

ESTIMATES AND TRENDS OF INDUCED ABORTION IN PIAUÍ: AN ECOLOGICAL STUDY OF THE PERIOD 2000-2010

Estimativas e tendências de aborto provocado no Piauí: um estudo ecológico no período de 2000-2010

Estimación y tendencias de aborto provocado en Piauí: un estudio ecológico en el período de 2000-2010

Original Article

ABSTRACT

Objective: To estimate the induced abortion and assess its trend in the state of Piauí state and its development territories (DTs) in the period 2000-2010. **Methods:** We conducted an ecological time-series study using secondary data from hospital admissions for abortion complications in the period from February to June 2014. Induced abortions was estimated using the Guttmacher Institute methodology. The Joinpoint method was used to identify significant changes in trends. **Results:** 55,678 admissions for abortion were analyzed; there was a 35% decrease between 2000 and 2010. The number of induced abortions decreased from 10,362 in 2000 to 6,738 in 2010. There was a statistically significant upward trend in abortion ratios in DT 1 and 7 as well as a significant downward trend in DT 4. The other DTs presented stable trends of abortion ratio. **Conclusion:** Postabortion hospitalization rate and estimates of induced abortion were high in the state of Piauí, with a downward trend of induced abortion ratio for the study period.

Descriptors: Abortion, Induced; Hospitalization; Time Series Studies.

RESUMO

Objetivo: Estimar o aborto provocado e avaliar sua tendência no estado do Piauí e em seus territórios de desenvolvimento (TD), no período de 2000 a 2010. **Métodos:** Realizou-se estudo ecológico, de série temporal, utilizando dados secundários de internações hospitalares por complicações de aborto, no período de fevereiro a junho de 2014. A estimativa de abortos induzidos foi calculada por metodologia do Instituto Guttmacher. Empregou-se o método Joinpoint para identificar mudanças significativas nas tendências. **Resultados:** Analisaram-se 55.678 internações hospitalares por aborto e verificou-se decréscimo de 35% entre 2000 e 2010. O número de abortos induzidos decresceu no Piauí entre os extremos da série temporal, passando de 10.362 em 2000 para 6.738 em 2010. Houve tendência de aumento significativo nas razões de aborto nos TD 1 e 7, como também tendência de redução significativa no TD 4. Os demais TD apresentaram tendência estável da razão de aborto. **Conclusão:** A taxa de internação pós-aborto e as estimativas de aborto induzido foram elevadas no estado do Piauí, com tendência de diminuição da razão de aborto induzido no período estudado.

Descritores: Aborto Induzido; Hospitalização; Estudos de Séries Temporais.

Alberto Madeiro⁽¹⁾
Andrea Cronemberger Rufino⁽¹⁾
Isadora Sousa Santos⁽¹⁾
Marina Sousa Carvalho⁽¹⁾

1) State University of Piauí (*Universidade Estadual do Piauí - UESPI*) - Teresina (PI) - Brazil

Received on: 02/01/2015

Revised on: 02/26/2015

Accepted on: 05/07/2015

RESUMEN

Objetivo: Estimar el aborto provocado y evaluar su tendencia en el estado de Piauí y en sus territorios de desarrollo (TD) entre el período de 2000 y 2010. **Métodos:** Se realizó un estudio ecológico, de serie temporal utilizando datos secundarios de ingresos hospitalarios por complicaciones del aborto entre febrero y junio de 2014. La estimación de los abortos inducidos fue calculada a través de la metodología del Instituto Guttmacher. Se aplicó el método Joinpoint para la identificación de los cambios significativos de las tendencias. **Resultados:** Se analizaron 55.678 ingresos hospitalarios por aborto y se verificó una disminución del 35% entre 2000 y 2010. El número de abortos inducidos disminuyó en Piauí en los extremos de la serie temporal variando de 10.362 en 2000 para 6.738 en 2010. Hubo una tendencia de aumento significativo de las razones de aborto en los TD 1 y 7 así como una tendencia de reducción significativa del TD 4. Los otros TD presentaron una tendencia estable de la razón del aborto. **Conclusión:** La tasa de ingreso pos-aborto y las estimaciones de aborto inducido fueron elevadas en el estado de Piauí con una tendencia de disminución de la razón del aborto inducido en el período estudiado.

Descriptor: Aborto Inducido; Hospitalización; Estudios de Series Temporales.

INTRODUCTION

Unsafe abortion is a major public health problem worldwide. It is estimated that, in 2008, there were 43.8 million induced abortions, 49% of which were unsafe⁽¹⁾. As a consequence, there were 47,000 deaths from abortion that year⁽²⁾. Despite this magnitude, it is difficult to measure the incidence of abortion and its complications, particularly in countries where laws are restrictive, as is the case in Brazil. One of the great difficulties posed to researches on abortion is the women's trend toward omitting such practice, usually due to the stigma and fear of complaint⁽³⁾. In spite of the confidentiality guarantee, many of them claim miscarriage when directly asked^(4,5).

In Brazil, researches on the magnitude of abortion were mainly performed through indirect methods. In 1991, the Alan Guttmacher Institute estimated the occurrence of 1,443,350 induced abortions in the country, with an annual rate of 3.65 abortions per every 100 women aged 15 to 49 years. Calculation was based on the official number of women hospitalized for abortion complications and uterine curettage, applying adjustment factors to estimate the induced abortion^(6,7).

The data based on hospital admission for uterine curettage in the Unified Health System (SUS - *Sistema Único de Saúde*) was updated in 2006. In all age groups

from 15 to 49 years, there was a reduction in the number of admissions for abortion between 1992 (344,956 admissions) and 2005 (250,447 admissions). Thus, the abortion estimates have also decreased from 1,455,283 abortions in 1992 to 1,056,573 in 2005. The unsafe abortion rate for every 100 women in the North and Midwest regions were more than twice the rate observed in the South⁽⁸⁾.

The main argument against abortion estimates through indirect techniques, such as the calculations obtained from the number of hospital admissions, is the fact that only women who had complications and required public hospital care are represented⁽⁹⁾. On the one hand there is a possibility of underestimating the magnitude, but on the other hand indirect methods have the advantage of being feasible from a financial and methodological point of view, mainly because they bypass the women's difficulty in reporting abortion practices⁽¹⁰⁾.

In 2010, a household random sampling survey used the urn process to assess the magnitude of abortion in urban Brazil, comprising small municipalities and including 2,002 literate women between 18 and 39 years. The survey showed that 15% of them had already had at least one abortion and, by the age of 40, one in every five women had previously induced an abortion. Moreover, almost half (48%) of those who aborted had demanded hospitalization to treat complications derived from that practice⁽¹¹⁾.

There are many gaps related to the security of evidences in the estimates of incidence, morbidity, and mortality regarding unsafe abortion in Brazil. It is unknown whether the abortion incidence, morbidity, and mortality behave similarly among women from different regions, in different socioeconomic contexts. Data from other studies showed that poor and less-educated women are the most vulnerable to the risks of abortion performed in an unsafe manner^(12,13). This paper presented the first consolidated information on the magnitude of induced abortion in the state of Piauí, by means of direct or indirect techniques. The objective of this study was thus to estimate the induced abortion and evaluate its trends in the state of Piauí and in its development territories (DTs) in the 2000-2010 period.

METHODS

We conducted an ecological time-series study of the induced abortion estimate, with the state of Piauí and its development territories (DTs) as unit of analysis in the period from 2000 and 2010, being developed in the period from February to June 2014.

The state of Piauí consists of 11 DTs, encompassing 224 municipalities⁽¹⁴⁾. The number of municipalities and the percentage of women in reproductive age (15-44 years) of

each DT are respectively: DT1 – *Planície Litorânea* (11; 8.5%); DT2 – *Cocais* (22; 11.3%); DT 3 – *Carnaubais* (16; 4.8%); DT 4 – *Entre Rios* (31; 40.4%); DT 5 – *Vale do Sambito* (16; 3.5%); DT6 – *Vale do Rio Guaribas* (39; 10.5%); DT 7 – *Vale do Canindé* (17; 4.0%); DT 8 – *Serra da Capivara* (18; 4.3%); DT 9 – *Vale dos rios Piauí e Itaueira* (19; 4.6%); DT 10 – *Tabuleiros do Alto Parnaíba* (12; 2.4%); DT 11 – *Chapada dos Mangabeiras* (25; 5.7%)⁽¹⁵⁾.

The number of hospital admissions of women who underwent uterine curettage as a consequence of abortion was retrieved from the Hospital Information System (SIH/SUS) of the SUS Department of Informatics (DATASUS). The number of live births, provided by the Live Birth Information System (SINASC - *Sistema de Informações sobre Nascidos Vivos*) and the Health Secretariat of Piauí, was collected for each municipality and then tabulated for each territory of development. Additionally, data regarding the number of women by age and city was obtained from the 2000 and 2010 Demographic Censuses, conducted by the Brazilian Institute of Geography and Statistics (IBGE - *Instituto Brasileiro de Geografia e Estatística*).

This study assessed the International Classification of Diseases (ICD-10), chapter XV (which addresses Pregnancy, Childbirth and Puerperium), and also the SUS hospital procedure code for abortion-related uterine curettage (0411020013) in the SIH/SUS database. ICD O03 (spontaneous abortion), O04 (abortion for medical and legal reasons), O05 (other types of abortion), O06 (unspecified abortion), and O07 (failed attempted abortion) were the ones used for data collection.

The induced abortion estimates were based on the methodology used by the Guttmacher Institute, previously employed in other Brazilian studies^(6-8,16). The estimate was calculated using the formula: total number of induced abortions = total number of hospital admissions for uterine curettage $\times (0.75)^j \times (1.125)^{ii} \times (2)^{iii}$. The Guttmacher Institute methodology considers the need for three adjustment factors, assuming that: i) 25% of hospital admissions for abortion complications would be due to miscarriage, so that the total number must be multiplied by 0.75; ii) 12.5% of cases could be underreported (women admitted with other diagnoses or to facilities not comprised in the Unified Health System), so the number of admissions should be multiplied by 1.125; and iii) women hospitalized for curettage represent 50% of those who induced abortion, i.e., for each woman who was hospitalized, there is at least another one who did not need to, or else did not go the hospital, so that the total number of admissions should to be multiplied by 2. This study used the adjustment factor 2 because, according to the National Abortion Survey, 48% of women who said they had induced an abortion needed hospitalization for uterine curettage⁽¹¹⁾.

Having established the induced abortion estimate, it was then obtained the induced abortion ratio, according to the number of live births, multiplying by 100, as in the formula: induced abortion ratio = number of induced abortions / number of live births $\times 100$ ⁽¹⁰⁾.

For the years 2000 and 2010, the admission rates for abortion complications were calculated standardized by the number of women in reproductive age (15-44 years) in each city, according to the formula: hospitalization rate due to abortion complications = number of women hospitalized for abortion complications/number of women of childbearing age $\times 1,000$ ⁽¹⁰⁾.

The trends of induced abortion ratio were evaluated using the Joinpoint method, based on a software developed by the National Cancer Institute of the United States⁽¹⁷⁾. The Joinpoint allows adjusting data series from the smallest possible number of joinpoints (zero, i.e., a line without inflection points), and it verifies whether the inclusion of joinpoints is statistically significant. The tests of statistical significance used were based on the Monte Carlo permutation method and on the calculation of the ratio annual percent change, by using its logarithm⁽¹⁸⁾. Whenever a change occurred, each significant point in the trend was maintained in the final model. To describe the linear trend for the periods, the annual percent change (APC) and their respective confidence intervals of 95% (95% CI) were calculated, composing a regression line according to the natural logarithm of the rates. It was considered that there was an increase in the abortion ratio when the trend was growing and the minimum value of the confidence interval was above zero (>0). Contrarily, a reduction was considered to have occurred when there was a decline in the trend, and the maximum value for the confidence interval was less than zero (<0). Stability was defined when, regardless of the trend, the value zero was included in the confidence interval.

Despite working with secondary data available in the public domain, this study was approved by the Research Ethics Committee of the State University of Piauí (opinion no. 44614).

RESULTS

Between 2000 and 2010, 55,678 women were assisted in hospitals in Piauí for abortion complications. Throughout the state, the number of admissions to perform uterine curettage decreased from 6,140 in 2000 to 3,993 in 2010 - a 35% reduction between the extremes of the historical series. Between 2002 and 2005, there was a fluctuation in that number, but a slow and gradual reduction in hospitalizations was observed from 2006 on (Figure 1). In the DT 4, where the state capital, Teresina, is located, the hospitalization rate

standardized per 1,000 women aged 15-44 years decreased from 16.7 in 2000 to 6.7 in 2010. In DTs 1, 7, 8, 9, 10,

and 11, there was an increase in the hospital admission rates (Figure 2).

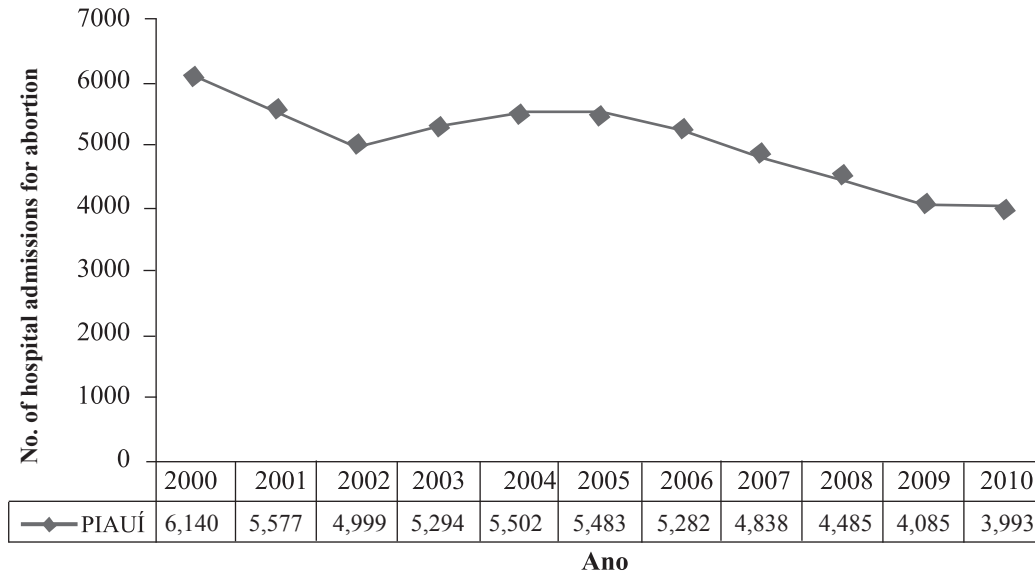


Figure 1 - Number of hospital admissions for abortion complications in the state of Piauí, in the period from 2000 to 2010. Piauí, 2014.

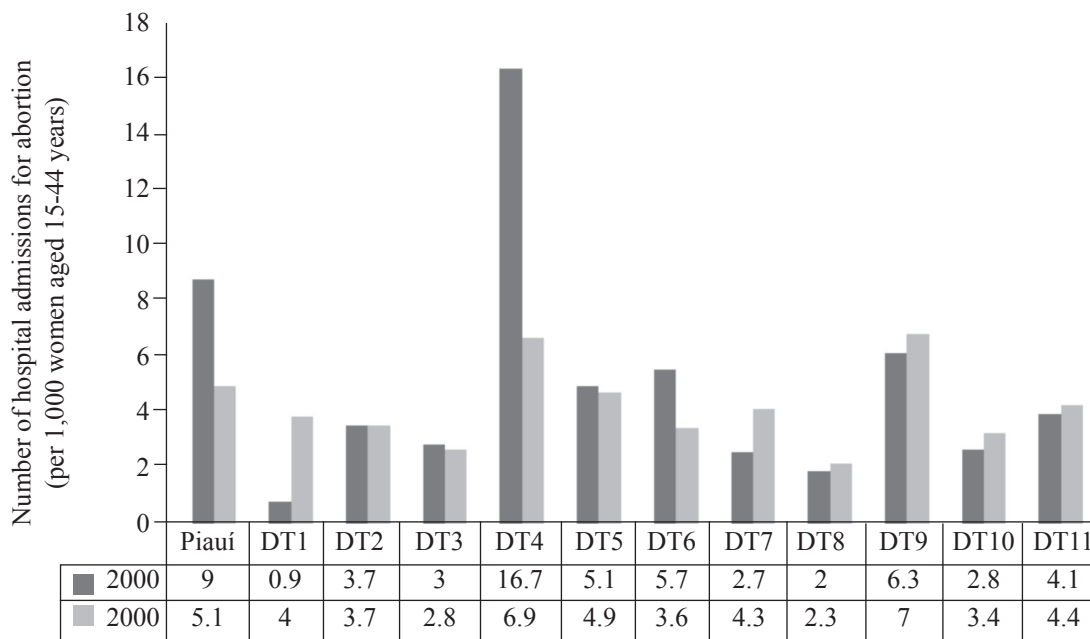


Figure 2 - Hospital admission rates for abortion complications according to the development territories in the state of Piauí, in the period from 2000 to 2010. Piauí, 2014.

Table I - Estimates for induced abortion according to the development territories in the state of Piauí, in the period from 2000 to 2010. Piauí, 2014.

DT	2000 n	2001 n	2002 n	2003 n	2004 n	2005 n	2006 n	2007 n	2008 n	2009 n	2010 n	TOTAL n/ %
All	10.362	9.412	8.436	8.935	9.288	9.252	8.914	8.165	7.568	6.893	6.738	93,963/ 100
DT1	87	182	230	203	125	467	466	628	474	505	440	3,807/ 4.0
DT2	473	633	584	600	741	705	668	606	432	380	548	6,370/ 6.8
DT3	186	194	98	122	275	187	255	213	174	172	177	2,053/ 2.2
DT4	7.752	6.723	5.675	6.244	6.337	5.986	5.311	4.632	4.352	3.839	3.635	60,486/ 64.4
DT5	224	162	140	127	157	152	138	133	172	138	224	1,767/ 1.9
DT6	717	538	545	521	574	486	579	604	646	604	493	6,307/ 6.7
DT7	128	160	169	160	149	172	221	184	223	184	226	1,976/ 2.1
DT8	103	137	116	140	203	305	370	311	189	169	132	2,175/ 2.3
DT9	363	334	454	420	289	304	461	491	489	467	424	4,496/ 4.8
DT10	74	73	126	103	108	113	116	127	103	91	108	1,142/ 1.2
DT11	255	276	299	295	330	375	329	236	314	344	331	3,384/ 3.6

DT: development territories.

Table II - Induced abortion ratio, according to the development territories in the state of Piauí, in the period from 2000 to 2010. Piauí, 2014.

DT	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
All	17.6	16.1	14.9	16.2	16.9	16.3	16.1	13.8	14.3	13.5	13.5
DT1	1.7	3.8	4.7	4.2	2.6	9.5	9.5	13.8	10.1	11.4	10.7
DT2	6.1	8.2	7.8	8.4	10.6	9.6	9.4	9.2	6.6	6.3	9.2
DT3	6.5	6.2	3.3	4.2	9.7	6.1	8.8	7.5	5.9	6.2	6.4
DT4	33.6	30.9	27.8	31.2	31.8	29.3	26.2	24.0	21.9	20.1	19.2
DT5	10.7	7.8	7.2	7.1	8.7	8.3	7.7	7.8	10.0	8.6	16.0
DT6	11.8	8.5	9.0	9.0	10.1	8.1	10.1	10.6	12.0	11.5	9.4
DT7	5.7	7.2	7.4	7.4	6.9	7.7	10.8	9.2	12.0	9.5	14.6
DT8	5.7	6.1	4.6	5.6	8.5	11.6	15.8	13.0	8.0	7.2	6.0
DT9	12.7	10.9	16.5	14.9	10.5	11.0	16.0	19.0	19.6	19.1	13.8
DT10	5.4	4.6	8.8	6.9	6.7	7.2	7.5	8.1	7.3	6.3	7.7
DT11	6.9	7.5	8.0	7.9	8.5	9.1	8.4	5.9	8.4	9.7	10.0

DT: development territories.

Table III - Trends of the induced abortion ratio, according to the development territories in the state of Piauí, in the period from 2000 to 2010. Piauí, 2014.

DT	AR - 2000	AR - 2010	APC (%)	95% CI	Trend
All	17.6	13.5	-2.2*	(-3.5 a -0.9)	reduction
DT1	1.7	10.7	+15.8*	(6.6 a 25.9)	increase
DT2	6.1	9.2	+1.4	(-5.3 a 8.6)	stable
DT3	6.5	6.4	+1.4	(-4.9 a 8.1)	stable
DT4	33.6	19.2	-5.1*	(-7.1 a -2.9)	reduction
DT5	10.7	16.0	+4.7	(-3.5 a 13.8)	stable
DT6	11.8	9.4	+0.9	(-1.9 a 3.9)	stable
DT7	5.7	14.6	+7.9*	(4.7 a 11.1)	increase
DT8	5.7	6.0	+3.4	(-5.1 a 12.8)	stable
DT9	12.7	13.8	+3.6	(-0.7 a 8.2)	stable
DT10	5.4	7.7	+2.0	(-1.7 a 5.9)	stable
DT11	6.9	10.0	+2.4	(-0.4 a 5.3)	stable

DT: development territories; AR: abortion ratio; APC: annual percent change; CI: confidence interval

* Significantly different from 0% (p < 0.05)

The estimate of induced abortions in the state, according to the year and development territory, is shown in Table I. Similarly to the hospitalizations, the number of induced abortions decreased in Piauí between the extremes of the time series, going from 10,362 in 2000 to 6,738 in 2010. During the period under analysis, the estimate of induced abortions increased in seven DTs (1, 2, 7, 8, 9, 10, and 11), decreased in two of them (4 and 6), and showed no change in DTs 3 and 5. DT 4 concentrated 64.4% of the estimated induced abortions.

Tables II and III show the ratio of induced abortions per 100 live births, and the trend of the induced abortion ratio, respectively. A significant decreasing trend was observed in the abortion ratio statewide (APC = -2.2; 95% CI -3.5 to -0.9; $p < 0.05$). Throughout the period, the ratios showed a significant upward trend in DT 1 (APC = 15.8; 95% CI 6.6 to 25.9; $p < 0.05$) and DT 7 (APC = 7.9; 95% CI 4.7 to 11.1; $p < 0.05$). DT 4 showed a significant downward trend (APC = -5.1; 95% CI -7.1 to -2.9; $p < 0.05$). The other DTs (2, 3, 5, 6, 8, 9, 10, and 11) showed stable trend in the abortion ratio.

DISCUSSION

This study is the first to estimate the incidence of induced abortion in Piauí by means of the hospital admission method. Obtaining reliable data on induced abortion is limited worldwide, especially in places where the law is restrictive, like Brazil. There is no ideal method to estimate the induced abortion; therefore, several methods may be appropriate in different contexts and goals. Even in places where it is allowed, abortion tends to be poorly declared by women when using direct search techniques such as face-to-face interviews^(9,16,19).

The research in Piauí evidenced a decrease in the number of admissions for abortion complications in the years 2000-2010, with significant decrease in the trend of induced abortion ratio. Reduction in the abortion incidence and ratio was also observed in DT 4, which comprises the largest share of women of reproductive age in the state. Most of the DTs showed a slight increase in abortion ratios, but without statistical significance. A similar pattern was verified in a study conducted in the state of Pernambuco, which used the method of hospital admissions (but adopted 5 as the multiplier) from 1996 to 2006. In Pernambuco, the unsafe abortion estimate was high in the studied period, but the abortion ratio showed a downward trend in the state as a whole⁽¹⁶⁾.

In Brazil, the number of admissions for treatment of abortion complications has been decreasing since the decade of 1990. A study showed a 41% reduction in hospitalizations, going from 282,000 in 1992 to 165,000 in

2009. Despite that decrease, the North and Northeast regions still concentrated the highest number of hospital admissions. The rate of hospitalizations per 1,000 women aged 15-44 years was 2.8 in Brazil and 3.7 in the Northeast⁽¹⁹⁾. Even with the reduction in hospitalization rates, almost all the territories in Piauí showed, in 2010, higher rates than those observed in Brazil and in the Northeast.

The survey data shows that the estimated number of abortions in Piauí decreased in the studied period, as well as the trend of the abortion ratio for the entire state. Only two DTs showed an upward trend in the induced abortion rate. At least two explanations for these findings must be considered. First, the number of unintended pregnancies may have been reduced because of the more disseminated and proper use of effective contraceptive methods. Data from the National Demographic and Health Survey shows a reduction in the ratio of unintended pregnancies in Brazil, from 23.1% in 1996 to 18.2% in 2006. Among the regions, the Northeast had in 2006 the more substantial reduction in the unintended pregnancy ratio, but the poor, less educated and older women were the ones who presented the highest number of unintended births. Furthermore, there was an increase in the use of oral contraceptives in all the economic classes, besides the male sterilization and the use of condoms⁽²⁰⁾.

Second, one must consider that women have begun to use safer abortion methods, requiring less hospitalization to treat complications. From the 1990s on, misoprostol, also known as Cytotec®, became the predominant form of abortion among Brazilian women⁽²¹⁻²³⁾. The growth in misoprostol sales in pharmacies, along with the increased use by women, occurred simultaneously to a lower incidence of severe cases of complications, especially of infectious nature. In Recife, a retrospective study evaluated 1,840 women hospitalized to perform post-abortion curettage, observing infection rate of 4.2% in misoprostol users and 49.4% among those who used other methods⁽²⁴⁾. A research conducted in the Dominican Republic also observed association between misoprostol increased sales and the reduction in complications and female mortality related to unsafe abortion. Hospital admissions in this country, where abortion is illegal, have decreased from 11.7% in 1986 to 1.7% in 2001, when the drug was introduced in the country⁽²⁵⁾.

If the hypothesis of the use of misoprostol is true for most women admitted to hospitals, one can consider that some flaw has hindered its effectiveness. When properly used, it represents an efficient, safe, and cost-effective method to perform the abortion, determining higher rate of complete abortions and thus less need for hospitalization for uterine curettage⁽²⁶⁾. Considering that the marketing of the drug is banned in the country, thus leading to its

clandestine acquisition by women, there is a possibility of using underdoses or that the active principle itself is fake⁽²⁷⁾. Information on how to use the medication is also often obtained from other women, drugstore clerks, and websites, which can contribute to inefficiency^(27,28). In addition, many women seek health services because of the side effects of the medication, such as cramps and bleeding, and also for being uncertain about the completeness of the abortion⁽²⁹⁾.

This study showed at least two limitations. First, the method of hospital admissions, based on data of women hospitalized for abortion complications, had the disadvantage of sample selection, which does not consider the women who did not require hospital admission after abortion. Despite being considered a useful tool to measure the incidence of induced abortion in a large population, a major criticism is that the method may underestimate or overestimate these findings depending on the multiplier used, which should be based on the reality of each location^(5,10). Second, the use of 2 as the multiplier factor was based on the only nationwide survey by the direct method previously carried out⁽¹¹⁾. This study, however, only assessed urban women. It did not evaluate the incidence of abortions, nor did it evidence the panorama of abortion in different regions of the country.

CONCLUSION

Post-abortion hospitalization rate and the induced abortion estimates were high in the state of Piauí, with a downward trend of induced abortion ratio in the period studied.

Further research is needed to estimate the induced abortion through direct methods, and to bring to knowledge the ways and paths women in Piauí adopt to abort.

REFERENCES

1. Sedgh G, Singh S, Shah IH, Ahman E, Henshaw SK, Bankole A. Induced abortion: incidence and trends worldwide from 1995 to 2008. *Lancet*. 2012;379(9816):625-32.
2. World Health Organization - WHO. Unsafe abortion: global and regional estimates of the incidence of unsafe abortion and associated mortality in 2008. 6th ed. Geneva: World Health Organization; 2011.
3. Jones RK, Hill KH. Underreporting of induced and spontaneous abortion in the United States: an analysis of the 2002 National Survey of Family Growth. *Stud Fam Plann*. 2007;38(3):187-97.
4. Shellenberg KM, Moore AM, Bankole A, Juarez F, Omideyi AK, Palomino N, et al. Social stigma and

induced abortion: results from an exploratory study. *Glob Public Health*. 2011;6(Suppl 1):S111-25.

5. Okonofua F, Omo-Aghoja L, Bello Z, Osughe M, Agholor K. Self-reporting of induced abortion by women attending prenatal clinics in urban Nigeria. *Int J Obstet Gynecol*. 2010;111(2):122-5.
6. Singh S, Wulf D. Estimating abortion levels in Brazil, Colombia and Peru, using hospital admissions and fertility data. *Int Fam Plan Perspect*. 1991;17(1):8-24.
7. Singh S, Wulf D. Estimated levels of induced abortion in six Latin American countries. *Int Fam Plan Perspect*. 1994;20(1):4-13.
8. Monteiro M, Adesse L. Estimativas de aborto induzido no Brasil e Grandes Regiões, 1992-2005. *Anais do XV Encontro Nacional de Estudos Populacionais, Caxambú-MG; 2006 Set 18-22*. Caxambu: Ações Afirmativas em Direitos e Saúde; 2006. p. 1-10.
9. Rossier C. Estimating induced abortion rates: a review. *Stud Fam Plann*. 2003;34(2):87-102.
10. Singh S, Remez L, Tartaglione A. Methodologies for estimating abortion incidence and abortion-related morbidity: a review. New York: Guttmacher Institute; Paris: International Union for Scientific Study of Population; 2010.
11. Diniz D, Medeiros M. Pesquisa Nacional de Aborto: um estudo com técnica de urna. *Ciênc Saúde Coletiva*. 2010;15(Supl 1):S959-66.
12. Souza MG, Fusco CL, Andreoni SA, Souza, Silva R. Prevalência e características sociodemográficas de mulheres com aborto provocado em uma amostra da população da cidade de São Paulo, Brasil. *Rev Bras Epidemiol*. 2014;17(2):297-312.
13. Cecatti JG, Guerra GVQL, Sousa MH, Menezes GMS. Aborto no Brasil: um enfoque demográfico. *Rev Bras Ginecol Obstet*. 2010;32(3):105-11.
14. Governo do Estado do Piauí. Lei Complementar nº 87, de 22 de agosto de 2007 [legislação na internet]. Estabelece o Planejamento Participativo Territorial para o Desenvolvimento Sustentável do Estado do Piauí e dá outras providências. Teresina: Governo de Estado do Piauí [accessed on 2014 Dec 12]. Available on: http://www.seplan.pi.gov.br/uapr/lei87_22-08-2007.pdf
15. Instituto Brasileiro de Geografia e Estatística - IBGE. Censo Demográfico 2000 e 2010. Características da População e dos Municípios [Internet]. Rio de Janeiro: IBGE; 2010 [accessed on 2014 Dec 12]. Available on: <http://www.sidra.ibge.gov.br/cd/cd2010universo.asp?o=7&i=P>

16. Mello FMB, Sousa JL, Figueroa JN. Magnitude do aborto inseguro em Pernambuco, Brasil, 1996 a 2006. *Cad Saúde Pública*. 2011;27(1):87-93.
17. National Cancer Institute. Joinpoint Regression Program. Version 3.4.3 [Internet]. Bethesda; 2013 [accessed on 2014 Jan 30]. Available on: <http://surveillance.cancer.gov/joinpoint/>
18. Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. *Stat Med*. 2000;19(3):335-51.
19. Ministério da Saúde (BR), Centro Brasileiro de Análise e Planejamento. Pesquisa Nacional de Demografia e Saúde da Criança e da Mulher – PNDS 2006: dimensões do processo reprodutivo e da saúde da criança. Brasília: Ministério da Saúde; 2009.
20. Singh S, Monteiro MFG, Levin J. Trends in hospitalization for abortion-related complications in Brazil, 1992-2009: why the decline in numbers and severity? *Int J Gynecol Obstet*. 2012;118(Suppl 2):S99-S106.
21. Barbosa R, Arilha M. The Brazilian experience with Cytotec. *Stud Fam Plann*. 1993;24(4):236-40.
22. Fonseca W, Misago C, Correia LL, Parente JAM, Oliveira FC. Determinantes de aborto provocado entre mulheres admitidas em hospitais em localidade da região Nordeste do Brasil. *Rev Saúde Pública*. 1996;30(4):13-8.
23. Fonseca W, Misago C, Freitas P, Santos E, Fernandes L, Correa L. Características sócio-demográficas, reprodutivas e médicas de mulheres admitidas por aborto em hospital da Região Sul do Brasil. *Cad Saúde Pública*. 1998;14(2):279-86.
24. Faúndes A, Santos LC, Carvalho M, Gras C. Post-abortion complications after interruption of pregnancy with misoprostol. *Adv Contracept*. 1996;12(1):1-9.
25. Miller S, Lehman T, Campbell T, Hemmerling A, Anderson SB, Rodriguez H, et al. Misoprostol and declining abortion-related morbidity in Santo Domingo, Dominican Republic: a temporal association. *BJOG*. 2005;112(9):1291-6.
26. Kapp N, White P, Tang J, Jackson E, Brahmi D. A review of evidence for safe abortion. *Contraception*. 2013;88(3):350-63.
27. Diniz D, Madeiro A. Cytotec e aborto: a polícia, os vendedores e as mulheres. *Ciênc Saúde Coletiva*. 2012;17(7):1795-803.
28. Diniz D, Medeiros M. Itinerários e métodos do aborto ilegal em cinco capitais brasileiras. *Ciênc Saúde Coletiva*. 2012;17(7):1671-81.
29. Zamberlin N, Romero M, Ramos S. Latin American women's experiences with medical abortion in settings where abortion is legally restricted. *Reprod Health*. 2012;9(1):34.

Mailing address:

Alberto Madeiro
Rua Olavo Bilac, 2335
Bairro: Centro/Sul
CEP: 64049-550 - Teresina - PI - Brasil
E-mail: madeiro@uol.com.br