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Health consequences of state-level restrictive abortion legislation

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Background and rationale

Abortion is a safe and common procedure that the majority of Americans support in most circumstances.[1–5] An estimated 14.6 abortions are performed per 1,000 women of reproductive age each year.[6] Safe and available abortion procedures are a key component of women's primary care, and abortion access allows women to pursue educational and economic opportunities.[7–9] Trends in abortions in the United States are patterned along a social gradient, with economically and educationally disadvantaged women and racial minorities receiving disproportionately high numbers of abortions; abortions help reduce the consequences of structural disparities in health education, birth control use, and unexpected pregnancies among historically underserved populations by allowing women to control their reproductive choices.[8,10]

Restrictive abortion legislation refers to state laws that place limitations on legal abortion. Though abortion is legal at the federal level in the United States, it is policies at the state level that determine the particulars of who can obtain abortion, how, when, and under what circumstances. State governments have attempted to restrict abortion access since its federal legalization: since 1973,[11] over 1,100 state abortion restrictions have been passed, a third of which passed in the last decade.[12] While legislators frequently cite women's health and safety as the motivation behind these laws, they often acknowledge – privately or publicly – the ultimate goal is to reduce the number of legal abortions.[13–16] Key examples of restrictive abortion legislation include Medicaid restriction laws that prevent state Medicaid programs from covering abortion costs,[1] waiting periods or mandatory delays laws which require a

[1] Medicaid funding is jointly covered by federal funds and state funds. The 1976 Hyde Amendment made it illegal nationally to use federal funds, but not state funds, to cover abortions.

certain amount of time to pass between making an abortion appointment and receiving a procedure, targeted regulation of abortion provider ("TRAP") laws that create licensing barriers or onerous building regulations for abortion providers, informed consent laws that require minors seeking abortion to obtain consent from one or both parents before the procedure, mandatory counseling laws which require women to receive state-created health information from a medical provider before the procedure, mandatory ultrasound laws which require women seeking abortion to receive ultrasounds regardless of medical necessity, or two-visit laws that require women to personally appear in the clinic at least once before the day of the procedure.

There is mixed evidence that restrictive abortion legislation impacts abortion rates. For example, Medicaid funding restrictions have been shown to lower abortion rates by an estimated 3 to 5 percent.[17–22] Parental notification laws have also been associated with reduced abortion rates.[17,21,23] However, mandatory counseling laws, two-visit laws, TRAP licensing and TRAP facility laws do not impact abortion rates.[17,21]

Examining the effects of individual restrictions may be less meaningful for health outcomes than considering the number and type of restrictive laws. Restrictive abortion laws can be divided into demand-side laws and supply-side laws.[22,24–26] Broadly, laws that make abortion less desirable or more difficult for patients to obtain are categorized as demand-side laws—these include parental consent laws, Medicaid restrictions, or mandatory delay laws—whereas those that limit the capability of providers to perform abortions or mandate certain clinical practices are categorized as supply-side. Supply-side laws are thought to be more detrimental to abortion access because they directly impact provider and clinic availability, though few studies have examined this hypothesis on the national scale.[24,27,28]

The population health impact of restrictive legislation in the United States is largely unknown. Generally, restrictive abortion legislation has not been shown to reduce the rate of abortion complications (in the United States, the safety profile of abortions is similar to that of dental procedures, 0.7 deaths per 100,000 at risk),[3–5] so these laws are not expected to make abortion procedures any safer, thus are unlikely to confer any immediate health benefit to women.[29–37]

Globally, fewer anti-abortion restrictions are associated with improved maternal mortality rates, both because abortion is overall safer for women than delivering to term, and due to the dangers of illegal and unsafe abortion in countries where abortion is not widely available.[9,38,39] Abortion laws may impact child and infant health as well, because unwanted pregnancy is a predictor of child maltreatment.[40–42] Certain laws may increase child abuse and increase child mortality; these studies, however, focused only on a small number of demand-side laws.[43–46].

The health consequences of restrictive abortion legislation are likely to be particularly detrimental to women and children of color. Restrictive abortion legislation leads to clinic closures, increased travel distances, delays, and increased expenses.[27,28,47–56] Black women not only utilize abortion services at disproportionately high rates, and but they are also more likely to be impacted by these barriers to care because of the entrenched, historic overlap between socioeconomic resources and race in the United States which have resulted in fewer flexible and health resources for women of color.[57–60] These laws are likely contributors to Black-White health disparities among US women and children need to be evaluated further.

In sum, restrictive abortion legislation is common in the United States and the effect of these laws on women's and children's health is poorly understood. It is similarly unknown if certain types of abortion-limiting laws – i.e., demand-side or supply-side – are more or less detrimental to health. The first aim of the current study was to examine the associations between of abortion-limiting legislation and women and children's mortality. We considered the total number of abortion restriction laws, as well as the only supply-side and only demand-side laws to understand if one or the other is a larger contributor to health effects. We anticipated that states with more restrictive abortion laws would have worse health outcomes than those with fewer; we expected that supply-side laws would have more pronounced effects than demand-side laws.

The second aim was to understand if these laws contribute to health disparities, by examining whether the effects of abortion regulation were more detrimental among Black vs. White women and children. We expected that negative health effects would be more pronounced

among Black women compared to White women for all outcomes. In Aim 2, we also examined whether supply-side or demand-side laws contribute differentially to mortality outcomes.

Methods

Measures

The exposure of interest was the number of restrictive abortion laws each of all 50 states and Washington, D.C. Restrictive abortion legislation can encompass up to 34 different abortion laws that have been enacted between 1973 and 2013;[61] due to variability from state-to-state (and similar laws being mutually exclusive with each other) the laws were ultimately grouped into 16 unique categories, consistent with previous research (e.g., [21,22,24–26,45,46,62–65]). The exposure was measured continuously for each state by year.

Abortion laws were further divided into supply-side (N=8) and demand-side laws (N=8). Table 1 lists the laws under examination, their first year of passage, their most recent year of passage (through 2013), and the number of states that have passed each law. Demand-side laws include requiring mandatory counseling before obtaining abortion procedures; restrictions on use of private insurance for abortion services; restrictions of medication abortion, including requiring multiple patient visits and non-evidence based medication guidelines; special laws targeting minors such as requiring parental consent; restrictions against using public funds to pay for abortions; mandatory waiting periods for women seeking abortions; restrictions against sex-selective abortion; and mandatory viability tests or ultrasounds regardless of medical necessity. Supply-side laws include requiring admitting privileges at nearby hospitals for abortion providers; special provisions for fetal tissue disposal; procedural laws limiting abortion due to fetal pain; procedural laws limiting the gestational limit for abortions, ranging from very early to very late; laws prohibiting physicians from performing intact dilation and evacuation procedures; laws specifying that only physicians can perform abortion procedures, rather than nurses/midwives or other trained providers; laws limiting the procedures that publicly funded providers can offer; and TRAP laws requiring special licensing and building requirements for abortion facilities.

The outcome variables considered were: all-cause mortality per 100,000 adult women; infant mortality defined infant death up until the age of 1 per 100,000 live births; maternal mortality defined as deaths during pregnancy, childbearing or the puerperium (ICD-10 code O00-O99 [66]) per 100,000 adult women; and child mortality defined as any death between the ages of 1 - 15 per 100,000 children. All adult mortality rates were age-standardized to the U.S. age distribution for women in 2000. Stratified analyses examine Black mortality outcomes and White mortality outcomes; these were respectively standardized to the U.S. age distribution for women in 2000 for Black and White subgroups. All outcomes were at the state level.

Because state laws are not randomly assigned, states have certain characteristics that lead to both the passage of certain laws and health outcomes; these may confound the relationship between restrictive abortion legislation and the health outcomes of interest. For this analysis confounders were selected based on their known associations with both the exposures and outcomes of interest. These included politics, beliefs, and attitudes, and state-level demographics.

Politics, beliefs, and attitudes: Common causes of both abortion legislation and mortality outcomes are state-level beliefs and attitudes and state-level legislative composition.[61,67] Abortion policies and other so-called "morality" policies are sensitive to area religious attitudes and lobbying by religious interest groups.[61,68] While the Catholic church's condemnation of abortion is important for international abortion rights, in the United States abortion policies are particularly impacted by strong mobilization of Evangelical Christian groups.[69–71] In addition, abortion restrictions are politically polarized in the United States, with political conservatives typically in favor of and political liberals typically opposed to more restrictions on abortion.[69] State-level beliefs and attitudes are potential confounders not only because of their effects on abortion policy, but because they impact health outcomes through other morality policies and health care laws; for example, more conservative states not only implement more anti-abortion legislation, but may also provide less state-matched Medicaid funding for public facilities, which impact women and children's health.

State-level beliefs and attitudes were therefore operationalized as 1. the proportion of evangelical Christians in each state, and 2. as state-level political ideology, captured continuously by a citizen ideology measure ("CITI score") developed by Berry et al[72] (this ranges from 0 to 100, with higher values indicating more liberal). The gender composition of state legislature is an important predictor of abortion policy[61] and was also included as a confounder, measured as the percentage of women in each state's legislature each year.

Demographic characteristics: Similar to previous research examining restrictive abortion legislation, we included demographic confounders that may be common causes of both changes in law and changes in mortality rates. These included the state poverty rate, birth rate (measured as number of live births/women ages 15-44), and the GINI coefficient for each state, which is a measure of economic inequality based on the income distribution within each state, ranging from 0 (complete equality) to 1 (complete inequality).[73]

Because of decreases in all mortality outcomes over time, year was included in all models (crude effects and adjusted).

Data sources

State exposure history by year between 1973-2013 was made available directly to the authors by Dr. Rebecca Kreitzer, who compiled the laws for each state and Washington, D.C.[61] Our outcomes of interest, state-level all-cause and cause-specific mortality by race and sex, were obtained from NCHS.[74–76] Covariate data were obtained through the Institute for Public Policy and Social Research at Michigan State University.[77] Not all covariates were always routinely collected or made available for the earliest years of exposure (1973-1979), so all models are restricted to 1980-2013.

Analytic approach

We modeled the effects of state-level abortion legislation on mortality risk using Poisson regression with robust standard error, first for crude effect (plus year), subsequently with adjustment for state-level politics, beliefs, and attitudes, and then finally with control for demographics. Outcomes and exposures were both modeled continuously. All analyses were

then stratified by race to examine differential effects among Black women compared to non-Hispanic White women.

All analyses were performed in SAS 9.4.

Results

Table 2 shows the distribution of the exposures and covariates over the study period. On average, any one state had approximately 5 restrictive abortion laws between 1973 and 2013, ranging from 0 to 15. No one state ever had all 16 restrictive abortion laws enacted. The average state had approximately equal supply-side and demand-side laws.

Table 3 shows the associations between restrictive abortion legislation and the outcomes of interest for Aim 1, with subsequent adjustment for relevant confounders. Model 1 examines the effects of a 1-unit increase in any abortion law, adjusted for year; model 2 further adjusts for politics, attitudes, and beliefs; model 3 further adjusts for state demographics. Models 4 and 5 examine the effects of a 1-unit increase in only demand-side laws or only supply-side laws, respectively, with adjustment for all confounders.

All effects are modest, and the majority of the models show null effects. Rates of all-cause mortality, reproductive cancer mortality, maternal mortality, and child mortality were not impacted to increases in restrictive abortion legislation, either in aggregate or disaggregated either supply-side or demand-side laws alone. However, infant mortality had small but significant increases in response to increases in restrictive abortion legislation (model 3 RR: 1.011, 95% CI: 1.002, 1.019 for infant mortality). For infant mortality, supply-side laws alone were significantly associated with increased rates of mortality, but the effects were similar in magnitude for both supply- and demand-side laws.

Table 4 examines shows the results for Aim 2, in which the associations are stratified by race. The Black vs. White adult outcomes were age-standardized to two different populations – the 2000 U.S. Black population and White population, respectively. In sensitivity analyses, we age-standardized both outcomes to the overall U.S. population for women in 2000, and this did not change our results or interpretation. Formal tests of interaction were performed by pooling the

two groups and examining the multiplicative interaction term between racial group and number of laws. Examining the mortality outcomes stratified by race, increased restrictive abortion legislation was shown to increase all-cause mortality among Blacks but not Whites, despite null findings in the overall population models (RR: 1.024, 95% CI: 1.012, 1.037 for Blacks; RR: 1.040, 95% CI: 0.960, 1.128 for Whites). Similarly, Black child mortality was significantly elevated in response to increased restrictive abortion legislation (RR: 1.028, 95% CI: 1.008, 1.048), in spite of null findings for the overall population. No other effects were significant or dramatically different across racial categories. Of the observed effects, only child mortality showed significant interaction between race and legislation, indicating not only larger effects but a steeper slope.

Discussion

In this study, we examine various mortality outcomes associated with increases in restrictive abortion legislation. We find modest but significant increases in infant mortality, with similar magnitude effects for both supply-side and demand-side laws. We find evidence that the effects of restrictive abortion legislation are stronger among Blacks than Whites, particularly Black children.

For Aim 1, we examined the associations between restrictive abortion legislation and mortality outcomes among the entire U.S. population. We found no evidence of increased rates of adult all-cause mortality in response to restrictive abortion legislation, but did find increases in infant all-cause mortality that are consistent with our study hypotheses. Infant mortality increased by approximately 1% with every additional restrictive law. These rates are calculated per 100,000 live births, thus these are small changes. However, on the population scale, these are numbers are meaningful and do add up: in 2014, there were approximately 3 million live births in the United States, and over 23,000 infant deaths; the infant mortality rate was 582.1 deaths per 100,000 live births.[78] The average state has multiple restrictive abortion laws, with some having up to 15 unique laws; if each increases the infant mortality rate by an estimated 1%, every additional law would lead to approximately 6 preventable infant deaths in the U.S. (using the

2014 estimates). Importantly, we found no evidence that restrictive abortion legislation confers any protective effects for women's and children's mortality.

In the U.S., the leading causes of infant mortality are congenital malformations, low birth weight, injury, sudden infant death syndrome (SIDS), and complications from birth.[79] Increases in each of these may be a plausible consequence of restrictive abortion legislation; increased neonatal mortality, low birth weight, and preterm birth (which causes low birth weight) have all been linked to reduced abortion availability.[80] Congenital malformations in particular are a leading reason why women seek later term abortions,[81,82] and if women are unable to access timely abortion and instead deliver at term, we would expect these women to experience infant loss at higher rates. Globally, unintended pregnancies are associated with increased rates of infant and neonatal mortality.[83] Abortion is socially patterned, and the women who are more likely to seek abortion for an unplanned pregnancy—those who are young, low-income, and low-education—are those whose infants are at increased risk for low birth weight, infant injury, SIDS, and birth complications.[84–86] If these women are unable to obtain abortion, their alternative is to deliver at term, and their babies will be at higher risk for infant mortality. However, these women are also at increased risk of high-risk labor conditions, so we were surprised to find an increased risk of infant mortality but not a commensurate increase in maternal mortality. Maternal mortality is much rarer than infant mortality, and the effects may have been extremely small. Alternatively, restrictive abortion legislation may instead impact maternal morbidity but not mortality, which is outside the scope of this current study.

Our second aim was to determine if restrictive abortion legislation contributed to further health disparities between Black and White women. We saw small increases in all-cause adult and child mortality among Black but not White women (Table 4), but did not see increases in the unstratified model (Table 3). This is consistent with our hypothesized mechanism that Black women experience more barriers to abortion as a function of restrictive abortion legislation, and that restrictive abortion legislation has contributed to Black-White health disparities. To better understand the specific pathways through which restrictive abortion legislation increases

all-cause mortality among Black women, in future research we will interrogate specific causes of death, including communicable diseases, which may be impacted by restrictive abortion legislation and which Black women may be at higher risk of contracting.

Our findings that restrictive abortion legislation is associated with Black child mortality is consistent with previous literature that has shown that certain laws increase rates of child death and child maltreatment.[43–46] Though we did not see increases in child mortality in the unstratified models, the stratified analyses were consistent with our hypothesis that the effects of restrictive abortion legislation would be more harmful to Black than to White women and children. Black women who cannot obtain abortion may have higher-risk children because of racial gaps in affordable child-care, education, social support, and services that increasingly disadvantage children of unplanned pregnancies, who already experience higher mortality rates than those of planned pregnancies.[57,58,83,87,88]

We found no significant effects for infant mortality when stratifying by racial subgroup, despite the significant findings in the population models. This could be a function of statistical power: the effects in the population model were very small, and it may be that in population subgroups those effects are vanishingly small, to the point of being statistically undetectable. It may instead be that the subgroup with the strongest effects in breast cancer and infant mortality is neither Black nor White, which were the only two subgroups under consideration. Women from other minority racial/ethnic subgroups, such as Hispanic White or American Indian, may be disproportionately vulnerable to the effects of restrictive abortion laws.

In both aims we also sought to understand whether supply-side laws and demand-side laws had differing health impacts. We find evidence that both categories of law are associated with mortality. For adult outcomes, both supply-side laws and demand-side laws were associated with positive effects of similar magnitude, suggesting that neither type of law is the main driver of the observed relationship, but that both contribute. For infant outcomes in undtratified models, supply- but not demand-side laws were significant (Table 3); for Black child mortality in

the stratified models (Table 4), the pattern was reversed. However, for these child and infant mortality outcomes, the supply-side and demand-side laws had similar effect sizes and highly overlapping confidence intervals, and were overall not suggestive of a meaningful difference in effect between the two domains of the law. Supply-side laws are hypothesized to be more impactful than demand-side laws because they target abortion providers directly, and could therefore have more pronounced impacts on abortion availability.[24] Yet for these particular outcomes, we find insufficient evidence that supply-side laws are dramatically more impactful, or driving the overall effect.

Because this relationship has been largely unexplored and we believe the number of state laws matter for health, we chose to model the exposures and outcomes continuously. This is a potential modeling limitation because the relationship between restrictive abortion legislation and health outcomes may not be a simple, linear relationship. Considering different ways to group and measure the exposure will help us to understand how these laws operate, which laws matter, and under what circumstances.

We chose to use multivariable regressions to model these relationships. For the observed associations to be interpreted causally, we need to have controlled for all common causes of both restrictive abortion legislation and the mortality outcomes. While we believe that all relevant confounders have been accounted for, residual confounding is always a concern; there may be unmeasured common causes of restrictive abortion legislation and mortality that are creating apparent effects. As other potential causes are identified, further research must rule them out as alternative explanations. Further research can help disentangle these effects by examining more proximate health outcomes that could likely mediate the relationship between laws and mortality; future studies may also examine the specificity of these effects by demonstrating the absence of effect in outcomes that could *not* be plausibly related to restrictive abortion legislation, which would give us more confidence in the observed effect. Future studies may also consider the use of alternative methods, such as quasi-experimental methods, to address residual confounding: for example, difference-in-difference models are

generally-accepted techniques for analyzing interventions like laws, and they allow for inclusion of covariates (to account for known confounders) while also accommodating time-invariant unmeasured confounders that do not change over the study period, like unmeasured differences between states.[89] These come with more assumptions than traditional regression techniques and are better suited for binary exposures, unlike the models we used which examined laws continuously.

Health policies impact people's lives, resources, decision making, and behaviors: the health and welfare of the public is a consequence of the policies that shape people's environments. In the case of abortion legislation, these laws are created and passed in order to directly impact women's health care and access; despite their prevalence, these policies are insufficiently evaluated with respect to their real effects on health. While much more work needs to be done to understand the nature of how these laws impact women and children's health, in this study we have found evidence that these policies are providing no benefits but may be causing significant harm, in particular Black women and children.

PAA Working Paper
Version: 03/22/2019

Tables and Figures

Table 1: List of restrictive laws, year of first/most recent adoption, number of states with the law as of 2013, and restriction domain (adapted from Kreitzer[61] and Joyce[24])

Law	*First adoption of law*	*Last adoption of law*	*N states with the law*	*Domain*
Mandatory counseling	1973	2013	40	Demand
Restrictions on private insurance use for abortion	1978	2013	24	Demand
Restrictions on medication abortion	2001	2013	18	Demand
Special restrictions for minors	1973	2006	28	Demand
Restrictions on public insurance for abortion	1977	2013	48	Demand
Mandatory waiting period	1973	2011	31	Demand
No sex-selective abortion	1975	2013	6	Demand
Mandatory viability test or ultrasound	1984	2012	25	Demand
Admitting privileges	2011	2013	13	Supply
Fetal tissue disposal	1980	2013	21	Supply
Gestational age limit	1975	2013	32	Supply
Fetal pain laws	2011	2013	10	Supply
Intact dilation and evacuation prohibited	1995	2000	31	Supply
Only physicians can provide abortions	1973	2002	45	Supply
Publicly funded providers cannot perform abortions	1981	2010	22	Supply
TRAP laws	1973	2013	37	Supply

Table 2: Covariate distribution, state level, all years		
	Average (S.D)	Range
Restrictive abortion laws		
• Number of laws	4.63 (3.56)	0 – 15
• Number of demand-side laws	2.21 (1.99)	0 – 8
• Number of supply-side laws	2.42 (1.79)	0 – 8
Politics, attitudes, beliefs		
• Women in state legislature (%)	19.07% (8.43)	0.70 – 41.10%
• CITI score	48.59 (15.80)	7.49 – 95.97
• Evangelical population (%)	18.93% (14.35)	1.10% – 74.00%
Demographic factors		
• Poverty rate (%)	13.15% (3.91)	2.90% – 27.20%
• GINI Index	0.55 (0.06)	0.43 – 0.71
• Birth rate	0.07 (0.01)	0.05 – 0.12

Table 3: Risk ratios of the effects of restrictive abortion laws on mortality outcomes				
	All-cause mortality rate Risk ratio (95% CI)	**Maternal mortality rate** Risk ratio (95% CI)	**Infant mortality rate** Risk ratio (95% CI)	**Child mortality rate** Risk ratio (95% CI)
Model 1: N of laws, adjusted for year	1.011 (0.998, 1.025)	0.970 (0.916, 1.027)	1.007 (0.980, 1.035)	1.011 (0.991, 1.032)
Model 2: Further adjusted for politics, attitudes, and beliefs	1.007 (0.995, 1.019)	0.975* (0.950, 1.000)	1.008 (0.999, 1.017)	1.003 (0.992, 1.015)
Model 3: Further adjusted for demographics	1.007 (0.997, 1.018)	0.981 (0.957, 1.006)	1.011* (1.002, 1.019)	1.006 (0.996, 1.016)
Model 4: Demand-side laws only, adjusted for all covariates	1.016 (0.997, 1.035)	0.981 (0.940, 1.024)	1.012 (0.998, 1.027)	1.005 (0.988, 1.022)
Model 5: Supply-side laws only, adjusted for all covariates	1.005 (0.991, 1.020)	0.960 (0.912, 1.010)	1.021* (1.004, 1.037)	1.015 (0.997, 1.033)
				*p<0.05, ** p<0.01, ***p<0.001

PAA working paper
3.20.19

Table 4: Mortality outcomes stratified by race		
Exposure	Mortality Outcome Adjusted RR⁺ (95% CI)	Mortality Outcome Adjusted RR⁺ (95% CI)
	Black all-cause mortality rate	**White all-cause mortality rate**
N laws	1.024 (1.012, 1.037)***	1.040 (0.960, 1.128)
N demand-side laws	1.039 (1.020, 1.058)***	1.041 (0.962, 1.126)
N supply-side laws	1.034 (1.009, 1.060)**	1.088 (0.908, 1.304)
	Black maternal mortality rate	**White maternal mortality rate**
N laws	1.103 (0.978, 1.245)	1.010 (0.965, 1.058)
N demand-side laws	1.149 (0.974, 1.355)	1.041 (0.966, 1.122)
N supply-side laws	1.161 (0.935, 1.442)	0.980 (0.910, 1.056)
	Black infant mortality rate	**White infant mortality rate**
N laws	1.011 (0.995, 1.027)	1.011 (0.995, 1.028)
N demand-side laws	1.019 (0.993, 1.047)	1.023 (0.996, 1.050)
N supply-side laws	1.012 (0.985, 1.039)	1.006 (0.978, 1.035)
	Black child mortality rate‡	**White child mortality rate‡**
N laws	1.028 (1.008, 1.048)**	1.011 (0.992, 1.031)
N demand-side laws	1.045 (1.015, 1.075)**	1.022 (0.991, 1.054)
N supply-side laws	1.035 (1.005, 1.066)*	1.007 (0.973, 1.042)
⁺Adjusted for year, political composition, beliefs and attitudes, and demographics *p<0.05, ** p<0.01, ***p<0.001, ‡p<0.05 for race x laws interaction		

PAA working paper
3.20.19

References

1. Pew Research Center. Public Opinion On Abortion Fact Sheet. (2017). Available at: http://www.pewforum.org/fact-sheet/public-opinion-on-abortion/. (Accessed: 20th December 2018)
2. Saad, L. Americans' Attitudes Toward Abortion Unchanged. *Gallup News* (2016). Available at: https://news.gallup.com/poll/191834/americans-attitudes-toward-abortion-unchanged.aspx. (Accessed: 20th December 2018)
3. Raymond, E. G., Grossman, D., Weaver, M. A., Toti, S. & Winikoff, B. Mortality of induced abortion, other outpatient surgical procedures and common activities in the United States. *Contraception* **90,** 476–479 (2014).
4. Raymond, E. G. & Grimes, D. A. The Comparative Safety of Legal Induced Abortion and Childbirth in the United States. *Obstet. Gynecol.* **119,** 215–219 (2012).
5. *The Safety and Quality of Abortion Care in the United States*. (National Academies Press, 2018). doi:10.17226/24950
6. Jones, R. K. & Jerman, J. Population Group Abortion Rates and Lifetime Incidence of Abortion: United States, 2008–2014. *Am. J. Public Health* **107,** 1904–1909 (2017).
7. Upadhyay, U. D., Biggs, M. A. & Foster, D. G. The effect of abortion on having and achieving aspirational one-year plans. *BMC Womens. Health* **15,** 102 (2015).
8. Cates, W., Grimes, D. A. & Schulz, K. F. The public health impact of legal abortion: 30 years later. *Perspect. Sex. Reprod. Health* **35,** 25–8 (2003).
9. Grimes, D. A. *et al.* Unsafe abortion: the preventable pandemic. *Lancet* **368,** 1908–1919 (2006).
10. Dehlendorf, C., Harris, L. H. & Weitz, T. A. Disparities in abortion rates: a public health approach. *Am. J. Public Health* **103,** 1772–9 (2013).
11. *Roe v. Wade :: 410 U.S. 113 (1973)*.
12. Llamas, A., Borkowski, L. & Wood, S. *PUBLIC HEALTH IMPACTS OF STATE-LEVEL ABORTION RESTRICTIONS Overview of Research & Policy in the United States*. (2018).
13. Blake, A. Perry signs Texas abortion bill into law. *The Washington Post* (2013).
14. Somashekhar, S. Ohio governor vetoes 'heartbeat bill' but signs another abortion restriction into law. *The Washington Post* (2016).
15. Somashekhar, S. & Wang, A. B. Lawmaker who called pregnant women a 'host' pushes bill requiring fathers to approve abortion. *The Washington Post* (2017).
16. Liptak, A. Supreme Court Strikes Down Texas Abortion Restrictions. *The New York Times* (2016).
17. Medoff, M. H. State Abortion Policies, Targeted Regulation of Abortion Provider Laws, and Abortion Demand. *Rev. Policy Res.* **27,** 577–594 (2010).
18. Bitler, M. & Zavodny, M. The effect of abortion restrictions on the timing of abortions. *J. Health Econ.* **20,** 1011–1032 (2001).
19. Blank, R. M., George, C. C. & London, R. A. State abortion rates the impact of policies, providers, politics, demographics, and economic environment. *J. Health Econ.* **15,** 513–553 (1996).
20. Levine, P. B., Trainor, A. B. & Zimmerman, D. J. The effect of Medicaid abortion funding restrictions on abortions, pregnancies and births. *J. Health Econ.* **15,** 555–578 (1996).
21. Medoff, M. H. Price, Restrictions and Abortion Demand. *J. Fam. Econ. Issues* **28,** 583–599 (2007).
22. Henshaw, S. K., Joyce, T. J., Dennis, A., Finer, L. B. & Blanchard, K. *Restrictions on Medicaid Funding for Abortions: A Literature Review*. (2009).
23. Joyce, T., Kaestner, R. & Colman, S. Changes in Abortions and Births and the Texas Parental Notification Law. *N. Engl. J. Med.* **354,** 1031–1038 (2006).
24. Joyce, T. The Supply-Side Economics of Abortion. *N. Engl. J. Med.* **365,** 1466–1469 (2011).
25. Joyce, T., Henshaw, S. K. & Skatrud, J. D. The impact of Mississippi's mandatory delay law on abortions

and births. *JAMA* **278,** 653–8 (1997).
26. Colman, S., Colman, S. & Joyce, T. Regulating Abortion: Impact on Patients and Providers in Texas. *J. Policy Anal. Manag.* **30,** 775–797 (2011).
27. Grossman, D., White, K., Hopkins, K. & Potter, J. E. Change in Distance to Nearest Facility and Abortion in Texas, 2012 to 2014. *JAMA* **317,** 437 (2017).
28. Fuentes, L. *et al.* Women's experiences seeking abortion care shortly after the closure of clinics due to a restrictive law in Texas. *Contraception* **93,** 292–297 (2016).
29. Schaff, E. A., Fielding, S. L. & Westhoff, C. Randomized trial of oral versus vaginal misoprostol 2 days after mifepristone 200 mg for abortion up to 63 days of pregnancy. *Contraception* **66,** 247–50 (2002).
30. Schaff, E. A. *et al.* Vaginal misoprostol administered 1, 2, or 3 days after mifepristone for early medical abortion: A randomized trial. *JAMA* **284,** 1948–53 (2000).
31. Upadhyay, U. D. *et al.* Comparison of Outcomes before and after Ohio's Law Mandating Use of the FDA-Approved Protocol for Medication Abortion: A Retrospective Cohort Study. *PLOS Med.* **13,** e1002110 (2016).
32. Grossman, D., White, K., Hopkins, K. & Potter, J. E. The public health threat of anti-abortion legislation. *Contraception* **89,** 73–74 (2014).
33. Berglas, N. F. & Roberts, S. C. M. The development of facility standards for common outpatient procedures and implications for the context of abortion. *BMC Health Serv. Res.* **18,** 212 (2018).
34. Roberts, S. C. M., Fuentes, L., Berglas, N. F. & Dennis, A. J. A 21st-Century Public Health Approach to Abortion. *Am. J. Public Health* **107,** 1878–1882 (2017).
35. Roberts, S. C. M. *et al.* Association of Facility Type With Procedural-Related Morbidities and Adverse Events Among Patients Undergoing Induced Abortions. *JAMA* **319,** 2497 (2018).
36. Berglas, N. F. *et al.* The effect of facility characteristics on patient safety, patient experience, and service availability for procedures in non-hospital-affiliated outpatient settings: A systematic review. *PLoS One* **13,** e0190975 (2018).
37. Weitz, T. A. *et al.* Safety of aspiration abortion performed by nurse practitioners, certified nurse midwives, and physician assistants under a California legal waiver. *Am. J. Public Health* **103,** 454–61 (2013).
38. Singh, K. & Ratnam, S. . The influence of abortion legislation on maternal mortality. *Int. J. Gynecol. Obstet.* **63,** S123–S129 (1998).
39. Berer, M. Making abortions safe: a matter of good public health policy and practice. *Bull. World Health Organ.* **78,** 580–592 (2000).
40. Brown, J., Cohen, P., Johnson, J. G. & Salzinger, S. A longitudinal analysis of risk factors for child maltreatment: findings of a 17-year prospective study of officially recorded and self-reported child abuse and neglect. *Child Abuse Negl.* **22,** 1065–1078 (1998).
41. Guterman, K. Unintended pregnancy as a predictor of child maltreatment. *Child Abuse Negl.* **48,** 160–169 (2015).
42. Olmsted, R. W. *et al.* Antecedents of child abuse. *J. Pediatr.* **100,** 823–829 (1982).
43. Bitler, M. & Zavodny, M. Child Abuse and Abortion Availability. *Am. Econ. Rev.* **92,** 363–367 (2002).
44. Bitler, M. P. & Zavodny, M. Child Maltreatment, Abortion Availability, and Economic Conditions. *Rev. Econ. Househ.* **2,** 119–141 (2004).
45. Sen, B. State Abortion Restrictions and Child Fatal-Injury: An Exploratory Study. *South. Econ. J.* **73,** 553–574 (2007).
46. Sen, B., Wingate, M. S. & Kirby, R. The relationship between state abortion-restrictions and homicide deaths among children under 5 years of age: A longitudinal study. *Soc. Sci. Med.* **75,** 156–164 (2012).
47. Henshaw, S. K. & Finer, L. B. The accessibility of abortion services in the United States, 2001. *Perspect. Sex. Reprod. Health* **35,** 16–24

48. Finer, L. B., Frohwirth, L. F., Dauphinee, L. A., Singh, S. & Moore, A. M. Timing of steps and reasons for delays in obtaining abortions in the United States. *Contraception* **74,** 334–344 (2006).
49. Gerdts, C. *et al.* Impact of Clinic Closures on Women Obtaining Abortion Services After Implementation of a Restrictive Law in Texas. *Am. J. Public Health* **106,** 857–64 (2016).
50. Jerman, J., Frohwirth, L., Kavanaugh, M. L. & Blades, N. Barriers to Abortion Care and Their Consequences For Patients Traveling for Services: Qualitative Findings from Two States. *Perspect. Sex. Reprod. Health* **49,** 95–102 (2017).
51. Hartley, D. Rural health disparities, population health, and rural culture. *Am. J. Public Health* **94,** 1675–8 (2004).
52. Roberts, S. C. M., Turok, D. K., Belusa, E., Combellick, S. & Upadhyay, U. D. Utah's 72-Hour Waiting Period for Abortion: Experiences Among a Clinic-Based Sample of Women. *Perspect. Sex. Reprod. Health* **48,** 179–187 (2016).
53. Medoff, M. The Impact of State Abortion Policy on the Price of an Abortion. *Behav. Soc. Issues* **24,** 56 (2015).
54. White, K., Turan, J. M. & Grossman, D. Travel for Abortion Services in Alabama and Delays Obtaining Care. *Women's Heal. Issues* **27,** 523–529 (2017).
55. Dennis, A., Henshaw, S. K., Joyce, T. J., Finer, L. B. & Blanchard, K. *HIGHLIGHTS The Impact of Laws Requiring Parental Involvement for Abortion: A Literature Review*. (2009).
56. Bartlett, L. A. *et al.* Risk Factors for Legal Induced Abortion–Related Mortality in the United States. *Obstet. Gynecol.* **103,** 729–737 (2004).
57. Bailey, Z. D. *et al.* Structural racism and health inequities in the USA: evidence and interventions. *Lancet* **389,** 1453–1463 (2017).
58. Krieger, N., Rowley, D. L., Herman, A. A., Avery, B. & Phillips, M. T. Racism, sexism, and social class: implications for studies of health, disease, and well-being. *Am J Prev Med* **9,** 82–122 (1993).
59. Krieger, N. Ecosocial Theory. in *Encyclopedia of Health and Behavior* (ed. Anderson, N. B.) (SAGE Publications, Inc., 2004).
60. Link, B. G. & Phelan, J. Stigma power. *Soc. Sci. Med.* **103,** 24–32 (2014).
61. Kreitzer, R. J. Politics and Morality in State Abortion Policy. *State Polit. Policy Q.* **15,** 41–66 (2015).
62. Sen, B. A preliminary investigation of the effects of restrictions on Medicaid funding for abortions on female STD rates. *Health Econ.* **12,** 453–464 (2003).
63. Medoff, M. Pro-Choice Versus Pro-Life: The Relationship Between State Abortion Policy and Child Well-Being in the United States. *Health Care Women Int.* **37,** 158–169 (2016).
64. Medoff, M. H. The Relationship between Restrictive State Abortion Laws and Postpartum Depression. *Soc. Work Public Health* **29,** 481–490 (2014).
65. Medoff, M. H. Unintended Pregnancy and State Abortion Policy: Rational Choice or Random Behavior? *J. Policy Pract.* **13,** 258–275 (2014).
66. World Health Organization. *The WHO Application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-MM*. (2012).
67. Medoff, M. H. The Relationship Between State Abortion Policies and Abortion Providers. *Gender Issues* **26,** 224–237 (2009).
68. Budde, E. T., Knill, C., Fernández-i-Marín, X. & Preidel, C. A matter of timing: The religious factor and morality policies. *Governance* **31,** 45–63 (2017).
69. Jelen, T. G. & Wilcox, C. Causes and Consequences of Public Attitudes Toward Abortion: A Review and Research Agenda. *Polit. Res. Q.* **56,** 489–500 (2003).
70. Medoff, M. H. Constituencies, ideology, and the demand for abortion legislation. *Public Choice* **60,** 185–191 (1989).
71. Hoover, D. R. & Den Dulk, K. R. Christian Conservatives Go to Court: Religion and Legal Mobilization in

the United States and Canada. (2004). doi:10.1177/0192512104038165
72. Berry, W. D., Fording, R. C., Ringquist, E. J., Hanson, R. L. & Klarner, C. E. Measuring Citizen and Government Ideology in the U.S. States: A Re-appraisal. *State Polit. Policy Q.* **10,** 117–135 (2010).
73. Frank, M. W. INEQUALITY AND GROWTH IN THE UNITED STATES: EVIDENCE FROM A NEW STATE-LEVEL PANEL OF INCOME INEQUALITY MEASURES. doi:10.1111/j.1465-7295.2008.00122.x
74. National Center for Health Statistics. *Compressed Mortality File, 1989-98 (machine readable data file and documentation, CD-ROM Series 20, No. 2E) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program*. (2007).
75. National Center for Health Statistics. *Compressed Mortality File 1968-1988*.
76. National Center for Health Statistics. *Compressed Mortality File, 1999-2016 (machine readable data file and documentation, CD-ROM Series 20 No. 2T) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program.*
77. Jordan, M. & Grossman, M. The Correlates of State Policy Project v.2.1. (2017).
78. Kochanek, K. D., Murphy, S. L., Xu, J. & Tejada-Vera, B. Deaths: Final Data for 2014. *Natl. Vital Stat. Rep.* **65,** 1–122 (2016).
79. Xu, J., Murphy, S. L., Kochanek, K. D. & Arias, E. Mortality in the United States, 2015. (2016).
80. Joyce, T. The Impact of Induced Abortion on Black and White Birth Outcomes in the United States. *Demography* **24,** 229 (1987).
81. Jones, R. K. & Finer, L. B. Who has second-trimester abortions in the United States? *Contraception* **85,** 544–551 (2012).
82. Steinberg, J. R. Later Abortions and Mental Health: Psychological Experiences of Women Having Later Abortions—A Critical Review of Research. *Women's Heal. Issues* **21,** S44–S48 (2011).
83. Gipson, J. D., Koenig, M. A. & Hindin, M. J. The Effects of Unintended Pregnancy on Infant, Child, and Parental Health: A Review of the Literature. *Stud. Fam. Plann.* **39,** 18–38 (2008).
84. Cramer, J. C. Social Factors and Infant Mortality: Identifying High-Risk Groups and Proximate Causes. *Demography* **24,** 299 (1987).
85. Singh, G. K., Kogan, M. D. & Slifkin, R. T. Widening Disparities In Infant Mortality And Life Expectancy Between Appalachia And The Rest Of The United States, 1990–2013. *Health Aff.* **36,** 1423–1432 (2017).
86. Jones, R. K. & Jerman, J. Abortion Incidence and Service Availability In the United States, 2014. *Perspect. Sex. Reprod. Health* **49,** 17–27 (2017).
87. Krieger, N. Embodiment: a conceptual glossary for epidemiology. *J Epidemiol Community Heal.* **59,** 350–355 (2005).
88. Chen, E., Martin, A. D. & Matthews, K. A. Understanding health disparities: the role of race and socioeconomic status in children's health. *Am. J. Public Health* **96,** 702–8 (2006).
89. Wing, C., Simon, K. & Bello-Gomez, R. A. Designing Difference in Difference Studies: Best Practices for Public Health Policy Research. *Annu. Rev. Public Health* **39,** 453–469 (2018).