

Cinthia Lociks de Araújo<sup>I</sup>  
Helena Eri Shimizu<sup>II</sup>  
Artur Iuri Alves de Sousa<sup>III</sup>  
Edgar Merchán Hamann<sup>II</sup>

# Incidence of congenital syphilis in Brazil and its relationship with the Family Health Strategy

---

## ABSTRACT

**OBJECTIVE:** To estimate the incidence of congenital syphilis and identify its relationship with Family Health Strategy coverage.

**METHODS:** An observational ecological study was carried out with both descriptive and analytical components, by two different approaches: one that explores a temporal series (2003 to 2008) and one that focuses on the 2008 data. The secondary data (epidemiological, demographic, and socioeconomic) were obtained from the Department of Informatics of the Unified Health System and the Brazilian Institute of Geography and Statistics. Analysis of the possible effects of the implementation of the Family Health Strategy on the prevention of congenital syphilis was performed on selected subgroups of municipalities according to two approaches: a) the variation of the average annual rate of incidence of congenital syphilis in different strata of Family Health coverage between 2003 and 2008 and the calculation of the simple linear regression coefficient; and b) a negative binomial regression analysis of data from 2008 to control for confounding factors.

**RESULTS:** Increasingly trends of congenital syphilis notification in Brazil reflect social inequalities in the distribution of cases. The incidence of congenital syphilis was lower in the municipalities with high Family Health Strategy coverage; however, after controlling for the co-variables, such an effect might be attributed to the coverage of prenatal care and the demographic characteristics of the municipalities where the implementation of the Strategy was a priority.

**CONCLUSIONS:** Despite the increase in prenatal care coverage, the actions implemented still exhibit low effectiveness in the prevention of congenital syphilis. Prenatal care performed by Family Health Strategy teams did not control syphilis better than the prenatal care performed within the context of other models of assistance.

**DESCRIPTORS:** Congenital syphilis, epidemiology. Prenatal care. Family Health Program. Socioeconomic Factors. Inequalities in health. Ecological studies.

---

## INTRODUCTION

Congenital syphilis (CS) is a traditional sentinel event in the monitoring of primary health care (PHC). Because CS is easy to prevent, its occurrence suggests flaws in the primary health care network or its integration with the overall health care system.<sup>16</sup> One-third of pregnancies in women infected by *Treponema pallidum* who are inappropriately treated will result in loss of the fetus, and another third will result in children with CS. Appropriate responses to this problem during the prenatal period might decrease the incidence of CS to

<sup>I</sup> Departamento de Atenção Básica. Secretaria de Atenção à Saúde. Ministério da Saúde. Brasília, DF, Brasil

<sup>II</sup> Departamento de Saúde Coletiva. Faculdade de Ciências da Saúde. Universidade de Brasília. Brasília, DF, Brasil

<sup>III</sup> Departamento de DST, AIDS e Hepatites Virais. Secretaria de Vigilância em Saúde. Ministério da Saúde. Brasília, DF, Brasil

### Correspondence:

Cinthia Lociks de Araújo  
UnB Colina bloco J – Apto. 403  
Campus Universitário Darcy Ribeiro  
70904-110 Brasília, DF, Brasil  
E-mail: cinthia.lociks@saude.gov.br

Received: 6/17/2011

Approved: 11/12/2011

Article available from: [www.scielo.br/rsp](http://www.scielo.br/rsp)

fewer than 0.5/1,000 live births (lb).<sup>22,24</sup> In addition to its effects on mortality, premature birth, low birth weight, and acute complications, CS is also associated with deformities, neurological damage, and other sequelae.

Despite the vulnerability and undeniable magnitude of the public health problem posed by CS, its control still represents a challenge in several countries. The World Health Organization (WHO) estimated that 12 million people, of whom 2 million were pregnant women, were infected with *Treponema pallidum* in 2008. In addition, the incidence of syphilis and CS is increasing worldwide.<sup>9,18,19</sup>

In 2008, approximately 50,000 Brazilian women were estimated to have gestational syphilis (GS); taking into account the high rate of vertical transmission (30% to 100%),<sup>14</sup> more than 15,000 children may have contracted the congenital form. Despite the high incidences reported by the *Sistema Nacional de Agravos de Notificação* (SINAN – National System for the Compulsory Notification of Diseases), under-reporting is estimated at up to 67% in Brazil.<sup>11,14</sup> Studies performed in hospitals indicate an incidence of CS between 9.8 and 22/1,000 lb.<sup>10,17</sup>

Assessments of the quality of prenatal care indicate unsatisfactory results, as less than half of infected pregnant women (7.7% to 49.6%) receive proper assistance.<sup>1,2,5,20</sup> Studies that collected primary data on the coverage of GS testing indicate that 66% to 95% of pregnant women have access to at least one venereal disease research laboratory (VDRL) test during the prenatal period, but only about one-fourth (0.2 to 20.7%) have access to the second VDRL test, which ought to be performed before gestational week 30.<sup>2,5,21</sup>

Brazilian policy for CS includes the Operational Plan for Reduction of Vertical Transmission of HIV and Syphilis published in 2007,<sup>a</sup> which defines actions and goals to improve the control of these diseases. The Ministry of Health has prioritized the Family Health Strategy (FHS) since 1994 to strengthen this level of assistance. Data supplied by the Ministry of Health in 2008<sup>b</sup> reported the existence of more than 29,000 healthcare teams funded by federal resources specifically allocated to the FHS, which could cover almost half of the Brazilian population.

With this increased coverage by the FHS and basic actions such as prenatal care, better control of the vertical transmission of syphilis was expected. However, few national studies have analyzed the association between the incidence of CS and the expanded

FHS coverage. The present study aimed to estimate the incidence of CS and to identify its relationship with FHS coverage.

## METHODS

This ecological, observational study with descriptive and analytic components used secondary data supplied by DATASUS (Database of the Unified Health System), which were analyzed using two methodological approaches: 1) an analysis of a temporal series (2003 to 2008) to describe the trends of the indicators of CS and to ascertain the association between the incidence of CS and FHS coverage over time; and 2) an ecological study based on data from 2008 to determine the profile of CS and GS reported in Brazil and the profile of access to prenatal care in the same year as well as to perform a binomial regression analysis of the association between the incidence of CS and variables such as FHS coverage, prenatal care coverage, and sociodemographic characteristics of a subgroup of selected municipalities.

In the temporal series (2003–2008) study, we described the behavior of CS-specific indicators, including the incidence (CS cases notified at SINAN), the mortality rate (deaths by CS supplied by the System of Information on Mortality [SIM]), and the hospitalization rate (hospital admissions supplied by the System of Information on Hospitals [SIH]) for all Brazilian municipalities. The average annual variation in the CS incidence (SINAN) between 2003 and 2008 was also analyzed for subgroups of municipalities classified as a function of FHS coverage strata (implanted FHS teams – *Sistema de Informação da Atenção Básica* [SIAB – System of Information on Primary Health Care] and *Sistema do Cadastro Nacional de Estabelecimentos de Saúde* [SCNES – System of National Registration of Health Institutions]) by using a simple linear regression coefficient defining duration of exposure to FHS as an independent variable and variation in the CS incidence as the dependent variable.

The ecological study based on data from 2008 described the profiles of CS and GS cases reported in SINAN and the determinants of access to prenatal care (SINAN and *Sistema de Informações sobre Nascidos Vivos* [SINASC – System of Information on Live Births]) based on age, schooling, and the race/color of the mothers in addition to the distribution of CS cases according to FHS coverage strata that same year in all Brazilian municipalities.

Based on the 2008 data, the association between CS incidence (SINAN) and FHS coverage (SCNES) was

<sup>a</sup> Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Programa Nacional de DST e Aids. Plano Operacional de Redução da Transmissão Vertical do HIV e da Sífilis. Brasília (DF); 2007 [cited 2010 Jan 27]. Available from: <http://www.aids.gov.br/publicacao/plano-operacional-reducao-da-transmissao-vertical-do-hiv-e-da-sifilis>

<sup>b</sup> Ministério da Saúde (BR), Departamento de Atenção Básica. Evolução do credenciamento e implantação da estratégia Saúde da Família. Brasília (DF); 2008 [cited 2010 Jan 10]. Available from: [http://dab.saude.gov.br/historico\\_cobertura\\_sf.php](http://dab.saude.gov.br/historico_cobertura_sf.php)

also analyzed by subgroups of Brazilian municipalities using negative binomial regression in a generalized linear model with a logarithm link function. The control of confounding factors included prenatal care consisting of four or more consultations (SINASC), the proportion of the population that was black, and the total populations of the municipalities (IBGE). Such variables were identified in a literature review of factors associated with CS;<sup>1,12,15,16</sup> from the variables for which there was available data, the most significant ones were selected by means of deviance residuals plots and verisimilitude ratio tests. Statistical analyses were performed by means of SPSS and SAS version 9.2 software.

Both simple linear (2003 to 2008) and negative binomial (2008) regression analyses were performed for subgroups of municipalities, which were selected on the grounds of the following justifications and criteria:

- to overcome the problem represented by underreporting of CS, the reporting of at least one case of CS between 2003 and 2008 and an incidence of CS higher than 1/1,000 lb in 2003 were used to select municipalities for inclusion because the national goal is to attain a value lower than 1/1,000 lb; and
- to overcome the problem presented by the wide variation in FHS coverage among the different municipalities and taking into account a hypothetical period of latency between implantation of teams and appearance of the expected results, it was necessary the maintenance of FHS coverage within the same stratum between 2003 and 2008.

## RESULTS

Analysis of the temporal series indicates an increasing incidence of CS, with a +6.38% average annual variation per year (1.7 to 2.1/1,000) and a +2.15% average annual variation per year (1.1 to 1.5/1,000) in hospital admissions. The rate of specific, CS-related mortality declined slightly at -1.03% per year (3.3 to 2.4/1,000).

The average annual variation in the CS incidence between 2003 and 2008 in subgroups of municipalities with stable FHS coverage decreased in almost all of the strata of coverage except in the stratum from 20% to 50%, which exhibited the lowest incidence in 2003 (Table 1). At the beginning of each analyzed period, the CS incidences tended to be higher in the strata with higher FHS coverage, such as in the stratum from 50% to 70%, whose rate was 6/1,000, i.e., almost one-third higher than the rate of 4/1,000 of the stratum with the lowest level of FHS implantation (FHS coverage < 20%). Five years later, the reduction in incidence was greater in the strata with higher FHS coverage (from -34.5% to -43.8%), thus implying a reversal concerning the stratum with least coverage, and attaining incidences up to 1.44/1,000 lb lower.

**Table 1.** Variation in the incidences of congenital syphilis among subgroups of different strata of coverage by the Family Health Strategy. Brazil, 2003-2008.

Strata of Family Health Coverage	No. of counties	Incidence		Variation 2003-2008	
		2003	2008	pp	%
Subgroup I					
< 50%	169	3.57	3.34	-0.23	-6.52
≥ 50%	271	4.18	2.73	-1.44	-34.55
Total	440				
Subgroup II					
<20%	66	4.12	3.52	-0.60	-14.59
20%  – 50%	36	3.63	3.63	0.29	8.68
50%  – 70%	18	3.41	3.41	-2.66	-43.80
≥ 70%	166	3.91	2.45	-1.46	-37.35
Total	286				

Source: DATASUS, Sistema de Informação de Agravos de Notificação, Sistema do Cadastro Nacional de Estabelecimentos de Saúde

The same result was observed after refining the analysis of the average annual variance in the CS incidence in several FHS coverage strata by applying the simple linear regression coefficient (Table 2). The decline was more significant in the stratum with 50% or more FHS coverage, where 65.3% of the variation could be attributed to FHS coverage. The analysis according to strata indicates a greater variation in the stratum with 50% to 70% coverage, where 77.9% of variation could be attributed to FHS coverage.

In the CS profile for 2008, 5,541 cases were reported in 897 (16%) Brazilian municipalities, a prevalence of 2.1/1,000 lb. Among the mothers of children with CS, most were black (49% were black or brown skinned), between 20 and 29 years old (50%), had less than eight years of schooling (32%), and resided in urban areas (87% to 90%). From the total number of cases, more than 70% of the mothers had received prenatal care, and 57% were diagnosed with syphilis. Only 38% were diagnosed at labor/curettage and 20% of the women's partners had been treated during the prenatal period. Conversely, among the mothers who received prenatal care, fewer than one-fourth (24%) were diagnosed with syphilis before labor or had a partner receiving treatment.

In 2008, 7,485 cases of GS were reported to SINAN, a coefficient of detection of 2.5/1,000 lb. The profile of pregnant women reported as having syphilis revealed three commonalities: 63% had black or brown skin, 63% had fewer than eight years of schooling, and 79% were between 20 and 29 years of age.

SINASC data indicate that in 2008, less than 2% of pregnant women did not have prenatal care, and most of those women had fewer than eight years of

**Table 2.** Average annual variation in the incidence of congenital syphilis according to strata of coverage by the Family Health Strategy in subgroups of counties. Brazil, 2003-2008.

Strata of Family Health Coverage	No. of counties	% variation	Regression coefficient	p	Adjusted r <sup>2</sup>
Stratification I					
< 50%	169	24,9	-0,03	0,31	0,06
≥ 50%	271	65,3	-0,23	0,05	0,57
Total	440				
Stratification II					
< 20%	66	57,0	-0,14	0,08	0,46
20%  – 50%	36	41,5	0,12	0,17	0,27
50%  – 70%	18	77,9	-0,42	0,02	0,72
≥ 70%	166	44,4	-0,20	0,15	0,31
Total	286				

Source: DATASUS, Sistema de Informação de Agravos de Notificação, Sistema do Cadastro Nacional de Estabelecimentos de Saúde

schooling (66%). The proportion of pregnant women who did not receive prenatal care varied between 11% among women without formal education to less than 1% in those with eight years or more of schooling. That same year, among 4,140 pregnant women who did not receive prenatal care, most were black (2,722 – 65.7%, of which 57.6% were mixed skin color and 9.1% were black). The black-skinned group exhibited a higher rate of cases without prenatal care (20%), less access to prenatal maternal syphilis diagnostic services (39%), and a lower proportion of treated partners (12.8%).

Analysis of all the notifying municipalities with FHS stratum coverage (Table 3) shows that the group with less than 50% coverage corresponded to 67% of CS notifications in 2008, with prevalences over 2.5/1,000 lb, whereas the stratum with the highest FHS coverage (50% or more) reported 33% of the cases and had a prevalence of 1.9/1,000 lb. The Figure shows that the proportion of mothers who did not receive prenatal care was 1.56 times higher in the lowest coverage stratum (less than 20%) than in the highest coverage stratum (70% or more). However, the proportion of cases in which diagnosis was not made in the prenatal period was 1.47 times greater in the latter than in the former. Lack of partner treatment was 9.2% lower in the higher FHS coverage stratum.

Negative binomial regression shows that after controlling for co-variables, the prevalence of CS in 2008 was directly related to FHS coverage, population size, and the proportion of the population that was black in the same year, and it was negatively associated with prenatal coverage comprising four or more consultations (Table 4).

## DISCUSSION

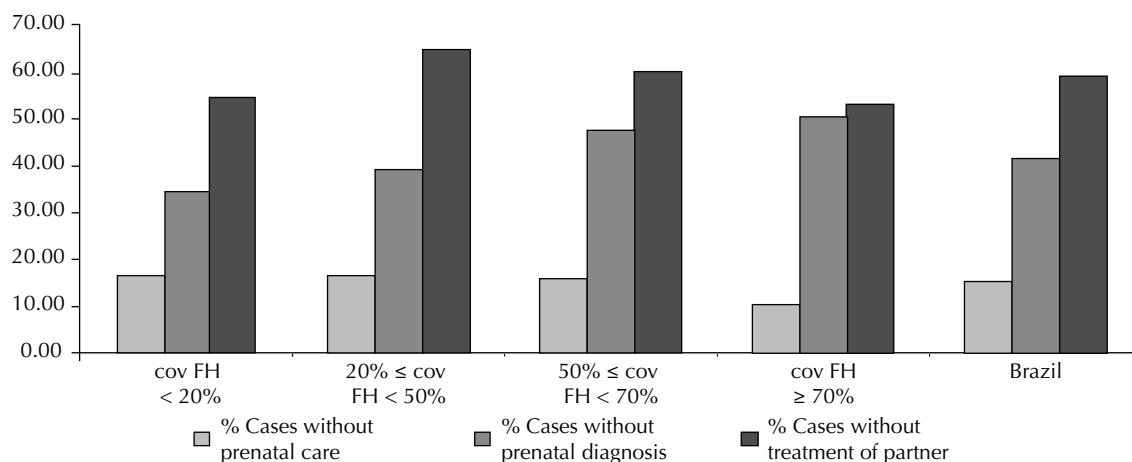
The incidences of GS and CS were higher in the social strata with less schooling and higher prevalences of

traditionally less socioeconomically favored racial groups (blacks). Most Brazilian pregnant women had access to at least four prenatal consultations; however, variation in the number of visits is still significant as a function of socioeconomic characteristics such as schooling and race or skin color. Therefore, the distribution of the investigated disease reflects social inequalities in healthcare that have previously been observed by others in both Brazil<sup>13,15,16</sup> and other countries.<sup>4,6,25</sup> Inequalities in access to and the quality of prenatal care might somehow explain the higher exposure of children belonging to the less privileged classes to the risk of CS. This hypothesis is supported by data from Sinasc and reports by different authors,<sup>1</sup> which also point to greater barriers to prenatal care among black women and those with low levels of education. The lost opportunities for CS prevention in 2008 (70% of CS cases with prenatal care) were greater than those previously observed by other authors.<sup>15</sup>

The large proportion of reported CS cases with prenatal diagnoses (57%) also points to flaws in the quality of prenatal care. This might be somewhat explained by difficulties administering penicillin (the best cost-benefit drug for the treatment of pregnant women with syphilis and their partners<sup>7,24</sup>) observed in the network of the basic healthcare units of the *Sistema Único de Saúde* (SUS – Unified Health System). Resistance to the treatment of syphilis in such networks has been justified by a lack of technical conditions able to handle cases of anaphylaxis, but the extremely low prevalence of lethal reactions to penicillin (1 to 2/100,000)<sup>8,24</sup> does not justify the huge social onus represented by the difficult access to this drug. According to the last Normative Assessment of the functional conditions of FHS (2008), almost half of the assessed teams did not have benzathine

<sup>c</sup> Ministério da Saúde (BR), Departamento de Atenção Básica; Faculdade de Ciências Econômicas da UFMG. Avaliação normativa do Programa Saúde da Família no Brasil: monitoramento da implantação das equipes de saúde da família e saúde bucal: relatório final. Brasília (DF); 2009; mimeo.

<sup>d</sup> Ministério da Saúde (BR), Departamento de Atenção Básica; Faculdade de Ciências Econômicas da UFMG. Avaliação normativa do Programa Saúde da Família no Brasil: monitoramento da implantação das equipes de saúde da família e saúde bucal: mimeo relatório final. Brasília (DF); 2009.



**Figure.** Percentage of flaws in the prevention of congenital syphilis according to strata of Family Health Strategy coverage. Brazil, 2008.

penicillin available.<sup>c</sup> The lack of structure in the FHS units sufficient to comply with the regulations<sup>d</sup> then in force regarding the conditions necessary to administer this drug is also a serious problem. More than 71% of the assessed teams lacked epinephrine, and more than 80% of the FHS units did not have sources of oxygen.

Despite the shortcomings in the functioning of FHS teams mentioned above, the subgroups of municipalities with stable implementations of the FHS for five years exhibited lower incidences and greater reductions in this indicator parallel to greater FHS coverage, which suggests a possible influence of the latter on the control of the investigated disease. To explain this result, we suggest that this model is more effective due to its prioritized expansion in areas formerly unassisted, where the value of this indicator was probably worse and thus more sensitive to intervention. However, the effect of underreporting was not fully controlled, and thus it limits the conclusions that may be inferred from the results. Nevertheless, the incidence of CS was, as a rule, higher in the strata with greater FHS coverage at the beginning of the assessed period (2003).

The incidences in the strata with greater FHS coverage are still higher than the national average (2.1/1,000).

Doubtless, the existence of CS cases in municipalities with high FHS coverage suggests flaws in the functioning of teams or the organization of the healthcare system, such as access to laboratory tests.

The inverse association between FHS coverage and CS incidence after controlling for other variables reveals a high incidence of CS in the areas with greater FHS coverage in 2008, despite the stable implementation of this model of assistance for at least five years. The negative association between FHS coverage and CS incidence initially found in some subgroups of municipalities may not be attributed to the model of assistance as such but to prenatal care, the populations, patient profiles, and the higher vulnerability of those residing in the areas where FHS attained greater coverage. After the confounding variables were neutralized, a positive association between FHS and CS incidence was observed.

A further limitation is the cross-sectional approach, which limits the possibility of suggesting causal hypotheses for the investigated variables. One may assert that in this particular sample of municipalities, five years of stable FHS implementation (which was one of the criteria for sample selection) was not sufficient to achieve distinct control of the vertical transmission of syphilis,

**Table 3.** Distribution of notifying counties and cases of congenital syphilis according to the strata of coverage by the Family Health Strategy. Brazil, 2008.

Strata of Family Health Coverage	Total counties		Resident population in 2008	Counties with notification in 2008		Notifications in 2008		Average prevalence
	n	%		n	%	n	%	
< 20%	508	9.1	24.6	135	15.1	1.372	24.8	2.5
20%   50%	603	10.8	37.8	180	20.1	2.318	41.8	2.6
50%   70%	595	10.7	13.0	137	15.3	711	12.8	2.3
≥ 70%	3.859	69.3	24.6	445	49.6	1.140	20.6	1.9
Total	5.565	100.0	100.0	897	100.0	5.541	100.0	2.4

Source: DATASUS, Sistema de Informação de Agravos de Notificação, Sistema do Cadastro Nacional de Estabelecimentos de Saúde

**Table 4.** Analysis of associations between the incidence of congenital syphilis, Family Health Strategy coverage and selected variables. Brazil, 2008.

Variable	Estimate	Standard error	95%CI
Intercept	-4.9034	0.5984	-6.0764; -3.7305
FHS Coverage	0.0035	0.0016	0.0003; 0.0067
Population	0.0337	0.0154	0.0035; 0.0640
Prenatal care Coverage	-0.0215	0.0061	-0.0335; -0.0095
Black population	0.0052	0.0030	-0.0006; 0.0111
Dispersion	1.0163	0.1120	0.7967; 1.2358

FHS: Health Family Strategy

Source: DATASUS, Sistema de Informação de Agravos de Notificação, Sistema do Cadastro Nacional de Estabelecimentos de Saúde

as would have been expected. The positive association between FHS coverage and CS incidence after controlling for co-variables might be explained by the greater FHS coverage in small-sized municipalities with worse social indicators and high CS rates or by greater barriers to access to diagnosis and treatment of GS in municipalities with high FHS coverage. Note that fewer than 19% of the FHS teams were able to administer benzylpenicillin.<sup>c</sup>

Analysis of temporal series after controlling for confounding variables might establish whether some changes might have occurred over time that are specifically attributable to the implementation of the FHS despite the persistence of high CS rates in 2008 in the municipalities with greater FHS coverage.

Further methodological limitations involve the investigated units of analysis (municipalities). Ecological studies restrict the inferences made from the results found in the whole only to its parts. Because it is not possible to render the data on CS as a function of FHS coverage, it is neither possible to establish where the CS cases occurred, that is, whether or not the mothers of these children received prenatal care in areas covered by the FHS. The selection of samples on the grounds of the chosen criteria, besides limiting the generalization of results, might also include the interference of other non-controlled variables. Such variables include factors related to health management at the level of municipalities, which are involved in the stability of FHS implementation, limiting comparisons across strata of coverage.

## REFERENCES

- Almeida SDM, Barros MBA. Equidade e atenção à saúde da gestante em Campinas (SP), Brasil. *Rev Panam Salud Publica.* 2005;17(1):15-25. DOI:10.1590/S1020-49892005000100003
- Carvalho VCP, Araújo TVB. Adequação da assistência

Despite their excellent cost-effectiveness, the actions taken for CS prevention require complex approaches because they involve issues related to sexual behavior. This means that the control of CS not only depends on biomedical knowledge and human and material resources, but, because interventions are not solely biological, also include behavioral and sociocultural factors. In this regard, the model of assistance represented by the FHS might possibly be more appropriate for CS than traditional PHC because it is characterized by the distribution of the target population per service, the registration of users, the prioritization of risk groups or more vulnerable populations with the capacity for active searching, and the early identification of pregnant women and their partners by means of home visits. Some studies show that pregnant women who received a visit from a health community agent may start prenatal care earlier, receive more consultations and laboratory exams, and obtain better counseling.<sup>3,5</sup>

However, the formal adherence of municipalities to FHS and the steady and automatic transfer of federal resources to fund it do not indicate that effective change will be accomplished in the practices performed by PHC teams according to the guidelines established by the federal government. Political-institutional contexts might largely explain “the differences in the degree of implantation of primary health care”,<sup>12</sup> that is, the effectiveness of the FHS might largely depend on how it is implemented.<sup>23</sup>

Despite the increase in prenatal coverage, such actions still exhibit low effectiveness in the prevention of CS. The results found reinforce the need not to limit the assessment of the FHS to process indicators because a high average coverage of basic actions such as prenatal care might mask access inequalities and does not represent the quality of assistance.

The negative association between FHS coverage and CS incidence in municipalities with stable implementation of FHS and high coverage rates does not remain after controlling for co-variables, suggesting that such effects might not be specifically attributable to the FHS but to prenatal care coverage and the demographic characteristics of the municipalities where FHS implementation was a priority. Therefore, the present study could not identify a more effective association between the prenatal care performed by FHS teams and control of CS compared to the corresponding association of prenatal care performed by other modalities of assistance.

- pré-natal em gestantes atendidas em dois hospitais de referência para gravidez de alto risco do Sistema Único de Saúde, na cidade de Recife, Estado de Pernambuco. *Rev Bras Saude Matern Infant.* 2007;7(3):309-17. DOI:10.1590/S1519-38292007000300010

3. Cesar JA, Mendoza-Sassi RA, Ulmi EF, Dall'Agnol MM, Neumann NA. Diferentes estratégias de visita domiciliar e seus efeitos sobre a assistência pré-natal no extremo sul do Brasil. *Cad Saude Publica*. 2008;24(11):2614-22. DOI:10.1590/S0102-311X2008001100016
4. Fowler CI, Gavin NI, Adams EK, Tao G, Chireau M. Racial and ethnic disparities in prenatal syphilis screening among women with Medicaid-covered deliveries in Florida. *Matern Child Health J*. 2008;12(3):378-93. DOI:10.1007/s10995-007-0247-7
5. Gonçalves R, Urasaki MBM, Merighi MAB, D'Avila CG. Avaliação da efetividade da assistência pré-natal de uma Unidade de Saúde da Família em um município da Grande São Paulo. *Rev Bras Enferm*. 2008;61(3):349-53. DOI:10.1590/S0034-71672008000300012
6. Gottlieb SL, Pope V, Sternberg MR, McQuillan GM, Beltrami JF, Berman SM, Markowitz LE. Prevalence of syphilis seroreactivity in the United States: data from the National Health and Nutrition Examination Surveys (NHANES) 2001-2004. *Sex Transm Dis*. 2008;35(5):507-11. DOI:10.1097/OLQ.0b013e3181644bae
7. Grumach AS, Matida LH, Heukelbach J, Coêlho HLL, Ramos Jr AN. A (des)informação relativa à aplicação da penicilina na rede do sistema de saúde no Brasil: o caso da sífilis. *DST J Bras Doenças Sex Transm*. 2007;19(3-4):120-7.
8. Idsoe O, Guthe T, Willcox RR, Weck AL. *Bull World Health Organ*. 1968;38(2):159-88.
9. Kent ME, Romanelli F. Reexamining syphilis: an update on epidemiology, clinical manifestations, and management. *Ann Pharmacother*. 2008;42(2):226-36. DOI:10.1345/aph.1K086
10. Koffman MD, Bonadio IC. Avaliação da atenção pré-natal em uma instituição filantrópica da cidade de São Paulo. *Rev Bras Saude Matern Infant*. 2005;5 Supl 1:S23-32. DOI:10.1590/S1519-38292005000500003
11. Komka MR, Lago EG. Sífilis congênita: notificação e realidade. *Sci Med*. 2007;17(4):205-11.
12. Medina MG, Hartz ZMA. The role of the Family Health Program in the organization of primary care in municipal health systems. *Cad Saude Publica*. 2009;25(5):1153-67. DOI:10.1590/S0102-311X2009000500022
13. Miranda AE, Figueiredo NC, Schmidt R, Page-Shafer K. A population-based survey of the prevalence of HIV, syphilis, hepatitis B and hepatitis C infections, and associated risk factors among young women in Vitoria, Brazil. *AIDS Behav*. 2008;12(4 Suppl):S25-31. DOI:10.1007/s10461-008-9378-0
14. Ramos Jr AN, Matilda LH, Saraceni V, Veras MASM, Pontes RJS. Control of mother-to-child transmission of infectious diseases in Brazil: progress in HIV/AIDS and failure in congenital syphilis. *Cad Saude Publica*. 2007;23 Suppl 3:S370-8. DOI:10.1590/S0102-311X2007001500005
15. Rodrigues CS, Guimarães MDC, Cesar CC. Missed opportunities for congenital syphilis and HIV perinatal transmission prevention. *Rev Saude Publica*. 2008;42(5):851-8. DOI:10.1590/S0034-89102008000500010
16. Saraceni V, Guimarães MHFS, Theme Filha MM, Leal MC. Mortalidade perinatal por sífilis congênita: indicador da qualidade da atenção à mulher e à criança. *Cad Saude Publica*. 2005;21(4):1244-50. DOI:10.1590/S0102-311X2005000400027
17. Schetini J, Ferreira DC, Passos MRL, Salles EB, Santos DDG, Raposo DCM. Estudo de prevalência de sífilis congênita em um hospital da rede SUS de Niterói - RJ. *DST J Bras Doenças Sex Transm*. 2005;17(1):18-23.
18. Schmid GP, Stoner BP, Hawkes S, Broutet N. The need and plan for global elimination of congenital syphilis. *Sex Transm Dis*. 2007;34(7 Suppl):S5-10. DOI:10.1097/01.olq.0000261456.09797.1b
19. Sendagorta E, De Lucas R, Rodriguez MF, Ramirez P, Gonzalez-Beato M, Corral D, et al. Congenital syphilis, case report and epidemiologic features in Spain. *Pediatr Dermatol*. 2010;27(3):308-9. DOI:10.1111/j.1525-1470.2010.01147.x
20. Succi RCM, Figueiredo EN, Zanatta LC, Peixe MB, Rossi MB, Vianna LAC. Avaliação da assistência pré-natal em unidades básicas do município de São Paulo. *Rev Latinoam Enferm*. 2008;16(6):986-92. DOI:10.1590/S0104-11692008000600008
21. Szwarcwald CL, Barbosa Jr A, Miranda AE, Paz LC. Resultados do Estudo Sentinela-Parturiente, 2006: desafios para o controle da sífilis congênita no Brasil. *DST J Bras Doenças Sex Transm*. 2007;19(3-4):128-33.
22. Valderrama J, Zacarias F, Mazin R. Sífilis materna y sífilis congénita en América Latina: un problema grave de solución sencilla. *Rev Panam Salud Publica*. 2004;16(3):211-17. DOI:10.1590/S1020-49892004000900012
23. Vidal SA, Samico IC, Frias PG, Hartz ZMA. Estudo exploratório de custos e consequências do pré-natal no Programa Saúde da Família. *Rev Saude Publica*. 2011;45(3):467-74. DOI:10.1590/S0034-89102011005000014
24. Wolff T, Shelton E, Sessions C, Miller T. Screening for syphilis infection in pregnant women: evidence for the U.S. Preventive Services Task Force reaffirmation recommendation statement. *Ann Intern Med*. 2009;150(10):710-6.
25. Zhou H, Chen XS, Hong FC, Pan P, Yang F, Cai YM, et al. Risk factors for syphilis infection among pregnant women: results of a case-control study in Shenzhen, China. *Sex Transm Infect*. 2007;83(6):476-80. DOI:10.1136/sti.2007.026187