Less than weekly	60.3% (38)
Drug use ever	42.9% (27)
Drug use in last 6 months	9.5% (6)
Ever involved in selling drugs	12.9% (8)
<i>HIV testing</i>	
Ever tested for HIV	76.6% (49)
Received counseling before last HIV test	52.1% (25)
Received counseling after last HIV test	56.3% (27)
Had previous diagnosis with HIV	42.2% (27)
<i>Sexual behavior</i>	
Total number sex partners in the last 30 days	1 (0-4)
Total number of new sex worker partners	0 (0-2)
Total number of regular sex worker partners	0 (0-3)
Total number of regular partners	1 (1-3)
Consistent condom use with all partners	61.9% (39)
<i>Prior HIV diagnosis (n=27)</i>	
Engaged in care in last 6 months	92.6% (25)
Currently on ART	84.0% (23)
Perfectly adheres to ART	90.5% (24)
Disclosed to FSW partner	55.6% (15)

Participant experiences with the *Abriendo Puertas* intervention

Overall, women participating in the IDIs and FGDs relayed that the intervention had a positive impact on their lives, their ability to manage living with HIV, and their health. Participants described the importance of different components of the intervention including the role of the individual counseling and health education, peer service navigation, and community mobilization through the support and income-generation skills that they learned.

Participants reported that talking to the intervention counselors and knowing that other people cared for them regardless of their HIV status or occupation provided them with a sense of relief, hope, and support. Many respondents indicated that before participating in the intervention they had a very low self-esteem. When invited to participate in the intervention, one respondent indicated she was reluctant at first because she wondered: *“Why would they be interested in a prostitute living with HIV?... [Before the intervention] I used to feel that I was insignificant.”* Low self-esteem was primarily related to feelings of guilt and anxiety around living with HIV and the strong discrimination that people living with HIV face in the Dominican Republic. This was compounded with gender-based violence and sex work-related discrimination faced by some of the respondents. Women indicated that through their counselors they learned coping strategies to avoid internalizing stigma and discrimination. They also appreciated the respect and kindness received from intervention staff that many did not otherwise have in their life.

Women also indicated that the intervention helped them to change their perspectives about the experience of living with HIV. They reported developing a sense that HIV was not insurmountable and was not in control of their fate. For example, one interviewee reported, that she *“will die when God wants it, not when the disease decides it.”* Another participant stated: *“This is a disease like any other disease; the main thing is that one has to take care of oneself.”* A few respondents indicated that before participating in the intervention they felt that HIV was a “monster” that besieged them. Through *Abriendo Puertas* many participants realized that a person living with HIV could lead a healthy life if one intentionally takes care of her health and adheres to treatment. The intervention helped the participants to make sense and learn from their experience living with HIV, and to empower themselves rather than feel like victims.

A few women indicated that they faced verbal or physical violence and that through the intervention they learned the importance of respecting themselves and not letting other people abuse or mistreat them. Over the course of the intervention, some of the respondents reported separating from partners who abused them emotionally or verbally and some separated from partners who refused to use condoms. Further, several respondents indicated that before participating in the intervention they were not using condoms consistently and that intervention counselors helped them to fully understand the importance of consistent condom use with their clients and regular partners. In the women’s narratives, the importance of condom use was closely tied to and enhanced by their improved self-esteem, respect for themselves, and solidarity with others. Consistent condom appeared to be the enactment of the strengthened belief that they were “important.” Some women also expressed being committed to using condoms consistently because of fear of violence and/or abuse if they were accused of passing the virus to others.

While the women's sense of control over HIV was strengthened over the course of the intervention, many indicated that they face a harsh socio-economic reality in a country devoid of strong safety nets for the poor and with an HIV anti-discrimination law that is often not enforced. Many women could not follow recommended health practices due to lack of resources to attend clinic visits or not having the economic means to take the medication with food as prescribed. Financial insecurity created stress related to responsibilities such as paying for rent and school fees for their children. A number of respondents indicated that they were planning to or had already started making and selling some of the products that they learned to make at the *casas abiertas* implemented by MODEMU including decorative sandals, hair products, and candles. Most of the women interviewed said that one of their major hopes and dreams was to improve their financial security by starting a micro-business or finding a different job. Several participants indicated that they would like to leave or cut back on sex work because this line of work was not conducive to taking care of their health as it sometimes required staying up late at night, having to drink alcohol with customers, or facing an abusive client.

Through the *casas abiertas* participants met other women who were living with HIV and leading healthy lives. Additionally, these gatherings improved the women's sense of belonging and solidarity. In the FGD with women who participated in the *casas abiertas* they revealed that they had developed friendships and networks with other program participants and kept in touch with them via phone or meetings after the intervention ended. These newly-formed connections enabled women to access additional networks to help themselves and others living with HIV. The ability to help others imbued a sense of meaning to the experience of living with HIV, coming from a sense of reciprocity and connection with others. This sense of community, however, was not fully shared by all study participants. The FGD with respondents who did not participate in the *casas abiertas* revealed that the women felt it was impossible to create solidarity among FSW. The comparison of both groups of women reveals that having the opportunity to openly interact with other FSW who were living with HIV in a safe environment helped to strengthen trust, solidarity, and reciprocity among participants. Several participants indicated the need to further strengthen the community mobilization component of the intervention offering more opportunities for a greater number of FSW to come together in a safe space on a regular basis and to build practical financial and income-generating skills.

The following story represents the reflection of one FSW participant on her experience with the intervention as a whole.

For me [the intervention] was very good because I was very depressed and I thank God for coming here to *Abriendo Puertas*. Now I feel great, I feel I can move forward, I have more faith in myself. All the staff members have helped me a lot. I thought that I was going to die, that my time was over. [At *Abriendo Puertas*] I got a very good psychologist. Whenever I came to see her she gave me support, she energized me, she always told me that I looked pretty. And here [at MODEMU] I participated in [*casas abiertas*] to learn to decorate sandals, and make hair products and candles. I thought to myself, but if I'm doing all of this, why can't I move forward? I came here and they changed my life because I was so depressed, I felt dirty, I felt isolated. [Here] I met many women who are just like me. When they sent me to the *casas abiertas* I did not want to go inside the room. When I sat down I wanted to run away but a lady said to me "no [don't leave], you're just like me and if I have not left why would you leave?" I appreciated that, I stayed there, I used to think that I was the only one in this world who is living like this. At the *casas abiertas* I met all those women who live full of joy, that smile to life. I can smile to life, too! – Female sex worker participant

Male partners of FSW interviewed also reported that they had a positive experience with the intervention, interacting with study staff and the services received. For example, one man said:

When I climbed those 4 flights of stairs, I felt good, because I felt above all like an important person...I did an interview here, I liked it a lot, they treated me not like a person, but they treated me like an important executive. – Male partner participant

The other men interviewed echoed this sentiment of feeling respected by the study staff. Additionally, men who had a previous HIV diagnosis noted that they were often treated poorly elsewhere. One man said, "*I felt good [here]...there are places where they say to you, 'Ay, you have HIV, don't infect me.'*" While the interviewer probed for any negative experiences with the study, none of the men interviewed reported any. Male participants reported that study staff was well-equipped to help them assess their risk and manage their fears of a possible HIV diagnosis.

All participating steady male partners of the participating FSW living with HIV said the study had either no effect or a positive effect on their relationship. Those who said it had a positive effect typically reported there was more open dialogue within the relationship as a result of being involved in the study.

DISCUSSION

We found the *Abriendo Puertas* model to be highly feasible and acceptable among female sex workers living with HIV and their steady male partners. The efficiency of our recruitment process, reaching 268 women in a 3-month period, and our retention rate of over 90% among the 250 women who started the intervention, reflect that this model responds to gaps in services and support currently available to this population. We also reached a substantial number of steady male partners and identified new HIV cases, suggesting that partner referral initiated by FSW living with HIV can be a safe and effective approach to reaching men, especially those not reached by other HIV testing strategies. Qualitative findings highlight the importance of the multi-level approach among women, which responded to the range of factors that shape HIV-related behaviors and outcomes, from the individual to the structural levels. In the qualitative interviews, women's narratives supported the integrated nature of the model and the importance of addressing the multiple levels of influence on their HIV prevention and care outcomes. Both men and women also emphasized the importance of feeling respected and trust in the context of the intervention.

With regard to sexual risk behaviors, women in the cohort demonstrated a significant increase in consistent condom use with all sexual partners in the last month (71.5% to 82.5%, $p < 0.002$), which was our primary outcome, as well as a significant reduction in their total numbers of sexual partners (13.0 to 4.6, $p < 0.001$). Consistent condom use was already high at baseline and the most substantial increase was with steady partners, which is an important achievement given the challenges to promoting consistent condom use in partnerships characterized by trust and intimacy. These findings suggest the potential for ongoing health education and counseling promoting consistent condom use as a strategy for preventing ongoing HIV transmission. While not statistically significant, we found a reduction in the overall prevalence of STI (21.1% to 19.1%) that suggests the potential for this intervention model to impact biological outcomes if studied in a larger sample and over a longer period of follow-up.

It is important to note that the topic of partner reduction was not addressed in any of the *Abriendo Puertas* intervention components, as this was not a goal of the intervention. The substantial reduction in the number of sexual partners may indicate that through involvement in the various intervention activities— in particular the *casas abiertas*—women developed new skills and contacts to generate income and consequently had fewer clients. Further data analysis is needed to better understand this unexpected finding including whether participants that engaged in income generating activities associated with the intervention were more likely to reduce their number of sexual partners.

We achieved significant improvements in indicators related to HIV care and treatment. The proportion of women engaged in care, while already quite high at baseline (85.5%), increased significantly to 94.5% ($p < 0.001$). Among women on ART, adherence to treatment increased significantly (72.5% to 88.8%, $p < 0.001$) and interruption in care decreased. The decline in interrupting treatment is important as we found this variable to be significantly associated with having a detectable VL at baseline. While the proportion of women who were virally suppressed essentially remained constant (49.8% to 49.1% for ≥ 50 copies/mL; 48.5% to 47.4% for ≥ 400 copies/mL) we did not power the study to detect changes in this indicator. Additionally, given the encouraging findings regarding engagement in care and treatment,

we would anticipate seeing more substantial improvements in VL suppression with a longer period of follow-up.

From both the baseline and follow-up data, one clear finding is that while there are high levels of engagement in care and treatment adherence, nearly half of the sample still had detectable viral loads. The gap between care and treatment coverage and viral suppression suggests the need to strengthen ongoing prevention, care, and treatment services to improve HIV treatment outcomes. Additional data analysis and research on factors associated with treatment continuity is also needed given that having a breakage in treatment, but not adherence to ART, was significantly associated with having a detectable viral load among participating FSW in multivariate analysis conducted at baseline. The importance of drug use as a significant factor associated with both VL and STI outcomes indicates that future research and programming must address this issue. Finally, baseline data indicate the need to address unique barriers to viral suppression among younger women, as they were found to be more likely to have a detectable VL at baseline.

In response, we recommend the following for future programming and intervention research:

- Implement the counseling and navigation components of the *Abriendo Puertas* model in the context of existing HIV clinics in the Dominican Republic and placing greater emphasis on comprehension of treatment and adherence throughout all levels of the model.
 - HIV care providers who participated in the sensitivity training demonstrated a high level of interest and commitment to applying the *Abriendo Puertas* model to their clinics. They also manifest the need for more ongoing capacity building. In response, we suggest creating a care collaborative to facilitate training and exchange between providers. Additionally, in the expansion and refinement of the *Abriendo Puertas* model, we would further connect the FSW peer navigators into the ongoing care system. Continue to provide opportunities for the engagement of male partners including periodic HIV counseling and testing and linkages to care and treatment as needed.
 - Complementary to the ongoing care and treatment system, it is critical to expand community mobilization activities among FSW including FSW living with HIV through well-received activities such as the *casas abiertas*, which sought to both promote and provide social support and solidarity and income generating skills and training.

Limitations

The current effort was a non-controlled longitudinal study that sought to assess the feasibility and initial effects of a tailored multi-level intervention. A more rigorous evaluation of the refined, expanded model recommended above would involve the potential use of a randomized controlled design with a larger number of participants over a longer period of time. The current study has provided us with the necessary data and encouraging findings to merit further implementation and evaluation of the model.

Conclusions

To our knowledge, this is the first integrated, multi-level model to address HIV prevention and outcomes among FSW living with HIV and their steady partners. The encouraging findings from this pilot suggest the potential for this model to be adapted for use in both concentrated and generalized epidemics.

Abriendo Puertas can also be adapted for use with other populations that experience multiple layers of stigma and sub-optimal HIV outcomes. Such efforts have the potential to improve the health and wellbeing of FSW living with HIV as well as reduce ongoing transmission at the population level.

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