The global elimination of congenital syphilis: rationale and strategy for action

World Health Organization

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Abbreviations and acronyms

AIDS	Acquired immunodeficiency syndrome
DALY	Disability-adjusted life year
HIV	Human immunodeficiency virus
IEC	Information, education, communication
IgG	Immunoglobulin G
MCH	Maternal and child health
MDG	Millenium Development Goal
NGO	Nongovernmental organization
PAHO	Pan American Health Organization
PMTCT	Prevention of mother-to-child transmission (of HIV)
RHR	WHO Department of Reproductive Health and Research
RPR	Rapid plasma reagin
STI	Sexually transmitted infection
TPHA	Treponema pallidum haemagglutination assay
TPPA	Treponema pallidum agglutination assay
UNICEF	United Nations Children's Fund
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

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Executive summary

Syphilis remains a global problem with an estimated 12 million people infected each year, despite the existence of effective prevention measures, such as condoms, and effective and relatively inexpensive treatment options. Pregnant women who are infected with syphilis can transmit the infection to their fetus, causing congenital syphilis, with serious adverse outcomes for the pregnancy in up to 80% of cases. An estimated two million pregnancies are affected annually; approximately 25% of these pregnancies end in stillbirth or spontaneous abortion, and in a further 25% the newborn has a low birth weight or serious infection, both of which are associated with an increased risk of perinatal death. Yet, there is still a general under appreciation of the burden of congenital syphilis.

Unlike many neonatal infections, congenital syphilis is a preventable disease, which could be eliminated through effective antenatal screening, and treatment of infected pregnant women. Elimination of congenital syphilis would reduce the numbers of miscarriages, stillbirths, preterm and low-birth-weight infants, and perinatal deaths, thus contributing to the achievement of the Millennium Development Goals on maternal and child health.

A large reduction in congenital syphilis is feasible with relatively simple interventions focused on maternal and newborn care. The building blocks for congenital syphilis prevention are already in place in many parts of the world: most countries have policy guidelines for universal antenatal syphilis screening; levels of antenatal attendance are generally high; screening tests are of low cost and can be carried out at the primary healthcare level; treatment with penicillin is inexpensive; and the drug is on the essential medicines list of all countries. However, despite all these factors, congenital syphilis still causes a high burden of disease.

The overarching global goal of the present initiative is the elimination of congenital syphilis as a public health problem. This would be achieved through reduction of prevalence of syphilis in pregnant women and by the prevention of mother-to-child transmission of syphilis. The strategy of the World Health Organization for elimination of congenital syphilis rests on four pillars (see Box 1).

Box 1. Four pillars for elimination of congenital syphilis

Pillar 1:

- **ensure sustained political commitment and advocacy.**

Pillar 2:

- **increase access to, and quality of, maternal and newborn health services.** Ensure that all pregnant women are screened and adequately treated, and decrease the frequency of missed opportunities for screening women outside maternal and newborn care.

Pillar 3:

- **screen and treat pregnant women and their partners.** Currently available diagnostic tests for syphilis are effective, affordable and require minimal logistic support. All infected women, and their partners, should be treated, as should infants born to infected mothers not treated during pregnancy.

Pillar 4:

- **establish surveillance, monitoring and evaluation systems.** Improve surveillance systems, develop indicators, and strengthen monitoring and evaluation systems.

The four guiding principles for country-level action to control congenital syphilis are:

- the process should be **country-driven**, taking into account the specific cultural, epidemiological and antenatal care conditions;
- an **integrated approach** should be adopted, linking with other maternal and newborn health services (prevention of mother-to-child transmission of human immunodeficiency virus (HIV), malaria screening, etc.), sexual and reproductive health initiatives (programmes to control genital ulcer disease and other sexually transmitted infections), and primary health-care services;
- a **rights-based approach** should be applied, giving women the right to information, counselling and confidentiality;
- **partnership and collaboration** are essential for making the best use of available resources.

If congenital syphilis is to be reduced and eventually eliminated as a public health problem, increased advocacy and awareness are needed at both international and national levels, together with a sustained commitment to implement the simple and effective actions needed. Coordinated actions to provide a total package of maternal and newborn health care (for example, combining screening and treatment for HIV, malaria, and syphilis with other efforts to improve the health of pregnant women) are highly desirable. Efforts to eliminate congenital syphilis would benefit from simultaneous control of infectious syphilis in the general population.

1. Introduction

Since the advent of penicillin, syphilis is not only preventable but also treatable. Despite this, it remains a global problem with an estimated 12 million people infected each year. Pregnant women who are infected with syphilis can transmit the infection to their fetus, causing congenital syphilis with serious adverse effects on the pregnancy in up to 80% of the cases.[1] Yet simple, cost-effective screening and treatment options could prevent and eventually eliminate congenital syphilis. With the current international focus on the Millennium Development Goals (MDGs) (see Box 1), there exists a unique opportunity to mobilize action to prevent, and subsequently eliminate, congenital syphilis.

Congenital syphilis is a serious but preventable disease, which can be eliminated through effective screening of pregnant women for syphilis and treatment of those infected. More newborn infants are affected by congenital syphilis than by any other neonatal infection, including human immunodeficiency virus (HIV) infection and tetanus, which are currently receiving global attention.[2] Yet the burden of congenital syphilis is still under-appreciated at both international and national levels.[1] Unlike many neonatal infections, congenital syphilis can be effectively prevented by testing and treatment of pregnant women, which also provides immediate benefits to the mother and allows potentially infected partners to be traced and offered treatment.

It has been clearly shown that screening of pregnant women for reactive syphilis serology, followed by treatment of seropositive women, is a cost-effective, inexpensive and feasible intervention for the prevention of congenital syphilis and improvement of child health.[3] In 1995, the Pan American Health Organization (PAHO) began a regional campaign to reduce the rate of congenital syphilis in the Americas to less than 50 cases per 100 000 live births. The strategy was to: (1) increase the availability of antenatal care; (2) establish routine serological testing for syphilis during antenatal care and at delivery; and (3) promote the rapid treatment of infected pregnant women.[4]

Box 2. Millennium Development Goals

The Millennium Development Goals (MDGs), adopted by all Member States of the United Nations in 2001, include three goals that directly relate to maternal and child health.

MDG 4: Reduce child mortality

- Reduce by two thirds, between 1990 and 2015, the mortality rate in children under 5 years.

MDG 5: Improve maternal health

- Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio.

MDG 6: Combat HIV/AIDS, malaria, and other diseases

- Halt by 2015, and begin to reverse, the spread of HIV/AIDS.
- Halt by 2015, and begin to reverse, the incidence of malaria and other major diseases.

Several "state of the art" reviews on maternal and congenital syphilis were recently published in the *Bulletin of the World Health Organization*, to highlight the problem of congenital syphilis and advocate for action for its elimination worldwide.[5] The Scientific and Technical Advisory Group of the WHO Department of Reproductive Health and Research (RHR) has endorsed a strategy for the global elimination of congenital syphilis, and elimination of congenital syphilis is included in the Department's work plan for 2004–2009.

The building blocks for congenital syphilis prevention are already in place in many countries: most countries have policy guidelines for universal antenatal syphilis screening; levels of antenatal attendance are generally high, the screening tests are of low cost and are technically feasible even at the primary health-care level (this is particularly true of the new rapid tests); treatment with penicillin is inexpensive; and the drug is on the essential medicines list of all countries. However, despite all these factors, congenital syphilis still causes a high burden of disease.

To prevent congenital syphilis, increased awareness is needed at all levels of the health service, including among policy-makers, public health officials, and health-care providers, regarding the extent and seriousness of syphilis, especially among pregnant women and children. Furthermore, service users in target communities must be informed about the disease and convinced that prevention and treatment can bring substantial benefits to the health of women and children. Community mobilization, through mass media or community-based approaches, might be important to inform the public about the issue, and stimulate demand for syphilis screening. Ideally, syphilis screening should be provided as part of a package of maternal and newborn health-care services (e.g. the Making Pregnancy Safer initiative, which combines screening and treatment for HIV/AIDS, malaria, and syphilis).

The incidence of congenital syphilis can be significantly reduced with a relatively simple set of existing interventions. As long as syphilis is prevalent among adults, however, the potential for congenital transmission will remain high. Sustainable elimination of congenital syphilis thus requires coordinated efforts to simultaneously reduce rates of infectious syphilis.

This document is aimed at policy-makers in countries and in multilateral organizations, as well as other stakeholders, donors and foundations involved in international health. It provides the background and rationale for international and national strategies for the elimination of congenital syphilis. As a first step, short-term and long-term goals and targets need to be agreed upon, and the strategy – which is simple and feasible – needs to be implemented.

2. Syphilis during pregnancy

2.1 Syphilis in adults

Syphilis is a systemic, sexually transmitted disease caused by the bacterial spirochaete, *Treponema pallidum*. If it is not treated in the primary, acute stage, it becomes a chronic disease.

Syphilis has three stages:

- the *primary stage* usually starts 21 days (range: 10–90 days) following infection; the infected person develops a painless genital ulcer, which lasts 2–6 weeks;
- the *secondary stage* is characterized by a skin rash over the whole body, often with fever and muscle pain. This stage also lasts 2–6 weeks, and is followed by a *latent phase* of many years, during which there are no signs or symptoms.[a] However, even during the latent phase, spirochaetes may occasionally circulate in the blood, though this happens less frequently as time goes on; as a result, virtually all the organs of the body may become infected;
- the *tertiary stage* occurs several years to several decades after infection, and can take the form of neurosyphilis (in which the brain or spinal cord is affected), cardiovascular syphilis (involving the aorta and heart), or late benign syphilis (involving primarily the skin). These complications will develop in about 40% of people with latent infection, in the absence of antibiotic treatment. [b]

2.2 Impact of maternal syphilis on pregnancy outcome

The infective organisms (*T. pallidum*) in the blood of a pregnant woman can be transmitted to the fetus, particularly in the early stage of infection (called early syphilis[a]). Most women with syphilis of less than one year's duration will transmit the infection to their unborn child. Although pregnant women can transmit the infection to the fetus as early as nine weeks of gestation, transmission usually takes place between the 16th and 28th week of pregnancy.

The likelihood of transmission is directly related to the stage of maternal syphilis during pregnancy, or the stage of pregnancy when infection is acquired. In early maternal syphilis the maternal–fetal transmission rate can be up to 80%, whereas in late syphilis infectivity decreases.[6] The concentration of spirochaetes in the blood is highest during the first two years after infection and decreases slowly thereafter as a result of acquired immunity. Thus the risk of infecting sexual partners is highest during the first two years, then virtually ceases, although the risk of maternal-fetal transmission continues. The course of maternal infection does not seem to be altered by pregnancy.[6]

As it can take 10–45 days for infection with syphilis to be detectable by blood tests, an initial negative test does not guarantee absence of infection. Pregnant women who are negative in the first test should be screened again later in the pregnancy or at delivery. Data on the incidence of congenital syphilis among liveborn infants are limited for many reasons, including difficulty in diagnosis, occurrence of asymptomatic infections, and absence of surveillance or reporting systems. Although there is considerable variation in the way the adverse outcomes of pregnancies of women infected with syphilis are reported, it is generally accepted that they include spontaneous abortion, perinatal death, low birth weight (including prematurity), and neonatal infection with syphilis.[7–10]

Several models have been proposed to estimate adverse pregnancy outcomes in women infected with syphilis, with resulting estimates ranging from 50% to 80%.[7–10] Tables 1 and 2 show the range of reported or estimated adverse outcomes of untreated maternal syphilis and the estimated annual number of cases of congenital syphilis.

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a. For purpose of treatment, syphilis is divided into early syphilis (less than one year's duration) and late syphilis.

b. With widespread use of antibiotics, the occurrence of tertiary syphilis is less common now.

Table 1.
Rates of adverse outcomes of untreated maternal syphilis

Outcome of pregnancy	Study					
	Harman[9]	Ingraham[11]	Schulz et al.[8, a]	Hira et al.[7, b]	Watson Jones[10, c] et al.	Global Burden of STI*
Stillbirth or miscarriage	17%	22%	30–40%	22%	25%	20%
Perinatal death	23%	12%	10–20%	No data	No data	15%
Infected infant	21%	33%	10–20%	2%	No data	20%
Prematurity or low birth weight	No data	No data	Not studied	33%	25%	20%
Any adverse outcome	61%	67%	50–80%	57%	49%	75%

a Estimates from a mathematical model.

b This study underestimated neonatal infection, since all babies of seroreactive mothers were treated at birth.

c This study was restricted to high-titre seroreactive mothers (RPR 1:8), who accounted for 73% of all women with active syphilis.

* Estimates used by the Global Burden of Disease 2000, Geneva, World Health Organization.

Table 2.
Estimates of annual incidence of congenital syphilis

Proportion of seropositive women with:	Conservative model (Watson-Jones et al.)[10]	Mid-range model (Schulz et al.)[8]	Less conservative model (Global Burden of Disease, WHO, 2000)
a. Untreated syphilis	0.95[a]	1.0	1.0
b. High serological titre (≥ 1:8)	0.73	–	–
c. Adverse pregnancy outcome due to syphilis	0.49	0.65	0.75
Global annual number of congenital syphilis cases [b, c]	713 600	1 365 000	1 575 000

a Modified from Watson-Jones' model to reflect the proportion of seropositive women who did not receive prior treatment.

b Calculated as: 2.1 million maternal cases x A x B x C.

c Includes miscarriage/fetal loss, perinatal death, premature birth/low birth weight, and neonatal infection.

2.3 Syphilis in pregnant women – the magnitude of the problem

In the absence of active surveillance, it is difficult to assess accurately the annual number of pregnant women with syphilis. Studies in the 1970s and 1980s, reviewed by Hira et al.,[7] demonstrated a wide range of seroprevalence values among pregnant women attending antenatal clinics, from 0.03% in Scotland to 16.0% in Brazil. However, no effort was made to estimate the total number of pregnant women infected worldwide. Gerbase et al.[12] estimated the global prevalence of active syphilis in 1999 to be 12 million cases. However, this figure included everyone with active syphilis and the number of pregnant women was not specified.

Mullick et al. (unpublished data, 2004) reviewed the published literature on maternal syphilis and confirmed high reported prevalence in several countries, most notably Ethiopia (13%), Swaziland (13%) and Mozambique (12%) (Table 3).

Table 3.
Studies of maternal syphilis seroprevalence 1997–2003

WHO region	Country	No. of studies	No. of women tested	Seroprevalence among pregnant women (%)
Africa	Benin	28	18 790	1.68
	Burkina Faso	3	17 322	0.21
	Cameroon	10	6 306	2.81
	Côte d'Ivoire	1	1 201	1.30
	Ethiopia	3	3 582	2.74
	Ghana	31	28 082	0.40
	Kenya	4	14 694	2.29
	Malawi	42	32 752	3.67
	Mali	1	549	2.00
	Nigeria	13	68 930	2.35
	Senegal	21	10 463	0.41
	South Africa	1	271	8.40
	Uganda	2	2 379	6.49
	Zimbabwe	2	6 967	0.76
Americas	Argentina	1	1 056	1.61
	Brazil	4	4 203	2.15
	Guatemala	1	1 170	0.09
	Haiti	16	7 710	5.75
South-East Asia	Bangladesh	2	508	2.57
	India	1	600	1.00
	Indonesia	1	395	0.80
Europe	Azerbaijan	1	407	1.70
	Finland	1	59 112	1.50
Eastern Mediterranean	Somalia	4	1 538	0.91
	Sudan	1	800	1.50
Western Pacific	China	6	126 032	0.44
	Malaysia	1	1 070	0.30
	Republic of Korea	4	7 126	0.11
	Papua New Guinea	1	5 385	7.10
	Vanuatu	7	1 611	2.42
	Western Samoa	1	441	0.40
Total		**215**	431 452	

Source: WHO database of STI prevalence/incidence studies, 2003.

However, these figures rely on published studies, which are subject to several potential limitations, including a lack of data from many countries, over-representation of urban populations, small sample sizes and reliance on women seeking antenatal care. Thus, they are likely to underestimate the total burden of maternal syphilis in developing countries.

More recently, investigators at WHO have developed a strategy to evaluate available maternal morbidity data on a country-by-country basis. The WHO effort involves examining not only published literature, but also country surveillance data for pregnant women, obtained in the context of national HIV surveillance programmes. This work is still in progress, but has the potential to provide a more comprehensive estimate of the global burden of syphilis in pregnancy. For example, there are 31 separate surveillance reports of syphilis seroprevalence among pregnant populations in Ghana, involving assessment of serostatus in more than 28 000 women, with seroprevalence ranging from 0% to 0.8%.

3. Interventions to prevent congenital syphilis

3.1 Diagnosis

3.1.1 Syphilis

A wide range of tools is available for the diagnosis of syphilis (see Annex 1), and the subject has been comprehensively reviewed by Peeling et al., 2004.[13] Traditional laboratory diagnosis in adults is based on initial use of a non-treponemal screening test. These tests detect antibody to reaginic antigen, which is found in both *T. pallidum* and some human tissues. They are thus not specific for *T. pallidum*. Examples include the Venereal Disease Research Laboratory (VDRL) test and the rapid plasma reagin (RPR) test. If a screening test is positive, the serum is then tested by a confirmatory treponemal test, using an antigen of *T. pallidum*; examples include the *T. pallidum* haemagglutination assay (TPHA) and the *T. pallidum* particle agglutination assay (TPPA).

The non-treponemal tests have the advantages of being inexpensive and sensitive (especially in early infection); in addition, the RPR test can be done rather quickly. However, these tests cannot be done on whole blood, they require a microscope or rotator for processing, and misinterpretation is common by inexperienced laboratory technicians because reading of the result is subjective. Studies have shown a wide variation in the reliability of screening results from non-treponemal tests.

Treponemal tests, while theoretically more specific than non-treponemal tests, may also give false-positive results. Moreover, they can not differentiate between individuals with active (untreated) syphilis and those who have previously been successfully treated for infection. In both cases, the treponemal test result will be positive. Non-treponemal tests, on the other hand, can distinguish current or recent infections from old, treated infections.

A combination of the two types of tests is recommended. Traditional confirmatory assays require expensive laboratory equipment and technical expertise, and are therefore seldom available outside reference laboratories. However, these can now be replaced by simple, rapid, point-of-care treponemal tests, which use whole blood, require minimal training, no equipment or special storage conditions, and cost US$ 0.45–1.40. Several rapid tests, with sensitivities of 85–98% and specificities of 92–98% compared with standard treponemal assays, are now available.

The affordability, convenience and practicality of rapid treponemal tests make them attractive tools, not only as confirmatory assays but also as on-site screening tests in primary health-care settings or in areas where laboratory services are not available. However, since treponemal antibodies persist for years, whether patients are treated or not, these rapid treponemal tests cannot be used to monitor effectiveness of treatment or to distinguish active infection from past treated infection.

In areas with a low prevalence of syphilis, or where screening has not previously been available, presumptive treatment should be considered for anyone with a positive rapid treponemal test result. Rapid treponemal tests are less useful as screening tests in areas where the prevalence of syphilis is high, since a high proportion of individuals will have antibodies as a result of past, treated infection. It would be preferable, however to treat women who test positive rather than risk missing a maternal infection. In any case, whatever the prevalence, the tests are very helpful in identifying women without syphilis.

3.1.2 Congenital syphilis

The use of serological tests for the diagnosis of congenital syphilis in infants under 15 months of age is problematic because of the passive placental transfer of maternal IgG to the fetus. Thus use of treponemal tests on an infant born to an infected mother is not recommended.

3.2 Treatment

3.2.1 Pregnant women

Syphilis in adults is easily cured. Depending on the stage of infection, treatment may consist of as little as a single dose of penicillin, which is widely available in primary health-care settings. Detailed treatment guidelines are given elsewhere (see also Annex 2a).[14]

When provided early in pregnancy, treatment of the mother effectively prevents infection in the fetus.[6] Even in women with syphilis of long duration, who themselves would benefit from three weekly doses of penicillin, a single dose of penicillin prevents infection in the fetus. Birth outcomes for such women are similar to those for women without syphilis.[10]

The new, rapid diagnostic tests for syphilis offer the possibility of more effective treatment of women compared with conventional tests. While the older tests had to be carried out in laboratories, often far removed from the primary health-care setting, the new tests can be performed immediately on-site, allowing infected women to be identified and treated at a single visit. This should significantly increase the numbers of women treated.

3.2.2 Infants

Infants born to seroreactive women who have not received appropriate treatment should be treated according to protocols recommended by WHO (see also Annex 2b).[15]

Diagnosis of congenital syphilis in infants and treatment are considerably more difficult than diagnosis and treatment of infected pregnant women. Current treatment regimens for congenital syphilis involve administration of parenteral penicillin every day for 10 days; hospitalization is often indicated to ensure that the infant receives the full course of treatment. Clearly, prevention of congenital syphilis by universal screening of women early in pregnancy and treatment, if indicated, is far preferable.

3.3 Cost-effectiveness

Syphilis rates have fallen in the developed world, prompting the question of whether screening of pregnant women for syphilis should continue. This question has led to full economic evaluations in Norway and the United Kingdom,[16] and partial evaluations in Australia and the United Kingdom.[17] Various modelling approaches were used, but each analysis concluded that screening is both cost-effective and cost-saving, even when the prevalence is considerably less than 1%.[2] Screening for syphilis in developed countries is cost-effective at very low prevalence because the medical costs of managing a case of congenital syphilis are high. The inclusion of indirect or intangible costs in the models further increases the cost-effectiveness of screening.

Few economic evaluations have been carried out in developing countries, where health-care programme costs differ substantially from those in developed countries. Nevertheless, in sub-Saharan Africa, several economic analyses of direct medical costs have indicated that screening is highly cost-effective, even at relatively low prevalences,[18] e.g. 1%. In three studies, the cost (in 2001) of averting one case of congenital syphilis was US$ 86–177 (US$ 86 at a prevalence of 6.5% and US$ 177 at a prevalence of 3.4%) (Table 4).

Converting cases of congenital syphilis into disability-adjusted life years (DALYs), the cost per DALY saved ranged from US$ 3.97 to US$ 10.56. These costs are extremely low in comparison with other widely implemented interventions, making congenital syphilis prevention one of the most cost-effective interventions available. Indeed, this is what the World Bank concluded in 1993, when it recommended that screening for congenital syphilis should be part of the essential health package.[3] The relatively low cost of syphilis screening programmes, at US$ 0.93–1.44 per person screened (Table 4), means that such programmes are affordable in all but the poorest countries.

Table 4.
Costs (in US$ at 2001 prices) of screening and treatment and cost savings achieved in four cost-effectiveness studies in Africa, 1986–2001

Type of cost	Study			
	Hira et al.[7]	Jenniskens et al.[21]	Fonck et al.[22]	Terris-Prestholt et al.[18]
Cost per woman screened	0.93	1.96	1.24	1.44
Cost per woman treated	22.11	34.26	40.32	20.05
Cost per person treated	11.93	21.82	26.27	14.54
Cost per congenital syphilis case averted	158	86	177	
Cost per DALY saved:				
- Original analysis by author	3.97	9.84	9.57	N/A*
- Cost obtained with the application of the Terris-Prestholt et al.[18] model to the original data	11.28	17.48	18.73	10.56

*N/A= not available

The findings from sub-Saharan Africa are substantiated by studies elsewhere. In Thailand, a cost–benefit ratio of 2.8 was realized even at a prevalence of 0.07%.[19]

The new diagnostic technology makes screening even more efficient. In a South African population with a prevalence of syphilis of 6.3% (1.7% with acute syphilis), screening of women using an on-site rapid immunochromographic strip test was shown to be more cost-effective (US$ 37 per case of congenital syphilis averted) than either on-site RPR testing (US$ 43 per case averted) or referral of specimens to a laboratory (US$ 111 per case averted).[20] The strip test was also preferred by nurses and patients.

Screening for syphilis using a rapid diagnostic test could be combined with HIV testing and malaria testing. It would then be even more cost-effective because counselling of patients, taking of blood, and testing could be done at the same visit.

In summary, the economic argument for universal screening of pregnant women for syphilis is persuasive.[18–20] Screening is extremely cost-effective and affordable, particularly with the new, simple, rapid diagnostic technology. The new tests can also potentially overcome many of the current barriers to services. Finally, synergy between a programme for antenatal syphilis testing and a similar programme for HIV and malaria testing, would consolidate resources and be more cost-effective than any one programme alone. The issue for the developing world is, therefore, not whether to screen but how to screen most efficiently.

4. Challenges for congenital syphilis prevention at different levels of the health system

Despite the availability of screening tools and efficacious and cheap treatment for pregnant women, and the inclusion of prevention programmes in antenatal care in many countries, congenital syphilis remains a public health problem in many parts of the world.

The findings presented below are based on a review of programme evaluations,[25] as well as case studies in three countries with established maternal and newborn health-care programmes that include syphilis screening. They pinpoint some of the obstacles and challenges that need to be overcome in implementing programmes to eliminate congenital syphilis.

4.1 Evaluation of programmes

Policies for control of maternal and congenital syphilis, together with available epidemiological data, were reviewed for 13 countries with different geographical, socioeconomic and epidemiological characteristics.[23] Concentrated efforts in the countries reviewed showed varying degrees of success in decreasing the prevalence of maternal syphilis. It was concluded that the policies are only as effective as the implementing health system and its users. Successful implementation of syphilis screening programmes depends on identifying the barriers and then improving the health-care system's capacity to provide the services required. The study highlighted the fact that countries face remarkably similar barriers, some of which are described below.

4.1.1 Policy adherence

Although antenatal screening was a policy in most of the 13 countries, the actual coverage varied widely. The proportions of pregnant women screened were 17–88% in Bolivia, 64–79% in Brazil, 51–81% in Kenya, 43% in Malawi, <5–40% in Mozambique, 83% in the United Republic of Tanzania and 32–83% in the USA.

4.1.2 Lack of clarity regarding roles, responsibilities and accountability

Where congenital syphilis control measures are part of both control programmes for sexually transmitted infections (STIs) and maternal and child health (MCH) programmes, roles, responsibilities and accountability of each need to be clearly defined to ensure successful implementation of the interventions aimed at eliminating congenital syphilis. Examples from countries, included in the mentioned review on programme evaluation with both low and high congenital syphilis prevalence levels, that incorporated congenital syphilis policies into national programmes for maternal-newborn health, HIV and prevention of mother-to-child transmission (PMTCT) of HIV, or STI prevention prove the success of these interventions.[24,25]

4.1.3 Importance of integration of programmes and services

There is no doubt that integration is the key to long-term, sustainable programmes. However, a variety of barriers to integration were noted, including the existence of vertical HIV/STI and MCH/family planning programmes.

4.1.4 Access to maternal and newborn health services

Maternal and newborn health services often provide the only opportunity to screen pregnant women for syphilis (and other infections). Thus the accessibility, use and quality of these services are critical to the success of the programme. Coverage of maternal and newborn health services ranged from 24% to 100% in the 13 country evaluations reviewed. However, the quality of service (staff, drug availability, equipment) may be even more important than access. Attendance for antenatal care late in pregnancy was frequently noted in high-prevalence countries, with the mean gestational age at screening ranging from six to nine months.

4.1.5 Screening and treatment

On-site rapid testing appears to increase the number of women diagnosed; however, it will not increase the proportion of women adequately treated if the necessary drugs are not readily available. Regional screening rates in Haiti, Kenya, Mozambique, and the United Republic of Tanzania were increased with introduction of on-site testing but evaluation showed that there were still obstacles to

effective treatment in these programmes. Constraints in supplies, costs and trained staff, and clients failing to return for follow-up treatment, hampered the programmes. Despite the use of simple RPR tests in both on- and off-site testing facilities, difficulties in processing were experienced in most countries. In Bolivia and Kenya, because of inadequate laboratory facilities or training of technicians, it was found that up to one-third of tests gave incorrect results.

Despite the fact that testing at delivery has been shown to decrease the development of clinical congenital syphilis, and is recommended in several countries, it was rarely performed.[26]

Partner notification was used in all countries but with varying degrees of success. Although it is an integral part of STI control, it was not always practised in low-income settings.

4.1.6 Surveillance data

Accurate data on the prevalence of maternal and congenital syphilis were limited in all countries. Variations in diagnostic procedures and case definitions made comparisons difficult, and in resource-poor settings surveillance data were often based on local or regional studies. Lack of data on maternal and congenital syphilis rates contributes to the low priority given to the disease as a public health problem.

4.1.7 Lack of monitoring and evaluation

It is important to note that no monitoring or evaluation was built into, or carried out in, most of the 13 programmes studied.

4.1.8 Recommendations from the review of evaluations of programmes[23]

- Compare and contrast any existing congenital syphilis control or elimination programmes with the proposed WHO strategy defined in the present document to identify any gaps or implementation issues.
- If no local or subnational policy currently exists, then adapt the WHO proposed action plan to the local context.
- Create programmatic links with international agencies working in the areas of sexually transmitted infections and HIV prevention and maternal and newborn care.
- Ensure sufficient attention is paid to the implementation of comprehensive monitoring and evaluation systems to assess programme efficiency and impact.
- Promote, through various media and other dissemination channels, political and stakeholder commitment to the goals of eliminating congenital syphilis.
- Standardize and strengthen international and national surveillance systems to allow better assessment of the magnitude of syphilis in pregnant women and congenital syphilis.

4.2 Health services: case-studies in Bolivia, Kenya and South Africa

Case-studies were carried out in three countries where syphilis control is integrated in established antenatal programmes, namely Bolivia, Kenya and South Africa. The aim was to assess the syphilis screening programmes, document their successes and failures, and identify factors that facilitated or hindered the programmes.[26] The results of these case-studies indicate some of the obstacles and challenges faced by screening programmes.

- Policy- and decision-makers in the health ministries were unaware of the problem of congenital syphilis or of the cost-effectiveness of screening; programme managers were unaware of the extent of the problem in their communities and were unable to make available the resources needed, including planning and monitoring, because syphilis in pregnant women was of lower priority than other health problems.
- Health-care providers were unaware of the consequences of syphilis in pregnant women and its extent in the community; moreover, they were not appropriately trained in screening and lacked resources and logistic support.

- Lastly, and perhaps most importantly, people in the community were unaware of the disease and its consequences for the unborn child; they did not know about the benefits of screening or the need for follow-up of both mother and baby, and notification and treatment of sexual partners.

The major issues and recommendations emerging from these case-studies are summarized below.

- **Early antenatal screening and management of positive cases were difficult,** because most women did not present for antenatal care until after six months' gestation. Women need to be encouraged to attend health-care services early in pregnancy. A coordinated and concerted effort to understand and change behaviour is required, as well as community mobilization on a large scale.
- **The time taken for test results to be made available to the health-care provider** varied from a few hours to four weeks. The lack of tracking systems meant that many RPR-reactive women did not return for results and treatment. Diagnosis and follow-up need to be made more effective.
- **A lack of guidelines for service providers** meant that they had little awareness or understanding of congenital syphilis and its management. Appropriate guidelines, training and supervision need to be emphasized.
- **Unavailability of drugs, notification cards and other supplies,** as well as a lack of understanding of the importance and consequences of syphilis in pregnant women and poor motivation of health-care workers, resulted in poor quality of care. Health education of clients of the maternal and newborn health services was generally poor. Management of supply logistics also needs to be improved.

4.3 Working with the community

At the community level, efforts need to be made to increase access to, and use of, maternal and child health-care services, and to encourage women to come for care early in pregnancy. Health-care programmes need to work together with women, families and communities to increase their understanding of the needs of mothers and their newborn babies. Two benefits can be expected from this: first, families will be able to seek timely solutions to the needs of mothers and their newborn; and second, health services will be able to plan services better in accordance with the needs of communities.

Health workers need to understand the perceptions and beliefs of women and communities regarding maternal and newborn health, including such issues as: health care during pregnancy and the health problems of pregnant women; the stigma associated with sexually transmitted infections; the role of men as motivators or barriers to seeking health care; the dynamics of household decision-making; the preferences for care during pregnancy and the perceptions of quality of care of health services. Such an understanding is crucial for building appropriate strategies to increase knowledge about health, disease and disease prevention, and to promote appropriate actions. Where communities are already involved in coalitions and partnerships focused on specific health issues (such as HIV/AIDS), it is important to consider how to build on this engagement and broaden its focus. Bringing together women, families and communities with health-care providers is not an easy process, but it is essential if the goals for maternal and newborn health, including reducing morbidity and mortality, are to be achieved.[27, 28]

In many communities, training traditional birth attendants and traditional healers to refer women to appropriate health services may be an important way of increasing attendance

at maternal and neonatal care facilities, since many women consult these caregivers first and tend not to mix conventional and traditional care. Many other groups and individuals (e.g. skilled birth attendants) in the community can also be mobilized to support women and families in identifying and responding to the health-care needs of women and their infants.

Community-based interventions, including community-based surveillance, in which easily recognized health-care problems are routinely reported, can also provide a means of sustainable monitoring. For instance, in one programme in Ecuador, yaws was eliminated in a community using this approach.[29] For congenital syphilis, community-based surveillance, perhaps involving traditional and skilled birth attendants reporting stillbirths and miscarriages, could be explored. Information from community-based surveillance and other monitoring mechanisms should be shared with the community to increase their knowledge and awareness of maternal and newborn health needs.

4.4 Addressing the challenges: the four pillars of a strategy to eliminate congenital syphilis

None of the challenges described above is insurmountable, and all could be effectively addressed through political commitment, priority-setting and advocacy at all levels. Screening of pregnant women and treatment of RPR-reactive women, their newborn babies and their partners can be integrated into existing maternal and newborn health-care programmes and other related interventions. Combination of syphilis screening with other efforts, such as PMTCT programmes and STI control, would yield additional benefits. On the basis of the studies mentioned above and others, the following four pillars of a strategy to eliminate congenital syphilis are proposed for countries to adopt, adapt and implement:

1. ensure sustained political commitment and advocacy;
2. increase access to, and quality of, maternal and newborn health services;
3. screen and treat pregnant women and their partners;
4. establish surveillance, monitoring and evaluation systems.

5. Goals for the elimination of congenital syphilis

5.1 The Millennium Development Goals

Interventions aimed at eliminating congenital syphilis will contribute directly to the achievement of three of the Millennium Development Goals (MDGs) – i.e. reducing child mortality, improving maternal health, and combating HIV/AIDS, malaria and other diseases. This will be achieved as follows:

- mortality rates among children under the age of five years will be reduced as a result of reduced incidence rates of low birth weight, perinatal death and congenital infection;
- maternal health will be improved as a result of fewer spontaneous abortions. In addition, the simultaneous implementation of interventions to eliminate congenital syphilis and efforts to control STIs in the population will reduce the incidence of syphilis in pregnant women;
- systematic screening of women for syphilis in PMTCT of HIV programmes will allow mothers and infants to be tested and, where necessary, treated for both HIV infection and syphilis, thereby improving maternal and neonatal health;
- there is increasing evidence that STIs, including syphilis, increase women's chances of becoming infected with HIV,[30–32] thus screening and treatment for syphilis will help reduce the risk of HIV transmission.

5.2 Overall goal: global elimination of congenital syphilis as a public health problem

The overall goal for WHO and its partners in relation to congenital syphilis is its global elimination as a public health problem. WHO is currently developing methods for defining an end-point for elimination of congenital syphilis, taking into account recently published studies on the prevalence of congenital syphilis. PAHO defined elimination of congenital syphilis as a public health problem as corresponding to an incidence of 0.5 cases or less per 1000 births (including stillbirths). However, this specific threshold was established for Latin America in 1995 and may not be appropriate for the rest of the world.

5.3 Specific goal: prevention of transmission of syphilis from mother to child

A specific goal is the prevention of transmission of syphilis from mother to child. This can be achieved by strengthening antenatal care programmes to ensure:

- early antenatal care for all women, with universal syphilis screening and prompt treatment of those infected;
- treatment of all sexual partners of infected women, promotion of condom use during pregnancy, and counselling of all women on how to prevent infection;
- all neonates born to RPR-positive mothers are given a single dose of penicillin as prophylactic treatment (Annex 2b).

This is the only realistic approach to elimination of congenital syphilis at present, because of the problems of diagnosing congenital syphilis and the lack of a universally applicable case-definition.

Examples of targets and indicators for monitoring and evaluation of congenital syphilis programmes are given in Annex 3.

6. Guiding principles for country-level action

6.1 A country-driven process

A strategic framework for elimination of congenital syphilis must take into account the wide range of cultural, epidemiological and antenatal care conditions in countries. The overall approach, therefore, needs to be readily adaptable to local situations. Countries have been involved in the development of the strategy and action plan for elimination of congenital syphilis at global and regional levels.

6.2 An integrated approach

The elimination of congenital syphilis should not be conceived as a vertical programme. Rather, syphilis screening and treatment programmes should be integrated into existing maternal and newborn health services and, where appropriate, into primary health-care, family planning and adolescent sexual and reproductive health services. Links between congenital syphilis elimination activities and other services, such as PMTCT of HIV infection and malaria treatment, should be strengthened.

WHO is currently developing a related initiative to control curable genital ulcer disease, which includes targets for treatment of syphilis. By means of targeted interventions, improved syndromic management and syphilis screening in primary health-care and STI clinics, rates of curable genital ulcer disease, such as syphilis and chancroid, can be reduced. Efforts to eliminate congenital syphilis, through expanded detection and treatment among pregnant women and their partners, will in turn contribute to syphilis control in the general population.

Thus, in developing policy and designing services, careful consideration should be given to how interventions will be implemented. In this regard it is recommended that those who will provide the integrated service be consulted. Involvement of all stakeholders, analysis of their roles and responsibilities and, if needed, reallocation of the stakeholders' roles and responsibilities, will be key to addressing the challenge of integration.

6.3 A rights-based approach to diagnosis and treatment

A rights-based approach to congenital syphilis control programmes would ensure that women, men, and young people have the right to information enabling them to protect themselves against infection, information on where to seek appropriate care, the right to know the results of their tests, and the right to seek and receive effective treatment.

Rights-based approaches also include the right to the highest possible quality of care and to care which is confidential and non-judgemental.

6.4 Partnership and collaboration

Especially where resources are limited, the key to success will be cross-sectoral collaboration at the government level (Ministry of Health, Ministry of Education, e.g. school-based programmes, etc.), as well as collaboration and partnership with other sexual and reproductive health services and community-based health programmes, run by nongovernmental organizations (NGOs), bilateral donors, foundations and United Nations agencies.

NGOs provide up to 50% of health care in many countries and are thus important stakeholders, particularly in areas of political unrest, conflict and complex emergencies. Partnership with NGOs and community-based health-care providers can accelerate delivery of services and expand coverage, especially in rural areas. Community health-workers can be effective in promoting and encouraging the early use of antenatal services. It is important to involve all stakeholders from the outset in planning and decision-making, to ensure that they are aware of, and committed to, the programme.

Participation of the community is crucial for acceptance of health programmes and compliance with recommended behavioural changes.

7. The strategy

7.1 At the global level

Actions need to be initiated at the global level, involving the following stakeholders: representatives of ministries of health, professional associations, donor agencies, multilateral organizations, international funding agencies, regional organizations, NGOs, private sector and industry. Specific efforts are needed to:

- develop a consensus on the need for a global effort to eliminate congenital syphilis, and raise awareness of congenital syphilis and the need for action;
- foster global cooperation to develop guidelines and training materials and appropriate monitoring and evaluation systems;
- involve international and private sector institutions in research and development of better tools for diagnosis of syphilis and congenital syphilis;
- promote international partnerships to coordinate efforts to eliminate congenital syphilis using an integrated approach;
- mobilize resources.

7.2 At the country level: the four pillars

The four pillars of the strategy to eliminate congenital syphilis were defined in section 4.4. Outlined below are the objectives of action to be undertaken in relation to each pillar.

Pillar 1: Ensure advocacy and sustained political commitment for a successful health initiative

Objectives

Efforts in countries should seek to:

- mobilize political commitment and advocacy, through partnerships at international and national levels;
- raise awareness of syphilis in pregnancy and adverse outcomes, such as stillbirth;
- underline the value of linking congenital syphilis elimination to other maternal and newborn health services, PMTCT of HIV programmes and STI prevention programmes;
- demonstrate the cost–benefit of interventions to prevent congenital syphilis;
- incorporate clear messages on the benefits of early attendance for antenatal care into maternal and neonatal health-care and other relevant programmes.

A sustainable programme is only possible if there is commitment at all levels. National policies, strategies and programmes need to be reviewed to ensure that congenital syphilis is addressed and strategies implemented.

Pillar 2: Increase access to, and quality of, maternal and newborn health services

2A. Where maternal and newborn health-care services exist

Objectives:

- increase the percentage of pregnant women attending maternal and newborn care facilities early in pregnancy;
- ensure that all pregnant women are screened and adequately treated, and that the sexual partners of those infected are treated;
- ensure that all women coming to services with possible complications of syphilis (spontaneous abortion, stillbirths, etc.) are screened for syphilis and treated, if necessary;
- decrease missed opportunities for screening women (ensure there is no lack of supplies for screening test, treatment, etc);
- increase access, and decrease barriers, to care;
- improve the quality of maternal and newborn care (training of staff, skilled birth attendants, etc.);
- increase the quality of care regarding syphilis testing and treatment of pregnant women (training of laboratory workers and of health-care staff);
- increase the percentage of pregnant women attending maternal and newborn care facilities overall;
- improve community awareness of health services and treatment of STIs;

- integrate health services to ensure that screening and treatment for HIV, malaria and syphilis are available;
- establish partnerships with nongovernmental health-care providers to ensure maximum coverage.

2B. Where there are no maternal and newborn health-care services

Objectives:

- define a minimum package of interventions for prevention of congenital syphilis;
- carry out a situation analysis of the context (stakeholders, activities in place, etc.);
- establish partnerships with NGOs that could provide health-care services, especially in areas of conflict;
- integrate syphilis activities with other disease-control/disease-elimination programmes for neglected populations;
- mobilize communities, using advocacy and awareness-raising programmes, and develop health structures that include specific interventions against syphilis, as well as other community health priorities;
- implement an education programme targeting pregnant women with advocacy on sexual and reproductive health issues, including STIs and congenital syphilis.

Pillar 3: Screen and treat pregnant women and partners

Each country will need to develop its own screening strategies for syphilis in pregnant women, depending on the prevalence of the disease and the level of health care available.

Objectives:

- provide effective diagnosis and treatment of all infected pregnant women and their partners, preferably at the point of care;
- determine the best combination of on-site rapid diagnostic tests, together with same-day treatment, which is effective, affordable and requires minimal logistic support for the detection of syphilis;
- treat all patients who test positive with (at least) single-dose treatment – 2.4 millions IU of benzathine benzylpenicillin, given intramuscularly;
- test and, when necessary, treat at delivery women who did not attend health services earlier or were not tested during the pregnancy;
- treat all infants born to infected mothers, and follow up every three months for the first year of life;
- ensure that women remain uninfected during pregnancy through effective STI treatment, counselling on STI prevention and condom use, partner notification and treatment;
- diagnose and treat, or use syndromic approach and treat for genital ulcer disease;
- screen all patients attending STI clinics for syphilis.

Pillar 4: Establish surveillance, monitoring and evaluation systems

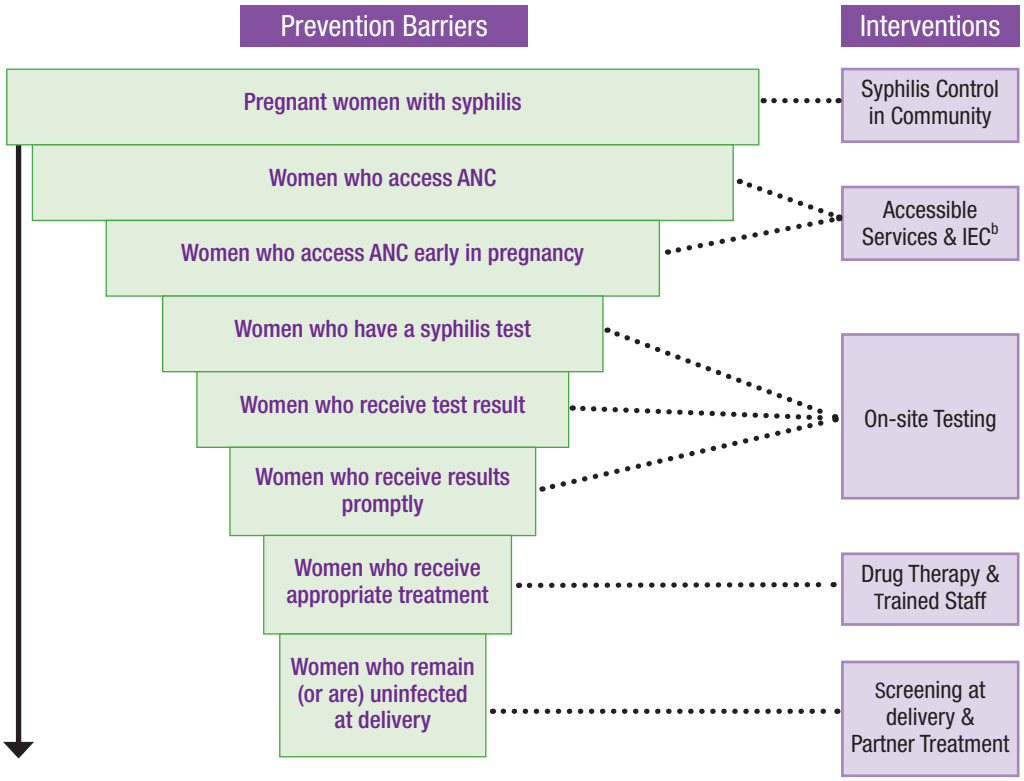
Objectives:

- establish baseline data and effective reporting, as an integral part of the making pregnancy safer and other maternal and child health programmes;
- identify and assign roles and responsibilities, to improve accountability for the elimination of congenital syphilis;
- develop or strengthen systems for monitoring progress;
- develop or strengthen systems for evaluating outcomes;
- develop or strengthen systems for evaluating sustainability;
- develop indicators for quality of care, coverage of screening and treatment and awareness in the community, to be used as proxy measurements of the effectiveness of intervention programmes.

As standardized diagnosis of cases of congenital syphilis is not possible in low-resource settings, the monitoring and evaluation of programme implementation will have to be done through indirect process indicators. These indicators will measure the impact of interventions implemented to improve the quality of care and access to services (Fig. 1).

If a diagnostic tool for congenital syphilis becomes available in the future, it could be used to measure the outcome of interest – incidence of congenital syphilis.

Figure 1.
Interventions to prevent loss to detection and treatment of pregnant women with syphilis[a]



[a] Congenital syphilis prevention is dependent upon successful implementation of each intervention in this model. Each bar represents a subgroup of women from the bar above. At the present time, at each stage some women remain untreated for a variety of reasons. For example, among women who are tested for syphilis but are not given the test results (and treatment, if required) immediately (because the services do not offer on-site testing and treatment), a proportion of women may not return to the health centre and thus may remain untreated. The interventions suggested in this model are designed specifically to address such problems.

[b] IEC= Information, Education and Communication.

8. Roles and responsibilities

8.1 Role of WHO at the global level: leadership

WHO will assume a leadership role at the global level, ensuring that the elimination of congenital syphilis becomes a priority within the Organization, and strengthening links, both within the Organization and with other relevant United Nations agencies and organizations, and encouraging partnerships with nongovernmental organizations and other stakeholders.

8.1.1 Advocacy and resource mobilization

WHO will work to galvanize interest and support for the initiative at national, regional and global levels. It will lobby and advocate for alliances and partnerships for mobilizing financial resources.

8.1.2 General framework

WHO will establish a general framework for the strategy for elimination of congenital syphilis, to be tailored by each country to its particular situation. WHO will support development of technical training manuals.

8.2 Role of WHO at regional level: leadership and technical support

At regional level, WHO will:

- assume leadership at the regional level for the elimination of congenital syphilis;
- provide support for the identification and implementation of appropriate regional strategies aimed at eliminating congenital syphilis;
- provide support for adaptation of technical and generic training manuals and materials;
- mobilize resources;
- promote the integration of prevention of congenital syphilis and of mother-to-child-transmission of HIV.

8.3 Role of WHO at country level: technical assistance

WHO will provide technical assistance to countries (from headquarters or regional or country offices), especially those with high rates of maternal and congenital syphilis. Specifically, it will provide support to countries to:

- determine the burden of congenital syphilis;
- develop and implement appropriate strategies aimed at eliminating congenital syphilis;
- identify populations isolated from the health system (socially or geographically) with a high prevalence of syphilis;
- carry out a situation analysis and identify needs and gaps;
- identify the weaknesses in the health system that lead to pregnant women not being screened or treated for syphilis;
- improve planning and implementation of programmes;
- provide support at country level in developing national plans;
- provide training to build a skilled, motivated workforce;
- develop and implement surveillance programmes;
- develop tools for evaluation and monitoring, with appropriate objectives that take into account the country context.

WHO will also help countries to identify strategies for increasing attendance of pregnant women at maternal and newborn health services.

8.3.1 A phased-in approach

It is envisaged that the elimination of congenital syphilis would take place in three phases, depending on country readiness.

During the first phase, WHO will provide technical support to several countries that meet certain criteria.[c] Ideally, two countries in each WHO region would take part in this first phase. However, if resources are insufficient, at least four countries from different regions will be supported while other countries are preparing for implementation.

The second phase would involve increasing the number of countries implementing the strategy to eliminate congenital syphilis, benefiting from the lessons learnt in the phase one countries.

The third phase would be a final scale-up of the remaining countries.

8.3.2 Advocacy at country level

WHO will aim to ensure that, in all countries implementing the Making Pregnancy Safer initiative, screening and treatment for congenital syphilis are given high priority and integrated into the initiative. In all countries implementing activities to prevent mother-to-child transmission of HIV, WHO will advocate for syphilis screening in all pregnant women screened for HIV. WHO will also support the implementation of syphilis control in high-risk populations. Finally, WHO will encourage partnerships in countries, raise awareness and help to mobilize resources.

8.4 Country roles in implementing the strategy

Countries are responsible for implementing the strategy.

8.4.1 Policy and programme level

Countries will need to ensure that there is awareness and sustained commitment at all levels of health services. Maternal syphilis control (screening, diagnosis, treatment and prevention) should be included in comprehensive antenatal care services and PMTCT of HIV programmes.

The strategy for the elimination of congenital syphilis aims to build on or develop collaboration between programmes in the health sector. Elimination of congenital syphilis can be achieved only through an integrated, collaborative response involving all programmes providing maternal and newborn care (including sexual and reproductive health, MCH, STI and HIV programmes).

Situation analysis and strategic assessment

Most countries have established antenatal services and recommend syphilis screening in pregnancy. The status of the services and the level of implementation of syphilis control vary, depending on socioeconomic conditions, political commitment, and the health-care infrastructure. A situation analysis is an essential first step in planning interventions to improve the performance of syphilis control programmes. Such an analysis will also provide important baseline data for use in setting targets and future evaluation. Strategic assessment will allow for appropriate planning and improvement of ongoing programmes.

Programme management

To have effective programmes, effective management needs to be in place. This can be achieved by addressing the following:

- identifying and assigning roles and responsibilities to ensure accountability within programmes;
- advocacy at all levels;
- financial sustainability and transparency;
- availability of supplies for screening and treatment of syphilis.

Effective supply-chain management to ensure reliable supplies of diagnostics, drugs and consumables will require close collaboration with the national medical stores (or equivalent). Supply-chain management training of staff at all

[c] These criteria include: (i) ready availability of epidemiological data on syphilis and congenital syphilis; (ii) high syphilis prevalence rate among pregnant women; and (iii) presence of other maternal and newborn health-care programmes in which the strategy could be embedded (e.g. a programme for making pregnancy safer or PMTCT of HIV).

levels (health centres, central stores, etc.) to allow accurate forecasting and ordering of supplies will be necessary.

Training

In addition, to address the high staff-turnover and movement, regular training and education should be implemented at all levels (including mobile facilities).

Training elements should be embedded in national curricula and should address:

- clinical skills;
- counselling;
- information, education, communication (IEC);
- knowledge management (use of information for decision-making);
- quality improvement methods;
- information systems, monitoring and evaluation;
- programme management, supervision.

Supervision

Improved supervision at all levels to ensure reporting for routine surveillance, monitoring and evaluation of programmes will be necessary. Ideally, reporting would be coordinated for the various health-care programmes so as not to overburden the health-care workers.

Monitoring and evaluation

The establishment and/or improvement of existing monitoring systems will be needed, with regular evaluation of programme interventions.

8.4.2 Health-service level

At the health-service level there will need to be improvement in, and operationalization and supervision of, the following activities:

- introduction of interventions and support for activities;
- improved attendance for maternal and newborn care;
- case-finding;
- laboratory tests;
- treatment;
- counselling during and after pregnancy and delivery to prevent the consequences of syphilis;
- working with community health-workers and traditional birth attendants to follow up on women who did not receive antenatal or obstetric care;
- provision of effective care for newborns to minimize the effects of congenital syphilis;
- training.

8.4.3 Community level

At the community level, there will be a need to apply behavioural change communication for:

- primary prevention of syphilis and other sexually transmitted infections;
- encouraging early antenatal care-seeking for pregnant women;
- community advocacy and information to raise the profile and understanding of the disease and its consequences;
- ensuring equity in access to antenatal care for all pregnant women;
- ensuring support to women found to be infected, and promotion of the importance of partner treatment;
- programmes to reduce the stigma and discrimination associated with a positive diagnosis of syphilis.

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Annex 1. Tests for adult and congenital syphilis

Table A1.1 Characteristics of syphilis tests[a]

	For patients presenting with an ulcer or other lesion			For screening					
				Non-treponemal tests		Treponemal tests			
	Dark-field microscopy	Antigen detection (DFA-TP)	DNA detection (PCR and RT PCR)	RPR	VDRL	Rapid test	EIA	TPHA/TPPA	FTA-ABS
Sensitivity	74–86%	73–100%	91%	86–100%	78–100%	84–98%	82–100%	85–100%	70–100%
Specificity	85–97%	89–100%	99%	93–98%	98–100%	94–98%	97–100%	98–100%	94–100%
Ease of use	easy	moderate	complex	easy	easy	easy	moderate	complex	complex
Level of use	examination room, on-site laboratory	intermediate or referral laboratory	referral laboratory	examination room, on-site laboratory	examination room, on-site laboratory	examination room, on-site laboratory	intermediate or referral laboratory	referral laboratory	referral laboratory
Equipment	light microscope with dark-field condenser	fluorescence microscope	microfuge, thermal cycler, incubator, microwell plate reader	rotator	light microscope	none	incubator, microwell plate washer and reader	incubator, microwell plate washer and reader	fluorescence microscope
Training	extensive	moderate	extensive	minimal	minimal	minimal	moderate	extensive	extensive
Average cost	US$ 0.40	US$ 3	US$ 14 (includes detection of *Haemophilus ducreyi* and herpes simplex virus)	US$ 0.50	US$ 0.50	US$0.55–3.0	US$ 3	US$ 3	US$ 3
Comments	Specificity may be compromised by presence of debris or endogenous treponemes		RT–PCR is 100x more sensitive than DNA PCR, but neither can distinguish between *T. pallidum* and *T. pertenue*	Most RPR reagents require refrigeration	Reagents require refrigeration	Most tests can be stored at room temperature for 9–18 months	Allows high throughput screening	Confirmatory test; does not distinguish between past treated and active infection	Confirmatory test; Does not distinguish between past treated and active infection

[a]DFA-TP: direct fluorescent antibody test for Treponema pallidum; RPR: rapid plasma reagin test; VDRL: Venereal Diseases Research Laboratory test; EIA: enzyme immunoassay; TPHA/TPPA = Treponema pallidum haemagglutination assay/Treponema pallidum particle agglutination assay; FTA-ABS: fluorescent treponemal antibody-absorption test. PCR = polymerase chain reaction; RT PCR: real time PCR.

Table A1.2 Diagnosis of congenital syphilis[a]

Surveillance definition	Test[b]	Level of laboratory	Comments
Infant antibody level 4 times higher than maternal antibody level	RPR	local or regional	Low sensitivity (<30%), treatment may diminish antibody response
IgM antibody in serum or cerebral spinal fluid	EIA or immunoblot	regional or reference	Performance satisfactory for symptomatic infants; unknown performance for asymptomatic infants; false-positive results may be due to rheumatoid factor or cross-reaction with other treponemes
Direct detection of *T. pallidum* in lesions, tissues or secretions	Dark-field microscopy	regional	Dark-field sensitivity diminished if lesion wiped with antiseptic; all tests affected by age of lesion and treatment
	DFA-TP	regional	
	PCR	reference	

[a] RPR: rapid plasma reagin test; DFA-TP: direct fluorescent antibody test for *Treponema pallidum*; EIA: enzyme immunoassay, PCR: Polymerase Chain Reaction.

[b] Negative test results do not exclude disease.

Table A1.3 Tools for the prevention and control of maternal and congenital syphilis in different settings[a]

	Diagnosis/screening tests			Surveillance	
	Local	Regional laboratory	Reference laboratory	Sentinel sites	Reference laboratory
Maternal syphilis					
Symptomatic	None	Darkfield microscopy; DFA-TP	Molecular tests such as PRC	Dark-field microscopy DFA-TP	Molecular tests
Asymptomatic	RPR Rapid treponemal tests	RPR/VDRL EIA Rapid treponemal tests	RPR/VDRL EIA TPHA/TPPA FTA-ABS Immunoblotting	RPR/VDRL Rapid treponemal tests EIA	EIA TPHA/TPPA FTA-ABS
Congenital syphilis[b]					
Symptomatic	None	Dark field microscopy DFA-TP	Molecular tests such as PRC	Dark-field microscopy DFA-TP	Molecular tests
Asymptomatic[c]	None	RPR/VDRL IgM antibody detection by EIA	RPR/VDRL IgM antibody detection by EIA	RPR/VDRL Rapid treponemal tests EIA	IgM antibody detection by EIA

[a] DFA-TP: direct fluorescent antibody test for *Treponema pallidum*; RPR: rapid plasma reagin test; VDRL: Venereal Diseases Research Laboratory test; EIA: enzyme immunoassay; TPHA/TPPA: *Treponema pallidum* haemagglutination assay/*Treponema pallidum* particle agglutination assay; FTA-ABS: fluorescent treponemal antibody-absorption test; PRC: polymerase chain reaction.

[b] The lack of sensitive and specific tests for diagnosis of congenital syphilis means that all infants born to mothers with syphilis should be treated.

[c] Serodiagnosis of an infant born to an infected mother reactive in treponemal tests is not recommended, because of passive transfer of IgG antibody through the placenta. Suspected congenital syphilis can be confirmed by an RPR titre in the infant more than four times the maternal titre; however, a negative result does not exclude syphilis in the infant.

Annex 2a. Standard for prevention of mother-to-child transmission of syphilis [a]

1. Prevention of mother-to-child transmission of syphilis

The standard

All pregnant women should be screened for syphilis at the first antenatal care (ANC) visit within the first trimester and again in late pregnancy. At delivery, women who for some reason do not have test results should be tested/retested. Women testing positive should be treated and informed of the importance of being tested for HIV infection. Their partners should also be treated and plans should be made to treat their infants at birth.

Aim

To reduce maternal morbidity, fetal loss and neonatal mortality and morbidity due to syphilis.

Requirements

- A national policy and locally adapted guidelines on syphilis prevention, management and care in pregnant women are available and are correctly implemented.
- All women have access to care during pregnancy, childbirth and the postpartum period.
- Health-care providers are competent in syphilis prevention, screening during pregnancy, treatment of seropositive pregnant women and their partners, prophylaxis and treatment in the newborn, counselling on STI prevention, and how to prevent reinfection during pregnancy by promoting condom use.
- One on-site screening method is available in ANC clinics and maternity wards.
- Supplies for testing for syphilis are available at both ANC and laboratory facilities at all levels of the health system.
- Laboratory centres and facilities to ensure the quality of laboratory testing for syphilis throughout the health system are available.
- Penicillin is available in ANC clinics, maternity wards and postnatal clinics.
- A functioning referral system is available that ensures that pregnant women who are allergic to penicillin can be referred for treatment to a higher level of care.
- An effective syphilis monitoring and information system is available for pregnant women.
- Health education activities are carried out to raise the awareness of individuals, families and communities of the importance of attending ANC clinics early in pregnancy for syphilis prevention and treatment.

Applying the standard

To apply the standard, providers of maternal and neonatal health care, in particular skilled attendants, must perform the following tasks.

- Screen all pregnant women for syphilis with on-site rapid plasma reagin (RPR) or another rapid test at the first antenatal visit. Screening should be done preferably before 16 weeks of gestation to prevent congenital infection, and again in the third trimester.
- Review syphilis test results at subsequent visits and at time of delivery. If the woman was not tested during pregnancy, syphilis screening should be offered after delivery.
- Treat all seroreactive women with benzathine benzylpenicillin at the recommended dosage of at least 2.4 million IU intramuscularly as a single dose, after having excluded allergy to penicillin. In the case of allergy to penicillin, the attendant should desensitize and treat with penicillin if trained to do so, or refer the patient to a higher level of care.

[a] *Standards for maternal and newborn care.* Web site of the WHO Department of Making Pregnancy Safer: http://www.who.int/making_pregnancy_safer/publications/standards/en/index.html

- Advise women who test positive that their partner(s) must also be treated with the same regimen, as well as the baby as soon as possible after birth.
- Advise women who test negative how to remain free from syphilis by promoting condom use during pregnancy.
- Test for syphilis all women with a history of adverse pregnancy outcome (abortion, stillbirth, syphilitic infant, etc.) and treat accordingly.
- Treat women with clinical disease or a history of exposure to a person with infectious syphilis.
- Screen all women with syphilis for other sexually transmitted infections, including HIV, and provide counselling and treatment accordingly.
- Offer voluntary counselling and testing of HIV to all women who screen positive for syphilis.
- Make plans for treating the baby at birth.
- Record testing results and treatment in the facility's logbook and in the woman's ANC card.

Audit

Input indicators

- A national policy and locally adapted guidelines on syphilis prevention, management and care in pregnant women are available and are correctly implemented.
- Proportion of health facilities providing ANC that have available adequate supplies to offer onsite screening tests for syphilis.
- The availability of supplies for performing screening tests for syphilis in primary level health facilities.
- The availability of penicillin at the primary level health facilities (including ANC and childbirth care).
- Health-care providers know when and how to perform the RPR test or VDRL (Venereal Disease Research Laboratory) test or the test which is available in the facility.
- Health-care providers know when and how to treat or refer women and their infants with syphilis.

Process and output indicators

- Coverage of RPR testing (or another test used) in pregnant women receiving ANC.
- Coverage of provision of correct treatment to pregnant women receiving ANC.
- Coverage of partners tested and treated accordingly.
- Coverage of provision of prophylactic treatment to asymptomatic babies born to mothers who tested positive for syphilis.

Outcome indicators

- Incidence of congenital syphilis.
- Perinatal and neonatal mortality and morbidity due to congenital syphilis.
- Stillbirth rate.

Rationale

Burden of suffering

Syphilis is a chronic, often latent infection with some clinically recognizable stages. Where the disease is prevalent most cases may be asymptomatic. Although estimates vary, at least 50% of women with acute syphilis suffer adverse pregnancy outcomes. The adverse pregnancy outcomes are estimated to be distributed as follow: 50% are stillbirths or spontaneous abortion, and 50% perinatal death, serious neonatal infection or low birth weight. Mortality in infected infants can be higher than 10% (1).

The more recent the maternal infection, the more likely the infant will be affected (2). Transmission occurs more commonly in the last two trimesters, but the spirochete can cross the placenta at any time during pregnancy (2). Clinical similarity with other congenital diseases and the limitations of diagnostic tests make it difficult to arrive at an early diagnosis in the newborn (1).

Efficacy and effectiveness

Syphilis control in pregnant women through universal antenatal screening and treatment of positive cases has been established as a feasible and cost-effective intervention (3,4), especially owing to the high direct and indirect cost of complications of syphilis in pregnancy (5) and the availability of cheap and effective therapy (6–8). Nevertheless, in low-income countries a number of technical, logistical and structural constraints make case detection and treatment through antenatal screening difficult (4,9), resulting in avoidable perinatal mortality (10,11).

Non-treponemal tests such as RPR and VDRL are helpful indicators of infection and are cheaper and easier to perform than treponemal tests. Their sensitivity increases from primary to secondary syphilis, while their specificity is generally high in the absence of an underlying chronic condition (7); they are therefore useful for follow-up after treatment (6–8,12). Titres in affected persons usually rise with infection and decrease after treatment (7). The on-site RPR test is quick and simple to use, and allows treatment to be given immediately if indicated; this "fast protocol" has proven cost-effective in settings where syphilis prevalence is higher than 0.15% (13). Nevertheless, these tests may give false-negative results in the affected mother or her baby (7,14). RPR and VDRL can also give false-positive results owing to tissue damage from other causes, such as viral infections, vaccinations, intravenal drug abuse and chronic disease (7). Ideally, non-treponemal tests should be confirmed by a treponemal test. Treponemal tests such as the *Treponema pallidum* haemagglutination assay (TPHA) have higher sensitivity and specificity but do not correlate with disease activity, are difficult and costly to conduct, and are thus not recommended for primary health-care facilities (7,15,16). Therefore, the lack of resources and higher prevalence of syphilis in less developed countries justify the treatment of all people testing seropositive with RPR (12).

New treponemal-based tests for syphilis make on-site testing feasible. Simple and effective screening tests for syphilis are now available, which can even be used at the lowest levels of health-service delivery. A simple strip of paper, impregnated with treponemal antigen, is used to test blood obtained by finger prick. Results are available in just a few minutes. These point-of-care diagnostic tests are accurate, affordable and simple to perform. Unlike earlier diagnostic tests, they do not require access to a laboratory or a refrigerator. In short, the new tests offer a practical alternative to older techniques. These tests have the potential to change the whole approach to syphilis testing even in isolated clinics. Because the results can be available immediately, women can be tested and receive treatment at the same visit. The new tests cost a mere US$ 0.93–1.44 per woman screened (16). Although this is more costly than the previous standard tests, the new tests are in fact more cost-effective, since more women can be tested and treated in a timely manner and hence more cases of congenital syphilis prevented. It is estimated that the new rapid treponemal-based tests cost only US$ 7 for each case of congenital syphilis averted (17).

Adequate penicillin treatment usually ends infectivity within 24–48 hours. A Cochrane review (18) indicates that, while there is no doubt that penicillin is effective in treating syphilis in pregnancy and in preventing congenital syphilis, uncertainty remains about the optimal treatment regimen (dose, duration and preparation) (18). Benzylpenicillin, administered parenterally in a single dose, is the preferred drug for treating pregnant women and prevent mother-to-child transmission of syphilis (6–8,18).

Single dose, however, will not treat latent syphilis in pregnant women. Based on the available evidence, pregnant women with a history of penicillin allergy should be desensitized before treatment with benzylpenicillin (8).

International guidelines recommend that every woman who tests seropositive for syphilis be also tested for HIV infection (8). Although there is no conclusive evidence, it is possible that HIV coinfection alters the predictive value of diagnostic tests (7,8,15). HIV coinfection could increase the possibility of early development of neurosyphilis and could increase the possibility of treatment failure; some guidelines therefore

suggest modifying currently recommended dose regimens in the case of HIV coinfection (6–8) (see also standard 1.2 "Prevention and management of sexually transmitted and reproductive tract infections").

Table 1 below summarizes the evidence from the most relevant studies and Table 2 outlines recommendations from relevant guidelines. The level of evidence is presented using the NICE methodology which applies a coding from 1 (high level) to 4 (low level). For details, see also the *Introduction to the Standards for Maternal and Neonatal Care* and the *Process to develop the Standards for Maternal and Neonatal Care* on http://www.who.int/making_pregnancy_safer/publications/en. For an overview of comprehensive list of evidence, please refer to the reference section of the standard.

Table 1

Study (type and level of evidence)	Population & Setting	Objective & Intervention	Outcomes linked to the standard	Results	Comments
10. Rotchford et al. 2000 **Observational study 2+**	158 pregnant women with syphilis ANC clinical setting; South Africa *Baseline risk* • Syphilis prevalence among pregnant women 9% (8–10%) • Perinatal death in offspring of inadequately treated pregnant women with syphilis 20%	To study the impact on perinatal mortality of inadequate treatment for maternal syphilis despite adequate screening *Definition* • Complete syphilis treatment: three doses of penicillin at weekly intervals (2.4 mega-units of benzathine benzyl-penicillin intramuscularly) • Adequate syphilis treatment: two or more doses of penicillin • Inadequate syphilis treatment: one or no doses of penicillin	Inadequate syphilis treatment Partner notification Partner treatment Perinatal death	32% 77% 26% Adequate vs inadequate treatment NNT[a] 5 (3–13)	Despite effective screening, many pregnant women with syphilis remain inadequately treated, resulting in avoidable perinatal mortality
18. Walker 2004 Most recent substantive amendment March 2001 **Systematic review 1++**	26 studies met the criteria for detailed scrutiny; none of the studies included in the review	To identify the most effective antibiotic regimen for syphilis in pregnant women, with and without concomitant HIV infection		While there is no doubt that penicillin is effective in the treatment of syphilis in pregnancy and in the prevention of congenital syphilis, uncertainty remains about optimum treatment regimens	

[a] NNT = Number needed to treat

Table 2

Study (type and level of evidence)	Title & author/ organization	Contents of the recommendations	Comments
8. CDC 2002 **Guideline 4**	Sexually transmitted diseases treatment guidelines Centres for Disease Control and Prevention, United States	All patients who have syphilis should be tested for HIV infection. Coinfection with HIV can increase the risk of neurological complication and the risk of treatment failure with currently recommended regimens. All women should be screened serologically for syphilis at the first prenatal visit. In setting of high syphilis prevalence, serological testing should be performed twice during the third trimester. **Parenteral penicillin G is the only therapy with documented efficacy for syphilis during pregnancy.** Based on available evidence, pregnant women who have a history of penicillin allergy should be desensitized and treated with penicillin	Parenteral benzylpenicillin has been used effectively for syphilis treatment and prevention for more than 50 years; nevertheless, no comparative trials have been adequately conducted to guide the selection of an optimal regimen (dose, duration and preparation)

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Annex 2b. Standard for preventive treatment and care of congenital syphilis in the newborn

The standard

All asymptomatic infants born to seropositive women should receive at birth a prophylactic single dose of benzathine penicillin. Newborn infants showing any clinical sign of congenital syphilis should be treated with penicillin crystalline or procaine for 10 days. Any suspected case of congenital syphilis should be confirmed by testing the mother.

Aim

To reduce neonatal mortality and morbidity due to congenital syphilis.

Requirements

- A national policy and locally adapted guidelines on prevention and management of congenital syphilis are available and are being correctly implemented.
- All women and families have access to maternal and neonatal care services.
- Health-care providers attending women and newborn infants throughout pregnancy, childbirth and the postnatal period are competent in: syphilis prevention and screening during pregnancy; treatment of seropositive pregnant women and their partners; detecting clinical signs of congenital syphilis and indications for prophylaxis and treatment in the newborn; counselling on prevention of sexually transmitted infections (STIs); and prevention of reinfection during pregnancy by promoting condom use.
- Equipment and supplies to perform testing are available at all levels of the health-care system
- Penicillin is available at all levels of the health-care system.
- A functioning referral system is in place to ensure any necessary referral of infants with congenital syphilis to a centre offering special care.
- A referral unit is available and accessible, where special care for congenital syphilis can be provided.
- Effective monitoring and information system for syphilis is available.
- Health education activities are implemented to increase the awareness individuals, families and communities of the importance of being tested for syphilis during pregnancy, having delivery with the support of a skilled attendant and being followed-up in the postnatal period for the prevention and treatment of neonatal syphilis, and STIs in general, including HIV.

Applying the standard

Skilled attendants and other health-care providers assisting women and their newborns at birth and in the postnatal period must perform the following tasks.

1. Check the antenatal care (ANC) card of all women giving birth and test and treat the woman as required (see standard on *Prevention of mother to child transmission of syphilis*).
2. Examine carefully the newborn of any mother who tested positive for syphilis at any time during her pregnancy or at delivery to exclude signs of congenital syphilis.
3. Administer intramuscularly benzathine penicillin G 50 000 units/kg of body weight, single dose, to asymptomatic infants of women who have tested positive for syphilis.
4. In symptomatic babies confirm the diagnosis by testing the mother with a rapid test.
5. Administer intramuscularly the first dose of aqueous crystalline penicillin 50 000 units/kg of body weight or procaine penicillin G 50 000 units/kg of body weight intramuscularly to symptomatic babies whose mothers have tested positive for syphilis and refer them for treatment to a special care unit to receive 10 days of treatment.
6. Provide information to the woman on the importance of treating the newborn, herself and her partner.

7. Provide information on STI prevention and on voluntary counselling and testing for HIV.

8. Record the treatment and the referral given on the ANC card and in the health facility logbook.

Audit

Input indicators

- National policy and locally adapted guidelines on the prevention and treatment of congenital syphilis are available in health-care facilities and are being correctly implemented.
- Drugs and supplies for the treatment of adults and infants are available in health-care facilities.

Process and output indicators

- The proportion of asymptomatic newborns whose mother tested positive for syphilis who were properly treated with a single dose of penicillin.
- The proportion of symptomatic newborns referred for treatment of congenital syphilis.
- The proportion of symptomatic newborns correctly treated with 10 days' course of penicillin.

Outcome indicators

- Reduced incidence of congenital syphilis.
- Reduced neonatal and infant mortality due to syphilis.
- Reduced neonatal and infant morbidity due to syphilis.

Rationale

Burden of suffering

WHO estimates that each year as a result of maternal syphilis there are at least 500 000 miscarriages or stillbirths, and 500 000 babies born prematurely, with congenital syphilis, or with low birth weight (1). Although estimates vary, at least 50% of women with acute syphilis suffer adverse pregnancy outcomes, which are estimated to be distributed as follow: 50% of pregnancies end in stillbirth or a spontaneous abortion, and 50% in perinatal death, serious neonatal infection or low birth weight (1). Even after treatment, women who have syphilis during pregnancy still have a 2.5-fold higher risk of adverse outcomes compared with uninfected women (2). Fetal infection usually occurs through placenta transfer or at delivery (3).

Congenital syphilis may be asymptomatic, especially in the first weeks of life, in about 50% of cases (4). Usually it becomes symptomatic in the first months of life, but its clinical manifestation may be delayed until the second year of life (4). The most frequent clinical signs of congenital syphilis at birth are hepatosplenomegaly, abnormal face, oedema, abdominal distension, pallor, skin lesions, fever and low birth weight (4,5). Reported case fatality rates for symptomatic congenital syphilis in Africa vary between 15% in Mozambique and 38% in South Africa (4,5).

The major factors contributing to congenital syphilis are lack of antenatal care, not screening pregnant women, negative test in the first trimester and test not being repeated, delayed treatment or failure of antenatal treatment (6).

Efficacy and effectiveness

There is general agreement on the need to examine carefully all infants born to seropositive mothers for evidence of congenital syphilis, and evaluate them where possible with a quantitative non-treponemal serological test (RPR or VDRL) (2). However, it should be noted that the efficacy and effectiveness of this approach in less developed countries is still open to question.

Making a clinical diagnosis of congenital syphilis at birth is difficult because the disease is clinically similar to other congenital infections and the available serological tests have limitations (5). In up to 45% of newborns with congenital syphilis the only indications for the clinician are maternal history of syphilis and non-specific signs in the infant such as fever, low birth weight or skin lesions (5).

Testing of all asymptomatic infants born to women who test positive for syphilis aims for early detection and treatment of the disease, and this approach is followed in developed

countries (7). However, if a woman becomes infected with syphilis late in pregnancy, her newborn may not test positive with available serological tests. Also, newborns can have a false-positive result because of transfer of maternal antibodies to them. These difficulties with diagnosis and the common logistic problems found in resource-poor settings can potentially seriously affect implementation of congenital syphilis prevention programmes in less developed countries.

One study has shown that a single dose of benzathine penicillin prevents syphilis in asymptomatic high-risk infants (whose mothers had VDRL titres $\geq$ 1:32, but who had not been treated) (8). Another study compared a single dose of benzathine penicillin with a 10-day course of procaine penicillin to treat asymptomatic congenital syphilis and found no difference between the two regimens (9). Thus, in resource-poor settings, the use of a single dose of benzathine penicillin 50 000 units/kg of body weight, independently of maternal treatment and without additional diagnostic tests, is an acceptable and perhaps a preferred option (4).

In symptomatic infants the recommended treatment is aqueous crystalline penicillin G 100 000–150 000 units/kg of body weight per day, intramuscularly or intravenously, or benzathine penicillin G 50 000 units/kg of body weight intramuscularly per day for 10 days (4). If more than one day of treatment is missed, the entire course should be restarted. Data are insufficient to recommend the use of other antimicrobial agents.

The availability of drugs and the ability to administer them remains a major constraint in implementing these recommendations. To be successful, public health strategies aimed at reducing the burden of congenital syphilis require increasing coverage of antenatal care, early identification and treatment in pregnancy, identification and treatment of partners, modification of high-risk behaviours and promotion of access to and use of health care.

See also the standard on *Prevention of mother to child transmission of syphilis.*

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Links and additional sources

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Annex 3. Targets and indicators

Recognizing the importance of the prevention and control of STIs and their complications, including elimination of congenital syphilis, the 59th World Health Assembly, in May 2006, adopted a strategy for the prevention and control of sexually transmitted infections.[a] This global strategy provides a framework for countries to improve and accelerate their national STI programmes and ensure that they are well integrated and linked with other sexual and reproductive health services such as those for family planning and maternal health, including actionable interventions for the control of congenital syphilis.

In the global strategy for the prevention and control of STI, the following key indicators and national targets are recommended:

Targets:

(i) > 90% of first antenatal care attendees aged 15–24 years screened for syphilis;
(ii) > 90% of syphilis-seropositive women treated adequately by 2015.

Indicator:

Proportion of pregnant women aged 15–24 years with a positive serology for syphilis attending antenatal care clinics.

However, **other examples of possible targets and indicators to monitor elimination of congenital syphilis are given below**; the final list adopted by any particular country will depend on its specific situation.

Coverage, uptake and screening

Target:

>90% of pregnant women attended by skilled health personnel before 12 weeks of gestation.

Indicator:

Proportion of pregnant women attended by skilled health personnel before 12 weeks of gestation (number of pregnant women attended by skilled health personnel before 12 weeks of gestation/total number of pregnant women attended by skilled health personnel).

Target:

>90% of pregnant women attended by skilled health personnel during pregnancy screened for syphilis.

Indicator:

Proportion of pregnant women attended by skilled health personnel screened for syphilis (number of pregnant women attended by skilled health personnel screened for syphilis/total number of women attended by skilled health personnel).

Target:

All (100%) seropositive pregnant women attended by skilled health personnel during pregnancy treated appropriately.[b]

Indicator:

Proportion of seropositive pregnant women who are appropriately treated (number of pregnant women attended by skilled health personnel screened for syphilis, with a positive serology for syphilis and treated appropriately/total number of pregnant women attended by skilled health personnel whose blood has been screened for syphilis, with a positive serology for syphilis).

Target:

>80% of partners of infected pregnant women identified and treated with at least one dose of benzathine benzylpenicillin.

Indicator:

Proportion of partners of infected pregnant women treated (number of pregnant women with a positive syphilis serology and treated appropriately whose partners are identified and treated/number of pregnant women with a positive syphilis serology and treated appropriately).

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[a] http://www.who.int/gb/ebwha/pdf_files/WHA59/A59_11-en.pdf

[b] "Treated appropriately" means receiving at least one dose of benzathine benzylpenicillin or alternative treatment.

Target:

All (100%) pregnant women whose delivery was attended by skilled health personnel and who were never tested for syphilis during pregnancy, screened for syphilis.

Indicator:

Proportion of pregnant women not tested for syphilis during pregnancy but screened for syphilis at delivery (number of women not screened for syphilis during pregnancy but screened at delivery/total number of births to women not screened for syphilis during pregnancy and attended by skilled health personnel).

Target:

All (100%) infants born to women testing positive for syphilis treated with at least one dose of benzathine benzylpenicillin.

Indicator:

Proportion of infants treated with at least one dose of benzathine benzyl penicillin who were born to seroreactive pregnant women (number of newborns born treated who were born to seroreactive pregnant women /total number of live births to seroreactive pregnant women).

Summary process indicator

A summary process indicator could be the proportion of the estimated syphilis-positive pregnant women (nationwide) who are screened and treated with at least one dose of penicillin by 24 weeks of gestation.

Outcome and impact targets and indicators

Because of the problems of diagnosis (of old infections, treated infections, tertiary syphilis, congenital syphilis in newborns, etc.) outcome and impact indicators are difficult to define. At present no reliable impact indicators are available and operational research is needed to develop and validate indicators.

Process targets and indicators

Target:

Development of a national strategy for the elimination of congenital syphilis that includes plans for the following (which will serve as *indicators*):

- making available general guidelines and training materials;
- making available adequate tests (equipment and supplies) and medications;
- implementation of a system for monitoring and evaluation.