

# Syphilis and Herpes Simplex Virus Type 2 Sero-Prevalence Among Female Sex Workers and Men Who Have Sex with Men in Ecuador and Andhra Pradesh (India)

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## 1. Introduction

Sexually Transmitted Infections (STI) are a major public health issue worldwide because of their severe consequences for millions of men, women and children (World health organization [WHO], 2001, 2007). Despite of that, there is lack of data on their magnitude; the most recent estimations from the World Health Organization (WHO) are from 1999, when it was estimated that 340 million of new cases of curable STIs such as Syphilis, *Neisseria gonorrhoeae*, *Chlamydia trachomatis* and *Trichomonas vaginalis* occurred every year (WHO, 2001). Recent studies continue to reveal an increment in STI diagnosis across the world (Centers for Disease Control and Prevention (CDC), 2011; Cliffe et al., 2008; Herida et al., 2005; Johnston et al., 2005; Nicoll & Hamers, 2002; Uuskula et al., 2010).

Female sex workers (FSW) and men who have sex with men (MSM) has been reported as population groups with an average number of sexual partner higher than the general population. Because of this, and because their partners are from different groups in the population, FSW and MSM are key for STIs transmission dynamics. Epidemiological studies among MSM are still scarce particularly in developing regions (Caceres, C. et al., 2006). However the existent studies on the effects of HIV/STI prevention interventions highlight the fact that, for the most largely affected community in the HIV era, rigorous prevention strategies are urgently needed (Coates et al., 2008; Herbst et al., 2005; Johnson et al., 2008; Johnson et al., 2002).

FSW are still at the center of the epidemic in many countries, especially where heterosexual transmission of HIV is the main mode of transmission (Ghys et al., 2001). FSW vulnerability to STI/HIV results from diverse factors including a high rate of sexual partners, unprotected sex or inconsistent condom use and lack of access to health services (Ghys et al., 2001). Also, gender inequities, violence, exploitation, and criminalization, are all factors affecting unprotected and forced sex, which will in turn increase the risk for a FSW to contract an STI (Okal et al., 2011; Panchanadeswaran et al., 2008).

This chapter provides an overview on STI among MSM and FSW from two developing countries: Ecuador and India. We aim to present a panorama of syphilis and herpes simplex

virus type 2 (HSV 2) sero-prevalence and trends during a 4 year period, in two high-level vulnerable groups from two countries with very different economies, cultural and social norms. We will explore the similarities and differences in the trends on STI in MSM and FSW, allowing the readers the reflection on individual and contextual factors that may contribute to these trends in STI sero-prevalence in each population.

The content is divided in three sections. The first section briefly reviews background information regarding STI epidemics in Ecuador and India, giving emphasis to the scarce available data for MSM and FSW in relation to syphilis and HSV-2 infection. Second section presents the results of our study, particularly those related to trends on STI and HIV sero-prevalence from 2002/3 to 2007. Finally, as discussion points, we present some reflections derived from the results, highlighting the challenges to develop effective prevention strategies for MSM and FSW, and the need for large scale survey research using biomarkers for STIs.

## 2. Background

Because of the HIV infections worldwide, STIs that result in genital ulcers such as syphilis and HSV-2 started to get a lot more attention since these infections predispose the risk of HIV infection (Sgaier et al., 2011). One important feature of these infections is that the effectiveness of condoms decreases in the presence of ulcers, as the right protection must not only cover body fluid exchange but also the affected areas.

In spite of the fact that syphilis is a treatable infection since antibiotics were introduced, it is still a major public health issue. Even when the use of antibiotics is evident because of the global decline in syphilis prevalence (Sgaier et al., 2011), there is some evidence showing that in the last decade there has been a reappearing in several countries, specially among high-risk population groups such as MSM (Buchacz et al., 2005; Doherty et al., 2002; Gao et al., 2009; Hopkins et al., 2004; Peterman et al., 2005). In addition, the low effectiveness of contraceptives (including condoms) to prevent infections such as syphilis, on one hand, and the indiscriminate use of antibiotics that increases the risk of resistant chains, on the other, could lead to a more complex situation regarding the eradication of this infection even when there is an effective treatment available nowadays.

At the same time, there has been an important increase in the prevalence of viral infections around the world, including HSV-2. It is known now that HSV-2 is the main cause of genital ulcers in developing countries (WHO, 2007). It has been documented that gender, race, the number of sexual partners and the place of residence are among the factors related to the prevalence of this virus (Whitley & Roizman, 2001). According to a systematic review of HSV-2 sero-prevalence studies on an international scale (Smith & Robinson, 2002), the highest prevalence found has been documented in Africa and America, and the lowest has been documented in Asia. According to the authors, the virus prevalence increases with the potential time of exposure, meaning that it consistently increases with age, especially among 15 to 24 year old women and it appears particularly in groups with a higher prevalence of risky practices. This virus is even considered as a reliable marker of high-risk sexual behavior.

Population groups such as MSM or FSW are specially vulnerable to STIs because of a higher number of sexual partners than the general population, resulting in more exposure. In addition, high-risk practices such as unprotected sex or inconsistent condom use that can be associated with a higher probability of infection among these groups have been documented.

India, in Asia, has the second highest population in the world. This country is extremely socially, economically, and culturally diverse. High marginalization conditions prevail over an important percentage of its population even when there is a growing economy. Andhra Pradesh is a southern Indian state, the fifth largest territory in the country, with a surface area that can be compared with that of Ecuador. It has a population of 80 million people and its main economic activity is agriculture, although it has had an important development in technological fields in recent years.

Ecuador, a south American country, has a population of 14 million people and an oil based economy with agriculture being the second economic activity.

Both Ecuador and Andhra Pradesh, located in opposite hemispheres, share similar economic conditions, which make them archetypes of countries with limited incomes, and with an important inequality in the income distribution. These countries are, however, countries with such a cultural diversity that they show distinctive traits. Stated below, we present a brief review of existing evidence regarding syphilis and HSV-2 sero-prevalence among FSW and MSM in Ecuador and India.

## 2.1 Evidence of STI in Ecuador

As in many Latin-American countries (LA), in Ecuador, STIs frequency and distribution registries provides little useful information, due partly to a sub report that has been estimated of a considerable magnitude, because of the stigma associated to these infections (Galban & Benzaken, 2007). In combination with these restrictions related to health information systems, the evidence resulting from scientific investigation and publications is limited as well. Regional research has been carried out in the Andean area (Colombia, Ecuador, Bolivia, Peru), which has provided more information to rely on. Data reported to UNAIDS indicates that regarding HIV, most countries in this region face a concentrated epidemic with HIV prevalence lower than 1%, around 0.4%, among general adult population, but with higher numbers among high-risk population groups such as MSM and among injectable drug users also in some countries (IDU) (UNAIDS/WHO, 2009).

Available data from multicentric studies carried out for several countries in the Andean area, particularly in Ecuador (Bautista et al., 2006; Bautista et al., 2004; Centers for Disease Control and Prevention (CDC), 2011; Montano et al., 2005), reveal that Ecuador has the highest HIV prevalence among FSW in the Andean area, with a 1.8-2% prevalence (Bautista et al., 2006; Montano et al., 2005). HIV prevalence among MSM in Ecuador has been found around 11 and 29% (Bastos et al., 2008; Bautista et al., 2004; Montano et al., 2005).

There is almost no available data regarding syphilis and HSV-2 epidemiological state in this country, except for a few studies reported before the year 2000 (Jaramillo & Medina, 1998; Oswaldo et al., 1993). Nevertheless, according to one study using data reported by health ministries of 19 LA countries, in 2006, Ecuador revealed 1,885 syphilis cases (Galban & Benzaken, 2007). There is no further published data regarding these two STIs among FSW and MSM.

## 2.2 Evidence of STI in India

Contrary to what happens in Ecuador, there is a large number of published studies regarding sero-prevalence of STIs among the Indian population, revealing a wide range of prevalence

(Das et al., 2011). Generally speaking, an important decrease in HIV prevalence in southern Indian states has been documented, where a series of strategies focusing on the prevention of new HIV infections have been put into practice (Kumar et al., 2006). According to the last UNAIDS report, in 2009 there were 2,300,000 people of 15 and up, living with HIV in India, in contrast with 2,500,000 in 2001; the HIV general prevalence among the adult population in 2009 is 0.3% (UNAIDS, 2010). An HIV prevalence of 5 to 13% specially among FSW has been reported (Pal et al., 2004; Shethwala et al., 2009; Uma et al., 2005), whereas MSM report a prevalence of 9 to 18% (Brahmam et al., 2008; Kumta et al., 2010; Solomon et al., 2010).

However syphilis and HSV-2 available data are not as specific, and results differ according to the population group and the geographic location (Sgaier et al., 2011).

Concerning the syphilis infection, studies carried out among FSW show a prevalence between a range of 6-10% (Das et al., 2011; Shethwala et al., 2009). Yet, other studies reveal higher rates, between 22-31% (Desai et al., 2003; Family Health International/Development Fund for International Development/Andhra Pradesh State AIDS Control Society, 2001; Pal et al., 2004; Wayal et al., 2011). Because of this variation, it has been suggested that a decrease in prevalence among this group has happened in the last few years. For example, in three southern Indian states, data show that from 2005 to 2009 syphilis prevalence significantly dropped among FSW population, even when this was not so clear among its clients (Adhikary et al., 2011).

In relation to MSM, there is a lot less reported regarding STIs; however some of the studies report a syphilis prevalence between 6 and 17% (Brahmam et al., 2008; Gupta et al., 2006; Kumta et al., 2010; Setia et al., 2006; Solomon et al., 2010). Just as for FSW population, one study show that in a ten years time, syphilis prevalence significantly dropped in a MSM sample group (Gupta et al., 2006).

There is even less information regarding the spread of HSV-2 than for other STIs. However, in the last few years, this infection has been placed among the most common in high-risk population groups in India (Kumarasamy et al., 2008). Data taken from FSW sample groups show that a high percentage of them are infected with HSV-2, reporting a prevalence of 56 to 73% (Shahmanesh et al., 2009; Uma et al., 2005; Wayal et al., 2011). MSM studies show elevated prevalence as well. For example, a study carried out with a MSM sample group in 8 Indian cities showed a HSV-2 prevalence of 26% (Solomon et al., 2010), whereas another study carried out with MSM in Mumbai clinics show a 40% prevalence (Setia et al., 2006).

### **2.3 The Frontiers Prevention Project (FPP)**

Data for this analysis are from the evaluation of a large HIV prevention intervention, the Frontiers Prevention Project (FPP). The FPP was implemented globally by the International HIV/AIDS Alliance. As part of the FPP evaluation, sero-surveys of MSM and FSW were conducted between 2002/2003 and 2007 in sites from 8 cities in Ecuador and 24 geographical sites in India. Potential sites of concentration of MSM and FSW were identified through interviews with key informants and mapping exercises that were conducted in each city. At selected sites, MSM and FSW were contacted and recruited by members of the same key population.

For the 2007 survey, a second mapping/identification exercise was carried out in each city to identify new meeting sites. MSM and FSW were recruited using the same strategy from

2002/2003. At both years, capillary blood samples were taken for assays on serological antibodies to herpes simplex virus type 2 using Focus Diagnostics HerpeSelect 2™, and Trepanostika™ from bioMérieux for the diagnosis of syphilis. For this work we use information collected at all the sites both in Ecuador and India, but controlling for the potential effect of the FPP prevention package. HerpeSelect 2 for sexually active adults has a sensibility of 96.1% and a specificity of 97% (Focus Diagnostics, n.d.). Trepanostika manufacturer reported 100% sensitivity and specificity (BioMérieux, n.d.).

This study was approved by the Ethics and Research Committee at the National Institute of Public Health of Mexico, the Ecuador National Health Board, the Administrative Staff College of India, the Indian Health Ministry's Screening Committee and the International HIV/AIDS Alliance.

### 3. Results

During these two periods (2003 and 2007), biological samples of 11,272 participants were collected: 7,178 provided biological samples between 2002/2003 (baseline data) and 4,584 in 2007. In 2003 information from 3,995 key populations (FSW and MSM) members in Ecuador and 2,524 in India was collected, whereas in 2007 the sample consisted of 2,060 members in Ecuador and 2,524 in India. Table 1 shows the population distribution according to group, country and time period.

Group	Country				Total
	Ecuador		India		
	2003	2007	2003	2007	
MSM	1,933	1,004	1,755	1,143	5,835
FSW	2,062	1,056	1,428	1,381	5,927
Total by year	3,995	2,060	3,183	2,524	
Total by country	6,055		5,707		11,762

Table 1. Study sample size by country, year and group.

For the analysis presented here, we fitted a probit model including three dummy variables and their pairwise and triple interaction. Interacted variables are time (2003 vs 2007), country (Ecuador vs India) and group (MSM vs FSW). We obtained the marginal effects of such interaction using `inteff3` command in Stata (V. 10), controlling for the potential effect of the FPP prevention package. Dependant variables are syphilis and HSV-2 sero-prevalence, and the co-infection between both.

Hereafter, the most important aspects of prevalence found for each population group in both countries is described, followed by the results of the multivariate analysis, presenting syphilis results first and HSV-2 data next. The proneness of co-infection between both STIs is also concisely pointed out. In order to thoroughly analyze the characteristics of these FSW and MSM sample groups, previous publications can be consulted (Dandona, L. et al., 2005; Dandona, R. et al., 2005; Dandona et al., 2006; Gutierrez et al., 2010; Gutierrez et al., 2006a; Gutierrez et al., 2006b; Kumar, G.A. et al., 2006).

### 3.1 Syphilis sero-prevalence

Regarding the presence of syphilis, Ecuador's data show an overall prevalence increase between 2003 and 2007, so that in 2007 general prevalence was twice as much (8%) as in 2003 (4%). While increase in prevalence is observed in Ecuador, the opposite findings were noted in India, meaning that in this country, syphilis prevalence decreased between 2003 and 2007, with an overall prevalence of 18% and 8% respectively for each year.

Even though this is the overall trend at a country level, this trend appears in different extents for each group in each country (Fig.1). It also shows that in both, Ecuador and India, syphilis prevalence is higher among MSM when compared with FSW, a condition that persists from the baseline to the follow-up. While in 2003 Ecuador has a syphilis prevalence of 5% and 3% among MSM and FSW respectively, in India this prevalence is 21% and 15%. It is interesting to notice that in 2007, both groups in the two countries tend to bare a syphilis prevalence of around 8%.

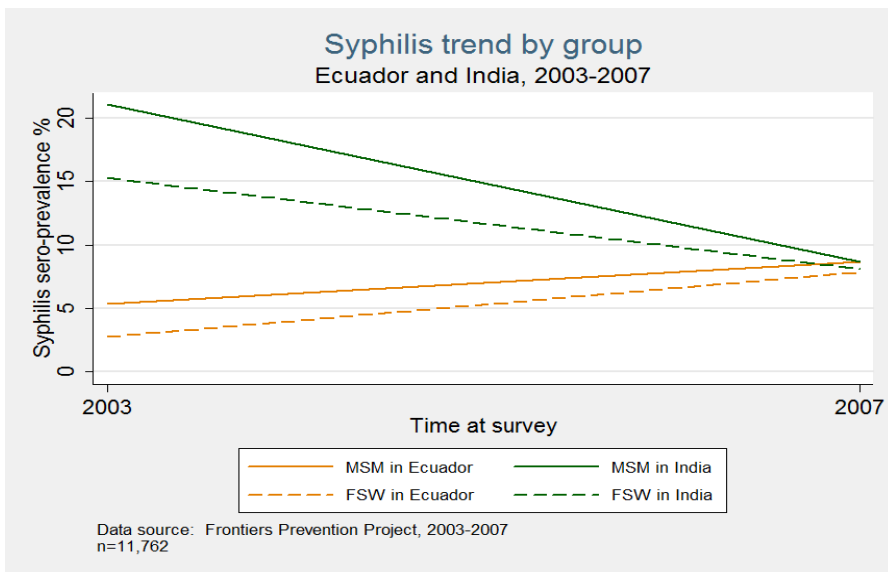


Fig. 1. Syphilis trend among men who have sex with men (MSM) and female sex workers (FSW) in Ecuador and India, 2003-2007.

The results from the multivariate analysis show that in 2003, the probability of a FSW of being syphilis sero-positive in Ecuador is 2.3 percentage points below when compared to MSM in that same country ( $p \leq 0.01$ ). In India, FSW have a probability of 5.7 percentage points below MSM of a syphilis sero-positive diagnosis in 2003 ( $p \leq 0.01$ ). In 2007 there are no significant differences when comparing FSW to MSM in either country.

The difference among these two groups in terms of their vulnerability is clearly shown when analyzing the effect of time in the probability of a syphilis positive diagnosis. For MSM in Ecuador, the time trend is shown in a 3 percentage points increase in syphilis probability ( $p \leq 0.01$ ). This effect is of a greater magnitude among FSW in this country, since

it shows an increase of near 5 percentage points in syphilis probability between 2003 and 2007 ( $p \leq 0.01$ ).

For Indian population, in contrast, the trend in time shows that the probability of syphilis sero-positive diagnosis among MSM decreased 12 percentage points in time ( $p \leq 0.01$ ), whereas for FSW there was a 6.8 percentage points decrease ( $p \leq 0.01$ ).

### 3.2 Herpes simplex virus type 2

Regarding HSV-2, the overall prevalence in both countries is high, nevertheless, there is a similar trend to the one that takes place with syphilis prevalence. As an increase in HSV-2 prevalence is perceived in Ecuador between 2003 (61%) and 2007 (87%), a decrease is observed in India, going from an overall prevalence of 43% in 2003 to a 20% in 2007.

As shown in figure 2, HSV-2 prevalence during 2003 among MSM was similar in both countries, with a prevalence around 37-38%. Also in both countries, but in contrast to the syphilis situation, the FSW group shows the highest HSV-2 prevalence, particularly in Ecuador. In this country the STIs prevalence among FSW is 83%, whereas in India it is documented to be 50%. By 2007 MSM show an important increase in the prevalence of this virus in Ecuador (80%), reaching a more similar prevalence to that documented for FSW in this same country in 2007 (92%). In India, there is a similar decrease for FSW and MSM from 2003 to 2007, showing a prevalence of 14% and 24% respectively in 2007.

The most significant variation in HSV-2 prevalence was observed among MSM in Ecuador. According to the multivariate analysis, the HSV-2 sero-positive probability is 43 percentage points higher for FSW in Ecuador in contrast with MSM ( $p \leq 0.01$ ), but in 2007 this difference narrows down so that the probability of infection is only 10 percentage points higher for FSW ( $p \leq 0.01$ ). In other words, in the follow-up, prevalence in both groups tend to resemble. In India, the risk for FSW in contrast with MSM is comparatively similar from 2003 to 2007; at baseline, the probability of an HSV-2 diagnosis is 13 percentage points higher for FSW in contrast with MSM ( $p \leq 0.01$ ), whereas at follow-up, the difference is only 10 percentage points ( $p \leq 0.01$ ), close to that of Ecuador (Fig. 2).

In terms of the time trend over the probability of a HSV-2 positive diagnosis, we found that time increases this probability 41 percentage points among the MSM population in Ecuador ( $p \leq 0.01$ ), whereas among the FSW population in the same country, the probability increases only 8 percentage points ( $p \leq 0.01$ ). On the other hand, the effect of time for the Indian population is closer between MSM and FSW, as HSV-2 sero-positive probability decreased 23 percentage points for MSM ( $p \leq 0.01$ ) and 26 points for FWS ( $p \leq 0.01$ ) from 2003 to 2007.

### 3.3 Syphilis and HSV-2 co-infection

Finally, it is important to look into the co-infection trend shown among these two STIs. In terms of overall prevalence, in 2003 in Ecuador, 3% of the sample was positive for both syphilis and HSV-2 infection, while in India it was 13%. In 2007 the prevalence of co-infection in Ecuador reached 7%, while in India it decreased to come at 3%.

At a group level it is clear that the co-infection pattern tends to be similar among MSM and FSW in each country, and this is evident both in 2003 and 2007 (Fig. 3). In 2003, the co-infection prevalence in Ecuador among MSM was 4.5%, while for FSW it was 2.6%. The

same year, in India, the co-infection prevalence was 13% for MSM and 12% for FSW. During the follow-up, in Ecuador around 7% of these groups show a co-infection of these two STIs, meanwhile, in India, a co-infection among both groups is documented in around 3-4% (Fig. 3). There is no evidence of a significant difference regarding co-infection when comparing MSM and FSW in each country and year.

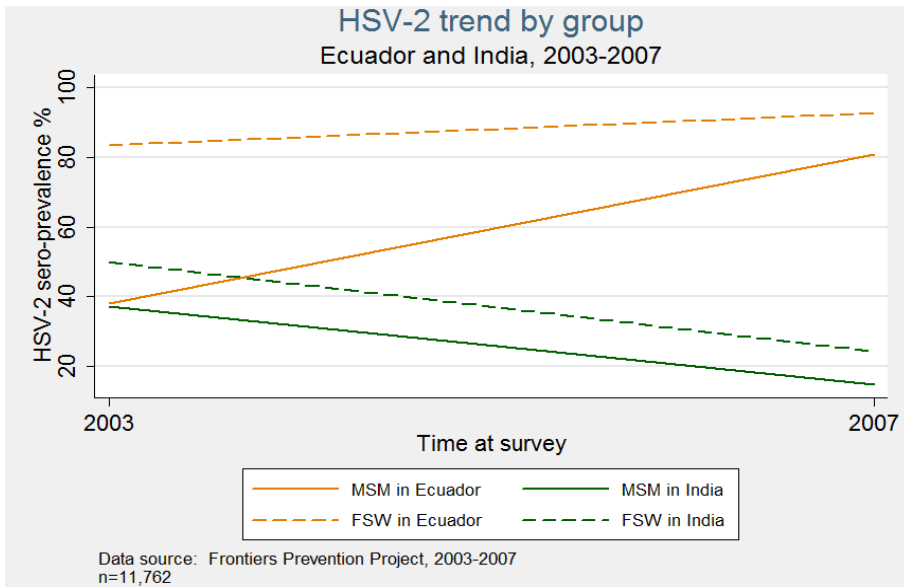


Fig. 2. Herpes simplex virus type 2 (HSV-2) trend among men who have sex with men (MSM) and female sex workers (FSW) in Ecuador and India, 2003-2007.

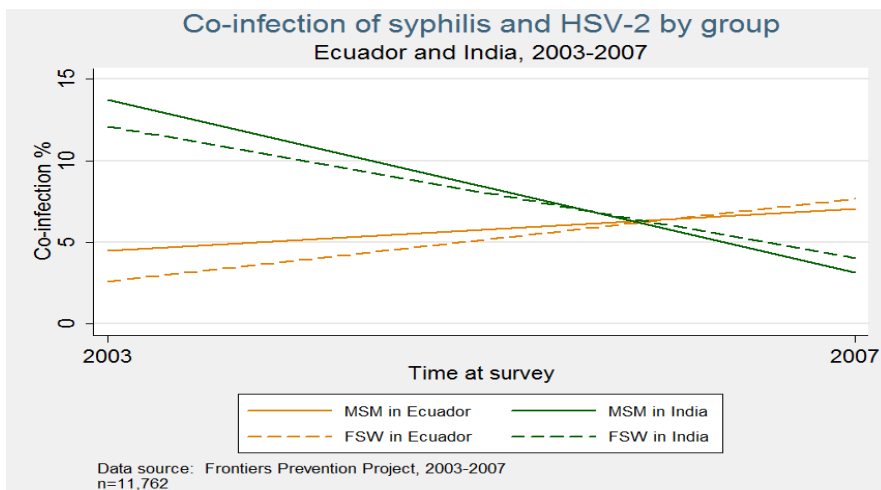


Fig. 3. Syphilis and Herpes simplex virus type 2 (HSV-2) co-infection among men who have sex with men (MSM) and female sex workers (FSW) in Ecuador and India, 2003-2007.



Regarding co-infection among both STIs at the country level, we found the same trend that is identified for each particular STI. In other words, while in Ecuador there is an increasing trend for both STIs co-infection, in India the trend is decreasing. For example, the results from the multivariate analysis show that the trend in time is that the probability of co-infection among MSM increases 2.5 percentage points ( $p \leq 0.01$ ) in Ecuador, in the mean time, it increases 5 points among FSW in that same country ( $p \leq 0.01$ ). In contrast, in India, the probability of co-infection among MSM from 2003 to 2007 decreases 10 percentage points ( $p \leq 0.01$ ), whereas for FSW it decreases as far as 7 percentage points ( $p \leq 0.01$ ).

#### 4. Conclusion

This chapter presents the results of a research conducted to explore syphilis and HSV-2 prevalence among MSM and FSW population groups in Ecuadorean and Indian sites, with data collected from 2003 to 2007. According to our results, there is an important presence of both STIs among these population groups, each one affecting to a different extent each one of the groups. Consistent with other published studies, the results show a reduction of syphilis and herpes sero-prevalence among high-risk population groups in India. On the other hand, an important STI increase was reported in Ecuador during the same time period among FSW and MSM. This breakdown shows, first of all, that there is no uniform behavior of STIs around the world, and secondly, that the extent of these infections is clearly related to the specific context.

Another contribution of this research is the fact that the data come from a much larger sample than the one usually reported in STIs studies in these countries. In addition, the research allows the examination of the co-infection pattern among these two STIs, bringing in extremely original data about a rarely published topic, specially in developing countries (Lama et al., 2006). According to this, the co-infection of these STIs show the same trend as when addressed individually, in other words, there is an increase in Ecuador's case, but a decrease in India.

In India, there has been great mobilization towards the creation and execution of HIV prevention strategies intended for different population groups in the last few years (Gangopadhyay et al., 2005; Guinness, 2011; Kumar et al., 2011; Reza-Paul et al., 2008; Verma et al., 2010). In our study, when comparing both countries, Ecuador's scenario is less favorable since for both MSM and FSW, prevalence of these STIs tends to increase in time. On the other hand, in India the prevalence of these infections shows a significant decrease. In this sense, it can be suggested from our results that the important effort carried out in AP (India) regarding control of HIV could have favored a decrease in high-risk behavior. This means that the documented reduction of HIV in India (Rao et al., 2009) may be due to a decrease in high-risk behavior that, at the same time, reduces other STIs infection such as syphilis and HSV-2, although this cannot be completely sustained for infections that cause ulcers, considering their high prevalence reported in this study. What seems evident is that even with such efforts, the number of infected people in AP is extremely elevated.

In Ecuador, there is no evidence regarding the implementation of prevention strategies, nevertheless, it is clear that on an overall scale, in the LA area, the few documented prevention efforts have been intended primarily for the general population, excluding more vulnerable population groups such as MSM and FSW (Caceres, C.F., 2004; Huedo-Medina et al., 2010). The results shown here, could symbolize the great need for the creation and execution of massive efforts focusing on these vulnerable population groups in the LA area.

The relationship between genital herpes and HIV infection has been thoroughly described in publications, pointing out that the risk of getting HIV is twice as much for a person infected with HSV-2 (Wald & Link, 2002). It is also known that syphilis infection assists HIV transmission as well (Buchacz et al., 2005). In this sense, prevention and treatment of other STIs can play a part in the reduction of risk of HIV transmission in a population group with a high rate of sexual partners, such as FSW and MSM (WHO, 2007).

International publications point out that in developing countries HSV-2 sero-positivity is mostly among women when compared to men. On the other hand, at an international scale, a syphilis outbreak has been reported particularly among MSM population groups (Buchacz et al., 2005; Doherty et al., 2002; Gao et al., 2009; Hopkins et al., 2004; Peterman et al., 2005). In accordance with this, the results of this research show that for both countries, syphilis prevalence in 2003 is higher among MSM, whereas HSV-2 mostly affects FSW population groups. Nevertheless, the time trend shows that in Ecuador's case, the most significant increase of HSV-2 prevalence happens among MSM, while syphilis increases affecting mostly FSW. In contrast, as stated before, in India the general trend is a decrease in syphilis infection, although such decrease was lesser among FSW.

MSM and FSW are a stigmatized and hard to reach population. Frequently, FSW are threatened by legal frameworks that criminalize sex work (Operario et al., 2008; Vandepitte et al., 2006). At the same time, in many developing countries MSM face social and cultural stigma and discrimination (Beyrer, 2008). These are factors that affect surveillance and research directed toward these populations, thus limiting the comprehension on how the STI epidemic is being driven in a specific group or country (Beyrer, 2008).

As stated earlier, available information related to syphilis and HSV-2 prevalence in these two countries is very scarce, particularly in Ecuador. So, the present study is a valuable contribution regarding the presence of STIs among two very vulnerable groups, allowing to detail the syphilis and HSV-2 prevalence trend for each one of these groups. Because of the profile described here for these STIs, the need to create and execute specific strategies for each one of these populations is evident.

It is important to mention that according to the manufacturer, the assay used for syphilis, Trepanostika, has a 100% sensitivity and specificity (BioMérieux, n.d.). HerpeSelect 2 has 96% sensibility and 97% specificity (Focus Diagnostics, n.d.). Both assays are therefore highly precise given the level of the prevalences.

The lack of data regarding STI distribution and magnitude remains as a problem in the HIV epidemic. Without such information, the size of the population being affected by STI may stay largely unknown as well as their health needs (Shahmanesh et al., 2008). An understanding of STI levels and its distribution across a geographical region would allow the planning of effective prevention efforts that correctly address the needs of most vulnerable groups (Dhawan & Khandpur, 2009; Jain et al., 2008). At the same time, the information provided by serological surveys can be used for evaluation purpose, allowing to assess the impact of preventive programs at a large scale in a given country (Smith & Robinson, 2002).

To conclude, the information provided in this research has a meaningful impact in terms of STI and HIV prevention. Syphilis and HSV-2 opportune detection is important in order to prevent HIV infection among vulnerable and affected groups, which translates in the need to execute effective interventions that include STI detection, treatment and control (Setia et al., 2006).

## 5. Acknowledgment

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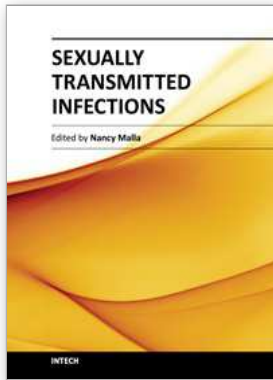
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Sexually transmitted infections (STIs) are infections that are spread primarily through person to person sexual contact. There are more than 30 different sexually transmissible bacteria, viruses and parasites. STIs lead to high morbidity and complications. This book entitled as Sexually Transmitted Infections is not a text book but provides useful information for general reference work for physicians, researchers and students interested in the subject. Each chapter is abundant in tips useful to general readers as well. It also includes the Introductory chapter providing an overview with special emphasis on syndromic approach to the management of STIs in clinical setting.

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