


NOTIFICATIONS OF SYPHILIS CASES AND THEIR IMPACTS ON EPIDEMIOLOGICAL SURVEILLANCE AND DISEASE CONTROL SYSTEMS IN BRAZIL: AN INTEGRATIVE REVIEW

 <https://doi.org/10.56238/arev6n4-010>

Submitted on: 02/11/2024

Publication date: 02/12/2024

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ABSTRACT

Introduction: Syphilis is a sexually transmitted infection (STI) caused by the bacterium *Treponema pallidum*, which represents a significant public health problem at a global level. Failure to detect syphilis early and properly treat it can lead to serious complications, including stillbirth and neonatal death, as well as the continued spread of infection in the general population. Objective: To investigate the fundamentals of the inaccuracy of syphilis case notifications in epidemiological surveillance systems and its consequences for the control and prevention of the disease in Brazil. Methodology: This is an integrative literature review on possible gaps in syphilis case notifications and their impacts on

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epidemiological surveillance and disease control systems in Brazil. Results and Discussion: From the descriptors selected for the development of the present research, there were 26 selected articles, of which 16 were included in the research. Compulsory notification of syphilis in Brazil is a mandatory process, established by the Ministry of Health, with the objective of tracking and controlling the infection. The notification of syphilis cases in Brazil is carried out through the Notifiable Diseases Information System (SINAN), and is crucial for the control of syphilis. The increasing complexity in filling out notification forms and the difficulty in accessing essential information contribute to incomplete records, increasing the underreporting of cases of congenital syphilis. This aggravates the situation, since accurate data is essential for the formulation of efficient health policies. The low training of the professionals responsible for notifications is a crucial point, as it negatively affects the scenario of the disease. Final considerations: This study highlights the need to improve the notification and treatment of syphilis in Brazil, especially to prevent congenital syphilis. Despite the advances, gaps in training and records compromise epidemiological surveillance. Investments in training and rapid testing, along with awareness campaigns, are essential to improve the response and reduce complications.

Keywords: Syphilis. Disease Notification. Underreporting. Notifiable Diseases Information Systems.

INTRODUCTION

Syphilis is a sexually transmitted infection (STI) caused by the bacterium *Treponema pallidum*, which represents a significant public health problem at the global level.

According to the World Health Organization (WHO), it is estimated that about 6 million new cases of syphilis occur annually worldwide, mainly affecting vulnerable populations, such as pregnant women and newborns. Failure to detect syphilis early and properly treat it can lead to serious complications, including stillbirth and neonatal death, as well as the continued spread of infection in the general population. (SECRETARIAT OF HEALTH SURVEILLANCE, MINISTRY OF HEALTH, 2023)

The diagnosis of syphilis is carried out through direct laboratory and immunological tests. Direct testing includes research of the *T. Pallidum* in samples collected from active lesions, while immunological tests are widely used and are based on the detection of specific antibodies in the blood. These can be divided into treponemal (TT) and non-treponemal (NTT) tests. The rapid tests (TT) used in basic health units detect anti-virus antibodies. *Treponema pallidum* in the blood and bring significant advantages to the management of syphilis, especially in pregnant women, where rapid diagnosis is essential to prevent congenital syphilis. (DOMINGUES et al., 2021a)

According to the World Health Organization (WHO), it is estimated that about 6 million new cases of syphilis occur annually worldwide, mainly affecting vulnerable populations, such as pregnant women and newborns. Failure to detect syphilis early and properly treat syphilis can lead to serious complications, including stillbirth and neonatal death, as well as the continued spread of infection in the general population (WORLD HEALTH ORGANIZATION, 2016). Emphasizing that syphilis is an STI of compulsory notification for all countries that are members of the World Health Organization (WHO), always with the necessary investigation of each notified case, as determined by article 11 of Law No. 6,259, of October 30, 1975. (BRAZIL; CIVIL HOUSE, 1975).

Compulsory notification of congenital syphilis was instituted in Brazil through Ordinance No. 542, of December 22, 1986; that of syphilis in pregnant women, by Ordinance No. 33, of July 14, 2005; and, finally, acquired syphilis, through Ordinance No. 2,472, of August 31, 2010. Currently, the ordinance that defines the National List of Compulsory Notification of diseases, injuries and public health events in public and private health services throughout the national territory and provides other measures is GM/MS No. 5,201, of August 15, 2024. In 2017, with the publication of Informative Note No. 02-

SEI/2017 – DIAHV/SVS/MS, the criteria for defining cases of acquired syphilis, syphilis in pregnant women, and congenital syphilis were revised and updated, becoming more specific, in accordance with the guidelines of the Pan American Health Organization (PAHO) (SECRETARIAT OF HEALTH SURVEILLANCE, MINISTRY OF HEALTH, 2023). Compulsory notification is a duty of citizens and mandatory for doctors, other health professionals or those responsible for public and private health services, who provide care to patients, in accordance with article 8 of Law No. 6,259, of October 30, 1975.(BRAZIL; CIVIL HOUSE, 1975).

In Brazil, syphilis has shown a worrying increase in recent years. Data from the Ministry of Health reveal that, between 2010 and 2020, there was a growth of more than 400% in the number of reported cases of acquired, congenital and pregnant syphilis. This increase can be attributed to several factors, including the expansion of diagnostic campaigns, improvements in reporting systems, and a possible real increase in the incidence of the disease. However, despite the advances, significant gaps in notifications persist, compromising the accuracy of epidemiological data and, consequently, the effectiveness of control and prevention strategies. (MINISTRY OF HEALTH, 2021; SECRETARIAT OF HEALTH SURVEILLANCE, MINISTRY OF HEALTH, 2023).

In the state of Mato Grosso do Sul, the syphilis situation reflects the national trend, with a growing notification of cases. According to data from the Notifiable Diseases Information System (SINAN), there was a significant increase in cases of acquired syphilis in the state between 2021 and 2022, with 2,366 and 2,979 cases respectively. States in the other 4 regions of Brazil also have an upward trend, in São Paulo, cases jumped from 41,167 in 2021 to 52,551 in 2022. In Paraná, cases increased from 8,293 in 2021 to 12,048 in 2022, while in Bahia cases rose from 7,711 in 2021 to 9,143 in 2022. In the northern region, Amazonas had an increase from 4,552 to 5,210 cases of acquired syphilis. Given the above, **Such numbers do not simply indicate the expansion of the infection, but also highlight possible failures in the notification and follow-up of cases, which are crucial for controlling the disease** (SECRETARIAT OF HEALTH SURVEILLANCE, MINISTRY OF HEALTH, 2023).

Regarding congenital syphilis, a condition that can be prevented with early diagnosis and treatment during pregnancy, in practically all the states mentioned above there was a significant increase in cases between 2021 and 2022, suggesting diagnostic failures and the existence of underreporting and inconsistencies in records, highlighting the need for an

in-depth investigation into the factors that contribute to these gaps (SECRETARIAT OF HEALTH SURVEILLANCE, MINISTRY OF HEALTH, 2023).

In addition, the underreporting of cases may mask the real dimension of the syphilis problem. When a patient tests positive for syphilis, it is vital to dedicate quality time to clarify doubts, make necessary referrals, record the evolution and notify the case. With the high demand, health professionals may postpone or even fail to make the notification. This failure to transfer information can compromise the continuity of care, both in primary and secondary care.

The general objective of this study is to investigate the fundamentals of the inaccuracy of syphilis case notifications in epidemiological surveillance systems and its consequences for the control and prevention of the disease in Brazil. Analyzing the methods and systems of syphilis notification in Brazil, verifying the consequences of the imprecision of notifications and identifying the gaps for the full notification of syphilis cases in Brazil.

Understanding the factors that influence the quality of notifications is essential for the development of more effective health policies and for the implementation of control actions that can reduce the incidence and complications of syphilis in the country. From this perspective, the following questions trigger the research are: What are the possible gaps in the notifications of syphilis cases in Brazil? And how do these possible gaps impact the epidemiological surveillance and disease control systems in Brazil?

METHODOLOGY

This is an integrative literature review research on possible gaps in syphilis case notifications and their impacts on epidemiological surveillance and disease control systems in Brazil. The integrative review determines the current knowledge on a specific theme, since it is conducted in order to identify, analyze and synthesize the results of studies, contributing to a possible beneficial repercussion on the quality of care provided to the individual. In addition, it is important to consider that the impact of its use is not only due to the development of policies, procedures and protocols, but is also reflected in the critical thinking that daily practice requires (SOUZA; SILVA; CARVALHO, 2010)

The research was divided into 3 subsequent stages, where the objective was to achieve the objectives and answer the triggering questions. In stage 1, the literature was

surveyed using the PubMed and Scielo databases. Using the following descriptors: Brazil, Syphilis, World Health Organization and Epidemiology published in English or Portuguese.

Step 2 will be summarized in the selection of articles and application of the inclusion and exclusion criteria. As inclusion criteria, articles published between the years 2019 and 2024, which address the descriptors mentioned in step 1 and which are written in English or Portuguese. As exclusion criteria, articles published before 2019, which do not address the descriptors of stage 1 and which are not published in English or Portuguese

And finally, step 3 will be summarized in the synthesis and analysis of the results in a qualitative way. The development of this stage occurred through tables of presentation of the results, considering the significant findings for the conclusion of the research, seeking to understand the possible gaps in the notifications of syphilis cases and their impacts on the epidemiological surveillance and disease control systems in Brazil.

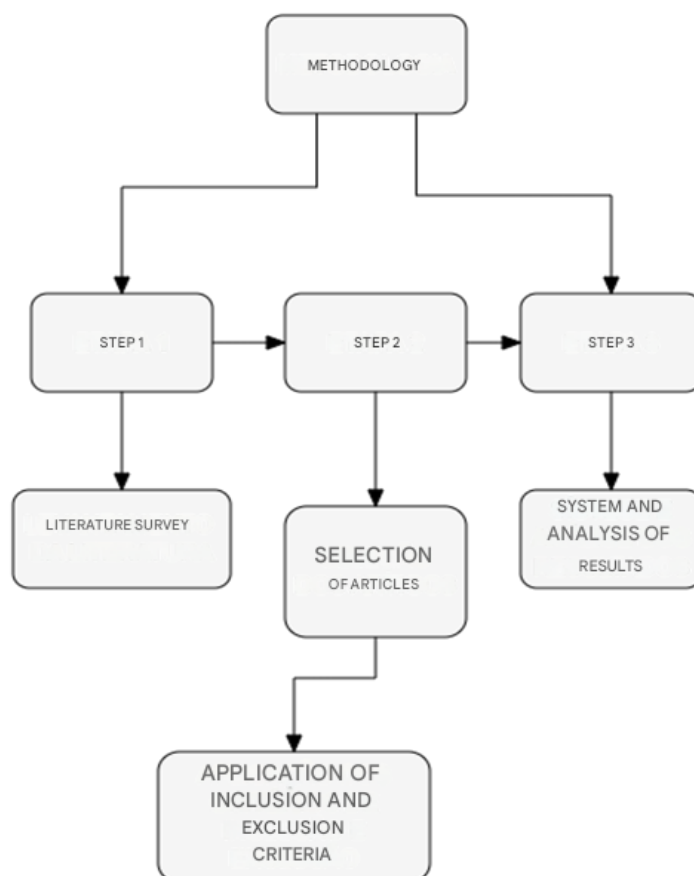


Figure (1) Methodology Diagram

RESULTS

From the descriptors selected for the development of the present research, there were 26 selected articles, where they passed the inclusion and exclusion criteria to be considered in the research.

Table 1 - Articles Excluded from the Research

Article Title	Anus
The magnitude of syphilis: from prevalence to vertical transmission	2017
Prevalence of syphilis in pregnancy and prenatal syphilis testing in Brazil: birth in Brazil study	2014
Ophthalmic manifestations og congenital Zika syndrome in Colombia and Venezuela	2017
Transitioning from antenatal surveillance surveys to routine HIV testing: a turning point in the mother-to-child transmission prevention programme for HIV surveillance in Brazil	2017
Congenital syphilis in Switzerland: a maker of inequality? A mini-review	2023
Systematic review of prevalence and risk factors of transfusion transmissible infections among blood donors, and blood safety improvements in Southern Africa	2023
Quality of life, depressive symptoms, anxiety, and sexual function in mothers of neonates with congenital syphilis in the Northeast Brazil: a cohort study	2021
Phase II trial evaluating the clinical efficacy of cefixime for treatment of active syphilis in non-pregnant women in Brazil (CeBra)	2020
Hepatitis B and C prevalence and risk factors among young men presenting to the Brazilian Army: A STROBE-compliant national survey-based cross-sectional observational study	2019

Table 2 - Articles Included in the Research

Article Title	Year of Publication
Brazilian Protocol for Sexually Transmitted Infections, 2020: congenital syphilis and child exposed to syphilis	2021
Syphilis in the state of São Paulo, Brazil, 2011–2017	2020
Burden of syphilis in Brazil and federated units, 1990-2016: estimates from the Global Burden of Disease Study 2019	2022
Prevalence of syphilis and sexual behavior and practices among adolescents MSM and TrTGW in a Brazilian multi-center cohort for daily use of PrEP	2023
Public policies on sexually transmitted infections in Brazil	2021
Gestational and congenital syphilis: gaps to be elucidated	2023
Detection of gestational and congenital syphilis in Paraná state, Brazil, 2007-2021: a time series analysis	2024
Temporal evolution and characterization of congenital syphilis cases in Minas Gerais, Brazil, 2007-2015	2020
Fetal and infant mortality of congenital syphilis reported to the Health Information System	2019
Brazilian Protocol for Sexually Transmitted Infections 2020: epidemiological surveillance	2021

Reemerging diseases in Brazil: sociodemographic and epidemiological characteristics of syphilis and its under-reporting	2019
Diagnosis, treatment and notification of syphilis during pregnancy in Goiás, from 2007 to 2017	2021
Spatiotemporal distribution analysis of syphilis in Brazil: Cases of congenital and syphilis in pregnant women from 2001–2017	2022
Congenital and gestational syphilis in southeastern Brazil	2023
Mortality from congenital syphilis: a systematic review	2023
Underreporting of unfavorable outcomes of congenital syphilis in the Notifiable Diseases Information System in the state of São Paulo, 2007-2018	2023
Congenital syphilis in Paraná and its twin cities: focus on Foz do Iguaçu	2023

DISCUSSION

Compulsory notification of syphilis in Brazil is a mandatory process, established by the Ministry of Health, with the objective of tracking and controlling the infection. Syphilis, especially in its gestational (GS) and congenital (CS) forms, was included among the notifiable diseases due to its great impact on public health and the possibility of prevention through early diagnosis and appropriate treatment. This regulation was formalized by Ordinance No. 33 of 2005, which includes gestational and congenital syphilis as notifiable diseases (DOMINGUES et al., 2021a; MINISTRY OF HEALTH, BRAZIL, 2020).

The notification of syphilis cases in Brazil is carried out through the Notifiable Diseases Information System (SINAN), a digital platform used by health units to register cases of notifiable diseases. Whenever a case of syphilis is detected at any stage of the disease — primary, secondary, latent, or tertiary syphilis — the health team is responsible for filling out the notification form and registering the information in SINAN. In the case of gestational syphilis, notification is mandatory for pregnant women with positive results in treponemal or non-treponemal tests, regardless of clinical symptoms. Congenital syphilis should be reported immediately after the diagnosis of the newborn, either based on laboratory tests or clinical manifestations (DOMINGUES et al., 2021b).

Therefore, compulsory notification is crucial for the control of syphilis, as it allows the health surveillance system to monitor the evolution of the disease in different regions of the country, identify outbreaks, and develop public policies for prevention and treatment. Notification is important to prevent vertical transmission, which can result in miscarriages, stillbirths, or congenital syphilis with complications for the newborn.

However, despite the obligation, Brazil faces significant challenges, such as underreporting and insufficient completion of notification forms, that is, low quality,

inaccuracy in data and underreporting in health information systems, mask the reality of a disease (GARBIN et al., 2019).

The underreporting of cases of congenital syphilis (CS) hides the true situation of the country, making it difficult to develop effective public policies. Insufficient and incomplete records in infant death certificates show the fragility of the information system. It is unacceptable that deaths from CS still occur, considering that the disease is treatable and preventable. (CANTO et al., 2019).

The increasing complexity in filling out notification forms and the difficulty in accessing essential information contribute to incomplete records, increasing the underreporting of cases of congenital syphilis. This aggravates the situation, since accurate data is essential for the formulation of efficient health policies. (OLIVEIRA; OLIVEIRA; ALVES, 2021). Many cases are not properly reported, especially in areas with poor infrastructure and insufficient training of health professionals. This problem results in inaccurate data, which makes it difficult to plan public health interventions and efficiently allocate resources for treatment and prevention (DOMINGUES et al., 2021a).

The failure to fill out the notification forms is analyzed in an article that reveals the lack of technical skills of the professionals for this task. In addition, the topic was not addressed in prenatal consultations, showing the low priority given to notification. This directly interferes with the quality of health care for the population and the decisions of public management (OLIVEIRA; OLIVEIRA; ALVES, 2021). In addition, the underreporting of pregnant women and the lack of adequate treatment can result in serious consequences, such as abortion, fetal death, and motor, cognitive, neurological, visual, and auditory sequelae (LUCIO et al., 2023)

The low training of the professionals responsible for notifications is a crucial point, as it negatively affects the scenario of the disease. The variations in incidence rates among Brazilian municipalities can be understood as indicative of the occurrence of underreporting of cases of congenital syphilis (CS). Despite being an emerging disease, CS is in an epidemic situation in the country, which prevents clear answers about the effectiveness of diagnoses and treatments performed by health professionals (SILVA et al., 2022).

Acquired syphilis, pregnant syphilis and congenital syphilis are diseases of compulsory notification and must be notified on a specific form, sent to the epidemiological surveillance (MINISTRY OF HEALTH, SECRETARIAT OF HEALTH SURVEILLANCE,

2022). Despite the improvement observed, the notification of cases of syphilis in pregnant women, sexual partners and congenital syphilis in the public health network and supplementary services is still quite initial, underestimating the true occurrence of syphilis in Brazil. Prioritizing public policies that involve health authorities, health managers, and the population in general can change this scenario and improve the fight against syphilis in the country (DOMINGUES et al., 2021a).

A systematic review study states that epidemiological data are essential to sensitize managers in defining congenital syphilis as a priority in public health policies. This evidence highlights the importance of early access to antenatal care, including universal screening for syphilis of all pregnant women in the first trimester of

pregnancy, as well as the immediate and appropriate treatment of maternal syphilis, aiming to prevent the morbidity and infant mortality associated with congenital syphilis. In addition, it is essential to ensure an accessible supply of health services, in order to reduce stillbirth rates, regardless of their specific etiology. (MACIEL et al., 2023)

It was also found that there was underreporting in cases of fetal death due to congenital syphilis in the descriptive study carried out from notifications of cases and deaths due to congenital syphilis in SINAN and SIM (Mortality Information System) in the State of São Paulo, between the years 2007 and 2018. (FESTA et al., 2023)

In a cross-sectional study on the number of cases of congenital syphilis (SC) in the State of Paraná and its twin cities, it observed a decline in notifications in 2020 compared to 2019. However, according to the epidemiological bulletin of syphilis, the trend indicates that the number of cases and the incidence rate will continue to increase. It is noteworthy that this reduction may be associated with the fragility of the data recorded in the investigation forms, as well as the underreporting of information in the system during the typing stage, in addition to underreporting in the Notifiable Diseases Information System (SINAN).(KIRIENCO et al., 2023)

It was also found in another study that several information was absent in many CS reports, and that underreporting of the disease may be associated with incorrect completion of notification forms and lack of information (GARBIN et al., 2019). In fact, the main function of disease notification is to provide a basis for implementing public health policies that promote, protect and control the health of the population. Incomplete notification hinders the development of public policies to implement preventive strategies.

The professionals responsible for filling out the notification forms need to be fully aware of the importance of this task. Errors or omissions can lead to underreporting, resulting in serious problems for the health service and the population. Underreporting is an error directly linked to the service provided by health professionals. Given the large volume of information that needs to be recorded and the non-mandatory nature of some fields, it is easy for professionals to commit this negligence. (ALVES. et al., 2020)

To ensure the quality and standardization of notifications, it is essential that health professionals receive adequate training. However, the literature suggests that, although the Ministry of Health promotes periodic campaigns and training, training is not uniform in all regions of the country. Especially in remote areas, where there is deficient infrastructure, there are greater difficulties in training professionals, which compromises the quality of notifications (DOMINGUES et al., 2021a; TUDDENHAM; GHANEM, 2015).

DOMINGUES et al., 2021a, says that in addition, the high turnover of professionals and the overload of work are factors that contribute to errors and omissions in filling out the forms. Often, critical information, such as laboratory confirmation or treatment details, is not recorded correctly, which hinders the planning of control and prevention actions.

In recent years, Brazil has experienced a significant increase in syphilis cases, which represents a major challenge for public health. Between 2010 and 2018, the number of reported cases of acquired, gestational, and congenital syphilis increased by more than 500%. This increase can be attributed to improvements in surveillance systems, such as SINAN, but it also reflects the increasing vulnerability of certain populations, due to decreased condom use and failures in sex education and prevention programs (LUPPI et al., 2020).

Underreporting and inadequate completion of notification forms are significant obstacles to epidemiological surveillance in Brazil. Many cases, especially of acquired and congenital syphilis, are not properly recorded in SINAN, leading to underestimation of the actual prevalence of the disease. This is exacerbated in regions with limited infrastructure, where access to diagnostic and treatment resources is restricted (ALVES. et al., 2020; BEZERRA et al., 2022).

Not reporting cases of congenital syphilis (CS) can cause serious damage to the population, compromising the actions of the Ministry of Health, such as disease prevention, health promotion and distribution of inputs for diagnosis and treatment. Therefore, it is essential that health professionals are trained to correctly fill out the

notification forms and interpret the syphilis detection tests, thus avoiding the underreporting of CS cases (DOMINGUES et al., 2021b)

Studies also indicate that regional inequalities affect the quality of notifications, with the most remote regions facing considerable difficulties in reporting cases. The lack of uniformity in the data makes the planning of strategies to combat syphilis less effective, in addition to compromising the allocation of resources to the most affected areas (BEZERRA et al., 2022; WESTIN et al., 2023).

Late diagnosis in pregnant women is one of the main causes of the increase in cases of congenital syphilis, a severe form of the infection that could be largely avoided with early diagnosis and appropriate treatment. However, inadequate screening during prenatal care, added to incomplete notification, aggravates the situation (BEZERRA et al., 2022; WESTIN et al., 2023).

These gaps in notifications directly affect public policy planning and the implementation of effective control strategies. Underreporting prevents a clear view of the extent of the epidemic, resulting in inadequate allocation of resources and failures in prevention campaigns (DOMINGUES et al., 2021a; LUPPI et al., 2020).

To address these challenges, it is necessary to invest in continuous training of health professionals, improve the completion of notification forms, and expand the use of rapid tests. Strengthening awareness campaigns on the importance of complete notification and adequate follow-up of pregnant women are crucial to reduce cases of congenital syphilis and improve epidemiological surveillance (BEZERRA et al., 2022; MIRANDA et al., 2021).

In summary, gaps in syphilis notifications in Brazil severely impact the epidemiological surveillance system and require coordinated interventions to improve data collection and follow-up of diagnosed cases.

FINAL CONSIDERATIONS

The evidence gathered in this study highlights the importance of effective approaches to the notification, diagnosis, and treatment of syphilis, with a special focus on the prevention of congenital syphilis, a disease of great impact on public health in Brazil. Despite advances in notification systems and the expansion of diagnostic tests, significant gaps persist, both in the proper completion of notification forms and in the training of health professionals, which contributes to underreporting and data fragility.

Epidemiological surveillance systems depend on complete and accurate records to support public health policies, allocate resources efficiently, and implement preventive actions that reach vulnerable populations, such as pregnant women and newborns. The low quality of notifications, associated with the lack of training and structure in the most remote regions, compromises the national response to syphilis, especially in the context of vertical transmission, which generates direct impacts on child health.

To overcome these challenges, it is essential to continuously invest in the training of health professionals to properly fill out notification forms and use rapid tests in health facilities. In addition, it is essential to strengthen awareness campaigns on the importance of complete notification, universal screening of pregnant women, and early treatment of syphilis cases to interrupt the chain of transmission and avoid the morbidity and infant mortality associated with congenital syphilis.

The analysis of the gaps and challenges in the notification of syphilis in Brazil reveals the need for coordinated actions that promote effective epidemiological surveillance and the execution of control strategies based on solid and reliable data. These measures are essential for the country to be able to face the syphilis epidemic assertively and offer adequate care to pregnant women and the population in general, thus reducing complications and expanding the prevention of congenital syphilis.

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