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### Maintaining rigor in abortion research: Flaws in a recent study and a re-analysis of the relationship between state abortion laws and maternal mortality in Mexico

---Manuscript Draft---

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<td>Maintaining rigor in abortion research: Flaws in a recent study and a re-analysis of the relationship between state abortion laws and maternal mortality in Mexico</td>
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<td>Short Title:</td>
<td>Re-analysis of the relationship between state abortion laws and maternal mortality in Mexico</td>
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| Corresponding Author: | Blair Grant Darney, PhD, MPH  
Instituto Nacional de Salud Publica  
Cuernavaca, MOR MEXICO |
| Keywords:          | Abortion research; abortion legislation; maternal mortality; Mexico; transparency |

### Abstract:

**Background**

Transparency and integrity in research is crucial, and perhaps even more in politically contested topics such as abortion. A recent publication (Koch et al 2015) claimed that Mexican states with more restrictive abortion laws had lower levels of maternal mortality. Our objectives are to replicate the analysis, re-analyze the data, and offer a critique of the key flaws in the paper.

**Methods**

We used corrected maternal mortality data (2006-2013), population estimates, and state-level indicators of poverty. We replicate the published analysis. We then re-classified states based on real access to abortion (Mexico City versus the other 31 states) and test the association of abortion access and Maternal Mortality Ratio (MMR) using descriptives over time, pooled chi-square tests and regression models. We included 256 state-year observations.

**Results**

We did not find significant differences in MMR between México City (MMR=49.1) and the 31 states (MMR=44.6; p=0.44). Using Koch's classification, we replicated published differences (MMR= 41 versus 50; p<0.001). We found a significant, negative association between MMR and abortion legislation in multivariable models using our state classification (beta = -22.49, 95% CI = -38.9 - 15.99). State-level poverty remains highly correlated with MMR. Our main study limitation is an inability to draw causal inference about abortion law or access and maternal mortality.

**Conclusions**

We replicated Koch's analysis and find overall declining maternal mortality across Mexican states during 2006-2013, with faster decline in Mexico City. Koch makes erroneous causal claims about abortion law and MMR. His publication suffers from three key weaknesses: 1) measurement of abortion-related morality; 2) classification of Mexican states by abortion law and of deaths by residence or place of occurrence; and 3) study design. We need rigorous evidence about the health impacts of increasing access to legal abortion worldwide.

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Biani Saavedra-Avendano

Rafael Lozano

### Opposed Reviewers:

### Additional Information:

### Question | Response
---|---
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<tr>
<td>We are not able to provide BIRMM &quot;Búsqueda Intencionada y Reclasificación de Muertes Maternas&quot; dataset beyond what is presented in the manuscript due to restrictions of the data use agreement signed between the National Institute of Public Health and the Ministry of Health.</td>
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Dear PLOS ONE Editors,

We are pleased to submit our manuscript “Maintaining rigor in abortion research: Flaws in a recent study and a re-analysis of the relationship between state abortion laws and maternal mortality in Mexico” for consideration for publication in PLOS ONE. This manuscript is not under review elsewhere.

This manuscript addresses the integrity and ethics of the research process and also a key global public health topic: the relationship between abortion laws, access, and maternal mortality. We present a re-analysis and critique of a recent publication on maternal mortality and abortion law in Mexico (1). Our manuscript goes beyond refuting the manuscript to engage in a discussion of transparency, acknowledging limitations of data, and contextualizing results, as recommended by recent guidance for abortion research (2). Our goal is to improve transparency and rigor in observational research, especially when considering links between safe and unsafe abortion and health outcomes, where results can be used by policymakers both in favour of and against expanding access to safe abortion.

All study authors are based in Mexico at the National Institute of Public Health and we are committed to improving the quality of evidence about Mexico, expertise in maternal health (3-8) as well as deep knowledge about the data used in Koch’s study. Dr. Darney, the lead author, affirms that this manuscript is an honest, accurate, and transparent account of the study. The study sponsor, The Society of Family Planning Research Fund, had no role in the analysis or interpretation of data. The authors have no conflicts of interest to disclose.
We feel this manuscript will be of high interest to your global clinical and policy readership, and can inform efforts to maintain rigor in global observational research, and in particular abortion research, and inform policies and programs worldwide. Please do not hesitate to contact me with any questions and thank you for considering our manuscript for publication in PLOS ONE.

Sincerely,

Blair G. DARNEY, PhD, MPH
email: blair.darney@insp.mx

References
Maintaining Rigor in Abortion Research: Flaws in a Recent Study and a
Re-analysis of the Relationship Between State Abortion Laws and Maternal
Mortality in Mexico

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Abstract

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Transparency and integrity in research is crucial, and perhaps even more in politically contested topics such as abortion. A recent publication (Koch et al 2015) claimed that Mexican states with more restrictive abortion laws had lower levels of maternal mortality. Our objectives are to replicate the analysis, re-analyze the data, and offer a critique of the key flaws in the paper.

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and maternal mortality.

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We replicated Koch’s analysis and find overall declining maternal mortality across Mexican states during 2006-2013, with faster decline in Mexico City. Koch makes erroneous causal claims about abortion law and MMR. His publication suffers from three key weaknesses: 1) measurement of abortion-related morality; 2) classification of Mexican states by abortion law and of deaths by residence or place of occurrence; and 3) study design. We need rigorous evidence about the health impacts of increasing access to legal abortion worldwide.
Introduction

Reducing maternal mortality remains a top global health priority [1]. The large disparities in the Maternal Mortality Ratio (MMR) between countries [2] and populations suggest that much of the burden of maternal death is preventable. It is imperative that we have solid evidence about the correlates and causes of maternal death to inform policies, programs, and services that contribute to reducing maternal mortality. Unsafe abortion is an important contributor to overall MMR – up to 13% of maternal deaths are due to complications from unsafe abortion [3], but where abortion is legal, the fraction of MMR due to abortion is very low [4].

A recent study by Koch et al [5] focused on state-level MMR in Mexico concluded that states with more restrictive laws “exhibited consistently lower maternal mortality rates” [5]. A press release for the study goes further, stating that the study “confirm[s] that Mexican states with less permissive abortion laws exhibited 23% lower overall maternal mortality and up to 47% lower mortality from complications of abortion” [6].

The purpose of this study is to describe MMR and access to abortion over time and test the association of state-level abortion law, maternal mortality, and socio-economic factors in Mexico, using the same data as Koch et al. We then focus on selected key flaws in the Koch et al. study: 1) measurement of abortion-related morality; 2) classification of Mexican states and of deaths by residence or place of occurrence; and 3) study design. Our aim is to improve transparency, acknowledge the limitations of data, and contextualize results, as recommended
in studies of abortion and abortion-related morbidity and mortality [7]. Our ultimate goal is to improve the evidence available to guide policies and services to reduce unsafe abortion.

**Materials and Methods**

This is a retrospective observational study drawing on several sources of existing data in Mexico. We used the Búsqueda Intencionada y Reclasificación de Muertes Materna (BIRMM) dataset for state-level maternal deaths by year (2006-2013). Details of the BIRMM project are described elsewhere [8, 9].

We used official corrected population statistics from CONAPO [10] in the denominator of our MMR calculations. Koch et al used birth registration data from INEGI [11] not corrected estimates, and thus overestimates births due to population mobility for registering, double registration, and time lags in registration. We calculated the state-level Maternal Mortality Ratio (MMR; number of maternal deaths per 100,000 live births), our dependent variable, by place of residence of the woman and place of occurrence of the death.

We classified the 31 Mexican states and the Mexico City (Distrito Federal DF) based on actual access to induced abortion. Abortion is theoretically available for narrow indications, which vary by state, but documentation remains burdensome and actual access is very limited. In 2007, the DF changed its abortion law and began a program of provision of first trimester abortion in public sector facilities. Thus in 2006 all 31 states and the DF were in the “restricted access” category, in 2007-2013 the DF became “wide access” and the 31 states remained in the “restricted access” category. Our classification of states, the key
independent variable, differs from Koch’s; this issue is discussed in more detail in the discussion.

We extracted state-level variables used by Koch: total fertility rate [10], proportion of the population with access to clean water, female literacy [12], contraceptive prevalence, proportion of births attended by a skilled birth attendant [13], prevalence of low birth weight, proportion of women who report interpersonal violence [14] and all-abortion related hospitalizations between 2000-2008 [15]. Data were extracted from publicly available data and we used the years of data closest to our study years (see supplementary material S1 Table).

In addition, we included the number of hospital beds and operating rooms per 100,000 population [14] in an effort to account for supply of tertiary-level care services. Mexico City, for example, has a higher capacity to treat severely ill women and likely have more high-risk patients and thus deaths.

We merged these data sources creating a state (n=32) and year (n=8) level dataset (N=256) with values for live births, maternal deaths, MMR, and covariates for each of Mexico’s 31 states and the DF by year. We first described MMR over time using the different data sources for the denominator of live births. We next replicated the Koch et al analysis. We used descriptive analyses over time and using pooled data of MMR by place of residence of the woman and place of occurrence of the death to examine differences by legal status of abortion using Koch’s classification and then our own (we used CONAPO population estimates for both the Koch and our analysis to improve
comparability). We used chi-square tests to test for differences by legal status of abortion.

We next estimated changes in MMR at the state level over the time by place of residence and place of occurrence using linear regression models that included only legal status of abortion and year, again using Koch's classification of states and then our own. Finally, we replicated Koch's multivariable models to estimate the association of the legality of abortion and MMR controlling for state-level covariates (as above).

We performed several multivariable sensitivity analyses, including running the ARIMA models Koch presents using an array of parameter assumptions for p,d,q [16] but found no differences with our linear model with fixed effects for year (data not shown). All analysis was done using stata v 13 (StataCorp, College Station, TX). This study was approved by the ethics committee of the National Institute of Public Health.

Results

We were successfully able to replicate Koch's results. Our estimates of MMR are higher due to the smaller denominator resulting from using population estimates instead of registered births, which inflate actual births, but trends are similar (Figure 1). Figure 2 panel a shows our replication of Koch’s MMR estimates by place of residence [5 Fig. 1]; Figure 2 panel b shows the same estimates using our classification of states. There is no data point for legal abortion in 2006 since Mexico City liberalized its law in 2007. Mexico City is the only federal entity classified as having legal abortion. We did not find significant differences in MMR
between Mexico City (49.1) and the 31 states (44.6; Figure 3 panel b); the higher
MMR observed in the states Koch classified has having legal abortion disappear
in our re-classification (Figure 3 panel a).

**Fig 1. Maternal Mortality Ratio by year and place of residence. Births from
CONAPO and INEGI as denominator.** Koch et al study ends in 2011, at the red
line. CONAPO (Consejo Nacional de Población), INEGI (Instituto Nacional de
Estadística y Geografía).

**Fig 2. Maternal Mortality Ratio by place of residence, access to abortion
and year.** Koch et al study ends in 2011, at the red line. Denominator for MMR is
birth estimates from CONAPO in both panels

**Fig 3. Pooled 2006-2013 Maternal Mortality Ratio by place of residence and
access to abortion.** Difference test between states with restricted access to
abortion (more restrictive legislation) and states with wide access (less restrictive
legislation) *p<0.05 **p<0.001

We replicated Koch’s estimates by place of occurrence of death (Figure 4
panel a and Figure 5 panel a; see Koch et al. 2015, p.7 Figure 2). In our re-
classification, the bias of using place of occurrence is clear (Figure 5 panel b and
see Koch et al. 2015, p.13 Figure 7): the MMR in Mexico City, where national
reference hospitals are located, is significantly higher than the 31 states where
abortion is restricted (P<0.001).

**Fig 4. Maternal Mortality Ratio by place of occurrence, access to abortion
and year.** Koch et al study ends in 2011, at the red line. Denominator for MMR is
birth estimates from CONAPO in both panels

**Fig 5. Pooled 2006-2013 Maternal Mortality Ratio by place of occurrence
and access to abortion.** Difference test between states with restricted access to
abortion (more restrictive legislation) and states with wide access (less restrictive
legislation) *p<0.05 **p<0.001
We replicated Koch’s estimates of the differences in the pooled MMR between states where abortion is legal and illegal (Table 1). While Koch reported higher MMR based on residence of the woman in states he classifies as having less restrictive legislation (49.8 versus 40.8 in states where abortion legislation is more restrictive, P<0.001; Table 1, top panel), we find no such difference (Table 1, bottom panel), consistent with figures 2 and 3. The bias introduced by focusing on Mexico City as a place of occurrence of death and confounding that with legal abortion, as Koch does in his conclusions and press release, is notable here as it as in Figure 5 panel b (MMR=74.4 versus 43.9 in other states; P<0.001; Table 1, bottom panel).

Table 1. Pooled 2006-2013 Maternal Mortality Ratio by place of residence and occurrence by access to abortion

<table>
<thead>
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<th>Using Koch’s state classification</th>
<th>Using state classification by access to abortion</th>
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<tbody>
<tr>
<td></td>
<td>More restrictive legislation</td>
<td>Restricted access</td>
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<tr>
<td></td>
<td>Less restrictive legislation</td>
<td>Wide access</td>
</tr>
<tr>
<td></td>
<td>Rate ratio</td>
<td>Rate ratio</td>
</tr>
<tr>
<td></td>
<td>Residence</td>
<td>(Mexico City)</td>
</tr>
<tr>
<td></td>
<td>40.8</td>
<td>44.6</td>
</tr>
<tr>
<td></td>
<td>49.8</td>
<td>49.1</td>
</tr>
<tr>
<td></td>
<td>0.82</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.441</td>
</tr>
<tr>
<td></td>
<td>Occurrence</td>
<td>43.9</td>
</tr>
<tr>
<td></td>
<td>41.4</td>
<td>74.4</td>
</tr>
<tr>
<td></td>
<td>0.84</td>
<td>0.59</td>
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<td></td>
<td>0.000</td>
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In regression models that include MMR, access to abortion and year, we again were able to replicate Koch’s findings (Table 2, top panel). Our reclassification of states by access to abortion (Table 2, bottom panel) produced
similar results but stronger relationships (coefficients for both “wide access” and “restricted access” are larger and “restricted access” became significant) We also replicated Koch’s findings for place of occurrence and again our reclassification produced stronger relationships for the estimate of change in MMR for each unit change in year.

**Table 2. Average change per year in Maternal Mortality Ratio by place of residence and occurrence and access to abortion**

<table>
<thead>
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<th>Using Koch’s state classification</th>
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<th>SE</th>
<th>p value</th>
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<tr>
<td><strong>By place of residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More restrictive legislation</td>
<td>-0.92</td>
<td>0.45</td>
<td>0.051</td>
</tr>
<tr>
<td>Less restrictive legislation</td>
<td>-1.72</td>
<td>0.65</td>
<td><strong>0.010</strong></td>
</tr>
<tr>
<td>All States</td>
<td>-1.27</td>
<td>0.40</td>
<td><strong>0.002</strong></td>
</tr>
<tr>
<td><strong>By place of occurrence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More restrictive legislation</td>
<td>-0.99</td>
<td>0.46</td>
<td><strong>0.034</strong></td>
</tr>
<tr>
<td>Less restrictive legislation</td>
<td>-1.86</td>
<td>0.73</td>
<td><strong>0.013</strong></td>
</tr>
<tr>
<td>All States</td>
<td>-1.37</td>
<td>0.42</td>
<td><strong>0.001</strong></td>
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<table>
<thead>
<tr>
<th>Using state classification by access to abortion</th>
<th>Coeff.</th>
<th>SE</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By place of residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restricted access</td>
<td>-1.25</td>
<td>0.41</td>
<td><strong>0.003</strong></td>
</tr>
<tr>
<td>Wide access (Mexico City)</td>
<td>-2.81</td>
<td>0.95</td>
<td><strong>0.032</strong></td>
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<tr>
<td>All States</td>
<td>-1.27</td>
<td>0.40</td>
<td><strong>0.002</strong></td>
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<tr>
<td><strong>By place of occurrence</strong></td>
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<tr>
<td>Restricted access</td>
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<tr>
<td>Wide access (Mexico City)</td>
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<td>1.21</td>
<td><strong>0.046</strong></td>
</tr>
<tr>
<td>All States</td>
<td>-1.37</td>
<td>0.42</td>
<td><strong>0.001</strong></td>
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</table>

In multivariable models that include state-level indicators of poverty (compare with Koch et al. 2015 Tables 7 and 8 and Figure 8), we find, as did Koch, that indicators of poverty are associated with MMR (Table 3). We also see further evidence of sharp declines in MMR in Mexico City, the only entity
classified as having wide access to abortion (beta = -22.5; 95% CI = -39; -6; Table 3).

Table 3. Linear regression model for state-level MMR by place of residence, 2006-2013. Using state classification by access to abortion and place of residence of the woman

<table>
<thead>
<tr>
<th>Maternal Mortality Ratio</th>
<th>N=256 state-years</th>
<th>Coeff.</th>
<th>CI 95%</th>
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<tr>
<td>Abortion legislation</td>
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<td>-22.49</td>
<td>[-38.9; -5.99]</td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td>-0.88</td>
<td>[-1.64; -0.13]</td>
</tr>
<tr>
<td>Clean water</td>
<td></td>
<td>-0.45</td>
<td>[-0.83; -0.80]</td>
</tr>
<tr>
<td>Female literacy</td>
<td></td>
<td>-0.10</td>
<td>[-0.83; 0.62]</td>
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<tr>
<td>Low Birth weight</td>
<td></td>
<td>-0.88</td>
<td>[-2.12; 0.34]</td>
</tr>
<tr>
<td>Skilled attendance at birth</td>
<td></td>
<td>-0.60</td>
<td>[-1.06; -0.14]</td>
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<tr>
<td>TFR</td>
<td></td>
<td>1.36</td>
<td>[-1.23; 25.01]</td>
</tr>
<tr>
<td>Contraceptive use</td>
<td></td>
<td>-0.21</td>
<td>[-0.66; 0.24]</td>
</tr>
<tr>
<td>Physical violence</td>
<td></td>
<td>1.94</td>
<td>[0.89; 3.00]</td>
</tr>
<tr>
<td>All-abortion hospitalisation ratio</td>
<td></td>
<td>-1.05</td>
<td>[-1.96; -0.13]</td>
</tr>
<tr>
<td>Hospital beds</td>
<td></td>
<td>-0.02</td>
<td>[-0.15; 0.11]</td>
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<td>Operating Room</td>
<td></td>
<td>1.72</td>
<td>[-1.45; 4.89]</td>
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<tr>
<td>p&lt;0.05</td>
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</table>

Discussion/ Conclusions

We replicated Koch’s analysis and find overall declining maternal mortality across Mexican states during 2006-2013, with faster decline in Mexico City. We now discuss three key flaws in the Koch et al. study in order to explain the differences in our results: over-reliance on International Classification of Diseases, 10th edition (ICD-10) codes for measurement of abortion-related morality; classification of Mexican states by access to abortion and of deaths by
residence or place of occurrence; and misuse of the term natural experiment for the study design.

1) Abortion-related morbidity and mortality remain difficult to measure

Estimates of the incidence of maternal deaths have improved [2], but cause remains difficult to discern. Abortion incidence and as a cause of maternal death is under-coded, under-reported [17], and therefore under-counted in civil registration and vital statistics data as well as in hospital discharge data that rely on ICD-10 codes. Even in countries such as Mexico with robust vital statistics systems [18], common causes of direct maternal death, e.g. post-partum hemorrhage and sepsis, may not be explicitly attributed to delivery or abortion.

Relying on abortion-related ICD-10 codes to assess prevalence, safety, mortality or morbidity related to abortion is flawed [7]; ICD-10 codes may not represent the gold standard for causes of maternal death as Koch claims [19]. While the BIRMM project is a powerful data resource to study maternal mortality in Mexico, the limitations of the data must be recognized. One approach is to focus on the larger categories of direct and indirect maternal death. In Mexico as at the global level poor women experience higher rates of maternal mortality [2, 20].

2) Misclassification of access to abortion at the state level and classification of deaths by residence or place of occurrence

Mexico City changed its abortion law in 2007, and abortion is available to all women (women under 18 must have an adult present) in the public, non-governmental non-profit, and private for-profit sectors. This is a watershed policy
and service delivery advance in Latin America; however, abortion remains highly
criminalized outside of Mexico City. Koch et al. classify states in Mexico as “more
or less permissive” (i.e. abortion is less or more criminalized) based on
exemption from prosecution of abortion in cases of congenital malformation
(Koch Table 1). The congenital malformation exemption appears to have been
selected because it was the only classification method that produced significant
results. The most common legal indications across states in Mexico are rape,
“imprudential conduct,” and “risk to the life of the mother” [21]. However,
accessing abortion service via these exemptions requires burdensome
documentation, which varies by state [22]. The burden of proof (e.g. of rape) to
access services means that abortion is essentially not available to women
outside of Mexico City, especially for poor women, who have less access to
health services in general and to abortion in particular [23].

Koch et al. present data [5 Fig. 7] that claim to show that Mexico City is
associated with increased MMR. For this analysis, Koch uses only on data from
2008-2011, so we do not have the opportunity to see if any changes occurred
following the decriminalization of abortion in 2007, which his dataset, going back
to 2002, would presumably permit. Furthermore, Mexico City is the location of
national-level reference hospitals, where sick or otherwise high-risk women are
referred, and Koch presents data on place of occurrence of the death.

In sum, the classification of the main exposure variable, whether legality of
or access to abortion, is deeply flawed. Koch presents a complex justification for
his selection of congenital malformation as the deciding factor in being classified
as “permissive” or not, while ignoring the obvious classification: prior to mid-2007, all 32 entities are restrictive and from mid-2007 on, only Mexico City has legal abortion; the other 31 states remain restrictive.

3) Study design

The title of the manuscript includes the words “a natural experiment.” The exposure in a natural experiment must be independent of other factors that could affect the outcome[24]. It is part of a researcher’s job to convince readers of the validity of the claim of independence of the “naturally occurring” phenomenon and other observable or non-observable factors. Koch provides no such justification. Abortion laws are not randomly distributed in Mexico (or globally); there are statistical techniques to address the endogeneity of abortion legislation, but Koch et al. neither employ such techniques nor acknowledge this limitation.

Second, no change is under study here. Koch et al. present descriptive data by year, ARIMA models to test for time trends [16], and pooled multivariable models. These approaches test associations but are not natural experiment designs. Finally, if no intervention or before/after period is under study, ARIMA models are likely not the most appropriate approach[25]. None of these results involve examining the effect of a change in abortion law or other exposure. This is not a natural experiment.

However, it is Koch’s interpretation of his own findings that is most flawed. Given Koch’s findings about changes over time in MMR by legal status of abortion (replicated by us in Table 3), a plausible interpretation is that MMR is
falling faster in states with legal abortion. This goes against his main conclusion, that states where abortion is illegal have lower maternal mortality, a difference that disappears once states are re-classified according to access to abortion services. Furthermore, it is the press release associated with this publication that is most misleading [6] and drawn from one result (see Table 2) while ignoring the most robust finding: maternal mortality is linked with poverty.

The relationship changing legal status or access to abortion remains a highly relevant question in Mexico and worldwide [26]. Correlates of maternal death are clear; we have strong evidence [27 Table 2] that demonstrates the strong relationship between poverty, low levels of female education, high fertility, and maternal death. Koch et al’s analysis supports previous work without adding anything new. Preventing undesired births via contraception and safe abortion are among key strategies to reduce maternal mortality, along with improving socio-economic conditions for women, emergency obstetric care, and access to high-quality antenatal, delivery, and post-partum care [28, 29]. We further support a recent call to improve abortion data and research by adhering to three criteria: transparency, acknowledging the limitations of data, and contextualizing results [7]. Koch and colleagues fail at all three and do not help us understand the relationship between legality or access to safe abortion and women’s health.
Acknowledgements

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References


Supporting information

S1 Table. Co-variables included in linear regression model for state-level MMR by place of residence, 2006-2013
Figure 1
Click here to download Figure Fig1.eps
Figure 2

a. Using Koch’s state classification

b. Using state classification by access to abortion
a. Using Koch’s state classification

- More restrictive legislation: 40.8
- Less restrictive legislation: 49.8**
- All States: 44.7

b. Using state classification by access to abortion

- Restricted access: 44.6
- Wide access (Mexico City DF): 49.1
- All States: 44.7

Figure 3
Figure 4

**a. Using Koch’s state classification**

- More restrictive legislation
- Less restrictive legislation
- All States

**b. Using state classification by access to abortion**

- Restricted access
- Wide access (Mexico City DF)
- All States
a. Using Koch's state classification

Average MMR per 100,000 live births

- More restrictive legislation: 41.4
- Less restrictive legislation: 49.0**
- All States: 44.7

b. Using state classification by access to abortion

Average MMR per 100,000 live births

- Restricted access: 43.9
- Wide access (Mexico City DF): 74.4**
- All States: 44.7

Figure 5
Supporting Information

Click here to access/download
Supporting Information
S1 Table.docx