



www.figo.org

Contents lists available at ScienceDirect

## International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo



## RESEARCH

## The need for further integration of services to prevent mother-to-child transmission of HIV and syphilis in Mwanza City, Tanzania



Rebecca Balira<sup>a,\*</sup>, David Mabey<sup>b</sup>, Helen Weiss<sup>c</sup>, David Anthony Ross<sup>c</sup>,  
John Changalucha<sup>a</sup>, Deborah Watson-Jones<sup>b,d</sup>

<sup>a</sup> National Institute for Medical Research (NIMR), Mwanza, Tanzania

<sup>b</sup> London School of Hygiene and Tropical Medicine, London, UK

<sup>c</sup> MRC Tropical Epidemiology Group, London School of Hygiene and Tropical Medicine, London, UK

<sup>d</sup> Mwanza Intervention Trials Unit, NIMR, Mwanza, Tanzania

## ARTICLE INFO

## Keywords:

HIV  
Integration  
PMTCT  
Pregnancy  
Syphilis

## ABSTRACT

**Objective:** To assess the operational integration of maternal HIV testing and syphilis screening in Mwanza, Tanzania. **Methods:** Interviews were conducted with 76 health workers (HW) from three antenatal clinics (ANC) and three maternity wards in 2008–2009 and 1137 consecutive women admitted for delivery. Nine ANC health education sessions and client flow observations were observed. **Results:** Only 25.0% of HWs reported they had received training in both prevention of mother-to-child transmission (PMTCT) and syphilis screening. HIV and syphilis tests were sometimes performed in different rooms and results recorded in separate registers with different formats and the results were not always given by the same person. At delivery, most women had been tested for both HIV (79.4%) and syphilis (88.1%) during pregnancy. Of those not tested antenatally for each infection, 70.1% were tested for HIV at delivery but none for syphilis. **Conclusion:** Integration of maternal HIV and syphilis screening was limited. Integrated care guidelines and related health worker training should address this gap.

© 2015 World Health Organization; licensee Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Background

Maternal HIV and syphilis infections are important public health problems. The WHO has called for the global elimination of mother-to-child transmission (MTCT) of both HIV and syphilis [1,2], which would help improve a broad range of maternal and child health outcomes. Interventions for the prevention of MTCT (PMTCT) of HIV include comprehensive antenatal and postnatal reproductive and child health services, HIV counseling and testing, provision of antiretroviral therapy, optimal obstetric care, and safer infant feeding practices [3,4]. Interventions for the prevention of congenital syphilis include screening of pregnant women and providing infected women, and their sexual partners, curative treatment with benzathine penicillin [5] along with prevention services.

Despite syphilis screening of pregnant women being a recommended policy in many low-resource countries [6], in reality, infants of HIV-infected mothers who receive antiretroviral therapy prophylaxis and successfully complete steps along the PMTCT cascade may still die

from congenital syphilis due to lack of maternal syphilis services [6]. A 2013 global analysis of antenatal surveillance data estimated that, in Africa, annually, more than 535 000 women with active syphilis become pregnant [7]. Untreated syphilis in pregnancy is associated with adverse clinical outcomes for the infant, including stillbirth, fetal and neonatal death, prematurity, and low-birth weight. Further, over 50% of pregnant women with untreated syphilis experience adverse pregnancy outcomes [7–9].

Antenatal care (ANC) services are the entry point for PMTCT of HIV services through HIV counseling and testing of pregnant women. Additionally, WHO recommends the integration of PMTCT services with maternal and child health services [10,11]. The introduction of PMTCT in ANC offers an excellent opportunity to leverage the investment in HIV prevention services to strengthen other maternal health interventions, such as syphilis screening and treatment, family planning, and malaria prevention, and can lead to high uptake of these services. A study conducted in Zambia documented an increase in maternal syphilis screening from 62.5% to 80.8% following introduction of PMTCT services in ANC [12,13].

PMTCT of HIV and maternal syphilis services are potentially suited for integration since they target the same population (pregnant women). Further, the interventions necessary to diagnose HIV and syphilis in pregnancy (testing, ideally at first pregnancy visit) are similar

\* Corresponding author at: National Institute for Medical Research, Mwanza Center, PO Box 1462, Mwanza, Tanzania. Tel.: +255 783 584 115/+255 763 127896; fax: +255 28250 0654.

E-mail address: [rbalira@yahoo.com](mailto:rbalira@yahoo.com) (R. Balira).

**Table 1**  
Training in PMTCT topics and syphilis testing among antenatal care and maternity ward health workers.

Facility type and name	ANC				Maternity				Overall total
	Makongoro	NDH	Igoma	Total	BMC	STRH	NDH	Total	
Total number of staff interviewed	6	3	6	15	23	33	5	61	76
<i>Percentage trained in</i>									
HIV testing	66.7	33.3	50.0	53.3	73.9	45.5	60.0	57.4	56.6
VCT for PMTCT	50.0	33.3	16.7	33.3	73.9	51.5	20.0	57.4	52.6
Provision of ARV for PMTCT	50.0	33.3	16.7	33.3	56.5	33.3	00.0	39.3	38.2
Infant feeding counseling	33.3	33.3	33.3	33.3	56.5	39.4	20.0	44.3	42.1
Optimal obstetric care	33.3	33.3	00.0	20.0	52.2	27.3	20.0	36.1	32.9
PMTCT record keeping	50.0	33.3	16.7	33.3	39.1	30.3	00.0	31.1	31.6
PMTCT guidelines (2007)	50.0	00.0	66.7	46.7	65.2	36.4	20.0	45.9	46.1
Any of the PMTCT subjects above	100.0	66.7	83.3	86.7	82.6	69.7	80.0	75.4	77.6
Syphilis testing	33.3	33.3	66.7	46.7	43.5	12.1	20.0	24.6	28.9
Both syphilis testing and any of the PMTCT subject above	33.3	33.3	66.7	46.7	39.1	9.1	00.0	19.7	25.0

Abbreviations: ANC, antenatal care; ARV, antiretroviral; BMC, Bugando Medical Center; NDH, Nyamagana District Hospital; PMTCT, prevention of mother-to-child transmission; STRH, Sekou-Toure Regional Hospital; VCT, voluntary counseling and testing.

and can be performed onsite in ANC clinics with limited equipment. The integration of PMTCT of HIV services with maternal syphilis screening services is cost-efficient, saving providers' and clients' time [14]. Thus, the integration of services has the potential to increase uptake of each individual intervention and to lead to improved maternal and reproductive health [6,11].

In Tanzania, HIV testing is recommended for pregnant women with an unknown HIV status when admitted for delivery and HIV-positive women are administered antiretroviral prophylaxis antenatally [4]. Similarly, maternal syphilis screening is national policy in Tanzania [5], recommending that women who missed a syphilis screening test during ANC are tested at delivery so that early treatment can be given to the infant and mother, as appropriate. Further, there is no policy for integration of PMTCT of HIV and maternal syphilis screening services. As part of a larger operational research study on PMTCT of HIV and maternal syphilis screening implementation, the present article reports the extent of integration of the two programs at the facility level in Tanzania.

## 2. Materials and methods

The present study was conducted at three reproductive and child health clinics, Nyamagana District Hospital (NDH), Makongoro Regional Reproductive and Child Health Clinic, and Igoma Health Center; and three maternity wards, Bugando Medical Center (BMC), Sekou-Toure Regional Hospital (STRH), and NDH—all located in Mwanza City, Tanzania. All study ANC facilities offered maternal services for PMTCT of HIV and syphilis daily.

The data were gathered from four research activities:

- (1) A structured questionnaire was administered to 28 health workers (HWs) at the ANC facilities and 61 HWs at the maternity wards between September 2008 and July 2009. Information collected included their key work activities and training on PMTCT of HIV and syphilis management.
- (2) A structured observation was undertaken assessing the flow of activities at the facility when women attended their first ANC visit during a new pregnancy. Two client flow observations were conducted at each ANC clinic, one during a day when the clinics were offering vaccination services to children (a very busy day) and one during a day when they were not (a less busy day). For each observation, the movements of one randomly selected woman attending her booking visit at the clinic in the morning were followed. The observation was used to determine the services that were offered to the women, the time spent at each station accessing different services, and the overall time spent in the ANC facility for that visit.
- (3) To understand the content and delivery of the health education talk that is routinely offered to pregnant women at their ANC visits, three health education sessions were observed at each ANC facility. A tool adapted from the 2007 UNAIDS tools for evaluating quality and contents of counseling for HIV testing uptake [15] was used to document points covered during the health education talks and to assess the quality and content of the information that was provided.
- (4) Finally, a cross-sectional study of all pregnant women who were admitted for delivery in the maternity wards at BMC and STRH

**Table 2**  
Time spent and distance covered by pregnant women attending antenatal clinic booking visits, three antenatal clinics in Mwanza.<sup>a</sup>

	Nyamagana		Makongoro		Igoma	
	Day 1 <sup>b</sup>	Day 2 <sup>c</sup>	Day 1 <sup>b</sup>	Day 2 <sup>c</sup>	Day 1 <sup>b</sup>	Day 2 <sup>c</sup>
Total time spent at the facility (min)	335	275	280	178	255	217
Waiting time before receiving any service (min)	180	135	20	30	45	20
Total waiting time from one station <sup>d</sup> to another (min)	105	75	187	80	145	136
Range of waiting times between stations (min)	5–50	5–30	7–60	0–30	5–60	26–70
Total time spent accessing services at different stations (min)	50	65	73	68	65	71
Range of time spent accessing services (min)	5–15	5–30	3–25	3–30	3–20	4–28
Total distance covered within the clinic (km)	0.10		0.35		0.05	
Total number of stations	5		6		4	

<sup>a</sup>Each column represents data on one woman.

<sup>b</sup>Busy day.

<sup>c</sup>Less busy day.

<sup>d</sup>Refer to Figs. 1–3 for the different stations visited by the woman at each visit.

**Box 1**

Case Study 1: Client movement first observation at Nyamagana District Hospital antenatal clinic.

Aisha arrived at the ANC on a Monday morning at 08:15 am for a first visit during that pregnancy. She waited for services on a bench in the waiting area (also used for health education). The nurse arrived at about 11:15 am, introduced herself and gave a 15-minute talk on general health, including HIV and PMTCT. After the talk, Aisha waited 20 minutes, and then entered the examination room (11:50 am), was examined, and exited at 12:00 pm. Aisha returned to the waiting area for 50 minutes before she was called into a second room where a blood sample for RPR and HIV testing was taken. She exited this room at 12:55 pm and returned to the waiting area until she was called back for her syphilis and HIV results at 13:25 pm. At 13:40 pm, she came out of the counseling room and returned to the waiting area for 5 minutes before being called to receive the tetanus toxoid vaccination, completed at 13:50 pm. Overall, Aisha spent 5 hours and 35 minutes at the clinic, including 4 hours and 45 minutes (85%) waiting for services and 50 minutes (15%) receiving these.

between September and October 2008 was conducted. The maternity ward at NDH was not included in the cross-sectional study because, at the time of the survey, very few women were admitted for delivery at this maternity ward. Overall, 1137 consecutive women admitted for delivery were interviewed to collect information on PMTCT of HIV and syphilis services received during ANC and in the maternity ward. The women's ANC cards were reviewed to confirm whether they had been tested and what occurred if women had not been screened for HIV and/or syphilis during pregnancy. The  $\chi^2$  and Fisher exact tests were used to compare proportions where appropriate.

Ethical approval was given by the Tanzania Medical Research Coordinating Committee. Written informed consent was sought from pregnant women participating in the study.

**3. Results**

**3.1. Health worker interviews**

This analysis was restricted to HWs who reported working in an ANC facility (15/76; 19.7%) or in a maternity ward (61/76; 80.3%) (Table 1). Overall, 25.0% of HWs, working at either facility type, reported receiving

training in both PMTCT of HIV and maternal syphilis screening (Table 1). There were differences by type of facility, with HWs in the ANC clinics more likely to report receiving training in both PMTCT of HIV and maternal syphilis screening than those in the maternity ward (46.7% vs 19.7%;  $P = 0.03$ ). The proportion of HWs reporting training in PMTCT of HIV was similar among HWs working at ANC facilities or in maternity wards (86.7% vs 75.4%;  $P = 0.50$ ). However, a somewhat higher proportion of HWs reported receiving training in syphilis testing in ANC facilities than in maternity wards (46.7% vs 24.6%;  $P = 0.07$ ). Further, the proportion receiving training in both PMTCT of HIV and maternal syphilis screening differed between the maternity wards (39.1% (BMC) vs 9.1% (STRH) vs 0% (NDH);  $P = 0.02$ ; Table 1).

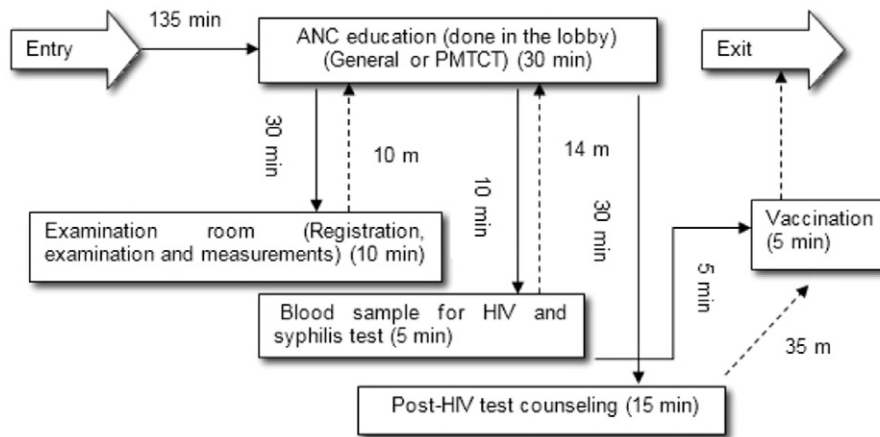
**3.2. Client flow observation**

On average, women attending ANC for the first time during their current pregnancy spent 3 hours and 35 minutes at the clinic. Much of this time was spent waiting after arrival before being able to access any services (ranging from 20 minutes in larger clinics to 3 hours at district hospitals). Following initial contact with the HW, total waiting time was longer on the busy days than the less busy days at the NDH and Makongoro clinics. At Igoma, the difference between busy and less busy days was 9 minutes (Table 2).

In all three ANC facilities, the time a client waited for the services ranged from 42 minutes to almost 4 hours (235 minutes). At NDH, much of the waiting time was due to a long delay before receiving any services, but even excluding this initial waiting time, on average, women spent 10 – 114 minutes more time waiting between stations than actually receiving services (Box 1 and Fig. 1).

The extent to which activities were integrated in the study clinics varied by clinic (Table 3) and affected the time women spent in the health facilities (Boxes 1–3 and Figs. 1–3). Of the three ANCs observed, only NDH consistently integrated syphilis and HIV testing and management at some of the steps of the service visit. Further, the time women spent accessing the services (excluding the waiting times) was less at NDH compared with the other two facilities. The Igoma ANC facility integrated the different steps inconsistently, depending upon staff availability (Table 3). At Makongoro, the largest ANC facility, blood was tested in different rooms for the two infections and, in cases of a positive result, HIV and syphilis screening results and treatment were provided by different people in various areas of the clinic.

Generally, the total distance covered while accessing various services at all the clinics was short (Table 2). However, at Makongoro, the distance was relatively longer since vaccination services were offered outside the main ANC building (Fig. 2).



**Fig. 1.** Case Study 2: Client movement second observation at Nyamagana District Hospital antenatal clinic – first antenatal clinic visit. Key: The numbers on the solid arrows indicate the average waiting times (minutes), the number on the dashed arrows indicates the distance from one station to another in meters, and the numbers in the boxes indicates the time spent at each station (minutes).

**Table 3**  
Extent of integrated PMTCT and maternal syphilis screening and treatment activities in the three antenatal clinics.

Activity	Facility name		
	Nyamagana ANC	Makongoro ANC	Igoma ANC
Health education	One health education session per day. General health education (including syphilis) and HIV education were the two topics that were alternated on a daily basis. Syphilis was not mentioned during ANC HIV education	Two different sessions of health education (general health education, including syphilis, and HIV education). Syphilis was not mentioned at all in ANC HIV education sessions. Occasionally, basic HIV education was covered during the general ANC health education during the observed sessions	Two different health education sessions. Syphilis education was part of the general education. In HIV education sessions, the counselor touched on issues around syphilis screening and treatment during pregnancy
Blood sample collection	One blood sample collected by the HIV counselor	A blood sample was taken in the laboratory by a laboratory technician. This was used to perform an RPR test for syphilis and the lab technician took the tube containing the remaining blood to the counselor in the PMTCT room for HIV testing. For women referred to Makongoro clinic from other ANCs that did not offer PMTCT, the counselor performed a finger prick blood sample for HIV testing	One blood sample was taken either by the laboratory assistant <sup>a</sup> or by the PMTCT counselor
Testing	Both syphilis (RPR) test and HIV test were performed by the nurse	RPR test was done in laboratory and HIV test was done by the counselor in the PMTCT room	The RPR test was performed by the laboratory assistant when present. The HIV counselor did the HIV test. In the absence of the laboratory assistant, both tests (HIV & RPR) were done by a counselor
Giving results	Both syphilis and HIV results were given by the same HW. RPR-positive women were also treated by the same HW	The PMTCT counselor offered post-test counseling and provided HIV results. RPR-positive women were sent back to see the nurse in the examination room, who informed them about RPR results and treated both woman and her contact(s) if he/she attended later	The PMTCT counselor delivered both RPR and HIV results along with post-test counseling. RPR positive women were sent to the STD clinic within the health center for syphilis treatment

Abbreviations: ANC, antenatal clinic; HW, health worker; PMTCT, prevention of mother-to-child transmission; RPR, rapid plasma reagin.

<sup>a</sup> A laboratory assistant at Igoma health center worked on a part-time basis.

### 3.3. Health education sessions and general clinic observations

Little, if any, integration of HIV and syphilis information occurred at the health education sessions that women received at their booking visit. In two facilities, there were two separate sessions, one general education session including syphilis screening and one HIV education session.

#### Box 2

Case Study 3: Client movement first observation at Makongoro antenatal clinic.

Mwasi arrived at the ANC on a Monday morning at 08:10 am for a first visit during that pregnancy. The general health education started at 08:30 am and lasted 23 minutes. After this talk, Mwasi waited 30 minutes before being called to the registration table, where she was given an ANC card, was interviewed, and had her details documented on the card. After registration, Mwasi was sent to the examination room. Both registration and examination took 7 minutes. Mwasi was then sent to the laboratory waiting area, where she waited for 40 minutes before a blood sample was taken (5-minute process). From the laboratory, she went directly to the PMTCT room for a group counseling session on HIV. Mwasi sat in the room for 1 hour waiting for the 25 minute session to start at 11:15 am. Mwasi continued to wait in the PMCTC waiting area for an additional 50 minutes before being called into the PMCTC room to receive her results and individual HIV post-test counseling (10 minutes), after which Mwasi went to the vaccination room located outside the main building, where she waited for 7 minutes. The tetanus toxoid vaccination took 3 minutes and Mwasi left the ANC facility at 12:50 pm. In total, Mwasi spent 4 hours and 40 minutes at the clinic, including 3 hours and 27 minutes (74%) waiting for services and 1 hour and 13 minutes (26%) receiving these.

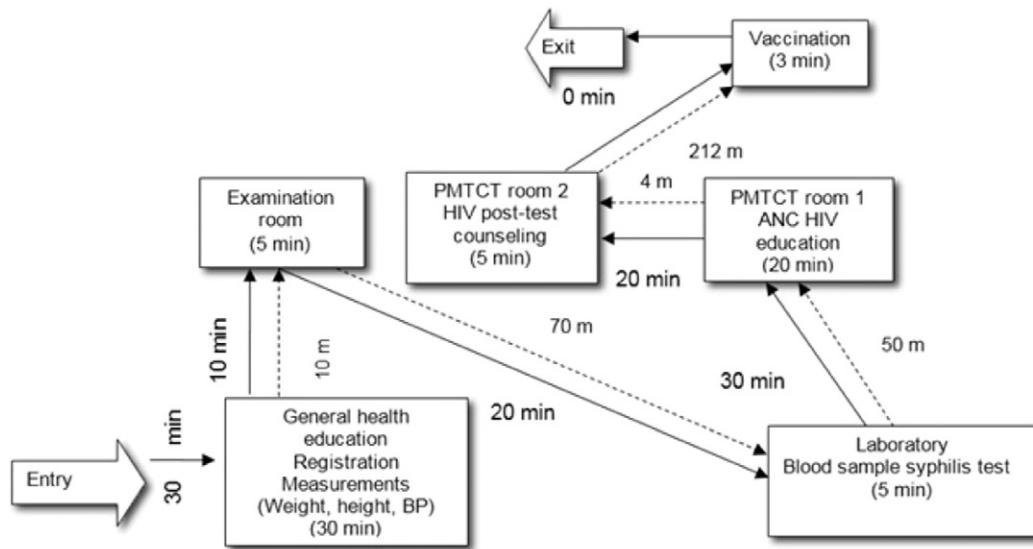
The actual laboratory testing was not observed, but laboratory results for HIV and syphilis were sometimes given by different people in different rooms. No treatment provision was observed since all women included in this study were negative for both infections. Due to ethical issues, no partner services were observed; however, most of these services were not documented, except for the syphilis register at Makongoro, which included information on partner treatment.

For reporting data, at all ANC facilities, information on access to PMTCT services was documented in designated PMTCT register books with pre-printed columns indicating the information to be completed for women tested for HIV. In contrast, information on syphilis screening

#### Box 3

Case Study 5: Client movement first observation at Igoma antenatal clinic.

Nyanjige arrived at the ANC clinic at 09:30 am for a first visit during that pregnancy. The general health education started at 10:15 am and lasted 15 minutes. After this, Nyanjige waited 60 minutes before being called to the registration table where she was given an ANC card, interviewed, and had her details documented on the card. Immediately after registration (11:35 am), Nyanjige entered the examination room and received a full examination, as well as the tetanus toxoid vaccination. The process took 15 minutes. Nyanjige exited the examination room at 11:50 am, and was instructed to gather with other women waiting for the ANC HIV education session. Her ANC card was taken to the laboratory. The ANC HIV education session started at 11:55 am and took 20 minutes. Nyanjige waited until 13:00 pm, then entered the laboratory at 13:03 am. After 30 minutes, Nyanjige was called back to receive her HIV results, post-test counseling, and syphilis results. She completed this session at 13:40 pm. Overall, Nyanjige was at the clinic for 4 hours and 5 minutes, including 3 hours and 10 minutes (75%) waiting for services and 1 hour and 5 minutes (25%) receiving these.



**Fig. 2.** Case Study 4: Client movement second observation at Makongoro antenatal clinic – first antenatal clinic visit. Key: The numbers on the solid arrows indicate the average waiting times (minutes), the number on the dashed arrows indicates the distance from one station to another in meters, and the numbers in the boxes indicates the time spent at each station (minutes).

and treatment services was recorded in simple, handwritten register books, and was recorded differently at each facility; for example, information on partner treatment was only recorded at the Makongoro clinic. Additionally, linking of individuals tested for HIV in PMTCT services with those who underwent syphilis screening and treatment was not possible through the register books because the identification numbering system for PMTCT registers was different from that used in other ANC records.

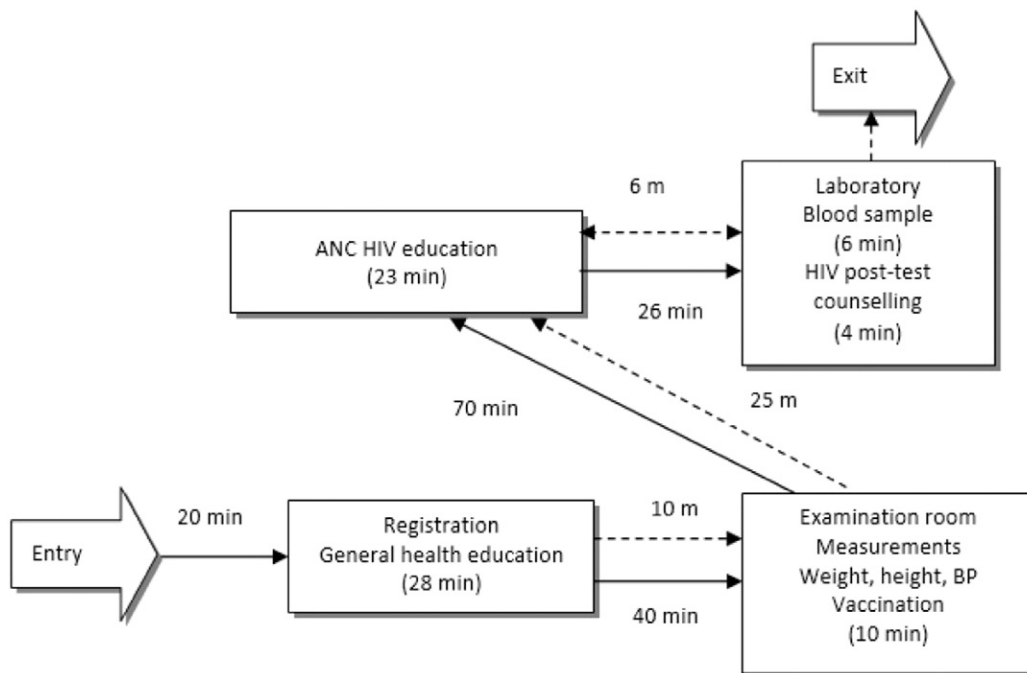
**3.4. Cross-sectional study in the maternity wards**

Overall, 1137 of the 1435 (79.2%) pregnant women admitted for delivery at BMC and STRH were interviewed and their ANC cards were reviewed. In total, 903 (79.4%) and 1002 (88.1%) women had

been tested for HIV and syphilis, respectively, during pregnancy. Of the 234 women who had not been tested for HIV antenatally, 164 (70.1%) were tested for HIV in the maternity ward before or after delivery. On the contrary, none of the 135 women who had not been screened for syphilis antenatally were offered syphilis screening at delivery (Table 4).

**4. Discussion**

Despite clinics having few staff trained in PMTCT of HIV and syphilis screening, there was some evidence of integration at some steps of the two prevention cascades in the smaller ANC facilities. However, scale-up to larger clinics and maternity wards will require joint policy



**Fig. 3.** Case Study 6: Client movement second observation at Igoma antenatal clinic. Key: The numbers on the solid arrows indicate the average waiting times (minutes), the number on the dashed arrows indicates the distance from one station to another in meters, and the numbers in the boxes indicates the time spent at each station (minutes).



**Table 4**  
HIV and syphilis testing among pregnant women admitted for delivery at Sekou-Toure Regional Hospital (STRH) and Bugando Medical Center (BMC), September to October, 2008.

	STRH No. (%)	BMC No. (%)	Total No. (%)
Women eligible and interviewed	724	433	1157
Number of women with antenatal care card in the maternity ward	711 (98.2)	426 (98.4)	1137 (98.3)
Tested for HIV at antenatal care	573 (80.6)	330 (77.5)	903 (79.4)
Tested for syphilis at antenatal care	624 (87.8)	378 (88.7)	1002 (88.1)
Tested for HIV in the maternity ward	98 (13.8)	66 (15.5)	164 (14.4)
Tested for syphilis in the maternity ward	0	0	0

guidelines and training of staff alongside a relatively minor reorganization of services within the facilities.

At the policy level, integration of PMTCT of HIV and syphilis screening may be achieved through policies formulated to guide the delivery of services, such as policies and guidelines on how to provide both maternal syphilis screening and HIV testing and treatment services in the ANC facility or maternity ward settings. At the health facility level, integration may take various forms and may require training of HWs in both syphilis and HIV counseling, testing, and treatment; thus, both services could be delivered using a “supermarket approach,” whereby services are offered by the same provider in the same unit or in different units but within the same building [16].

The levels of integration of PMTCT of HIV and syphilis services were examined at the ANC facility and maternity ward level. Considering the definition of integration of services at facility level [16,17], although both PMTCT of HIV and syphilis services were available and offered at the ANC facilities, there was evidence of missed opportunities for integration within these facilities.

Women attending ANC at the observed facilities spent several hours waiting for services. A number of steps were noted where integrating HIV and syphilis services could help to reduce the time spent at the facilities. For example, PMTCT health education and ANC general education, including syphilis, could be provided as one session by one HW. One blood sample could be collected, with rapid point-of-care testing performed by the same HW. Issuing results, counseling, and documentation could be carried out by the same HWs without extra resources.

True service integration is missing at the policy level. In Tanzania, both PMTCT of HIV and maternal syphilis screening and treatment services are documented policies [4,5]. However, the absence of integrated guidelines and protocols may facilitate vertical systems and hinder the successful implementation of integration of these services. At the service delivery level, although opportunities existed to integrate PMTCT of HIV and maternal syphilis screening and provide swifter, more efficient services, these were seldom taken. Relatively few staff had received training in the provision of both services. In data reporting, records were not integrated and priority was given to collection of PMTCT data. At delivery, priority was given to HIV testing for women who had not been tested antenatally, despite policies recommending both HIV and syphilis testing at delivery for such women. The reasons for this remain unclear, but may be related to the absence of HW training in the importance of testing for both HIV and syphilis, a lack of understanding of the guidelines, or logistic issues such as shortage of testing kits and reagents.

Availability of trained and motivated HWs remains crucial for service integration. The present study found that a very small proportion of HWs in maternity wards (12.5%) and around half of those working in ANC facilities (46.7%) reported receiving some training in syphilis screening and PMTCT. Adequacy of trained staff has been documented as an obstacle for integrated services [12,16,18]. For the successful integration of these two important reproductive and maternal health programs, training gaps must be addressed, ideally by the use of phased onsite training to avoid service delivery interruptions.

Although some aspects of integration of PMTCT of HIV and syphilis screening and treatment services were observed at the ANC level,

implementation of maternal syphilis screening at the maternity wards in Mwanza city failed despite PMTCT of HIV services being frequently offered. The study did not explore the causes of these failures. However, future studies could help elucidate why pregnant women admitted to hospital for delivery and who were not screened for syphilis antenatally were not screened at admission.

The study has several limitations. First, only data from three ANC facilities and three maternity wards in one district in Tanzania were included, and may thus not be representative of rural clinics in other settings. The number of HWs whose training was assessed was small; therefore, the findings may not be applicable to all HWs providing services for pregnant women in Mwanza. Finally, only two visits for each of the ANC facilities were observed, although these days may not have provided a typical representation of services. Nevertheless, this study may provide insight into the delivery of HIV and syphilis services in other parts of Africa.

A previous study in Mwanza, Tanzania, published in 2002, showed that 51% of stillbirths and 24% of pre-term live births could be attributed to syphilis [19,20]. These adverse outcomes can be prevented with a single dose of penicillin given before 28 weeks of pregnancy [19], with this being one of the most cost-effective healthcare interventions available [21]. Screening of pregnant women for syphilis is national policy in most countries; yet, in 2001, it was estimated that less than 40% of pregnant women were screened for syphilis in Sub-Saharan Africa [22]. Since that time, point-of-care tests for syphilis, which can be performed anywhere and provide a result in 15 minutes, have been developed [6]. Moreover, considerable resources have been made available for the PMTCT of HIV in many African countries. Unfortunately, these have been usually provided through vertical programs, which have not been integrated with other maternal and child health activities, and have not included syphilis screening. We have previously drawn attention to the tragedy of infants in whom HIV infection was prevented through PMTCT programs in Haiti, only for them to die of congenital syphilis [23].

## 5. Conclusions

The present study highlights the importance of ensuring that syphilis and HIV screening are performed simultaneously on all pregnant women through an integrated program. Dual point-of-care tests for HIV and syphilis, which meet the WHO ASSURED criteria of being Affordable, Sensitive, Specific, User-friendly, Rapid and robust, Equipment free, and Deliverable to those who need them, are now available [24]. Replacement of individual HIV and syphilis tests with these dual tests has occurred in some countries in South America [25] and will facilitate the integration of programs for PMTCT of HIV and syphilis, ensuring that all women screened for HIV are also screened for syphilis.

## Acknowledgments

We gratefully acknowledge the Ministry of Health and Social Welfare and the Director General of the National Institute for Medical Research, Tanzania, for permission to conduct and publish the results of this study. The study was funded by the UK Department for

International Development through the Evidence for Action on HIV Treatment and Care Systems Research Program, and the Tanzanian National Institute for Medical Research.

### Conflicts of interest

The authors declare that they have no conflicts of interest.

### References

- [1] World Health Organization. PMTCT strategic vision 2010–2015: Preventing mother-to-child transmission of HIV to reach the UNGASS and Millennium Development Goals. Geneva: WHO; 2010.
- [2] World Health Organization, Department of Reproductive Health and Research. The global elimination of congenital syphilis: rationale and strategy for action. Geneva: WHO; 2007.
- [3] Newell ML. Prevention of mother-to-child transmission of HIV: challenges for the current decade. *Bull World Health Organ* 2001;79(12):1138–44.
- [4] Tanzania Ministry of Health and Social Welfare. Prevention of mother-to-child transmission of HIV: national guidelines. Dar-es-Salaam: MoHSW; 2007.
- [5] Tanzania Ministry of Health and Social Welfare. National guidelines for management of sexually transmitted and reproductive tract infections. Dar-es-Salaam: MoHSW; 2007.
- [6] Mabey DC, Sollis KA, Kelly HA, Benzaken AS, Bitarakwate E, Changalucha J, et al. Point-of-care tests to strengthen health systems and save newborn lives: the case of syphilis. *PLoS Med* 2012;9(6):e1001233.
- [7] Newman L, Kamb M, Hawkes S, Gomez G, Say L, Seuc A, et al. Global estimates of syphilis in pregnancy and associated adverse outcomes: analysis of multinational antenatal surveillance data. *PLoS Med* 2013;10(2):e1001396.
- [8] Watson-Jones D, Changalucha J, Gumodoka B, Weiss H, Rusizoka M, Ndeki L, et al. Syphilis in pregnancy in Tanzania. I. Impact of maternal syphilis on outcome of pregnancy. *J Infect Dis* 2002;186(7):940–7.
- [9] Gomez GB, Kamb ML, Newman LM, Mark J, Broutet N, Hawkes SJ. Untreated maternal syphilis and adverse outcomes of pregnancy: a systematic review and meta-analysis. *Bull World Health Organ* 2013;91(3):217–26.
- [10] World Health Organization. Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants. Recommendations for a public health approach. Geneva: WHO; 2010.
- [11] World Health Organization. Global guidance on criteria and processes for validation: elimination of mother-to-child transmission of HIV and syphilis. Geneva: WHO; 2014.
- [12] Potter D, Goldenberg RL, Chao A, Sinkala M, Degroot A, Stringer JS, et al. Do targeted HIV programs improve overall care for pregnant women? Antenatal syphilis management in Zambia before and after implementation of prevention of mother-to-child HIV transmission programs. *J Acquir Immune Defic Syndr* 2008;47(1):79–85.
- [13] Strasser S, Bitarakwate E, Gill M, Hoffman HJ, Musana O, Phiri A, et al. Introduction of rapid syphilis testing within prevention of mother-to-child transmission of HIV programs in Uganda and Zambia: a field acceptability and feasibility study. *J Acquir Immune Defic Syndr* 2012;61(3):e40–6.
- [14] Dinh TH, Kamb ML, Msimang V, Likibi M, Molebatsi T, Goldman T, et al. Integration of preventing mother-to-child transmission of HIV and syphilis testing and treatment in antenatal care services in the Northern Cape and Gauteng provinces, South Africa. *Sex Transm Dis* 2013;40(11):846–51.
- [15] UNAIDS, UNICEF, WHO. Local monitoring and evaluation of the integrated prevention of mother to child HIV transmission in low-income countries. New York, NY: USAID; 2000.
- [16] Hardee K. Delivering reproductive health promises. *China Popul Today* 1995; 12(5–6):18–9.
- [17] WHO Working Group on Service Delivery. Integrated health services – what and why? Technical brief No. 1, May 2008. Geneva: WHO; 2008. [http://www.who.int/healthsystems/technical\\_brief\\_final.pdf](http://www.who.int/healthsystems/technical_brief_final.pdf).
- [18] Uwimana J, Jackson D. Integration of tuberculosis and prevention of mother-to-child transmission of HIV programmes in South Africa. *Int J Tuberc Lung Dis* 2013;17(10): 1285–90.
- [19] Watson-Jones D, Gumodoka B, Weiss H, Changalucha J, Todd J, Mugeye K, et al. Syphilis in pregnancy in Tanzania. II. The effectiveness of antenatal syphilis screening and single-dose benzathine penicillin treatment for the prevention of adverse pregnancy outcomes. *J Infect Dis* 2002;186(7):948–57.
- [20] Watson-Jones D, Oliff M, Terris-Prestholt F, Changalucha J, Gumodoka B, Mayaud P, et al. Antenatal syphilis screening in sub-Saharan Africa: lessons learned from Tanzania. *Trop Med Int Health* 2005;10(9):934–43.
- [21] Terris-Prestholt F, Watson-Jones D, Mugeye K, Kumaranayake L, Ndeki L, Weiss H, et al. Is antenatal syphilis screening still cost effective in sub-Saharan Africa. *Sex Transm Infect* 2003;79(5):375–81.
- [22] Gloyd S, Chai S, Mercer MA. Antenatal syphilis in sub-Saharan Africa: missed opportunities for mortality reduction. *Health Policy Plan* 2001;16(1):29–34.
- [23] Peeling RW, Mabey D, Fitzgerald DW, Watson-Jones D. Avoiding HIV and dying of syphilis. *Lancet* 2004;364(9445):1561–3.
- [24] Humphries RM, Woo JS, Chung JH, Sokovic A, Bristow CC, Klausner JD. Laboratory evaluation of three rapid diagnostic tests for dual detection of HIV and *treponema pallidum* antibodies. *J Clin Microbiol* 2014;52(12):4394–7.
- [25] Flores EC, Lluque ME, Chiappe M, Lino R, Bayer AM. Operations research study to implement HIV and syphilis point of care tests and assess client perceptions in a marginalised area of Lima, Peru. *Int J STD AIDS* 2014 in press.