

A Longitudinal Cohort Study of Emergency Room Utilization Following Mifepristone Chemical and Surgical Abortions, 1999–2015

Health Services Research and
Managerial Epidemiology
Volume 8: 1–11
© The Author(s) 2021
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/23333928211053965
journals.sagepub.com/home/hme
 SAGE

James Studnicki¹ , Donna J. Harrison², Tessa Longbons¹ ,
Ingrid Skop¹, David C. Reardon³, John W. Fisher¹,
Maka Tsulukidze⁴, and Christopher Craver¹

Abstract

Introduction: Existing research on postabortion emergency room visits is sparse and limited by methods which underestimate the incidence of adverse events following abortion. Postabortion emergency room (ER) use since Food and Drug Administration approval of chemical abortion in 2000 can identify trends in the relative morbidity burden of chemical versus surgical procedures.

Objective: To complete the first longitudinal cohort study of postabortion emergency room use following chemical and surgical abortions.

Methods: A population-based longitudinal cohort study of 423 000 confirmed induced abortions and 121,283 subsequent ER visits occurring within 30 days of the procedure, in the years 1999–2015, to Medicaid-eligible women over 13 years of age with at least one pregnancy outcome, in the 17 states which provided public funding for abortion.

Results: ER visits are at greater risk to occur following a chemical rather than a surgical abortion: all ER visits (OR 1.22, CL 1.19–1.24); miscoded spontaneous (OR 1.88, CL 1.81–1.96); and abortion-related (OR 1.53, CL 1.49–1.58). ER visit rates per 1000 abortions grew faster for chemical abortions, and by 2015, chemical versus surgical rates were 354.8 versus 357.9 for all ER visits; 31.5 versus 8.6 for miscoded spontaneous abortion visits; and 51.7 versus 22.0 for abortion-related visits. Abortion-related visits as a percent of total visits are twice as high for chemical abortions, reaching 14.6% by 2015. Miscoded spontaneous abortion visits as a percent of total visits are nearly 4 times as high for chemical abortions, reaching 8.9% of total visits and 60.9% of abortion-related visits by 2015.

Conclusion: The incidence and per-abortion rate of ER visits following any induced abortion are growing, but chemical abortion is consistently and progressively associated with more postabortion ER visit morbidity than surgical abortion. There is also a distinct trend of a growing number of women miscoded as receiving treatment for spontaneous abortion in the ER following a chemical abortion.

Keywords

induced abortion, mifepristone, medical abortion, emergency room, Medicaid

Introduction

Since its fast-track approval by the USA Food and Drug Administration (FDA) in September 2000, induced abortion by the administration of mifepristone and misoprostol (ie, chemical abortion) has grown to over 50% of all induced abortions in the United States and may, in fact, be responsible for ending a long-term decline in the number of induced abortions in the United States¹

Research on the safety of induced abortion, and particularly those that are chemically induced, continues to be handicapped

¹ Charlotte Lozier Institute, Arlington, VA, USA

² American Association of Pro-Life Obstetricians and Gynecologists, Eau Claire, MI, USA

³ Elliot Institute, Springfield, IL, USA

⁴ Florida Gulf Coast University, Fort Myers, FL, USA

Corresponding Author:

James Studnicki, Charlotte Lozier Institute, Arlington, VA, USA.

Email: jstudnicki@lozierinstitute.org



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access page (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

in the United States by the absence of a comprehensive national reporting system of pregnancy outcomes. The Centers for Disease Control and Prevention (CDC) Abortion Surveillance Reports are derived from a profoundly flawed system in which reporting by the states is voluntary, with many states reporting intermittently and some not at all. The reporting of specific data elements is similarly piecemeal and, most disappointing, no event-level data is actually available for any rigorous analytical purposes. Adverse events which may be related to an induced abortion such as a death, incomplete abortion, severe bleeding, or infection are often underreported because there is no certain way to link the adverse event to the precipitating abortion. Further, the FDA's adverse event reporting requirements for mifepristone extend only to deaths.² Large population-based record-linkage studies from nations with comprehensive reproductive history data linked to adverse events provide the best opportunity to overcome many of these data limitations and find a much higher overall incidence of adverse events in the chemical compared with the surgical cohort.^{3,4} By contrast, USA studies of chemical abortion safety are frequently conducted on opportunity samples of women who have recently undergone an induced abortion. Already limited by the nonrandom nature of patient selection, these studies are frequently subject to design limitations such as the exclusion of an incomplete abortion as a complication, or an unacceptably high percentage of women lost to follow-up.^{5,6}

The emergency room (ER) visit is a particularly insightful event by which to assess and compare the relative safety of chemical and surgical abortions for 2 reasons. First, adverse events following a mifepristone abortion are more likely to be experienced at home in the absence of a physician, increasing the likelihood of an ER visit. Second, the ER visit can be for any number of complications and is, therefore, a broad proxy indicator for abortion-related morbidity. One major concern is that ER secondary data describes treatment for a condition (eg, hemorrhage) which may be attributed to a prior event (eg, abortion), but, as we have seen, the prior event is often missed. For example, a study of abortion-related emergency room visits in the United States, using the Nationwide Emergency Department Sample, categorized whether visits were abortion related based only on information taken from the ER visit record. There was no independent confirmation from a different source that an abortion had occurred. Therefore, a woman who was experiencing excessive bleeding following a chemical abortion but did not reveal the abortion to the ER physician would not be identified as an abortion-related visit. Not surprisingly, the study found an extraordinarily low percentage (0.01%) of abortion-related visits among all ER visits to women age 15 to 49.⁷ For all the reasons related to data availability and quality, as well as methodological inadequacies, evidence suggests that postabortion complications are substantially underreported.^{8,9}

As we have described, research on adverse events following induced abortion varies by procedure, protocols to detect complication, length of follow-up and the sources and quality of data. The emergency room visit as a comprehensive marker for post-abortion complications has been infrequently and inadequately

utilized in existing research. Therefore, the objective of this research was to complete the first population based longitudinal cohort study of the trajectory of postabortion emergency room utilization following both chemical and surgical abortions in order to test the hypothesis that chemical abortion results in higher emergency room utilization. We selected a longitudinal cohort design because of its superiority to cross-sectional approaches in suggesting causation. Uniquely, our methodology includes first a confirmation of the actual provision of either a chemical or surgical abortion and, only after confirmation, identifies broadly all emergency room utilization before disaggregating abortion-related ER use. In the absence of a national abortion registry, this analysis is intended to provide the most comprehensive view of postabortion-related morbidity in the years following the FDA approval of mifepristone abortion, as well as a glimpse of what we might expect in the future.

Methods

Data were obtained from the enrollee-level Medicaid Analytic eXtract files licensed through the Centers for Medicare and Medicaid Services (CMS) Chronic Condition Data Warehouse's Medicaid data. The analytic dataset is comprised of enrollees from the 17 states whose official policies applied state funds to most abortions not covered by federal Medicaid during the period 1999 through 2015. Not all states funded abortion consistently or to the same extent during the study period. Despite their official policies, Arizona and Illinois funded relatively few abortions during this period, and Alaska experienced a short interruption to its abortion coverage.¹⁰ Not all states had provided claims data through 2015 due to differing reporting timeframes. The latest year of data relative to each state was 2013 for Arkansas, Illinois, Maryland, Montana, and New Mexico; 2014 for Arizona, Hawaii, Massachusetts, and Washington; and 2015 for California, Connecticut, Minnesota, New Jersey, New York, Oregon, Vermont, and West Virginia.

The study population was made up of enrollees over 13 years of age with at least one identifiable pregnancy outcome from 1999 through the latest year of data available for each state. For each beneficiary, all unique pregnancy outcomes were identified using International Classification of Diseases, Ninth Revision (ICD-9) codes. Additionally, Current Procedural Terminology, fourth Edition (CPT4) and Healthcare Common Procedure Coding System (HCPCS) codes were used to confirm pregnancy outcomes.

These codes were used to allocate all pregnancy outcomes into 4 categories: live birth (ICD-9V27.0, V27.2, and V27.5), natural fetal loss (ICD-9V27.1, V27.4, V27.7, 630, 631, 633, 634), induced abortion (ICD-9 635.xx, CPT4 59840, 59841, 59850, 59851, 59852, 59855, 59856, 59857, and HCPCS: S0199, S2260, S2265, S2266, S2267, X7724, X7726, S0190, S0191), and undetermined (ICD-9 636.xx, 637.xx, 638.xx). In order to identify each unique pregnancy, multiple diagnostic or treatment codes within 30 days of a pregnancy loss (natural, induced, or undetermined) or within 180 days of a live birth were counted as a single pregnancy outcome using the first

date associated with that series of Medicaid claims. Twins and higher order gestations that resulted in a combination of live birth and fetal loss were excluded from the analysis.

The analytic strategy was composed of 3 phases. First, we identified every confirmed surgical induced abortion (ICD/CPT codes—CPT4 59840, 59841, 59850, 59851, 59852, 59855, 59856, 59857) and every confirmed chemical induced abortion (HCPSC codes S0190, S0191) in each specific year 1999 to 2015 (index abortion). Codes S0190 and S0191 were added by CMS on January 1, 2001, so chemical abortions prior to that date could have been missed; however, because mifepristone did not receive approval from the FDA until September 28, 2000, the number of mifepristone abortions not captured here is likely minimal. Additionally, as an explanatory variable, we determined whether there was a prior induced abortion or live birth in the 12 months preceding the index abortion procedure. Second, we identified every emergency room visit occurring within thirty days of the index abortion procedure (Place of Service code 23 [emergency room]), including multiple visits for each patient. We further disaggregated ER visits into 3 categories: all-cause, abortion-related codes (ICD-9, 630-639) and spontaneous abortion code (ICD-9, 634). We mapped and adjusted the appropriate codes during the last two quarters of calendar year 2015 to reflect the transition from ICD-9 to ICD-10. The following descriptive metrics were calculated: chemical abortions as a percent of total induced abortions; ER visits following chemical abortions as a percent of total ER visits following total induced abortions; coded abortion-related visits as a percent of total ER visits following an induced abortion; miscoded spontaneous abortion ER visits as a percent of total ER visits following an induced abortion; miscoded spontaneous abortion ER visits as a percent of abortion-related ER visits following an induced abortion; and abortion ER visit rates per 1000 specified induced abortions for all-cause, coded abortion-related, and miscoded spontaneous abortion visit categories. Comparisons of the 1999 to 2015 longitudinal trajectory of these descriptive metrics are displayed in a series of 9 figures.

Third, we performed logistic regression models to identify the association of selected predictor variables with the likelihood of experiencing each of the 3 defined categories of ER visits following an induced abortion. The outcome variable in each equation was the dichotomous indication (yes/no) of the specific type of ER visit. The predictor variables were as follows: surgical abortion; chemical abortion; age at induced abortion; race; months of Medicaid eligibility at induced abortion; prior (within a calendar year of induced abortion) birth; and prior (within a calendar year of induced abortion) induced abortion. The odds ratios were calculated for the entire 17-year study period and, with the disproportional growth of chemical abortions over time, underestimate the current advantage of chemical abortion (vs surgical) in eliciting emergency room visits in the later years of the study observation period.

Summary analytic tables were created using (SAS/STAT) software, version (10) of the SAS system for (Unix).

Copyright (2019) SAS Institute Inc. All comparative analyses were completed using Microsoft Excel (version 16).

The study has been exempted from Institutional Review Board (IRB) review pursuant to the USA Department of Health and Human Services Policy for Protection of Human Research Subjects at C.F.R. 46.101(b). See IRB ID: 7269, www.sterlingirb.com.

Findings

From 1999 to 2015, there was a total of 423 000 confirmed induced abortion Medicaid procedures, 361 924 surgical and 61,706 chemical. Surgical abortions increased from 4479 in 1999 to a peak of 36 204 in 2012, declined in 2013 to 28 101, and concluded 2015 at 29 558. Chemical abortions had no Medicaid claims in the study population in 1999 to 2000 and only 15 in 2001. From 2002 when there were 352, chemical abortions increased to 8768 in 2012, followed by a 2013 to 2014 decline similar to that experienced by surgical abortion. Following inclusion of California chemical abortions in 2015, the chemical abortion number more than doubled to 15 279. As the result, mifepristone abortions grew from 4.4% of total abortions in 2002 to 34.1% in 2015 (Table 1 and Figure 1).

Similarly, emergency room visits within 30 days of an induced abortion increased during the study observation period for both surgical and chemical abortions. Emergency room visits following chemical abortions grew consistently as a percentage of all ER visits within 30 days of the procedure: 3.5% ($36 \div [36 + 977]$) in 2002; 6.9% ($452 \div [452 + 6060]$) in 2007; 22.0% ($3220 \div [3220 + 11,401]$) in 2012; and 33.9% ($5421 \div [5421 + 10,578]$) in 2015 (Table 1). The steeper growth in total and abortion-related ER visits for mifepristone abortions are apparent in the comparison of Figure 2 (surgical) and Figure 3 (chemical). Total ER visits during the study period totaled 121,283, 99,928 surgical and 21,355 chemical.

There are clear differences for surgical and chemical abortions in terms of the reason for the ER visits following the procedure. Abortion-related visits (ICD-9 630-639) remain stable at 4% to 5% of total ER visits for surgical abortions, reaching a high of 6.2% in 2015. This percentage is 8% to 9% between 2002 and 2013 for chemical abortions, with increases in 2014 to 2015 peaking at 14.6%. Abortion-related ER visits represent a higher percentage of total ER visits for chemical abortions (Figure 4).

ER visits miscoded as a spontaneous abortion following a chemical abortion range between 2% and 3% of total visits from 2003 to 2012, increasing abruptly between 2013 and 2015 reaching 8.9%. ER visits miscoded as a spontaneous abortion following a confirmed surgical abortion averaged less than 1% of all ER visits until 2008, 1.2%-1.3% from 2009 to 2014, and peaked at 2.4% in 2015. Therefore, from 2005 to 2015, visits miscoded for spontaneous abortion treatment in the ER as a percent of all visits, went from 2 to 4 times as likely following a chemical abortion as compared to a surgical abortion (Figure 5).

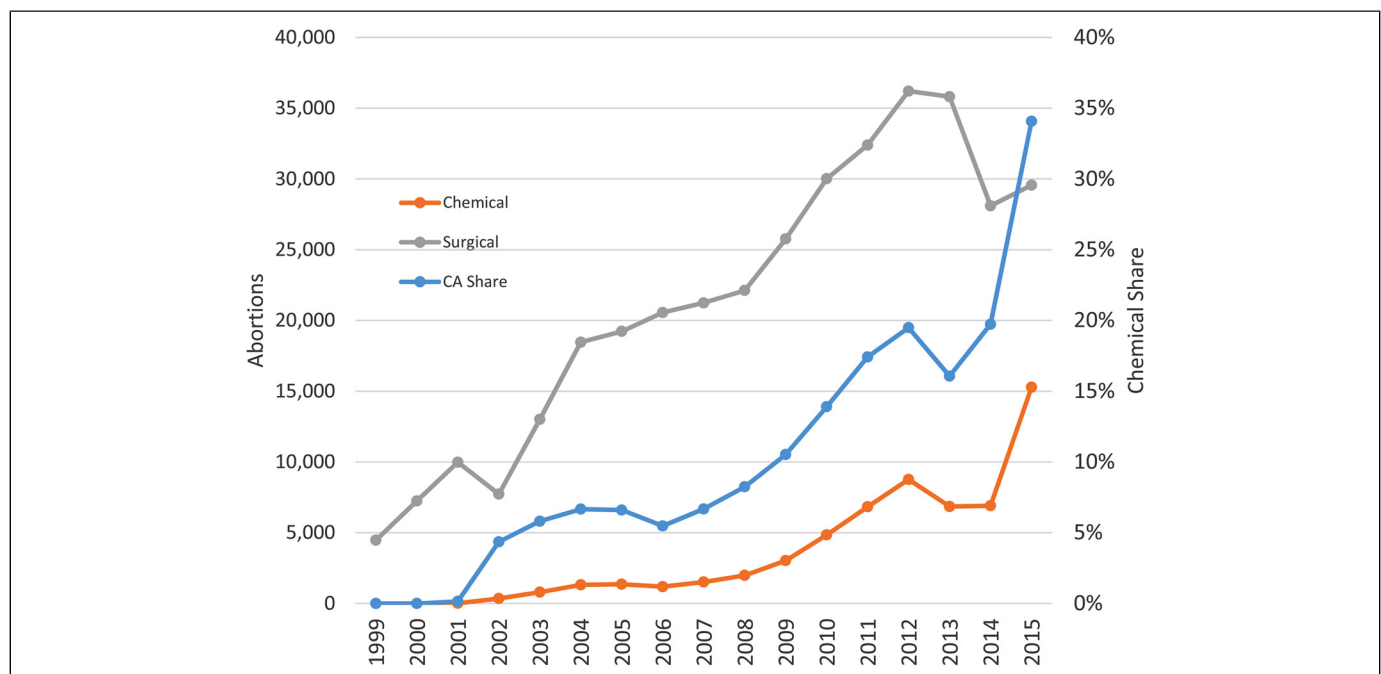
Table 1. Chemical and Surgical Induced Abortions and ER Visits Within 30 Days, 1999-2015.

Year	Chemical				Surgical			
	Abortions	All ER Visits	630 to 639	634	Abortions	All ER Visits	630 to 639	634
1999	0				4479	351	15	5
2000	0				7248	598	31	11
2001	15	1			9986	732	20	7
2002	352	36	3	0	7729	977	41	10
2003	803	108	6	2	13 012	1792	70	12
2004	1319	198	17	1	18 463	2871	99	14
2005	1360	316	29	9	19 226	4178	170	42
2006	1192	351	23	6	20 558	5042	218	51
2007	1521	452	37	13	21 244	6060	263	53
2008	1988	799	50	14	22 125	6954	313	66
2009	3032	1121	100	27	25 764	7879	358	91
2010	4848	1702	147	48	30 019	8820	386	114
2011	6834	2787	233	99	32 394	10 044	465	104
2012	8768	3220	277	88	36 204	11 401	536	150
2013	6856	2401	219	94	35 814	11 681	558	142
2014	6909	2442	270	117	28 101	9970	466	120
2015	15 279	5421	790	481	29 558	10 578	651	254

As a percent of abortion-related visits (ICD-9, 630-639), visits miscoded for spontaneous abortion treatments (ICD-9, 634) following a confirmed mifepristone abortion averaged approximately 30% between 2003 and 2012 and increased between 2013 and 2015, reaching 60.9%. ER visits miscoded as treatment for spontaneous abortion as a percent of abortion-related visits following a confirmed surgical abortion are a consistently lower percentage than for those following a chemical abortion, peaking at 39% in 2015 (Figure 6). Treatment in the

ER miscoded as for spontaneous abortion is consistently and progressively more likely following a chemical abortion than following a surgical abortion.

All-cause ER visit rates within 30 days of an abortion have increased consistently throughout the study period for all types of induced abortion. There were 78.4 all-cause visits per 1000 surgical abortions in 1999 and 357.9 in 2015, an increase of 356% in the rate. Using 2002 as the initial year with sufficient abortion and ER visit counts to calculate a rate, the chemical

**Figure 1.** Medicaid abortions (surgical and chemical), 1999–2015, and chemical abortion % total.

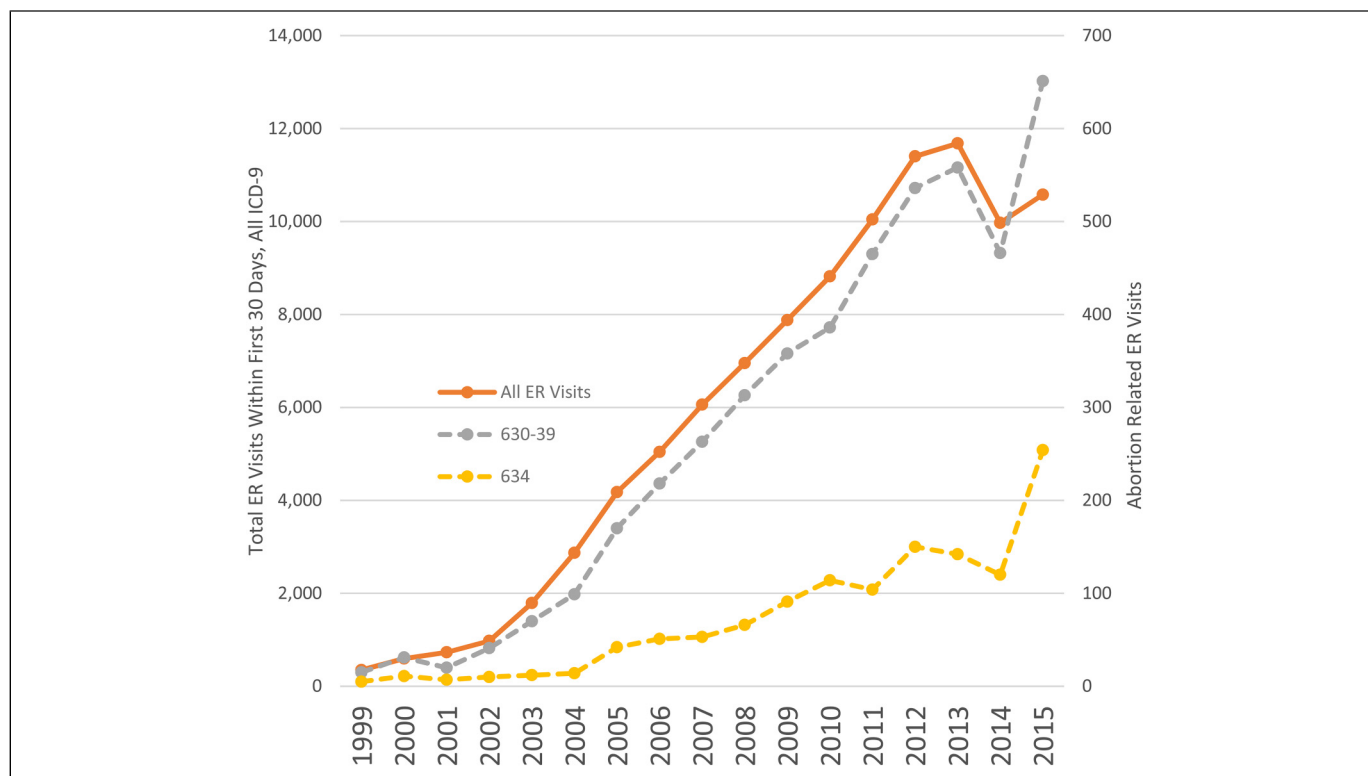


Figure 2. Emergency room (ER) use following surgical abortion, 1999-2015.

abortion rate increased from 102.3 in 2002 to 354.8, a rate increase of 247%. When the surgical rate increase is calculated from 2002 (126.4) and 2015 (357.9), the rate increase is 183%. Both the consistent increase in the rate of ER visits per abortion procedure and the higher chemical rate relative to the surgical rate after 2004 are apparent in Figure 7.

Abortion-related ER visits (ICD-9 630-639) per abortion exhibit a similar upward trend in rates for both surgical and chemical abortions, but, beginning in 2002, a growing divergence by type of abortion is evident. The surgical abortion to abortion-related visit rate increases from 5.3 in 2002 to 22.0 in 2015, an increase of 315%. Chemical abortion visit rates during the same period went from 8.5 to 51.7, an increase of 507% (Figure 9).

ER visit rates miscoded as for spontaneous abortion (ICD-9 634) within 30 days of a surgical abortion show a declining pattern from a peak of 1.5 in 2000 to a low point of 0.8 in 2004, a gradual increase between 2.2 and 4.3 from 2005 to 2014, and a doubling to 8.6 in 2015. By contrast, ER visit rates miscoded as for spontaneous abortion treatment following a chemical abortion show a consistent increase from 8.55 in 2007, the first year ER visits in this category reached double digits, to 31.5 in 2015. Between 2007 and 2015, the ER visit rate miscoded for spontaneous abortion increased 244% following surgical abortion and 268% following chemical abortion (Figure 8). Caution previously noted regarding the coding and classification of these visits is similarly warranted here.

A summary of the logistic regression analyses is in Table 2. All 3 types of ER visits during the study observation period are more likely to occur following a chemical abortion than following a surgical abortion: all-cause (OR 1.22, CL 1.19-1.24); abortion-related (OR 1.53, CL 1.49-1.58); and spontaneous abortion (OR 1.88, CL 1.81-1.96). Prior pregnancy outcomes increase the likelihood of any type of subsequent ER visit. However, an ER visit is significantly more likely to occur following a prior chemical abortion than following a prior surgical abortion: all-cause (OR 2.54, CL 2.38-2.70 vs OR 1.78, CL 1.73-1.82); abortion-related (OR 1.80, CL 1.65-1.97 vs OR 1.35, CL 1.29-1.41); and spontaneous abortion (OR 1.74, CL 1.54-1.96 vs OR 1.43, CL 1.35-1.52). A prior live birth is a lower risk factor for post abortion ER visits than is either a chemical or surgical induced abortion: all-cause (OR 1.52, CL 1.48-1.56); abortion-related (OR 1.09, CL 1.04-1.15); and spontaneous abortion (OR 1.12, CL 1.04-1.20).

Hispanics are slightly more likely than whites to experience any type of post abortion ER visit: all-cause (OR 1.07, CL 1.05-1.10); abortion-related (OR 1.03, CL 1.00-1.07); and spontaneous abortion (OR 1.03, CL 0.98-1.09). Blacks, by contrast, are consistently less likely than whites to experience any type of post abortion ER visit: all-cause (OR 0.59, CL 0.58-0.61); abortion-related (OR 0.68, CL 0.66-0.71); and spontaneous abortion (OR 0.72, CL 0.68-0.76). Age at time of the abortion and years of Medicaid eligibility are not important risk factors in predicting post abortion emergency room use.

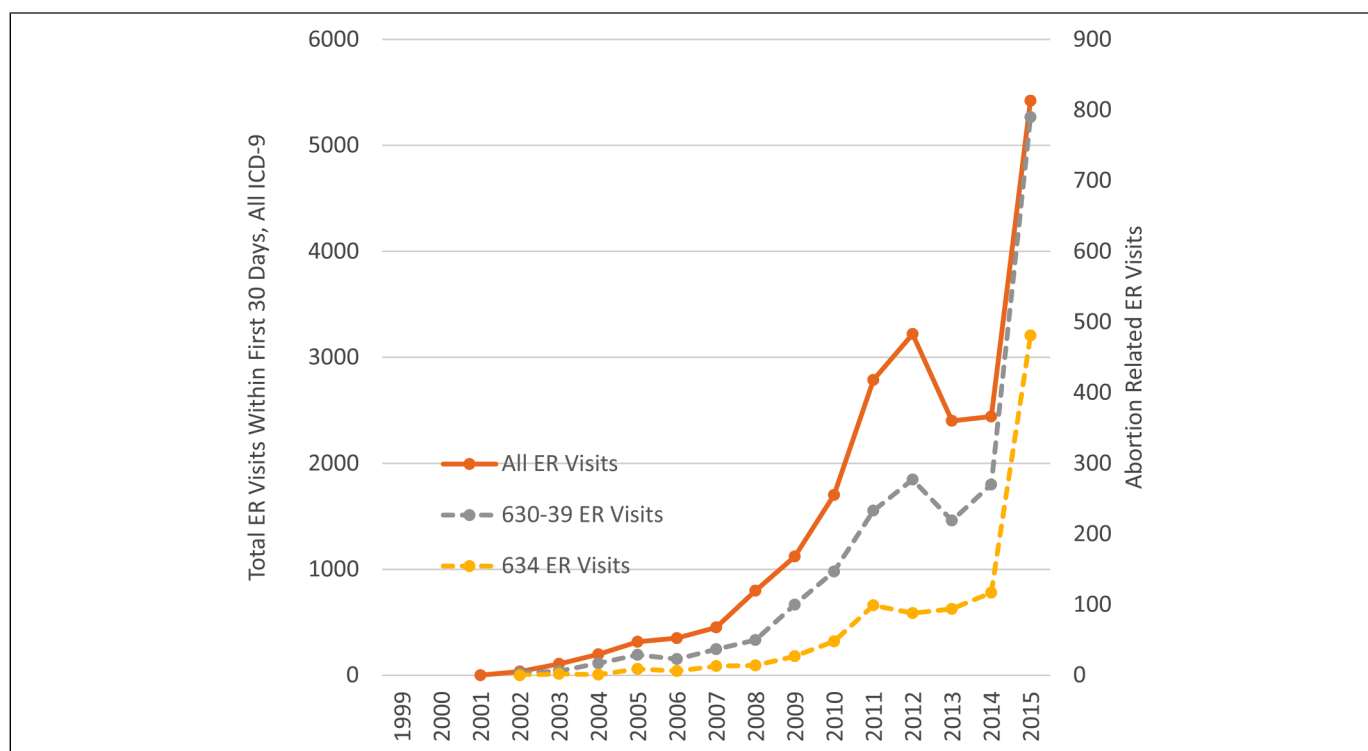


Figure 3. Emergency room (ER) use following chemical abortion, 1999–2015.

Discussion

Regression analysis definitively supports the hypothesis that chemical abortion is associated with more frequent emergency room visits of all kinds for the entire study period. In addition, we found that ER visit rates per 1000 abortion procedures

increased consistently throughout the study period following both types of induced abortion, but the rates for mifepristone abortion visits grew faster, especially for abortion-related visits. By 2015, mifepristone versus surgical ER rates were: all visits (354.8 vs 357.9); miscoded spontaneous abortion

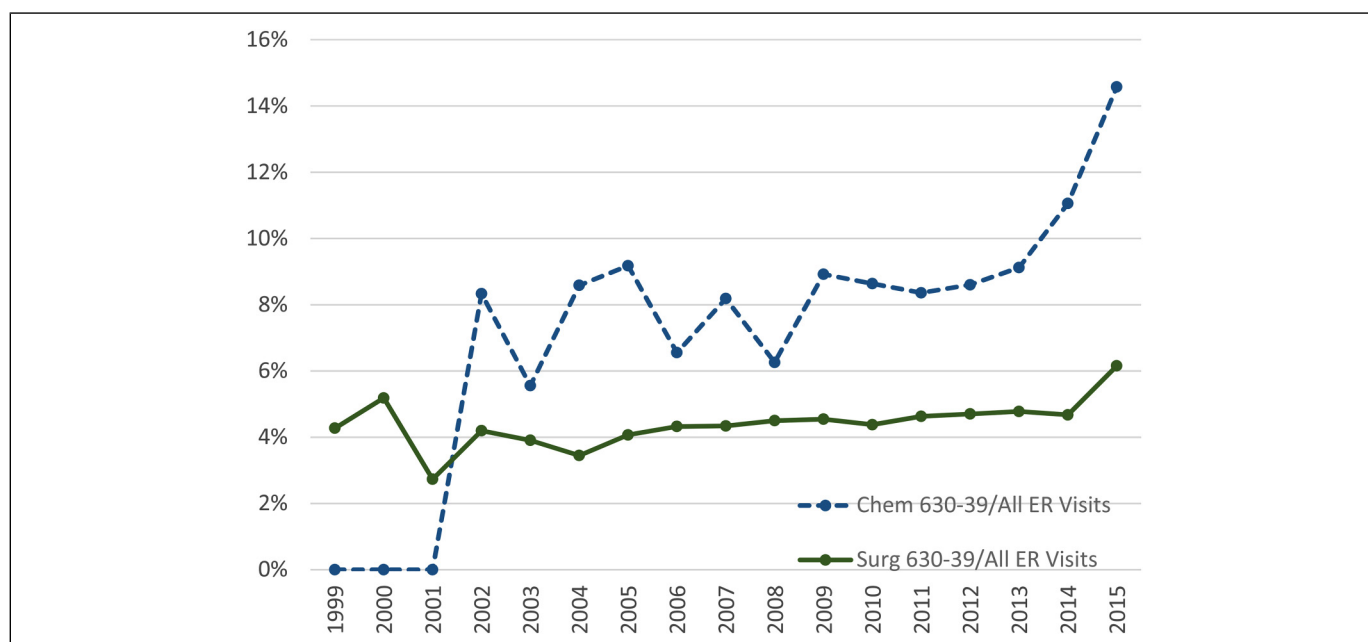


Figure 4. Abortion-related visits as a percent of all emergency room (ER) visits.

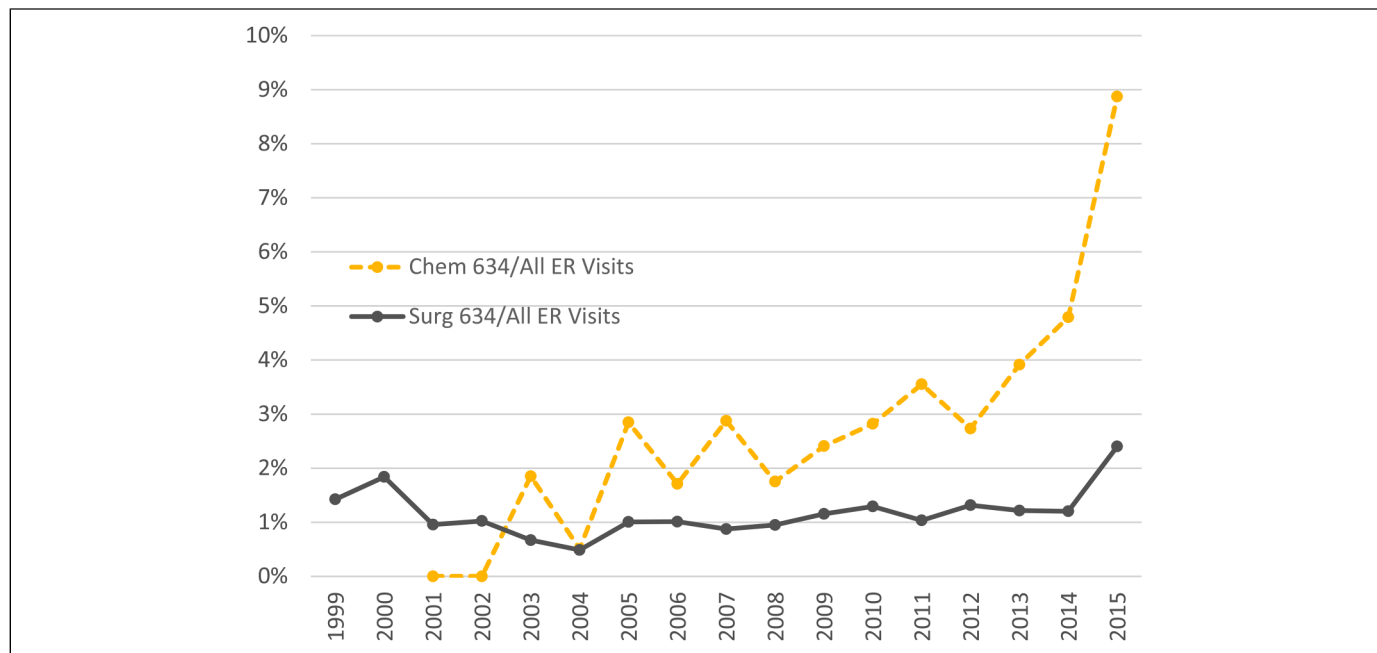


Figure 5. Miscoded spontaneous abortion visits as a percent of all emergency room (ER) visits.

(31.5 vs 8.6); and abortion-related (51.7 vs 22.0). The reasons for the increasing rate of ER visits following mifepristone abortions are not readily apparent but may be influenced by mifepristone abortion providers who are unable or unskilled to handle complications after chemical abortions. This finding would be consistent with an analysis of FDA Adverse Event Reports which showed that abortion providers only managed slightly over half of the dilation and curettage procedures (D&Cs) required for hemorrhage and retained tissue, and the remainder were handled by the emergency room.¹¹ Further research is needed to delineate whether there is a difference between ER visit utilization after abortions performed by those abortion providers untrained in surgical procedures (ie, midwives, advance practice clinicians, Family Medicine providers and other types of providers). This finding is also of significance when considering the implications of removing a requirement for in-person medical supervision of mifepristone abortion as is currently under consideration by the FDA.¹²

These findings are especially consequential because they are derived directly from all paid medical claims records, unlike most other studies of abortion complications which involve voluntary survey reporting and/or a more limited query of a select set of treatment codes. The more comprehensive examination of all ER codes associated with confirmed abortion events undertaken in this research requires reconsideration of previous findings which now appear to have understated the full range of risks associated with abortion. For example, previous research on only fee-for-service California Medicaid beneficiaries and using only a single code (ICD-9 635.xx) in 2009 to 2010 concluded that 6.4% of all abortions were followed by any ER visit within 6 weeks and 0.87% were followed by an abortion-related

visit.¹³ Results of our research summarized for the same 2 years found 4.8 times (30.7%) the number of total ER visits and 1.8 times (1.56%) the number of abortion-related visits within our shorter 30-day postabortion observation period. We were able to detect this more accurate number of complications because the women were included in our study based on a CPT code payment for mifepristone abortion, thus eliminating the need for the treating physician to recognize a complication from a chemical abortion.

The finding that many ER visits following known induced abortions are misclassified as postmiscarriage complications is particularly noteworthy. Abortion studies in the United States consistently report lower postabortion complication rates than are documented in the international scientific literature. There are likely multiple reasons for this discrepancy, but among them are the miscoding of abortion-related complications by the provider and the nondisclosure of prior abortion history by the patient. Women obtaining chemical abortions must sign a patient agreement indicating they will bring with them the mifepristone medication guide if seeking emergency care, but some abortion advocates encourage women to withhold information if seeking treatment for an adverse event.^{14,15} Our study demonstrated ER visits misclassified or miscoded as spontaneous abortion grew for both types of induced abortion, reaching 39% of abortion-related visits following surgical abortion and 60.9% of visits following chemical abortion in 2015. These mifepristone abortion complications would have been invisible to previous researchers, resulting in a large underestimation of actual mifepristone abortion complications. Our more accurate estimation has significant implications for the evaluation of risks communicated

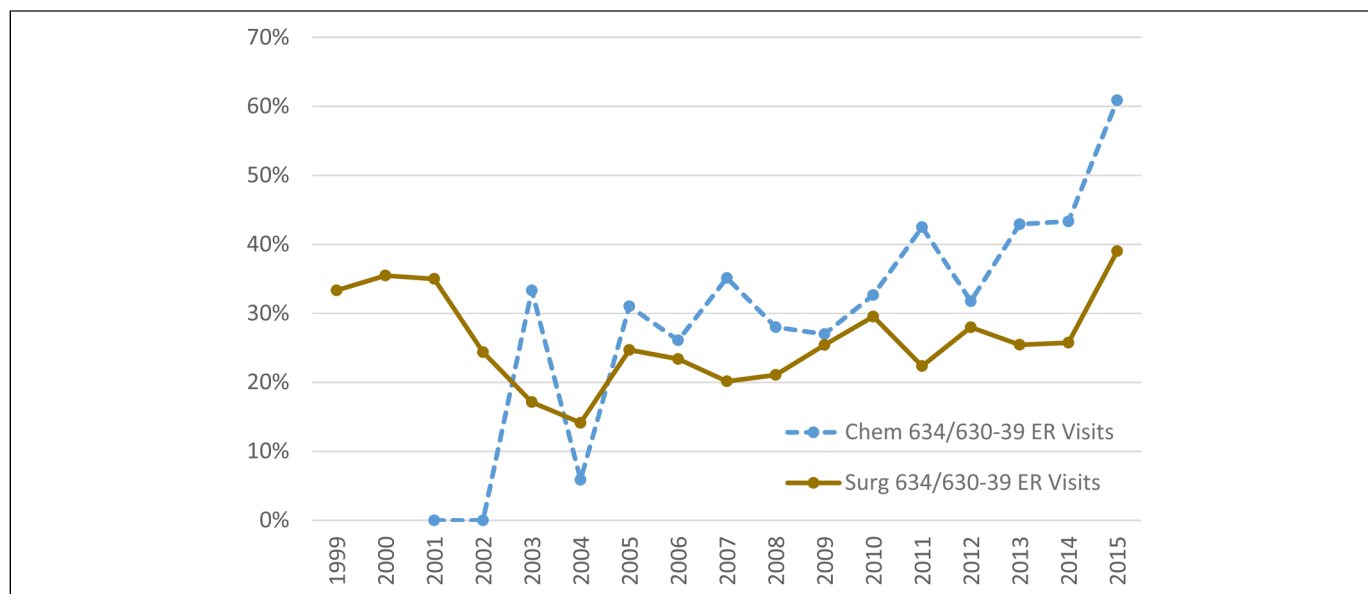


Figure 6. Miscoded spontaneous abortion visits as a percent of abortion-related emergency room (ER) visits.

to women in the process of informed consent prior to abortion, as well as in policy making regarding mifepristone abortion.

Consistent with CDC reports, we found the percentage of abortions performed by means of mifepristone and misoprostol increased from 4.4% of total abortions in 2002 to 34.1% in 2015. Similarly, ER visits following mifepristone abortion grew from 3.6% of all postabortion visits in 2002 to 33.9% of all postabortion visits in 2015. The trend toward increasing use of mifepristone abortion requires all concerned with health

care utilization to carefully follow the ramifications of ER utilization.

There are limitations related to the use of Medicaid claims data. Medicaid-eligible beneficiaries are by definition financially disadvantaged and are not representative of all women experiencing abortion. Conversely, a data set composed entirely of low-income women may also be considered an advantage since results are unlikely to be explained by differences in income or other factors strongly associated with income. The lower risk of any ER visit following induced abortion among

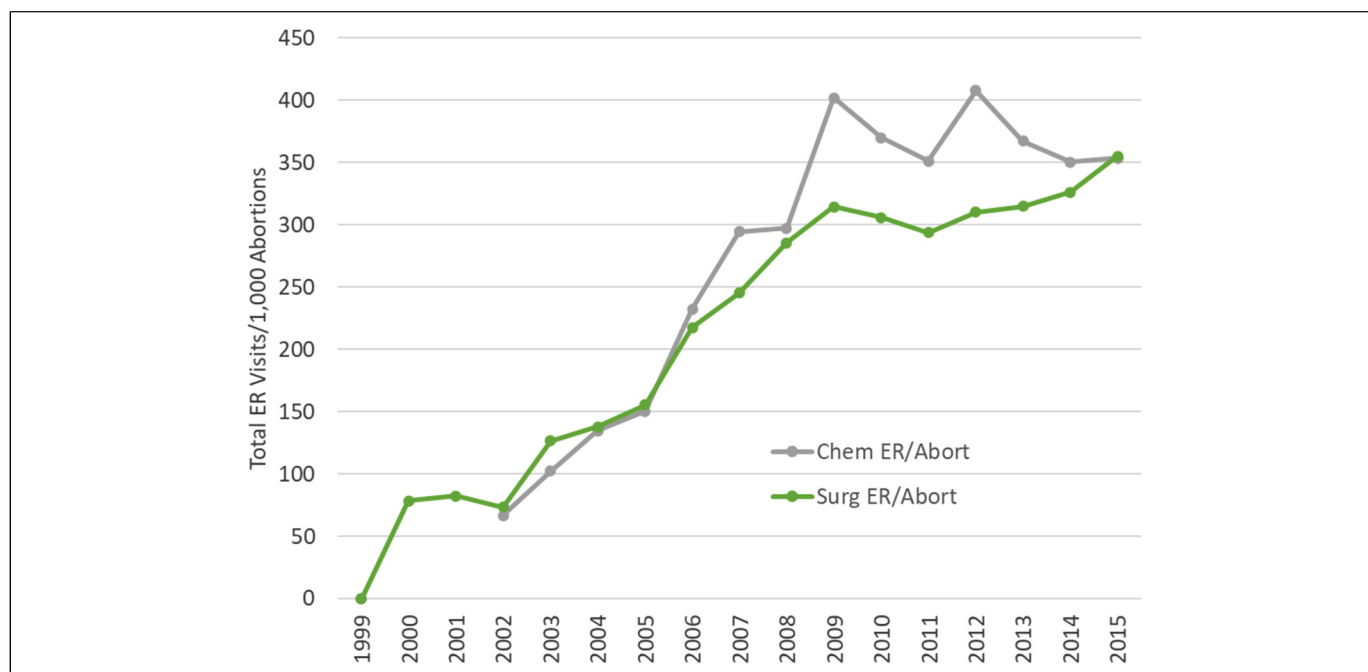


Figure 7. Total emergency room (ER) visits per 1000 abortions.

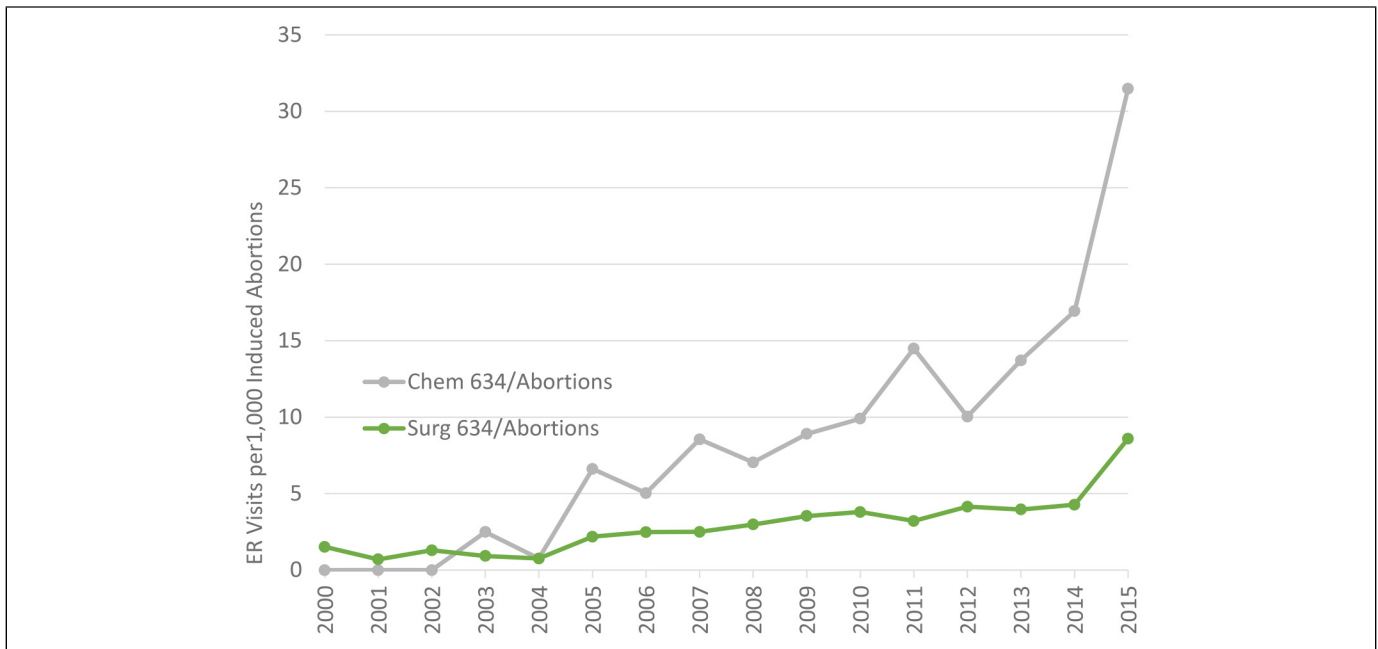


Figure 8. Miscoded spontaneous abortion emergency room (ER) visits per 1000 abortions.

Black women suggests that a more granular analysis of the influence of race is warranted. Services received by eligible women but paid by another source (eg, out of pocket) are not included in the claims data. Services received when the women were not eligible are similarly not included.

Administrative data are also subject to limitations regarding coding errors, inconsistent coding, and the exclusion of codes considered nonessential for billing.^{16,17} There are inconsistencies in coding which may vary state by state. Our data extraction protocol required both an ICD code and CPT code to

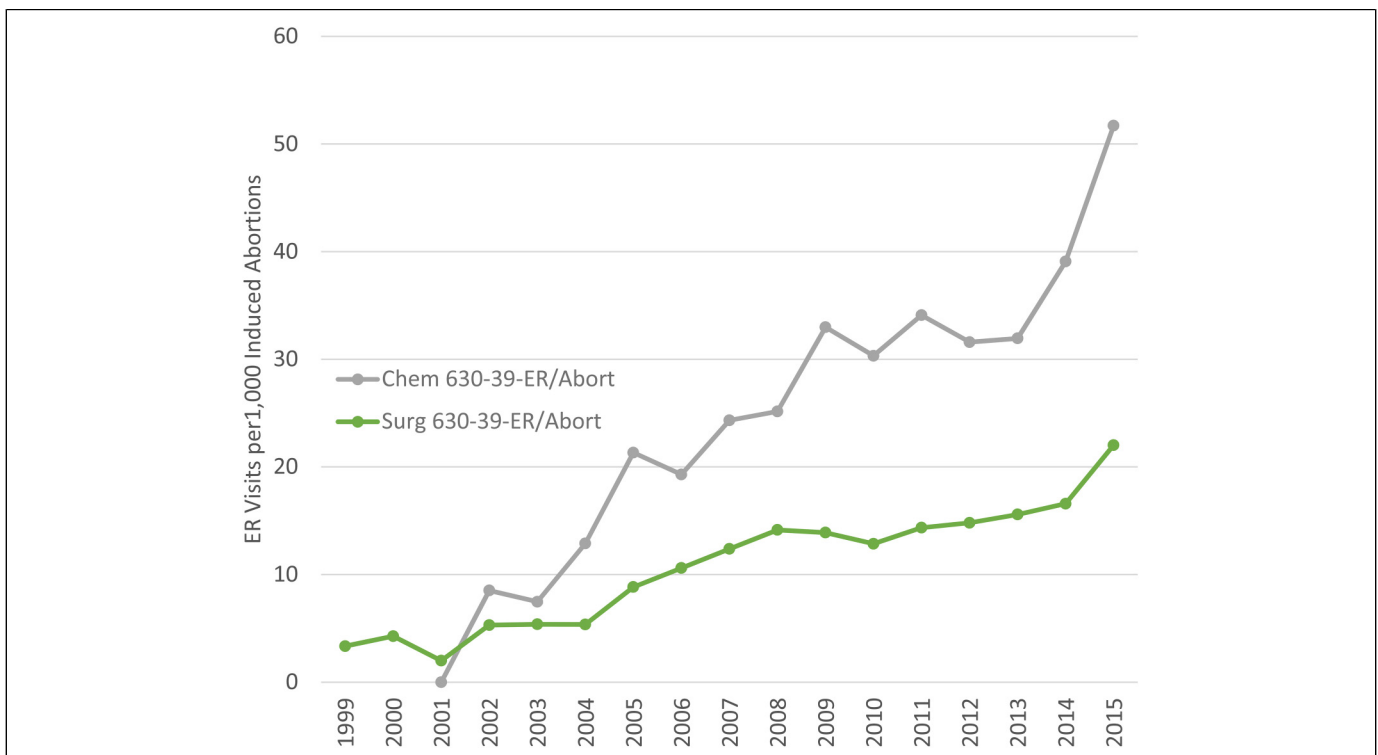


Figure 9. Abortion-related emergency room (ER) visits per 1000 abortions.

Table 2. Logistic Regression Odds Ratio Estimates (OR) and (Wald) Confidence Limits (CLs).

	Any ER Visit		Abortion-Related Visit		Spontaneous Abortion Visit	
	OR	95% CLs	OR	95% CLs	OR	95% CLs
Chemical versus Surgical Abortion	1.22	1.19 to 1.24	1.53	1.49 to 1.58	1.88	1.81 to 1.96
Race						
Black versus White	0.59	0.58 to 0.61	0.68	0.66 to 0.71	0.72	0.68 to 0.76
Hispanic versus White	1.07	1.05 to 1.10	1.03	1.00 to 1.07	1.03	0.98 to 1.09
Other versus White	0.91	0.89 to 0.93	0.88	0.85 to 0.91	0.85	0.81 to 0.89
Pregnancy 365 d prior versus no						
Prior surgical abortion	1.78	1.73 to 1.82	1.35	1.29 to 1.41	1.43	1.35 to 1.52
Prior chemical abortion	2.54	2.38 to 2.70	1.80	1.65 to 1.97	1.74	1.54 to 1.96
Prior live birth	1.52	1.48 to 1.56	1.09	1.04 to 1.15	1.12	1.04 to 1.20
Age	0.993	0.992 to 0.994	1.003	1.001 to 1.004	1.000	0.997 to 1.003
Months Medicaid Eligibility	1.008	1.007 to 1.008	1.006	1.005 to 1.007	1.006	1.006 to 1.006

identify beneficiaries who had an induced abortion. To the extent that some states or individual providers do not code an abortion with an ICD code, our study population may undercount the number of abortions. This undercount would likely be due to a random variation in coding protocols and is unlikely to affect the trends related in our findings.

In summary, mifepristone abortion is consistently and progressively associated with increased morbidity in the form of postabortion emergency room utilization among the population of women with publicly funded abortions. The determination of the causes and potential means of prevention for this burden of illness should have the highest priority of our health agencies and elected officials. Additional research is necessary to investigate the prevalence and type of effects beyond 30 days.



Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Charlotte Lozier Institute.

ORCID iDs

James Studnicki  <https://orcid.org/0000-0003-2958-7493>
Tessa Longbons  <https://orcid.org/0000-0003-0479-9166>

References

- Longbons T. U.S. abortion trends: 2019 and preliminary 2020. Charlotte Lozier Institute. American Reports Series Issue 19, September 2021. Accessed September 10, 2021. <https://lozierinstitute.org/us-abortion-trends-2019-and-preliminary-2020/>
- U.S. Government Accountability Office. Food and Drug Administration: Information on mifeprex labeling changes and ongoing monitoring efforts. GAO-18-292. Published March 28, 2018. Accessed September 9, 2021.
- Niinimäki M, Pouta A, Bloigu A, et al. Immediate complications after medical compared with surgical termination of pregnancy. *Obstet Gynecol*. 2009;114(4):795-804. doi: 10.1097/AOG.0b013e3181b5ccf9
- Carlsson I, Breeding K, Larsson P-G. Complications related to induced abortion: a combined retrospective and longitudinal follow-up study. *BMC Women's Health*. 2018;18(1):158. doi: 10.1186/s12905-018-0645-6
- Cleland K, Creinin MD, Nucatola D, Nshom M, Trussell J. Significant adverse events and outcomes after medical abortion. *Obstet Gynecol*. 2013;121(1):166-171. doi: 10.1097/aog.0b013e3182755763
- Ireland LD, Gatter M, Chen AY. Medical compared with surgical abortion for effective pregnancy termination in the first trimester. *Obstet Gynecol*. 2015;126(1):22-28. doi: 10.1097/AOG.0000000000000910
- Upadhyay UD, Johns NE, Barron R, et al. Abortion-related emergency department visits in the United States: an analysis of a national emergency department sample. *BMC Med*. 2018;16(1):88. doi: 10.1186/s12916-018-1072-0
- Studnicki J, Reardon D, Harrison D, Fisher J, Skop I. Improving the metrics and data reporting for maternal mortality: a challenge to public health surveillance and effective prevention. *Online J Public Health Inform*. 2019;11(2):e17. doi: 10.5210/ojphi.v11i2.10012
- Schaible B. Improving the accuracy of maternal mortality and pregnancy related death. *Issues Law Med*. 2014;29(2):231-242.
- New MJ. Hyde @ 40: analyzing the impact of the Hyde amendment. Charlotte Lozier Institute, On Point Series 12. 2016. Accessed September 9, 2021. https://s27589.pcdn.co/wp-content/uploads/2016/09/OP_hyde_9.28.3.pdf
- Aultman K, Cirucci CA, Harrison DJ, Beran BD, Lockwood MD, Seiler S. Deaths and severe adverse events after the use of mifepristone as an abortifacient from September 2000 to February 2019. *Issues Law Med*. 2021;36(1):3-26.
- Joint Mot. to Stay Case Pending Agency Review, *Chelius v. Becerra*, Civ. No. 1:17-00493 JAO-RT (D. Haw.).
- Upadhyay UD, Desai S, Zlidar V, et al. Incidence of emergency department visits and complications after abortion. *Obstet*

- Gynecol.* 2015;125(1):175-183. doi: 10.1097/AOG.0000000000000603
14. Safe2Choose. Will medical staff be able to notice that I am having an abortion? Accessed September 9, 2021. <https://safe2choose.org/faq/medical-abortion-faq/during-abortion-with-pills/will-medical-staff-be-able-to-notice-that-i-am-having-an-abortion>
 15. Plan C. Abortion pills FAQ: Can I get in trouble for using abortion pills? Accessed September 9, 2021. <https://www.plancpills.org/guide-how-to-get-abortion-pills#faq>
 16. Hicks J. *The Potential of Claims Data to Support the Measurement of Health Care Quality*. Dissertation, RAND; 2003.
 17. Romano PS. Using administrative data to identify associations between implanted medical devices and chronic diseases. *Ann Epidemiol.* 2000;10(4):197-199. doi: 10.1016/s1047-2797(00)00041-7

Author Biographies

James Studnicki is currently Vice President and Director of Data Analytics at the Charlotte Lozier Institute in Arlington, Virginia. Over a span of four decades, he held academic appointments at the Johns Hopkins University School of Hygiene and Public Health, the University of South Florida College of Public Health, and the University of North Carolina, Charlotte, where for ten years he served as the Irwin Belk Endowed Chair in Health Services Research. He holds Doctor of Science (ScD) and Master of Public Health (MPH) degrees from Johns Hopkins and a Master of Business Administration (MBA) from the George Washington University.

Donna J. Harrison, M.D. dip ABOG received her M.D. from the University of Michigan and completed ObGyn residency at a University of Michigan Affiliate hospital (St. Joseph Mercy Hospital). She is currently CEO of the American Association of Pro-Life Obstetricians and Gynecologists.

Tessa Longbons is a research associate with the Charlotte Lozier Institute. Her research focuses on abortion statistics at the state and national levels and the changing landscape of abortion policy, provision, and access in the United States. She received her B.A. from Thomas Edison State University.

Ingrid Skop, M.D., F.A.C.O.G. has been a practicing obstetrician-gynecologist in San Antonio, Texas for 24 years. She received her Bachelor of Science in physiology from Oklahoma State University and her medical doctorate from Washington University School of Medicine. She completed her residency in obstetrics and gynecology at the University of Texas Health Science Center at San Antonio. She is a Fellow of the American College of Obstetrics and Gynecology, a Charlotte Lozier

Institute Associate Scholar and Chairman of the American Association of Pro-Life Obstetricians and Gynecologist's Maternal Mortality Committee. She is the Board Chairman of Any Woman Can Pregnancy Resource Center-which specializes in free mental health counseling and is a board member of The Source for Women-a consortium of holistic women's health care centers in Texas. She is married to a physician and is the proud mother of two sons and a daughter.

David C. Reardon is the director of Elliot Institute, a biomedical ethicist, and a lead author on numerous studies and books examining the risk factors and effects of pregnancy loss on women and families.

John W. Fisher is currently an Associate Scholar at the Charlotte Lozier Institute. Following a 22 year career as a nuclear submarine officer, he served as the Director of Life Support and engineering at the Florida Aquarium, Chief Financial Officer of Technology Transfer Services, and 10 years as an Assistant Professor at the University of North Carolina at Charlotte College of Health and Human Services. He holds a PhD in Information Systems and Decision Sciences from the University of South Florida, a JD from Massachusetts School of Law, and Master's degrees from the Massachusetts Institute of Technology (Ocean Engineering), University of Notre Dame (Administration), Indiana University (Business Administration), and the United States Naval War College (National Security Policy). He is currently a member of the bar in New Hampshire and Massachusetts.

Maka Tsulukidze, MD, PhD, MPH is an Assistant Professor at the Florida Gulf Coast University, Marieb College of Health & Human Services. Before joining FGCU, she was a Postdoctoral Fellow at the Dartmouth Center for Health Care Delivery Science. She has earned a PhD degree from the University of North Carolina at Charlotte and MD from Tbilisi Medical Academy. Previously she was a UNICEF National Consultant to the Parliament of Georgia, Short-Term Consultant at PAHO/WHO and Senior Expert at the Parliament of Georgia, Committee on Health and Social Issues. She has also worked as a Deputy Chair/Project Manager for the Task Force for Prevention of Micronutrient Malnutrition and Food Fortification Initiatives established under the Parliament of Georgia, Committee on Health and Social Issues.

Christopher Craver is an independent health services researcher affiliated with the Charlotte Lozier Institute focused on the use of secondary healthcare data sources in population based scientific research. He is widely published in many healthcare topics including cancer treatment, rare disease populations, and the efficacy of surgical services.