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## RESEARCH

# Estimating the uptake of maternal syphilis screening and other antenatal interventions before and after national rollout of syphilis point-of-care testing in Ghana

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## ABSTRACT

**Objective:** To compare the uptake of maternal syphilis and HIV screening, intermittent preventive treatment for malaria, and tetanus toxoid administration in three regions of Ghana, before and after the rollout of syphilis point-of-care tests (POCTs). **Methods:** Antenatal register records were reviewed in 15 selected health facilities over an eight-month period, 16 months apart. Register records had been evaluated using the maternal record booklets as a gold standard in a separate prior survey. **Results:** In the evaluation study, the sensitivity of register data was low, ranging from 33.3% for tetanus toxoid administration to 53.8% for syphilis serology. In total, 8282 antenatal client records (4141 in each period) were reviewed. Less than a third of pregnant women received any single intervention at either period (ranging from 17.8% for tetanus toxoid to 29.8% for HIV testing). Overall, HIV screening had a marginal absolute increase of about 2% while the remaining interventions experienced non-significant absolute decreases of 4.1 to 11.1%. When adjusting for under-recording, syphilis screening uptake was 50% before and 33.6% after the introduction of POCTs. **Conclusion:** Use of POCTs for syphilis did not result in increased uptake. Routine monitoring of antenatal interventions using the antenatal register may result in underestimation of their uptake.

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## 1. Background

Syphilis in pregnancy accounts for over half a million entirely preventable perinatal deaths annually [1]. Yet, only less than 40% of women receiving antenatal care (ANC) in Sub-Saharan Africa are screened for syphilis [2]. Control of congenital syphilis is a global priority; the World Health Organization initiative for the Global Elimination of Congenital Syphilis stipulates that at least 90% of pregnant women should be tested for syphilis and that no less than 90% of those found to be seropositive should receive adequate treatment by 2015 [1]. To achieve these targets, antenatal syphilis testing (AST) with rapid point-of-care tests (POCTs) and same-day benzathine penicillin treatment (usually at the first antenatal visit) for seropositive women is currently recommended [1,3,4].

Given the poor implementation of syphilis screening for pregnant women and the reported dramatic increases in antenatal syphilis

seroprevalence in Ghana [5–7], a national rollout of rapid syphilis POCTs for pregnant women was undertaken in 2009, offering an unprecedented opportunity to increase the uptake of screening and treatment. However, estimating such an uptake, especially in low- and middle-income countries such as Ghana, remains a major challenge [8]. While routinely collected data, such as ANC register records, are valuable and remain the only accessible resource, their completeness and accuracy are often doubted [9,10]. Therefore, an assessment of the accuracy of ANC register data was required to provide useful estimates of the uptake of interventions delivered in the antenatal setting in Ghana.

The aims of the present study were to compare the uptake of AST and treatment in three regions of Ghana, before and after the rollout of syphilis POCTs, and to assess the accuracy of ANC registers regarding documentation of AST results and treatment. Uptake of AST was also compared with three other recommended antenatal interventions, namely prevention of mother-to-child transmission of HIV, intermittent preventive treatment for malaria in pregnancy (IPT<sub>p</sub>), and prevention of maternal and neonatal tetanus (tetanus toxoid), as tracer control interventions. We hypothesized that the rollout of syphilis POCTs in Ghana would increase AST and treatment uptake; however, uptake of the tracer control interventions was not expected to change over time.

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## 2. Material and methods

### 2.1. Study context and settings

A revamping of routine AST was performed by the Ghana Health Service through the National AIDS/STI Control Programme in 2009 [11]. Contrary to previous practice, where AST was carried out by trained laboratory personnel using non-treponemal tests, these POCTs were to be used by trained midwives at the antenatal clinic in all facilities. Details of the implementation, including training, supply chain management, and testing and treatment guidelines are the subject of a related study (unpublished data).

Based on reported treponemal seroprevalence from the 2004–2009 national HIV/syphilis sentinel surveys [6,7], we categorized the 10 administrative regions of Ghana into three strata: regions with seroprevalence of greater than 10%, 5% – 10%, and less than 5%. One region was selected from each category and according to one of three geographical locations, namely southern, middle, and northern sectors of the country, often used as “representative” regions in other Ghanaian health surveys [12]; the Central, Ashanti, and Northern regions were thus selected. Within each region, two districts were randomly selected, except in the Central region, where one district, which had the highest seroprevalence of treponemal infections in the country, was purposively selected.

In each region, the teaching, regional, and district hospitals (of selected districts) were included. One smaller health unit with at least 20 antenatal registrants per month was also randomly selected from each district to represent all levels of implementation of the ANC intervention. The teaching and regional hospitals in the Ashanti region were not included owing to a known lack of documentation of AST results in the ANC register and the relatively low antenatal clinic attendance, respectively. A total of 15 health facilities were selected: three district hospitals, one private hospital, and one health center in the Ashanti region; one regional hospital, two district hospitals, and two health centers in the Central region; and one teaching hospital, two district hospitals, and two health centers in the Northern region.

### 2.2. Estimating uptake of key antenatal interventions

Retrospective register record reviews covering four months in each of two phases were conducted to measure uptake of AST before (January to April 2009) and after (September to December 2010) the national rollout of syphilis POCTs. A period of 16 months (May 2009 to August 2010) was chosen to allow enough time for the national rollout to elapse before review and ensure the same duration of observation in both periods. Register records were selected from each facility by systematic random sampling using the ANC register as the sampling frame.

For purposes of confidentiality, in some facilities, syphilis or HIV test results were recorded in special books for the two interventions without documentation in the ANC register. We searched for the test results of selected clients from these special books up to three months post-registration (as documented in the ANC register). If the test results for a given client were not found in the books, we assumed the test was not performed for this particular case. Three hospitals, one in each region, also had similar IPT<sub>p</sub> and tetanus toxoid administration books and recording practices during both periods. However, due to time constraints, we could not review these during our assessment.

### 2.3. Validation sub-study

There are two main sources of ANC data in Ghana: the maternal record booklet (MRB [or ANC card]) and the ANC register. The former is the primary record of all clinical evaluations, including history, physical examination, laboratory investigations, and interventions/treatments given, while the latter is a summary of key assessments and interventions [13], commonly extracted from the MRB before the attendee leaves the clinic. The MRB is kept by the attendee, who presents it at

each ANC visit, while the ANC register is retained at the health facility. Hence, ANC register recording of the four interventions was validated against those in the MRB as the gold standard. IPT<sub>p</sub> was given after the first trimester, while the remaining three interventions were to be administered at the first ANC visit regardless of the trimester [13]. Results of tests performed in the laboratory (e.g. syphilis testing) were recorded in the MRB or ANC register at the subsequent visit. Therefore, antenatal clinic attendees who had had at least one prior antenatal visit and in the second trimester of their pregnancy in each of the 15 selected healthcare facilities were systematically selected during the second phase using the ANC register (records for the day) as the sampling frame. The sampling fraction varied from one in two to one in four attendees depending on the number of eligible women, with the first being randomly selected. Selected attendees were approached individually after their antenatal evaluations and invited to participate in the study if found eligible according to their MRB. Consenting clients were then interviewed using a structured questionnaire and documentation of each of the four interventions in the MRB and ANC register was reviewed and compared.

Sensitivity was defined as the proportion of women whose test results or treatments were recorded in the ANC register among those who had test results or treatments recorded in the MRB. Specificity was the proportion of women who did not have any test results or treatments recorded in the ANC register among those who had no test results or treatments recorded in the MRB [10,14,15]. Positive predictive value (PPV) was defined as the proportion of women whose test results or treatments were recorded in the MRB among those whose test results or treatments were recorded in the ANC register. Negative

**Table 1**

Sociodemographic characteristics of women attending antenatal clinics in selected healthcare facilities in Ghana.<sup>a</sup>

Characteristic	Number of women (n = 390)
Age group, y	
18–19	29 (7.4)
20–24	103 (26.4)
25–29	116 (29.7)
30–34	86 (22.1)
35–46	56 (14.4)
Mean (standard deviation)	27.4 (5.8)
Marital status	
Single	15 (3.8)
Married/cohabiting	375 (96.2)
Education	
No formal education	117 (30.0)
Basic education	210 (53.8)
Secondary or higher education	63 (16.2)
Occupation (woman)	
Professional	24 (6.2)
Vocational	85 (21.8)
Trading/business	144 (36.9)
Manual/farmer	94 (24.1)
Unemployed	43 (11.0)
Occupation (spouse)	
Professional	75 (19.2)
Vocational	128 (32.8)
Trading/business	60 (15.4)
Manual/farmer	124 (31.8)
Unemployed	3 (0.8)
Parity <sup>b</sup>	
0	98 (25.8)
1–2	168 (44.2)
3–10	114 (30.0)
Median (Interquartile range)	2 (0–3)
Trimester at booking <sup>c</sup>	
First trimester	178 (48.1)
Second trimester	180 (48.7)
Third trimester	12 (3.2)

<sup>a</sup> Values are given as number (percentage) unless otherwise indicated.

<sup>b</sup> Parity, 10 missing values.

<sup>c</sup> Trimester at booking, 20 missing values.

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