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HIV testing among pregnant women in Brazil: rates and predictors

Testagem anti-HIV em mulheres grávidas no Brasil: taxas e preditores

ABSTRACT

OBJECTIVE: To assess rates of offering and uptake of HIV testing and their predictors among women who attended prenatal care.

METHODS: A population-based cross-sectional study was conducted among postpartum women (N=2,234) who attended at least one prenatal care visit in 12 cities. Independent and probabilistic samples were selected in the cities studied. Sociodemographic data, information about prenatal care and access to HIV prevention interventions during the current pregnancy were collected. Bivariate and multivariate analyses were carried out to assess independent effects of the covariates on offering and uptake of HIV testing. Data collection took place between November 1999 and April 2000.

RESULTS: Overall, 77.5% of the women reported undergoing HIV testing during the current pregnancy. Offering of HIV testing was positively associated with: previous knowledge about prevention of mother-to-child transmission of HIV; higher number of prenatal care visits; higher level of education and being white. HIV testing acceptance rate was 92.5%.

CONCLUSIONS: The study results indicate that dissemination of information about prevention of mother-to-child transmission among women may contribute to increasing HIV testing coverage during pregnancy. Non-white women with lower level of education should be prioritized. Strategies to increase attendance of vulnerable women to prenatal care and to raise awareness among health care workers are of utmost importance.

DESCRIPTORS: Pregnant Women. HIV Infections, diagnosis. Acquired Immunodeficiency Syndrome, prevention & control. Prenatal Care. Socioeconomic Factors. Cross-Sectional Studies.

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RESUMO

OBJETIVO: Estimar as taxas de oferta e realização do teste anti-HIV e seus preditores entre mulheres que receberam atendimento pré-natal.

MÉTODOS: Foi conduzido estudo transversal, de base populacional, com 2.234 puérperas em 12 cidades do Brasil. Amostras probabilísticas foram selecionadas independentemente por cidade, entre puérperas que compareceram a pelo menos uma visita pré-natal. Foram coletados dados sociodemográficos, informações sobre cuidado pré-natal e acesso a intervenções de prevenção do HIV durante a gravidez corrente, com a utilização de um questionário. Foram realizadas análises bivariadas e multivariadas para verificar os efeitos independentes das covariáveis na oferta e realização do teste anti-HIV. Os dados foram coletados no período de novembro de 1999 a abril de 2000.

RESULTADOS: A realização do teste na gravidez foi relatada por 77,5% das entrevistadas. A oferta do teste anti-HIV foi positivamente associada a: conhecimento prévio sobre a prevenção da transmissão materno-infantil do HIV; maior número de visitas pré-natal; maior nível de escolaridade e ter cor da pele branca. A taxa de aceitação do teste anti-HIV foi de 92,5%.

CONCLUSÕES: Os resultados indicam que a disseminação da informação sobre prevenção da transmissão materno-infantil do HIV pode contribuir para aumentar a cobertura da testagem anti-HIV durante a gravidez. Mulheres não-brancas com menores níveis educacionais devem ser priorizadas. Estratégias para aumentar a participação de populações vulneráveis ao cuidado pré-natal e a sensibilização de trabalhadores de saúde são de grande importância.

DESCRIPTORIOS: Gestantes. Infecções por HIV, diagnóstico. Síndrome de Imunodeficiência Adquirida, prevenção e controle. Cuidado Pré-Natal. Fatores Socioeconômicos. Estudos Transversais.

INTRODUCTION

The availability of effective interventions to prevent mother-to-child transmission (PMTCT) of HIV infection makes the identification of HIV-infected pregnant women a high priority.²

In 2000, it was estimated that 600,000 people were living with HIV/AIDS in Brazil with 0.4% prevalence among childbearing women.¹⁸ By mid 2006, 433,067 AIDS cases had been reported to the Brazilian Ministry of Health (30% in females).^a Overall, three million deliveries occur each year in the country, 14,000 among HIV-infected women.

Brazil was the first developing country to implement a large scale PMTCT program.^b Since 1997, the Brazilian Ministry of Health has adopted a policy of universal offering of HIV testing to pregnant women, coupled

with counseling.^c The three components of the Pediatric AIDS Clinical Trial Group 076 protocol are free to all HIV-infected pregnant women and their newborns.^{2,d}

Despite being crucial to the proper management of AIDS programs, evaluation of coverage of PMTCT interventions and outcomes are still limited in Brazil. The objective of the present study was to assess the rates of HIV testing offering and uptake and their predictors among women who attended prenatal care.

METHODS

A population-based cross-sectional study was conducted among postpartum women (≥ 18 years of age) who delivered under the coverage of the *Sistema Único de Saúde* (Brazilian Health System, SUS) and who

^a Ministério da Saúde. Coordenação Nacional de DST/AIDS. 01^a a 26^a semanas epidemiológicas - janeiro a junho de 2006. *Bol Epidemiol Aids DST*. 2006;3(1).

^b Ministério da Saúde. Programa Nacional de Doenças Sexualmente Transmissíveis/AIDS/Secretaria de Assistência à Saúde; Considerações gerais do binômio: HIV/Aids e gravidez. Brasília; 1995.

^c Ministério da Saúde – Brasil. Portaria Técnica Ministerial Nº 874/97 de 03 de julho de 1997, Diário Oficial da União, 04 jul 1997.

^d Veloso VG, Vasconcelos AL, Grinsztejn B. Prevenção da transmissão vertical no Brasil. *Bol Epidemiol Aids DST*. 1999;12(3):16-23. Available from: http://www.aids.gov.br/udtv/boletim_jun_ago99/prevenc_trans_vertical.htm

attended at least one prenatal care visit and signed an informed consent form. According to Brazilian law, any woman younger than 18 years old, if not legally married or living with a partner, was only eligible for the study if their parents/guardians signed an informed consent form. Those women who had experienced an abortion, a stillbirth or any other clinical condition preventing an interview were excluded from the eligible population and from the study.

The study was conducted in 12 Brazilian cities highly affected by HIV/AIDS epidemic – Rio de Janeiro, Duque de Caxias, São Paulo, Santos, Sorocaba, Campo Grande, Brasília, Curitiba, Florianópolis, Itajaí, Porto Alegre and Uruguiana. Twelve independent, 24-hour cluster samples, stratified by hospital, were selected.

Every maternity hospital with at least one delivery per day comprised a selection stratum. The sample size of postpartum women for each city studied was determined to estimate the prevalence of HIV testing during prenatal care with a relative error varying from 0.1 to 0.3 (Table 1). The ratio of postpartum women sample size by mean daily deliveries covered by SUS in the city provided the number of survey days in a city. Each survey day corresponded to a cluster in which all women who delivered in the previous day, if eligible, were interviewed. After the number of clusters was de-

termined, women were randomly selected from the set of days of the period of fieldwork, with equiprobability and independently for each maternity hospital.

Since the number of 24-hour clusters was the same in all maternity hospitals in a given city, the sample size of women was proportionally allocated to the number of deliveries per hospital, which lead to a self-weighted sample by city.

Postpartum women were approached to participate in the study prior to being discharged from the maternity hospitals.

All eligible women were invited to participate.

Trained interviewers queried the women using a validated questionnaire. Sociodemographic data, information about prenatal care service utilization as well as access to HIV counseling, testing and prevention interventions during the current pregnancy were collected. Data was collected between November 1999 and April 2000.

Data entry and management were carried out using the Integrated Microcomputer Processing System, a statistical package developed by the United States Bureau of the Census.^a

Table 1. Calculated and effective sample size by city. Brazil, 1999–2000.

City	Number of hospitals with more than one delivery per day*	Expected prevalence of prenatal care coverage (proportion)	Expected prevalence of HIV testing coverage (proportion)	Relative error	Calculated sample size (postpartum women)	Calculated number of clusters** (study days)	Effective sample size (postpartum women)
Brasília	9	0.80	0.30	0.15	254	3	322
Campo Grande	3	0.80	0.05	0.25	153	5	153
Curitiba	13	0.80	0.30	0.15	198	3	213
Duque de Caxias	3	0.60	0.10	0.15	104	4	97
Florianópolis	2	0.65	0.10	0.25	183	14	185
Itajaí	1	0.70	0.50	0.10	113	16	81
Porto Alegre	7	0.75	0.40	0.15	164	2	148
Rio de Janeiro	24	0.60	0.30	0.15	270	2	290
Santos	3	0.60	0.70	0.10	111	7	116
São Paulo	38	0.80	0.40	0.10	464	2	385
Sorocaba	2	0.80	0.70	0.10	126	6	128
Uruguiana	1	0.80	0.10	0.30	111	18	116
Total	106	-	-	-	2 251	82	2234

* Based on data from 1997, excluding maternity hospitals that discontinued their services and those funded after 1997.

** The calculated number of clusters is the number of study days in each hospital and was calculated as the ratio of the calculated sample size of postpartum women by the number of daily deliveries in a city, without adjusting for the expected prevalence of prenatal care coverage rate.

In order to account for the effects of a complex sampling design, analyses were performed using SAS¹³ version 8.2 and SUDAAN (SAS callable) version 8.¹⁷ Descriptive statistics were generated for all study variables. Bivariate analyses were conducted to assess the relationship between offering and uptake of HIV testing and potential explanatory variables – age, race, level of education, formal employment, monthly income, previous knowledge about the importance of knowing one's HIV status and its potential benefits to the child (“previous knowledge”), primiparity (vs. previous birth[s]), trimester of first prenatal visit, number of prenatal visits, and utilization of a public primary care unit for prenatal care. Moreover, there was a concern with capturing the effects of differences among the cities studied on the outcomes. Counseling and testing offering were considered in the explanation of testing uptake.

Multivariate logistic regression models were developed to assess the independent effects of the variables on HIV testing offering and uptake.

The National Research Ethics Committee approved the study protocol and all participating women signed an informed consent.

RESULTS

A total of 2,234 women were interviewed, 96.5% of the total sample size, who were selected from the study eligible population of 20,886 women.

Mean age was 25 years and half of the interviewees were non-white. Most reported 8 or less years of education and having received prenatal in a public primary care service. The large majority reported that the first prenatal care visit occurred during the first (66.5%) or the second trimester (27.6%) of pregnancy. Most of them reported they had attended at least six prenatal care visits. Knowledge about AIDS and awareness about the importance of HIV testing for PMTCT was reported by 92.6% and 85.2% of the women, respectively (Table 2).

Overall, 77.5% of the women reported undergoing HIV testing during the current pregnancy. Of them, 13.8% (1.2% – 21.8%) reported they had been tested during routine prenatal screening tests without their prior knowledge or consent.

Among those who were offered HIV testing, 92.5% accepted it, but only 37.5% were informed they could choose not to take it. In addition, among those who received their HIV testing result, only 47.4% reported they were explained the meaning of the HIV testing result.

Regarding information about HIV prevention, only 50% of the women surveyed reported they had received it. A previous HIV testing at any point in lifetime before the current pregnancy was reported by 26.4%.

Table 2. Sociodemographic data and knowledge about prevention of mother-to-child transmission by city, Brazil, 1999–2000.

City	Weighted sample	Years of age (%)			Race (%)			Years of education (%)			Previous knowledge about HIV testing to prevention of mother-to-child transmission* (%)	Formal employment (%)	Monthly income (R\$)	
		<18	18–30	>30	White	Black	Other	<5	5–8	>8			≤500.00 (%)	>500.00 (%)
Overall	20886	10.1	72.1	17.7	46.8	16.6	36.6	24	47.7	28.3	85.4	19.9	41.4	48.2
Rio de Janeiro	4560	9.8	71.1	19.1	32.5	30.6	36.9	23.4	42.3	34.3	85.8	19.2	47.4	39.1
Duque de Caxias	832	13.1	63.5	23.4	48.3	23.1	28.5	29.3	52.7	18.0	76.1	11.5	68.5	23.6
São Paulo	5880	9.9	73.5	16.5	51.0	11.6	37.4	21.6	52.9	25.6	85.7	18.2	40.6	50.8
Santos	384	10.3	69.7	20.0	39.7	16.7	43.6	22.5	41.2	36.3	96.8	30.3	28.6	53.1
Sorocaba	339	10.0	66.8	23.2	73.7	11.5	14.7	35.4	44.0	20.6	73.6	20.2	45.3	36.0
Curitiba	1853	7.1	75.3	17.2	54.1	4.5	41.4	23.7	44.8	31.5	76.2	24.1	50.4	39.4
Florianópolis	293	9.1	69.3	21.6	87.4	10.4	2.2	17.3	50.4	32.3	89.8	26.4	41.3	49.9
Itajaí	157	18.5	60.5	21.0	90.1	6.2	3.7	56.8	27.2	16.0	70.4	19.8	61.7	37.0
Porto Alegre	2235	13.5	64.8	21.7	64.0	29.8	6.2	19.5	52.9	27.6	89.8	22.2	55.5	41.8
Uruguiana	145	16.4	69.0	14.7	65.5	12.9	21.6	16.4	71.6	12.1	26.7	15.5	72.4	23.3
Campo Grande	918	12.4	74.5	13.1	49.7	11.1	39.2	41.2	35.9	22.9	77.8	11.8	69.9	26.8
Brasília	3290	8.3	77.4	14.1	33.6	5.7	60.7	24.7	46.7	28.6	93.8	22.9	46.9	36.7

The bivariate analyses showed that years of education, previous knowledge about HIV testing for PMTCT, number of prenatal care visits and cities were significantly associated with testing offering and uptake. In addition, testing uptake was also significantly associated with race, monthly income, primiparity, trimester of first prenatal care visit, counseling and testing offering. Table 3 shows the findings of cross-analyses between testing offering and uptake and potential explanatory variables.

The multivariate logistic regression model for HIV testing offering is shown in Table 4. Offering of HIV testing was found to be positively associated with being white (borderline significance, $p=0.0655$), having more years of formal education, having previous knowledge about the importance of HIV testing for the prevention of HIV vertical transmission, and having a higher number of prenatal care visits. The interaction effect of being white and having previous knowledge about the importance of HIV testing was found to be negative. The cities Duque de Caxias, Uruguaiana, and Curitiba did not differ significantly from the city of Rio de Janeiro, which was the first city to implement large-scale PMTCT training of health care workers. For this reason, these cities were taken as the reference group in the analysis. In the cities São Paulo, Florianópolis, Porto Alegre, Campo Grande, and Brasília, testing offering was significantly lower than in the reference group. The cities of Santos, Sorocaba, and Itajaí had a higher testing offering vis-à-vis all other cities.

We made several attempts to fit a model for testing uptake but unsuccessfully. This is probably because 'testing offering' explained most of the variation in test uptake ($OR=35.31$) (Hosmer-Lemeshow test, $p=0.2084$). Nonetheless, the study data indicate that counseling and total number of prenatal care visits do had a positive effect on testing uptake.

DISCUSSION

The results showed that, in spite of receiving prenatal care, almost one-fourth of the women went through pregnancy without being tested. Unaware of their status, these women were unable to benefit from interventions available in Brazil to reduce mother-to-child HIV transmission.

Several studies have already demonstrated that minority populations have more difficult access to health care, even when it is free.^{1,20,21} This seems to be the case of HIV counseling and testing during pregnancy in Brazil. It was found a lower rate of HIV testing offering among non-white women, those with lower level of education and those attending fewer prenatal care visits when compared to white women, those with intermediate or higher level of education, and those attending a higher number

of prenatal care visits. This is a matter of concern, since in Brazil the HIV/AIDS epidemic has primarily affected the poor, especially those with lower education and belonging to the Black population.⁵ Education and prenatal care were found to be determinants for being tested in several studies conducted in developed and developing countries, including Brazil.^{10,16}

In developed countries, the lack of testing offering is known to be one of the main reasons for pregnant women not to receive HIV testing.¹⁰ Although most obstetricians support HIV testing in prenatal care, they often rely on their perceptions about women's risk.¹⁹ Insufficient time and training and the sensitive nature of discussing issues related to HIV infection may also prevent providers from offering HIV testing to pregnant women.³

Since there are now available effective interventions to reduce HIV transmission from mother to child to below 2%, failure to offering HIV testing to pregnant women and appropriate interventions for those infected should be considered negligence.

The finding of 92.5% of HIV testing acceptance is reassuring. Similar rates of acceptance were also found in other studies conducted in Brazil, including when HIV testing was offered during labor.^{6,9,12} The wide availability of free HIV prevention and care services in Brazil, which includes highly potent antiretroviral therapy and HIV testing, as well as the policy of universal offering of HIV testing to pregnant women would be among the several factors contributing to the high rate of HIV testing acceptance seen in the present study.

The high proportion of women (14%) who reported they were HIV tested as part of prenatal care routine tests without being informed raises concern. In addition, among those women to whom HIV testing was offered, less than two-thirds were informed they had the right to refuse it. This practice can explain a higher number of women tested for HIV than the number of women offered testing in the cities of São Paulo, Sorocaba, Curitiba, and Porto Alegre. A large study conducted in Porto Alegre for one year during the same period covered by the present study also found a high proportion of unawareness of being tested/compulsory HIV testing.⁹ The literature review we carried out did not find any study in the other three cities addressing the issue of compulsory HIV testing. In a study performed in Spain to compare self-reporting with medical record information regarding HIV testing, unawareness of having been tested was found in 10.7% of the study population.

Although it is unquestionable that HIV testing would be beneficial to all pregnant women, they must not be tested without their knowledge and have the right to be informed to make decisions about their health.

Table 3. Bivariate analyses crossing testing offering and uptake with explanatory variables. Brazil, 1999–2000.

Variable	HIV testing offered			HIV test uptake		
	Yes (%)	No (%)	χ^2 (p)	Yes (%)	No (%)	χ^2 (p)
Age			0.6887			0.1348
<18	72.3	27.7		79.5	20.5	
18–30	73.8	26.2		76.5	23.5	
>30	75.5	24.5		80.8	19.2	
Race			0.8496			0.0361
White	74.2	25.8		80.0	20.0	
Non-white	73.7	26.3		75.4	24.6	
Years of education			0.0039			<0.0001
<5	67.0	33.0		69.0	31.0	
5–8	74.7	25.3		79.0	21.0	
>8	78.6	21.4		82.3	17.7	
Missing	87.2	12.8		87.2	12.8	
Previous knowledge about HIV testing for prevention of mother-to-child transmission			0.0502			0.0446
Yes	75.1	24.9		78.5	21.5	
No	67.5	32.5		71.8	28.2	
Employed			0.1715			0.2749
Yes	76.6	23.4		79.5	20.5	
No	73.3	26.7		77.1	22.9	
Monthly income (R\$)			0.1548			0.0001
≤500.00	72.4	27.6		74.5	25.5	
>500.00	76.1	23.9		81.9	18.1	
Primiparity			0.2541			0.0178
Yes	75.4	24.6		80.2	19.8	
No	73.0	27.0		75.7	24.3	
Trimester of first prenatal care visit			0.4298			0.0054
1st	74.4	25.6		79.8	20.2	
2nd	74.6	25.4		74.9	25.1	
3rd	63.5	36.5		64.2	35.8	
Missing	73.7	26.3		66.7	33.3	
Number of prenatal care visits			0.0038			<0.0001
1–2	56.1	43.9		52.2	47.8	
3–5	70.3	29.7		70.1	29.9	
>5	76.4	23.6		81.8	18.2	
Prenatal care at primary care unit			0.9266			0.6420
Yes	73.9	26.1		77.9	22.1	
No	74.1	25.9		76.8	23.2	
City			<0.0001			<0.0001
Rio de Janeiro	81.6	18.4		74.7	25.3	
Duque de Caxias	88.9	11.1		85.0	15.0	
São Paulo	70.4	29.6		80.8	19.2	
Santos	96.1	3.9		94.4	5.6	
Sorocaba	89.7	10.3		91.1	8.9	
Curitiba	82.5	17.5		87.7	12.3	
Florianópolis	74.5	25.5		66.4	33.6	
Itajaí	90.1	9.9		88.9	11.1	
Porto Alegre	62.4	37.6		90.5	9.5	
Uruguaiiana	85.3	14.7		69.8	30.2	
Campo Grande	50.3	49.7		47.7	52.3	
Brasília	70.1	29.9		65.0	35.0	
Counseling						<0.0001
Yes				89.6	10.4	
No				67.0	33.0	
Testing offered						<0.0001
Yes				92.7	7.3	
No				34.6	65.4	

Table 4. Logistic regression model for explanation of the variation in HIV testing offering to pregnant women. Brazil, 1999–2000.

Variable	Coefficient estimate	Standard error	Wald test (p)	Odds ratio estimate	95% Wald confidence interval
Intercept	0.80	0.23	0.0005		
Race					
White	0.52	0.28	0.0655	1.67	0.97;2.90
Non-white					
Years of education					
<5 (ref)					
5-8	0.34	0.16	0.0363	1.40	1.02;1.92
>8	0.48	0.17	0.0051	1.61	1.16;2.25
Previous knowledge about HIV infection for prevention of mother-to-child transmission					
Yes	0.62	0.24	0.0097	1.86	1.16;2.96
No (ref)					
Interaction of race and previous knowledge about HIV testing uptake					
White and “previous knowledge”	–0.58	0.29	0.0435	0.56	0.32;0.98
Non-white or no “previous knowledge”					
Number of prenatal care visits					
1–2	–0.69	0.28	0.0149	0.50	0.29;0.87
≥3 (ref)					
City					
São Paulo	–0.73	0.24	0.0027	0.48	0.30;0.78
Santos	1.55	0.63	0.0142	4.73	1.37;16.32
Sorocaba	0.69	0.36	0.0586	1.99	0.98;4.07
Florianópolis	–0.58	0.21	0.0062	0.56	0.37;0.85
Itajaí	0.75	0.38	0.0514	2.12	1.00;4.49
Porto Alegre	–1.12	0.47	0.0192	0.33	0.13;0.83
Campo Grande	–1.49	0.26	<0.0001	0.23	0.13;0.38
Brasília	–0.76	0.17	<0.0001	0.47	0.33;0.65
[Rio de Janeiro; Duque de Caxias; Curitiba; and Uruguaiana] (ref)					

Hosmer-Lemeshow goodness-of-fit test (p) = 0.2084

Another reason for concern is the high proportion of women who reported not receiving any information on the meaning of the HIV testing result. Hence, this prompts to question the quality of HIV voluntary counseling and testing provided in Brazil. Studies conducted in São Paulo and Porto Alegre also identified the sub-optimum quality of HIV counseling.^{6,15}

In the present study there was seen an association between knowledge about the importance of HIV testing for PMTCT and the likelihood of being offered HIV testing. In England, it was shown that any discussion of HIV transmission related to pregnant women increased the likelihood of testing.^{4,8}

In the literature, there is strong evidence of the impact of disseminating sound and culturally-sensitive information on the increase in the uptake of health interventions

among disadvantaged populations.¹⁴ Women with adequate knowledge about the availability of interventions to prevent HIV mother-to-child transmission were found to be more likely to have received an HIV testing, regardless of race/ethnicity, age, education or number of previous births.¹¹ Dissemination of information focusing women more vulnerable to not be offered HIV testing in Brazil may significantly contribute to increased rates of testing coverage.

Although the attempts to fit a model to explain HIV testing uptake were unsuccessful, the study findings suggest that counseling contribute to increase HIV testing uptake.

Among the main strengths of the present study is its large population-based random sample, calculated independently for each city. Furthermore, choosing

postpartum women allowed to gathering data about interventions received during the entire prenatal care period. In Brazil, births take place predominantly in hospitals. In the year 2000, only 1.4% of the deliveries occurred outside hospitals, and home delivery is uncommon in the cities included in the study.⁷

Among limitations of the study, HIV testing data were based on self-reports. However, while recall bias cannot be excluded, it is unlikely that patients would not recall their testing and counseling experiences related to the current pregnancy. Also, it cannot be excluded that some women assumed they were tested for HIV, when they were not. Another point to consider is that women under 18 years of age were not adequately represented in the study population, as the Brazilian law does not allow them to be enrolled in such studies.

In conclusion, Brazil continues to face a huge challenge to prevent mother-to-child transmission of HIV infection. In spite of the high rate of HIV testing acceptance among pregnant women, one-fourth of the women attending prenatal care has not been tested for HIV or even have been offered it. The study data indicate that dissemination of information about prevention of mother-to-child transmission among women may

contribute to increase HIV testing coverage during pregnancy. Non-white women with lower education should be prioritized. In addition, strategies to increase attendance rates of vulnerable populations to prenatal care visits as well as to sensitize and train health care workers to systematically offer HIV testing in prenatal care are of utmost importance to overcome the barriers to prevent HIV infection among children.

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REFERENCES

- Almeida C, Travassos C, Porto S, Labra ME. Health sector reform in Brazil: a case study of inequity. *Int J Health Serv.* 2000;30(1):129-62. DOI: 10.2190/NDGW-C2DP-GNF8-HEW8
- Connor EM, Sperling RS, Gelber R, Kiselev P, Scott G, O'Sullivan MJ, et al. Reduction of maternal-infant transmission of human immunodeficiency virus type 1 with zidovudine treatment. Pediatric AIDS Clinical Trials Group Protocol 076 Study Group. *N Engl J Med.* 1994;331(18):1173-80. DOI: 10.1056/NEJM199411033311801
- Ethier KA, Fox-Tierney R, Nicholas WC, Salisbury KM, Ickovics JR. Organizational predictors of prenatal HIV counseling and testing. *Am J Public Health.* 2000;90(9):1448-51.
- Fernández MI, Wilson TE, Ethier KA, Walter EB, Gay CL, Moore J. Acceptance of HIV testing during prenatal care. Perinatal Guidelines Evaluation Project. *Public Health Rep.* 2000;115(5):460-8. DOI: 10.1093/phr/115.5.460
- Fonseca MG, Bastos FI, Derrico M, Andrade CLT, Travassos C, Szwarcwald CL. AIDS e grau de escolaridade no Brasil: evolução temporal de 1986 a 1996. *Cad Saude Publica.* 2000;16 (Supl 1):S77-87.
- Goldani MZ, Giugliani ERJ, Scanlon T, Rosa H, Castilhos K, Feldens L, et al. Voluntary HIV counseling and testing during prenatal care in Brazil. *Rev Saude Publica.* 2003;37(5):552-8. DOI: 10.1590/S0034-89102003000500002
- Instituto Brasileiro de Geografia e Estatística. Censo demográfico. Rio de Janeiro; 2006.
- Meadows J, Jenkinson S, Catalan J, Gazzard B. Voluntary HIV testing in the antenatal clinic: differing uptake rates for individual counselling midwives. *AIDS Care.* 1990;2(3):229-33. DOI: 10.1080/09540129008257735.
- Rosa H, Goldani MZ, Scanlon T, Silva AAM, Giugliani EJ, Agranonik M, et al. Barriers for HIV testing during pregnancy in Southern Brazil. *Rev Saude Publica.* 2006;40(2):220-5. DOI: 10.1590/S0034-89102006000200006
- Royce RA, Walter EB, Fernandez MI, Wilson TE, Ickovics JR, Simonds RJ. Barriers to universal prenatal HIV testing in 4 US locations in 1997. *Am J Public Health.* 2001;91(5):727-33.
- Ruiz JD, Molitor F. Knowledge of treatment to reduce perinatal human immunodeficiency virus (HIV) transmission and likelihood of testing for HIV: results from two surveys of women of childbearing age. *Matern Child Health J.* 1998;2(2):117-22. DOI: 10.1023/A:1022944907256
- Santos VV, Bastos FI, Nielsen K. A prospective study of feasibility of rapid HIV testing in pregnant women during the peripartum period in Rio de Janeiro, Brazil. In: 8th Conference on Retroviruses and Opportunistic Infection; 2001; Chicago, Ill. Alexandria, Virginia: Foundation for Retrovirology and Human Health; 2001. p.inicial-final.
- SAS v. 8e (USA); Copyright 1999-2001. SAS Institute, Inc.; Cary, NC.
- Schellenberg JA, Victora CG, Mushi A, de Savigny D, Schellenberg D, Mshinda H, et al. Inequities among the very poor: health care for children in rural southern Tanzania. *Lancet.* 2003;361(9357):561-6. DOI: 10.1016/S0140-6736(03)12515-9
- Segurado AC, Miranda SD, Latorre MD. Evaluation of the care of women living with HIV/AIDS in Sao Paulo, Brazil. *AIDS Patient Care STDS.* 2003;17(2):85-93. DOI: 10.1089/108729103321150818
- Souza Junior PR, Szwarcwald CL, Barbosa Junior A, Carvalho MF, Castilho EA. Infecção pelo HIV durante a gestação: estudo-Sentinela Parturiente, Brasil, 2002. *Rev Saude Publica.* 2004;38(6):764-72. DOI: 10.1590/S0034-89102004000600003
- SUDAAN - Research Triangle Institute. 2001. SUDAAN User's Manual, Release 8.0. Research Triangle Institute, Research Triangle Park, NC.
- Szwarcwald C, Carvalho M. Estimativa do número de indivíduos de 15 a 49 anos infectados pelo HIV, Brasil, 2000. *Bol Epidemiol Aids DST.* 2001;14(1).
- Troccoli K, Pollard H 3rd, McMahon M, Foust E, Erickson K, Schulkin J. Human immunodeficiency virus counseling and testing practices among North Carolina providers. *Obstet Gynecol.* 2002;100(3):420-7.
- Victora CG, Wagstaff A, Schellenberg JA, Gwatkin D, Claeson M, Habicht JP. Applying an equity lens to child health and mortality: more of the same is not enough. *Lancet.* 2003;362(9379):233-41.
- Wood E, Montaner JS, Bangsberg DR, Tyndall MW, Strathdee SA, O'Shaughnessy MV, et al. Expanding access to HIV antiretroviral therapy among marginalized populations in the developed world. *AIDS.* 2003;17(17):2419-27.

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