Received: 11 June 2019 | Revised: 17 October 2019 | Accepted: 6 December 2019 | First published online: 27 December 2019

DOI: 10.1002/ijgo.13077

CLINICAL ARTICLE

Obstetrics

WILEY | International Journal of Gynecology & Obstetrics | FIGO

Con la ley y sin la ley/With and without the law: Utilization of abortion services and case fatality in Mexico, 2000–2016

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Funding Information
Society of Family Planning Research Fund; Agency for Healthcare Research and Quality

Abstract

Objective: To describe utilization of health services for, and case fatality from, abortion in Mexico.

Method: A historical cohort study using a census of state-level aggregate hospital discharge and primary care clinic data across Mexico's 32 states from January 2000 to December 2016. Abortive events and changes over time in utilization per 1000 women aged 15–44 years, and case fatality per 100 000 abortion-related events were described by year, health sector, and state. Associations of location (Mexico City vs 31 other states) and time (Mexico City implemented legal abortion services in 2007) with outcomes were tested by linear regression, controlling for secular trends.

Results: The national abortion utilization rate was 6.7 per 1000 women in 2000, peaked at 7.9 in 2011, and plateaued to 7.0 in 2016. In Mexico City, utilization peaked at 16.7 in 2014 and then plateaued. Nationwide, the case-fatality rate declined over time from 53.7 deaths per 100 000 events in 2000 to 33.0 in 2016. Case fatality declined more rapidly in Mexico City than in the other 31 states to 12.3 in 2015.

Conclusion: Case fatality from abortive events has decreased across Mexico. Where abortion became legal, utilization increased sharply but plateaued afterward.

KEYWORDS

Abortion; Abortive events; Case fatality; Health system; Mexico; Public health sector; Utilization

1 | INTRODUCTION

Access to induced abortion remains highly restricted in Mexico. In Mexico City, induced abortion in the first trimester was decriminalized in 2007, and services became immediately available both in the public sector under the *Interrupción Legal de Embarazo* (ILE) program[1] and in the private sector. Induced abortion law is determined at the state level in Mexico. Outside Mexico City, abortion law varies in the other 31 states. Access to induced abortion under the rape exception has been legal nationwide since 2016.[2] Other exceptions, such as risk to a woman's life (23 states) or health (15 states), or fetal anomalies (16 states), are allowed in some states but not others.[3,4]

The incidence of induced abortion is difficult to measure in Mexico owing to legal restrictions, stigma, fragmented health information systems, and wide availability of misoprostol outside the formal health system.[5,6] Estimates of the national incidence of induced abortion combine expert opinion with aggregate health system data,[7] and suggest that there are 38 induced abortions per 1000 women aged 15–44 years.[8]

The ILE program has provided over 200 000 first-trimester induced abortions since April 2007,[9] but far less is known about induced

abortion services outside Mexico City. However, services for all abortive events, which include International Classification of Disease 10th revision (ICD-10) code O00-O08 (ectopic and molar pregnancy, spontaneous, incomplete and induced abortion), do take place in health facilities across Mexico.

Case fatality owing to abortive events represents a subset of the deaths due to total direct obstetric causes.[10] Case fatality and utilization are related by definition. Utilization is calculated as the number of cases per women of reproductive age, and forms the denominator of case fatality, which is calculated as deaths per total cases.[11] It is anticipated that case fatality will rise as utilization increases in situations where abortive events are very unsafe, patients are very sick, and/or health care is poor quality. By contrast, a decrease in case fatality would be expected as utilization increases in situations where abortions are "less unsafe",[12] patient health is less complicated, access to services improves, and/or there is better quality care. It is important to document both utilization and outcomes of the range of abortion services that are provided across the publicly managed health sectors in Mexico over time to both assess policy impact and provide evidence to guide service delivery and policy-making.

The aim of the present study was to describe utilization of health services for abortive events and case fatality from all abortive events across the Mexican health system, as well as the relative contribution of different sectors of the public system to service provision over time, testing for changes over time and by location (Mexico City vs the rest of Mexico).

2 | MATERIALS AND METHODS

The present historical cohort study used state-level aggregate hospital discharge and primary care clinic data in Mexico from January 1, 2000, to December 31, 2016. Because it was based on secondary aggregate data, the study was deemed non-human subjects research by the Oregon Health & Science University Institutional Review Board and consent was not needed.

Mexico has robust, if fragmented, health information systems. The Mexican health system is divided into several institutions, all publicly managed. Each institution is vertically integrated and provides services and coverage for distinct populations.[13] The Ministry of Health (MoH; Secretaria de Salud) serves the most vulnerable population, who are either unemployed, self-employed, or work outside the formal employment system. The Instituto Mexicano del Seguro Social (IMSS) and the Instituto de Seguro y Servicios Sociales de los Trabajadores del Estado (ISSSTE) provide services to the sector of formal employees.[12] Major national health reforms in 2003 expanded access for the uninsured, incorporating them into the MoH services under Seguro Popular (Popular Health Insurance).[14] The present analysis included the MoH, IMSS, and ISSSTE sectors (see Supplementary Table S1 for a description of data sources). Care in the private sector, outside health facilities, and in emergency departments was not included.

Data were analyzed from all abortive events using ICD code O00-O08 (ectopic and molar pregnancies, spontaneous, unspecified and other abortions) plus ICD-code Z30.3, which has been used since 2007 to report legal first-trimester abortions in Mexico City. First-trimester abortion was decriminalized in Mexico City in 2007, but remains restricted in the other 31 states. The analysis was limited to women aged 15–44 years; although abortive events occur outside this age range, this criterion facilitated comparison with previously published data.

The two study outcomes were utilization of health services for abortive events and abortion case fatality. Annual utilization rates were calculated as the number of all abortive events per 1000 women (aged 15–44 years) per year. Population estimates for each year at national and state levels were used to calculate rates (see Supplementary Table S1). Case-fatality rates were calculated as the number of deaths per 100 000 abortive events, using all deaths attributed to abortive events. The two sectors that serve formal employees (IMSS and ISSSTE) were grouped together and compared with the MoH in all analyses.

Stata version 13 (StataCorp, College Station, TX, USA) was used for all data analysis. The annual utilization and case-fatality rates were described over time and by location (Mexico City vs Mexico's other 31 states). In addition, pooled (2000–2016) utilization and case fatality at the state level (all 32 states) were described. The proportion of utilization by sector (MoH hospital, MoH outpatient, IMSS/ISSSTE) were compared over time.

A linear regression model was developed to test for changes in the study outcomes (utilization per 1000 women or deaths per 100 000 events) by location (Mexico City vs the other 31 states), and before and after implementation of the ILE program in Mexico City in 2007. Data were treated as panel data: yearly observations (2000–2016) were available for every Mexican state including Mexico City, affording 544 state–year observations. The regression model, which was a variation of the standard difference-in-difference model, included a binary indicator to compare Mexico City to Mexico's other 31 states. The analysis also included an interaction of continuous time trend (every year numbered from 1 to 17) and an indicator for before and after implementation of the ILE program. The continuous (year) by binary (pre/post) interaction term tests whether the slope of the continuous variable (year) differs by the level of the binary variable (pre/post). This approach helps to control for secular trends and identifies any change in slope at the 2007 time point, when the ILE program was implemented. It is a conservative approach when the standard difference-in-difference model cannot be used: in the present case, pre-2007 trends in Mexico City and the 31 remaining states were not parallel, violating a key assumption of difference-in-difference models.[15] Individual state fixed effects (n=32 states) were also included to control for unobserved state differences that do not change over time. A P value of less than 0.05 was considered statistically significant.

3 | RESULTS

In total, 3 351 704 cases of abortive outcome were identified between 2000 and 2016 among women aged 15–44 years. Utilization increased from 165 750 events in 2000 to a maximum of 228 650 events in 2012, and then decreased to 209 018 events in 2016. Nationwide, the utilization rate was 6.7 per 1000 women in 2000, peaked at 7.9 in 2011,

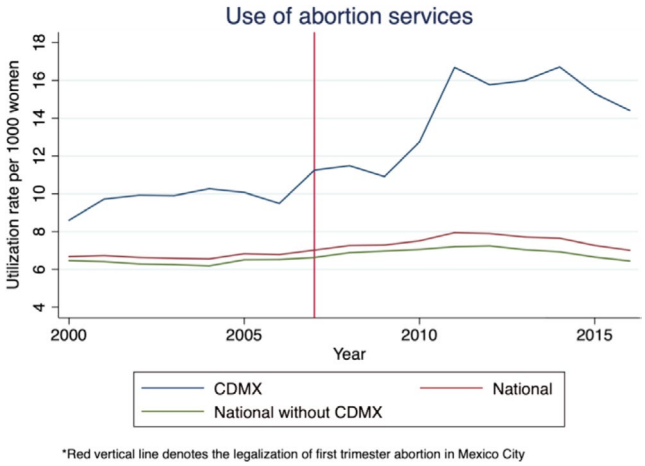

FIGURE 1 Utilization of abortion services per 1000 women aged 15–44 y over time and by location. Abbreviation: CDMX, Mexico City.

but then decreased and stabilized at 7.0 in 2016 (Figure 1, red line). In Mexico City, utilization was always higher than the national mean, starting at 8.6 in 2000 and increasing steadily over time. After 2007 and the beginning of abortion services offered by the ILE program, the increase was much sharper: utilization rates reached a peak of 16.7 in 2014, then flattened and declined to 14.4 in 2016 (Figure 1, blue line).

The pooled data (2000–2016) highlighted heterogeneity among the Mexican states in utilization of health services for abortive events. The average utilization was 7.1 abortions per 1000 women aged 15–44 years, but there was geographic variation: utilization was as low as 4.9 in the State of Mexico, adjacent to Mexico City, but nearly double this value (9.9) in Aguascalientes. Utilization was highest in Mexico City at 12.3 per 1000 women (Figure 2).

The relative contribution of different health sectors and different levels of care to abortion service utilization changed over time. Nationally, MoH accounted for 45.8% of all abortion-related services in 2000 and rose to 65.6% in 2016, whereas the contribution of other sectors (ISSSTE/IMSS) proportionally declined (data not shown). Primary care services accounted for 0.01% of services in Mexico City in 2000, but increased to 53.9% in 2016, largely due to implementation

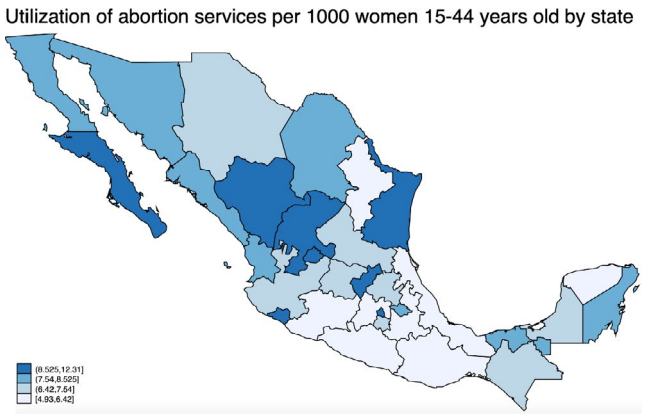

FIGURE 2 Utilization of abortion services by state (data are means for the study period).

of the MoH first-trimester ILE program in Mexico City, which began in hospital-based clinics and gradually shifted over time to primary care clinics[1] (Figure 3, top panel).

Nationally, the case-fatality rate, expressed as deaths per 100 000 abortive events per year, declined over time from 53.7 deaths per 100 000 events in 2000 to a lowest national mean of 33.0 in 2016 (Figure 4; red line). Declines in case fatality occurred both in Mexico City and in Mexico's 31 states with restrictive abortion laws, although case fatality was lower in Mexico City. In Mexico City (Figure 4, blue line), case fatality was increasing before the legalization of abortion, from 24.3 deaths per 100 000 events in 2000 to 49.8 in 2007, when it exceeded the national average; after the change in law, it declined to a low of 12.3 in 2015. In Mexico's other 31 states, the case-fatality rate declined from 57.9 deaths per 100 000 events in 2000 to 35.8 in 2016 (Figure 4, green line). However, there were important differences among the states in the pooled data (2000–2016), with a case-fatality rate as low as 8.2 and 9.1 in Baja California Sur and Colima, but many times higher in Chiapas and Guerrero (83.9 and 96.4, respectively; Figure 5).

In the regression model controlling for secular trends (Table 1), utilization increased significantly more in Mexico City than in Mexico's other 31 states (β, 2.33; 95% CI, 1.81–2.85). Case fatality was not

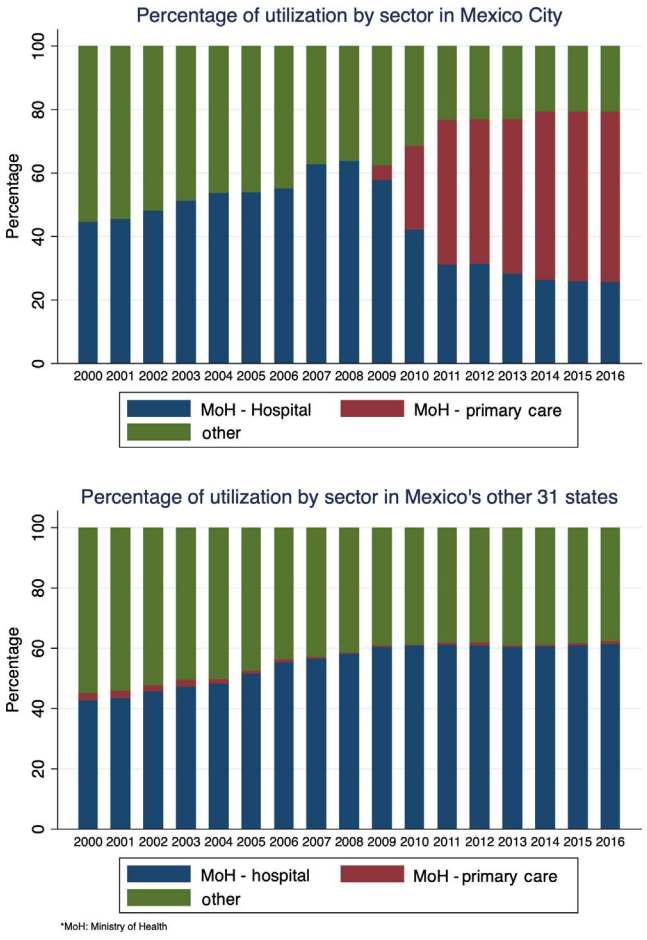

FIGURE 3 Contribution of Ministry of Health hospitals, primary care, and formal employee (ISSSTE/IMSS, "other") sectors to service provision for abortive events in Mexico, 2000–2016.

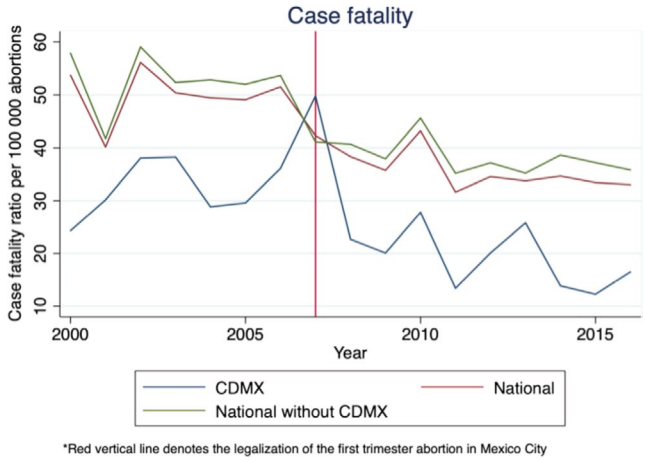

FIGURE 4 Case-fatality rate per 1000 abortions over time and by location.

significantly different between Mexico City and the other states over the whole study period, and decreased slightly but significantly after 2007 (β, −1.01; 95% CI, −1.43 to −0.60).

4 | DISCUSSION

The present study found that, overall, utilization of health services for all types of abortive event has increased across Mexico. Utilization per 1000 women increased sharply in Mexico City after implementation of the ILE program in 2007, and has since plateaued. The MoH accounted for an ever-increasing share of service provision over time. Case fatality (deaths per abortive events) declined over time in the whole country; the data indicate that this decline was sharper after 2007 when the ILE program was implemented. Overall, where utilization was lower (i.e., the southern states), case fatality remained highest. The present findings show that, even where induced abortion was legally restricted (in 31 Mexican states and in Mexico City until 2007), utilization was still slightly

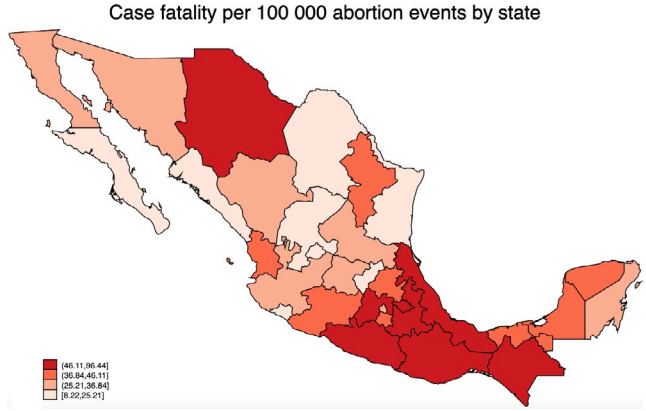

FIGURE 5 Case fatality by state (data are means for the study period).

increasing. This supports and extends previous research covering the time period to 2008 (2 years after implementation of the ILE program).[16]

A previous estimate of hospitalization for abortive events (excluding ectopic pregnancy) was 8.1 per 1000 women aged 15–44 years[17]; the present value was slightly lower nationally (7.1 overall, peaking at 7.9 in 2011), but higher in Mexico City. These updated data allow a follow-up of national trends, including all types of abortive event and all primary care facilities. The data also show that, after the sharp increases in utilization following implementation of the public sector induced-abortion program in Mexico City, utilization plateaued, as observed in other countries after abortion legalization.[18] It is possible that utilization outside Mexico City is increasing because of better access to legal induced abortion under the current exceptions (e.g. rape, health, fetal malformation). However, research does not support this hypothesis: full implementation of legal exceptions is known to be lacking.[3,4,19] Woman may also have greater access to misoprostol outside facilities and present for care to confirm a safe induced abortion process: local evidence suggests that misoprostol is widely available in the country and in the capital city, but the incidence of use or women's knowledge about safe use is unknown.[6]

The MoH, which serves the most vulnerable population in Mexico, provided the majority of all abortion-related services nationally. This may reflect either women's preferences or a relative lack of commitment by the IMSS and ISSSTE sectors to providing essential care for abortive events. Both IMSS and ISSSTE have so far refused to comply with the change in law, and do not provide legal induced abortions in Mexico City.[20] More studies are needed to understand whether the present findings indicate a denial of induced abortion and other abortive event services in these sectors.

Between 2000 and 2016, the case-fatality rate declined from 53.7 deaths per 100 000 abortive events to 33.0. The decline in case fatality occurred nationwide but was steeper in Mexico City, where case fatality decreased sharply after the decriminalization of abortion in 2007. After controlling for secular trends, there was a small but significant decline in case fatality after 2007 when the ILE program was implemented, but no association with Mexico City specifically. The present data support previous findings of a decline in abortion case fatality in Mexico at the national level, with heterogeneity between the most and least marginalized states.[15] Globally, case fatality due to abortion has been decreasing. The present data are in line with the most recent international data, which show case-fatality rates of 30 deaths per 100 000 unsafe abortions in the Latin America and Caribbean region[21]; however, the present case-fatality rates are based on all abortive events, not estimated unsafe abortions, and therefore are not directly comparable.

The study has some limitations. First, it did not include the private sector, which probably has a large impact on the calculations of service utilization for first-trimester abortion in Mexico City.[22] For later gestational ages, and for the rest of the country, underrepresentation is likely to be less significant: for example, it is estimated that private health sector provides no more than 30% of delivery care overall in Mexico.[23] Second, the study relied on ICD codes, which may be affected by underreporting of abortion. For example,

TABLE 1 Association of Mexico City and state-level utilization and case fatality for abortive events in Mexico, 2000–2016.

	Utilization		Case fatality	
Association	**β Coefficient (95% CI)**	***P* value**	**β Coefficient (95% CI)**	***P* value**
Mexico City vs 31 other states	2.33 (1.811–2.849)	<0.01	3.48 (−18.505 to 25.461)	—
Pre–post[a]	0.03 (0.016–0.036)	<0.01	−1.01 (−1.430 to −0.589)	<0.01
Observations	544		544	
R^2	0.814		0.325	

[a]Before and after implementation of the Interrupción Legal de Embarazo (ILE) program in Mexico City in 2007.

cases coded as sepsis or hemorrhage might be abortive events but not coded as such. Thus, both utilization and case fatality might be undercoded or misclassified, as previously reported in the Mexican context.[24] Third, the study data cannot be used for comparisons of abortion incidence, or overall abortion rates, because the focus was in-facility utilization. However, the specific focus of the study was health facilities that are part of the publicly managed sectors: health services research, which focuses on what happens in health facilities, is essential to tracking the quantity and quality of care provided through the formal health system and is ultimately essential for holding governments accountable to their citizens. Fourth, it was not possible to include emergency room data and therefore some abortive event cases were missing. However, women who were subsequently admitted to public hospitals were included in the data.

The strengths of the study include triangulating data sources to cover the majority of the health system. The inclusion of all abortions via ICD-code O00-O08 and the additional incorporation of the Z30.3 code for legal induced abortions enabled us to examine the impact of changes associated with the law and the successful implementation of the ILE program in Mexico City on service utilization and case fatality.

With and without changes to abortion law, abortion is getting safer in Mexico. The present findings suggest that increased utilization and decreasing case fatality go hand in hand, even in legally restricted contexts. Where the law allows access to legal abortion, utilization of services increases and then plateaus, and case fatality decreases.

AUTHOR CONTRIBUTIONS

RS conceived the study. BGD secured funding. BGD, EF-R, GP, LTA, and BS-A conducted the analysis. BGD drafted the manuscript, and EF-R, BS-A, GP, LTA, and RS contributed to manuscript revision.

ACKNOWLEDGMENTS

BGD was supported by a Society of Family Planning Research Fund award (SFPRF12-2) and a grant from the Agency for Healthcare Research and Quality (K12HS022981). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Agency for Healthcare Research and Quality.

CONFLICTS OF INTEREST

The authors have no financial conflicts of interest. BGD is a consultant for Ipas, a global non-profit organization focused on expanding access to safe abortion. RS is a consultant for the International Planned Parenthood Federtaion (IPPF), United Nations Population Fund (UNFPA), and Merck, Sharp & Dohme (MSD).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. Data sources.