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Maternal mortality profile in Great ABC Region from 1997 to 2005

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SUMMARY

Objective: To analyze the maternal mortality in the ABC Region, comparing indicators from the Committee for the Study of Maternal Mortality in the Great ABC Region (CEMM) of the II Regional Health Center of Santo Andre (DIR II), and the State Data Analysis System Foundation (SEADE). **Methods:** This is a cross sectional study. The information was obtained from the database of CEMM DIR II – Santo André, which includes data from seven counties of the ABC Region. We analyzed all deaths of child-bearing-age women that occurred from 1997 to 2005 in that region. The paired *t* test, Wilcoxon and Kruskal-Wallis tests were used for statistical analysis. **Results:** There were differences regarding the maternal mortality rates in the towns of Diadema, São Bernardo do Campo, Santo André and DIR II, with the coefficients calculated by CEMM being higher than those provided by the SEADE ($p < 0.001$). Concerning the towns of Mauá, Rio Grande da Serra, Ribeirão Pires and São Caetano do Sul, no significant differences were observed between these two coefficients ($p > 0.05$), although the coefficients provided by CEMM were higher than the coefficients obtained from SEADE. **Conclusion:** Our results demonstrate that the official data of maternal mortality in Brazil are still underestimated and point to the lack of healthcare quality during pregnancy, childbirth and postpartum.

Keywords: Mortality coefficient; mortality; maternal mortality; mortality registries; cross-sectional studies.

INTRODUCTION

Maternal mortality is a good indicator of the socioeconomic status of a country and the quality of life of its population. Worldwide, every minute a woman dies in childbirth or due to pregnancy-related complications and in Brazil this problem affects the several regions of the country differently[1-3]. A pregnant woman from a developing country has a 100 to 200-fold higher risk of death due to pregnancy-related causes than another from a developed country[4].

In 2000, the United Nations (UN) gathered world leaders from 192 countries and defined the Millennium Development Goals, aiming at decreasing the socioeconomic inequality in 68 developing countries and among them, in Brazil. One of the main objectives of this program is the reduction in child mortality by two-thirds and maternal mortality by three-fourths in a 15-year period[5].

According to the World Health Organization (WHO), approximately 585,000 women die annually worldwide due to complications related to pregnancy and childbirth and 95% of these deaths occur in developing countries[4].

For the WHO, calculation of the maternal mortality rate must include only deaths that occur within the 42-day period after the end of pregnancy. In Brazil, calculation of maternal mortality rate includes all deaths that occur during an 11-month and 29-day period after the end of pregnancy[1,4].

It was only after the mid-80s that maternal mortality started to receive due attention as a public health problem in developing countries[6]. Brazil declared maternal mortality a priority problem only in March 1994, as established by Law #663 of the Ministry of Health (MH)[1].

In Brazil, the real magnitude of maternal mortality remains unknown and it is estimated that 5,000 deaths occur annually related to pregnancy-childbirth complications, with mortality rates varying in different cities and states[3,7,8].

It is believed that access to the healthcare system, prenatal care, assistance during childbirth and the puerperal period, well-equipped hospitals and a structured healthcare service would lead to a lower rate of maternal mortality[1,3]. Deficient prenatal care due to too few consultations and/or patient low adherence to follow-up contribute to the lack of diagnosis of diseases that can appear at the end of the pregnancy or have a late onset, thus increasing the risk of maternal death[1,4,9,10].

Regarding the mortality rate in the city of São Paulo, it was verified that most maternal deaths occur within the hospital environment and that most deliveries in the capital city of São Paulo State take place in private hospitals or those associated with health-insurance companies[11,12].

Maternal mortality ratio (MMR) is the ratio between the number of maternal deaths (direct and indirect ones) within a certain period of time and the number of live births within the same period generally multiplied by 100,000 live births. Given the importance of this indicator (MMR), the Committee for Study of Maternal Mortality of the ABC region (CEMM-ABC) was created, which included the seven cities that comprise the ABC region (Santo André, São Bernardo do Campo, São Caetano do Sul, Diadema, Mauá, Ribeirão Pires and Rio Grande da Serra). The committee objective was to identify all maternal deaths, construct a regional MMR and indicate intervention measures to decrease maternal mortality[1].

The CEMM-ABC developed its activities between 1997 and 2006 and during this period, it produced information on maternal mortality in the region in parallel to that routinely produced by the State Data Analysis System Foundation (SEADE)[13].

The objective of the present study is to analyze the maternal mortality situation in the ABC region through data produced by the CEMM-ABC and SEADE for the period of 1997 to 2005.

METHODS

This is a cross-sectional study, in which the information was obtained directly from the CEMM-ABC. All deaths of women (female population) of child-bearing age (10 to 49 years) that occurred from 1997 to 2005 in the Great ABC Region were analyzed.

CEMM-ABC collected the information on maternal mortality for the study period and used two distinct methodologies for that purpose. Between the years 1996 and 2000, death reports (DR) of women of child-bearing age were obtained directly from Civil Registry Offices in the Great ABC Region, and between 2001 and 2005, the DR were extracted from the SIM (Mortality Information System) Database.

Other sources of information were used, such as the SEADE and IBGE (Instituto Brasileiro de Geografia e Estatística) databases, for comparison between the official sources and the CEMM-ABC research, in order to identify the under-notification of maternal deaths. CEMM-ABC obtained the information on live births directly from the Live Birth Information System (SINASC), to carry out the annual calculation of the MMR according to the MH standardization. The data obtained by the CEMM-ABC included all deaths of women that were found in death certificates, which were individually verified by the CEMM-ABC team. That ensured a higher quality of these registries.

CEMM-ABC used research tools (questionnaires) recommended by the Ministry of Health for home and hospital visits (Manual of Maternal Mortality Committees of the Ministry of Health)[1].

Descriptive analysis of all study variables was conducted. Quantitative variables were presented regarding their central tendency and dispersion values[14].

Data normality and homogeneity of variances were verified by Kolmogorov-Smirnov and Levene tests, respectively[14]. To compare the variables that met these two principles, paired *t* test was used; otherwise, Wilcoxon and Kruskal-Wallis tests were used, followed by Dunn's multiple comparisons[14,15]. The significance level was set at 5%. Statistical package SPSS 17.0 for Windows was used for the statistical analysis.

This study was approved by the Ethics Committee of Faculdade de Medicina do ABC, under the No. 390/2007.

Results

Significant differences were observed between maternal mortality rates obtained by CEMM and SEADE in some municipalities of the Great ABC for the period 1997 to 2005. Following are the means ± standard deviations and ranges (minimum and maximum values) by obtained coefficient (CEMM and SEAD) for each municipality in the ABC region. For Diadema it was observed, by paired *t* test, that the maternal mortality rate obtained by CEMM (53.8 ± 24.5, ranging from 22.1 to 93.1) was statistically higher than the coefficient obtained by SEADE (26.6 ± 11.6, ranging between 11.1 and 43.6) (p < 0.001). No differences were observed in Mauá by Wilcoxon test between the maternal mortality rate obtained by CEMM (45.4 ± 26.2, ranging from 14.3 to 88.13) and SEADE (36.8 ± 16, 7, ranging from 0 to 50.4) (p = 0.08). Moreover, there were no significant differences, by Wilcoxon test, between the maternal mortality rate obtained by CEMM (108.1 ± 106.5; ranging from 0 to 279.7) and SEADE (72.3 ± 108.1; ranging from 0 to 265.3) for the municipality of Rio Grande da Serra (p = 0.15).

The same pattern is repeated for Ribeirão Pires, where there were no significant differences (Wilcoxon test) between the maternal mortality rate obtained by CEMM (69.2 ± 59.4, ranging from 0 to 172.9) and SEADE (55.3 ± 37.9, ranging from 0 to 119.9) (p = 0.11).

As for the municipality of São Bernardo do Campo, by the paired *t* test, significant differences were observed between these two coefficients (p < 0.001), where the maternal mortality rate obtained by CEMM (41.5 ± 17.8, ranging from 14.4 to 64.6) was statistically higher than the coefficient obtained by SEADE (19.8 ± 13.8, ranging from 0 to 43.1) (p < 0.001). This significant difference is also observed for the municipality of Santo André, where paired *t* test showed that the maternal mortality rate obtained by CEMM (54.9 ± 11.7, ranging from 30.6 to 71.7) was statistically higher than that obtained by SEADE (38.3 ± 18.1, ranging from 20.9 and 72.5) (p < 0.001).

In São Caetano do Sul there were no significant differences between the two coefficients (CEMM: 39.4 ± 39.6, ranging from 0 to 114.0 and SEADE: 55.7 ± 52.6, ranging from 0 to 167.6) (Wilcoxon test, p = 0.08).

However, when one considers the region as a whole by the results obtained by DIR II, paired *t* test shows significant difference between the two maternal mortality rates (p < 0.001). The coefficient obtained by CEMM (50.0 ± 10.6, ranging from 32.1 to 66.8) was statistically higher than the coefficient obtained by SEADE (32.3 ± 11.4, ranging from 14.7 to 48.0).

Figure 1 presents the analysis of maternal mortality coefficients obtained by CEMM and SEADE for municipalities of Diadema, Mauá, Rio Grande da Serra and Ribeirão Pires in the period 1997 to 2005. Kruskal-Wallis test showed the years differed between them (p < 0.001) in Diadema, Mauá and Ribeirão Pires. Dunn's multiple comparison test showed that for the municipality of Diadema there was an increase of two maternal mortality coefficients (CEMM and SEAD) in 2002 (p < 0.001) and 2005 (p < 0.001). As for the municipality of Mauá, we observed increases in the coefficients in 2000 (p < 0.001) and 2003 (p < 0.001). No increases in maternal mortality coefficients were observed for the municipality of Ribeirão Pires in 2002 (p < 0.001). For Rio Grande da Serra, no differences were observed throughout the period (p > 0.05).

Figure 2 shows the maternal mortality coefficients obtained by SEADE and CEMM for Santo Andre, São Bernardo do Campo and São Caetano do Sul. Kruskal-Wallis test showed significant differences for each of the coefficients throughout this period, for both São Bernardo do Campo and Santo André (p < 0.001). Dunn's test showed that the municipality of São Bernardo do Campo had peaks in 1998 (p < 0.05) and 2002 (p < 0.001), where maternal mortality coefficients obtained by CEMM were always higher than those obtained by SEADE (p < 0.05). For Santo André, coefficient increases occurred in 2000 (p < 0.05) and from 2003 on (p < 0.05). In São Caetano do Sul, there were no significant differences between the study years (Kruskal-Wallis, p > 0.05).

Figure 3 shows the maternal mortality coefficients obtained by CEMM and SEADE for DIR II, which includes all municipalities in the Great ABC Region for the study period. Kruskal-Wallis test showed significant differences between the coefficients that were accentuated during the period from the year 2000 on. In the series of data supplied by CEMM, 2002 was the year that presented the highest maternal mortality coefficient (Dunn's test, p < 0.05).

Discussion

This cross-sectional study showed significant difference in maternal mortality rates between CEMM and SEADE, where the indicator obtained by CEMM had higher values than those obtained by SEADE and this difference was also observed in each of the municipalities per study year. The highest MMRs shown by CEMM are attributed to greater accuracy of information due to an active search
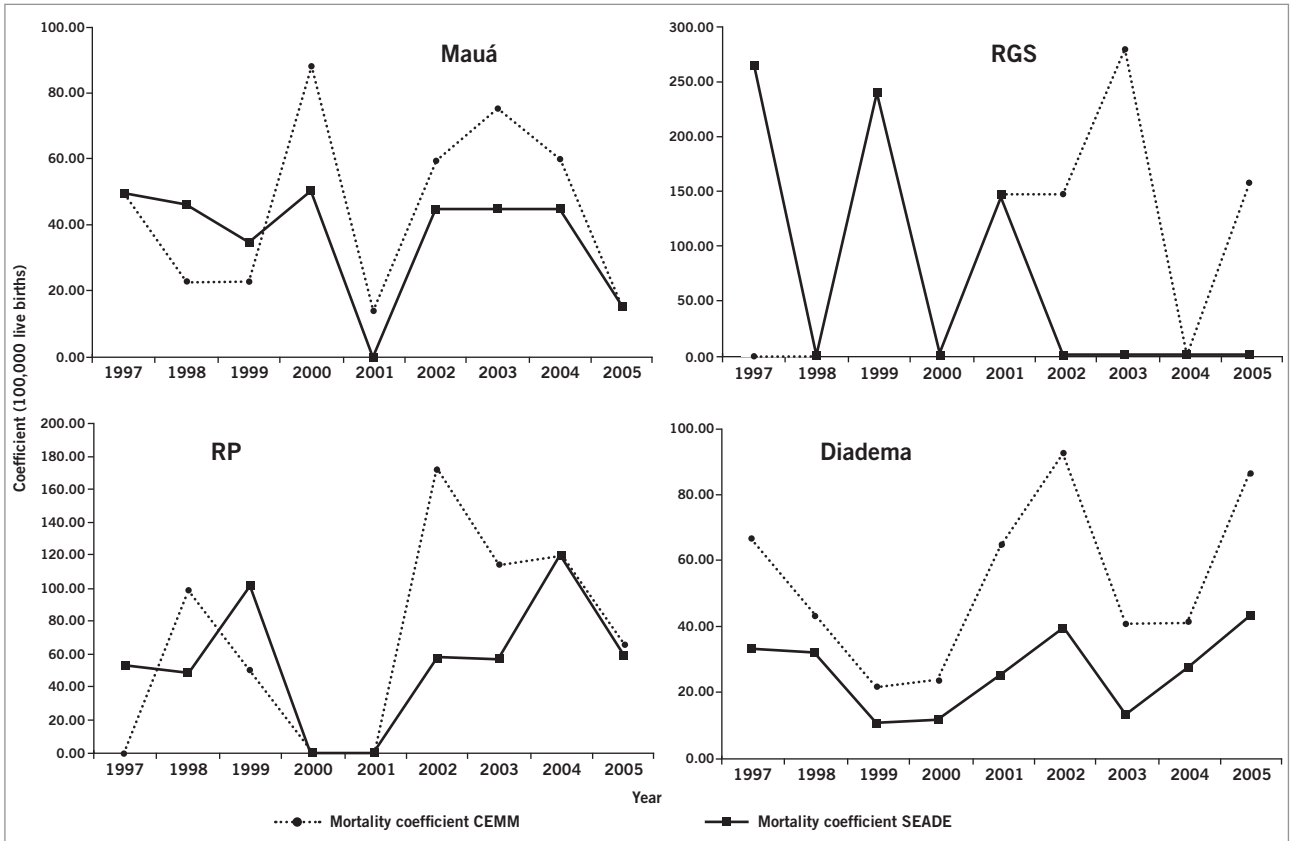
Figure 1 – Maternal mortality coefficients (100,000 live births) for the towns of Mauá, Rio Grande da Serra, Ribeirão Pires and Diadema from 1997 to 2005.
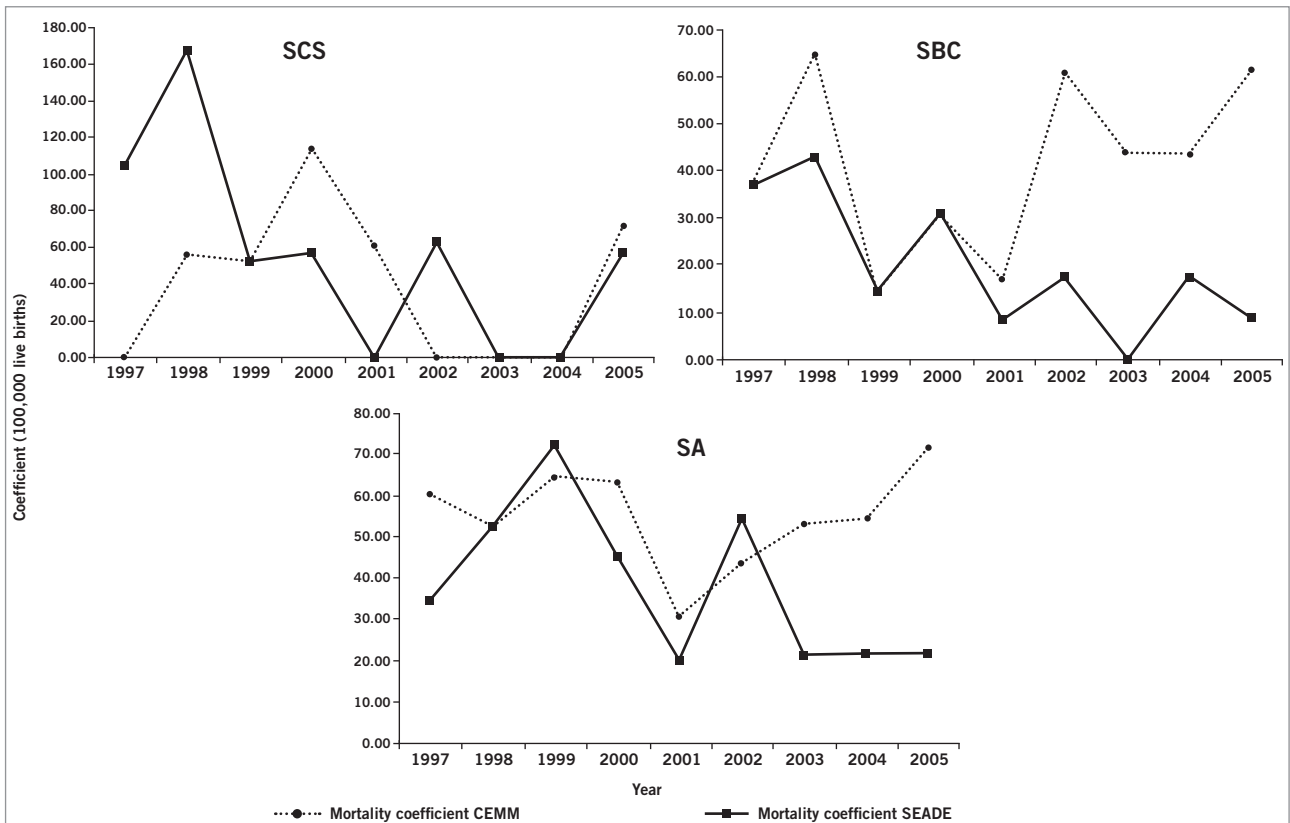

Figure 2 – Maternal mortality coefficients (100,000 live births) for the towns of São Caetano do Sul São Bernardo do Campo, and Santo André from 1997 to 2005
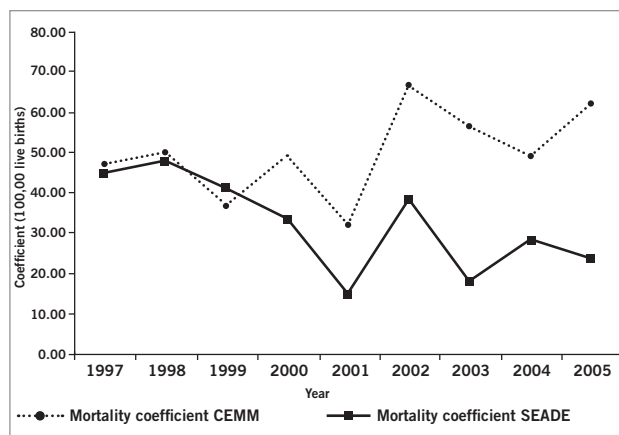
Figure 3 – Maternal mortality coefficients (100,000 live births) for DIR2 from 1997 to 2005.

of the deaths registries and review of several databases that contained the same information. Thus, data from CEMM better reflect the reality of maternal mortality in the studied region.

CEMM-ABC developed a work that had a greater precision in MMR estimates for the region, which was accompanied every year and supplied annual reports to the managers, allowing a more intense work for maternal mortality prevention.

Maternal death in developing countries is a silent epidemic and a public health problem, not only due to its magnitude, but because 90% of the causes of death during pregnancy and childbirth are preventable[16].

In Brazil, maternal mortality has been a concern of health authorities, both at federal, state and municipal levels. According to the Ministry of Health, maternal mortality constitutes a violation of human rights of women and children, unequally affecting those from the lower social classes, with lower access to social benefits in the several Brazilian regions[3,7,17,18]. Therefore, its more accurate detection provides the rationale for intervention regarding this important health issue.

Estimates by the World Bank and WHO show that wide variations in maternal mortality are observed in developing countries in different regions of the world and that it may vary from 1 to 15 up to 1 to 70 women of child-bearing age; in developed countries it ranges from 1 to 3,000 women to up to 1 to 10,000[1].

According to the Millennium Development Goals estimates, Brazil has reduced child mortality and maternal mortality rates by decreasing regional and socioeconomic inequalities in health, through public healthcare policies implemented in the last 20 years[5,19].

The maternal mortality statistics are used in epidemiology and public health as an indicator of health status, in health program evaluations and population studies, in order to compare temporal trends and geographic differences. The main variable used in this statistic is cause

of death[20]. Research on maternal mortality should be encouraged, especially in developing countries, which have high mortality rates when compared with developed countries.

Childhood mortality has been used as an indicator of social and economic development for many years by different countries. This is considered a classic indicator of health. Maternal mortality, on the other hand, has not been duly recognized by the public and health authorities, despite the adverse conditions observed in the poorest communities and even in certain poorer zones in developed areas, such as metropolitan areas in the Brazilian southeast[5].

To study maternal mortality rates and registries it is necessary not only to know about the potential risks of pregnancy, childbirth and puerperium, but also to learn about women's health in general and their social and cultural status[5,19,21].

According to Victora[5], 10 years after the start of Millennium Program several factors are determinants of maternal and childhood mortality in developing countries. In his editorial, the author points out that developing countries follow Hartman's proposal, where socioeconomic status is inversely proportional to the health needs of the population.

Death of women before, during and after childbirth, due to direct or indirect causes related to pregnancy, represents a huge proportion of deaths among adults worldwide, especially in developing countries and among these, Brazil. Direct causes are related to obstetric deaths in pregnancy, childbirth and puerperium, caused by interventions, omissions, incorrect treatment or sequence of events resulting from any of these situations. Indirect deaths are those resulting from diseases that are present before or that develop during pregnancy and not due to direct obstetric causes, but which are aggravated by the physiological effects of pregnancy[6,11].

Our results demonstrate that the official figures of maternal mortality in Brazil are still underestimated and point out the lack of healthcare quality received during pregnancy, childbirth and postpartum. This characteristic is common in developing countries, where pregnant women are most in need and have more difficult access to quality care[6,21].

Knowledge of actual maternal mortality situation is necessary to ensure the government's sensitization to prioritize integrated assistance to women's health programs and to raise awareness among the population regarding the need for effective healthcare services and decrease in mortality rates.

Moreover, this study contributes to demonstrate the need for better discrimination and homogenization when obtaining actual health-related data in developing countries, such as Brazil.

References

1. Brasil. Ministério da Saúde. Secretaria de Políticas de Saúde, Área Técnica de Saúde da Mulher. Manual dos Comitês de Mortalidade Materna. 2ª ed. Brasília (DF): Ministério da Saúde; 2002.
2. Tanaka ACA. Mortalidade materna: reflexo da má qualidade e da desintegração dos serviços de saúde. J Rede Saúde 2000;20:5-8.
3. Laurenti R, Mello-Jorge MHP, Gotlieb SLD. A mortalidade materna nas Capitais Brasileiras: algumas características e estimativa de um fator de ajuste. Rev Bras Epidemiol 2004;7(4):449-60.
4. OMS. Organização Mundial da Saúde. Classificação Internacional de Doenças e de Problemas Relacionados à Saúde: décima revisão: manual de instrução. 7ª ed. São Paulo: Edusp; 2004. v. 2.
5. Victora CG. The millennium development goals and the inverse care law: no progress where it is most needed? J Epidemiol Community Health 2008;62(11):938-9.
6. Laurenti R. Mortalidade materna nos países subdesenvolvidos ou em desenvolvimento. Rev Assoc Med Bras 2002;48(1):1-25.
7. Martins AL. Mortalidade materna de mulheres negras no Brasil. Cad Saúde Pública 2006; 22(11):2473-9.
8. Melo ECP, Knupp VMAO. Mortalidade materna no município do Rio de Janeiro: magnitude e distribuição. Esc Anna Nery Rev Enferm 2008;12(4):773-9.
9. Calderon IMP, Cecatti JG, Vega CEP. Intervenções benéficas no pré-natal para prevenção da mortalidade materna. Rev Bras Ginecol Obstet 2006;28(5):310-5.
10. Nagahama EEI, Santiago, Silvia Maria. Cuidado pré-natal em hospital universitário: uma avaliação de processo. Cad Saúde Pública 2006;22(1):173-9.
11. Haddad N, Silva MB. Mortalidade feminina em idade reprodutiva no Estado de São Paulo, Brasil, 1991-1995: causas básicas de óbito e mortalidade materna. Rev Saúde Pública 2000; 34(1):64-70.
12. Luz AG, Tiago DB, Silva JCG, Amaral E. Morbidade materna grave em um hospital universitário de referência municipal em Campinas, Estado de São Paulo. Rev Bras Ginecol Obstet 2008;30(6):281-6.
13. SEADE - Fundação Sistema Estadual de Análise de Dados. Institucional. 2010. [cited 24 Jun 2010]. Available at:http://www.seade.gov.br/master.php?opt=ins.
14. Callegari-Jacques, SM. Bioestatística: princípios e aplicações. Porto Alegre: Ed. ARTMED, 2003.
15. Siegel S. Estatística não paramétrica. São Paulo: McGraw-Hill do Brasil; 1981.
16. Oba MDV, Tavares MSG. Análise da mortalidade materna do município de Ribeirão Preto - SP - no período de 1991 a 1995. Rev Latino-am Enferm 2001;9(3):70-6.
17. Rezende CHA, Moreli D, Rezende IMAA. Mortalidade materna em cidade de médio porte, Brasil, 1997. Rev Saúde Pública 2000;34(4):323-8.
18. Amaral E, Luz AG, Souza JPD. A morbidade materna grave na qualificação da assistência: utopia ou necessidade. Rev Bras Ginecol Obstet 2007;29(9):484-9.
19. Bhutta ZA, Chopra M, Axelson H, Berman P, Boerma T, Bryce J et al. Countdown to 2015 decade report (2000-10): taking stock of maternal, newborn, and child survival. Lancet 2010;375(9730):2032-44.
20. Laurenti R, Jorge MHPM, Gotlieb SLD. Mortalidade segundo causas: considerações sobre a fidedignidade dos dados. Rev Panam Salud Publica 2008;23(5):349-56.
21. Leal MC. Desafio do milênio: a mortalidade materna no Brasil. Cad Saúde Pública 2008;24(8):1724-5.