S3.3 USE OF TRANSMISSION DYNAMICS MODELS TO DESIGN AND EVALUATE THE IMPACT OF LARGE SCALE HIV/STI PREVENTION INTERVENTION: HOW, WHY AND WHEN?
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When HIV or STI prevention programmes (eg, large core group intervention, human papillomavirus vaccination programme) are being scaled up to entire populations, it often becomes difficult to conduct randomised experiments to evaluate their impact. In this talk, I will discuss some of the challenges often present when evaluating large scale interventions and how and why transmission dynamics models, in combination with surveillance data, should be used to address some of these issues and to help estimate the intervention impact more objectively. Mathematical models should also be used at an early stage, not only to choose the most optimal prevention package, but to optimally design and validate evaluation studies in a cost-effective manner.

S4.1 CHALLENGES IN GLOBAL ESTIMATES OF SYphilIS IN PREGNANCY
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Background Estimates of the current number of pregnant women infected with syphilis (maternal syphilis) are necessary for the global Elimination of Congenital Syphilis initiative such that advocacy, program implementation, and monitoring are based on a clear understanding of the current situation. In addition to understanding morbidity in pregnant women, an accurate estimate of maternal syphilis is also the cornerstone of calculations of the burden of adverse outcomes associated with syphilis in pregnancy.

Methods A MEDLINE search from January 2005 to September 2010 was conducted to identify studies of syphilis prevalence in women attending antenatal care with the following inclusion criteria: sample size of at least 100, use of both reaginic and non-reaginic tests, English language, and no apparent selection bias. Methods are similar to those used by Schmid et al in 2007 to estimate maternal syphilis, except that current estimates include Europe and North America, and will be compared with syphilis seropositivity data reported by countries through the WHO HIV Universal Access Reporting system for 2008 through 2010 (reported data may or may not use both reaginic and non-reaginic tests). Global and regional estimates will be based on country data where available, and where not available, a regional pregnancy-weighted mean based on live births (per United Nations Population Division) and known country seropositivity will be used. Country and regional estimates will be validated by WHO regional advisors to assess if estimates are reasonable.

Results Studies on approximately 35 of 193 countries (18%) met the inclusion criteria for the MEDLINE search, and 96 countries (50%) reported seropositivity in either 2008 or 2009; additional reported data for 2010 will be available in May 2011, at which time estimates will be completed.

Conclusions Data on maternal syphilis are available in recent published literature for only a small proportion of countries. Therefore, global and regional estimates of maternal syphilis must rely on alternative data sources such as the WHO HIV Universal Access reporting system. Increased efforts are required globally to highlight the importance of having sufficient high-quality data to guide implementation of congenital syphilis elimination efforts.

S4.2 INTRODUCTION OF RAPID SYphILIS TESTING STRENGTHENS HEALTH SYSTEMS AND HEALTH WORKER CAPACITY TO PROVIDE INTEGRATED PMTCT SERVICES
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Background In partnership with Ministries of Health of Uganda and Zambia, we piloted the introduction of rapid syphilis testing (SD Bioline) in large scale PMTCT programs. Both countries provide PMTCT services within integrated maternal newborn child health programs. Point of care (PoC) testing for HIV, malaria and haemoglobin are routine. While Uganda did not have routine access to syphilis testing prior to the study, Zambia was using RPR as part of the standard package of antenatal care (ANC) services although access was inconsistent and not available in remote clinics.

Methods A mixed method study using both qualitative and quantitative indicators was used to assess acceptability, feasibility and affordability of the rapid syphilis testing. Ongoing engagement of Ministries of Health and clinic staff was used to assess health system ability to integrate rapid syphilis testing within PMTCT programs.

Results The use of rapid syphilis testing in ANC was acceptable, feasible and cost effective see Abstract S4.2 table1 with statistically significant increases in same day testing and treatment and high
levels of healthcare worker satisfaction as reported elsewhere (IAS, 2011). This study has resulted in measurable improvements to the health system including: the development of robust internal and external laboratory quality assurance (QA) systems and an integrated training for health workers on congenital syphilis prevention, treatment and quality assured use of PoC technologies. Use of integrated registers in MCH for data collection allowed for seamless initiation of the service into ANC. Supply chain systems were developed and enhanced especially in Uganda where syphilis testing was previously not routine. 13 151 women in Uganda and 12 761 women in Zambia received syphilis testing during the 5 month study period with a significant number of tests successfully carried out by nurse/midwives. Integrating syphilis and HIV supply chains led to reduced days of stock out of HIV test kits due to better ordering practices in some sites and did not negatively impact or integration significantly improved HIV service uptake.

**Conclusions** In addition to being acceptable, feasible and affordable, the systematic introduction of a PoC diagnostic for syphilis can lead to wider health system improvements and enhanced HIV service uptake in ANC. Wider use of PoC technologies is encouraged.

**Abstract S4.2** Table1 Uptake of HIV services in sites with concurrent rapid syphilis testing

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Rapid syphilis test study period</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV testing</td>
<td>Zambia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7,479 (95.5%)</td>
<td>11 151 (97.7%)</td>
<td>$\chi^2$=74.7; p=0.0001</td>
</tr>
<tr>
<td>ARV prophylaxis</td>
<td>1,363 (98.3%)</td>
<td>2,036(100.1%)</td>
<td>$\chi^2$=35.56; p=0.0001</td>
</tr>
<tr>
<td>Referral to care and treatment</td>
<td>977 (75%)</td>
<td>1,721(104.6%)</td>
<td>$\chi^2$=60.62; p=0.0001</td>
</tr>
<tr>
<td>HIV testing</td>
<td>Uganda</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6,479 (95.6%)</td>
<td>11 192 (96.4%)</td>
<td>$\chi^2$=7.01; p=0.008</td>
</tr>
<tr>
<td>ARV prophylaxis</td>
<td>570 (78.5%)</td>
<td>964 (83.6%)</td>
<td>$\chi^2$=7.72; p=0.006</td>
</tr>
<tr>
<td>Referral to care and treatment</td>
<td>85 (15.9%)</td>
<td>118 (16.1%)</td>
<td>$\chi^2$=0.168; p=0.68</td>
</tr>
</tbody>
</table>

**S4.3 IMPLEMENTATION OF RAPID TESTS FOR PRENATAL SYPHILIS SCREENING: OVERCOMING HEALTH SYSTEM CONSTRAINTS**

**Background** Congenital syphilis and syphilis in pregnancy in Peru persist as important public health issues, and improvement of screening/treatment for pregnant women remains challenging. Rapid syphilis testing (RST) allows simple and immediate diagnosis and treatment at a single clinic visit and could increase screening and treatment coverage and thereby reduce the incidence of stillbirth and congenital syphilis and generate in the long term a sustainable cost effective intervention.

**Methods** We tested the feasibility, performance, impact and cost-effectiveness of implementing RST in an underserved urban area at a single clinic visit and could increase screening and treatment coverage and thereby reduce the incidence of stillbirth and congenital syphilis and generate in the long term a sustainable cost effective intervention.

**Results** Data from the baseline pre-implementation evaluation revealed limited coverage of screening and treatment services for maternal syphilis and a complex and inefficient system for ANC. RST was started in January 2010. Overall success of implementation was measured by rates of maternal syphilis screening and treatment coverage, partner treatment, and acceptability of RST among providers and patients. Complementary evaluations comparing cost-effectiveness of RST against the Rapid Plasma Reagin, and a performance analysis of RST against the “multiple gold test” [Rapid Plasma Reagin + Treponema pallidum particle agglutination assay or fluorescent treponemal antibody absorption] were also simultaneously performed. Attention was paid to the successful development of a system of internal and external quality control for testing and test supplies and the process of dissemination and transfer activities to the Ministry of Health of Peru, through the involvement of both the National Program of STIs and HIV and the Reproductive Health Program. National guidelines have been modified, and recommend the use of both tests, RST and rapid HIV testing in the screening of pregnant women.

**Conclusions** RST implementation was feasible, successful, acceptable and cost effective. Its introduction catalysed improvements in the quality of care, and by the end of the project it has been introduced in the country as a national policy.