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in Reducing HIV-Related Risk Among Female
Sex Workers in the Dominican Republic**

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Executive Summary

We evaluated the impact on HIV-related risk of two models of a 100% condom use intervention among establishment-based female sex workers in the Dominican Republic. In Santo Domingo a solidarity-based “100% condom use” model was implemented. This was compared to a combined solidarity and government policy model implemented in Puerto Plata. Both models were evaluated using data from pre- and post- intervention cross-sectional surveys, participant observations, and LCR testing for STIs among participating sex workers. Monthly cross-sectional data monitoring participating sex establishments’ compliance with the intervention was also collected over the course of the one-year intervention to support pre-post evaluation findings. Statistically significant improvements in all study outcomes were observed among female sex workers in Puerto Plata where the integrated solidarity and government policy intervention arm was implemented. For example, among participating sex workers in Puerto Plata, reported consistent condom use with all sexual partners in the last month increased from 44.0% to 66.0 (OR 2.46; CI 1.63-3.72); ability to reject unsafe commercial sex increased from 50.0% to 77.9% (OR 3.85; CI 1.79-8.29) and STI prevalence decreased from 28.8% to 16.3% (OR 2.08; CI 1.28-3.37). Environmental-structural interventions that combine institutional and community-based solidarity with government policy and regulation were effective in reducing HIV-related risk among female sex workers.

INTRODUCTION

HIV-related vulnerability of female sex workers

Female sex workers, especially those working and living in disadvantaged socio-economic settings, are often placed at heightened vulnerability for public health problems such as violence and sexually transmitted infections, including HIV/AIDS (Gysels 2002; Ghys 2001; Kalipeni 2000; Campbell 2000; Gray 1997; Akililu 2001). Epidemiological studies from many countries have specifically documented significantly higher rates of HIV infection among female sex workers as compared to other population groups within the same geographic and cultural context (Asamoah-Adu 2001; Quan 2000; Mehendale 1995). For example, according to the most recent data available through UNAIDS, HIV prevalence in the general population is currently estimated at 2.8% in the Dominican Republic (UNAIDS 2000). However, the present national HIV prevalence rate among female sex workers in the Dominican Republic stands at approximately 7%, with infection rates reaching up to 12% in some regions of the country (SESPAS 2000). While the Dominican Republic is a relatively small country comprised of approximately 8.4 million people, the number of female sex workers working in the country has been conservatively estimated at 60,000, indicating that a substantial amount of women find themselves at increased risk for HIV infection within this setting (AIDSCAP 1993).

The evolution of HIV prevention strategies among female sex workers and their clients

Strategies frequently employed to prevent HIV/STI among female sex workers have historically involved one or more of the following intervention components: peer education, condom distribution and STI management. Several programs in developing country settings have demonstrated increased rates of condom use and/or reductions in STI among female sex workers using these one or more of these approaches (Laga 1994; Bhave 1995; Ngugi et al 1996; Ford 1996). Over time, however, HIV prevention programming in the context of female sex work has continued to evolve. Many programs are now based upon or have integrated key intervention components such as: personal empowerment and capacity building as well as community mobilization and development strategies among female sex workers (Jana 1998; Campbell 2001; Evans 2000; Busza 2000), and the increased involvement of key

stakeholders such as sex establishment owners and managers (Visrutaratna 1995; Sanondhavat 1997; Morisky 1998), and educational activities with male clients (Leonard 2000). Such efforts reflect the general consensus forming in the field of public health that behavior change and reduced HIV-related vulnerability does not occur in a social vacuum, rather it is the product of a myriad of individual, relational, socio-cultural, environmental-structural, and technological processes and forces (Sweat and Denison 1995; Tawil 1995; O'Reilly 1996; Aggleton 1997; Merson 2000; Parker 2000; Aurebach 2000; Waldo 2000).

Environmental-structural approaches to HIV prevention within the context of female sex work

Environmental-structural approaches to HIV prevention include efforts to address the physical, social, economic, legal and/or policy environment in which individual risk and the potential for agency is situated (Sumartjo 2000). Such approaches in the context of female sex work have gained considerable attention as a result of the Thai 100% condom program. The Thai program was based on a government-sponsored 100% condom policy requiring that condoms be used in all brothel-based sex acts (Rojanapithayakorn 1996). This policy initiative includes free access to condoms in sex establishments, monthly medical check-ups of female sex workers, and a national media campaign directed at male clients of sex workers. Sex establishment owners not complying with the policy are subject to sanctions such as fines and closings. Evaluation data from the Thai government shows that between 1989 and 1993 reported condom use among female sex workers and their clients rose from 14% to 94% and the number of cases of the five most common sexually transmitted diseases among men presenting at government clinics declined 79% during this same time period (Hananberg 1994). Subsequent evidence has also confirmed a decline in HIV incidence among Thai military recruits who reported visiting commercial sex establishments (Mason 1995; Nelson 1996; Celentano 1998; Nelson 2002). Recent publications and discourse have begun to articulate some concerns regarding the level of community participation in the original Thai 100% condom program as well as challenges to the transferability and sustainability of the program (Kilmarx 1998; Evans 2000; Parker 2000; Horizons 2001). However, the initial success of this structural intervention has inspired several countries in Southeast Asia to adopt its key elements in an effort to curb the spread of HIV (UNAIDS 2000), and others to consider adapting selected elements of the program that best fit the socio-political and cultural context of sex work in their country (Morisky 1998; Tiglao 1996).

HIV Prevention in the female sex industry of the Dominican Republic

The two non-governmental organizations (NGOs), COIN (Centro de Orientación e Investigación Integral) and CEPROSH (Centro de Promoción y Solidaridad Humana.), with whom the current research was conducted, have been engaged in HIV prevention in the female sex industry of the Dominican Republic since 1989. During this time they have facilitated the development of a network of sex worker peer-educators in key cities across the country. Over time they have combined both individual (e.g. peer education, condom distribution, and STI management) and community-level prevention strategies (e.g. group empowerment and community mobilization) in order to maximize HIV-related protective behaviors among female sex workers and their clients (Moreno and Kerrigan 2000). Using this approach, consistent condom use with new clients has risen significantly in intervention areas in both cities over the last decade. However, rates of consistent condom use with regular paying and non-paying partners have remained relatively stable and significantly lower than with new clients during recent years (COIN 1994; CESDEM 1996; CESDEM 1999). Formative qualitative research conducted among female sex workers in Santo Domingo suggests that it is in the context of such regular paying and non-paying partnerships where many sex workers characterized themselves as being at increased risk for HIV/STI (Kerrigan et al 2001). Hence, seeking to continue to strengthen their programming and overcome such challenges, these NGOs and governmental health agencies from the Dominican Republic began to explore the possibility of adapting elements of the Thai 100% condom program to the socio-cultural reality of their country's female sex industry in the mid-1990s (Kerrigan et al 1997).

Adapting the Thai 100% Condom Program

In 1996 formative ethnographic research was conducted in Santo Domingo to examine the acceptability and feasibility of adapting elements of the Thai 100% condom program to the Dominican context. Study participants included sex workers, clients, owners/managers, and governmental health officials. Study results revealed significant support for government policies and support systems to promote and monitor the use of condoms within sex establishments. For example, many sex workers reported that a 100% condom policy would save them considerable time by alleviating some of the difficulty negotiating with resistant clients. Several sex establishment owner/managers suggested that being part of a 100% condom use program could bring prestige to their business.

The study also revealed that some environmental-structural HIV prevention strategies were already in place in several of the participating sex establishments including institutional condom use policies developed by establishments owners and solidarity-based initiatives among sex workers and sex establishment owner/managers and employees to assist and support sex workers in condom use negotiation with clients (Kerrigan et al 2001). These findings led the research team to adapt the original Thai approach and to develop two “100% Condom Use” models in the Dominican Republic: (1) a voluntary, solidarity based model of HIV/STI prevention based on collective commitment to condom use at the level of the sex establishment and, (2) a solidarity plus government regulation model, where community-based collective commitment was reinforced by a regional government 100% condom policy. Hence, the primary objective of this study was to test and compare the effectiveness of these two approaches in increasing HIV-related protective behavior and decreasing STI among female sex workers in an effort to inform future national and international program planning and policy making.

METHODS

Study Design

A pre-test/post-test evaluation design was utilized to evaluate the impact of the two adapted “100% condom use” intervention models implemented over the course of one-year in 34 female sex establishments in Santo Domingo and 34 female sex establishments in Puerto Plata. The pre-post evaluation design was supported by serial cross-sectional data collected on a monthly during the course of the intervention. The two cities selected to participate in the study were chosen based on the commitment of policy makers in each city to support the intervention trial, the technical expertise of the NGOs based in those cities to carry out the intervention, the large number of sex establishments in each city, and the availability of a viable public STI management and monitoring system. Within each city, geographic areas where commercial sex was most prevalent at the time of the study, based on NGO census data, were purposively selected as locations to implement the intervention. All sex establishments that met the study site selection criteria within those areas were invited to participate in the intervention. Management of all sex establishments invited to participate agreed. Selection criteria for participating sex establishments included having more than five women working on the premises at the time the study began and being a place where a

“*salida*” or fee is paid by the client to the establishment in order to go out on a date with a woman working on the premises. These criteria allowed for the inclusion of both direct (e.g. brothels) and indirect (e.g. bars and discos) sex establishments.

The Intervention

The two “100% condom use” program models were developed in the Dominican Republic after extensive formative qualitative and quantitative research and in consultation with sex worker peer leaders and members of the sex worker rights organization, MODEMU (Kerrigan 2000 and Kerrigan 2001). The model implemented in Santo Domingo involved a voluntary, solidarity-based approach to 100% condom use, while the model implemented in Puerto Plata included the same solidarity-based approach and activities as Santo Domingo reinforced by a regional governmental 100% condom use policy. Both models build on more than a decade of HIV/AIDS peer education efforts of the participating NGOs. Such programmatic efforts were ongoing and standardized during the course of the current intervention trial in both cities.

At the core of both intervention models was the presence of environmental-structural theory which assumes that individual behavior change is facilitated or constrained by the physical, social and political environment in which the realm of choice is defined and decisions are made (Sweat and Denison 1995). In the case of female sex workers and HIV prevention, sex workers have often been the lone responsible actors made responsible and accountable for risk reduction without regard for the gender and class based power imbalances that often exist between sex workers and clients and/or sex workers and establishment owners and managers. Interventions based on environmental-structural theory seek to create an environment in which not only sex workers, but all members of the female sex industry are mutually responsible for preventing HIV/STI.

The intervention was implemented by a combination of non-governmental and governmental agencies in the Dominican Republic. Two NGOs, Centro de Orientación e Investigación Integral (COIN) in Santo Domingo and Centro de Promoción y Solidaridad Humana (CEPROSH) in Puerto Plata led both the research and community-based solidarity building and educational intervention efforts in each city in coordination with the sex worker rights

organization, Movimiento de Mujeres Unidas (MODEMU). The National HIV/AIDS/STI Control Program, Dirección General para el Control de las Infecciones de Transmisión Sexual y SIDA (DIGECITSS) and the Regional Health Department of Puerto Plata played a key role in developing and implementing policy and regulation based initiatives throughout the project. The Instituto Dermatológico y Cirugía de la Piel and several other public STI clinics conducted periodic STI screening and biomedical analysis. Additionally both the national and local branches of the Dominican Department of Environmental Health assisted by providing government health inspectors to assist in the evaluation of the project. International donors, universities and agencies such as the Horizons Program of the Population Council, the Johns Hopkins School of Public Health, the AcciónSIDA Project of the Academy for Educational Development, USAID/Washington and USAID/Dominican Republic assisted in the provision of both financial and technical support of the intervention research.

Building solidarity and collective commitment

In both cities efforts to encourage and strengthen a sense of solidarity and collective commitment among female sex workers, sex establishment owners/managers and other establishment employees to ensure 100% condom use and prevent HIV/STI between sex workers and their clients were undertaken during the course of the intervention. These initiatives included the use of participatory workshops that facilitated discussions regarding the role of each member of the sex work community in helping to prevent HIV and to support female sex workers in their communication and negotiation with clients regarding safe sex. These workshops were held with each group of actors, both within and across neighboring sex establishments. All workshop participants were asked to sign a social contract pledging their collective commitment to promote health and wellbeing within the establishment. Group-specific educational materials were developed to reinforce the idea of collective commitment and highlighting the rights and responsibilities of each group with regard to protecting their health and livelihoods. An additional focus of the workshops was to address the role of trust and intimacy among sex workers and regular paying and non-paying partners with regard to the risk of HIV/STI. Four workshops were conducted during the course of the intervention period. The final workshop was also utilized to engage participants in a discussion on their experience and feedback regarding the process and results of the intervention. Monthly follow-up meetings were also held in each establishment to assess and/or overcome barriers to achieving the principles of collective commitment. Both

the quarterly workshops and monthly follow-up meetings were facilitated by a combination of NGO staff members and sex worker peer educators.

Facilitating environmental cues to action

In both cities, environmental cues to actions were utilized to promote consistent condom use among sex workers and their clients. As part of their collective commitment, each sex establishment owner was responsible for ensuring that several enabling elements were in place in the physical environment, including 100% condom use posters and stickers, and the presence of glass bowls filled with condoms placed in visible locations throughout the establishment. Additionally, all establishments were responsible for ensuring stable access to quality condoms and maintaining a stock of at least 100 condoms on the premises at all times. The project provided 100% condom posters and stickers free of charge and sold condoms at discount rates to all establishments. Establishment owners were also responsible for ensuring that all of the women working there received monthly health checks and STI screenings at local government clinics. Additional environmental cues included jockeys playing brief messages regarding the importance of condoms and safe sex throughout the course of selected evenings. On these same nights, disc jockey messages were reinforced by 100% condom information booths at the entrance of participating establishments, and participatory theater with and educational materials for the male clients of female sex workers.

Ensuring respectful and quality clinical services for sex workers

Historically, female sex workers in the Dominican Republic have been required by the government to attend monthly STI checks in government clinics. Additionally, government health inspectors were to ensure that all sex workers attended these screenings by checking that each woman had an update STD card. In the past, this system was not implemented in a standardized fashion due to lack of government resources and training, and because of charges of government corruption. The current intervention sought to overcome these barriers by doing an initial needs assessment with local public health clinics serving female sex workers and government health inspectors. NGO staff then provided training to both public health clinicians and government health inspectors on basic HIV/AIDS information, communication and education, data collection and monitoring and evaluation techniques, as

well as the human rights of sex workers and ethical standards and procedures related to confidentiality. The project also assisted government health workers to lobby national governmental agencies to acquire much needed STI management equipment, personnel and medicines. Additionally, several sex worker peer educators from the project were for the first time given private offices in government clinics serving female sex workers in order to provide pre/post test counseling for HIV/STI.

Establishing a regional, governmental 100% condom use policy

In Puerto Plata, where the solidarity-based approach was combined with government regulation, a regional government policy mandating condom use between sex workers and clients was communicated to all participating sex establishment owners in an event jointly sponsored by the regional health department of Puerto Plata and the implementing NGO, CEPROSH, at the beginning of the project. Owners were told that they, not the sex workers, would be responsible for ensuring that their establishment complied with the 100% condom use policy and program activities. NGO staff and government officials in Puerto Plata met with participating sex establishment owners on a quarterly basis to encourage continued collaboration and discuss barriers to compliance.

Monitoring and encouraging compliance with the intervention

In both Puerto Plata and Santo Domingo, sex establishment owners were notified of their compliance or non-compliance with key intervention elements on a monthly basis (e.g. presence of 100% condom posters, visible condoms supplies within the establishment, stocks of at least 100 condoms, attendance of sex workers at monthly STI checks, and lack of a positive STI diagnosis among sex workers working at the establishment) by government health inspectors accompanied by NGO staff. The purpose of these monthly monitoring visits was to ensure continuous feedback and support to each participating sex establishment. At the end of each month sex establishments in both cities who were not in compliance with these elements received intensified educational efforts to encourage future participation and compliance. In addition to increased educational efforts, participating sex establishments in Puerto Plata who were not in compliance were subject to a graduated sanction system targeted to the establishment owner including notifications, fines and closings. Award certificates were given to sex establishments complying with the five intervention elements described above on a quarterly basis.

Data Collection

Collection of evaluation data occurred at baseline and at the end of the twelve-month intervention. Data collection involved a triangulation of reported, observed and clinical data. Structured socio-behavioral surveys and non-routine STI testing were conducted among a random sample of female sex workers from participating sex establishments in each city. Participants were recruited from government health clinics where sex workers are required by the Dominican government to attend monthly health checks. Due to the established relationship between NGO peer educators who served as recruiters and participating sex workers, study participation rates were 95%. Trained interviewers, who were not peer educators, were recruited from local health NGOs to administer the survey. Participants were asked to provide urine samples for gonorrhea and chlamydia and cervical swabs for trichomoniasis screening to government health clinicians. All survey interviews were anonymous. STI testing was confidential. Names were recorded with participant record numbers in a separate location from survey data. All participants were instructed to come back within one week to receive test results. Those participants who tested positive but did not come back within one week were contacted in a confidential manner by NGO peer educators and provided with free treatment for their STI. All participants gave written consent to be interviewed and screened for STI and received a reimbursement of approximately \$US3 for their time and participation.

Participant observations were also conducted among random sample of sex workers recruited from sex establishments. Male NGO staff members, not involved in direct community education, were trained in research ethics and participant observation methodology. Posing as male clients, two NGO staff members randomly selected the first two women they saw wearing red or a color close to red within each of the 68 sex establishments at baseline and twelve month follow-up. After selecting a woman NGO staff followed a strict research protocol whereby they talked with the participant for approximately thirty-minutes and then ask her if she would have sex with him without a condom under a series of four distinct socio-economic conditions. After discussing whether or not the participant would have sex with him excused himself from the interaction, paid the bill for his table, and paid the sex worker a tip of approximately \$US 6 for her time. All interactions took place within the confines of the sex establishments. After leaving the establishment, NGO staff documented the interaction with the participant in private. All

interactions were anonymous, no identifying information was collected on any of the participating woman, and results of the observations were kept under lock and key at the study office and were not shared with anyone outside the research team ensuring that the methodology did not place sex workers at risk. Support for this and all study data collection methods was obtained from the Dominican sex worker rights organization (MODEMU).

In addition to pre/post data, serial cross-sectional data were also collected on a periodic basis at the level of the participating sex establishment to document compliance with the intervention. These data were a combination of observed and clinical data and were collected by government health inspectors and NGO staff at the end of each month during the twelve-month intervention period.

Measures

Condom use behavior was assessed by self-report of condom use in the survey with the following: new clients in the last month, regular paying or non-paying partners in the last month, and all partners in the last month. New clients were defined as people they had sex with only once or twice in exchange for money. Regular partners were defined as people they have had sex with several times and/or have a relationship of trust with, whether they directly pay for sex or not. For new clients and regular partners a five-point Likert scale was used e.g. always, almost always, sometimes, almost never and never. For all partners, participants were asked how many sexual partners they had sex in the last month and with how many of them did they always use condoms. All three variables were then dichotomized into consistent vs. inconsistent condom use.

Ability to reject unsafe sex is a measure of the participant's ability to reject dates with clients without a condom. This was assessed through participant observation. Four specific scenarios developed on the basis of prior formative research were presented to the sex worker in each participant observation: not wanting to use a condom simply because client didn't like condoms, not needing to use a condom because client is a "serious guy who is married and has kids", offering 50% more money than her asking rate, offering 100% more money than her asking rate. The NGO worker recorded if the sex worker accepted any of the scenarios, or if they were able to reject unsafe sex in all four hypothetical situations.

Sexually transmitted infections were documented by calculating the prevalence of each of the three STI assessed by the study: gonorrhea, chlamydia and trichomoniasis as well as a dichotomized measure of whether participants had any one of these three STI. Chlamydia and gonorrhea were detected using Ligase chain reaction (LCR) DNA tests while the presence of trichomoniasis was established using culture-based tests. Treatment was provided to all women testing positive for any STI at both baseline and follow-up.

Exposure and compliance with the intervention was measured in two ways. In the survey, exposure to the intervention was measured using an 13-item scale (Cronbach's alpha=.80) including participants' perceptions of exposure to: (1) 100% condom intervention activities such as workshops and clinic checks, (2) environmental cues such as posters and condoms, (3) policies, solidarity and support for condom use and HIV prevention from establishment owners and employees, and (4) monitoring of the program by governmental and NGO staff. Reported exposure with the intervention was then dichotomized into high exposure (positive response 11 items or more) versus low exposure (positive response to 10 items or less). Additionally, an observed measure of the level of compliance with the intervention was calculated for each month for each establishment. Each establishment received a score of 0-5 for each month depending upon with how many of the five key intervention elements it had complied in the last month. The average level of compliance over the one-year intervention period per establishment was then calculated and applied to the individual level data set for the purposes of regression analysis. Hence sex workers from the same establishment received the same average observed compliance score.

Socio-demographic information such as age in years, number of years of school completed, civil status (married or in union versus single or divorced) the number and types of sexual partners (new and regular) in the last month, number of dates with clients in the last week and the average fee charged per client date was also collected at baseline and follow-up.

Data Analysis

Univariate analyses included frequencies and distributions of all study variables, and was conducted with both baseline and follow-up data. Bivariate analyses included chi-square tests of association, and were conducted to

assess whether statistically significant differences in HIV-related risk outcomes, exposure to and compliance with the intervention, and socio-demographic characteristics of the sample from baseline to follow-up. A multivariate regression model was developed to test the association between exposure to and compliance with the intervention and consistent condom use with all sexual partners in the last month.

RESULTS

Characteristics of the sample

The median age in years of female sex workers participating in the baseline survey was 24 years in Santo Domingo and 25 years in Puerto Plata as shown in Table 1. The percent of women over twenty-five did not vary significantly across cities ($p=.167$). Among women from both cities, the median number of years of schooling completed was 7.0. The percent of women who completed more the primary school (>8 years) was not significantly different across cities ($p=.378$). While more than seventy-percent of participating women from both cities reported their official civil status as single, over sixty-percent from each city reported currently having a regular partner. Neither civil status ($p=.901$), nor having a regular partner ($p=.328$) varied significantly across the two cities. The median, number of dates with clients in the last week among sex workers from Santo Domingo was 1.0 (0-30) as compared to 2.0 (0-32) among sex workers from Puerto Plata. The percent of women having two or more dates with clients in the last week was significantly different across cities ($p=.02$), with 43.5 percent from Santo Domingo and 55.3 percent from Puerto Plata reporting more than two dates with clients. The median number of total sex partners in the last month was 1.0 (0-40) among women from Santo Domingo and 2.0 (0-50) among women from Puerto Plata. The percent of women reporting three or more sexual partners in the last month also varied significantly across cities ($p.000$), whereas 24.9 percent of women from Santo Domingo reported having three or more sexual partners in the last month as compared to 49.7 percent in Puerto Plata. The median, average amount of money charged per client date was \$18 USD among participants from both cities. However, the percent of women charging more than \$18 per date also varied significantly per city ($p=.002$), with a higher percent of sex workers from Santo Domingo, 42.9 percent, charging \$19 USD or more per date than women from Puerto Plata, 28.5 percent.

Some socio-demographic characteristics differed significantly from baseline to follow-up ($p<.05$). In Santo Domingo, there were more married women in the sample at follow-up than at baseline. In Puerto Plata, there were more women with lower levels of secondary education, more than two dates in the last week, and who currently had regular partners at follow-up versus baseline. In both cities, there were more participants with more than three sexual partners in the last month at follow-up as compared to baseline.

Table 1-Demographic characteristics of the sample at baseline

Variables	Median/Range and Frequencies		P-value
	Santo Domingo (n=210)	Puerto Plata (n=200)	
Age in years:	24.0 (18-40)	25.0 (18-51)	
18-25	60.8	54.0	
26+	39.2	46.0	.167
Education in years:	7.0 (0-13)	7.0 (0-12)	
0-8	69.0	73.0	
9+	31.0	27.0	.378
Civil Status:			
Single	72.1	71.5	
Married	27.9	28.5	.901
Currently has a regular partner:			
Yes	68.6	64.0	
No	31.4	36.0	.328
Number of client dates last week:	1 (0-30)	2 (0-32)	
0-1	56.5	44.7	
2+	43.5	55.3	.020*
Total number of sexual partners in the last month:	1 (0-40)	2 (0-50)	
0-2	75.1	50.3	
3+	24.9	49.7	.000***
Ave. fee charged per client date:	\$18 (12-90)	\$18 (12-60)	
\$ 0-18	57.1	71.5	
\$ 19+	42.9	28.5	.002**

P-value: <.05=*; <.01=**; <.001=***

Pre to Post Intervention Changes in HIV-Related Risk

Consistent condom use

As shown in Table 2, consistent condom use (CCU) with new clients in the last month at baseline was 75.3 percent in Santo Domingo as compared to 96.5 percent in Puerto Plata. The rate of consistent condom use with new clients increased among participants at follow up as compared to baseline in both cities, to 93.8 percent in Santo Domingo and to 98.6 percent in Puerto Plata. However, given the already high rates of condom use with new clients in Puerto Plata at baseline, this change was statistically significant in Santo Domingo only, where the odds of CCU with new clients at follow up was almost five times greater than at baseline (OR 4.97; CI 2.02-12.21).

In the case of regular partners, the base rates of CCU were similar across the two cities, 14.6 percent in Santo Domingo versus 13.0 percent in Puerto Plata. However, the rate of consistent condom use with regular partners in the last month increased significantly in Puerto Plata only, where the odds of CCU with regular partners at follow up was almost three times greater than at baseline (OR 2.70; 1.45-5.02).

When the rate of CCU with all partners in the last month (both paying and non-paying) is examined across the cities, only in Puerto Plata where significant increases documented. Consistent condom use in Puerto Plata increased from forty-four percent at baseline to sixty-six percent at follow-up, with the odds of CCU with all partners in the last month being almost 2.5 times higher at follow-up than baseline (OR 2.46; CI 1.63-3.72).

Table 2-Consistent condom use in the last month among participating sex workers, baseline to follow-up

Type of partner	Santo Domingo			Puerto Plata		
	Pre n=159	Post n=203	OR and 95% CI n=362	Pre n=184	Post n=200	OR and 95% CI n=384
New clients	75.3	93.8	4.97 (2.02-12.21)***	96.5	98.6	2.50 (.45-13.92)
Regular partners	14.6	17.6	1.24 (.67-2.30)	13.0	28.8	2.70 (1.45-5.02)***
With all partners	50.3	42.4	.72 (.48-1.10)	44.0	66.00	2.46 (1.63-3.72)***

P-value: <.05=*; <.01=**; <.001=***

Ability to reject unsafe sex

Sex workers' ability to reject unsafe commercial sex increased from baseline to follow-up in both cities. However, as shown in Table 3, statistically significant increases were documented in Puerto Plata only. These significant increases were found at each of the four levels of social interaction assessed by the study. The total percent of participating sex workers able to reject unsafe sex after all four scenarios were presented to them increased almost twenty-eight percentage points, from 50.0 to 77.9 percent, from baseline to follow-up. The odds of participants being able to reject unsafe commercial sex was almost four times greater at follow up than at baseline (OR 3.85; CI 1.79-8.29).

Table 3-Ability to reject unsafe sex among participating sex workers, baseline to follow-up

	Santo Domingo			Puerto Plata		
	Pre n=67	Post n=65	OR and 95% CI n=132	Pre n=64	Post n=68	OR and 95% CI n=132
Cumulative % rejecting unsafe sex per level						
Stated he didn't like condoms	76.1	78.5	1.14 (.50-2.58)	79.7	94.1	4.07 (1.25-13.25)*
Stated he was "serious guy"	71.6	77.0	1.31 (.60-2.89)	64.1	91.2	5.79 (2.17-15.46)***
Offered 50% more money	67.2	73.9	1.38 (.65-2.92)	54.5	83.8	4.29 (1.90-9.66)***
Offered 100% more money	64.2	72.3	1.46 (.69-3.04)	50.0	77.9	3.85 (1.79-8.29)***

P-value: <.05=*; <.01=**; <.001=***

Sexually Transmitted Infections

Significant decreases were detected in the rates of chlamydia in Santo Domingo and in the rates of trichomoniasis in Puerto Plata. Additionally, the prevalence of having at least one of these three STI (gonorrhea, trichomoniasis or chlamydia) decreased significantly in both cities, falling from 25.5 to 15.9 percent in Santo Domingo and from 28.8 to 16.3 percent in Puerto Plata. The increased odds of not having an STI at follow up as compared to baseline were 2.08 in Puerto Plata (OR 2.08; 1.28-3.37) as compared to 1.80 in Santo Domingo (OR 1.80; 1.12-2.90).

Table 4-Sexually transmitted infections among participating sex workers, baseline to follow-up

Type of STI	Santo Domingo			Puerto Plata		
	Pre n=220	Post N=214	OR and 95% CI n=434	Pre n=198	Post n=204	OR and 95% CI n=402
Gonorrhea	2.3	1.9	1.22 (.32-4.60)	6.6	3.9	1.72 (.69-4.25)
Trichomoniasis	9.1	6.1	1.54 (.75-3.19)	9.6	3.9	2.58 (1.10-6.05)*
Chlamydia	16.4	9.3	1.89 (1.05-3.39)*	14.6	9.8	1.58 (.86-2.89)
One or more of three STI	25.5	15.9	1.80 (1.12-2.90)*	28.8	16.3	2.08 (1.28-3.37)**

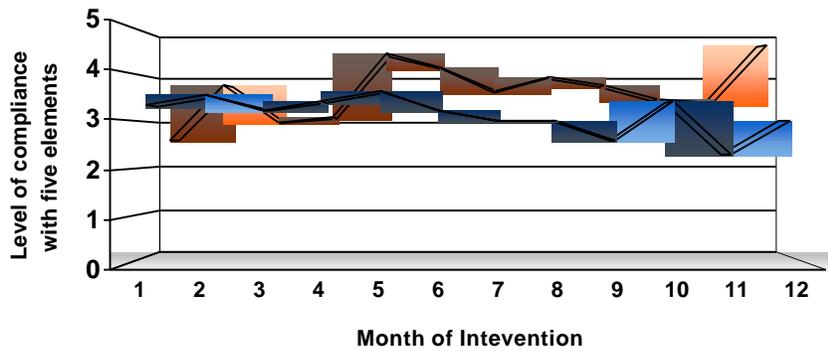
P-value: <.05=*; <.01=**; <.001=***

Exposure to and compliance with the intervention

In both cities, the percent of participants reporting high levels of exposure to the intervention on the survey at baseline versus follow-up increased significantly, from 3.9 to 32.7 percent in Santo Domingo ($p=.000$) and from 20.9 to 67.0 percent in Puerto Plata ($p=.000$). At post test, exposure to the intervention was significantly higher in Puerto Plata as compared to Santo Domingo ($p=.000$).

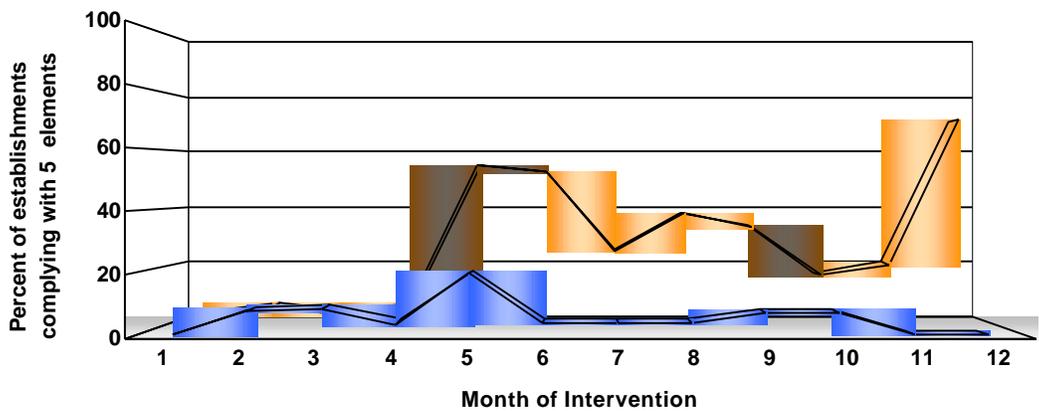
Figure 1 shows the average level of compliance with the five key structural elements observed on a monthly basis over the course of the intervention: (1) visible 100% condom posters, (2) visible glass bowl filled with condoms, (3) stock of more than 100 condoms on the premises, (4) all women attending STI checks, and (5) no women testing positive for STI. Based on this data, the average level of observed compliance appears to have increased more steadily and intensely in Puerto Plata than in Santo Domingo. The average level of compliance with these five intervention elements in participating establishments in Santo Domingo was 3.3/5.0 at Month 1, and ended at almost the same point, 3.0/5.0, at Month 12 of the intervention. In establishments in Puerto Plata, the average level of compliance with the five intervention elements started at 2.6/5.0 at Month 1 and rose significantly to 4.7/5.0 by Month 12 of the intervention ($p=.000$). Cross-city differences in compliance with structural intervention components are seen even more starkly in Figure 2. The percent of participating sex establishments complying with all five elements observed at Month 1 is similar across the two cities, 0.0 percent in Santo Domingo and 3.0 percent in Puerto Plata. However, at Month 12 of the intervention the percent of establishments complying with all five elements remained at 0.0 in Santo Domingo, yet rose significantly in Puerto Plata, to more than 70 percent ($p=.000$).

Figure 1- Average level of observed compliance with structural intervention elements among participating sex establishments (N=68)



	1	2	3	4	5	6	7	8	9	10	11	12
SD	3.3	3.5	3.2	3.4	3.6	3.2	3.0	3.0	2.6	3.4	2.3	3.0
PP	2.6	3.8	3.0	3.1	4.5	4.2	3.7	4.0	3.8	3.5	3.4	4.7

Figure 2- Percent of participating sex establishments complying with all observed structural intervention elements (N=68)



	1	2	3	4	5	6	7	8	9	10	11	12
SD	0.0	7.7	8.3	3.6	20.0	3.7	4.0	4.2	7.1	7.1	0.0	0.0
PP	3.0	5.9	3.2	6.3	54.8	52.9	25.0	38.2	33.3	16.7	20.7	70.4

Assessing the effects of exposure to and compliance with the intervention on consistent condom use

Table 5 shows the unadjusted and adjusted odds of consistent condom use with all partners in the last month based on the level of exposure to and observed compliance with the intervention as well as other socio-demographic factors that may be associated with consistent condom use among sex workers across both cities. Bivariate analyses demonstrate that both reported exposure to and observed compliance with the intervention are significantly associated with increased condom use, whereas the odds of CCU were 2.17 greater among participating sex workers with higher levels of reported exposure to the intervention and 3.57 times greater among sex workers from participating sex establishments with the highest level of observed compliance to key intervention components. Other variables significantly associated with increased CCU include having more than two dates with clients in the last week and charging more than \$18 USD per client date. Variables significantly associated with inconsistent condom use with all partners in the last month include being married or in union and having a current regular partner. Additionally, the city from which sex workers were based, which is a proxy for the type of intervention model they received was also a significant predictor of consistent condom use. Women from Puerto Plata, for example, were 2.64 times as likely to use condoms consistently in the last month as women from Santo Domingo.

In multivariate analysis, exposure and compliance remain significantly associated with consistent condom use. Participants with high levels of reported exposure to the intervention were 1.84 times more likely to use condoms consistently as compared to women with low levels of reported exposure. Participants working in sex establishments with the highest levels of observed compliance with the intervention were 2.33 times more likely to use condoms consistently as compared to women with low levels of reported exposure. Being married and having a current regular partner also remained significantly associated with inconsistent condom use. City remained a significant predictor of CCU when controlling for all other variables with the exception of observed compliance to the five structural intervention elements. However, when observed compliance was controlled for in the model, the significant association found between city and CCU was no longer present.

Table 5- Effects of exposure to and compliance with the intervention on consistent condom use with all partners in the last month among sex workers participating in the follow-up survey (n=405)

Variables	Unadjusted Odds Ratio			Adjusted Odds Ratio		
	OR	95% CI	P-value	OR	95% CI	P-value
Reported exposure to the intervention: Low High	2.17	1.41-3.34	.000***	1.84	1.07-3.17	.027*
Average level of observed compliance with the intervention: 0.0-3.0 3.01-3.50 3.51-4.00 >4.00	1.92 3.29 3.57	1.11-3.35 1.87-5.78 1.96-6.48	.020* .000*** .000***	1.60 2.43 2.33	.79-3.25 .97-6.15 1.01-5.39	.195 .059 .047*
City: Santo Domingo Puerto Plata	2.64	1.76-3.95	.000***	1.45	.68-3.06	.332
Age in years: 18-25 26+	1.07	.72-1.60	.740	.98	.60-1.60	.936
Education in years: 0-8 9+	.89	.57-1.38	.604	.89	.45-1.76	.743
Civil status: Single/Divorced Married/In Union	.26	.17-.40	.000***	.40	.26-.61	.000***
Currently has regular partner: No Yes	.08	.04-.16	.000***	.10	.04-.25	.000***
Number of client dates last week: 0-1 2+	1.51	1.01-2.24	.044*	1.22	.63-2.35	.560
Total number of partners last month: 0-2 3+	1.08	.73-1.60	.713	.68	.32-1.45	.321
Average fee charged per client date: \$US 0-18 \$US 19+	1.51	1.00-2.28	.050	1.24	.72-2.13	.433

P-value: <.05=*; <.01=**; <.001=***

Process indicators

Several process indicators were assessed by the study to examine the effects of the intervention on participant's perception of their environment and to ensure that the intervention did not have any unintended negative consequences on participating women's health or livelihood.

All participating sex workers were asked at post-test if they perceived that participation in the 100% condom intervention had led to increases in the prestige of their establishment and/or increases in the numbers of clients coming to the establishment as had been the contention of several establishment owners in formative research. High percentages of sex workers from both cities believed that both prestige and clientele had increased due to the intervention at post-test. Almost 84 percent of sex workers from Santo Domingo and a significantly greater percent, 93 percent, from Puerto Plata believed that the prestige of the establishment had risen due to participation in the 100% condom program ($p=.019$). Sixty-seven percent of sex workers from Santo Domingo and a significantly greater percent, 87 percent, from Puerto Plata perceived that the number of clients coming to the establishment increased over the course of the intervention due to improvements in the establishment's reputation ($p=.000$). Additionally, neither the reported number of dates with clients in the last week nor the total number of sexual partners reported in the last month by sex workers decreased from pre to post intervention in either city.

Reported abuse and/or mistreatment in the last three months by sex establishment owners, male employees and/or male clients towards participating sex workers were also assessed pre to post intervention. In the case of Puerto Plata no significant changes were found pre to post intervention in any of these three variables. In Santo Domingo one significant change was documented whereby the reported level of abuse and mistreatment in the last three months on the part of male clients towards participating sex workers declined from 30.2 to 18.0 percent pre to post intervention ($p=.015$). Participating sex workers were also asked if sex establishment owners had imposed any type of fine upon them in the last three months. The percent of sex workers reporting having received a fine for any reason in the last three months did not change significantly in either city pre to post intervention.

The last workshop with each of the three main intended audiences of the intervention (sex workers, sex establishment owners/managers and other male establishment employees) provided the opportunity to have a dialogue about participants experience with the intervention. Additionally, open ended questions were asked of participating sex workers at post test regarding how the intervention may have positively or negatively affected themselves and their relationships with establishment owners or employees, clients and/or other sexual partners. These interactions and assessments suggest that participants perceived no negative outcomes of the intervention. Instead all three groups reported the positive and/or useful elements of the intervention. For example, many sex workers reported that the intervention assisted them to value and protect themselves and their families; establishment employees reported that for the first time they were taken into consideration and given the opportunity to positively contribute to society; establishment owner/managers reaffirmed that being part of a 100% condom use initiative did not negatively, but positively affected their business. Additionally, all three groups reported an increased sense of awareness of the challenges of preventing HIV/STI and documented the importance of working on this issue collectively rather than in isolation.

The final workshop also provided an opportunity to discuss the sex establishment owners' attitudes and reactions to the regional, governmental 100% condom policy model and graduated sanction system in Puerto Plata. During the course of the intervention in Puerto Plata, 113 notifications, 18 fines and 1 temporary closing was levied on participating sex establishments from that city due to non-compliance with the five key intervention elements assessed on a monthly basis. Sex establishment owners from Puerto Plata generally stated that complying with all five intervention elements on a monthly basis was challenging. However, most agreed that they much preferred the transparent policy and regulation system establishment through the 100% condom use initiative, developed as a result of prior dialogue with them and other stakeholders, as compared to the prior government monitoring and enforcement system of sex establishments that was plagued by reports of corruption and manipulation.

DISCUSSION

Interest in environmental-structural interventions as potential strategies to prevent HIV/STI has increased steadily over recent years. However, limited data exists documenting the relationships between environmental-structural interventions and reductions in HIV-related risk. Additionally, the transferability of “successful” environmental-structural interventions has not been well evaluated and/or documented in the literature (Parker 2000). The current research helps to fill such knowledge gaps by testing and comparing the impact of two adapted models of the original Thai 100% condom program, widely recognized as one of the first environmental-structural HIV prevention interventions which significantly increased HIV-related protective behavior among sex workers and their clients.

The issue of the acceptability and feasibility of the Thai model in other cultural contexts is not just an issue of whether the political will or the capacity of health systems in other settings exists in order to replicate the model. The question of whether the Thai model is the “right” model to address the vulnerability faced by female sex workers with regard to HIV infection, for example, is at the heart of this debate. The perceived top-down approach of the original Thai program, and the apparent lack of sex worker participation in a mandate which affects their daily lives and survival is a key criticism leveled by some sex worker rights organizations regarding the original 100% condom program (Horizons 2002). This debate is not limited to the Thai program, but extends itself naturally to the role of policy and legislation in helping to “protect” the public’s health in general. Program planners and policy makers must examine the question of if and when policy and regulation are appropriate and justifiable to reduce risk for any health outcome critically. The inherent political nature of public health interventions cannot be avoided. Instead we must continually ask ourselves whom the interventions that are developed benefit and threaten and how do the most marginal and vulnerable groups with whom we work receive them.

The Dominican version of the Thai 100% condom program builds on over a decade of peer education, personal empowerment and community mobilization work by several NGO and government agencies, including the sex worker rights organization, MODEMU. Significant formative qualitative and quantitative research was carried out prior to implementing and evaluating the two models described herein (Kerrigan 2001; Kerrigan 2002). Several years were spent opening dialogues with key stakeholders and community members and assessing the appropriateness and

applicability of elements of the Thai model in this distinct socio-political and cultural context. Based on findings from formative research suggesting that elements of the original Thai program could assist sex workers in the struggle to protect themselves and their families, interest in adapting the program rose. Additionally, formative research indicated that community-based solidarity and collective commitment within and across sex establishments might be equally important and/or complementary to government-sponsored policy initiatives to reduce HIV. The belief and practice of truly integrated community-government-NGO alliances for HIV prevention is a critical component what makes the Dominican 100% condom experience unique.

Significant changes were documented pre to post intervention in all three of the study's outcomes including consistent condom use, ability to reject unsafe sex, and STI rates. However, the type and level of these changes varied by city and intervention model. For example, statistically significant increases were documented with new clients in Santo Domingo, significant increases were found with regular partners and all partners in the last month in Puerto Plata. Both cities experienced reductions in STI over the course of the intervention, while only in Puerto Plata were significant increases found in participating sex workers ability to reject unsafe sex. Such findings indicate that both models may have had a positive impact of reducing HIV-related vulnerability among sex workers, but in different areas.

The data also suggest that the additional structural or policy components of the intervention in Puerto Plata may be linked to the significantly higher levels of increased protective behavior documented in that city. In bivariate analysis, exposure and compliance with the intervention have independent, significant associations with consistent condom use with all partners in the last month, as does the city that is a marker for the type of intervention model implemented. When fitting the final multivariate model, however, we find that the significant effect of city only fades when the observed compliance with structural intervention components is added to the model. This suggests that it is not 'city' in and of itself, but rather the more intense adoption of structural intervention elements in Puerto Plata that is truly associated with increased protective behavior among participating sex workers. These findings indicate that in places where such compliance can be achieved, comparable increases in condom use may be possible. Yet, it was in Puerto Plata only where the integrated solidarity and policy based model was implemented where such levels of compliance were documented.

Program planners and policy makers in the Dominican Republic are now left with the question of which if any of these models to adopt as part of ongoing programming. Study findings have been well received by NGO, community members, government agencies and donors. Most of those involved in the study agree based on the data available and their experience in the field that the integrated solidarity and policy based model in conjunction with ongoing peer education and community mobilization activities is an appropriate, effective and ethical intervention package for the Dominican Republic. This study's findings, however, do not necessarily answer that question for other countries, even those with similar socio-cultural contexts. Each country and community must examine how both solidarity and policy based initiatives will be received and work in their own practical and political realities. Yet, the study findings offer insight and initial evidence to interested parties that environmental-structural interventions which seek to enable and promote individual as well as collective efficacy to prevent HIV are important and effective options to consider.

In the case of the Dominican Republic, the current dialogue is focused on how to scale up this successful experience in a way that continues to respect all members of the sex work community and continues to be effective in curbing the HIV epidemic. A key component of any scale up of the program will surely include a more intense set of intervention activities directed at the male clients of female sex workers. Participating sex workers from the current study who tested positive for STI at both baseline and follow-up were asked in a brief open ended questionnaire as part of post test counseling, how the intervention could help support them to not get reinfected. Almost unanimously the women stated that future intervention efforts must increase the reach and scope of work with male clients. Additionally, most women articulated the importance of special efforts to involve both regular paying and non-paying partners of female sex workers, by whom many of the women felt they had been infected. Currently, formative ethnographic research is underway in the Dominican Republic to understand how to engage male clients and mobilize their potential to prevent HIV. An additional future operations research question for the Dominican Republic and potentially other countries, is how to implement or scale up policy based initiatives like the adapted 100% condom model in areas of the country or in other countries where peer education and community mobilization work has not occurred historically. A key operations research question is hence, is knowledge and empowerment among female sex workers a prerequisite for the success of such policy initiatives or can these strategies be implemented in an integrated way from the beginning of program development in new intervention areas?

Limitations of the research

The main limitation of the current study is the pre-test/post-test research design that limits our ability to establish causal associations. Specifically, with regard to changes in HIV-risk pre to post intervention, the current research cannot fully establish whether the changes that occurred and/or the associations found between higher levels of exposure to and compliance with the intervention and consistent condom use are the result of the intervention. However, in an effort to address some of the limitations of the pre-test/post-test design, triangulation of data collection for study outcomes and serial cross-sectional data establishing temporal trends were also utilized. The internal consistency across all three study outcomes (e.g. consistent condom use, ability to reject unsafe sex, and STI) corroborate that significant improvements, particularly in the case of Puerto Plata, were achieved from pre to post intervention. Additionally, serial cross-sectional data on observed compliance helps to illuminate the mechanism by which the intervention may have had an effect on reducing sex workers vulnerability to HIV infection.

CONCLUSIONS

Both the adapted 100% condom models implemented as part of this study in the Dominican Republic had a positive impact on specific HIV-related outcomes. However, findings suggest that an integrated model involving both community-based solidarity and collective commitment as well as government policy and regulation regarding HIV prevention and condom use may lead to more significant increases in HIV-related protective behavior as well as reductions in STI among female sex workers. Environmental-structural interventions must engage community members in the conceptualization, implementation and evaluation of policy based initiatives in order to maximize their acceptability, appropriateness and effectiveness in reducing HIV-related risk in the context of female sex work.

REFERENCES