Temporal trends and spatial distribution of unsafe abortion in Brazil, 1996-2012

Tendência temporal e distribuição espacial do aborto inseguro no Brasil, 1996-2012

ABSTRACT

OBJECTIVE: To analyze temporal trends and distribution patterns of unsafe abortion in Brazil.

METHODS: Ecological study based on records of hospital admissions of women due to abortion in Brazil between 1996 and 2012, obtained from the Hospital Information System of the Ministry of Health. We estimated the number of unsafe abortions stratified by place of residence, using indirect estimate techniques. The following indicators were calculated: ratio of unsafe abortions/100 live births and rate of unsafe abortion/1,000 women of childbearing age. We analyzed temporal trends through polynomial regression and spatial distribution using municipalities as the unit of analysis.

RESULTS: In the study period, a total of 4,007,327 hospital admissions due to abortions were recorded in Brazil. We estimated a total of 16,905,911 unsafe abortions in the country, with an annual mean of 994,465 abortions (mean unsafe abortion rate: 17.0 abortions/1,000 women of childbearing age; ratio of unsafe abortions: 33.2/100 live births). Unsafe abortion presented a declining trend at national level (R²: 94.0%, p < 0.001), with unequal patterns between regions. There was a significant reduction of unsafe abortion in the Northeast (R²: 93.0%, p < 0.001), Southeast (R²: 92.0%, p < 0.001) and Central-West regions (R²: 64.0%, p < 0.001), whereas the North (R²: 39.0%, p = 0.030) presented an increase, and the South (R²: 22.0%, p = 0.340) remained stable. Spatial analysis identified the presence of clusters of municipalities with high values for unsafe abortion, located mainly in states of the North, Northeast and Southeast Regions.

CONCLUSIONS: Unsafe abortion remains a public health problem in Brazil, with marked regional differences, mainly concentrated in the socioeconomically disadvantaged regions of the country. Qualification of attention to women’s health, especially to reproductive aspects and attention to pre- and post-abortion processes, are necessary and urgent strategies to be implemented in the country.

DESCRIPTORS: Abortion, Induced, statistics & numerical data. Epidemiology. Spatio-Temporal Analysis.
Unsafe abortion represents a controversial and challenging question, which incorporates social justice aspects in low and middle income countries, involving a complex network of legal, economic, social, and psychological factors. Unsafe abortion is defined as the interruption of a pregnancy performed by persons/professionals without the necessary technical abilities and/or in environments without adequate sanitary standards. On the other hand, abortion that is considered safe is that which performed in situations set forth in law, making it possible to provide women with the necessary and qualified treatment on behalf of structured health services. These services should offer psychosocial assistance at the moment of decision and guarantee the quality of health care necessary for the treatment and monitoring of the event. Unsafe abortions occur mainly in countries where the laws are restrictive to the procedure or in those where it is legal, but women’s access to health services is hampered. As a consequence, unsafe abortion is one of the main causes of maternal morbidity and mortality in these countries. In 2008, it is estimated that

a World Health Organization. Safe abortion: technical and policy guidance for health systems. Geneva; 2003 [cited 2013 Jan 10]. Available from: http://whqlibdoc.who.int/publications/2003/9241590343.pdf
b Singh S, Wulf D, Hussain R, Bankole A, Sedgh G. Abortion worldwide: a decade of uneven progress. New York: Guttmacher Institute; 2009 [cited 2013 Jan 10]. Available from: http://www.guttmacher.org/pubs/Abortion-Worldwide.pdf
22 million unsafe abortions occurred around the world, 97.0% in developing countries. Approximately 13.0% of maternal deaths in the world are related to unsafe abortion, resulting in 47,000 deaths of women each year, mainly in Latin American countries.

In Brazil, the illegality of unsafe abortion obscures its real magnitude and repercussions. The practice of abortion is considered a crime in the country, being permitted by law in cases of sexual violence (rape) or maternal risk of life and, more recently, in cases of pregnancies of anencephalic fetuses. Against the difficulties of registering the number of abortions, the estimates are based on hospital admissions due to abortion recorded in the Brazilian Unified Health System (SUS). It is estimated that between 729,000 and 1.25 million unsafe abortions are performed annually. It is additionally estimated that by the end of reproductive life, one in five women in Brazil will have had an abortion. Post abortion curettage is the second most frequent obstetric procedure in the public health system. Around 240,000 hospital admissions are performed annually for treatment of complications arising from abortions in the SUS, generating annual costs of approximately 45 million reais. Besides this, abortion-related indicators reveal strong social and regional inequalities. States in the North and Northeast regions present higher abortion rates and constitute the main cause of maternal death in some capitals of these states.

Knowledge of the magnitude and trends of unsafe abortion is necessary to monitor the progress in the direction of improving maternal health care and access to family planning. Furthermore, it can contribute to the development of public policies that promote the discussion, prevention, and integral and humanized care for women in abortion situations. Post abortion curettage is the second most frequent obstetric procedure in the public health system. Around 240,000 hospital admissions are performed annually for treatment of complications arising from abortions in the SUS, generating annual costs of approximately 45 million reais. Besides this, abortion-related indicators reveal strong social and regional inequalities. States in the North and Northeast regions present higher abortion rates and constitute the main cause of maternal death in some capitals of these states.

The objective of this study was to analyze time trends and spatial distribution patterns of unsafe abortion in Brazil, from 1996 to 2012.

METHODS

Ecological study of time-series and spatial analysis, utilizing secondary data of hospital admissions due to abortion occurring in Brazil, from 1996 to 2012. A database was compiled based on the number of hospital admissions due to abortion, the number of live births and the population of women aged 10 to 49. The data were obtained from the Sistema de Informações Hospitalares (SIH – Brazilian Hospital Information System) and the Sistema de Informações sobre Nascidos Vivos (SISNAC – Brazilian Live Birth Information System), from the Departamento de Informática do SUS (DATASUS – Brazilian Unified Health System Information Technology Department) and the Brazilian Institute of Geography and Statistics (IBGE). The population data were obtained from the Brazilian Population Demographic Census (2000 and 2010), Population Counting (1996) and population estimates for intercensus years (1997-1999, 2001-2009 and 2011-2012). The data of live births were obtained from the live birth declarations (DN), standardized nationwide (data available until 2011). The information about hospitalizations due to abortion were obtained from the Autorização de Internação Hospitalar (AIH – Hospital Admission Authorization) recorded from 1996 to 2012, according to place of residence. Abortion and its complications correspond to the codes O00-O08 (Pregnancy with abortive outcome), of Chapter XV – Pregnancy, childbirth and puerperium, of the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10).

The number of hospitalizations due to abortion (NIH – internações hospitalares por abortamento) subsidized the calculation of estimates of unsafe abortions (NAI – número de abortos inseguros) by year and place of residence. To achieve this, the methodology of Alan Guttmacher was used, based on the following formula:

\[ NAI = (5) \times (1.125) \times (0.75) \times NIH \]

This methodology estimates the number of unsafe abortions, considering: 20.0% of hospital admissions due to abortion complications (one admission for every five abortions); parameter of 12.5% as an estimate of underreporting (admissions performed outside SUS) and a discount of 25.0% of abortions due to spontaneous causes. The following indicators were calculated: unsafe abortion rate per 1,000 women of childbearing age (10 to 49), a measurement that describes the number of unsafe abortions in a female population in reproductive age, and the unsafe abortion ratio per 100 live births (2000-2011), that indicates the probability of a pregnancy ending in unsafe abortion instead of a live birth.
Data analysis was performed in two stages. In the first, the time trends of unsafe abortion indicators were analyzed using the five geographic regions (North, Northeast, Central-West, South and Southeast) and the 27 states as units of analysis. Time trends analysis was performed using the polynomial regression method, with the objective of identifying the curve that best adjusted to the data, in order to describe the relationship between the dependent variable Y (unsafe abortion indicator) and the independent variable (year of study). To avoid the autocorrelation between the terms of the regression equation, an artifice of centralizing the year variable was used, transforming it to calendar year minus the mid-point of the historic series. The following models were tested: first order (simple linear) \( Y = \beta_0 + \beta_1 X \), second order \( Y = \beta_0 + \beta_1 X + \beta_2 X^2 \), third order \( Y = \beta_0 + \beta_1 X + \beta_2 X^2 + \beta_3 X^3 \), where \( \beta_0 \) is the period average rate and \( \beta_1 \), \( \beta_2 \) and \( \beta_3 \) represent the average annual increment. The choice of the best model was based on the best function according to scatterplot, best adjustment by the analysis of residuals, greatest statistical significance and greatest determination coefficient \( R^2 \). In the case of similar statistical models, the simpler one was chosen. The trends were considered statistically significant when the models presented a p-value < 0.05.

In the second stage, the spatial distribution patterns of unsafe abortion in Brazil were analyzed using the municipalities of residence (5,565; territorial division of 2010) as unit of analysis. Methods of spatial analysis and GIS techniques were used to evaluate the geographic distribution and spatial dependence of unsafe abortion indicators in Brazil.

Two strategies were used as the basis for the construction of thematic maps. To correct the random fluctuations and provide greater stability of unsafe abortion rates, especially in municipalities with small populations, the average rates were estimated in three sub-periods (1996-2000, 2001-2006 and 2007-2012) and total period (1996-2012). The unsafe abortion rates were again estimated (smoothed rates) through the Local Empirical Bayesian method.5

The presence of global spatial dependence was analyzed using the Global Moran’s I index on crude rates.6 The local autocorrelation (LISA – Local Index of Spatial Association) was assessed by the Local Moran’s index.7 To identify critical or transition areas, we used the Moran scatterplot based on the Local Moran’s index.7 For spatial representation of the Moran scatterplot, we used the Moran Map that considers only the mapping of municipalities with statistically significant differences \( p < 0.05 \).

We used SPSS software version 15.0 in the preparation of polynomial regression and scatterplots. ArcGIS software version 9.3 (Environmental Systems Research Institute, ESRI, Redlands, CA, USA) and TerraView version 4.2 (INPE – Instituto Nacional de Pesquisas Espaciais, Sao José dos Campos, SP, Brazil) were used for processing, analysis and presentation of cartographic data, calculation of autocorrelation spatial indicators and construction of thematic maps.

Since this is an ecological study using secondary data available to the public without identifying individuals, there was a waiver of the submission to the Ethics Research Committee.

RESULTS

Between 1996 and 2012, 4,007,327 hospital admissions due to abortion were recorded in SIH/SUS, with an average annual of 235,725 hospital admissions. We estimated 16,905,911 unsafe abortions in Brazil, with an average annual of 994,465 (95% CI 961,767; 1,027,163).

Hospital admissions due to abortion, estimates of unsafe abortion and unsafe abortion indicators by regions and states are shown in Table 1. The average annual unsafe abortion rate was 17.0 abortions/1,000 women of childbearing age, while the unsafe abortion ratio was 33.2 abortions/100 live births. The highest proportion of cases of hospital admissions and unsafe abortions was recorded in the Southeast region (39.2%), especially in the state of Sao Paulo (19.0%). The Northeast region presented the highest values of unsafe abortion indicators (rate: 21.6 abortions/1,000 women of childbearing age; ratio: 39.7 abortions/100 live births). Most states in the North (6/7) and Northeast (6/9) regions, and the states of Federal District and Rio de Janeiro, had higher unsafe abortion rates than the national average, while most states in the Northeast (6/9) and Southeast (3/4) regions, as well as the states of Amapá, Acre and the Federal District, presented unsafe abortion ratio values higher than the national level (Table 1). The state of Amapá had the highest unsafe abortion rate (35.9 abortions/1,000 women of childbearing age) and the state of Bahia, the highest unsafe abortion ratio per live births (53.6 abortions/100 live births) (Table 1).

Trends of unsafe abortion indicators, grouped by regions and states, are presented in Tables 2 and 3. The unsafe abortion rate presented a trend of significant and steady decline in the country \( R^2: 94.0\% ; \ p < 0.001 \) (linear model), with distinct patterns among the regions and states. Similar to the national pattern observed, the Northeast \( R^2: 93.0\% ; \ p < 0.001 \), the Southeast \( R^2: 92.0\% ; \ p < 0.001 \) and Central-West \( R^2: 64.0\% ; \ p < 0.001 \) regions presented trend of significant and steady decline in the period (linear model). The largest decrease was observed in the Northeast region, with an
annual reduction of 0.63 abortions/1,000 women of childbearing age. In contrast, the North region (R²: 39.0%; p = 0.030) showed a trend of significant and not constant increase (second order model), while the South region (R²: 22.0%, p = 0.340) showed a stable trend (Table 2). Most states (16/27) showed a decline trend in the unsafe abortion rates in the period. The states of Amazonas, Amapá, Tocantins, Maranhao, Paraíba and Rio Grande do Sul showed significant increase trends over the period (Table 2).
In contrast to the pattern of decline observed in
the unsafe abortion rate, the unsafe abortion ratio/
live births presented a stable trend at the national
level (R²: 46.0%; p = 0.052). The North (R²: 60.0%;
p < 0.001), South (R²: 78.0%; p < 0.001) and Central-
West (R²: 23.0%; p = 0.006) regions presented trends
of significant and steady increase in the period (linear
model). The North (R²: 57.0%; p < 0.001) and Southeast
(R²: 25.0%; p = 0.047) regions presented trends of
significant and steady decline of this indicator (linear
model) (Table 3). Over 40.0% of the states (12/27)
presented increase trends in the period. The states of
Rondônia, Amazonas, Roraima, Amapá, Tocantins, in
Northern Brazil, Paraíba, Northeastern Brazil, Paraná,
Rio Grande do Sul, Southern Brazil, Mato Grosso and
Goiás, Central-Western Brazil, presented trends of ste-
dy increase (linear model) (Table 3).

During the period, 99.9% (5,560/5,565) of municip-
alities recorded at least one case of hospitalization
due to abortion. The distribution of average unsafe
abortion rates among municipalities ranged from
zero to 124.5 abortions/1,000 women of childbear-
ing age, while the smoothed rates ranged from 0.4
to 122.3. Figures 1 and 2 show maps of the spatial

### Table 2. Trend analysis of unsafe abortion rates by regions and states. Brazil, 1996-2012.

| Regions/States             | Modela                     | R²b       | p      | Trend                  |
|---------------------------|----------------------------|-----------|--------|------------------------|
| North                     | Y = 21.139 + 0.66x - 0.044x² | 0.393     | 0.03   | Increasing, not constant |
| Rondônia                  | Y = 15.363 - 0.079x + 0.011x² + 0.003x³ | 0.061     | 0.838  | Stable                 |
| Amazonas                  | Y = 31.433 - 0.538x              | 0.328     | 0.016  | Decreasing and constant |
| Acre                      | Y = 25.043 + 0.416x - 0.165x²   | 0.710     | < 0.001| Increasing, not constant |
| Amapá                     | Y = 17.140 + 0.454x              | 0.380     | 0.008  | Increasing and constant |
| Tocantins                 | Y = 21.747 - 0.631x              | 0.930     | < 0.001| Decreasing and constant |
| Northeast                 | Y = 14.529 + 0.248x              | 0.443     | 0.004  | Increasing and constant |
| Maranhão                  | Y = 21.160 - 0.609x              | 0.863     | < 0.001| Decreasing and constant |
| Piauí                     | Y = 22.342 - 0.778x              | 0.873     | < 0.001| Decreasing and constant |
| Rio Grande do Norte       | Y = 12.267 - 0.550x + 0.048x² + 0.009x³ | 0.368     | 0.103  | Stable                 |
| Paraíba                   | Y = 12.835 + 0.630x              | 0.686     | < 0.001| Increasing and constant |
| Pernambuco                | Y = 21.073 - 0.724x              | 0.927     | < 0.001| Decreasing and constant |
| Alagoas                   | Y = 18.133 - 0.741x              | 0.747     | < 0.001| Decreasing and constant |
| Sergipe                   | Y = 32.287 - 1.513x              | 0.956     | < 0.001| Decreasing and constant |
| Bahia                     | Y = 27.321 - 1.113x              | 0.921     | < 0.001| Decreasing and constant |
| Bahia                     | Y = 15.817 - 0.431x              | 0.921     | < 0.001| Decreasing and constant |
| Minas Gerais              | Y = 16.105 - 0.557x              | 0.881     | < 0.001| Decreasing and constant |
| Espírito Santo            | Y = 17.110 - 0.760x              | 0.911     | < 0.001| Decreasing and constant |
| Rio de Janeiro            | Y = 17.938 - 0.609x              | 0.768     | < 0.001| Decreasing and constant |
| São Paulo                 | Y = 14.770 - 0.323x              | 0.894     | < 0.001| Decreasing and constant |
| South                     | Y = 11.358 - 0.122x - 0.005x² + 0.003x³ | 0.220     | 0.340  | Stable                 |
| Paraná                    | Y = 11.461 - 0.110x              | 0.268     | 0.033  | Decreasing and constant |
| Santa Catarina             | Y = 13.991 - 0.355x              | 0.698     | < 0.001| Decreasing and constant |
| Rio Grande do Sul         | Y = 9.569 + 0.354x              | 0.508     | 0.001  | Increasing and constant |
| Central-West              | Y = 15.542 - 0.274x              | 0.637     | < 0.001| Decreasing and constant |
| Mato Grosso do Sul        | Y = 16.412 - 0.521x              | 0.866     | < 0.001| Decreasing and constant |
| Mato Grosso               | Y = 11.682 + 0.077x + 0.016x² - 0.003x³ | 0.215     | 0.352  | Stable                 |
| Goiás                     | Y = 13.647 - 0.117x - 0.047x²   | 0.683     | < 0.001| Decreasing, not constant |
| Federal District          | Y = 25.275 - 0.662x              | 0.534     | 0.001  | Decreasing and constant |
| Brazil                    | Y = 17.221 - 0.396x              | 0.942     | < 0.001| Decreasing and constant |

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a Model: y = unsafe abortion rate (per 1,000 WCBA); x = year of abortion – middle year of period studied (2004).
b R²: coefficient of determination.
distribution of average crude and adjusted (smoothed) unsafe abortion rates, respectively. In general, both maps show municipalities and/or clusters of municipalities with high unsafe abortion rates (> 20 abortions/1,000 women of childbearing age) in almost all states, located mainly in North, Northeast, Southeast and Central-West regions (Figures 1 and 2). The Northeast and North regions concentrate most of these municipalities, covering important areas with high rates in all states (Figures 1 and 2). Furthermore, important clusters of municipalities with high rates in west of Mato Grosso do Sul, south of Mato Grosso, east of Goiás, the Federal District and north of Minas Gerais were found (Figures 1 and 2).

The Global Moran’s I index for the entire period and sub-periods showed positive (ranging from 0.18 to 0.28) and significant (p < 0.01) values, indicating global spatial autocorrelation with similar patterns in Brazil. Figure 3 shows the clusters of municipalities identified according to the Local Moran’s index for the unsafe abortion rates and visualized by Moran Map. During this period, were identified clusters of municipalities with high rates (high/high) located from the north and east of Sao Paulo, extending to

Table 3. Trend analysis of unsafe abortion ratios by regions and states. Brazil, 1996-2011.

| Region/States         | Model*                        | R²b | p       | Trend               |
|-----------------------|-------------------------------|-----|---------|---------------------|
| North                 | Y = 30.106 + 0.554x           | 0.60| < 0.001 | Increasing and constant |
| Rondônia              | Y = 26.405 + 0.992x           | 0.602| < 0.001 | Increasing and constant |
| Acre                  | Y = 38.152 + 0.900x + 0.021x² - 0.023x³ | 0.150| 0.568 | Stable |
| Amazonas              | Y = 30.299 + 1.066x           | 0.486| 0.003 | Increasing and constant |
| Roraima               | Y = 31.435 + 2.385x           | 0.288| 0.032 | Increasing and constant |
| Pará                  | Y = 29.306 - 0.307x           | 0.380| 0.011 | Decreasing and constant |
| Amapá                 | Y = 43.603 + 2.947x           | 0.725| < 0.001 | Increasing and constant |
| Tocantins             | Y = 26.281 + 1.313x           | 0.634| < 0.001 | Increasing and constant |
| Northeast             | Y = 39.775 - 0.623x           | 0.572| 0.001 | Decreasing and constant |
| Maranhão              | Y = 22.347 - 0.073x + 0.122x² | 0.436| 0.024 | Decreasing, not constant |
| Piauí                 | Y = 40.617 - 1.337x           | 0.533| 0.001 | Decreasing and constant |
| Ceará                 | Y = 41.403 - 0.573x           | 0.428| 0.006 | Decreasing and constant |
| Rio Grande do Norte   | Y = 22.033 - 0.594x + 0.097x² + 0.027x³ | 0.474| 0.046 | Decreasing, not constant |
| Paraíba               | Y = 24.841 + 1.296x           | 0.627| < 0.001 | Increasing and constant |
| Pernambuco            | Y = 37.614 - 0.407x           | 0.418| 0.007 | Decreasing and constant |
| Alagoas               | Y = 38.496 - 0.090x - 0.122x² | 0.383| 0.043 | Decreasing, not constant |
| Sergipe               | Y = 52.718 - 0.730x           | 0.361| 0.014 | Decreasing and constant |
| Bahia                 | Y = 53.733 - 1.574x           | 0.641| < 0.001 | Decreasing and constant |
| Southeast             | Y = 32.943 - 0.210x           | 0.254| 0.047 | Decreasing and constant |
| Minas Gerais          | Y = 37.378 - 1.079x           | 0.424| 0.006 | Decreasing and constant |
| Espírito Santo        | Y = 33.396 - 0.692x           | 0.798| < 0.001 | Decreasing and constant |
| Rio de Janeiro        | Y = 41.354 - 0.282x - 0.194x² | 0.744| < 0.001 | Decreasing, not constant |
| São Paulo             | Y = 31.884 + 0.072x - 0.093x² | 0.677| 0.001 | Decreasing, not constant |
| South                 | Y = 23.314 + 0.695x           | 0.781| < 0.001 | Increasing and constant |
| Paraná                | Y = 22.495 + 0.380x           | 0.557| < 0.001 | Increasing and constant |
| Santa Catarina        | Y = 28.592 + 0.027x + 0.015x² + 0.001x³ | 0.106| 0.705 | Stable |
| Rio Grande do Sul     | Y = 21.104 + 1.357x           | 0.744| < 0.001 | Increasing and constant |
| Central-West          | Y = 28.815 + 0.268x           | 0.231| 0.006 | Increasing and constant |
| Mato Grosso do Sul    | Y = 28.851 - 0.367x           | 0.392| 0.009 | Decreasing and constant |
| Mato Grosso            | Y = 21.365 + 0.404x           | 0.631| < 0.001 | Increasing and constant |
| Goiás                 | Y = 24.685 + 0.487x           | 0.377| 0.011 | Increasing and constant |
| Distrito Federal      | Y = 50.223 + 0.273x - 0.241x² | 0.798| < 0.001 | Decreasing, not constant |
| Brazil                | Y = 33.606 + 0.290x - 0.019x² - 0.011x³ | 0.462| 0.052 | Stable |

* Model: y = unsafe abortion ratio (per 100 live births); x = year of abortion – middle year of the period studied (2003,5).

b R²: coefficient of determination.
north of Ceará and east of Piauí. An important concentric cluster covered municipalities in south, east and northeast of Bahia, covering most municipalities of the states of Alagoas, Sergipe and Pernambuco and bordering the south of the states of Paraíba and Ceará. In the North region, four other areas with high values of this indicator were identified, highlighting the cluster which covers almost the entire state of Acre and northwest Pará (Figure 3). Clusters of municipalities with low values (low/low) were found covering almost the entire South region, large part of the Central-West region and the state of Maranhão, as well as in isolated areas in the North, Northeast and Southeast regions (Figure 3).

**DISCUSSION**

This national population-based study provides a comprehensive overview of unsafe abortion and measures its magnitude as a public health problem in Brazil. Although unsafe abortion shows a national decline trend, there are different patterns among the regions. Unsafe abortion has a widespread geographic distribution in the country, with records in almost all

**Figure 1.** Spatial distribution of unsafe abortion rates per 1,000 women of childbearing age, by municipalities of residence. Brazil, 1996-2012.
municipalities. Furthermore, the existence of clusters of municipalities with high values of unsafe abortions has been identified, especially in states of the North, Northeast and Southeast regions.

A network of high complexity of determinants and conditioning factors, including social, cultural, religious, moral, and legal aspects, inhibits women from declaring their abortions, compromising the existence of more accurate information, thus hindering identification of its real magnitude. The situation of illegality in which abortion is performed in Brazil affects the reliability of the statistics that could potentially subsidize the implementation of more precise policies for the different regional realities and age groups.

Despite the illegality of abortion in Brazil, as in other countries with restrictive laws, a high number of hospital admissions for abortion was observed. The criminalization of abortion does not prevent women

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Figure 2. Spatial distribution of unsafe abortion rates per 1,000 women of childbearing age after smoothing by the Local Empirical Bayesian method, by municipalities of residence. Brazil, 1996-2012.

WCBA: women of childbearing age

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\(^a\) Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Área Técnica de Saúde da Mulher. Atenção humanizada ao abortamento: norma técnica. Brasília (DF); 2011.
from interrupting an unwanted or unplanned pregnancy. It only exposes the indiscriminate, unsafe, dehumanized practices with high risk of death, that generate high economic, political and social costs.\textsuperscript{9,20}

There was significant heterogeneity of estimated unsafe abortions among Brazilian regions and states. The North and Northeast regions showed the highest values of the indicators analyzed. The distribution of the indicators by state is consistent with the regions with high indicators, mainly in the North and Northeast.\textsuperscript{18}

The unsafe abortion rates showed decline nationally and in most regions (Northeast, Southeast and Central-West), while in the North region there was an increasing trend. The estimated number of unsafe abortions was equivalent to 33.2\% of total live births. This indicator showed a stable trend at national level and increase in North, South and Central-West regions. The observed pattern suggests that, despite the decline of unsafe abortion in relation to the population of women of reproductive age in most regions and states, in some of these geographic areas there is an increase in the number of pregnancies that result in abortions rather than births.\textsuperscript{18}

The reduction in the number of unsafe abortions can be explained by better access to modern and effective contraception, declining fertility rates, increased medication abortion (misoprostol) and expansion of the jurisprudence in cases of legal abortions provided by law.\textsuperscript{12,18,h} Currently, women suffering sexual violence

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{moran_maps.png}
\caption{Moran Maps of unsafe abortion rates by municipalities of residence. Brazil, 1996-2012.}
\end{figure}
can turn to public health services to carry out the termination of pregnancy in an assisted and safe manner. Regional differences can be attributed in part to increased access and adherence to contraception in regions/states with the lowest indicators of unsafe abortions. It is emphasized the possible effect of increased use of misoprostol for induction of abortion, reducing the frequency of complications and consequently resulting in lower number of hospital admissions, which could partly explain the reduction in the period studied. The National Survey of Abortion in Brazil, conducted in 2010, found that misoprostol was the method of choice most cited by women for induction of abortion. Misoprostol reduces the frequency of complications caused by the use of methods associated with high rates of infection, such as foreign bodies from entering and use of other invasive techniques for inducing abortion. However, additional studies are needed to assess the impact of the use of misoprostol for the induction and incidence of abortion in Brazil. The highest fertility rates can make the female population more vulnerable to unsafe abortion risks. Although the fertility rates have declined in all Brazilian regions between 2000 and 2010, there are still significant regional differences, with higher levels of fertility in the North and Northeast regions.

It is undeniable that there have been improvements in access to family planning, mainly to the expansion of the National Family Planning Policy, as well as the quantitative availability of some effective contraceptive methods distributed free by the SUS. However, there was little change in the diversity in options for contraception used by women with lower socioeconomic and access to health care conditions. Abortion performed in unsafe conditions is among the main causes of maternal mortality in Brazil and it is an important cause of institutional discrimination and violence against women in health services. Violence represented by the delay of care, lack of easy access and quality care, or explicit discrimination with negative, prejudiced and judgmental attitudes, besides the negligence of preventive actions of recurrence of abortions.

Despite Brazil being a signatory to international agreements, the impact of unsafe abortion on maternal morbidity and mortality hinders the achievement of targets of the Millennium Development Goals (MDG) and does not guarantee, in its entirety, sexual and reproductive rights of women. Addressing this problem touches upon deep questions of social justice, ethics, civil legislation and citizenship. Regardless of the legal question that encompasses the abortion, the importance of ensuring access and qualified care to maternal health is emphasized. Strategies for prevention of unsafe abortions and consequently, resulting deaths, involve integrated actions at all levels of prevention in the health services network, such as: reduction of unwanted pregnancies, quality health care during the abortion procedure, recognition and appropriate management of complications and pre-and post-abortion family planning.

The need for timely care is imperative, given the difficulty for women to recognize signs of possible complications, combined with factors that may delay seeking care. From the perspective of comprehensiveness of care, health professionals must not only provide immediate individualized care for women in abortion situations, but also provide contraceptive alternatives, avoiding the resource of repeated abortions, and involve the family, especially the partners. For women with spontaneous abortions and wishing new pregnancies, suitable care for their needs must be guaranteed. The desired quality of care includes aspects related to its humanization, encouraging health professionals, regardless of their moral and religious precepts, to show an ethical posture, ensuring respect for women’s human rights.

Public policies will only be effective when guided by greater knowledge of the causality chain of unsafe abortion, which can be achieved through a larger number of studies with specific methodology. There is a need for studies with direct estimation techniques to determine the real magnitude of unsafe abortion. Moreover, there is clear need to expand efforts to develop research to better analyze the real impact of unsafe abortion on women, families, and the health sector.

This study has some limitations that should be taken into account in the interpretation of the results. The application of the indirect estimation technique depends
on the data quality of hospital admissions.\textsuperscript{14,17,18} The use of secondary data may have inconsistencies in the quantity and quality of the information.\textsuperscript{19} We used data from the SIH, which records the procedures performed in hospitals linked to the SUS, not considered admissions by abortion performed in hospitals not affiliated with the SUS.\textsuperscript{17,18} Additionally, this information system may not detect inconsistencies in the classification of the cause of hospital admission recorded, i.e., faults in the coding of cause of hospital admission may interfere in the results, requiring careful interpretation. Due to the stigma associated with the procedure and the illegality of abortion, there may have been underreporting of the occurrences of abortion by women and providers of health services, even when they are directly involved in the care.\textsuperscript{19} Indirect methods for estimating the magnitude of unsafe abortion through secondary data are approximate and are based on assumptions for performing the calculation.\textsuperscript{13} We used the method developed in 1994\textsuperscript{2} and previously used in large-scale studies in Brazil.\textsuperscript{17,18} This technique assumes that 20.0% of abortions resulted in hospital admissions recorded by the SUS.\textsuperscript{2,18} However, this parameter may not be valid, especially because of regional and temporal variations of the admissions by abortions, the increased use of misoprostol, and the decreased fertility occurred in recent years. Despite these limitations, this study provides rough estimates that contribute to the knowledge, even if still insufficient, of the distribution of unsafe abortion in Brazil. We conclude that unsafe abortion, despite the decline at a national level, still constitutes an important public health problem and is a neglected event in Brazil. Expansion of access to care, qualification and humanization of assistance for women in abortion situations, including post-abortion contraceptive counseling services are needed.

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HIGHLIGHTS

The results presented in this article show that unsafe abortion is a significant public health problem, characterized as a neglected event in this country. Although there was a decline over the period studied, there are still significant differences between regions, with higher concentrations in the socioeconomically poorer regions.

The scale and social relevance of the problem indicate the need to create strategies to deal with it.

The context of inequality indicates the need for reinforcing health care actions in the areas of highest risk, offering safe alternatives.

The health care system urgently needs to increase access, qualify care and humanize health care actions for women, especially with regards to reproductive and pre- and post-abortion aspects.

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