

The Pregnancy-Related Mortality Impact of a Total Abortion Ban in the United States: A Research Note on Increased Deaths Due to Remaining Pregnant

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ABSTRACT In this research note, I estimate one component of the mortality impact of denying all wanted induced abortions in the United States. This estimate quantifies the magnitude of an increase in pregnancy-related deaths that would occur solely because of the greater mortality risk of continuing a pregnancy rather than having a legal induced abortion. Using published statistics on pregnancy-related mortality ratios, births, and abortions, I estimate U.S. pregnancy-related deaths by race and ethnicity before and in the first and subsequent years of a hypothetical total abortion ban. The number of estimated deaths following a total abortion ban is determined by assuming three conditions: that all wanted induced abortions are denied, that each abortion denied leads to 0.8 births, and that there is a corresponding increase in exposure to pregnancy-related mortality. I find that in the first year of such a ban, estimated pregnancy-related deaths would increase from 675 to 724 (49 additional deaths, representing a 7% increase), and in subsequent years to 815 (140 additional deaths, for a 21% increase). Non-Hispanic Black people would experience the greatest increase in deaths (a 33% increase in subsequent years). Estimated pregnancy-related deaths would increase for all races and ethnicities examined. Overall, denying all wanted induced abortions in the United States would increase pregnancy-related mortality substantially, even if the rate of unsafe abortion did not increase.

KEYWORDS Abortion • Policy • Maternal mortality • Pregnancy-related mortality • Family planning

Introduction

Recently passed laws in 13 U.S. states attempt to ban abortion at six weeks' gestation or earlier (Guttmacher Institute 2021). The United States Supreme Court declined to block one such law in Texas, allowing that state to ban 85%–90% of abortions, which has led clinics to turn away people seeking abortion care and stopped some clinics from providing abortions altogether (Cohen et al. 2021). These laws and the rightward shift in the U.S. Supreme Court heighten the need to estimate the mortality benefits of legal induced abortion in the United States (Nash 2019). Much attention has focused on anticipated increases in potentially unsafe abortion outside the clinical context and resulting pregnancy-related deaths (Cummings 2018; Durkin 2019), but the mortality burden of a total or nearly total abortion ban would also include additional

pregnancy-related mortality owing to the fact that childbirth in the United States carries substantially greater mortality risk than does legal induced abortion (Raymond and Grimes 2012). Thus, policies that end or radically curtail the legal provision of abortion care could increase pregnancy-related deaths simply by increasing exposure to the risks of carrying a pregnancy to term because wanted abortions are denied. In this research note, I describe how denying all wanted induced abortions in the United States would increase the exposure to risk of pregnancy-related death by causing more pregnancies to be continued, and estimate how this increase in exposure would impact the annual number of pregnancy-related deaths by racial and ethnic group.

Apart from the current Texas ban, no U.S. state has enforced a total or nearly total abortion ban for more than a few weeks (White et al. 2021), so the mortality impact of totally banning abortion cannot be measured directly. Inference from historical evidence is of limited salience because pregnancy-related mortality before *Roe v. Wade* legalized abortion nationwide was largely due to unsafe abortion (Cates and Rochat 1976; Cates et al. 1978), the prevalence of which would likely be different under a contemporary total ban. This prevalence is particularly difficult to project because of recent advances in safer self-managed medication abortion (Aiken et al. 2017). Before the current wave of bans, the national prevalence of self-managed abortion was relatively low (Ralph et al. 2020), but organizations that support the practice operate in the United States (Aiken et al. 2020) and only five states explicitly criminalize it, so its use could conceivably increase (Lawyering for Reproductive Justice 2019). Therefore, self-managed medication abortion is poised to provide a safe alternative to in-clinic care, mitigating the likelihood that people will resort to unsafe methods that were common prior to *Roe*. In this context, the extent of additional mortality due to unsafe abortion that would occur under a possible total ban is unknown and unlikely to be similar to that in the pre-*Roe* era.

However, published statistics on the numbers of induced abortions in the United States make it possible to estimate the additional number of pregnancies that would be carried to term if all abortions were denied. By applying published pregnancy-related mortality ratios (PRMRs) to these additional pregnancies carried to term and subtracting the lower mortality risk of the legal induced abortions denied, it is possible to estimate part of the mortality consequence of totally banning induced abortion in the country. Any increases in pregnancy-related mortality attributed to increased unsafe abortion would be in addition to this estimate. Hence, this estimate represents a lower bound on the mortality impact of banning all abortions in the United States.

Methods

This analysis relies on the most recent published statistics for U.S. pregnancy-related mortality for pregnancies ending in birth and induced abortion, population-level births, and estimated abortions. I estimate annual pregnancy-related deaths by race and ethnicity under three conditions: at baseline (prior to a hypothetical national ban on abortions), for the first year during which all induced abortions are denied, and during subsequent years of denials.

In the first year that all abortions are denied, some additional pregnancy-related deaths will not occur until the following year. Induced abortion (and thus abortion

denial) commonly occurs early in pregnancy, but the majority of pregnancy-related mortality risk occurs late in pregnancy. Therefore, I estimate additional pregnancy-related deaths separately for the first year and for subsequent years. After the first year, assuming no changes in population, additional deaths balance across years. The additional pregnancy-related deaths in year x caused by pregnancies continued because of abortions denied in year $x-1$ would equal the additional pregnancy-related deaths in year $x+1$ caused by pregnancies continued because of abortions denied in year x .

I generate estimates separately for racial and ethnic groups whose counts of abortions may be estimated from published statistics: non-Hispanic White, non-Hispanic Black, Hispanic, and other non-Hispanic people. PRMRs are available for births to non-Hispanic White, non-Hispanic Black, and Hispanic people but not for the category of other non-Hispanic people. Therefore, I apply the overall PRMR to this group.

Estimating Baseline Pregnancy-Related Deaths

I use births and abortions from 2017 and PRMRs from 2014 to 2017 to represent conditions at baseline, because 2017 is the most recent year for which a national estimate of the number of abortions is available and 2014–2017 is the latest period for which PRMRs are available by race and ethnicity.

I estimate pregnancy-related deaths in 2017 from 2017 births by race and ethnicity and use PRMRs by race and ethnicity for the period 2014–2017 (CDC Division of Reproductive Health 2020; Martin et al. 2018). This calculation provides an estimated baseline level of pregnancy-related mortality before a total abortion ban.

Estimating Pregnancy-Related Deaths After a Total Abortion Ban

The most complete statistics on abortion service delivery in the United States come from the Guttmacher Institute. Estimated total abortions are available for 2017, but the most recent year with estimated abortions by race and ethnicity is 2014 (Jerman et al. 2016). The number of total estimated abortions in 2017 is 7% lower than the total in 2014 (Jones et al. 2019). Therefore, I reduce the estimated number of 2014 abortions received by people in each racial and ethnic group by 7% to estimate 2017 abortions.¹ This represents the number of abortions received at baseline and the numbers that would be denied if induced abortion were totally banned in the United States.

To estimate additional births if all abortions were denied, I assume that each abortion denied contributes 0.8 births (a number less than one because of miscarriage and return of fecundability) (Potter 1972). For the first year of a total ban, I also estimate the fraction of additional pregnancy-related deaths that would occur in the same calendar year as abortion denial. I begin by assuming a uniform distribution of abortions across calendar months and that all terminations occur at eight weeks' gestation, the

¹ Distributing the 7% overall decline from 2014 to 2017 proportionally across racial and ethnic groups according to the change in abortions by group between 2008 and 2014 yielded very similar results.

modal gestational age of abortion in the United States (Jones and Jerman 2017). On the basis of these assumptions, I calculate the fraction of pregnancy-related deaths associated with abortions denied in each calendar month that would occur in the same calendar year, relying on published fractions of pregnancy-related deaths by timing relative to delivery. I estimate that 42% of pregnancies ending in abortion in the first year would reach 40 weeks' gestation during the same year in subsequent years (all abortions denied in May or earlier: $5/12=0.42$). Following published statistics regarding the timing of pregnancy-related deaths with respect to delivery (Petersen et al. 2019), I estimate that 83% of deaths associated with these 42% of pregnancies would occur in the same calendar year.² Using a similar approach, I estimate that 5% of the deaths associated with the 58% of pregnancies continued after abortion denials in June or later would occur in the same year.³ Thus, to estimate the impact of denying all abortions in the first year, I estimate deaths for each racial and ethnic group as if counts of births increased by 30% of estimated abortions denied in the first year— $0.8 \times (0.42 \times 0.83 + 0.58 \times 0.05) = 0.30$ —and as if counts of births increased by 80% of estimated abortions in subsequent years.

Since PRMRs include any mortality due to induced abortion in the numerator but not the denominator, I apply published PRMRs for pregnancies ending in induced abortion (Raymond and Grimes 2012) to estimated abortions by race and ethnicity in 2017 and subtract the resulting estimates from the estimated deaths for each group in both the first year of a ban and subsequent years of a ban.

The difference in pregnancy-related deaths estimated for the 2017 baseline and for the first and subsequent years of a ban is an estimate of the additional pregnancy-related mortality resulting from denying all wanted induced abortions in the United States, assuming no additional mortality associated with unsafe terminations and that all pregnancies are continued because of abortion denial.

To compare estimated levels of pregnancy-related death before and after an abortion ban across groups while capturing the contribution of level of fertility and population size, I estimate the probability that a 15-year-old will die from a pregnancy-related cause if the prevailing fertility and pregnancy-related mortality rates continue for her reproductive life, assuming negligible mortality before age 50 (Wilmoth 2009). To estimate this probability at the 2017 baseline, I calculate the probability for each

² This estimate is the result of distributing deaths over time based on when abortions denied would reach term. It includes all deaths during pregnancy (31.3% of pregnancy-related deaths), all deaths on the day of delivery (16.9% of pregnancy-related deaths), all deaths 1–6 days postpartum (18.6% of pregnancy-related deaths), most deaths 7–24 days postpartum (21.4% of pregnancy-related deaths; note that only for abortions denied in December would some of these deaths occur in the next year), and a very small fraction of deaths 43–365 days postpartum (11.7% of deaths; note that even for abortions denied early in the year, an overwhelming majority of these deaths would occur in the next year, since these pregnancies would not reach term until late in the first year).

³ For these pregnancies—which would not reach term during the first year—I assume for simplicity that pregnancy-related deaths during pregnancy occur with a uniform distribution across the months of pregnancy, and for each month I calculate the fraction of the nine months of pregnancy that would occur in the first year of a ban. I apply these percentages to the 31.3% of pregnancy-related deaths occurring during pregnancy over the first year to generate the fraction of additional pregnancy-related deaths associated with these pregnancies that would occur in the first year of a ban.

racial and ethnic group r such that the probability is 1 in $\frac{100,000}{(TFR_{2017,r})(PRMR_r)}$, where $TFR_{2017,r}$ is the published total fertility rate for group r in 2017.

To estimate the probability after all wanted abortions are denied (for subsequent years), I begin by estimating $TFR_{post,r}$ as the product of the total fertility rate for racial and ethnic group r in 2017 and that group's ratio of estimated births in subsequent years after a ban to births in 2017 as

$$TFR_{post,r} = TFR_{2017,r} \left(\frac{Births_{2017,r} + 0.8(Abortions\ denied_r)}{Births_{2017,r}} \right),$$

where $Births_{2017,r}$ is the published number of births for racial and ethnic group r in 2017 and $Abortions\ denied_r$ is the estimated number of abortions in group r in 2017.

Then the risk of death is 1 in $\frac{100,000}{(TFR_{post,r})(PRMR_r)}$.

The institutional review board at the University of Colorado Boulder determined that this research did not involve human subjects.

Results

In the first year in which all wanted induced abortions in the United States are denied, the estimated annual number of pregnancy-related deaths would increase from 675 to 724 (49 additional deaths, representing a 7% increase), and in subsequent years to 815 (140 additional deaths, for a 21% increase) (Table 1). Non-Hispanic Black people would experience the greatest increase in pregnancy-related deaths: a 12% increase in the first year, and a 33% increase in subsequent years. Hispanic people would experience the next greatest increase in mortality: 6% and 18% increases in the first and subsequent years, respectively. Overall, estimated pregnancy-related deaths would increase for the total population by 7% in the first year of a ban and by 21% in subsequent years. Because the estimated deaths before and after a ban are based on the same population and fertility rates, percentage increases also reflect increases in the annual risk of dying from pregnancy-related causes.

In terms of the lifetime risk of dying from pregnancy-related causes, denying all wanted induced abortions would be associated with an increase in risk from 1 in 3,300 to 1 in 2,800 among all women. Among non-Hispanic Black women, the risk would rise from 1 in 1,300 to 1 in 1,000.

Conclusion

Annual pregnancy-related deaths in the United States are estimated to increase if all wanted legal induced abortions are denied, even if people denied legal access to abortion do not resort to unsafe procedures. In terms of the number of additional deaths and the increase in lifetime risk, the additional mortality burden is estimated to be

Table 1 Estimated annual pregnancy-related deaths in the United States before and after a hypothetical ban on induced abortion, assuming no increase in the rate of unsafe abortions

Racial and Ethnic Group	A. PRMR, 2014–2017 (per 100,000 births) ^a	B. No. of Births, 2017 ^b	C. No. of Estimated Deaths Before Ban ^c	D. No. of Estimated Abortions Before Ban (denied after ban) ^d	E. No. of Additional Deaths in First Year of Ban ^e (% increase)	F. No. of Additional Deaths in Later Years of Ban ^f (% increase)	G. Annual Rate Expressed as Lifetime Risk Before Total Ban ^g	H. Annual Rate Expressed as Lifetime Risk in Later Years of Total Ban ^h
Non-Hispanic White	13.4	1,992,461	267	334,060	11 (4%)	33 (13%)	1 in 4,500	1 in 3,900
Non-Hispanic Black	41.7	560,715	234	238,000	28 (12%)	78 (33%)	1 in 1,300	1 in 1,000
Hispanic	11.6	898,764	104	213,940	6 (6%)	18 (18%)	1 in 4,300	1 in 3,600
Non-Hispanic Other	17.3	403,560	70	76,310	3 (5%)	10 (14%)	na ⁱ	na
All	17.3	3,855,500	675	862,300	49 (7%)	140 (21%)	1 in 3,300	1 in 2,800

^a National pregnancy-related mortality ratios (PRMRs) by racial and ethnic group, 2014–2017 (CDC Division of Reproductive Health 2020). Note that the PRMR for the non-Hispanic other category is the overall PRMR because the compositions of the births and abortions in this category do not align with the subgroups for which PRMRs are available.

^b Published total births by racial and ethnic group. Non-Hispanic other includes all births to individuals who were not identified as non-Hispanic White, non-Hispanic Black, or Hispanic of any race. This partitioning of births by race and ethnicity was selected because it was the most precise one for which annual abortions may be estimated based on published estimated totals.

^c Estimated pregnancy-related deaths before a ban were calculated as $\frac{(\text{Births}) \times (\text{PRMR})}{100,000}$ using births from column B and PRMR from column A (rounded to the nearest whole number). Note that the All in this column is the sum of deaths from all racial and ethnic groups.

^d Estimated abortions in 2017 were calculated as 93% of estimated abortions by racial and ethnic group from 2014 (the most recent year for which group-specific estimates of counts or rates of abortions are available) on the basis of the ratio of total estimated abortions in 2014 to 2017 (the most recent year for which total estimated abortions are available) (Jones and Jerman 2017; Jones et al. 2019). This calculation assumes that declines did not vary across groups. Figures are rounded to the nearest 10.

^e Estimated as follows for each racial and ethnic group (r):
$$\frac{0.3(\text{Abortions denied}) \times (\text{PRMR}_i)}{100,000} - \frac{(\text{Abortions denied}) \times (0.7)}{100,000}$$

where abortions denied are the estimated abortions before a ban from column D and 0.7 represents the estimated mortality related to pregnancies ending in induced abortion in the United States (Raymond and Grimes 2012).

^f Calculated as above, but using 0.8 instead of 0.3, because each abortion denied is estimated to yield 0.8 births in subsequent years.

Table 1 (continued)

^a Estimated probability that a 15-year-old would die from a pregnancy-related cause if the prevailing fertility and PRMRs continue for her reproductive life, assuming negligible mortality before age 50. Estimated for each racial and ethnic group (r) by: $\frac{100,000}{(TFR_{2017,r})(PRMR_r)}$. Figures are rounded to the nearest 1 in 100.

^b Estimated probability that a 15-year-old would die from a pregnancy-related cause if current PRMRs continue for her reproductive life and prevailing fertility rates in her racial and ethnic group increased because of all induced abortions being denied, such that the total fertility rate for her racial and ethnic group became

$$TFR_{post,r} = TFR_{2017,r} \left(\frac{Births_{2017,r} + 0.8(Abortions\ denied_r)}{Births_{2017,r}} \right)$$

where $TFR_{2017,r}$ is the published total fertility rate for group r in 2017, $Births_{2017,r}$ is the published number of births for group r in 2017, and $Abortions\ denied_r$ is the same as the estimated number of abortions in group r in 2017. Then the risk of death is 1 in $\frac{100,000}{(TFR_{post,r})(PRMR_r)}$ (rounded to the nearest 1 in 100).

^c na = not applicable. The population of non-Hispanic other is heterogeneous and does not align with published TFRs, and thus the probability is not estimated for this group.

greatest among non-Hispanic Black women. Structural racism is a fundamental cause of maternal health inequity (Bailey et al. 2021; Crear-Perry et al. 2021; Krieger et al. 2020), and Black women already experience excessive levels of pregnancy-related mortality (CDC Division of Reproductive Health 2020). Increasing Black women's exposure to the risk of pregnancy-related mortality because their wanted abortions are denied would exacerbate an existing public health crisis.

This analysis is limited by reliance on abortion rates from 2014 and 2017. If U.S. abortion numbers continue to decline (Jones and Jerman 2017), impacts could be smaller. The mortality impact of denying all wanted induced abortions could also be smaller if many who are denied abortion procedures turn to effective protocols for self-managed abortion and thus successfully terminate their own pregnancies. Impacts could be larger if reliance on unsafe abortion methods increases or if PRMRs increase. However, applying prevailing PRMRs to pregnancies currently ending in abortion is conservative insofar as the population terminating pregnancy with abortion exhibits a higher prevalence of factors associated with elevated risk of pregnancy-related mortality than does the population carrying to term (Jones and Jerman 2017; Raymond and Grimes 2012). Moreover, allowing each abortion denied to contribute only a fraction of a birth to the hypothetical number of births if all abortions are denied is also conservative (Potter 1972). The results presented here use demographic estimation methods to estimate the consequence of banning induced abortion for pregnancy-related mortality and do not reflect actual counts of pregnancy-related deaths.

These estimates describe how denying wanted abortions will increase exposure to the mortality risks of pregnancy, and I quantify the effect of denying all wanted abortions in the United States as of 2017. While a total ban on abortion at the federal level is possible, the logic underlying these results also sheds light on the possible consequences of state-level total or nearly total bans on induced abortion. In short, denying all (or nearly all) wanted abortions will expose more people to the mortality risks of continuing pregnancy and thereby increase pregnancy-related deaths.

By estimating this effect separately for the first year and for subsequent years of all abortions being denied, the results highlight for future researchers that the full impact on pregnancy-related mortality of any future bans of this kind will likely not be observed until the second year.

Proposed legislation sometimes—though not always—includes exceptions under which abortions are not denied to victims of rape or incest or if abortion is required to save the pregnant person's life. When such exceptions are afforded to Medicaid recipients, they are very rarely utilized (U.S. Government Accountability Office 2019). Similarly, bans on abortion as early as at six weeks' gestation may lead to widespread abortion denials, because this is before many people even know they are pregnant (Kost and Lindberg 2015), only some abortion providers perform terminations at such early gestations (Jones and Kooistra 2011), and most abortion-seekers experience delays owing to restrictive laws or logistics (Jones and Jerman 2016).

In this research note, I estimate how denying all wanted abortions in the United States would increase pregnancy-related deaths. Yet any state-level total or nearly total ban on abortion could also cause more pregnancy-related deaths by the process illustrated here if pregnant people do not successfully access abortion via self-management or travel to another state. Similarly, other abortion bans (e.g., banning

abortions sought for specific reasons or at specific gestations) will also cause more deaths if they lead to more pregnancies being continued. ■

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