Appendix 1: Characteristics of the different syphilis POC tests

Rapid test	Cost (C_r)	Test setting	Test done on serum			Test done on blood		
			Sensitivity for syphilis (S_r)†	Specificity for syphilis (Sp_r)†	Sensitivity for HTAS (S_r^{Hi})‡	Sensitivity for syphilis (S_r)†	Specificity for syphilis (Sp_r)†	Sensitivity for HTAS (S_r^{Hi})‡
Determine (Abbot)	$1.00	Antenatal clinic				59.6% (45.8-72.4%)	99.4% (98.1-99.9%)	92.3% (64.0-99.8%)
		Laboratory	91.2% (80.7-97.1%)	97.9% (96.1-99.0%)	92.9% (66.1-99.8%)	80.7% (68.1-90.0%)	99.4% (98.1-99.9%)	92.9% (66.1-99.8%)
Visitect (Omega)	$0.75	Antenatal clinic				75.4% (62.2-85.9%)	99.8% (98.8-100%)	100% (75.3-100%)
		Laboratory	84.2% (72.1-92.5%)	99.1% (97.8-99.8%)	100% (75.3-100%)	80.7% (68.1-90.0%)	99.6% (98.5-99.9%)	100% (75.3-100%)
Syphcheck (Qualpro)	$0.75	Antenatal clinic				78.6% (65.6-88.4%)	99.1% (97.8-99.7%)	100% (78.2-100%)
		Laboratory	87.3% (75.5-94.7%)	98.9% (97.5-99.6%)	100% (78.2-100%)	85.4% (7.3-93.5%)	99.1% (97.8-99.7%)	100% (78.2-100%)
Bioline (Standard)	$0.47	Antenatal clinic				85.7% (74.6-93.2%)	98.1% (96.4-99.1%)	94.7% (74.0-99.9%)
		Laboratory	90.9% (81.3-96.6%)	95.5% (93.4-97.1%)	100% (83.2-100%)	90.9% (81.3-96.6%)	96.1% (94.1-97.6%)	95.0% (75.1-99.9%)

† The sensitivity and specificity of each POC test was calculated using the TPPA test as a gold standard.

‡ The sensitivity of each POC test for high titre active syphilis was calculated using a gold standard of a positive TPPA test result and an RPR titre >=1:8, both tests being undertaken in the reference laboratory.

Appendix 2: Methods used to estimate the sensitivity and specificity of the RPR test used at the ANC clinic [1].

Over the 26 months from September 1997 to November 1999, 19,878 women were screened for syphilis by RPR testing at the ANC clinic [3], and 1522 were found to be RPR sero-positive. Amongst these women, a sub-sample of 556 RPR positive and 1132 RPR negative women were also tested using the RPR test at a reference laboratory. When these test results were compared with the RPR test results obtained at the ANC clinic the following was found:

Table 1: Comparison of ANC and reference laboratory RPR results

		Reference laboratory		
		RPR positive	RPR negative	Total
ANC clinic	RPR positive	508	48	556
	RPR negative	53	1079	1132
	Total	561	1127	1688

Because this sub-sample was selected on the basis of the screening test at the ANC clinic, it is necessary to adjust for this weighting to calculate the sensitivity and specificity of the on-site test. When this was done the following was obtained:

Table 2: Comparison of ANC and reference laboratory RPR results adjusted for weighted sampling.

		Reference laboratory		
		RPR positive	RPR negative	Total
ANC clinic	RPR positive	1390.6	131.4	1522
	RPR negative	859.4	17496.6	18356
	Total	2250	17628	19878

After having adjusted for the weighted sample, the sensitivity and specificity of the RPR test undertaken at the ANC clinic was found to be 61.8% (1390.6/2250) and 99.25% (17496.6/17628) respectively.

Appendix 3: Derivation of the equation for the threshold cost of a POC test

The threshold cost (C_r^*) of a POC test is defined as the test cost that results in the cost-effectiveness of using POC tests (CE_r) being equal to the cost-effectiveness of using RPR tests (CE_{RPR}). This is true when the following applies:

$$\frac{COST_r}{N^{Hi} S_r^{Hi} DALY_{\tan}} = \frac{COST_{RPR}}{N^{Hi} S_{RPR}^{Hi} DALY_{\tan}}$$

After cancellation of some common terms this can be written as follows:

$$\frac{\left(COST_r - \Delta_t^r\right) + \Delta_t^r}{S_r^{Hi}} = \frac{COST_{RPR}}{S_{RPR}^{Hi}},$$

where Δ_t^r is the total test cost when using POC tests and the term $\left(COST_r - \Delta_t^r\right)$ is the total cost of the using POC tests without the test costs included. If we then substitute the formulation for Δ_t^r (equation 6 in manuscript) in to the equation the following is obtained:

$$\frac{\left(COST_r - \Delta_t^r\right) + C_r^* N\left(1+\delta W\right)}{S_r^{Hi}} = \frac{COST_{RPR}}{S_{RPR}^{Hi}},$$

where N is the total number of women screened, δW is the percentage wastage of POC tests and C_r^* is the threshold cost of the POC test. This equation can then be manipulated to give:

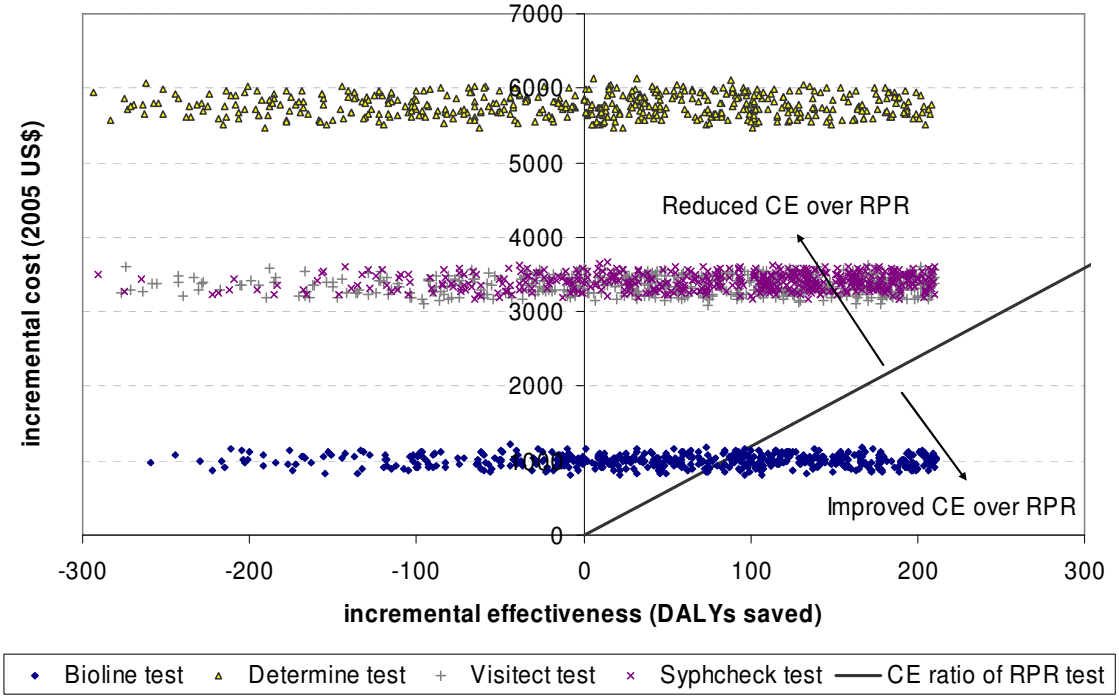
$$C_r^* N\left(1+\delta W\right) = \frac{S_r^{Hi}}{S_{RPR}^{Hi}} COST_{RPR} - \left(COST_r - \Delta_t^r\right),$$

and so the following formulation for C_r^* is easily obtained:

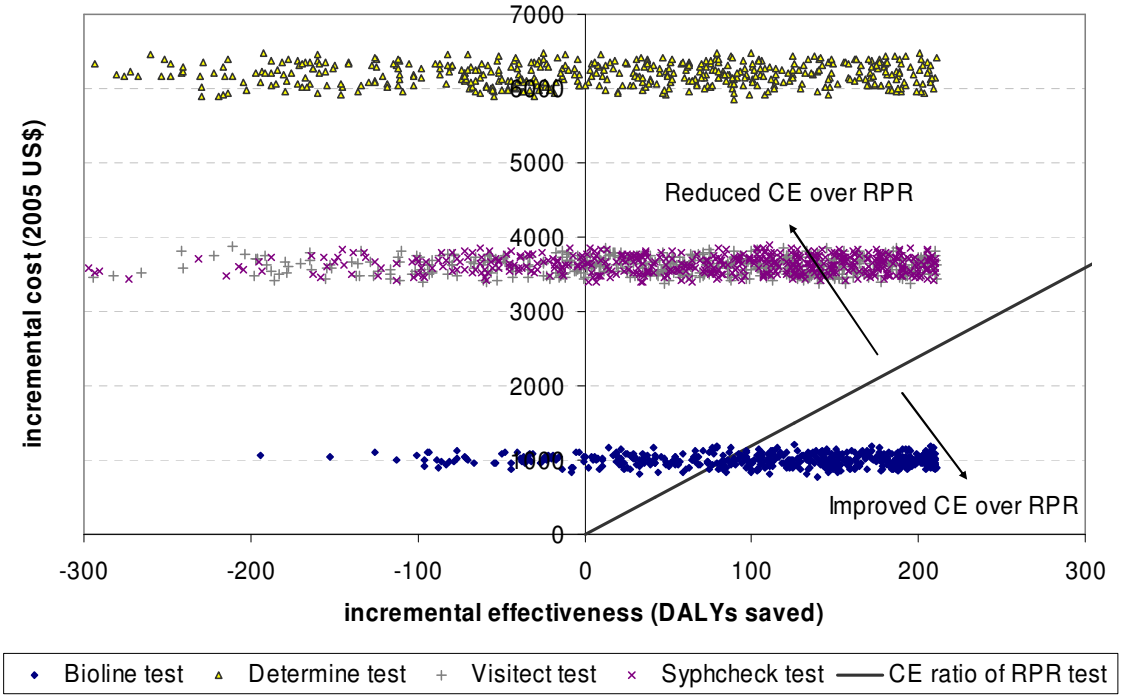
$$C_r^* = \frac{1}{N\left(1+\delta W\right)}\left[\frac{S_r^{Hi}}{S_{RPR}^{Hi}} COST_{RPR} - \left(COST_r - \Delta_t^r\right)\right]$$

Appendix 4: Uncertainty analysis on the incremental (or additional) cost and effectiveness of using different syphilis POC tests compared to using the RPR test.

2a. POC tests used on blood



2b. POC tests used on serum



Appendix 5: Cost thresholds (in 2005 US$) for the POC tests to be as cost-effective as the RPR test for different sensitivities for HTAS

POC test	Test substrate	Threshold test cost (US$) for different sensitivities of POC test for HTAS (S_r^{Hi})				
		80%	**85%**	**90%**	**95%**	**100%**
Determine (Abbot)	Blood	$0.27	$0.36	$0.45	$0.54	$0.63
	Serum	$0.24	$0.33	$0.42	$0.51	$0.60
Visitect (Omega)	Blood	$0.27	$0.36	$0.45	$0.54	$0.63
	Serum	$0.25	$0.34	$0.43	$0.52	$0.61
Syphcheck (Qualpro)	Blood	$0.27	$0.36	$0.45	$0.54	$0.63
	Serum	$0.25	$0.34	$0.43	$0.52	$0.61
Bioline (Standard)	Blood	$0.25	$0.34	$0.43	$0.52	$0.61
	Serum	$0.23	$0.32	$0.41	$0.50	$0.59

Appendix 6: Sensitivity analysis comparing the relative cost-effectiveness of the Bioline test (on blood in an ANC clinic) with the cost-effectiveness of the RPR test in other settings (both per DALY saved in 2005 US$). '-' signifies that the variation in the parameter value does not affect the output. Numbers in '( )' are percentage change in cost-effectiveness of using that test.

Scenario	Initial value of model parameter to be varied	Minimum parameter value (% change)	CE with RPR test	CE with POC test		Maximum parameter value (% change)	CE with RPR test	CE with POC test	
				S_r^{Hi}=90%	S_r^{Hi}=100%			S_r^{Hi}=90%	S_r^{Hi}=100%
Baseline scenario	*No parameters varied*		12.0 (0%)	12.0 (0%)	10.8 (0%)		12.0 (0%)	12.0 (0%)	10.8 (0%)
Lower sensitivity of RPR test	S_{RPR}^{Hi} =*86.2%* (sens RPR for HTAS)	S_{RPR}^{Hi} =75% [2]	13.8 (+15%)	-	-	S_{RPR}^{Hi} =100%	10.3 (-14%)	-	-
Not all women return for treatment	R_{RPR}=*100%* (return rate for RPR test)	R_{RPR}=60% (-40%) [3]	19.8 (+65%)	-	-	R_{RPR}=80% (-20%) [4-6]	15.0 (+25%)	-	-
Different prev of RPR false positives	N_{RPR}=*696* (Number of RPR positives at clinic)	N_{RPR}=*563* (-20%) [7]	11.9 (-1%)	-	-	N_{RPR}=*1301* (+86%) [8]	12.2 (+2%)	-	-
Higher prev of past infections	θ=*95.4* (ratio of TPHA to RPR positives)	θ=*104%* (+9%) [9]	-	12.0 (0%)	10.8 (0%)	θ=*188%* (+97%) [8]	-	12.3 (+3%)	11.1 (+3%)
Different prevalence of syphilis	Syphilis prevalence=10.5%	Syphilis prev=5.25% (-50%)	23.7 (+97%)	23.6 (+97%)	21.3 (+97%)	Syphilis prev=21% (+100%)	6.1 (-49%)	6.2 (-49%)	5.6 (-49%)

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