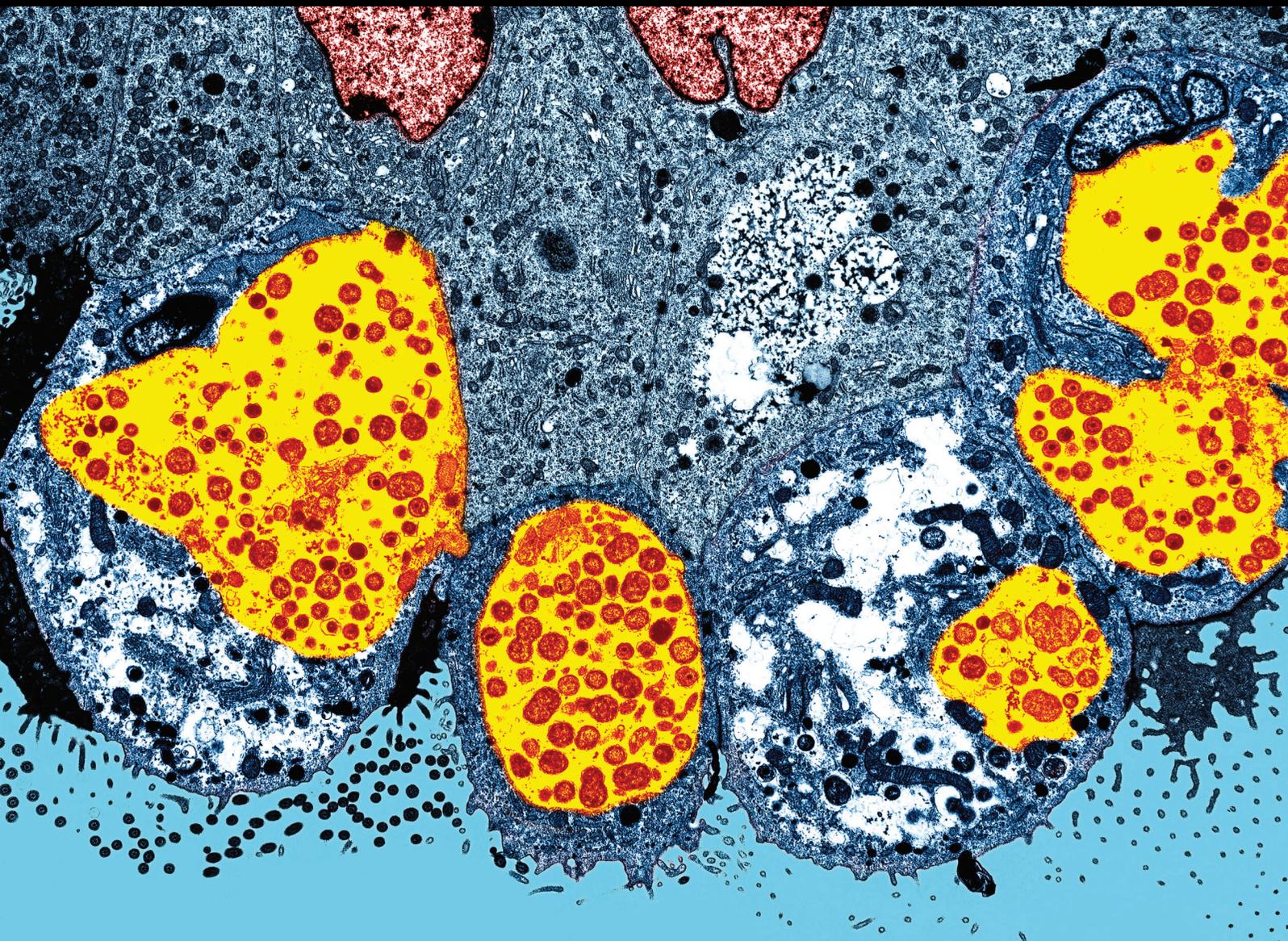


# Women and Children First: The Impact of Sexually Transmitted Infections on Maternal and Child Health

Guest Editors: Consuelo Beck Sagué, Carolyn Black, Stephen A. Morse, and George Schmid





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Journal of Sexually Transmitted Diseases

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## Editorial

# Women and Children First: The Impact of Sexually Transmitted Infections on Maternal and Child Health

Consuelo Beck Sagué,<sup>1</sup> Carolyn Black,<sup>2</sup> Stephen A. Morse,<sup>2</sup> and George Schmid<sup>3</sup>

<sup>1</sup> Department of Health Promotion and Disease Prevention, Robert Stempel College of Public Health and Social Work, Florida International University, 11200 SW 8 Street HLS (AHC II) 571, Miami, FL 33199, USA

<sup>2</sup> Centers for Disease Control and Prevention (CDC), Atlanta, GA 30333, USA

<sup>3</sup> Centers for Disease Control and Prevention (CDC), Astana 010000, Kazakhstan

Correspondence should be addressed to Consuelo Beck Sagué; [becksague@gmail.com](mailto:becksague@gmail.com)

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In 2000, all 189 Member States of the United Nations (UN) adopted the UN Millennium Declaration, committing them to pursue eight measurable targets, the Millennium Development Goals (MDGs) [1, 2] to be achieved by 2015. The MDGs were intended to: (1) eradicate severe poverty and hunger; (2) achieve universal primary education; (3) promote gender equality and empowerment of women; (4) reduce child mortality; (5) improve maternal health; (6) combat HIV/AIDS, malaria, and other infectious diseases; (7) ensure environmental sustainability; and (8) develop a global partnership for development. The unprecedented effort required to achieve the MDGs addresses issues and conditions especially relevant to the health and survival of women—particularly mothers—and infants, children, and youth. Despite calls for universal access to reproductive and sexual health, no MDG addressed these issues, which are critical to maternal and child health and remain neglected [3].

The MDGs proposed dramatic reductions in, or elimination of, scourges that have plagued humankind since its beginnings including severe poverty, famine, and pregnancy-related mortality as well as one emerging infectious disease, human immunodeficiency virus (HIV) infection, only recognized in the last decades of the 20th century, which was singled out for particular attention [1, 2]. Arguably, never before has elimination of the inequalities at the root of these scourges been articulated even as a possibility, let alone as goals to be urgently pursued. But without an MDG focused on reproductive health, progress on this issue relies

on its being buoyed by efforts towards addressing the eight MDGs. Progress towards achievement of MDG indicators has been impressive; some (such as the halving of the number of people living in extreme poverty) were achieved before 2015 [4]. Others, including reduction of HIV mother-to-child transmission to less than 2% [5], are either on schedule or achievable by 2016–2017. Much, however, remains to be done.

It is in that context that the disproportionate and largely preventable toll that sexually transmitted infections (STIs) exact on women, including mothers, and infants, children, and youth, is reexamined. Women, particularly adolescent women, are especially vulnerable to STIs due to, among other factors, a larger exposed mucosal surface area, hormonal effects, changes in the protective female genital tract microflora, and the intermittent presence of ectopy, especially in adolescence [6–8]. These groups are also at increased risk due to sexual partnerships with older men, little power over when, where, and how sex occurs, and other social and cultural factors. However, poverty, neglect, and inequality drive much of the increased risk of women and children. The impact of STIs on maternal and child populations is greatest in low- and middle-income countries, where over 75% of STIs reportedly occur [9, 10]. Within these countries and in under-served populations in industrialized countries STIs continue to disproportionately impact the most disadvantaged women and children [11, 12].

This issue of the Journal of Sexually Transmitted Diseases offers heartening news about emerging tools for elimination

of the impact of these illnesses and reminders that we struggle against formidable forces. Control of the worst outcomes of STIs in low- and middle-income countries is achievable [13]. Moreover, the elimination of mother-to-child transmission of syphilis and HIV infection is clearly attainable; the global commitment to elimination is based on compelling evidence that their elimination is not only possible, but also cost effective and essential to the health of their mothers [14–16]. But unlike the case with smallpox eradication, as long as HIV and *Treponema pallidum* infections exist in the human population—and they will—the threat of mother-to-child transmission remains a possibility [17]. Similarly, as long as orphaning, poverty, neglect, and abuse drive children and youth to homelessness and life in “the streets” in urban settings worldwide, their vulnerability to coerced and unprotected consensual sex, as well as resultant STIs and their sequelae, will continue to be considerable [18, 19].

The papers in this special issue document the tragic circumstances endured by street children in Ethiopia, the elevated risk of herpes simplex virus type 2 infection among monogamous women in India associated with their husbands’ work-related travel, and innovations and challenges in the progress towards congenital syphilis elimination in Haiti and Kenya, and HIV mother-to-child transmission in India. The report from the United Kingdom describes the efforts to reach out to the population of children born to HIV-infected parents who even in high-resource environments, while at extraordinarily high risk of perinatally acquired HIV infection and orphaning, often remain invisible, untested, and underserved.

At first glance, these reports appear to be a potpourri of glimpses of the impact of STIs on the health of mothers, infants, and youth. But, in fact, they illustrate both the complex forces that sustain the persistent problem of STIs in these populations and innovative, multilevel approaches that have already resulted in progress towards elimination. The recommendations set forth in the mixed methods study to support street children in Ethiopia may seem painfully obvious but, worldwide, street children are often viewed as a public nuisance or a law enforcement issue; the tragic stories told in the focus groups illustrate how utterly at the mercy of predatory forces these youth really are [18]. Similarly, creating work opportunities for men in rural communities that do not result in long separations of stable couples may reduce the risk of STIs not only in India, where this risk is particularly well documented, but also worldwide as a critically important aspect of global development efforts [20].

The development and implementation of simple point-of-care testing for syphilis have contributed to the identification of infected women in some of the most challenging environments on earth [21–23]. Similarly, innovative processes for dramatically expanding access to prenatal HIV testing and timely initiation and continuation of combination prenatal antiretroviral therapy are being successfully implemented in the most impacted populations in the world [24, 25]. Nevertheless, it is clear that in efforts to eliminate congenital syphilis there are no “magic bullets.” The cascade from antenatal care availability and use, point-of-care testing, and treatment with benzathine penicillin for the pregnant woman

and, ideally, her partner is very effective but often fragile; “systems improvements” that consistently guarantee and monitor response to treatment of 100% of infected women can be elusive. The use of cash incentives to microcredit women’s groups based on villagers’ antenatal care attendance and provision of mobile health care were associated with a dramatic increase in antenatal care enrollment and, as a result, prenatal HIV testing. In nations with large HIV epidemics, conditional cash transfers [26, 27] may contribute to elimination of mother-to-child transmission. The success of case finding for children of HIV-infected parents in the United Kingdom is encouraging to all who understand that, worldwide, HIV-infected parents are often underserved and face daunting problems, and their children are an often hidden and neglected population. Identifying and providing quality services to HIV-affected families remain challenges that are increasingly recognized and addressed [28–30].

These reports highlight challenges, possible solutions, and inspiring successes that worldwide promise the possibility of eliminating the most devastating consequences of STIs for mothers, children, and youth. The slogan “women and children first” inspired an impressive array of reports describing approaches that may help achieve the MDG vision of a fairer, safer world for mothers, children, and youth.

Consuelo Beck Sagué  
Carolyn Black  
Stephen A. Morse  
George Schmid

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## Research Article

# Assessment of Sexual and Reproductive Health Status of Street Children in Addis Ababa

Demelash Habtamu<sup>1</sup> and Addisie Adamu<sup>2</sup>

<sup>1</sup> College of Medicine and Health Science, Madawalabu University, Bale, Goba, Ethiopia

<sup>2</sup> College of Health Science, School of Public Health, Addis Ababa University, Addis Ababa, Ethiopia

Correspondence should be addressed to Demelash Habtamu; [hab2396@yahoo.com](mailto:hab2396@yahoo.com)

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Street children worldwide do not have the information, skills, health services, and support they need to go through sexual development during adolescence. This study is undertaken to systematically investigate the fit between street children's sexual and reproductive health needs and the existing services. A cross-sectional study was conducted among 422 street children and four service providers. About 72.5% of the respondents were sexually active during data collection and 84.3% of males and 85.7% of females tended to have multiple sexual partners. More than two-thirds (67.3%) of the participants had used at least one type of substance. History of substance use (OR = 2.5; 95% CI = 1.42–4.56) and being on the street for the first one to three years (OR = 5.9; 95% CI = 1.41–7.22) increased the likelihood of having sexual activity. More than half (64.9%) of the street children did not attend any kind of sexual or reproductive health education programs. Lack of information on available services (26.5%) was the biggest barrier for utilization of local sexual and reproductive health services. From the individual interview with coordinator, the financial and networking problems were hindering the service delivery for street children. In conclusion, street children who are special high risk group have not been targeted and hence continue to remain vulnerable and lacking in sexual and reproductive health services and sexual health services are poorly advertised and delivered to them.

## 1. Introduction

The problem of street children is becoming a worldwide phenomenon since these children exist in every part of the world. The vast majorities of these children work and live in large urban areas of developing countries [1]. Like many underdeveloped nations challenges facing the Ethiopian children are diverse and immense. Thousands of children live under difficult circumstances and are exposed to various forms of abuse and exploitation [2]. Street children in this study include those children aged between 10 and 18 years. The family may have neglected them or may have no family members left alive. Such children have to struggle for survival and might move from friend to friend or live in shelters such as abandoned buildings, plastic shelters, and public phone rooms [3].

Though street children are hard to count, estimates of the number of street children range from about 20 million to over 100 million worldwide. What is certainly known is that

their numbers are increasing for various reasons including the global population growth, poverty, rapid urbanization, and AIDS pandemic [4].

In Ethiopia, due to push factors (poverty, family dysfunction abuse, and school problems) and pull factors (independence, freedom, and drug/alcohol abuse) children are drifted to street life to support themselves or their families in major cities [5]. Over 4 million children are estimated to live under especially difficult circumstances. It is estimated that 600,000 children are taking part in street life and as many as 500,000 children find themselves at an extremely high risk of becoming involved in street life in Ethiopia [6].

The streets of Addis Ababa, the capital city of Ethiopia, are said to be home to a population of between 60,000 and 100,000 street children with the lower estimates originating from the Ministry of Labor and Social Affairs and the higher ones from aid agencies [7]. Street children live and work in conditions that are not conducive for healthy development. They are exposed to the street subculture such

as smoking, drug, alcohol and substance abuse, gambling, engaging in sexual activities, or selling sex for survival [1]. The circumstances in which they live and work increase their vulnerability also to sexual exploitation and abuse and put them at a higher risk of unintended pregnancies, sexually transmitted infections and HIV/AIDS. The problem is further compounded by the lack of access to sexual and reproductive health information and services [8]. A few studies that exist on the sexual behavior of street children in Addis Ababa showed that these children are more familiar to high-risk behavior and are sexually active at an early age [6]. Despite these alarming realities, street children rarely have a voice in the sexual and reproductive health discourse. Governmental and nongovernmental organizations intervention programs do not based on the realities of street children. This is because these organizations work through the existing societal structures such as hospitals, schools, local communities and facilities from which street children are disconnected [4].

Though study reports and other literatures on street children sexual health problems are very limited and even when available are not comprehensive, some studies tried to reveal the magnitude of sexual and reproductive health problems of street children and tried to recommend appropriate intervention strategies for governmental and nongovernmental organizations [6]. To date, little is known about sexual and reproductive health status of street children and whether they have access to sexual and reproductive health services and information and, if so, to what extent. Hence undertaking a study in this area is believed to provide information on their sexual and reproductive health status and the types of sexual and reproductive health services offered to street children and relevant information was generated that could help organizations to design appropriate sexual and reproductive health programs and improve future services for this disadvantaged segment of the population.

## 2. Literature Review

**2.1. Background.** A personal sense of sexual wellbeing as well as the absence of disease, infections, or illness associated with sexual behavior is termed as *sexual health*. People with adequate sexual and reproductive health have a satisfying and safe sexual life, can have children, and can make a choice as to whether they would like to have children and, if so, when and how to have them [9]. Unfortunately youth in general are at greater risk for abnormal sexual and reproductive health compared to other age groups due to risky sexual behaviors. Homeless children and youth are likely to be at even higher risk for several different reasons [10]. A risky sexual behavior is one that increases the likelihood of adverse sexual and reproductive health consequences. These health consequences may include unwanted pregnancy, unsafe abortion, HIV/AIDS and STIs [9].

### 2.2. Risky Sexual Activities

**2.2.1. Sexual Activity under the Influence of Substance/Alcohol.** Substance use may influence sexual behavior in ways that

increase the risk of acquisition of HIV and other STDs. The street child's decisions on sexual behaviors such as whether to use a condom during sexual activity, to negotiate for sex, or to use force (rape) depend on the level of intoxication. In general alcohol and other substance use often accompany the early sexual experiences, especially among boys [9, 11].

**2.2.2. Commercial Sex/Survival Sex/Prostitution.** It has been estimated that 25% of Ethiopia's street children are girls and there is indisputable evidence that street girls in Ethiopia are often obliged to take on commercial sex work for survival. Unfortunately recent information on the number of street girls engaged in it is lacking [1]. One of the studies done in Addis Ababa showed that a significant number, 69.6%, of the study subjects (who were commercial sex workers) were between the ages of 13 and 15 years [12].

**2.2.3. Unprotected Sexual Intercourse.** Unprotected sex is common among street children. This could result in a variety of sexual and reproductive health problems. Street children spend a lot of time in settings where casual sexual encounters occur (bar or "crack houses") [11]. Their risk of acquiring blood borne diseases and STDs such as HIV, syphilis, and hepatitis is increased by the fact that they often have sex with persons at high risk for these diseases like people with multiple sexual partners or those sharing injection equipment for substances. Research results highlight the critical need for sexual and reproductive health programs for street children. For example, a study in Awassa showed that, Among the 280 respondents who practiced sex, 216 (77.1%) did not use any of the modern methods of contraception [13].

**2.2.4. Same Sex Sexual Activity.** Street children sometimes have sex with other street children of the same sex. This is much more common among boys. In addition, street boys are often sexually exploited by older men. Engaging in unprotected sexual intercourse can lead to acquisition of STDs including HIV [9]. Based on the study done by Getnet Tadele on sexual abuse against male street children in Merkato area, Addis Ababa, peers/friends were found on the top list of abusers as reported by 47% of the children, followed by unknown persons/strangers 17%, relatives 11%, and 10% students and rich businessmen. Foreigners/Ethiopian diaspora, bar owners, and police were reported by 6%, 5%, and 4% of the respondents, respectively. This finding shows that street children themselves are involved in the practice [14].

### 2.3. Consequence of Risky Sexual Behaviour and Unprotected Sex

**2.3.1. Pregnancy and Its Consequences.** Street girls may become pregnant because of unprotected sex and the baby born to such mothers may have a low birth weight and may be prone to infections and illness. Coping with the needs of the child may be difficult for a street girl [15]. Although having a child before the age of 15 is reported to be common in many families, unwanted pregnancy in early age is a complicated process and it accounts for the majority of maternal mortality and morbidity [12]. One study conducted in Dessie

town showed that, out of sexually active female street youth, 25.0% had a history of unintended pregnancy at least once prior to the study, out of which 55.5% of them reported history of induced abortion at least [16]. Another study in Addis Ababa revealed that nearly a quarter (23%) of the girls had encountered unwanted pregnancy meaning that, in one way or another, they were exposed to unprotected sex (either consensual or forced). It, therefore, suggests that unprotected sex among commercial sexual workers is not rare phenomenon. Girls who faced unwanted pregnancy in the same study were also asked about the measures they took to deal with the problem and over half (57.2%) reported that they terminated it using unsafe/traditional means of abortion, 17.8% terminated it in a clinic/and other medical institutions while a quarter of them (25%) opted to deliver the baby/instead of abortion [17].

**2.3.2. Sexually Transmitted Infections and HIV.** Sexually transmitted infections including HIV are consequences of unprotected sexual intercourse with an infected individual. The risk of STIs increases if a person has more than one sexual partner [9]. A study conducted by Taffa showed an overall HIV-1 prevalence of 5.3% among the 358 out-of-school youth in Addis Ababa. There was a 60% excess prevalence rate among out-of-school females compared to that among the males. The study indicated significant prevalence of HIV infection, particularly among female and out-of-school youth [17]. Available data showed that HIV seroprevalence rates for street children are 10–25 times higher than that among other groups of adolescents [18].

#### *2.4. Street Children's Sexual and Reproductive Health Needs*

**2.4.1. Accurate Information.** Information lies the basis for interventions that follow, such as the building of skills and counseling. Street children should be provided with information on growth and development, sexual and reproductive health, substance use, prevention of disease, promotion of good health and other issues such as rights and laws [15]. When working with street children, it may not be possible to find an appropriate place or time to provide information to them. It is important to take advantage of as many situations as possible whenever in contact with street children.

**2.4.2. Life Skill Training.** Life skills are positive behaviors that enable individuals to adapt to and deal effectively with the demands and challenges of life [15]. It can also help street children in taking the opportunity to get off the street. Helping street children think about strategies for getting off the streets will need to include creative ways of getting them to think beyond their current situation [19].

**2.4.3. Safe and Supportive Environment.** The term environment is used to refer to what a child encounters outside of himself or herself in daily life. It refers to the political, legislative, legal, economic, social, and cultural context of the child's life, including opportunities to get an education and gain livelihood skills as well as the opportunity to experience positive relationships with other people. This broader

environment influences behavioral choices. The aim of creating a safe and supportive environment is to promote positive behavior among street children [15].

Unless immediate preventive and protective measures are taken to check the spread of the problem, it will greatly endanger the rights of survival and development of children protected in the convention of the right of children (CRC) [20]. It is only by recognizing the barriers and limitations imposed upon them by mainstream society as a whole and health services in particular, that their needs can be met [21]. But homeless people feel excluded from mainstream sexual health services. Numerous real and perceived barriers exist, which make it difficult for them to engage fully with these services. Many street children may not also consider sexual health to be a priority. This in itself can make providing a sexual and reproductive health service for this group a difficult task [1]. In order to tackle these problems, government and NGOs should provide both internal and external resources. Internal resources like intelligence, capacity to work and external resources in the environment like schools, health services, community organizations, and people who care can induce positive impact on street children's life. Even though street children usually have many internal resources, they usually lack external ones [15]. Life skills (the ability to be assertive about choices of sexual activities and to negotiate the use of contraceptive method) can help street children resist sex or have safer sex. Similarly, life skills such as problem solving and critical thinking help in healthy decision making. Practical skills like knowing how to use a condom are essential for the practice of safer sex. Livelihood skills would decrease dependence on survival sex [22]. Street children are also traditionally reluctant to access health services due to transportation problems along with a perceived lack of respect from providers and fear of being judged by health care workers, creating physical and psychological barriers to accessing health care. Surveys of homeless youth have found that health advice is most often required from other homeless persons, followed by self-treatment, and finally accessing clinics when self-treatment no longer work [23].

It is also possible that support-giving organizations are not publicizing their services sufficiently. This is due to the fact that the capacity of these organizations is extremely low in comparison to the number of street children in need of sexual and reproductive health support [24].

In the assessment survey done for supports provided to street children, respondents were requested to indicate whether or not they have knowledge of support-giving organizations and only 36.7% said that they did with the proportions being 58.5% for female and 34.1% for male within gender groups, respectively. This shows that street children, especially male street children, even in Addis Ababa have low access to the public media including the radio, TV, and newspapers. If these children had some access, they would have known at least one or two organizations working in support of street children [6]. Respondents who reported that they were getting services from support providing organizations were further asked to specify the type of support they were receiving and the highest proportion (44.8%) reported that they were getting support for food. This shows that sexual and

reproductive health issues for street children are neglected [6].

Given the numerous reasons associated with poor sexual and reproductive health among street children like histories of abuse and sexual risk-taking behavior, a holistic approach to intervention is necessary to improve their wellbeing.

But still the problem of street children remains an ignored tragedy. Street children are not targeted in fighting against HIV/AIDS [5]. For example, in one study, When the key informants were asked about the attention given to the problem by governmental and nongovernmental organizations, they all unanimously replied that enough has not been done [14].

This study therefore tries to systematically investigate street children's Sexual and reproductive health status and services, their utilization patterns, and street children-friendliness from the point of view of street children and service providers. The study also endeavor, to pinpoint the existing problems and gaps in providing sexual and reproductive health prevention and treatment services for street children. Such findings can hopefully impact the manner by which service provider can address sexual and reproductive health needs effectively.

### 3. Objectives

*3.1. General Objective.* To assess the sexual and reproductive health status of street children in Addis Ababa.

*3.2. Specific Objectives*

- (i) To assess sexual and reproductive health needs of street children in Addis Ababa.
- (ii) To assess the nature and scope of sexual and reproductive health services for street children in Addis Ababa.
- (iii) To determine the proportion of street children who are aware and have used specific sexual and reproductive health services.
- (iv) To examine factors associated with sexual activity.

### 4. Methods

*4.1. Study Area.* The study was conducted in Addis Ababa the capital of Ethiopia which has an area of 530.14 square kilometers divided into 10 subcities (Kifle Ketema) with a total of 100 kebeles. The study was carried out from December 29, 2010, to January 13, 2011. Based on 2007 Ethiopian census, Addis Ababa has a total population of 2,738,248, consisting of 1,304,518 men and 1,433,730 women [25]. Addis Ababa is the largest urban area in Ethiopia and attracts many children and youth who are searching for employment. The city has a high population of street children who are engaged in the informal sectors. The research was conducted in the five sub cities of Addis Ababa: Arada, Addis Ketema, Kirkos, Lideta and Bole. These sub cities were selected purposively for the research based on high concentration of street children.

*4.2. Study Design.* Since triangulation of research methods can overcome personal biases and limitations that stem from the use of a single method, cross-sectional quantitative and qualitative mixing methods were used in the current study. Individual interviews using a structured questionnaire were conducted to gather relevant information on sociodemographic characteristics, substance abuse, sexual behavior, sources of information on HIV/AIDS and unwanted pregnancy (Table 9), and so forth. Qualitative methods were then conducted to verify data collected in quantitative method and to gain an in-depth understanding of the sexual behaviour and the service provided to them.

*4.3. Study Population.* The source populations for this study were street children in Addis Ababa and street children, who were living or working independently on the street, aged 10–18 years, resided in Addis Ababa for at least 6 months, and can speak and heard Amharic language, were the study population of this research.

*4.4. Sample Size.* Considering the absence of previous data in Ethiopia in this specific study group which comprises both sexes up to the knowledge of the investigator and to obtain a large sample size the following assumptions are undertaken. The proportion of street children having at least one type of sexual and reproductive health services is estimated to be 50%, with a precision level 5% and 95% confidence interval. 10% was added to compensate for nonresponse. Based on this assumption, the actual sample size for the study was computed using the formula for single population proportion as follows:

$$n = \frac{(Z\alpha/2)^2 p(1-p)}{d^2} + 10\% \text{ non response}, \quad (1)$$

where  $n$  is sample size,  $p$  is expected proportion (0.5), and  $d$  is margin of error/level of precision (0.05). Therefore,

$$n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = \frac{(3.8416 \times 0.25)}{0.0025}, \quad (2)$$

$$n = 384.$$

Thus the study included 384 study subjects plus 10% nonresponse. Then the data was collected from 422 street children.

*4.5. Sampling Procedures.* In Addis Ababa, street children are known to congregate in various city locations throughout the day. These locations, along with time at which high number of children congregated, our sampling frame. Based on the calculated sample size and determined the number of locations needed. In this case the sample size was determined to be 422 and during the formative assessment, the minimum number of children found in each location was 10 therefore 42 locations were considered. In order to create the frame we observed the sites and counted how many street children were there for a specific time of day (1 to 2 hours). An earlier work done by Forum on Street Children-Ethiopia (FSCE) was used as base for sampling plan [6]. This earlier work was adapted to suit this work on demanded information. Finally we selected 42 of the venues randomly from the universe of venues.

**4.6. Sample Selection.** A sampling frame of locations which were defined by both location and time was constructed. Locations and individuals in that location were selected using equal probability sampling (lottery method). The interviewers were instructed to try a take-all approach. They were only going to each site once and got everyone they could in the time period 2 hours no more or less. In this case any one that was present had an equal chance of being interviewed.

**4.7. Data Collection Procedures.** The data for the quantitative section of the study were collected by 10 trained data collectors (8 males and 2 females) for 14 days who were master students in public health at Addis Ababa University with some experience in data collection in previous studies. To maximize openness of the children male interviewers were assigned for male respondents and female interviewers were assigned for female respondents. A structured questionnaire extracted from standardized questions such as BSS which addressed all the variables, was prepared and pretested. The pretest was conducted among 25 street children and these were excluded from the study. The data collection was conducted within two weeks from December 29, 2010 up to January 13, 2011.

The second set of instruments constitutes unstructured questions designed to serve as a guide for focus group discussion and interview with service providers. A total of four (two among males of 10–14 years of age and 15–18 years of age and another two among females of the same age group) focus group discussions were conducted in the two sub cities (Arada and Addis Ketema). FGDs were conducted separately for boys and girls. Each FGD was consisted of 8 participants. Participants were selected in such a way that children do not know each other to encourage them to express the realities.

**4.8. Data Analysis Procedures.** The quantitative data was entered into EPI Info version 3.5.1, then exported to SPSS version 16 statistical program. Descriptive statistics of percentages mean and frequency distribution using tables and figures were carried. In addition Bivariate analysis was used to determine the association between different factors and sexual activities. Those variables which have significant association with sexual activities were entered to multivariate analysis. Finally binary logistic regression and odds ratio with 95% confidence intervals was used to identify the independent predictors of sexual activity. FGD notes were typed and the audio tapes were transcribed. Responses were analyzed by arranging them in the general categories identified in the discussion guide. The various opinions were assessed and summarized so that the degree of consensus or differences were expressed by the groups and synthesized by the themes or patterns that emerged. All the recorded interviews with service providers were transcribed and analyzed manually.

**4.9. Data Quality Management.** The quality of data was maintained through careful design; translation, and retranslation, and pretest of the questionnaire, proper training of the interviewers and close supervision of the data collecting procedures; and proper categorization and coding of the data.

#### 4.10. Study Variables

**Dependent Variable.** Sexual practice.

**Independent Variable.** Sociodemographic and economic variables (sex, age, and previous residency), connectedness to NGOs, and life skill training and personal factors like smoking status, khat, and alcohol use.

#### 4.11. Operational Definition

**Street Children.** They are children less than 18 years old, comprising *on* and *off* street children.

They are children in difficult circumstances, who struggle to survive in the city.

**Children on the Street.** Those children who primarily engaged in economic activities of street. They are children of either sex falling with the age group of less than 18 years working or begging on the street but living with their parents or visiting their parents regularly.

**Children off the Street.** Children of either sex who are within the age group of less than 18 years and who are both economically and socially engaged in street life. These children live and work on street without any kind of control or assistance from parents or relatives.

**Risky Sexual Practice.** Children who had sex earlier than 18 years of age, or have sex with nonregular sexual partner, or exchange sex for money, or have more than one sexual partner or use condoms inconsistently.

**Rape.** It is defined as any nonconsensual of penile penetration of the vagina or anal by physical violence or by threat of harm, or when the victim is incapable of giving consent due to drug or intoxication of alcohol.

**Drug/Substance.** Any substance that when taken into the living organism may modify one or more of its function. In this study the concept of drug covers substances of alcoholic drinks, tobacco, khat, hashish, and benzene.

**Sexual and Reproductive Health Needs.** They include access to health care, services, sexuality education, and access to birth control method.

**Organizational Response.** Any organized primary prevention, care or support activity designed by many actors to make sexual and reproductive health information and services available to street children.

**4.12. Ethical Consideration.** In this study, parents/guardians were not available. Therefore children were asked personally for their consent to participate. All participants were given full information regarding the purpose of the research, what is expected from them and how long the interview is expected to last. In addition the research did not expose children to any physical and emotional stress. Furthermore the study

protocol was approved by the Addis Ababa University, College of Health Science, School of Public Health Research and Ethics Committee (REC). The objective of the study was also discussed with organizations that are working with children and Addis Ababa police crime protection sector (child protection unit, CPU).

## 5. Results

In total, 422 street children, 314 (74.4%) males and 108 (25.6%) females were interviewed resulting in an overall male to female ratio of 3:1. As indicated in Table 1, from the total of interviewed street children, 73.2% were “off the street” type while the rest were “on the street” type. The age range of those children included in this study was between 10 and 18 years. Nearly two-thirds (65.2%) of the sample street children respondents were between 16 and 18 years of age and 31.0% are between 13 and 15 years of age while only 3.8% of the children are between 10 and 12 years of age. The mean age was 15.9 (SD ± 1.7) years. The mean age for males and females was 15.9 years and 16 years, respectively. Street children were also asked how long they had been on the streets and roughly half (51.2%) indicated that it had been from 1–3 years while quarter (24.9%) of them said less than one year and 15.9% for 3–5 years. Fewer than ten percent (8.1%) had been on the streets for more than five years. Furthermore, majority street boys (81.5%) than street girls (24.1%) were sleeping on the street during the night. Up to 77.9% of participants had dropped out-of-school at the primary level. More than two-fifths (44.3%) were dropped out from 5 to 8 grades and 33.6% from 1 to 4 grades while only 1.9% were from 9 to 12 grades and 20.1% were either never attended or read and write only.

Regarding income generating activities, nearly all participants (94.1%) were involved in an income-yielding activity (Table 2). The sources of income for males and females were different. Males were mostly carrying items (54.1%), washing and watching cars (10.8), doing any occasional jobs (10.5%), and shoeshining (7.6%) and 7.0% were involved in other activities like jeblo (cloth selling), hair dressing, stealing and so forth, while females (43.5%) were involved in commercial sex and 16.7% were doing any occasional jobs while 15.7% were working as message conveyer. Concerning the average income they earned per day, most of the participants (36.8%) earned 11–20 birr and 33.0% interviewee indicated 5–10 birr per day while only 10.8% stated that they earned more than 50 birr per day (majority were female commercial sex workers).

**5.1. Reasons for Joining the Street.** According to the responses of the children involved in the study, job searching account for about 28.9% (26.8% males versus 35.2% females) and peer influence are the second most common reason for their initiation of street life which accounts for 21.8% (19.4% males versus 28.7% females); family disharmony 19.2% (19.4% males versus 18.5% females), orphaned 18.5% (20.1% males versus 13.9% females), poor family 4.3% (5.4% males versus 0.9% females), and alcoholic parents 3.3% (4.8% males versus 1.9% females) are mentioned by the respondent as reasons for

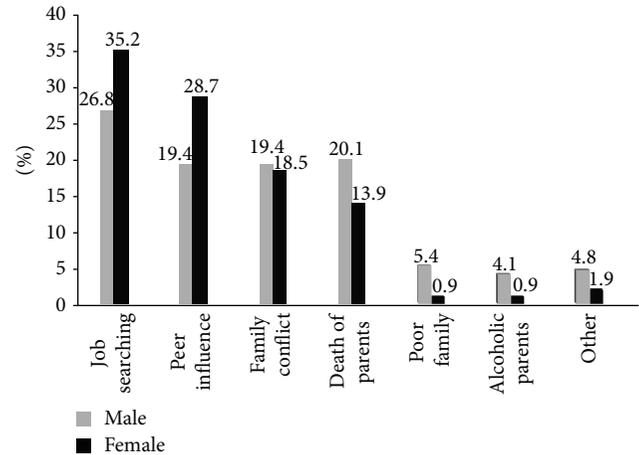


FIGURE 1: Reasons of street children to join street life in Addis Ababa, January, 2011.

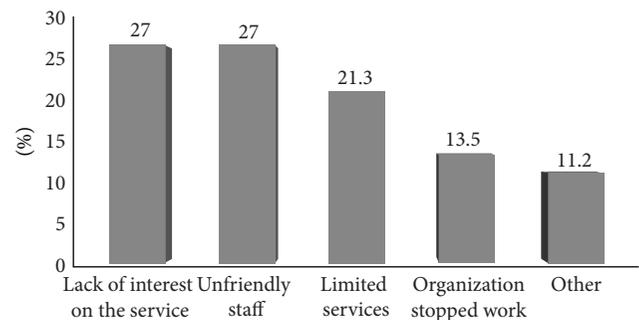


FIGURE 2: The distribution of street children by their reasons for rejoining the street life in Addis Ababa, January, 2011.

joining the street life. The above reasons push children mainly boys to engage in street activities.

In our interviews almost one-third of street children (33.4%) claimed to have been supported by one organization at least once, but they had left and come back to the streets (Figure 1). The remaining 46.7% never been helped and 19.9% were using the service (mainly food) during data collection. Children were further asked why they came back to the street. Respondents had diverse reasons for rejoining the street (Figure 2). Among the reasons, the services were not based on our interest and unfriendly staffs were equally mentioned by 27.0% of the respondents each. While 21.3% of them stated limited services as a reason for rejoining the street life and 13.5% mentioned the organization stopped its work now, the remaining 11.3% of street children mentioned other reasons like finishing their training term, conflict with other children, long distance, and so forth.

The street children in Addis Ababa are just as diverse as any other group in society. Almost three-fourths of interviewed children (70.9%) had arrived to Addis Ababa from other towns and regions of the country. 36.1% of girls and 26.8% of boys were born in Addis Ababa and 63.9% of girls and 73.2% of boys came from other regions or towns of the country.

TABLE 1: Sociodemographic characteristics of street children in Addis Ababa, January, 2011 (N = 422).

Variables	Male		Female		Total	
	No	%	No	%	No	%
Type of street life						
On the street	48	15.3	65	60.2	113	26.8
Off the street	266	84.7	43	39.8	309	73.2
Sex	314	74.4	108	25.6	422	100
Age group (in years)						
10–12	15	4.8	4	3.7	19	4.5
13–15	100	31.8	28	25.9	128	30.3
16–18	199	63.4	76	70.4	275	65.2
Religion						
Orthodox Christian	176	56.1	46	42.6	222	52.6
Muslim	52	16.6	20	18.5	72	17.1
Protestant	57	18.2	39	36.1	96	22.7
Catholic	11	3.5	0	0	11	2.6
Has no religion	18	5.7	3	2.8	21	5.0
Ethnic group						
Amhara	102	32.5	27	25	129	30.6
Oromo	97	30.9	40	37	137	32.5
Tigry	52	16.6	23	21.3	75	17.9
Others	63	20.1	18	16.7	81	19.4
Marital status						
Single	285	90.8	63	58.3	348	82.5
Married	13	4.1	25	23.1	38	9.0
Divorced	16	5.1	20	18.5	36	8.5
Educational level						
Never attend	33	10.5	6	5.6	39	9.2
Read and write only	31	9.9	15	13.9	46	10.9
1–4 grades	98	31.2	44	40.7	142	33.7
5–8 grades	147	46.8	40	37.0	187	44.3
9–12 grades	5	1.6	3	2.8	8	1.9
Duration on the street						
1–3 years	90	28.7	15	13.9	105	24.9
3–5 years	145	46.2	71	65.7	216	51.2
5–7 years	46	14.6	21	19.4	67	15.9
7–9 years	33	10.5	1	0.9	34	8.1
Currently living with						
Peers	218	69.4	53	49.1	271	64.2
Alone	49	15.6	10	9.3	59	14.0
Boy/girlfriend	22	7.0	23	21.3	45	10.7
Parents	24	7.6	19	17.6	43	10.2
Others	1	0.3	3	2.8	4	0.9

5.2. *Substance Use.* Data received through the interviews indicated that 284 (67.3%) of the selected sample of street children consumed various substances or drugs on a habitual basis, whereas 138 (32.7%) did not refer to use at the time when interviews were conducted (Table 4). Gender differences were not found to be highly significant for substance use. Overall, the findings indicated that almost two-thirds of street children in Addis Ababa used one or more substances. Substance abusing was further investigated by

requesting respondents to indicate the type of substances they were using. According to the results summarized in Table 3 multiple responses were forwarded. It was found out that, among those who were used, nearly all (95.1%) of them chew chat, while three-fourths (75.7%) smoke cigarette, one-fifth smok shisha and (6.0%) sniff benzene. Comparison by gender revealed that within gender group more boys (81.3%) than girls (40.0%) smoked cigarettes while more girls (98.7%) than boys (93.8%) were chewing chat.

TABLE 2: Socioeconomic characteristics of street children in Addis Ababa, January, 2011 (N = 422).

Variables	Number	Percent (%)
<b>Income generating activities</b>		
Carrying items	173	54.1
Transferring message	31	7.3
Any occasional job	51	12.1
Commercial sex	49	11.6
Shoeshine	22	5.2
Car washing	34	8.1
Other	37	8.8
<b>Average income per day</b>		
<5 birr	18	4.5
5–10 birr	131	33.0
11–20 birr	146	36.8
21–50 birr	59	14.9
>50 birr	43	10.8
<b>Ever helped by the organizations</b>		
Yes	84	19.9
Yes but leaved now	141	33.4
No	197	46.7

TABLE 3: The distribution of street children by sex and their former residence in Addis Ababa, January, 2011 (N = 422).

Former residence	Sex		Total
	Male	Female	
<b>In Addis Ababa</b>			
Frequency	84	39	123
% within sex	26.8	36.1	29.1
<b>Outside Addis Ababa</b>			
Frequency	230	69	299
% within sex	73.2	63.9	70.9
<b>Total</b>			
Frequency	314	108	422
% within sex	100.0	100.0	100.0

Substance abuse was further examined by requesting respondents to identify the reasons that initiated them to use the various substances. The findings are summarized in Figure 3; majority (40.1%) of street children started substance use to avoid depression, while 35.6% of them initiated it by peers, 13% stated to avoid frustration during sex or stealing, and other 10% of them stated to endure hunger.

**5.3. Alcohol Intake.** Alcohol consumption of street children was investigated by requesting respondents to indicate their exposure to alcohol drinking (Table 5). Accordingly the multiple responses of the respondents indicate that among interviewed children, almost two-thirds (64%) of the respondents were drink alcohol. The frequency of their consumption were tried to investigated. Of those 50.0% drunk sometimes (once per week) and 9.3% drunk most of the time (three times per week) while 4.7% drunk daily. Interviewed children were further asked for their sexuality after alcohol intake. Their

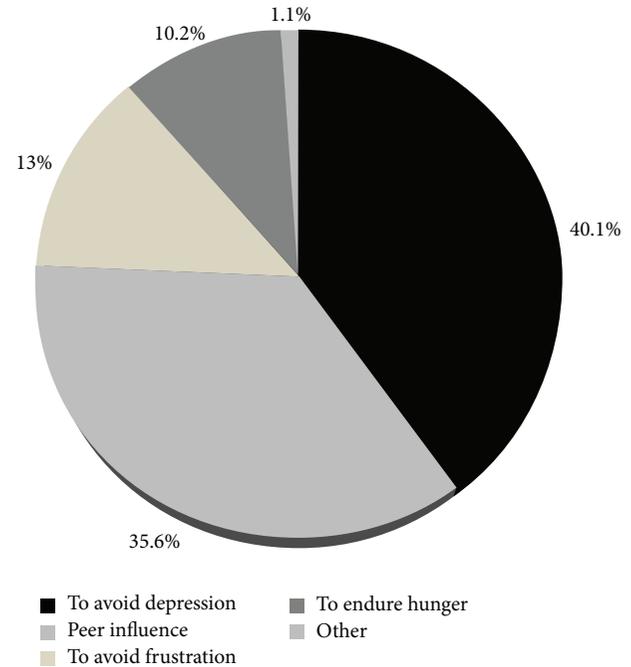


FIGURE 3: Percentage distribution of reasons for substance use among street children in Addis Ababa, January, 2011.

responses as given in Table 4 indicated that 177 (65.6%) of them have sex after alcohol intake most of the time. Further analysis by gender revealed that females had sex after alcohol more frequently than male street children (83.5% versus 59.4%). Significant number of children (66.7%) used condom during sex after alcohol intake. But 15.3% of the street children did not use condom while 18.0% of them responded as they do not remember due to heavy intoxication.

Children were asked how they spend most of their day times. High proportion of them (32.8%) responding working (35.5% males versus 25.0% females), sleeping 24.9% (17.5% versus 47.9%), and chat chewing 18.6% (19.2% versus 16.7%) (Figure 4). The reason for significant differences in this regard between males and females specially for sleeping could be the presence of high number of female street children working during the night as commercial sex worker.

**5.4. Risky Sexual Behavior.** The majority of street children respondents 302 (71.6%) said that they had ever practiced sexual activity (65.0% of boys and 90.7% of girls). The overall mean age at first sexual intercourse is 15 years with male mean age at first sexual intercourse 15.4 (SD ± 1.2) years and female 14.3 (SD ± 0.87) years. Among sexually active street children 42.7% mentioned personal desire as a reason for having sexual intercourse. Other reasons for sexual intercourse are fall in love 34.4%, exchange for money 8.3%, peer pressure 7.0%, marriage 3.3%, influence of chat/alcohol 2.3%, and rape 2.0%.

Sexually active street children were also asked about their sexual experience within the last three months. A total of 197 (65.2%) respondents answered as they had sexual intercourse at least once. They further asked about whether they faced unwelcome sex within the last 12 months and about 55 (18.2%)

TABLE 4: The types of substances or drugs consumed by the sample of drug consumers of street children in Addis Ababa, January, 2011.

Substances	Male		Female		Total	
	Yes No (%)	No No (%)	Yes No (%)	No No (%)	Yes No (%)	No No (%)
Chat	196 (93.8)	13 (6.2)	74 (98.7)	1 (1.3)	270 (95.1)	14 (4.9)
Cigarette	170 (81.3)	39 (18.7)	45 (60.0)	30 (40)	215 (75.5)	69 (24.3)
Shisha	41 (19.6)	166 (79.4)	21 (28.0)	53 (70.7)	62 (21.8)	219 (77.1)
Benzene	17 (8.1)	187 (89.5)	0 (0.0)	73 (97.3)	17 (6.0)	260 (91.5)
Other	18 (8.6)	187 (89.5)	4 (5.3)	70 (93.3)	22 (7.7)	257 (90.3)
Total	442 (211.4)	592 (283.3)	144 (192)	227 (302.6)	586 (206.1)	819 (288.1)

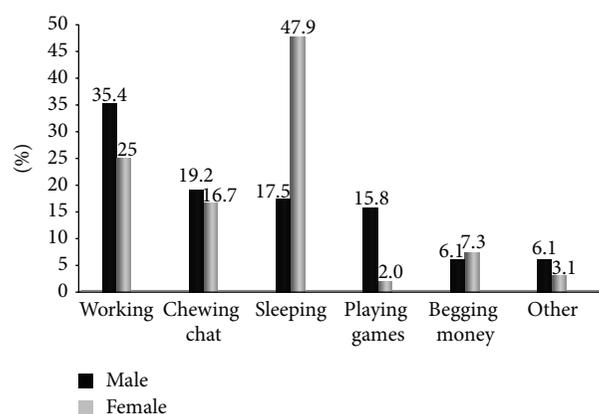


FIGURE 4: Common day time activities by street children in Addis Ababa, January, 2011.

responded that they have faced unwelcome sex. Out of these victims 23 (41.8%) were males and 32 (58.2%) were females.

Children were also asked to mention risky sexual activities which they expect expose them to sex related problems. Majority of respondents 129 (30.6%), answered that they did not remember and 101 (23.9%) mentioned sex without condom. Injury with sharp materials was indicated by 67 (15.9%) children. Other activities like more than one sexual partner 58 (13.7%), sex with commercial sex worker (male only) 33 (7.8%), inconsistent condom use 17 (5.0%) were mentioned as risky activities that were performed previously.

To identify the current most common sexual and reproductive health problems in the street life, children were asked questions related to sexual and reproductive health problems in the last 12 months before the survey. More than half of street children 233 (55.2%) respondents (199 (63.4%) males and 34 (31.5%) females) answered that they faced no problem, while 198 (44.8%) have encountered sexuality related problems. Among commonly mentioned sexual health problems, unprotected sex under the influence of chat/alcohol 60 (14.2%), unwanted pregnancy 40 (9.5%), rape attempt 35 (8.3%), STIs 24 (5.7%), rape 23 (5.5%), and abortion 7 (1.7%) were indicated as the main sexual related health problems.

Concerned with life time number of sexual partners 67.6% have more than one sexual partner and 17.2% responded as they cannot remember the number of individual that having sex with them. These are particularly male

TABLE 5: Alcohol consumption status among street children in Addis Ababa, January, 2011 (N = 422).

Variables	Male No (%)	Female No (%)	Total No (%)
Alcohol intake			
Never	112 (35.7)	40 (37.0)	152 (36.0)
Sometimes	161 (51.3)	50 (46.3)	211 (50.0)
Most of the time	28 (8.9)	11 (10.2)	39 (9.3)
Daily	13 (4.1)	7 (6.5)	20 (4.7)
Total	<b>422 (100)</b>	<b>108 (100)</b>	<b>422 (100)</b>
Sex after alcohol intake (n = 270)			
Yes	120 (59.4)	57 (83.8)	177 (65.6)
No	82 (40.6)	11 (16.2)	93 (34.4)
Total	<b>202 (100)</b>	<b>68 (100)</b>	<b>270 (100)</b>
Sex with condom after alcohol drink (n = 177)			
Yes	76 (63.3)	42 (73.7)	118 (66.7)
No	21 (17.5)	6 (10.5)	27 (15.3)
Do not remember	23 (19.2)	9 (15.8)	32 (18.0)
Total	<b>120 (100)</b>	<b>57 (100)</b>	<b>177 (100)</b>

children who have sexual relation with commercial sex workers and female children mainly involved in commercial sex, while only 15.2% have a single sexual partner.

**5.5. Pregnancy among Female Street Children.** Among the 108 street girls who participated in this study, more than half (70.4%) reported that they had ever been pregnant (31.9% once and 68.1% more than one time) and almost three-fifths (59.4%) of these pregnancies resulted in abortion. Nearly all (95.7%) of female respondents said that pregnancies were unwanted. Further the reasons for pregnancies were asked and reluctance to use contraceptive (42.4%), unavailability of contraceptive (16.6%), inappropriate use of contraceptive (15.2%), rape (10.6%), and others like slippage of condom, failure of contraceptives (15.2%) were mentioned as the main reasons for the occurrence of unwanted pregnancies.

From the analysis it was found that some sociodemographic and other variables were significantly associated with

TABLE 6: Sexual and reproductive health behaviors and practices of street children in Addis Ababa, January, 2011 ( $N = 422$ ).

Variables	Male	Female	Total
	No (%)	No (%)	No (%)
Ever had sexual intercourse			
Yes	204 (65.0)	98 (90.7)	302 (71.6)
No	110 (35.0)	10 (9.3)	120 (28.4)
Reasons to have sex ( $n = 302$ )			
Exchange for money	0 (0)	25 (25.5)	25 (8.3)
Fall in love	54 (26.5)	50 (51.0)	104 (34.4)
Influence of khat/alcohol	7 (3.4)	0 (0)	7 (2.3)
Marriage	4 (2.0)	6 (6.1)	10 (3.3)
Peer pressure	13 (6.4)	8 (8.1)	21 (7.0)
Personal desire	125 (61.3)	4 (4.1)	129 (42.7)
Rape	1 (0.5)	5 (5.1)	6 (2.0)
Life time number of sexual partner ( $n = 302$ )			
One	32 (15.7)	14 (14.3)	46 (15.2)
Two and above	172 (84.3)	84 (85.7)	182 (84.8)
Sexual intercourse in the last 3 months ( $n = 302$ )			
Yes	112 (55.1)	85 (86.7)	197 (65.2)
No	92 (44.9)	13 (13.3)	105 (34.8)
Unwelcome sex in 12 months ( $n = 302$ )			
Yes	23 (11.3)	32 (32.7)	55 (18.2)
No	181 (88.7)	66 (67.3)	247 (81.8)
Risky activities for contracting HIV			
Sex without condom	62 (18.9)	39 (36.8)	101 (23.9)
Not remember	103 (32.9)	28 (26.4)	131 (31.0)
More than one sexual partner	31 (9.9)	27 (25.5)	58 (13.7)
Injury with sharp materials	64 (20.4)	4 (3.8)	68 (16.1)
Sex with commercial sex worker	33 (10.5)	0 (0.0)	33 (7.8)
Inconsistence condom use	12 (3.8)	5 (4.5)	17 (4.0)
Others	8 (2.6)	3 (2.8)	11 (2.6)
The most common SRH problem for street life			
Rape	68 (21.7)	39 (36.1)	107 (25.4)
STIs	63 (20.1)	17 (15.7)	80 (19.0)
Sexual exploitation	58 (18.5)	18 (16.7)	76 (18.0)
Lack of SRH information	55 (17.5)	16 (14.8)	71 (16.8)
Unwanted pregnancy	46 (14.6)	15 (13.9)	61 (14.5)
Lack of legal protection	24 (7.7)	3 (2.8)	27 (6.4)

practicing sexual intercourse of participants. A history of drug use (OR = 2.5; 95% CI = 1.42–4.56) and being on the street for the first 1–3 years (OR = 5.9; 95% CI = 1.41–7.22) increased the likelihood of having sexual activity. Street boys (as compared to girls) are significantly less likely to report having sex (OR = 0.09; 95% CI = 0.03–0.23) preceding the survey. Alcohol use is significantly associated with engaging in sexual activities (OR = 5.2; 95% CI = 3.73–8.32). Sexual behaviour of street children is also associated with their former residences. Street children who reported that they were coming from outside of Addis Ababa were more likely to experience sexual activities (OR = 1.7; 95% CI = 1.10–2.70) and children who had no connections with NGOs (through infrequent or even frequent visits to the NOGs) show most

likely to be engaged in sexual behavior (OR = 2.1; 95% CI = 1.25–3.64) (Table 8).

Regarding the sexual and reproductive health information received Table 6 shows that a modest proportion of street children 191 (45.3%) of the total interviewed responded that they have information about the issue (sexuality, STIs, and HIV/AIDS), while regarding gender difference, Boys received less information 134 (42.7%) regarding prevention with pregnancy, STDS, and HIV/AIDS compared to girls 57 (52.8%).

Participants were further asked about their source of information about pregnancy, STIs, and HIV/AIDS (Table 10). The majority (28.8%) stated mass media, 19.4% stated friends (other street children), 16.8% stated health workers, 11.0%

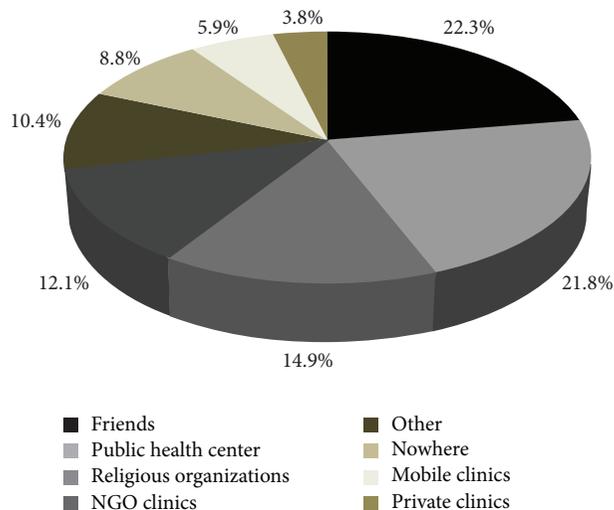


FIGURE 5: Distribution of street children by preferable place for sexual and reproductive health services and advices in Addis Ababa, January, 2011.

stated schools, (before dropping out-of-school), 8.4% stated outreach workers (street educators), 6.8% and others like training and posters, and pamphlets.

The study questionnaire also includes questions to identify the barriers of health information for street children. As a result, those children responding have no information about pregnancy, STIs, and HIV/AIDS were asked to mention the reasons. The significant numbers of street children were answered inaccessibility 94 (40.7%) as the main reason for lacking information. Other reasons, less priority 79 (34.2%) and it does not concern me 58 (25.1%) were mentioned.

On the other hand, older street children are more likely to receive such information as compared to their younger counter parts. only 10.5% among 10–12 age group and 39.1% within 13–15 age group have informed, while half of the 16–18 age group have reported that they have received such information.

The study participants were also asked about the reliable and easily accessible health information sources about unwanted pregnancy, STIs and HIV/AIDS for street children. Majority of participants 194 (46.0%) were mentioned their friends as the main reliable and easily accessible information source followed by street educators 98 (23.2%).

In relation to places where they go for help when sexual and substance abuse related health problems faced, (22.3%) of participants stated friends, 15% stated public health centre, 14.9% stated religious organizations, 12.1% stated NGO clinics, and 8.8% responded that they do nothing, 5.9% stated mobile clinics and only 3.8% mentioned private clinics (Figure 5).

Study participants were further asked for the reasons why they prefer these places. As result they list their reasons by mentioning the majority 31.0% reported they easily understand my problem as the main reason followed by 22.8% stated no other alternatives, 14.7% free service, 12.2% short waiting time, 10.2% good confidentiality, 6.6% affordable cost

and 2.5% others like short distance, friendly staff and so forth (Table 13).

The interviewers also ask the street children about the current most common sexual and reproductive health problem for street children. Rape was mentioned by the majority of street children 105 (24.9%) as the most common sexual health problem for street life.

Life skills education programs that include sexual and reproductive health information have proven to be effective in delaying the onset of sexual intercourse and, among sexually experienced children, in increasing the use of condoms and decreasing the number of sexual partners. This reality was observed in this study. Significant difference was observed among participants who took life skill training and who did not on the knowledge of SRH service providers (43.9% versus 20.5%) (Table 11).

To identify the level of awareness of the street children about the health centers that exclusively give sexual and reproductive health services for street children the questionnaire included the following question: “do you know any health facility that provide sexual and reproductive health services for street children?” Only 24.2% of the participated street children have heard about such health facilities. The remaining 75.8% of interviewed children responded that they have never heard about them out of which (48.1%) stated that there are no such facilities and (27.7%) were not sure (might or might not) of the presence of such health facilities in Addis Ababa (Table 12).

The analysis of the responses by sex of the respondents led to even more alarming results. Female children more often than male children have stated that they have heard about the health centers (36.1% among females versus 20.1% among males).

Furthermore there was a question for those children who have heard/know health facilities that provide sexual health for them about the type of health facility they know. 38% of them mentioned family guidance and 30.4% stated NGO clinics. Of the remaining mentioned 12.0% stated public hospital, 7.8% public clinics, 5.9% privet clinic and 4.9% others like traditional.

The next question was about their experience of using theses health facilities and almost half (47.1%) of the street children who have heard about these health facilities have actually visited them for service. During the data analysis a slight correlation between the type of answers and the gender of the respondents was identified 63.2% among females and 37.5% among males have visited the health center.

The remaining 52.9% were asked to identify any barriers they faced when accessing services from the above health facilities. More than half of the respondents (53.7%) mentioned unaffordable cost as the main reason for not visiting the health facilities. while 20.4% stated long waiting time and inaccessible location, unfriendly staff, for inappropriate opening time each accounts 7.4% and I have no problem accounts for about 3.7% (Figure 6).

Street children’s opinion about the sexual and reproductive health services given to them in Addis Ababa was asked and the responses from the participant are given in the following table. Based on the respondents answer, for each

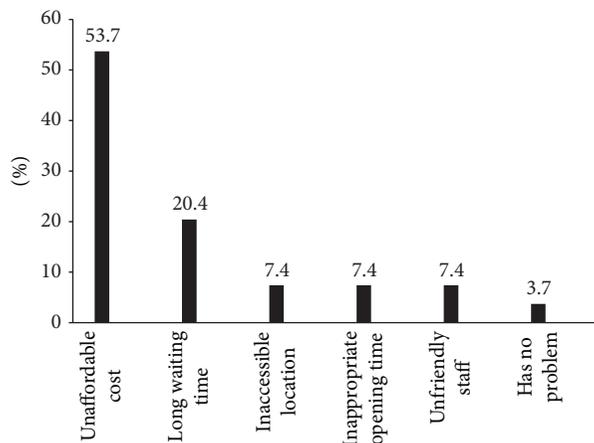


FIGURE 6: The distribution of street children due to the reason that inhibit visiting the health facilities in Addis Ababa, January, 2011.

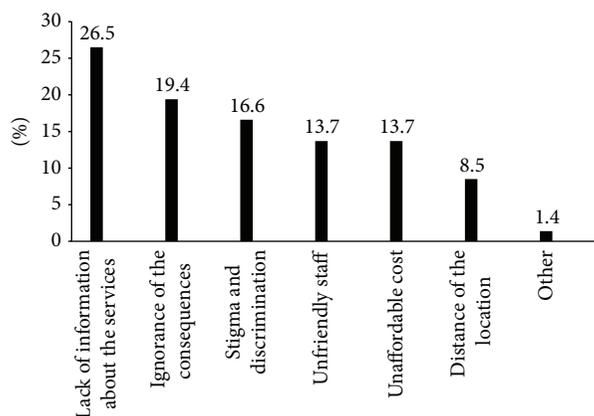


FIGURE 7: Barriers for street children utilization of local sexual and reproductive health services in Addis Ababa, January, 2011.

sexual and reproductive health service characteristics, majority of them were answer as not fulfil friendly service character.

Participants were also asked what barriers they faced when accessing local sexual health services (Figure 7). The majority, 26.5% of participants stated lack of information on available services as the biggest barrier, 19.4% stated ignorance of the consequence of risky sexual activities, 16.6% stated fear of stigma and discrimination, 13.7% stated unaffordable cost and 13.7% stated lack of unfriendly staff. The participants also were able to state “other” barriers which account for about 1.4% of respondents.

When participants were asked if they were satisfied with the way sexual health services are advertised and delivered to street children, only 2.4% of respondents stated that they are satisfied with it and 21.8% of respondents reported as slightly satisfied and 75.8% of respondents were not satisfied with it (Figure 8).

The participants who were not satisfied tried to mentioned some of the reasons for service unsatisfaction. Lack children participation in program implementation and evaluation was the major reason 95 (29.7%) followed by poor

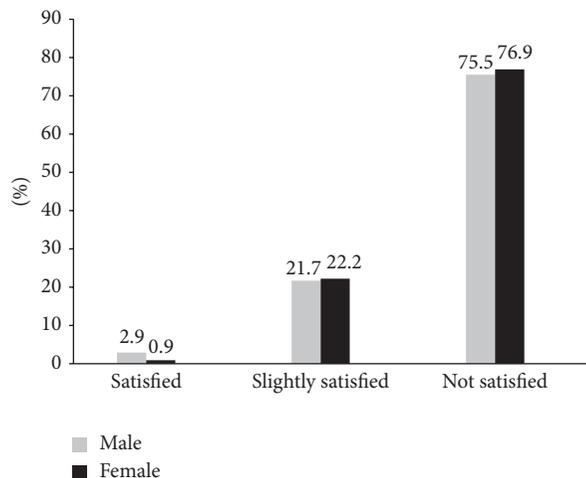


FIGURE 8: The distribution of street children by their satisfaction status with SRH services in Addis Ababa, January, 2011.

advertisement of the service 94 (29.4%). while 71 (22.2%) mentioned lack of peer service and 27 (8.4%) lack of confidentiality and poor distribution of condom and other contraceptive methods 33 (10.3%).

## 6. Results of Focus Group Discussion

The discussion was mainly focused on the risky sexual activity of street children, major sexual health problems of the street life, sexual and reproductive health services for street children, information of street children about STIs and HIV/AIDS, unwanted pregnancy, and service provider places. The discussion was started by asking the general question “*why they joined the street life.*” Almost all discussant from both sex mentioned the reasons that were listed in the quantitative part like searching jobs, conflict with family, poor family, and so forth. Female group mainly mentioned sexual related reasons like rape attempt, voluntary and involuntary unsafe sex resulting unwanted pregnancy. In connection with this, a 17-year-old girl FGD participant also stated the following:

*My aunt brought me from rural to Addis Ababa by convincing to attend school. I started life in Addis serving my aunts family and attending the class. But aunt's husband asked me many times for sex. I became feel bad when he come to home from work. One day when my aunt went to market, he came and tried to rape me. I swept from his hand and run away and never go back, start street life.*

Next to the general question about the reasons for streetism, discussants were invited to discuss commonly faced sexual and reproductive health problems. All participants were agreed that street girls are more exposed to sexual attacks and related problems than boys.

An 18-year-old male participant had the following to say in this regard;

*Street boys only have the risk of contracting STIs including HIV/AIDS and sometimes sexually abused and psychological problems but female children have more than this. We chewed chat and had drink then no one could remember condom and have unsafe sex. In the morning we all concentrate on searching food. She remembers as she got pregnant when her abdomen gets larger or her menstruation stopped.*

This unsafe sexual relationship, among other factors, is believed to be the major source for the rapid increase of street mothers in Addis Ababa. As most of the participants mentioned, female street children are at most risk. They are vulnerable for unwanted pregnancy and STIs including HIV/AIDS. Sometimes they did not know when and from whom they had sex and got pregnant.

A 16-year-old street girl had the following to say:

*In the mid night there would be alcoholic boys and if they get female sleeping on the road, they will have even group and unusual sex.*

Sexual abuse and exploitation of male children is also one of the emerging social problems affecting the physical, social and psychological wellbeing of children in Addis Ababa. Almost all participants of the FGD session had heard at least once about this issue.

A 17-year-old street boy have said this:

*Male sexual abusing becomes common in Addis Ababa, especially around merkato distant bus station. It was last year summer, one 14 years old child was sent to shop to buy soap. Unfortunately the money was stolen and his mother told him to get out of the home. He came to the street and start to cry due hunger. In the mid time someone who is known thief and HIV carrier approach him and gave him biscuit and tea. Then he brought him to hidden place and had sex with him. We went there and fight with him. finally we brought him to police and he denied his activity and show them his card of HIV positive and they released him free. Legal action is not strong to punish those abusers.*

Another question was about their measures taken when sexual health problems were faced. As a result, diverse responses were given like report to police, abortion, give birth on the road and drop the baby on the road and so forth.

A 15-year-old girl says the following in this regard.

*I have no problem up to now, but I do not know what to do if I raped. Most probably I will kill myself.*

The next issue that was raised for discussion was about their general knowledge and information about sexual health services. They were asked about their experience (if any) with sexual health services in Addis Ababa. Both male and female discussants start the discussion by blaming the existing sexual and reproductive health services. They agree that they are totally disconnected from the existing service stream.

A 17-year-old male child suggests the following idea concerning this issue.

*Governmental and nongovernmental organizations declared more as they did a lot on sexual health to street children. But no free condom, no free contraceptive and no free treatment for us. I think now days everybody should have condom in his/her pocket. Most of the street children's attention is dominated by another issue like, cloth, food and shelter. So they won't have condom in their pocket but eager to have sex which leads them to unsafe sex. Sometimes we use chat plastic (yechat pestal) for sex. But I know it might have air, opening or easily ruptured, but we use it for confidence.*

Participants tried to mention some effective strategies to address the sexual and reproductive health needs of street children like mobile clinics and postal condom distribution.

An 18-years old state as following in this regard:

*There was postal style condom distribution in the areas where street children were congregated we insert fifty cent in it and have condom at the bottom. I'm in doubt about the presence of such services now. But it was effective in addressing social, physical and financial barriers of the service.*

Another 16-year-old street boy said the following about the mobile clinics:

*Mobile clinics give effective and easily accessible services for street children when avail. We can have condom whenever we want and we can check ourselves with the service without long waiting to get the services. But these mobile clinics seldom exist in the city. Most of the time mobile clinics were functional during the holiday and lasts maximum fifteen days. But no one wait the holidays to have condom.*

Barriers that prevent street children from using existing sexual health services were well discussed among participants. Both perceived and actual barriers were mentioned. Unaffordable cost is mentioned by many participants as a big barrier for utilization of the existing services among others. Lack of information about the services and the health facilities, ignorance of the consequence, unfriendly staff were mentioned as other barriers.

A 15-year-old boy stated the following in relation to staff character as service barrier.

*We do not have positive attitude for them. They give priority to the rich. They tried to judge the clients based on clothes them weare and physical status. We started to suffering from the gate keeper. They will never allow us to see the doctor.*

## 7. Results from Service Providers

Individual interview with service provider about staff characteristic, current practice, service quality, staff capacity, areas

for improvement/change were conducted in three health facilities to present their ideas to one another and to make recommendations on how to make SRH services more appropriate and accommodating to street children. The service providers were selected based on the information obtained from Family Guidance Association Ethiopia area coordinator and other key informants about service providers.

In the interview program coordinators agreed that estimating the number of clients per day/week is difficult. This is because street children are not stable and will not attend based on appointment. But roughly coordinator of confidential clinic (piazza) stated that her organization sees about 15 street children per day and goal Ethiopia project coordinator estimates 50 street children per day but Sheger clinic coordinator express cannot estimate the number of street children per day and coordinator of Addis Ababa model clinic stated that they had no means of identification of street children from other clients. The types of sexual and reproductive health problems that street children were presented to the health facilities were discussed in the interview. As street children mentioned in the individual interview of the quantitative part, the program coordinators mentioned unwanted pregnancy, lack of awareness about family planning, STIs including HIV, and opportunistic infection are some of from others. Counselling, outreach reproductive health service, health education, clinical case management, VCT, distribution of condom were indicated by all of the interviewee as health services given from their project.

Program coordinator of confidential clinic, stated the following in relation to outreach services.

*The reality of providing such a service is that many street children clients will not attend arranged appointments and may disengage entirely for periods of time. In these stages the clients can be most vulnerable, and despite not looking for it, are often most in need of a sexual health service. It is therefore crucial to offer outreach and support to access sexual health services for those children who are most vulnerable and at risk.*

Research results indicate that sexual and reproductive health of street children is intricately connected to other aspects in their lives such as alcohol and other drug use, self esteem, and perception of judgment from peers. Trading sex is found to be a serious and growing problem in Addis Ababa for street children, particularly amongst street girls.

*Beside education and service provision, the basic thing is social and financial support. It must be to touch parallel; otherwise our intervention is not effective. Because children daily struggles to survive demanded that their sexual and reproductive health was a very low priority as a result they will back to street life for survival. We are unable to do this by now due to financial shortage. (In-depth interview, program coordinator, confidential clinic, Addis Ababa.)*

The next issue was about the types of SRH services that the project is unable to provide to the street children but should

be provided. Different coordinators mentioned different SRH services that unable to provide to street children. VCT service (goal international), social and financial support (confidential clinic), and income generating skill (sheger clinic) are some of unaddressed SRH services for street children.

The main barriers/problems that service providers face in providing SRH services to street children were also raised and different barriers were mentioned. Among these problems, lack of training to build our capacity, problem in getting street children regularly and when needed, lack of resources, lack of coordination among service providers and policy restriction were some of the problems that negatively affect service provision.

In addition to the above issues, interviewees were also asked about the mechanism of promoting their SRH services to street children being confidential for the cases, taking time to discuss individually and in group, applying interactive teaching methods, making the environment friendly were some of techniques mentioned.

One of the questions that were raised *was have you taken any steps to make street children comfortable using the services and to create a street children-friendly environment?* All of the respondents answered yes and tried to mention some of the steps they took. Coffee ceremony, panel discussion, self support group (saving activities).

Regarding to the training received by the staff members of the organization, most of the interviewer said enough has not been done in this regard. Based on the responses given by the interviewer the main training given to the staff members was on child right, life skill, first aid, reproductive health and street life, friendly relationship with MARPs, drug abuse and its management (including alcohol and cigarette).

Interviews with coordinator of selected health facilities that exclusively provide sexual and reproductive health service to street children revealed that all programmes for street children, be they government run or supported by NGOs, lack adequate co-ordination between similar organizations. Almost all projects tried to address the same issue for street children independently which leads their effort less effective.

## 8. Discussion

Describing the street children's risky sexual behaviour (service need) and the existing programming response in Addis Ababa towards evolving recommendation for future programming was the major intention behind the present study. In seeking to address the issue of street children, it is essential to know why children are fledging in to the street of Addis Ababa. Many factors were listed for the reasons that push children to the street of Addis Ababa. Unemployment (28.9%), peer influence (21.8%), conflict with in the family (19.2%) and death of family (18.5%) were the reasons for joining the street life in this study. The reasons are similar with different percentage in the previous study. In one study done in Addis Ababa more than 41% of the respondent children joined street life because their families were poor to sustain them and more than a quarter (26.4%) of the respondent children was influenced by friends to leave home and 9.2% respondents mentioned conflict in the home as the reason behind

leaving their homes [6]. The reasons have consistency for regions in the country. The result done in Dessie on street children showed that death of parents was reported by 36.2%, to look for a job by 23.0%, poor family by 12.8% and peer pressure by 4.4% [16].

Based on this study most participants (72.5%) were already sexually active, and 67.6% have had multiple sexual partners. Among sexually active children 90.4% were girls and 66.2% were boys. This result is slightly higher than the result obtained from the research among street children in Dessie town in which (67.9%) had ever practiced sexual intercourse [16]. This might be due to high sample size used in this study.

The mean and median ages of first sexual intercourse in this study were (15.4 and 15 years) for boys and (14.3 and 14 years) for girls. This result is also comparable with other studies in some part of the world. In Kinshasa, Democratic republic of Congo where the mean age of street children at first sexual intercourse was 14.3 years for males and 13.5 year for girls [26]. Another study done in India, showed the mean age of sexual intercourse for boys and girls were 15 and 13.2 years, respectively [11]. Here the main point is the proportion of sexually active in-school and out-of school children varied substantially by age. Out-of-school children who includes street children were more likely than their in-school counterparts to be sexually active in all age categories. For instance in one study in Ethiopia showed that 29 (3.1%) out-of-school children aged 10–14 years were sexually active, while there were no sexually active in-school children in the same age group. Similarly, the figures for sexually active out-of-school and in-school youth among the age groups 15–19 were 38.7% versus 84.8% [17]. Relatively comparable results were obtained in this study. 1.3% for age group of 10–12 years, 21.9% for 13–15 years age group and 76.8% for 16-16 age group have ever practice d sexual intercourse [17].

The reasons for early initiation of sexual intercourse among street children were also explained in this study. More than two-fifth (42.7%) of sexually active street children mentioned personal desire as the main reason for initiation of sex followed by love 34.4%. In another study personal desire was the dominant reason for initiation of sexual intercourse accounting about 38.2% followed by peer pressure 24.5% [18].

Children are addicted to chat, alcohol cigarette, ganja and shisha, even during the focus group discussion, some were chewing chat. Research results revealed that use of these substances influences sexual behavior in ways that increase the risk of acquisition of HIV and other STDs. The street child's decision on sexual behaviours such as whether to use a condom during sexual activity and whether to negotiate for sex or to use force (rape) depends on the level of intoxication. In general alcohol and other substance use often go along with the early sexual experiences, especially among boys. In this study, high proportion 284 (67.3%) of street children reported that they consumed some kind of substance. Chat was the dominant substance used by almost all 95.1% children. cigarette, ganja and shisha were reported as commonly used substance [19]. These substances were mentioned in other research results [6, 16]. Alcohol consumption is also common among street children. Almost two third (64%) of

TABLE 7: Sexual and reproductive health situation of female street children in Addis Ababa, January, 2011 ( $N = 108$ ).

Variables	Number	Percent (%)
Ever been pregnant		
Yes	69	70.4
No	29	29.6
Life time number of pregnancy ( $n = 69$ )		
One	22	31.9
More than one	47	68.1
Pregnancies were wanted ( $n = 69$ )		
Yes	3	4.3
No	66	95.7
Reasons for pregnancy ( $n = 69$ )		
Rape	7	10.6
Failure of contraceptive	10	15.2
Ignorance	28	42.4
Unavailability of contraceptive	11	16.6
Other	10	15.2
Ever had child ( $n = 69$ )		
Yes	28	40.6
No	41	59.4
Undertake abortion ( $n = 69$ )		
Yes	59	85.5
No	10	14.5
Consulting before abortion ( $n = 59$ )		
Boyfriend	11	18.6
Peers	36	61.0
Health worker	12	20.4
Place of abortion ( $n = 59$ )		
Health center	34	57.6
Private clinic	6	10.2
Traditional abortionist	12	20.3
Self-induced	7	11.9

the respondents in this study were drinking alcohol. Among these alcoholic children, 50% drink sometimes (once per week) and 9.3% drink most of the time (three times per week) while 4.7% drink daily. Alcohol intake was investigated by other researchers and the result revealed high proportion of children drinking alcohol [8].

Living on the street, with no supervision, protection or guidance and wide risky sexual practice often makes street children vulnerable to a wide range of sexual and reproductive health problems. In total 198 (44.8%) among sexually active respondents have encountered sexual health problems. Among commonly mentioned sexual health problems, unprotected sex under the influence of chat/alcohol 60 (14.2%), unwanted pregnancy 40 (9.5%), rape attempt 35 (8.3%), STIs 24 (5.7%), rape 23 (5.5%) and abortion 7 (1.7%) (Table 7). Sexual health problems were more dangerous among females than males. Unwanted pregnancy in early age makes the problem among female street children is highly vulnerable than male counter parts [27]. Unintended pregnancy leads to a complicated process and it accounts for

TABLE 8: Relationship between selected sociodemographic variables and sexual behavior of street children in Addis Ababa, January, 2011.

Variables	Ever had sexual intercourse		OR (95% CI)	
	Yes	No	Crude	Adjusted
Sex				
Male	204	110	0.19 [0.10, 0.38]**	0.09 [0.03, 0.23]**
Female	98	10	1.00	1.00
Had connection with NOGs				
Yes	36	48	1.00	1.00
No	254	84	2.6 (1.26, 5.18)*	2.135 (1.25, 3.64)*
Ever taken life skill training				
Yes	9	57	1.00	1.00
No	245	111	3.18 [1.15, 8.81]*	2.87 [1.37, 6.00]*
Length of street life				
<1 year	60	45	1.00	1.00
1–3 years	158	58	7.75 [2.23, 8.96]	5.96 [1.41, 7.22]**
3–5 years	53	14	4.79 [1.12, 12.88]	4.29 [1.05, 17.59]*
>5 years	31	3	4.56 [1.33, 20.02]	4.97 [1.04, 23.86]
Former residence				
Inside Addis	78	45	1.00	1.00
Outside Addis	224	75	1.9 [1.09, 3.51]*	1.7 [1.10, 2.70]*
Alcohol drinking				
Yes	235	85	6.84 [4.19, 11.18]**	5.23 [3.73, 16.32]
No	67	35	1.00	1.00
Substance use				
Yes	230	54	3.9 [2.49, 6.10]**	2.5 [1.42, 4.56]*
No	72	66	1.00	1.00

NB \*  $P < 0.05$ .\*\*  $P < 0.001$ .

TABLE 9: Distribution of street children by their sexual health information status in Addis Ababa, January, 2011.

Variables	Male		Female		Total	
	No	%	No	%	No	%
Had information about HIV/AIDS, unwanted pregnancy ( $n = 422$ )						
Yes	134	42.7	57	52.8	191	45.3
No	180	57.3	51	47.2	231	54.7
Sources of information ( $n = 191$ )						
Mass media	37	27.6	18	31.6	55	28.8
Friends	28	20.9	9	15.8	37	19.4
School	17	12.7	4	7.0	21	11.0
Health workers	16	11.9	16	28.1	32	16.6
Informal talk	14	10.4	3	5.3	17	8.9
Street educator	14	10.4	2	3.5	16	8.5
Training	6	4.5	2	3.5	8	4.2
Posters	2	1.5	3	5.3	5	2.6
Reasons for lacking information ( $n = 231$ )						
No means of getting it	74	40.9	20	40.0	94	40.7
Less prioritized	63	34.8	16	32.0	79	34.2
It does not concern me	44	24.3	14	28.0	58	25.1

TABLE 10: Distribution of street children, who have information about HIV/AIDS and sexual related risks by age group in Addis Ababa, January, 2011.

Had an information about HIV and pregnancy	Age Group			Total
	10–12	13–15	16–18	
<b>Yes</b>				
Number	2	50	139	191
(%) Within age group	10.5	39.1	50.5	45.3
<b>No</b>				
Number	17	78	136	231
(%) Within age group	89.5	60.9	49.5	54.7
<b>Total</b>				
Number	19	128	275	422
(%) Within age group	100	100.0	100.0	100.0

the majority of maternal mortality and morbidity [28]. Out of 108 female participants in this study, 66.6% had a history of unwanted pregnancy which is higher than the study in Dessie (25%) (16). out of the total unintended pregnancies in this study, 59.4% ends up with abortion which is almost similar to the same study in Dessie (55.5%) [16]. Reasons for Unintended pregnancy mentioned by participants were unavailability and misuse of contraceptives, slippery of condom; ignorance and rape were some of among others.

Despite the many sexual and reproductive health risks of street life, many Street children face multiple barriers to accessing sexual and reproductive health information and services. Among those who had sexual health information, the source from which the information was obtained is not accessible (mass media, 28.8%) and some of them are not reliable (friends, 19.4%). Only 16.8% reported health workers as their source of information. The responses from the study done in Dessie also showed that peers (55.4%), health workers (29.7%) and mass media (27.4%) were reported to be the major source of information on STIs, HIV/AIDS and unwanted pregnancy [16]. Majority of them do not know where to go for help when in trouble. In response to a question in this regard, (75.8%) of the participants indicated that they did not know where to go for help in case of sexual related problem. Only 24.2% of the participants have heard about such health facilities. The remaining 75.8% of interviewed children either have never heard (48.1%) or they are in doubt of the presence of such sexual health providers in Addis Ababa (27.7%). Low knowledge of street children about support giving organization is also observed in another research results. In one study only 36.7% said that they knew support giving organizations [6]. In Zambia, 47% of the sampled street children stated that they had nowhere to go in case they needed help with sexual related health problem [29]. This shows that less proportion of the total respondents were getting services from Support giving organizations and considering the fact that the highest number of these Organizations are working in Addis Ababa, the proportion of street children receiving services is extremely low.

In this study nearly one third (33.4%) of participants were incorporated in one organization for support at least once

but they had left and come back to the streets. The reasons of rejoining the street life were non interest based services (27.0%) and unfriendly staffs (27.0%). While 21.3% of them stated limited services (provision of food only) as a reason for rejoining the street life.

Children's low awareness about the existing legal, medical and social support organization made them reluctant for action they are going to take when sexually abused or unwanted pregnancy faced. In this regard 30.0% of the respondent stated I will do nothing 24.9% and 11.0% responded that they will tell to their friend and 24.9% answered to report to police. Existing reporting practices were poor as investigated by other research in Addis Ababa. Accordingly slightly over half (51.8%) of the respondents kept the incident secret and they never attempted to disclose it to anyone. The remaining 48.2% reported the cases but the majority (42.4%) shared it to their intimate friends. Only (11.4%) reported it to legal enforcement bodies [6].

There are both perceived and actual barriers that prevent street children from using existing sexual and reproductive health services. Of the street children involved in this study, Only less than half 47.1% respondents reported ever visiting existing health institutions for SRH services. There was also considerable gender difference among those who visited institutions (63.2% females versus 37.5% males). among the reasons for nonuser the services, (53.7%). Unaffordable cost, long waiting time, inaccessible location, unfriendly staff, and inappropriate opening time were mentioned as the reason among non-visitors according to the percentage magnitude. These barriers were also indicated by respondents involved in another study in which services are too expensive (42%), too much waiting time (12.8%), feeling of embarrassment (12.2%), inconvenient health institutions (8.7%), too far health institutions (7.9%), poor handling and failure to keep privacy and confidentiality by health workers (7.6%) were some of the barriers [16].

Mobile health facilities which bring services directly to people are one method of addressing physical barriers to access for the most isolated and often the poorest populations like street children. Participant children in this study preferred separate SRH service delivery centre for street children (43.6%), mobile services (28.4%), separate room in existing health setup (15.4%) and by trained street children (11.8%). This result is similar to the study done among the general young population in selected region of Ethiopia. The majority (over 72.0%) said that they would prefer to go to a separate health institution with a youth-friendly environment [30].

In the FGDs that were held with street children, most participants (both male and female) stated that they would prefer SRH services that were provided in specific health facilities organized for them in an accessible, convenient and confidential environment.

## 9. Strengths and Limitations of the Study

**9.1. Strength.** This research considers marginalized and neglected group of people about whom the information on sexual and reproductive health services is lacking.

TABLE 11: Knowledge of sexual and reproductive health service providers among street children who took life skill training in Addis Ababa, January, 2011.

Ever taken life skill training	Knowledge of SRH service provider			Total
	Yes	No	Do not know	
Yes	29 (43.9%)	20 (30.3%)	17 (25.8%)	66 (100%)
No	73 (20.5%)	183 (51.4%)	100 (28.1%)	356 (100%)
Total	102 (24.2%)	203 (48.1%)	117 (27.7%)	422 (100%)

TABLE 12: The distribution of street children by their knowledge of health centers that give sexual and reproductive health for them in Addis Ababa, January, 2011.

Knowledge of health centers that provide SRH services for street children	Sex		Total
	Male	Female	
<b>Yes</b>			
Number	63	39	102
% within sex	20.1%	36.1%	24.2%
<b>No</b>			
Number	155	48	203
% within sex	49.4%	44.4%	48.1%
<b>Do not know</b>			
Number	96	21	117
% within sex	30.6%	19.4%	27.7%
<b>Total</b>			
Number	314	108	422
% within sex	100%	100%	100%

The reliability of the data was maintained by predata collection training of the interviewers and the supervisors, close supervision by the principal investigator, and using pretested questionnaire.

Combining quantitative and qualitative data to triangulate the findings is strength of this study.

**9.2. Limitations.** There is no comprehensive baseline data available on the size of the street-child population in general and the sexual and reproductive health services in particular to street children. It is therefore difficult to estimate whether the situation is getting better or worse.

Recall bias cannot be ruled out, as the majority of children had dropped out-of-school at the primary level, leading to an overall lower education level in the group.

As in all self-reported behaviour studies, we also cannot rule out socially desirable answers to sensitive questions on sexual behaviour, which might have introduced biases of unknown magnitude and direction.

## 10. Conclusion and Recommendation

The most significant drivers of the street child population appear to be a complex of poverty, death of parents, conflict in family, job searching and limited alternatives.

Despite the efforts taken to address sexual and reproductive health issues among street children, research results

showed that children face major sexual and reproductive health problems such as lack of information, unwanted pregnancy and unsafe abortion up to date.

The high proportion of street children in Addis Ababa is engaging in risky behaviors such as unprotected sex, forceful sexual intercourse and early initiation of drug abuse.

Street children in Addis Ababa need to be educated about ways to protect themselves from early pregnancy, STDs and HIV/AIDS.

There is demand of capacity building training for staffs of service provider.

It was observed that street children are poorly informed about sexual health and sexual health service provider organizations.

Friends and the media were obtained as the most important sources of information about sexuality and related problems.

Street children refuse to go to clinics because they do not think that clinics will serve them or too young and inexperienced to know how to find clinics.

Sex, alcohol consumption, life skill training and connectedness to NGOs were found to have statistically significant influence on sexual experience among street children.

Unaffordable cost, unfriendly staff and long waiting time were identified as major barriers in accessing SRH services for street children.

Service provider organizations are not advertising their services sufficiently for street children.

Majority of street children had negative attitude towards service providers.

## 11. Policy Recommendation

**11.1. Ethiopian Health Policy.** The national health policy should recognize the need to develop and improve urban health extension services to meet the challenges of the street children.

In addition to this the policy should recognize street children are a population group with special needs.

The government guidelines should also exempt street children from health service user fee. Because based on this research result street children are vulnerable to sexual health problems, but underutilize the health services.

**11.2. Child Development Policy.** The Ethiopian child development policy should recognize street children as special target group and street children friendly strategies should be

TABLE 13: Street children's opinion about the sexual and reproductive health service characteristics in Addis Ababa, January, 2011.

Services character	Yes	No	Do not know	Total
Friendly	93	244	85	422
Not judgmental	72	264	86	422
Consider street culture	53	285	84	422
Good confidentiality	130	209	83	422
Found at appropriate location	47	285	85	422
Short waiting time	46	293	83	422

devised to reduce their vulnerability to sexually related problems. Currently the policy does not recognize street children as special target group requiring special attention.

**11.3. Practical Actions to Support Street Children.** To improve the access of health services to street children should not only provide free health care services, but also address the social, cultural and environmental factors that restrict access. Therefore efforts should be made to ensure that children who drop out-of-school and other street children are provided basic primary education. None formal or special primary education program will be critical in reaching children living on the street. In addition to this older street children (16–18 years) should be helped to secure properties and facilitated to acquire startup tools and capitals to undertake income generating activities.

**11.4. Recommendations for Further Research.** Greater understanding of the living condition and other health status of children living on the street is necessary to formulate appropriate policies, strategies, programs and health services for this highly vulnerable group. The current study covered only one city, Addis Ababa (four sub cities within the city). A large study covering the main cities in the country should be carried out. Such studies would provide more comprehensive understanding of the sexual and reproductive health status of street children in diverse city context. Further research is also needed to examine the attitude and practice of health personnel towards children living on the street.

## Acronyms and Abbreviations

AIDS:	Acquired immuno deficiency syndrome
CFSC:	Consortium for street children
CRC:	Convention for the right of children
EPIINFO:	Epidemiological information
FGD:	Focus group discussion
FSCE:	Forum on street children in ethiopia
HIV:	Human immuno deficiency virus
NGOs:	Nongovernmental organizations
SPSS:	Statistical package for social science
SRH:	Sexual and reproductive health
STD:	Sexually transmitted diseases
STIS:	Sexually transmitted infections
UN:	United Nation
UNICEF:	United Nation International Children Emergency Fund

USAID: United States Agency for International  
Development

WHO: World Health Organization.

## Disclosure

The authors declare that this is our original work, has not been prepared for a degree in this or other universities, and that all sources of materials used for the thesis have been fully acknowledged.

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## Research Article

# Rapid-Testing Technology and Systems Improvement for the Elimination of Congenital Syphilis in Haiti: Overcoming the “Technology to Systems Gap”

Linda Severe,<sup>1</sup> Daphne Benoit,<sup>1</sup> Xi K. Zhou,<sup>2</sup> Jean W. Pape,<sup>1,3</sup>  
Rosanna W. Peeling,<sup>4</sup> Daniel W. Fitzgerald,<sup>1,3</sup> and Kedar S. Mate<sup>5,6</sup>

<sup>1</sup> GHESKIO Centres, Port-Au-Prince, Haiti

<sup>2</sup> Department of Public Health, Weill Cornell Medical Center, New York, NY, USA

<sup>3</sup> Global Health Center, Weill Cornell Medical Center, New York, NY, USA

<sup>4</sup> London School of Tropical Medicine, London, UK

<sup>5</sup> Department of Medicine, Weill Cornell Medical Center, 525 East 68th Street, P.O. Box 130, New York, NY 10065, USA

<sup>6</sup> Institute for Healthcare Improvement, Cambridge, MA, USA

Correspondence should be addressed to Kedar S. Mate; [kmate@ihi.org](mailto:kmate@ihi.org)

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**Background.** Despite the availability of rapid diagnostic tests and inexpensive treatment for pregnant women, maternal-child syphilis transmission remains a leading cause of perinatal morbidity and mortality in developing countries. In Haiti, more than 3000 babies are born with congenital syphilis annually. **Methods and Findings.** From 2007 to 2011, we used a sequential time series, multi-intervention study design in fourteen clinics throughout Haiti to improve syphilis testing and treatment in pregnancy. The two primary interventions were the introduction of a rapid point-of-care syphilis test and systems strengthening based on quality improvement (QI) methods. Syphilis testing increased from 91.5% prediagnostic test to 95.9% after ( $P < 0.001$ ) and further increased to 96.8% ( $P < 0.001$ ) after the QI intervention. Despite high rates of testing across all time periods, syphilis treatment lagged behind and only increased from 70.3% to 74.7% after the introduction of rapid tests ( $P = 0.27$ ), but it improved significantly from 70.2% to 84.3% ( $P < 0.001$ ) after the systems strengthening QI intervention. **Conclusion.** Both point-of-care diagnostic testing and health systems-based quality improvement interventions can improve the delivery of specific evidence-based healthcare interventions to prevent congenital syphilis at scale in Haiti. Improved treatment rates for syphilis were seen only after the use of systems-based quality improvement approaches.

## 1. Introduction

Congenitally acquired syphilis remains a leading cause of perinatal morbidity and mortality in developing countries with an estimated 1.5 million annually affected pregnancies worldwide [1]. In Haiti, studies document that more than 3,000 babies are born with congenital syphilis each year [2]. More than half of these result in still-births or perinatal death [3, 4].

Syphilis is easily detected during antenatal care using rapid test technology for point-of-care diagnosis [5, 6]. Same day treatment can be provided with a single shot of penicillin

preventing more than 90% of congenital transmission [3]. Point-of-care diagnosis and same-day treatment can prevent high rates of lost to follow up that occur when treatment is provided at a second visit. Studies in Haiti and Sub-Saharan Africa demonstrate that when treatment is provided at a second visit, nearly fifty percent of women who test positive for syphilis never receive treatment [7]. Point-of-care diagnosis and same-day treatment are inexpensive, and financial analyses in Haiti and elsewhere have demonstrated their cost-effectiveness [8, 9]. Remarkably, same-day care has been known for more than 25 years, yet reliable national implementation of this practice remains elusive.

Recognizing the cost-effectiveness of point-of-care diagnosis and same-day treatment of syphilis in pregnant women, the Haitian Ministry of Health has established a national goal of eliminating congenital syphilis by 2015 [2]. Here, we report on the introduction of rapid test technology and health systems improvement intervention at national scale in Haiti to improve syphilis care and treatment for pregnant women. Their sequential implementation allowed us to measure their independent effects on syphilis case detection and treatment.

## 2. Methods

**2.1. Ethics Statement.** Approval for this study was obtained from the ethics review boards of both the GHESKIO Centres and Weill Cornell Medical College.

**2.2. Study Sites.** Fourteen geographically distributed clinics throughout Haiti were selected for participation in this study. We selected larger clinics that were supported by the US Government's PEPFAR program to provide PMTCT services for pregnant women and that were supervised by staff from the GHEKSIO Centres, a Haitian nongovernmental organization based in Port-au-Prince. We describe the facility-based characteristics of these sites including public versus private, rural versus urban, and geographic location.

**2.3. Study Design.** Rapid syphilis testing technology and a systems-based improvement intervention were introduced sequentially to these fourteen PEPFAR-supported clinics over 51 months from 2007 to 2011. In the first phase of the study, a syphilis point-of-care test (Standard Diagnostics BIOLINE, Syphilis 3.0) was introduced to all clinical study sites between January 2008 and April 2009. This was part of a national program to incorporate point-of-care syphilis testing at all PEPFAR sites in the country that were testing pregnant women for HIV. In the second phase, a systems-improvement intervention was introduced to all 14 study sites simultaneously in October 2010. A time series analysis was utilized to understand the effects of these interventions occurring sequentially over the study period.

**2.4. Interventions: Point of Care Tests with Traditional Educational Program.** In 2008, the Haitian Ministry of Health introduced routine prenatal syphilis screening using a rapid syphilis test as part of a national plan to eliminate congenital syphilis. Clinic staff attended a two-day lecture-based training on the epidemiology of syphilis, modes of transmission, clinical manifestations, diagnosis, treatment, and prevention of congenital syphilis. Laboratory technicians also attended an additional one-day workshop to learn how to perform the rapid point of care test. SD BIOLINE is a whole blood, immunochromatographic assay for the qualitative detection of antibodies of all isotypes against *Treponema pallidum* (SD Bioline Syphilis 3.0, Kyonggi-Do, republic of Korea). No additional equipment is required and all reagents can be stored at room temperature. Test results were available within 30 minutes at the point of care. Quality assurance of the rapid

test was done according to the manufacturer's recommendations. Each rapid test includes a control test "band" to indicate the appearance of a negative test. In addition, GHESKIO runs known positive and known negative serums to assure rapid test validity periodically. Studies from Haiti and other countries show that the test is highly sensitive and specific for the diagnosis of syphilis in pregnant women [10, 11]. In our experience in Haiti, a positive rapid test is also positive by RPR and confirmatory TPFA more than 95% of the time, suggesting that the rapid test is diagnosing active infection in more than 95% of cases.

**2.5. Systems-Based Quality Improvement.** Prior systems strengthening efforts to improve coverage of syphilis care and treatment have focused on laboratory support, supply chain improvements, workforce training, and monitoring and evaluation [12]. In 2010, GHESKIO used a systems-based quality improvement (QI) approach to strengthen prenatal syphilis screening and treatment. The effectiveness of the QI approach to strengthen care delivery systems for tuberculosis, HIV, maternal and child health, and PMTCT has been documented in other resource-poor countries [13–16]. The QI approach used a conceptual framework called the "model for improvement" based on the original work of statistician Deming [17, 18]. The approach uses local facility-based systems improvement teams, composed of facility staff, to select the best evidence-based healthcare interventions, to conduct local gap and root-cause analyses (fishbone Ishikawa diagrams) to diagnose systems failures, and to use the plan-do-study-act (PDSA) rapid cycle change approach to improve failing systems [17].

The QI approach addressed implementation failures at each clinic using three techniques taught to clinic staff during two workshops.

- (1) *Forming Multidisciplinary, Facility-Based Systems-Improvement Teams.* These teams, established at the beginning of the intervention period, were composed of the facility manager, at least one nurse, the data clerk, and other interested facility members. Each participating site formed a systems-improvement team and the size of these teams varied based on the size of the clinic and availability of staff. All teams established clear, facility-based improvement goals in each clinical area, used root-cause analysis to understand system barriers and process mapping to understand patient flow and bottlenecks in clinical pathways. They were asked to meet on a twice-monthly basis to oversee the QI activities.
- (2) *Conducting Local Process Indicator Analysis.* QI experts from GHESKIO (2 of them) assisted the facility-based teams to use their own local register data to conduct facility-specific data analysis using Pareto and basic run-chart analysis [19]. Such Pareto and run-chart analyses allowed facility teams to visually depict service delivery gaps that were present in their day-to-day work. This analysis was completed on a monthly basis for all clinics.

TABLE 1: Number and percent of pregnant women tested for syphilis.

	Pregnant women	Tested for syphilis	Percent tested for syphilis
Prerapid test (24 months)	34776	31810	91.5
Postrapid test initiation (9 months)	16025	15373	95.9*
Prequality improvement (9 months)	14137	13542	95.8
Postquality improvement initiation (9 months)	16435	15916	96.8*

\* denotes significant increase compared to prerapid test rates with  $P < 0.001$ .

(3) *Using the Model for Improvement Systems Change Strategy.* Facility-based QI teams used a problem-solving strategy based on the conceptual framework offered by the model for improvement to implement solutions to local barriers [17]. Job aids, distribution of guidelines and new protocols, training materials, changes to clinic flow, and other specific systems improvement tools were employed to solve specific systems failures or to reinforce the reliable performance of a desired clinic behavior. The tool or technique which would be successful for each individual clinic was not predicted at the outset. Each PDSA cycle culminated in a decision about whether to adopt, adapt, or abandon a specific systems change based on whether it had produced an improved service. Each clinic was encouraged to complete one PDSA cycle each month during the intervention period.

We documented the primary service delivery failures and the corresponding specific solutions that were tested and implemented by these facility-based teams. These data were gathered during the two QI training sessions through two techniques: focus group interviewing and presentations by each facility involved with the initiative on key systems barriers, solutions tested, and results obtained.

In all cases, partner notification was done by sending an invitation card through the patient/pregnant woman. Data on uptake of this intervention were not tracked as part of this study; however, GHESKIO and its partners made every effort to urge pregnant women to communicate their status to their partners and would link them to testing and treatment as soon as they presented for care.

**2.6. Study Endpoints.** The study focused on two clinical measures: the proportion of all pregnant women tested for syphilis and receiving their results, and the proportion of those women testing positive who were subsequently treated for syphilis during the antenatal period.

**2.7. Data Collection and Analysis.** Data were obtained from the web-based MESI.HT health information system of the Haitian Ministry of Health. Data were analyzed over a 51-month time period, divided into four phases: prerapid test (March 2007–March 2009), postrapid test initiation (April 2009–December 2009), prequality improvement (January 2010–September 2010), and postquality improvement initiation (October 2010–June 2011). We also examined the effect of the January 2010 earthquake on testing and treatment rates.

Logistic regression was used to compare testing and treatment rates in all four study periods. Differences in the testing and treatment rates between periods were further examined using simultaneous tests for general linear hypotheses.  $P$  values were controlled for multiple comparisons using the Bonferroni method. Differences in clinic specific testing and treatment rates in the four study periods were also examined for all clinics in aggregate, for each individual clinic, and for subgroups of clinics (public, private, urban and rural). This analysis allowed us to see whether each intervention was associated with a significant increase or decrease in the outcome variables across all participating clinics in each individual clinic and in each type of clinic. For clinics where rates were close to 100%, Fisher's exact test was used to compare rates.

Using population estimates from the Ministry of Health, rates of congenital syphilis, and the results of the logistic regression, we estimated the effects of these interventions if they were scaled up country wide. Our estimation is based on a previously described model by Schackman et al. [9] using the following assumptions: 320,000 pregnancies in Haiti annually, a 4% syphilis positivity rate country wide, and a 43.8% serious birth complication (stillbirth or neonatal death) rate for untreated mothers and a 1.1% complication rate for treated mothers [3].

### 3. Results

Fourteen clinical sites participated in the study. Twelve sites were characterized as hospitals (bed size ranged between 10 and 150) and two as clinics. The sites were evenly split between publicly managed ( $n = 7$ ) and privately operated by nongovernmental organizations (NGOs). Eleven (78%) were situated in urban settings and three (22%) were located in rural settings. The average population in the catchment area for the urban health facilities was 410,000 individuals (range = 80,000–1.6 million). Average catchment areas for the rural facilities was 55,000 (range = 32,000–79,000). All facilities received the rapid syphilis test, and all facilities received the two systems-based QI workshops. Under the systems-based QI intervention, all facilities composed a multidisciplinary team and all conducted at least one PDSA cycle during the study period.

**3.1. Syphilis Testing.** During the baseline period, the overall syphilis testing rate was 91.5% (Table 1). During the nine months after the introduction of the rapid syphilis test, the syphilis testing rate increased to 95.9% ( $P < 0.001$ ).

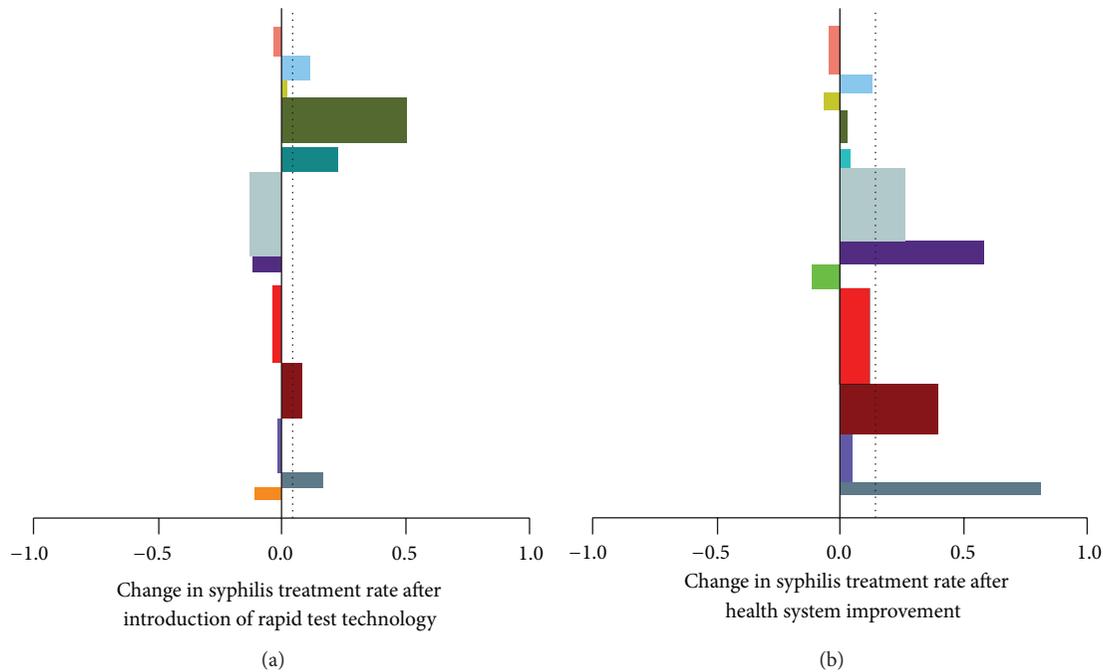


FIGURE 1: Change in syphilis treatment rate after the rapid syphilis test (a) and the introduction of quality improvement. (b) Each bar represents one of the fourteen participating clinics and the direction represents the change in treatment rate compared with the preintervention period (0.5 = 50%). the width of the bar represents the number of pregnant women that the clinic saw during the study period. The dotted line represents the mean change across all sites.

TABLE 2: Number and percent of pregnant women treated for syphilis.

	Syphilis positive pregnant women	Treated for syphilis	Percent treated for syphilis
Prerapid test (24 months)	1397	982	70.3
Postrapid test initiation (9 months)	652	487	74.7
Prequality improvement (9 months)	543	381	70.2
Postquality improvement initiation (9 months)	630	531	84.3*

\* denotes significant increase compared to prerapid test rates with  $P < 0.001$ .

After the January 2010 earthquake, the testing rate remained similarly at 95.8%. After the QI intervention, further small yet significant increase in testing rate to 96.8% was observed ( $P < 0.001$ ).

Despite the overall improvement in testing rates following the interventions, substantial variation in subgroups of clinics was observed. After the introduction of the rapid test, syphilis testing rates in public clinics increased from 87.0% to 96.1% ( $P < 0.001$ ) whereas private clinics decreased from 98.1% to 95.8% ( $P < 0.001$ ). After the QI intervention, public clinics improved significantly (93.2% to 95.5%,  $P < 0.001$ ) while private clinics were not significantly different (99.4% to 99.2%).

**3.2. Syphilis Treatment.** During the baseline period, the overall syphilis treatment rate was 70.3% (Table 2). During the nine months after the introduction of the rapid syphilis tests, the syphilis treatment rate increased to 74.7% which

was not statistically significant improvement compared to the baseline after adjusting for multiple comparisons ( $P = 0.28$ ). After the 2010 earthquake, the treatment rate returned to 70.2%. Statistically significant improvement in treatment rate was seen after QI to 84.3% compared to each of the previous study periods ( $P < 0.001$ ) Figure 1.

After the rapid test was introduced, treatment rates improved in public clinics (64.4% to 75.3%,  $P = 0.002$ ) but not in private clinics. After the QI intervention, all clinics had improved treatment rates with the greatest gains in private clinics (private: 68.5% to 93.6%,  $P < 0.001$ ; public: 71.6% to 78.1%,  $P = 0.36$ ).

**3.3. Systems Barriers to Same-Day Testing and Treatment.** During the quality improvement intervention, clinics described their key system barriers and the solutions that they used to overcome them. A summary of the systems barriers and solutions is detailed in Table 3.

TABLE 3: Health system areas addressed by the intervention, problems, and solutions.

(1) Stock management of syphilis tests and penicillin	
Problems	Solutions
(i) Frequent outages of lab tests and penicillin (ii) No communication within health facility between clinic staff using tests/drugs and stock room/pharmacy (iii) Multiple approvals and administrative layers for facility to reorder rapid syphilis tests and penicillin from national supplier (iv) Requisitions from facility to national supplier often late (v) National supplier often has stock outages of penicillin	(i) Clinic inventory and communication between clinic staff and pharmacy (ii) Earlier requisition by facility of larger stocks from national supplier (iii) Creation of a reserve stock of penicillin (iv) Emergency budget for local procurement of penicillin (v) National supplier of medications includes penicillin as essential drug
(2) Task shifting among health facility staff as syphilis testing moves from laboratory to the point-of-care	
Problems	Solutions
(i) Clinical staff reports insufficient time to perform rapid syphilis tests on every pregnant woman (ii) Laboratory staff reluctant to give up work and fear job loss (iii) Injectable benzathine penicillin located in pharmacy and given by pharmacists only and not in clinic (iv) Job descriptions do not match new responsibilities	(i) Staff becomes more “polyvalent” and performs multiple tasks (ii) Staff backs each other up in case one becomes busy (iii) Laboratory staff comes to clinic to draw blood and perform test on site (iv) HIV counselors taught to draw blood (v) Retraining and continuing education (vi) Team building with goal of preventing newborn death
(3) Patient flow through the health facility	
Problems	Solutions
(i) Multistep process between pregnant woman’s arrival to clinic, testing for syphilis, and penicillin injection. “The clinic process resembles an obstacle course for pregnant woman” (ii) Bottlenecks (waiting for clinic chart; waiting for test results; etc.) (iii) Long lines and waits between each step (iv) Frustrated pregnant women leave clinic between steps	(i) Simplify flow and decrease number of steps (ii) Give priority to pregnant women at key points of care (phlebotomy, pharmacy) (iii) “Mobile laboratory staff” within facility to perform lab test in clinic rooms (iv) Group counseling, education, and phlebotomy of all pregnant women in clinic waiting areas (v) Decentralize prenatal care and syphilis screening to satellite facilities to decrease patient volume at large clinics
(4) Data collection and evaluation	
Problems	Solutions
(i) Clinic data flows up to administration, ministry, and PEPFAR but is not available in real time for clinic staff (ii) No locally available indicators on percent of pregnant women tested for syphilis and percent of syphilis positive women treated (iii) Need immediate feedback to reward and motivate staff (iv) Need to correct problems in real time and not wait for a report from a central authority	(i) Use local registers to track a few key indicators (ii) Local “improvement teams” meet regularly to review and report indicators to all staff (iii) Data entry programs redesigned to generate local reports in real time
(5) Patient and community participation	
Problems	Solutions
(i) Women do not know about the dangers of congenital syphilis and importance of screening during pregnancy (ii) Women afraid of injection needle and refuse penicillin (iii) Community needs to hold health facility accountable for syphilis screening	(i) “Bottom up accountability,” by informing women in the community about dangers of congenital syphilis and that they have a right to free prenatal syphilis screening (ii) Community health workers encourage pregnant women to seek prenatal care and screening (iii) Include community members in discussions of how best to provide prenatal care and syphilis screening

**3.4. Adverse Events Averted.** Given the geographic spread of this project and the size of the involved clinics, we estimated that if the two interventions were scaled up country wide, this would result in 16,612 additional pregnant women being screened for syphilis, an additional 2,008 pregnant women treated for syphilis, and 567 fewer babies stillborn or born with serious complications of congenital syphilis every year.

## 4. Discussion

Both technology- and health systems-based interventions improve the delivery of prenatal services to prevent congenital syphilis in Haiti. Technology-based solutions in the absence of systems-improvement interventions will have minimal impact on clinical outcomes. In the case of syphilis

in Haiti, the availability of a rapid test improved diagnostic testing rates, but it did not significantly affect rates of treatment. The Haitian earthquake in January 2010 did not have significant effects on syphilis testing rates but did cause small but significant declines in syphilis treatment which were overcome during the QI intervention.

Rapid syphilis testing and treatment required a combination of point-of-care testing and systems-based interventions to improve the clinic organization, human resources, supply chain, and other management structures to ensure concurrent improvements to treatment delivery. In a randomized trial from South Africa, point-of-care syphilis testing reduced testing delays; however, there was no significant difference in overall treatment rates [20]. Similar results were found with a point-of-care CD4 test where rapid results had limited impact on HIV treatment initiation [21].

Our results should inform global efforts to eliminate congenital syphilis [22]. Some 10% of women in resource-limited settings are infected with syphilis and over 490,000 babies are born annually with syphilis in Sub-Saharan Africa [23, 24]. In some countries, syphilis is the largest cause of stillbirths and an important cause of premature infant death [25]. Despite availability of rapid tests, prenatal syphilis treatment rates remain below 40% [26]. Our data suggest combining rapid test technology and health systems improvement could lead to large scale implementation success.

Our results are consistent with a growing body of evidence suggesting that quality improvement systems strengthening interventions can successfully increase access to HIV, tuberculosis, and maternal and child health care in resource-limited settings [14, 27–30]. We are now using the QI approach to strengthen HIV and TB integration in Haiti.

These results suggest an important lesson for those introducing new health care technologies in resource-limited settings. When new technologies are introduced, the health system must be adjusted to take advantage of what the new technology offers. This adjustment does not happen automatically without deliberating attention to health system change. In fact, as new therapeutic, diagnostic and preventative technologies are introduced, the gap between what is possible and the actual performance of health systems may grow wider. This “technology to systems gap” means that clinically important discoveries are often held hostage to the inability of our health systems to deliver them. We need parallel investments in systems transformation to ensure that all patients can reap the benefits of clinically meaningful new technologies.

Our data suggest that the introduction of the rapid test technology had its biggest impact in public clinics. We postulate that breakdowns in lab equipment prior to the intervention made rapid-test technology (which require minimal equipment) very advantageous. All clinics, both public and private, benefitted from the quality improvement intervention.

The main strengths of our study were the large sample size and geographic spread across fourteen large clinics in a number of heterogeneous settings. The main limitation of this study is the lack of matched concurrent control facilities. As the study took place within PEPFAR’s programmatic

constraints, we were not afforded a matched control group. In addition, the high baseline testing rates at all time points did not allow marked improvements in testing rates. While this is certainly a limitation, this does not obscure the impact of the systems improvement intervention on treatment rates.

Our results, despite being encouraging, require further validation in additional implementation research environments, continued study to evaluate sustainability, and costing studies to establish cost-effectiveness of the combined technology and systems-based interventions. Our experience in Haiti demonstrates that health systems improvement efforts coupled with technology can improve care delivery systems to prevent congenital syphilis in resource-poor settings.

## Conflict of Interests

The authors have declared that no competing interests exist.

## Authors’ Contribution

Linda Severe participated in the study design and analysis, carried out the study, and participated in the drafting of the paper. Daphne Benoit carried out the study. Xi K. Zhou carried out the statistical analysis. Jean W. Pape conceived the study and participated in the study design. Rosanna W. Peeling participated in the study and the drafting of the paper. Daniel W. Fitzgerald conceived the study, participated in the study design, oversaw the analysis, and participated in the drafting of the paper. Kedar S. Mate conceived the study, participated in the study design, carried out the study, and drafted the initial paper. All authors read and approved the final paper.

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## Research Article

# The Epidemiology of Herpes Simplex Virus Type-2 Infection among Pregnant Women in Rural Mysore Taluk, India

Aaron F. Bochner,<sup>1</sup> Purnima Madhivanan,<sup>2,3</sup> Bhavana Niranjankumar,<sup>3</sup> Kavitha Ravi,<sup>3</sup> Anjali Arun,<sup>3</sup> Karl Krupp,<sup>3,4</sup> and Jeffrey D. Klausner<sup>2,5</sup>

<sup>1</sup> Department of Epidemiology, School of Public Health, University of Washington, Seattle, WA 98195, USA

<sup>2</sup> Department of Epidemiology, Robert Stempel College of Public Health and Social Work, Florida International University, 11200 SW 8 Street, HLS 390W2, Miami, FL 33199, USA

<sup>3</sup> Public Health Research Institute of India, Mysore, Karnataka 560020, India

<sup>4</sup> Department of Health Promotion and Disease Prevention, Robert Stempel College of Public Health and Social Work, Florida International University, Miami, FL 33199, USA

<sup>5</sup> Division of Infectious Diseases, David Geffen School of Medicine, University of California, Los Angeles, CA 90095, USA

Correspondence should be addressed to Purnima Madhivanan; pmadhiva@fiu.edu

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**Objectives.** To assess the prevalence and determinants of herpes simplex virus type 2 (HSV-2) infections among pregnant women attending mobile antenatal health clinic in rural villages in Mysore Taluk, India. **Methods.** Between January and September 2009, 487 women from 52 villages participated in this study. Each participant consented to provide a blood sample for HSV-2 and HIV testing and underwent an interviewer-administered questionnaire. **Results.** HSV-2 prevalence was 6.7% (95% confidence interval (CI) 4.4–9.0), and one woman tested positive for HIV. The median age of women was 20 years and 99% of women reported having a single lifetime sex partner. Women whose sex partner traveled away from home had 2.68 (CI: 1.13–6.34) times the odds of being HSV-2 seropositive compared to women whose sex partner did not travel. Having experienced genital lesions was also associated with HSV-2 infection ( $P$  value = 0.08). **Conclusion.** The 6.7% HSV-2 prevalence was similar to results obtained in studies among pregnant women in other parts of India. It appeared that most women in this study contracted HSV-2 from their spouses and few regularly used condoms. This finding highlights the need for public health policies to increase awareness and education about prevention methods among women and men living in rural India.

## 1. Background

An estimated 536 million people aged 15–49 are infected with the herpes simplex virus type 2 (HSV-2) worldwide [1]. HSV-2 is typically spread through sexual contact and results in a lifelong infection. The predominant symptom of the disease is genital lesions, but a majority of infected individuals experience no symptoms or mild ones that are often unrecognized [2]. The high rate of asymptomatic cases enhances HSV-2 transmission because asymptomatic individuals shed the virus and transmit the disease [3].

Pregnant women are particularly vulnerable to the adverse sequelae of HSV-2 infection [4]. HSV-2 infection

in pregnancy has been associated with premature delivery, low birthweight infants, fetal malformations, and vertical transmission of the virus during childbirth [4, 5]. While neonatal herpes occurs in less than 1% of prevalent infections, the risk of transmission increases to 25–50% among women infected during pregnancy [6, 7]. In addition, it is estimated that prevalent HSV-2 infection is associated with a 2- to 4-fold increased risk of HIV-1 acquisition [8].

The seroprevalence of HSV-2 varies by region, country, and population [9]. Various studies have estimated that about 40% of pregnant women in sub-Saharan Africa, 30% in Latin America, 17–22% in North America, and 4 to 24% in Europe are HSV-2 infected [8, 10–12]. An analysis of

prevalence by country shows even greater heterogeneity. Studies from Sweden, Italy, Switzerland, and China show the HSV-2 prevalence in antenatal cases of 10.4%, 7.6%, 20.7%, and 10.8%, respectively [10, 13–15].

There are few studies describing HSV-2 prevalence among pregnant women in India. One cross-sectional study conducted among 1,640 pregnant women attending antenatal clinics in Arunachal Pradesh, Assam, Manipur, Meghalaya, and Mizoram (all states are located in the northeast of India) found overall HSV-2 seroprevalence of 8.7% with states ranging from a high of percentage 15% in Arunachal Pradesh to a low percentage of 2.7% in Manipur [16]. Another study of asymptomatic pregnant females attending the Obstetrics and Gynecology Outpatient Department for a routine antenatal checkup in the North Indian State of Jammu found HSV-2 prevalence of 7.5% [17].

With one antenatal study from Tamil Nadu, a southern state in India, and limited seroprevalence estimates from other parts of the country, there is a great need for additional studies among pregnant women [18]. The research describes the prevalence and determinants of HSV-2 infection among pregnant women living in rural villages in Mysore *Taluk*, Karnataka, India.

## 2. Methods

**2.1. Setting.** Public Health Research Institute of India (PHRII) is a nonprofit organization based in Mysore, India. PHRII operates a health clinic in Mysore providing free reproductive healthcare to women. PHRII maintains a public health laboratory and conducts mobile health clinics offering integrated antenatal care and HIV testing services in villages in Mysore *Taluk* for pregnant women. Mysore *Taluk* is located in the southern part of the state of Karnataka, India.

**2.2. Study Population.** Pregnant women living in rural villages located in Mysore *Taluk* were enrolled in the study from January to September 2009. Pregnant women in the villages were recruited through extensive community outreach and with the assistance of community and local health professionals. A total of 487 women from 52 villages submitted blood samples to be tested for HSV-2 and HIV. The Institutional Review Boards at the University of California, Berkeley, and Public Health Research Institute of India approved the study protocol.

**2.3. Study Design.** A list of the 141 villages in Mysore *Taluk* was obtained through the 2001 Indian Census and 52 villages were randomly selected to participate in an intervention providing integrated antenatal care and HIV testing using mobile medical clinics. Prior to the health camp, an outreach team met with village leaders and local health professionals to seek permission to work in the community. The team also met with the national rural health mission workers—the auxiliary nurse midwife (ANM), the accredited social health activist (ASHA), *Anganwadi* teacher and helper to discuss the program. The *Anganwadi* teacher provided a list of registered

pregnant women in each of the villages and assisted in referring these women to the health clinic. Mobile health clinics were typically conducted in primary schools or community halls located in each village one day after a community-wide education and awareness program was conducted on the importance of antenatal care and institutional deliveries. Pregnant women were offered a free antenatal screening including clinical examination and laboratory evaluation and completed an interviewer-administered questionnaire.

**2.4. Interview and Counseling.** All pregnant women who came to the mobile medical clinic were offered pretest counseling in groups in the local language of *Kannada*. Each woman was then directed to a private space where she could discuss and ask any questions or clarifications before proceeding further through the program. Then, a trained female interviewer used a standardized questionnaire to collect information on sociodemographic status, work experience and economic status, knowledge about HIV/AIDS, sexual history, information on main sex partners, history of sexually transmitted infections, and HIV test reports. All women were assured of confidentiality of their responses.

**2.5. Diagnostic Testing.** After completion of an examination by the physician, a trained nurse collected blood samples from consenting participants to screen for HSV-2, HIV, and other routine antenatal investigations. Diagnostic tests were performed in the PHRII laboratory in Mysore. A type-specific ELISA was used to detect HSV-2 IgG antibodies in sera (Focus Technologies, Cypress, CA, USA). Tests were performed following manufacturer instructions using index values > 1.1 to define positive results. A blinded panel of 20 serum samples provided by St. John's Medical College Research Institute, Bangalore, was used to validate testing and results were in agreement with 20 out of 20 samples. The first 89 samples were run in duplicate and all results were successfully replicated. In addition, all positive test results were duplicated to provide confirmation. HIV testing was performed using ELISA following manufacturer instructions (HIVASE 1 + 2, General Biologicals Corporation, Taiwan). All HIV testing was performed in duplicate. Any woman who was found to be infected with HIV was provided medications for prevention of vertical transmission of HIV and referred to the antiretroviral therapy center in KR Hospital. All women were subsequently followed up after delivery up to a period of two years.

**2.6. Statistical Analysis.** Data were analyzed using Stata 10.1 (Stata Corporation, College Station, TX). Pearson's chi-square test adjusted to account for the cluster survey design was used to assess association of clinical characteristics and HSV-2 status using a *P* value cutoff of 0.1 for significance [19]. To obtain odds ratios, data were modeled using logistic regression, with HSV-2 status as the binary outcome of interest. In addition, relative risks were obtained using a generalized linear model with a log link function and binomial distribution. A cluster survey design was used because pregnant women were geographically grouped into

villages; thus robust variance estimates adjusted within village correlation were obtained [19].

### 3. Results

Most of the pregnant women in the selected villages participated in the program. Only 21 pregnant women in the community did not provide a blood sample, either because they had only recently done their antenatal investigations ( $n = 8$ ) or they declined to attend the medical clinic for personal reasons ( $n = 13$ ). Of the 487 (95.6%) pregnant women tested for HSV-2 antibodies, 32 tested positive, giving a prevalence of 6.6%. Accounting for the cluster design of the sampling gives a prevalence of 6.7% (95% confidence interval (CI): 4.4–9.0). Of these 487 women, only one woman (0.2%) tested positive for human immunodeficiency virus antibodies.

Of the 487 women who provided a blood sample, 478 (98%) agreed to be interviewed, which included all women who tested positive for HSV-2. Characteristics of the study population are shown in Table 1. The median age of the study population was 20 years, ranging from 15 to 33 years of age. Education level varied, with 13% of women reporting completion of less than one year of education, while 33% had completed 1–7 years, 36% had completed 8–10 years, and 18% had completed more than 10 years of school. All but one woman participating in the study were married, with 34% of women married for one year or less, 40% married between 1 and 3 years, and only 26% married for longer than three years. About half the women in the study had children (52%). The median household income per month was 3000 INR (1 USD = 45.9 INR), ranging from 0 to 40,000 INR per month, while only 2.7% (13/478) of participants reported regularly earning income themselves. Almost all of the participants (99.2%, 473/477) in the study population reported a single sex partner in their lifetime and 88.7% (422/476) of study participants reported never using a condom with their main sex partner.

The majority of participants who tested positive for HSV-2 did not report symptoms commonly associated with HSV-2 (Table 2). Vaginal sores were experienced by 4% of the women in the study, while 21% reported experiencing painful urination and 13% reported having abnormal vaginal discharge. Evidence of an association was found for the presence of vaginal sores ( $P$  value = 0.08), with 9% of HSV-2 seropositive women reporting vaginal sores compared to 3% of HSV-2 seronegative women. Painful urination ( $P$  value = 0.26) and abnormal vaginal discharge ( $P$  value = 0.49) were not associated with HSV-2 status.

Using logistic regression, the unadjusted odds ratio was determined for each characteristic (Table 3). The only characteristic that showed evidence of affecting the odds of HSV-2 infection was if the sex partner ever traveled away from home, where participants whose partner ever traveled had 2.68 times the odds of being HSV-2 positive as compared to participants whose partner never traveled (95% CI: 1.14–6.34). A generalized linear model estimated the relative risk of HSV-2 among women whose partners ever traveled to be

TABLE 1: Descriptive characteristics of the sample of pregnant women attending the mobile medical clinics in rural Mysore, India.

Characteristic	HSV-2			
	Seronegative		Seropositive	
	No.	(%)	No.	(%)
Age	446		32	
≤17	15	28.6%	0	0%
18–20	228	60.0%	15	46.8%
21–23	142	32.1%	11	34.4%
≥24	61	13.9%	6	18.8%
Education completed, years	445		32	
None	60	13.5%	4	12.5%
1–7	144	32.4%	14	43.8%
8–10	165	37.1%	6	18.8%
>10	76	17.1%	8	15.0%
Length of marriage, years	446		32	
≤1	151	33.9%	10	31.3%
1–3	181	40.6%	11	34.4%
>3	114	25.6%	11	34.4%
Have children	446		32	
No	248	55.6%	19	59.4%
Yes	198	44.4%	13	40.6%
Household income, INR/month	445		32	
<4000 (\$87 USD)	232	52.1%	18	56.3%
≥4000 (\$87 USD)	213	47.9%	14	43.8%
Sex while you or partner was under influence of alcohol	441		32	
Never	386	87.5%	26	81.3%
Ever	55	12.5%	6	18.8%
Main partner smokes cigarettes	439		32	
Never	288	65.6%	23	71.9%
Ever	151	34.4%	9	28.1%
Main partner education completed, years	443		32	
None	119	26.9%	10	31.3%
1–7	115	26.0%	9	28.1%
8–10	130	29.4%	6	18.8%
>10	79	17.8%	7	21.9%
Main partner travels	444		32	
Never	402	90.5%	25	78.1%
Ever	42	9.5%	7	21.9%
Main partner had other sex partners	444		32	
Never	374	84.2%	25	78.1%
Ever	48	10.8%	3	9.4%
Do not know/refused	22	5.0%	4	12.5%

2.44 (95% CI: 1.16–5.14) times greater than the probability of women whose husbands never traveled.

To control for possible confounding, multivariable logistic regression was used to adjust for the participant's age and husband's education level. In this model, women whose main

TABLE 2: Clinical characteristics of the sample of pregnant women living in rural Mysore *Taluk*, India.

Characteristics	HSV-2				Design-based Pearson P value
	Seronegative (n = 443)		Seropositive (n = 32)		
	No.	(%)	No.	(%)	
Vaginal sores					0.077
Ever	14	3.1%	3	9.4%	
Never	429	96.8%	29	90.6%	
Painful urination					0.258
Ever	89	20.1%	9	28.1%	
Never	354	79.9%	23	71.9%	
Abnormal vaginal discharge*					0.492
Ever	55	12.4%	5	15.6%	
Never	387	87.6%	27	84.4%	

\*One individual with missing data.

sex partner ever traveled away from home had 2.77 (95% CI: 1.20–6.41) times the odds of having a prevalent HSV-2 infection.

#### 4. Discussion

This study found HSV-2 prevalence of 6.7% among pregnant women attending mobile antenatal care clinics in 52 rural villages located in Mysore *Taluk*, Karnataka, India. This is comparable to previously obtained measures of HSV-2 prevalence among other pregnant women in India [16, 17]. The 6.7% prevalence is lower than the three previously obtained estimates of HSV-2 prevalence in the state of Karnataka, which ranged from 10.9 to 18.9% [20–22] although these studies focused on nonpregnant populations.

Almost all the women in this study reported having a single sex partner in their lifetime and one woman reported being unmarried. It appears that the main route of HSV-2 transmission in this population is through sexual transmission from their spouses. Since very few married women consistently use a condom, the risk behavior of their husbands is a primary risk factor. This information highlights the need to increase awareness and discuss risk behaviors among both men and women living in rural India.

In our exploratory analysis, only having a husband who traveled away from home was significantly associated with an increased risk of HSV-2 infection. *P* values were not adjusted for multiple comparisons. Misclassification should not have affected this finding since women would know how often their husbands traveled and there is no social stigma attached to this activity. In addition, living in a small rural village may present limited opportunity for sex outside of marriage, so only husbands who travel may have access to other sex partners. Furthermore, this may be the main entry point for HSV-2 into rural communities since sex workers are more common in urban areas and have been shown to have high rates of HSV-2 infection [23].

TABLE 3: Correlates of HSV-2 infection among pregnant women living in rural Mysore *Taluk*, India.

Characteristic	HSV-2 seropositivity			
	OR	95% CI	RR	95% CI
Age				
15–19	1.00		1.00	
20–24	1.19	(0.49, 2.89)	1.18	(0.51, 2.71)
>25	1.51	(0.49, 4.67)	1.47	(0.52, 4.16)
Education completed, years				
None	1.00		1.00	
1–7	1.46	(0.45, 4.76)	1.42	(0.47, 4.27)
8–10	0.55	(0.17, 1.81)	0.56	(0.18, 1.75)
>10	1.58	(0.42, 5.95)	1.52	(0.45, 5.20)
Length of marriage, years				
<1	1.00		1.00	
1–3	0.92	(0.42, 2.02)	0.92	(0.44, 1.93)
>3	1.46	(0.70, 3.04)	1.42	(0.72, 2.79)
Have children				
No	1.00		1.00	
Yes	0.86	(0.38, 1.96)	0.87	(0.40, 1.87)
Household income, INR/month				
<4000	1.00		1.00	
>4000	0.85	(0.35, 2.04)	0.86	(0.38, 1.95)
Sex while you or partner was under influence of alcohol				
Never	1.00		1.00	
Ever	1.62	(0.67, 3.92)	1.56	(0.70, 3.48)
Main partner smokes cigarettes				
Never	1.00		1.00	
Ever	0.75	(0.34, 1.64)	0.76	(0.36, 1.59)
Main partner education completed, years				
None	1.00		1.00	
1–7	0.93	(0.36, 2.44)	0.94	(0.38, 2.28)
8–10	0.55	(0.19, 1.58)	0.57	(0.21, 1.54)
>10	1.05	(0.43, 2.60)	1.05	(0.46, 2.41)
Main partner travels				
Never	1.00		1.00	
Ever	<b>2.68</b>	<b>(1.13, 6.34)*</b>	<b>2.44</b>	<b>(1.16, 5.14)~</b>
Main partner had other sex partners				
No	1.00		1.00	
Yes	0.94	(0.28, 3.15)	0.94	(0.30, 2.95)
Do not know/refused	2.72	(0.89, 8.27)	2.46	(0.94, 6.43)

\* *P* value = 0.026.

~ *P* value = 0.020.

It is possible that this study overestimated the prevalence of HSV-2 in this population. There is a debate about the accuracy of the Focus Diagnostics HerpeSelect HSV-2 IgG ELISA test kits used in this study. Some researchers have suggested that the cutoff value for a positive test should be raised from 1.1 to 3.0 or 3.5 when the test is used in low prevalence settings [24, 25]. Raising the cutoff value to 3.5 would have affected the study results since 14 of the 32 positive tests fell in the disputed range, decreasing the estimated prevalence from 6.6% to 4.7%. Additional HSV-2 studies should be conducted using a gold standard like western blot to confirm the results.

In this study, the majority of HSV-2 positive individuals did not report experiencing symptoms caused by HSV-2. This is consistent with previous findings that HSV-2 is frequently asymptomatic or symptoms go unrecognized. We did find an association between the presence of vaginal sores and HSV-2 ( $P$  value = 0.08). However, only 9.4% of HSV-2 positive women reported experiencing vaginal sores, highlighting the challenge of diagnosing HSV-2 and the ability of HSV-2 to circulate undetected in a population.

There are several limitations to the study. Information about spouses was obtained from participants who were likely to possess incomplete knowledge of their partners' behaviors, resulting in misclassification. There is the possibility of social desirability bias. Though interviews were conducted in a private setting and women were guaranteed anonymity, it is possible that participants still feared disclosing personally or socially sensitive information. This may also have resulted in misclassification that biased the results toward finding no association between certain risk behaviors. This study was limited by a small sample size and a low prevalence of HSV-2 in the study population limiting the power of the study to detect associations between personal characteristics and HSV-2. Associations found in other studies between older age and alcohol consumption and increased risk for HSV-2 infection were not found to be statistically significant in this study. It is possible that with a larger sample size, associations would be found between additional factors and increased risk of HSV-2 infection.

This study provides needed information regarding the prevalence of HSV-2 among rural pregnant women in India and will serve as an important baseline measurement as investigators continue to monitor rates of HSV-2 in the future in rural India.

### Conflict of Interests

The authors declare no conflict of interests.

### Authors' Contribution

Dr. Madhivanan has full access to all data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis. Study concept and design was done by Madhivanan, Arun, Krupp, and Klausner. Acquisition of data was done by Bochner, Niranjankumar, Ravi, and Arun. Analysis and interpretation of data was done by Bochner,

Madhivanan, and Krupp. Drafting of the manuscript was done by Bochner and Madhivanan. Critical revision of the paper for important intellectual content was done by Bochner, Madhivanan, Niranjankumar, Ravi, Arun, Krupp, and Klausner.

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## Research Article

# The Impact of Integration of Rapid Syphilis Testing during Routine Antenatal Services in Rural Kenya

Eleanor Fleming,<sup>1,2</sup> Jared Oremo,<sup>3</sup> Katherine O'Connor,<sup>2,4</sup> Aloyce Odhiambo,<sup>3</sup> Tun Ye,<sup>5</sup> Simon Oswago,<sup>6</sup> Clement Zeh,<sup>6</sup> Robert Quick,<sup>4</sup> and Mary L. Kamb<sup>1</sup>

<sup>1</sup> Centers for Disease Control and Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Office of the Director, Office of Health Equity, 1600 Clifton Road Mailstop E07, Atlanta, GA 30333, USA

<sup>2</sup> Division of Applied Sciences, Epidemic Intelligence Service, Centers for Disease Control and Prevention, Scientific Education and Professional Development Program Office, Atlanta, GA 30333, USA

<sup>3</sup> Safe Water and AIDS Project, Kisumu 40100, Kenya

<sup>4</sup> Division of Foodborne, Waterborne and Environmental Diseases, Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, Atlanta, GA 30333, USA

<sup>5</sup> Centers for Disease Control and Prevention, Center for Global Health, Office of the Director, Atlanta, GA 30333, USA

<sup>6</sup> Kenya Medical Research Institute (KEMRI), Kisumu 40100, Kenya

Correspondence should be addressed to Eleanor Fleming; [efleming@cdc.gov](mailto:efleming@cdc.gov)

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We evaluated the integration of rapid syphilis tests (RSTs) and penicillin treatment kits into routine antenatal clinic (ANC) services in two rural districts in Nyanza Province, Kenya. In February 2011, nurses from 25 clinics were trained in using RSTs and documenting test results and treatment. During March 2011–February 2012, free RSTs and treatment kits were provided to clinics for use during ANC visits. We analyzed ANC registry data from eight clinics during the 12-month periods before and during RST program implementation and compared syphilis testing, diagnosis, and treatment during the two periods. Syphilis testing at first ANC visit increased from 18% (279 of 1,586 attendees) before the intervention to 70% (1,123 of 1,614 attendees) during the intervention ( $P < 0.001$ ); 35 women (3%) tested positive during the intervention period compared with 1 (<1%) before ( $P < 0.001$ ). Syphilis treatment was not recorded according to training recommendations; seven clinics identified 28 RST-positive women and recorded 34 treatment kits as used. Individual-level data from three high-volume clinics supported that the intervention did not negatively affect HIV test uptake. Integrating RSTs into rural ANC services increased syphilis testing and detection. Record keeping on treatment of syphilis in RST-positive women remains challenging.

## 1. Introduction

The World Health Organization (WHO) estimated that globally in 2008 1.4 million women had syphilis in pregnancy, causing approximately 520,000 adverse pregnancy outcomes including 305,000 perinatal deaths [1]. Untreated maternal syphilis currently equals or exceeds HIV, neonatal tetanus, or malaria as a cause of perinatal mortality [2]. Caused by the bacterium *Treponema pallidum*, syphilis is efficiently transmitted *in utero* to the fetus [3, 4]. When left untreated, adverse pregnancy outcomes can occur in up to 80% of affected

pregnancies [4], with the most severe outcomes occurring in women with early (i.e., primary, secondary, or early latent) infections [3]. A recent meta-analysis adjusting for other causes of mortality estimated that, among asymptomatic women, untreated maternal syphilis caused stillbirth in 21% and neonatal death in 9% of affected pregnancies and led to low birth weight in 6% and congenital infection in 15% of surviving infants [5]. Infants born with syphilis may suffer disfigurement, delayed development, or other complications [3]. Early detection and adequate treatment (i.e., long-acting

intramuscular penicillin) prevent poor outcomes due to mother-to-child transmission (MTCT) of syphilis [3, 4].

Nyanza Province, located in western Kenya, has the second highest neonatal (39 per 1000 live births) and fifth highest perinatal (37 per 1000 live births and stillbirths) mortality rates among Kenya's eight administrative provinces [6]. In comparison, Western European nations have neonatal and perinatal mortality rates of less than 5 per 1000 live births and 10 per 1000 live births plus stillbirths, respectively [7]. Nyanza also has the nation's highest prevalence of HIV (14%) and syphilis (2.3%) among reproductive-aged women [8].

Low maternal educational attainment, limited health care access, and poverty may adversely influence maternal and infant health outcomes. In 2008-2009, only 17% of women in Nyanza Province had completed primary school [6], 48% of pregnant women received antenatal care (ANC) at low-level facilities with minimal services, and 35% delivered their infants with a skilled birth attendant [6]. About 63% of the population lives on the equivalent of less than \$1 a day. Although some ANC services, such as HIV testing, are provided without cost, women must pay for most basic services and supplies such as syphilis testing, antibiotics, and exam gloves.

Antenatal syphilis testing and treatment are highly cost effective [9] and are recommended by WHO in the basic ANC package [10]. Until recently, diagnosis in asymptomatic populations (the case for most pregnant women infected with syphilis) has depended on serologic tests requiring basic laboratory capacity that is unavailable at most low-level facilities. Newer, inexpensive, and rapid syphilis tests (RSTs) have been developed that use finger-prick whole blood samples and can be done at low-level facilities, with results and treatment provided at the clinic visit. In this evaluation, we sought to identify the feasibility and challenges of integrating RSTs into ANC services in low-level health facilities in a remote, rural setting and to assess the impact of RSTs on diagnosis and treatment of syphilis in pregnant women. Because introduction of new services can affect existing services, we also sought to ascertain the impact of the introduction of RSTs on uptake of rapid HIV testing.

## 2. Methods

**2.1. Implementation of Antenatal Program.** In 2011-2013, a Kenyan nongovernmental organization called the Safe Water and AIDS Project (SWAP), the Kenya Medical Research Institute (KEMRI), the Kenyan Ministry of Public Health and Sanitation (MOH), and the US Centers for Disease Control and Prevention (CDC) conducted an evaluation of a pilot RST program that was incorporated into a project that integrated nurse training; health facility improvement; and safe water, hygiene, and nutritional interventions into antenatal care in low-level facilities in two rural districts (Mbita and Suba) in Nyanza Province, Kenya. This evaluation was a component of a larger project integrating improved ANC services and safe water practices in low-level health facilities in Mbita and Suba Districts [11]. The large project involved an intervention with three components: (1) special

training of nurses on emergency obstetrical care, neonatal resuscitation, safe water and hygiene practices, and improved ANC services including congenital syphilis prevention; (2) diagnosis and treatment supplies for clinics, including hand-washing and drinking water stations, infant resuscitation equipment, RST kits, and penicillin and injection equipment for women with reactive syphilis tests; and (3) public health commodities (safe water storage containers, water treatment products, soap, protein-fortified flour at ANC visits, and clean delivery kits with exam gloves, sterile razor blades, and swaddling cloths) provided to pregnant women as incentives to attend ANC. This intervention was available at no cost to the estimated 8000 pregnant women receiving ANC services during the intervention period (from March 2011 to February 2012).

**2.2. Study Design.** For this evaluation assessing the feasibility and challenges of RSTs in low-level facilities, we used several methodologies: (1) a before-and-after assessment without concurrent controls using summary statistics of syphilis testing uptake and treatment among women receiving ANC services in eight facilities; (2) an assessment of diagnosis and treatment commodity stock outs (i.e., occasions when supplies of RSTs and penicillin in the clinics had been consumed and not yet resupplied) using stock books from the eight facilities; (3) an assessment of syphilis and HIV testing uptake using individual, patient-level data from ANC registries at three high-volume facilities; and (4) an evaluation of intervention challenges from in-depth interviews of nurses and patients.

**2.3. Study Setting.** We worked with all 25 rural health facilities to test the impact of various incentives on the use of antenatal and delivery services, including syphilis testing. Because of time and resource constraints, we limited the RST evaluation to all eight clinics selected using the following criteria: (1) public (MOH) clinics; (2) feasible to reach within one day; and (3) maintained antenatal registries from 2010 to 2012. Hereafter, these clinics are referred to as "priority clinics." They included three dispensaries, four health centres, and a subdistrict hospital (Table 1). Dispensaries are the lowest-level facilities in the health care system, providing simple outpatient and preventive services with basic supplies and a nurse. Managed by a clinical officer and staffed by two or more nurses and a pharmacist, health centres can provide simple ambulatory and preventive services (e.g., vaccines). The subdistrict hospital is similar to health centres but has a laboratory for simple tests (e.g., blood slides for malaria parasites and urine dip tests).

**2.4. Implementation of RSTs.** In February 2011, faculty from Emory University, CDC, and SWAP provided a two-day, hands-on training for nurses and midwives that included modules on the public health importance, diagnosis, and treatment of congenital syphilis. Nurses were instructed on integrating RSTs with existing rapid HIV testing, counseling women about syphilis results, referring partners for treatment, and recording results of testing and treatment

TABLE 1: Antenatal syphilis and HIV testing coverage and seropositivity rates at eight priority clinics, 12 months before and 12 months during implementation of a rapid syphilis testing intervention, Suba and Mbita Districts, Kenya, March 2010–February 2012.

Clinic type	Before intervention				During intervention				Change in HIV testing (P value)			
	# at 1st ANC	# (%) Tested for syphilis	# (%) Tested for positive syphilis	# (%) Tested for HIV	# at 1st ANC	# (%) Tested for syphilis	# (%) Tested for positive syphilis	# (%) Tested for HIV		Change in syphilis testing (P value)		
Facility 1	34	0	0	33 (97)	70	66 (94)	7 (11)	58 (83)*	24 (41)	<0.001	0.04	
Facility 2	162	0	0	153 (94)	171	132 (77)	6 (5)**	162 (95)	22 (14)	<0.001	0.45	
Facility 3	157	0	0	151 (96)	122	90 (74)	2 (2)	92 (75)*	9 (7)	<0.001	<0.001	
Subtotal	<b>353</b>	<b>0</b>	<b>0</b>	<b>337 (95)</b>	<b>363</b>	<b>288 (79)</b>	<b>15 (5)</b>	<b>312 (86)</b>	<b>55 (31)</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	
					Health center							
Facility 4	351	104 (30)	0	307 (88)	345	161 (47)	7 (4)	300 (87)	34 (11)	<0.001	0.84	
Facility 5	114	3 (7)	0	97 (85)	144	115 (80)	3 (3)	126 (88)	10 (8)	<0.001	0.57	
Facility 6	178	1 (1)	0	165 (93)	216	166 (77)	6 (4)	174 (81)*	12 (7)	<0.001	<0.001	
Facility 7	297	98 (33)	1 (1)	239 (81)	255	206 (81)	3 (2)	159 (62)*	38 (13)	<0.001	<0.001	
Subtotal	<b>940</b>	<b>206 (22)</b>	<b>1 (&lt;1)</b>	<b>808 (86)</b>	<b>960</b>	<b>648 (68)</b>	<b>19 (3)</b>	<b>759 (79)</b>	<b>94 (12)</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	
					Subdistrict hospital							
Facility 8	293	73 (25)	0	241 (82)	291	187 (64)	1 (1)	221 (76)*	23 (10)	<0.001	0.03	
Total	1586	279 (18)	1 (<1)	1386 (87)	1614	1123 (70)	35 (3)	1292 (72)	172 (15)	<0.001	<0.001	

<sup>1</sup>Dispensaries: lowest level of health system, typically have one nurse and provide simple ambulatory and preventive services.

<sup>2</sup>Health centres: lower-level facilities that are larger than dispensaries, under a clinical officer and with basic health staff (e.g., two or more nurses, a pharmacist), and provide ambulatory and preventive health services (e.g., vaccines).

<sup>3</sup>Subdistrict hospital: similar to health centre but has basic laboratory services (although not RPR testing).

\*Facilities reporting HIV test stock outs from February 29–April 2012.

\*\* Facility reporting syphilis test kit stock outs for the following dates: June 7–9, 2011, September 7, 2011, and October 11–12, 2011, due to problems with distribution.

into ANC registries. Nurses began implementing enhanced services in March 2011.

**2.5. Data Collection.** For the before-and-after assessment comparing syphilis testing uptake, seropositivity, and treatment rates, we abstracted data from the records of all ANC attendees in the ANC registries at the eight facilities during the preintervention period (March 2010–February 2011) and during the intervention period (March 2011–February 2012). To further estimate syphilis treatment adherence, we reviewed ANC registry and stock book data to determine the ratio of penicillin vials used overall to the number of women whose syphilis tests were seroreactive. To assess the impact of syphilis testing on HIV testing rates, we used individual-level program data on syphilis and HIV testing from 330 consecutive women attending ANC at three “high-volume” clinics (i.e., served more than 400 women per year) during a time without shortages (“stock-outs”) of HIV or syphilis test kits. We collected individual data on gestational age, syphilis testing, HIV testing, and test results and determined syphilis and HIV test uptake by month before and during the intervention. We believed these data were useful because they allowed a purer assessment of test uptake in a time without test-kit stock-outs, and the individual-level data allowed exclusion of women with previous positive HIV status (i.e., ineligible for another HIV test). Finally, to assess the challenges of introducing RSTs, we conducted a series of qualitative, semistructured interviews with a convenience sample of nurses and mothers from the priority clinics. Interview guides were written in English and translated into the local language (Dholuo) by two SWAP enumerators who conducted and recorded the interviews.

**2.6. Data Analysis.** Quantitative data were entered into Microsoft Excel 6 databases and analyzed with SAS 9.3 (Cary, N.C.) and OpenEpi Version 2.3.1 (Atlanta, GA) to calculate the proportion of women tested for syphilis and HIV at the first ANC visit and compare the proportion testing positive in the 12-month intervals before and during the intervention. The ratio of penicillin vials used to total positive syphilis tests was also calculated. Qualitative data were analyzed using QSR International NVivo 8.0 (Melbourne, Australia). In an iterative process, we read and reread the interview texts for emerging themes and attached codes to the text representing them until no new themes emerged [12].

**2.7. Ethical Review.** The KEMRI Ethical Review Committee approved the study protocol (protocol 1898). The CDC Institutional Review Board approved the reliance on a non-CDC IRB in accordance with 45 CFR 46.114 (protocol 5996). Written informed consent was obtained from all participants, and personal identifiers were irretrievably removed from databases at the end of the study.

### 3. Results

Of 1614 ANC attendees recorded in the ANC registries in the eight clinics during the one-year intervention period, 1123

(70%) were tested for syphilis compared with 279 (18%) of 1586 ANC attendees recorded in ANC registries during the prior year ( $P < 0.001$ ) (Table 1). The increase in syphilis testing was statistically significant for each facility. Notably, at the three dispensaries, 79% of attendees were tested during the intervention period compared with none during the previous year. During the intervention period, 35 women (3%) tested positive for syphilis compared with one (<1%) during the previous year. No syphilis treatment data were collected in the ANC registries.

A total of 34 penicillin treatment kits were used at seven health facilities where 28 ANC syphilis tests were positive for a ratio of 1.2:1, suggesting that women testing positive received at least one penicillin injection (stock book (i.e., treatment) data in one facility were incomplete and thus were excluded). During the intervention period, most clinics had sufficient syphilis testing and treatment commodities. However, we noted that one dispensary temporarily lacked saline to dissolve penicillin and referred two patients to other facilities for treatment. Another facility experienced stock outs for one-two days during three separate months. During the 12-months prior to the intervention, syphilis test kits and treatment were unavailable at most low-level facilities and inconsistently available in the district hospitals. In contrast, HIV test kits were more consistently available at ANC facilities than syphilis tests during the 12 months prior to the intervention, although stock-outs in HIV test kits occurred for short periods during the intervention.

ANC registry data indicated that 1292 (72%) of 1614 ANC attendees had HIV testing during the intervention period compared to 1386 (87%) of 1586 attendees during the prior year ( $P < 0.001$ ) (Table 1); HIV testing frequency during the intervention period was significantly lower at two of three dispensaries, two of four health centres, and the subdistrict hospital. The summary ANC registry data did not indicate results of previous HIV testing (previously positive women would not have been offered another HIV test).

Of 330 women attending ANC in three high-volume clinics during the intervention (combined data from two health centres and one subdistrict hospital), more women were tested for HIV (87%) than syphilis (76%); 67% received both tests and 4% received neither (Table 2). In the 12 months before intervention, HIV test uptake (60–94% per month, median 82%) exceeded syphilis test uptake (5–49% per month, median 26%). During the intervention, HIV uptake was similar (70–95% per month, median 82%), and syphilis uptake increased greatly (44–98% per month, median 60%). HIV testing exceeded syphilis testing during all months of the intervention period except for July–August 2012 (Figure 1).

From qualitative interviews, 10 nurses worked an average of 13 years (range, 2 years to 27 years) in a variety of facilities and four years at the current facility (range, one month to 10 years). Although syphilis treatment practices varied among the nurses, none of the nurses mentioned that patients are declining treatment because of partner violence. About half of the nurses (6) had attended the training on syphilis testing and treatment. Although all knew that proper treatment included intramuscular penicillin injections, not all knew the correct number of injections. Most nurses

TABLE 2: Percentage of pregnant women tested for HIV, syphilis, or both, by clinic and gestational age, among consecutive women attending first antenatal care visit in three high-volume clinics, Suba and Mbita Districts, Kenya, from March 2011 to February 2012.

	HIV test only N (%)	Syphilis test only N (%)	Both tests N (%)	Neither test N (%)	Any HIV test N (%)	Any syphilis test N (%)
Women at 1st ANC visit (N = 330)	66 (20.0)	29 (8.8)	222 (67.3)	13 (3.9)	288 (87.3)	251 (76.1)
Clinic						
Facility 4 (N = 100)	20 (20.0)	3 (3.0)	77 (77.0)	0	97 (97.0)	80 (80.0)
Facility 7 (N = 120)	6 (5.0)	10 (8.3)	100 (83.3)	4 (3.3)	106 (88.3)	110 (91.7%)
Facility 8 (N = 110)	40 (36.4)	16 (14.6)	45 (40.9)	9 (8.2)	85 (77.3)	61 (55.5)
Gestational age at 1st ANC*						
≤12 weeks (N = 16)	4 (25.0)	3 (18.8)	9 (56.3)	0	13 (81.3)	12 (75.0)
13–24 weeks (N = 130)	21 (16.2)	9 (6.9)	95 (73.1)	5 (3.9)	116 (89.2)	104 (80.0)
weeks (N = 163)	37 (22.7)	15 (9.2)	108 (66.3)	3 (1.8%)	145 (89.0)	123 (75.5)

\*21 records had missing information.

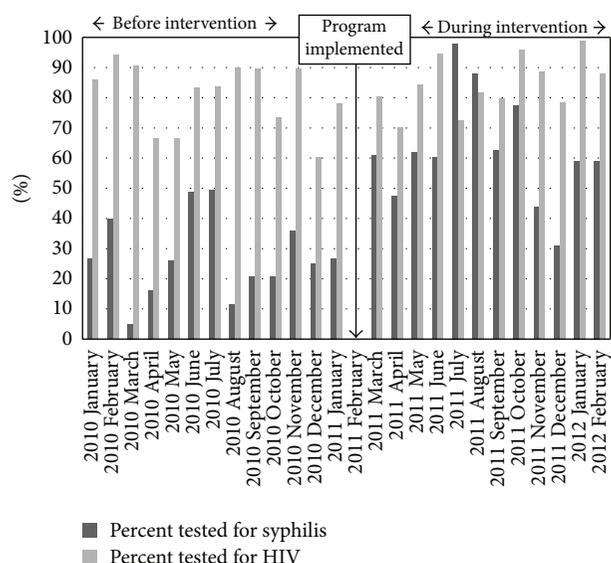


FIGURE 1: Percentage of pregnant women receiving syphilis and HIV tests at first ANC visit in three high-volume, rural health facilities. Facilities evaluated included two health centres (facilities 4 and 7) and one subdistrict hospital (facility 8). 12 months before and 12 months during implementation of a rapid syphilis testing intervention.

reported that the overall program had been successful but identified three main challenges. First, partner treatment was unaffordable for many; nurses recommended providing free partner treatment. Second, nurses were concerned about sustaining the program of free testing and treatment when the study ended. Finally, some nurses did not receive the training because of staff shortages at their facilities and recommended making training available to all nurses. Interviews with 21 mothers revealed that they were not always fully informed about the tests and did not feel they could ask nurses for more information. Testing practices were inconsistent from one pregnancy to the next and some mothers had never been tested.

## 4. Discussion

Findings from this evaluation suggest that RSTs are feasible for use in ANC services at low-level, rural facilities, resulted in an increased diagnosis and treatment of syphilis in pregnant women, and did not impact rapid HIV testing uptake. The percentage of pregnant women tested for syphilis at their first ANC visit increased dramatically from <1% to 70%, resulting in the identification of 35 infections. Although documentation of treatment was poor, the number of syphilis treatment kits used in the clinics roughly corresponded to the number of cases identified, suggesting that women testing positive were usually treated, likely averting cases of congenital syphilis. Syphilis prevalence in this population (3.5%) exceeded the rate reported in national surveys (2.3%), a finding that is consistent with studies elsewhere reporting higher syphilis prevalence among rural than urban women [13]. Syphilis testing is frequently unavailable in remote settings where syphilis infections may go undetected and consequently untreated.

Although ANC registry data suggested that most women testing positive for syphilis received at least a single dose of 2.4 million units long acting penicillin intramuscularly (IM) (sufficient to prevent MTCT of syphilis), data recording was inconsistent and therefore difficult to interpret. Additionally, although a single IM dose of penicillin can prevent congenital syphilis, Kenya's guidelines (and global guidelines) recommend three weekly doses of 2.4 million units (7.2 million units total) to treat an asymptomatic, seroreactive mother with unknown duration of infection. Thus our data suggested that the syphilis-positive women were undertreated. Prior to the intervention, high-level approvals were obtained to modify existing ANC registries to include syphilis treatment; and the nurses' training involved intensive instruction on recommended treatment, the need to use IM penicillin during pregnancy, and practice on modifying the registry and documenting syphilis treatment. The failure of this aspect of the interventions suggests that to improve collection of syphilis treatment data, an important indicator of program effectiveness, MOH officials will need to add a syphilis treatment field to existing ANC registries and assure that

providers are trained in both adequate treatment of syphilis in pregnancy and in entering treatment data properly [4].

Our data suggested that women were willing to be tested for both syphilis and HIV. Although overall ANC data suggested that a smaller percentage of women were tested for HIV during the intervention period than before, a more in-depth analysis of three high-volume clinics indicated the reverse: that, following the introduction of RSTs, HIV testing did not change. The latter finding was consistent with other studies that found that the introduction of RSTs did not adversely affect antenatal HIV test uptake [14]. The discrepant findings in this study could be explained by a lack of data on previous HIV testing in ANC registries. Women who previously tested positive for HIV would not be retested at later pregnancies, and including them in the denominators would (incorrectly) suggest a decrease in HIV test uptake. Furthermore, in November 2011 one of the tests used in Kenya's HIV testing algorithm was removed from stocks due to inadequate performance in some lots [15, 16], leading to short-term but widespread shortages in HIV tests. This may explain the documentation of HIV test shortages in some clinics during the intervention period. Some ANC attendees in early 2012 may have been offered HIV testing at later ANC visits or not at all.

The qualitative data suggested three problems in service delivery that are modifiable. First, the nurses did not adequately communicate the importance of syphilis testing and treatment to ANC attendees, and women did not feel comfortable asking nurses for information. This problem may have been exacerbated by the frequent transfer of nurses and other providers who may have taken their knowledge of performing RSTs, maintaining RST stock, and recording results with them without transferring knowledge to new nurses. Addressing these training problems, as well as possibly including community outreach regarding congenital syphilis prevention, could help improve program operation. Second, treatment of male partners in this program was unsuccessful. Their lack of participation in ANC and inability to pay for treatment is a lost opportunity that also places treated women at risk of reinfection. The ANC setting has been found to be an appropriate place to counsel and test male partners in other programs (e.g., HIV) [17, 18], and treatment of partners for syphilis would be a relatively simple and inexpensive addition, possibly serving as an incentive for men to accompany their partners to ANC. Finally, some nurses were concerned about the sustainability of the program when outside funding to purchase RSTs is no longer available. Health ministries will need to consider means of covering basic ANC services in order to achieve global maternal and infant health goals.

Our evaluation had several limitations. First, because the facilities we evaluated were in only two districts of Nyanza Province they may not have been representative of rural facilities elsewhere. Second, most antenatal registries were incomplete, limiting our interpretation of the findings, particularly of treatment of women with positive RSTs. Despite this limitation, the very large increment in the percentage of women receiving RSTs left little doubt about the program's impact on syphilis detection. Third, HIV test uptake in

the 8 clinics was likely underestimated because antenatal registries did not allow identification of previously positive women. Additionally, the removal of one of the HIV tests in Kenya's HIV testing algorithm during the intervention may have led to lower HIV testing rates in some clinics that were unrelated to introduction of RSTs (a problem inherent to before-and-after studies). Finally, the perspectives from the key informants may not have represented the broader population of nurses and mothers. However, we believe the sample was of sufficient size to capture a comprehensive range of perspectives.

In conclusion, our findings suggest that integrating RST into routine ANC services in low-level facilities in remote, rural settings where many women in sub-Saharan Africa receive MCH services was feasible, led to large increases in syphilis testing uptake, and uncovered higher syphilis prevalence than had been previously reported. These data are important for health ministries seeking practical and affordable methods for providing syphilis testing, a recommended component of basic ANC services. The data also add support for projected benefits from modeling studies indicating that early syphilis detection and treatment in antenatal women are a cost-saving intervention in settings with moderate-to-high syphilis prevalence, even when laboratory capacity is limited [9]. Introducing RSTs also did not appear to adversely impact HIV testing in the ANC setting [14]. This study documented that reporting treatment data was not optimal but could be addressed by improving ANC registries and training providers. Additional training for nurses could help ensure that patients are fully counseled on the tests that are offered to them and on the meaning of the results. Nurses could also receive additional training on partner notification to ensure that partners of patients diagnosed and treated are also tested and treated. Community education programs would be another strategy to promote syphilis testing to mothers and their partners. Taken together, these strategies could provide a meaningful contribution to global efforts to reduce MTCT of syphilis.

## Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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## Research Article

# Remembering the Children: Implementation and Success of a Robust Method for Identifying and Testing Children of HIV Patients

Christopher Darlow,<sup>1,2</sup> Peter Tovey,<sup>1</sup> Fiona Wallis,<sup>1</sup> Clare Knowles,<sup>1</sup> Ian Fairley,<sup>1</sup> Charles Lacey,<sup>1,2</sup> and Fabiola Martin<sup>1,2</sup>

<sup>1</sup>York Teaching Hospital NHS Trust, Mongate Health Center, 31 Monkgate, York YO31 7WA, UK

<sup>2</sup>Centre for Immunology and Infection, Department of Biology, HYMS, University of York, Heslington, York YO10 5DD, UK

Correspondence should be addressed to Christopher Darlow; [chrisdarlow@gmail.com](mailto:chrisdarlow@gmail.com)

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**Background.** Children of HIV patients are a historically neglected demographic by HIV services. It has been recommended by CHIVA that HIV services have a robust method of detecting and testing untested children. We note that no such method is either in widespread use or in the literature. **Method.** In December 2011, a one-page proforma to identify HIV untested children and a clear multidisciplinary pathway to test them were implemented. Twelve months later the uptake of the proforma and pathway, the numbers of patients and children identified for testing, and their outcomes were audited. **Results.** The proforma was completed in 192/203 (94.6%) eligible patients. Twenty-five (21.5%) of 118 identified offspring had not been tested. Ten (8.5%) of these were <18 years old. All were reported to be clinically well. Ten children were referred for testing, seven were tested immediately, and three were tested within 18 months of identification. All children were tested HIV negative. **Discussion.** We have identified a method of identification that is easy and robust and provides a user-friendly safety net to empower healthcare providers to identify and test children at risk. We recommend the implementation of such strategies nationwide to prevent death due to undiagnosed HIV in children.

## 1. Introduction

HIV infection in children is an important public health issue. Although global transmission rates are decreasing, 3.3 million children under the age of 14 are infected with HIV of whom 330,000 contracted the virus in 2011 [1]. In contrast, vertical transmission rates are <1% in the UK due to the successful UK antenatal HIV testing program and routine postdelivery HIV testing of all children born to HIV-positive mothers [2].

However, there are still children living in the UK who are HIV-positive without being tested [3] with potentially catastrophic consequences. These are mostly children of mothers who have received their antenatal care outside the UK. Children with HIV may remain asymptomatic until adolescence and early adulthood [4] and therefore present

late in their disease. In the period of 2003–2006, 18 children were known to have died from HIV, nine within one month of their HIV diagnosis [5]. In order to prevent HIV associated morbidity and mortality it is important to identify children of HIV-positive patients who have never been HIV tested, regardless of age.

The children of HIV patients are a historically poorly captured demographic within UK HIV medicine services [6, 7] for a multitude of reasons.

- (1) Poor and inconsistent data collection on the children of HIV-positive parents;
- (2) Parents may be worried and feel ashamed about potential disclosure of their HIV status to their children;

- (3) Parents may feel anxious and guilty about having a potential HIV-positive child;
- (4) Parents and healthcare professionals may feel that a child, who has been well for many years, erroneously does not need testing;
- (5) Healthcare professionals may have apprehensions about the breakdown of a trusting relationship with their patients by broaching the HIV testing of their children.

Following the sudden AIDS related death of a 10-year-old child born to a parent who had been in HIV care for the previous six years, the Children's HIV Association (CHIVA) and the British HIV Association (BHIVA) published "Don't Forget the Children" in 2009 [8]. This document recommends the following.

- (1) All adult HIV services, including statutory and voluntary, as well as NHS and social services, must have protocols and procedures in place to ensure that all children of HIV-positive parents are tested for HIV.
- (2) A multisector, multidisciplinary team (MDT) needs to be identified for each HIV service, or network, and be responsible for setting up protocols and managing cases if and when they arise.
- (3) All HIV units will need to perform a "look back" exercise to establish the HIV status of any children whose HIV-positive parents attend that service.
- (4) All HIV services need effective operational procedures and information systems to monitor this process comprehensively.
- (5) All new HIV-positive patients attending adult HIV services should have all children identified and tested and the information clearly documented.
- (6) There needs to be joint protocols in place between health and social care to manage those cases where parents initially refuse, in order that these cases may be dealt with sensitively and appropriately. A clear pathway of referral needs to be identified within the multidisciplinary team.
- (7) The process of identifying children to performing an HIV test is completed within a time period of 12 months [9].

Historically, patients at our unit were questioned about living with, having children, and the children's HIV status opportunistically. We could not find a national or internationally agreed systematic method for implementing the "Don't Forget the Children" recommendations. Therefore, we developed a new strategy to identify and test the children of HIV-positive parents attending the North Yorkshire HIV services led by York Teaching Hospital. We audited its effectiveness 12 months later. The aim of this report is to introduce the strategy and to inform of the outcomes of its implementation.

## 2. Methods

The Strategy Implemented Was Three-Pronged. First, we set up a regular three-monthly MDT meeting with local paediatricians at Harrogate and York Teaching Hospital and established a social service referral pathway should a parent refuse to cooperate.

Secondly, we developed five HIV testing options offered to HIV-positive parents emphasising our aim to safeguard confidentiality. Patients could choose to have their children HIV tested by (i) general practitioner (GP), (ii) TB services as part of immigration check, (iii) paediatrician, (iv) provider referral if the child was an adult and/or sexually active, and (v) HIV specialist nurse.

Finally we introduced a colour-coded single page proforma, the Yellow Proforma (Figure 1), which was attached to the front of all HIV patient notes for completion at their next clinic visit. This proforma was filed in the front of the notes once completed. This strategy was implemented in December 2011 and audited retrospectively in December 2012. Patients were excluded from the audit process if they were <14 years old, new patients yet to be seen, or patients who had transferred care out of our service before 2011. Duplicates were removed. Parents with children <18 years old were followed up actively, while those with older children were offered HIV testing for their children but less actively so.

The effectiveness of this audit was measured by.

- (1) Proportion of patients with completed proforma within 12 months,
- (2) Number of tested and untested children identified within 12 months,
- (3) Number of clinically well but untested children tested within 12 months,
- (4) Number of potentially unwell but untested children tested within 7 days.

## 3. Results

A total of 214 HIV patients attended our services; 203 patients were eligible for inclusion in the audit. The process and outcomes of screening these patients are depicted in Figure 2. Table 1 shows the demographics of the 203 patients. By 12 months, 192 (94.6%) patients had completed proformas. Reasons for non-completion of the remaining 11 were patients not attending or clinicians forgetting. None of these patients were known to have children who needed testing.

Using the yellow proforma (YP) helped identify a total of 90 (46.9%) HIV patients with children, with a total of 118 offspring. The breakdown of these offspring and their testing status is shown in Figure 3. Of the total, 74/118 (62.7%) offspring had an adequate proof of testing available. The remaining 44/118 (37.3%) had never been tested: 19/118 (16.1%) did not require or could not be tested, leaving 25/118 (21.9%) offspring who needed further testing. All were clinically well at the time of identification. 10/118 (8.5%) offspring were ≤18 years old, and their parents were entered into the testing

Yorclinic: Test The Children Proforma v 1 F Martin 22 11 2011

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Date	Initials of Patient	Clinic	Clinic No
Does patient have any children?		Yes / No	
How many in total?		< 16y:	≥16y:
Do any children live with patient?		Yes / No	
How many in total?		< 16y:	≥16y:
Has patient children who are living in the UK, but not with patient?		Yes / No	
How many in total?		< 16y:	≥16y:

All children < 18 y living in the UK or living with patient:

Child's First name	D.O.B	Place of Birth	Mother HIV pos. Y/N	Child tested? Y/N	When?	Where?	Copy of results filed or requested?

Identified children who need testing:

Child's First name:	D.O.B.	Test offered? Y/N	Date	Accepted? Y/N	Arranged? Y/N	MDT referral? Y/N	Date

Name of Clinician: \_\_\_\_\_ Date: \_\_\_\_\_

---

Please also document everything in the notes including the time point at which the children's HIV test was first offered to carers.

FIGURE 1: The yellow proforma (YP).

pathway. The median age of these children was 13.5 years (1–18), and 9/10 were of Black African origin. Their parents had been attending the local services for a median of 3.5 years (range 0–15), and all 10 children were tested HIV negative. Seven (70%) had been tested by the time of completion of the audit.

The parents of three offspring were not happy to test their child for HIV. One mother, with a history of depression, stopped attending HIV services and would send her partner to pick up her medication in order to avoid discussing HIV testing of her child. She was convinced that she had an HIV test during her antenatal care. But further investigation

revealed that the opt-out testing for HIV had not been fully implemented during her pregnancy. Fourteen months after implementation of the YP, she was persuaded to have her child tested by informing her that a failure to attend would result in an automatic referral to the social services. The child was tested HIV negative by the paediatricians, and the mother started engaging again with her own HIV care.

Originating from overseas, the parents of the remaining two clinically well, but HIV untested, children reasoned that testing them was culturally unacceptable. After implementation of the YP, they promised to test the children but continued to find reasons for not doing so. Eighteen months

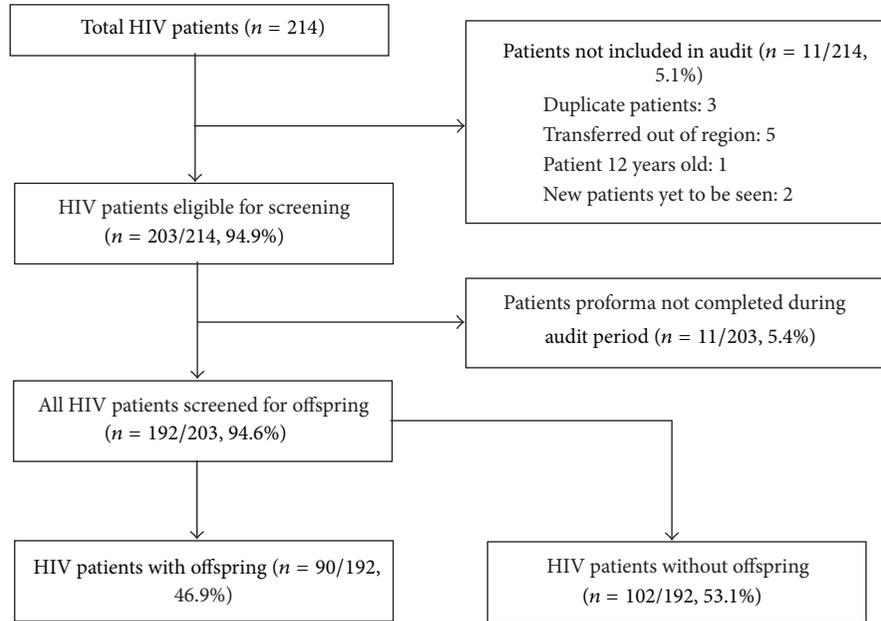


FIGURE 2: HIV patients screened for offspring. A total of 214 HIV patients attend the York/Harrogate HIV services. Eleven (5.1%) were deemed ineligible for inclusion in the audit, leaving 203/214 (94.9%) patients eligible for proforma completion. Of these, 192/203 (94.6%) had a completed proforma. A total of 90/192 (46.9%) had offspring and 102/192 (53.1%) did not.

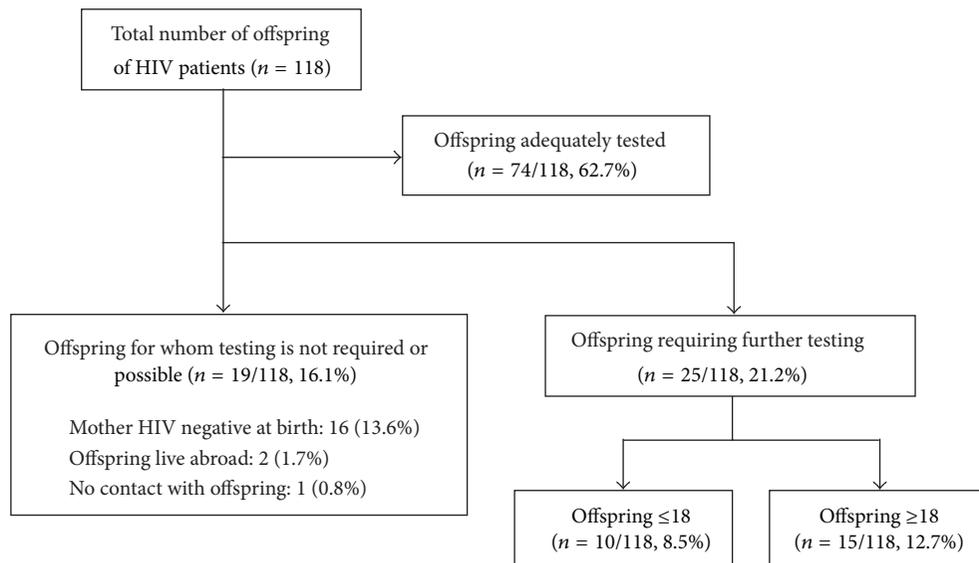


FIGURE 3: Breakdown of offspring of HIV patients. There are a total of 118 offspring from the 90 adult HIV patients identified to have offspring. Of these, 74/118 (62.7%) were adequately tested; 19/118 (16.1%) did not require testing or were unable to be tested; and 25/118 (21.2%) were in need of an HIV test. Of these, 10/118 (8.5%) were <18 years of age and were actively pursued for testing. The remaining 15/118 (12.7%) over 18 were encouraged to be tested, but less actively so.

after implementation of the YP, they were informed that their family would be referred to social services if they did not attend the appointment made with the paediatrician for HIV testing. Within 18 months of identification, their children were tested HIV negative.

The parents of the children considered to be adults were strongly encouraged to discuss HIV testing with their

adult children. The same testing options, bar testing through paediatrician, were offered to all families.

#### 4. Discussion

Prior to the implementation of this new strategy and despite the best intentions of the clinicians, children requiring HIV

TABLE 1: Demographics of HIV-positive adults included in this audit ( $n = 203$ ).

Median age (range)	43 (19–76)
Gender (male : female)	146 : 57
Ethnicity	
White British	140
Black African	48
Other	11
Not disclosed	4
Risk factor for infection	
Heterosexual	101
MSM	63
Bisexual	13
Other	3
Unknown	23
Median length of time attending local HIV services (range)	4 years (0–23)

testing were being missed, since parents were approached on an ad hoc basis. Not all children were identified and follow-up of identified children was erratic and poorly documented.

We have shown that our three-pronged approach made easy, fast, and methodical identification and testing of children of HIV-positive patients, both retrospectively and prospectively, possible.

The YP reminded the clinicians to address this emotionally loaded subject and made documentation and followup easy and reliable. Using the same colour coded tool for all patients proved to patients that all patients were treated equitably and that they had not been singled out as “infectious parents.”

The paediatricians and HIV team have universally accepted the usage of YP and coordination with the new MDT at our unit. Eighteen months onward, none of the MDTs have been cancelled. Progress with each untested child was monitored and reported at each MDT until testing was achieved. The combination of the YP tool, MDT approach, the multiple HIV testing options, and the clear social service referral pathway has empowered clinicians to actively and transparently follow up the HIV testing of children living with HIV-positive patients and make appropriate referrals. As a result, clinicians feel supported by this network.

By identifying parents who find testing difficult we could focus time and resources on those particularly vulnerable children and parents, who may have otherwise slipped through the net and remained untested. Although three children had not been tested within the CHIVA recommended time frame of twelve months from identification, the novel strategy allowed identification and active management of these three cases by the MDT. None of the children were unwell, allowing us some grace time to persuade the parents eventually without deterring them from attending our services or jeopardising the children’s health.

The cost and benefit of a new strategy, which led to HIV testing of all untested children, are difficult to calculate, and

the implementation of this new strategy was not formally costed. However it did not seem to require more funds or time than usually spent on other auditable standards of care recommended by BHIVA, and the process facilitated appropriate use of resources on the children who needed testing. All MDT members have been very enthusiastic and proactive participants in the three monthly meetings, which last no more than one hour. The testing process utilised testing modalities were already in place independently but were unified by a single referral process.

In summary, 94.5% of HIV patients had a YP completed within 12 months. Seven out of 10 identified children needing an HIV test had been tested within 12 months of identification by the YP and one child by 14 months and two children of one family by 18 months. All children were tested HIV negative and no family needed to be referred to social services.

Despite our active efforts to test adult children, 13/15 adult children born to HIV-positive parents remain untested but could be HIV-positive. We could not find guidelines on testing and followup of this potentially infected cohort. Clear guidelines as to how to offer testing to the adult children without breaching our duty to maintain confidentiality towards our patients need to be developed urgently.

Universal implementation of our strategy might aid identification of untested children of HIV-positive patients and subsequently provide appropriate testing in a structured and timely fashion, in accordance with CHIVA and BHIVA guidance. A paper or electronic version of this method can also be used to aid data collection for a national children HIV testing audit.

## Conflict of Interests

The authors declare no conflict of interests.

## Acknowledgments

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## Research Article

# Increasing Antenatal Care and HIV Testing among Rural Pregnant Women with Conditional Cash Transfers to Self-Help Groups: An Evaluation Study in Rural Mysore, India

**Purnima Madhivanan,<sup>1,2</sup> Bhavana NiranjanKumar,<sup>2</sup>  
Reshma Shaheen,<sup>2</sup> Poornima Jaykrishna,<sup>2</sup> Kavitha Ravi,<sup>2</sup> Savitha Gowda,<sup>2</sup>  
Vijaya Srinivas,<sup>2</sup> Anjali Arun,<sup>2</sup> and Karl Krupp<sup>2,3</sup>**

<sup>1</sup> Department of Epidemiology, Robert Stempel College of Public Health and Social Work, Florida International University, 11200 SW 8 Street, HLS 390W2, Miami, FL 33199, USA

<sup>2</sup> Public Health Research Institute of India, 89/B, 2nd Cross, 2nd Main, Yadavgeri, Mysore 560021, India

<sup>3</sup> Department of Health Promotion and Disease Prevention, Robert Stempel College of Public Health and Social Work, 11200 SW 8 Street, HLS 390W2, Miami, FL 33199, USA

Correspondence should be addressed to Purnima Madhivanan; pmadhiva@fiu.edu

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*Background.* We describe a one-year evaluation study comparing SCIL intervention of mobile provision of integrated ANC/ HIV testing with an enhanced (SCIL+) intervention of community mobilization strategy providing conditional cash transfers (CCT) to women's SHG for identifying and accompanying pregnant women to mobile clinics. *Methods.* Twenty pairs of villages matched on population, socioeconomic status, access to medical facilities, and distance from Mysore city were divided between SCIL and SCIL+ interventions. The primary study outcome was the proportion of total pregnancies in these villages who received ANC and HIV testing. *Results.* Between April 2011 and March 2012, 552 pregnant women participated in SCIL or SCIL+ interventions. Among women who were pregnant at the time of intervention delivery, 181 of 418 (43.3%) women pregnant at the time of intervention delivery received ANC in the SCIL arm, while 371 of 512 (72.5%) received ANC in the SCIL+ arm ( $P < 0.001$ ); 175 (97%) in the SCIL and 366 (98.6%) in the SCIL+ arm consented to HIV testing ( $P < 0.001$ ). HIV prevalence of 0.6% was detected among SCIL clinic, and 0.9% among attending SCIL+ clinic attendees. *Conclusion.* Provision of CCT to women's microeconomic SHG appears to significantly increase uptake of ANC/HIV testing services in rural Mysore villages.

## 1. Introduction

Almost three decades after the first HIV antibody test, the vast majority of pregnant women in middle and low income countries are still not being tested for HIV as part of their antenatal care [1]. According to the United Nations Population Division, only about 26% of 125 million pregnant women in these countries learn their HIV status prior to delivery [2]. Not only is this knowledge essential to the initiation of prevention of mother-to-child transmission (PMTCT) of HIV services, but also it is an important gateway to antiretroviral therapy for HIV infected mothers and children [3]. Despite

widespread scale-up of HIV prevention and PMTCT interventions, uptake of services remains low because a majority of HIV-positive pregnant women continue to be unaware of their status. Unsurprisingly, the group with least access to HIV testing remains rural and poor women who are more vulnerable to infection and less able to access needed services [4].

India is among the top ten countries in the world with the highest burden of pediatric HIV infections [5]. Of 27 million women giving birth each year, only 6 million are tested for HIV [6]. Those with least access to prevention services live in the country's 600,000 rural villages. In a 2011 study, only 9%

of rural Indian women had an HIV test during their current pregnancy [7]. Low rates of HIV testing have been found closely associated with a lack of accessible and affordable healthcare [8]. The 2005/2006 National Family Health Survey (NFHS III) found that only 6% of poor rural women received prenatal care and only 13% delivered in a medical institution [9]. Current strategies for increasing HIV testing among rural pregnant women have been largely ineffective [10, 11]. New strategies are needed for identifying and testing pregnant women living in India's more than 600,000 rural villages.

About 5,000 integrated counseling and testing centers (ICTC) currently provide public HIV testing and PMTCT services in India. Only 12% of these facilities are located in rural areas where 61% of Indians live [12, 13]. A study of Karnataka's health infrastructure illustrates the difficulty: a majority of rural residents were required to travel an average of 40 km to access district-level hospitals where ICTC are typically located [13]. As a result, 63% of rural pregnant women elect private healthcare—a problematic choice because HIV prevention services are almost nonexistent in India's "for-profit" sector [14, 15]. Expectant mothers attending public hospitals also face significant challenges. They are referred to outside laboratories for antenatal investigations and to ICTCs for HIV testing. Complicating things further, they are often required to return up to three days later for results. Finally, if they are found to be HIV infected, they must then visit a government Antiretroviral Therapy Centre before or after being seen by a physician for antenatal care. The challenges are obvious. Structural obstacles including distance, expense, and fear of HIV stigma often discourage many rural pregnant women from ever travelling to a government hospital for antenatal care or HIV testing [16]. Only 48% of indigenous tribal populations, for instance, and 20% of the lowest income Hindu women, attend public facilities where they would have access to HIV prevention services [17]. Each step is a barrier to successful provision of PMTCT and a serious cause for loss-to-followup. Studies from Africa have shown that each stage in an HIV prevention cascade results in a loss of 6–12% of women [18].

The Saving Children and Improving Lives (SCIL) intervention was developed to address many of the current barriers to HIV testing among rural women in Karnataka, India. SCIL delivers integrated antenatal care and HIV testing services directly to rural villages using mobile medical clinics, eliminating expense, reducing loss of wages, and mitigating the difficulty of traveling to a public hospital for ANC and ICTC center for HIV testing. The intervention also mobilizes village support for maternal services and reduces fear of HIV stigma among rural pregnant women. An enhanced version of SCIL (SCIL+) adds an additional feature: conditional cash transfers (CCT) given to local women's microeconomic self-help groups for assisting in mobilizing attendance at the mobile medical clinics.

In the past, use of CCT and women's microeconomic self-help groups in interventions has mainly been confined to development programs [19, 20]. With "traditional" cash assistance, recipients receive benefits because they fall into a particular income range or geographic area. CCT are distributed only if recipients comply with certain requirements.

For instance, CCT have been shown to increase attendance at health screenings, nutritional education meetings, and immunization clinics [20, 21]. Studies have shown they can have a positive impact on infant birth weight [21] and nutritional status of the infant [22]. SCIL+ uses CCT in an innovative way. Typically, women's microeconomic self-help groups collect small amounts of money from each member and loan it back on a revolving basis. With the SCIL+ intervention, the entire group earns CCT that can then be loaned to members. By identifying and accompanying pregnant woman to ANC/HIV testing clinics, groups increase their capacity for helping members start new businesses and pay unanticipated expenses. As a strategy, utilizing women's self-help groups is also not new, but here again SCIL+ changes the current paradigm viewing women self-help groups as a distribution network instead of seeing them as a collaboration network that helps implement interventions. This ensures dramatically increased ANC/HIV testing coverage in rural areas.

The paper describes an evaluation study that compares the success of SCIL and SCIL+ interventions for mobilizing pregnant women for ANC and HIV testing in 40 rural Mysore district villages in the south Indian state of Karnataka.

## 2. Materials and Methods

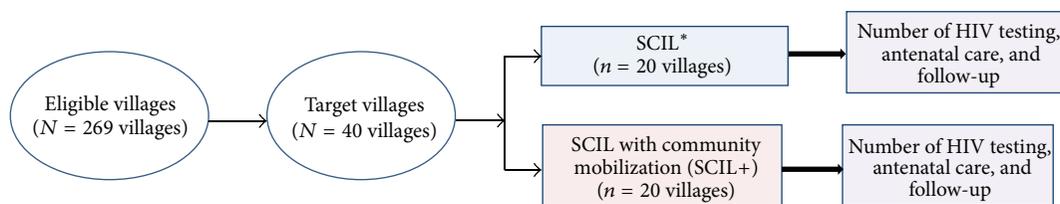
The primary objective of the evaluation study was to examine the effectiveness of the SCIL+ compared with the basic SCIL intervention for increasing uptake of integrated ANC and HIV testing services among women in rural Mysore district. SCIL+ delivers the same community education and awareness activities followed by mobile clinics offering ANC/HIV testing as SCIL, with an additional community mobilization strategy offering CCT to women's microeconomic self-help groups for identifying and accompanying pregnant women to mobile medical clinics. We hypothesized that the "enhancement" would lead to greater uptake of ANC/HIV testing as compared to the basic SCIL intervention.

## 3. Ethics Review

This evaluation study was approved by the Institutional Review Board of the Public Health Research Institute of India (Protocol number 2011-03-26-10). All women participating in the study gave written informed consent for ANC/HIV testing.

## 4. Study Setting

The study was conducted from April 2011 to March 2012 in Mysore district, Karnataka. The district has a population of 2,994,744 persons, of which 1,483,538 are female. About 58.6% of residents live in 1,332 rural villages. Annual per capita income for rural residents is estimated at INR 16,086 (USD \$322) and literacy at 63.3%, compared with an all-India annual per capita income of INR 38,005 (USD \$760) and literacy rate of 74.0% [23–25]. Rural residents are mainly Hindu (86%), 7% Muslim, and 7% belonging to other religions.



\*SCIL: Integrated mobile antenatal care and HIV testing

FIGURE 1: Study design for evaluating the two interventions in rural Mysore, India.

The district has a 0.8% HIV prevalence in the general population and 1% prevalence among ANC attendees [26]. A 2009 survey evaluating HIV testing in rural Mysore district found that 89.2% of rural women age 15–49 reported no knowledge of an HIV testing center and 80.3% said that they never had an HIV test [27].

## 5. Study Design

This study employed a quasiexperimental nonequivalent control group design to evaluate whether the SCIL+ was superior to the basic SCIL intervention for increasing uptake of ANC and HIV testing among rural pregnant women. This design is often used when funds are inadequate to conduct a randomized controlled trial but useful data can be gained by comparing different community-level interventions in similar neighboring areas [28]. Both interventions were designed for delivery at the village level, so the study compared interventions in communities closely matched on population size, socioeconomic status, access to public medical facilities, and distance from Mysore city. Forty villages were selected from a sampling frame of 269 villages in Mysore district that met inclusion and exclusion criteria. To be included in the study a village was (a) located more than 10 km outside of Mysore city (to ensure that study villages were rural); (b) having a population size of 1,500–3,000; and (c) not having a public medical facility (Figure 1).

## 6. Participants

The study population included pregnant women, 18 years and older residing in a study village for more than six months. Community education meetings emphasizing the importance of ANC and HIV testing were conducted in all study villages prior to a mobile clinic visit. In SCIL+ villages, study staff met with all women's self-help groups and selected 25 groups in proximity to locations where mobile medical clinics would operate, with a minimum of one group in each village. On the day of the mobile medical clinic, pregnant women who came to access services were screened for eligibility. All eligible women were informed about the study and, if interested, underwent an informed consent process in a private location.

## 7. Intervention Description

**7.1. SCIL Intervention.** The following activities comprising the SCIL intervention were carried out two times in twenty selected villages during the one-year study.

**7.1.1. Community Education and Awareness.** Meetings that included street theatre, presentations on antenatal care and HIV, and participatory activities were conducted in study villages one day prior to arrival of mobile ANC/HIV testing clinics. They were conducted in the local language of *Kannada* and included key messages on birthing preparedness, the importance of antenatal care and HIV testing, recognizing danger signs during pregnancy, and planning ahead for transportation, place of delivery, and healthcare provider. Meetings typically lasted two hours and program staff conducted several times each day.

**7.1.2. Integrated Mobile Antenatal Care and HIV Testing Clinics.** Intervention staff traveled by minivan with the equipment and supplies necessary for operating a full-service ANC/HIV testing clinic. Pregnant women typically arrived at the clinic site prior to set-up. Staff collected locator information from each pregnant woman to ensure communication of their test results. Women were then provided with group HIV pretest counseling using visual aids designed for low literacy population [29]. Each of the pregnant women underwent an informed consent process in a private setting. Trained interviewers administered a questionnaire to each woman collecting data on knowledge and attitudes about antenatal care, HIV/PMTCT, HIV stigma, institutional delivery, and breastfeeding. Women underwent a detailed physical examination by a physician. A trained nurse phlebotomist collected 2 mL of venous blood for all the antenatal investigations including blood grouping, Rh Typing, random blood sugar, hemoglobin, syphilis, hepatitis B, and HIV testing. Each pregnant woman also provided two mL of urine for prenatal investigations including protein, sugars, and white blood cells. Finally, all women were provided iron, folic acid, and vitamin supplements before they left the clinic.

**7.1.3. Delivery of Laboratory Results and Posttest Counseling.** Within 48 hours of a mobile clinic visit, a trained counselor returned back to the same village to deliver results for antenatal and HIV tests to each pregnant woman in person in

a private location. The counselor explained the results, helped women cope with any emotional impact of results, and provided appropriate support and referrals. Women found to be HIV-infected were also provided antiretroviral medications for PMTCT and given additional information about HIV-positive women support group and health and social services. Each person referred for additional services was then followed up by phone within a week to find out if she had received needed healthcare and encouraged to do so if she had not done so.

**7.1.4. Followup of Pregnant and Delivered Women.** All SCIL clinic attendees were contacted prior to the next clinic visit. Once they delivered, they were followed up in person or by phone within a week and again at three months following delivery. Data were collected on mode of delivery, baby's birth weight, and postnatal healthcare. Information was also collected on breastfeeding practices.

**7.2. SCIL+ Intervention.** The following activities comprising the SCIL+ intervention were carried out two times in twenty selected villages during the one-year study. The 20 villages in the SCIL+ program received services identical to those in the SCIL intervention along with the following additions.

**7.2.1. Social Mobilization Using Women Self-Help Groups.** Prior to implementation of the interventions, program staff met with all women's microeconomic self-help groups in SCIL+ program villages to explain the intervention. Groups that expressed interest and capacity to participate (i.e., having at least 10 active members, regular meetings, and a self-help group bank account) were registered to participate in the program. Two weeks prior and again one day before each mobile medical clinic, women's self-help group leaders were notified and reminded of the upcoming medical clinic. Each time a self-help group member accompanied a pregnant woman to the mobile clinic, they were given vouchers that the group's treasurer could redeem for a cash amount equivalent to USD \$2.00.

## 8. Data Analysis

The primary outcome of the study was to estimate the proportion of pregnant women in the SCIL and SCIL+ interventions who received antenatal care and HIV testing. The denominator for the proportion, the total number of pregnant women in villages during the study period, was obtained from a report provided by the India National Rural Health Mission (NRHM) on all pregnant women registered with the NRHM in these villages from the beginning of April 2011 to the end of March 2012. Data analysis was carried out in Stata 12.0 (Stata Corporation, College Station, TX).

## 9. Results

Between April 1, 2011 and March 31, 2012, 76 community awareness programs were conducted in the villages. Programs were open to all adults, and participation was encouraged

TABLE 1: Reasons for not attending the mobile medical clinics in the two intervention groups in rural Mysore, India.

Reasons	SCIL intervention	SCIL+ intervention
Gone to mother's house for delivery	91	79
Already delivered	8	45
Already received antenatal care	13	7
Went to hospital for antenatal care	1	6
Miscarriage/aborted	2	15
Relocated residence	2	9
Refused to attend	120	1
Total	237	162

among spouses and other family members to increase support for maternal healthcare. Meetings were attended by 1,634 residents (480 men and 1154 women) of SCIL villages and 1,479 occupants (535 men and 944 women) of SCIL+ villages.

A total of 418 pregnancies were identified in SCIL villages. While 24 of the pregnancies (5.7%) had not been registered with NRHM, 181 (43%) attended one or more SCIL clinics. All women underwent pretest counseling, and 175 (96.7%) agreed to HIV testing and received their results after posttest counseling. Six women refused HIV testing as they had recently been tested for HIV and did not want to be tested again. An HIV prevalence of 0.6% was found among participants in the SCIL study arm.

In the SCIL+ arm, 512 pregnancies were identified with 133 (26%) not registered with the NRHM. About 371 (72.5%) attended at least one medical clinics. Attendees were accompanied by 197 members of 22 women's self-help groups. Among the pregnant women who attended the medical clinics, 366 (98.6%) agreed on pretest counseling and had their HIV testing done. All of them received their results after posttest counseling. Five women refused to get tested for HIV as they had already been tested. An HIV prevalence of 0.9% was detected among SCIL+ mobile clinic attendees. In SCIL+ arm, 67% more pregnant women received antenatal care and HIV testing. The reasons for not attending the medical clinics in the two interventions are reported in Table 1.

## 10. Discussion

Currently almost 80% of pregnant women in India fail to receive an HIV test during their pregnancy [6]. This is a significant public health issue in India because almost 50,000 HIV infected Indian women, mostly living in rural areas, give birth annually without the benefit of interventions to prevent vertical transmission of HIV. Recent studies have shown that as few as 9% of rural women receive HIV testing during their pregnancy [7]. Framed in this way, both SCIL and SCIL+ interventions with 43% and 72% uptake of HIV testing, respectively, show great promise for increasing uptake of life-saving interventions such as PMTCT.

Further research is needed to explore the efficacy of the SCIL and SCIL+ interventions using a randomized controlled trial. The question of how the cost of mobile delivery of ANC and HIV testing to rural areas compares with the expense of lifetime provision of antiretroviral drugs for HIV-infected infants and the social and medical costs of maternal and infant morbidity and mortality will also require additional study before the interventions are considered more widely.

This study has the following several weaknesses. (a) Due to financial limitations, SCIL and SCIL+ intervention teams were only able to visit study villages twice during the one-year study. For this reason, one-third or more of women who were pregnant during the period were unlikely to have been able to access the mobile medical clinics. (b) In contrast to a true experimental design, this study lacked random assignment. Without this, internal validity is reduced, and causal claims are difficult to make [30]. (c) We did not compare SCIL or SCIL+ to the current standard of care, so we were unable to infer how interventions increase uptake of ANC and HIV testing compared with services that were currently being offered. (d) A quasi-experimental design is unable to ensure that study arms are equivalent, so intervention arms may have differed in important ways that influenced results. For instance, although we found that the SCIL+ intervention performed better, there is no definitive way of determining if this was because of a superior intervention or whether there were other biases or unmeasured confounding.

Despite these limitations, the evaluation study has several important strengths. It is the first study we know of that involved CCT to women's microeconomic self-help groups instead of self-help group members. Importantly, the methods studied could also be applied to a wide range of interventions in both public health and the development areas. In addition, quasi-experimental designs like the ones used here are used to explore interventions under real-world situations increasing external validity to study data.

## 11. Conclusion

There is a critical need for novel solutions to increase uptake of ANC and HIV testing among rural pregnant women in India and other low and middle income countries. The SCIL and SCIL+ interventions both show great promise for increasing uptake of ANC and HIV testing and reducing mortality and morbidity among expectant mothers and their infants.

## Abbreviations

ANC:	Antenatal care
CCT:	Conditional cash transfer
HIV:	Human immunodeficiency virus
ICTC:	Integrated counseling and testing centers
NRHM:	National rural health mission
PMTCT:	Prevention of mother to child transmission
SCIL:	Saving children improving lives
USD:	United states dollars.

## Conflict of Interests

The authors declare that there is no conflict of interests.

## Authors' Contribution

Purnima Madhivanan had full access to all data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis. She is the guarantor. Purnima Madhivanan, Anjali Arun, Karl Krupp, and Poornima Jaykrishna were responsible for the study concept and design. Karl Krupp, Bhavana Niranjankumar, Reshma Shaheen, Poornima Jaykrishna, Vijaya Srinivas, and Anjali Arun were responsible for the acquisition of the data. Purnima Madhivanan, Bhavana Niranjankumar, Reshma Shaheen, and Karl Krupp analyzed and interpreted the data. Purnima Madhivanan and Karl Krupp drafted the paper. Purnima Madhivanan, Bhavana Niranjankumar, Reshma Shaheen, Poornima Jaykrishna, Karl Krupp, Vijaya Srinivas, and Anjali Arun critically revised the paper for important intellectual content. All authors had full access to all the data including statistical reports and tables in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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