Changes in abortion access and incidence in a post-Roe world

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Abbreviations: United States (U.S.), Confidence Interval (C.I.)

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Abstract

Objective

To examine changes in travel distance and abortion incidence if Roe v. Wade were reversed or if abortion were further restricted.

Study Design

We used a national database of abortion facilities to calculate travel distances from the population centroids of United States counties to the nearest publicly-identifiable abortion facility. We then estimated these travel distances under two hypothetical post-Roe scenarios. In the first, abortion becomes illegal in 8 states with preemptive “trigger bans.” In the second, abortion becomes illegal in an additional 13 states classified as at high risk of outlawing abortions under most circumstances. Using previously-published estimates of the short-run causal effects of increases in travel distances on abortion rates in Texas, we estimate changes in abortion incidence under each scenario.

Results

If Roe were reversed and all high-risk states banned abortion, 39% of the national population of women aged 15-44 would experience increases in travel distances ranging from less than 1 mile to 791 miles. If these women respond similarly to travel distances as Texas women, county-level abortion rates would fall by amounts ranging from less than 1% to more than 40%. Aggregating across all affected regions, the average resident is expected to experience a 249 mile increase in travel distance, and the abortion rate is predicted to fall by 32.8% (95% confidence interval 25.9 to 39.6%) in the year following a Roe reversal.

Conclusion

In the year following a reversal, increases in travel distances are predicted to prevent 93,546 to 143,561 women from accessing abortion care.

Implications

A reversal or weakening of Roe is likely to increase spatial disparities in abortion access. This could translate to a reduction in abortion rates and an increase in unwanted births and self-managed abortions.
1. Introduction

Abortion is currently legal in all 50 states. However, accessing abortion care is difficult for some individuals, and research has established that increases in travel distances lower abortion rates [1–4]. In 2017 individuals in 27 United States (U.S.) cities lived more than 100 miles from the nearest abortion facility [5].

Distance to the nearest abortion facility could increase in the coming months and years. Since 2011, states have implemented hundreds of abortion laws. These laws have the potential to shutter clinics because they establish requirements that abortion clinicians cannot meet, such as admitting privileges laws [6,7]. In May 2019 Alabama passed a law making abortion illegal except in situations where the pregnancy put a woman’s life at risk or the fetus could not survive. There are currently more than a dozen legal challenges to some of the most extreme abortion restrictions—such as the one passed in Alabama—that have the potential to reach the Supreme Court. However, it is unclear whether the current court would uphold the legal precedent established by Roe v. Wade in 1973. If Roe is overturned, abortion would immediately become illegal in 8 states; other states could begin to enforce pre-Roe abortion bans or enact new ones, and still others could enact laws that present such a burden that facilities would have to close [8]. This analysis uses data on abortion facility locations in 2019 to examine the potential impact of a Roe reversal on abortion access and incidence.
2. Methods

2.1 Data Sources

We identified abortion facilities using the 2018 Abortion Facilities Database maintained by Advancing New Standards in Reproductive Health (ANSIRH) at the University of California, San Francisco [9]. This database includes the names and addresses of all U.S. facilities that publicly advertise abortion services. ANSIRH verifies the facilities on this list via annual internet searches and phone calls, and has updated this database to reflect known facility closures and openings through July 1, 2019.

We identified the geographic coordinates of the population centroid of each county using data published by the U.S. Census Bureau [10]. We measured the population of women aged 15-44 in each county using the most recent estimates of county populations by age and sex published by The National Cancer Institute Surveillance, Epidemiology, and End Results Program [11].

We examined two policy scenarios. If Roe v. Wade were overturned eight states have pre-emptive “trigger bans” and abortion would become immediately illegal (Table 1). Ten additional states retain and could begin to enforce pre-Roe bans on abortion, and other states could quickly enact new restrictions effectively outlawing abortions under most circumstances. We relied on a legal analysis by the Center for Reproductive Rights to identify those states most likely to enforce their pre-Roe bans or enact new restrictions that would make abortion virtually inaccessible. Their analysis considers recent activity and compositions of state legislatures as well state constitutional protections, and they assign each state a level of “risk” of banning abortion if Roe were reversed [8]. In total, 21 states are classified as at high-risk of banning abortion (Table 1).
2.2 Analysis

We used the Stata [12] georoute module [13] to identify the geographic coordinates of each abortion facility and to calculate one-way travel distance via car from the population centroid of each county in the continental U.S. to the geographic coordinates of the nearest facility in any state. For each policy scenario, we modeled all abortion facilities in states with bans as closed and then re-calculated travel distances from each county to the nearest abortion facility among those that remain. When aggregating county-level distances to construct regional or national averages, we weighted the distances by the population of women aged 15-44 in each county [11] so that all averages account for the spatial distribution of the population and represent distances for the average woman in a given region.

We predicted changes in published abortion rates using estimates of the causal effects of travel distance based on prior research of abortion restrictions in Texas. In November 2013, Texas began enforcing a law mandating that physicians who provide abortions have admitting privileges with a hospital located within 30 miles of the facility where abortions were performed. In turn, 22 of the state’s 41 abortion clinics closed, most of them suddenly and as a direct result of the law [6]. These closures caused sudden changes to distances to the nearest abortion facility, which varied spatially across the state [2–4]. Lindo et al. exploited this natural experiment, estimating a difference-in-difference Poisson model of county resident abortion rates as a function of travel distance and its square [4]. The results indicated that increasing distance prevents women from accessing abortion care, but at a diminishing rate. For example, an increase in travel distance from 0 to 100 miles reduces resident abortion rates more substantially (by 29.8%) than an increase from 100 to 200 miles (by 18.7%). Intuitively, these results mean that the same increase in travel distance is less impactful to women who already are distant from
a provider than to women who currently are close to one. Lindo et al. emphasize that this approach captures changes in abortions obtained from medical facilities reporting abortions per state mandates. Their analysis cannot capture changes in self-managed abortions. Fischer et al. independently adopt a similar approach, and reach similar conclusions [3].

We conducted a thought experiment: How would published abortion rates change in a post-Roe world if women in affected regions responded to increasing travel distances similarly to women in Texas? We used the results of Lindo et al.’s most flexible functional form to predict percent changes in county abortion rates due to hypothetical post-Roe changes in travel distance. To aggregate county-level predictions to regional summary statistics, we used county populations as weights because abortion rates were not available for all U.S. counties.

Appendix A provides additional details about the methodology.

3. Results

3.1 Travel distances in 2019

There were 743 publicly-identifiable abortion facilities in the continental U.S. in the ANSIRH database. In 2019 the average woman age 15-44 lived 25 miles from the nearest abortion facility (Table 1). Distances vary substantially across the country (Figure 1), ranging from less than 50 to more than 200 miles. Counties facing high travel distances tend to be more sparsely populated. At present, 83% of the population of U.S. women of childbearing age live within 50 miles of an abortion facility, and 1% live more than 200 miles from the nearest facility. Mean travel distances range from 5 miles in New York and New Jersey to 145 miles in North Dakota (Table 1).
3.2 Predicted changes in travel distances

In a post-Roe scenario in which trigger bans cause abortion to become illegal in 8 states, the distance the average woman would travel to the nearest abortion facility would increase from 25 to 33 miles (Table 1), and the percent of women living more than 200 miles from an abortion facility would increase from 1% to 3%. The enforcement of trigger bans would substantially exacerbate spatial inequalities in abortion access (Figure 2). The increases in distances are larger in Arkansas (48 to 213 miles), Louisiana (47 to 190 miles), and Tennessee (35 to 133 miles) than in Kentucky (64 to 115 miles), Mississippi (62 to 144 miles), and Missouri (62 to 73 km). This is largely because each of the latter three states has only a single abortion facility, and many residents already travel out of state to reach the closest abortion provider. Overall, the average woman living in an affected county would experience an increase in travel distance from 56 to 156 miles.

In the second scenario, if all 21 high-risk states were to ban abortion, increases in travel distance would be larger and more widespread. Nationally, average travel distance would increase from 25 to 122 miles (Table 1). Regional disparities are pronounced in this scenario (Figure 2): 56% of women of childbearing age would live within 50 miles of an abortion facility, while 26% would live more than 200 miles from one.

Travel distances in states with trigger bans reach even greater levels in the scenario in which their neighboring states also ban abortion. For instance, the average travel distance for Louisiana residents is 47 miles at present, 190 miles under the trigger ban scenario, and 465 miles under the high-risk scenario in which it and all of its neighbors enforce abortion bans. Women in the Midwest would also experience large increases in travel distances. For instance travel distances increase from 34 to 127 miles in Indiana, 18 to 245 miles in Michigan, and 25 to
183 miles in Ohio (Table 1). Overall, the average woman living in an affected county would experience an increase in travel distance from 37 to 286 miles.

3.3 Predicted changes in abortion rates

The effects of a Roe reversal on women seeking abortions vary substantially both between and within states (Figure 3). Wide swaths of the country, are expected to have no major changes to travel distances and, in turn, no resulting reductions in abortion rates (gray counties in Figure 3). For the remaining counties, three factors determine the magnitudes of the predicted effects on abortion rates: current travel distances, neighboring states’ policy environments, and facility locations in neighboring states.

The contrasting predictions for Missouri and Arkansas illustrates these factors. Both states have trigger bans, but abortions are predicted to decline by 2.8% in Missouri (95% C.I. 2.1% to 3.5%) and by 29.8% in Arkansas (95% C.I. 23.3 to 36.3%). This is because the closest providers for many Missouri residents are already out of state requiring travel to neighboring states. In addition, if Missouri’s sole provider in St. Louis were to close, another provider is located nearby in Granite City, Illinois. In contrast, Arkansas has lower present travel distances than Missouri, and also is surrounded to the north, south, and east by other states with trigger bans. As a result, the enforcement of trigger bans would have a much greater impact on abortion access for Arkansas residents.

If all high-risk states were to ban abortion, predicted declines in abortion rates expand to much of the rest of the South and Midwest (Figure 3). Abortion rates are predicted to decline by more than 40% across most urban areas in affected states, and overall by more than 20% in
Alabama, Arizona, Arkansas, Georgia, Idaho, Indiana, Kentucky, Louisiana, Michigan, Mississippi, Ohio, Oklahoma, South Dakota, Tennessee, Texas, and Utah (Table 1).

Aggregating to broader geographic levels, abortion rates are predicted to fall by 32.8% (95% C.I. 25.9 to 39.6%) for the regions at high risk of banning abortions. For the country as a whole—including counties where distances and abortion rates are not predicted to fall—the results suggest there would be 12.8% (95% C.I. 10.1 to 15.5%) fewer abortions in the immediate aftermath of a Roe reversal. Using the most recently available estimates for abortions [14], this would amount to 118,554 (95% C.I. 93,546 to 143,561) women prevented from obtaining abortions in a single year due to increased travel distances.

4. Discussion

In this paper we found that in two post-Roe scenarios the predicted effects of abortion bans spill across state boundaries. An in-state ban causes little or no increase in travel distances for residents close to neighboring states where facilities are likely to remain open. On the other hand, some women residing in states that are not likely to ban abortions could nonetheless experience substantial increases in travel distances because their nearest facility is in a neighboring state that is likely to enforce a ban. Overall, in a scenario in which all high-risk states ban abortions, residents of affected counties face a predicted increase in travel distances of 249 miles, an effect that is particularly concentrated in the Midwest and the South due to the potential for bans to be enforced in multiple neighboring states.

Even if federal protections of abortion rights are weakened rather than reversed, states could pass new laws that could close abortion facilities. Between 2011 and 2014, the number of abortion clinics in the U.S. declined by 6%, and declines were largest in states that had enacted
the greatest number of regulations of providers [14]. The admitting privileges law in Texas illustrated that state regulations can have dramatic effects on provider operations [2,4]. While the law was struck down by the Supreme Court in 2016, other states have since passed and enforced similar laws, and it is unclear if the current court will uphold the precedent set by Whole Woman’s Health v. Hellerstedt.

Prior research has demonstrated that increases in distance are associated with lower abortion rates [1–4]. Three-quarters of abortion patients are low-income or poor, 59% have children, and 55% have experienced a recent disruptive life event [15,16]. Women with limited resources and difficult personal circumstances would likely find substantial increases in travel distances a major impediment.

To develop our estimated effects on abortion rates in a Post-Roe world, we applied the magnitudes of the effects of distances on abortion rates documented in a previous Texas study to the entire continental U.S. [4]. We believe this is a reasonable assumption given that similar effects of travel distances were observed across ages and racial and ethnic groups in Texas [4], and women have been found to be responsive to travel distances in other contexts [17,18].

Our predictions likely understate the magnitudes of effects that would actually be observed. First, Lindo et al. do not observe evidence that increases in distances beyond 291 miles cause further reductions in abortions. In keeping with this finding, we model all distance increases beyond 291 miles as having no additional effect on abortion rates. However, increases of this magnitude also are largely beyond what has been observed in Texas, and it is possible that there are further effects that have yet to be observed. Second, our models do not account for the congestion that is likely to arise if thousands of residents of states with abortion bans begin flowing to states without bans. To the extent that the remaining providers cannot fully absorb this
influx, the estimated reductions are likely to be even greater. In fact, Lindo et al. found that congestion accounted for substantial portion of declines in abortions in Texas [4]. Increasing congestion also has been found to increase delays in obtaining abortions [4,19].

In the long-run, individuals could change their sexual behavior in response to the decreased availability of abortion but the limited evidence on such behavioral responses suggests they are unlikely to be large [20]. Some supply-side responses might also occur: facilities in states where abortion remains legal might expand or open, providers and policymakers might innovate on telemedicine to mail abortion pills to border towns [21], and organizations might facilitate information and transportation for women seeking abortion care. Such long-run increases in supply could increase the availability of abortion services. They might also increase women’s awareness of where abortion services are available, lowering information barriers to abortion access [22]. On the other hand, women in much of the South and in Michigan are surrounded by states at high risk of banning abortions, and these developments would do little to reduce travel distances faced by women in these states.

In the short-run, our estimates suggest that increased travel distances alone are likely to prevent 93,546 to 143,561 women from obtaining abortion care in the first year following a reversal of Roe. This may translate to an increase in births resulting from unintended pregnancies, which is associated with negative outcomes for both the woman and existing children [23–27]. It is also possible that more women would obtain abortion pills on the internet that would allow them to pursue self-managed abortion [28]. Regardless, these findings demonstrate that a Roe reversal would dramatically increase regional disparities in abortion access, and prevent large numbers of women from obtaining reproductive health care from a health care provider.
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References


Table 1. State-level summary of current abortion access at present and under two post-Roe policy scenarios

<table>
<thead>
<tr>
<th>State</th>
<th>Population of women aged 15-44</th>
<th>Number of abortion facilities</th>
<th>Mean travel distance (miles)</th>
<th>Policies</th>
<th>Affected population</th>
<th>New mean travel distance (miles)</th>
<th>Predicted change in abortion rate (%)</th>
<th>Affected population</th>
<th>New mean travel distance (miles)</th>
<th>Predicted change in abortion rate (%)</th>
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<td>317</td>
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## Post-Roe World

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<th>Population of women aged 15-44</th>
<th>Number of abortion facilities</th>
<th>Mean travel distance (miles)</th>
<th>Policies</th>
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<td>1</td>
<td>145</td>
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<td>325</td>
<td>-19.5 ± 6.1</td>
<td>135,893</td>
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<td>-19.5 ± 6.1</td>
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<td>HR</td>
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<td>4</td>
<td>37</td>
<td>PB, HR</td>
<td>32,722</td>
<td>38</td>
<td>-0.3 ± 0.1</td>
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<td>0</td>
<td>7,226</td>
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<td>33,849</td>
<td>&lt;</td>
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<td>8</td>
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<td>8</td>
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<tr>
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<td>HR</td>
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<td>TB, HR</td>
<td>141,086</td>
<td>248</td>
<td>-20.1 ± 4.3</td>
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<td>TB, HR</td>
<td>1,189,422</td>
<td>133</td>
<td>-24.2 ± 5.4</td>
<td>1,309,667</td>
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<td>40</td>
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<td>1</td>
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<td>PB, HR</td>
<td>2,911</td>
<td>64</td>
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<td>24,777,283</td>
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<td>-12.8 ± 2.7</td>
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</tbody>
</table>

---

1. TB=Trigger ban  PB=‘Pre-Roe ban’  HR=’High-Risk of enforcing ban’

2. Predictions are presented as percent change in the abortion rate plus or minus the margin of error for a 95% confidence interval.

3. The affected population is defined as the population of women aged 15-44 living in counties for which the travel distance to the nearest abortion facility increases in a given scenario.
Figure 1: Travel distances from county population centroids to the nearest publicly-identifiable abortion facility in the ANSIRH database

![Travel distances from county population centroids to the nearest publicly-identifiable abortion facility in the ANSIRH database](image)
Figure 2: Predicted travel distances from county population centroids to the nearest remaining abortion facility in the ANSIRH database under two post-Roe policy scenarios

Panel A. Travel distances if trigger bans take effect

Panel B. Travel distances if all high-risk states ban abortion
Figure 3: Predicted changes in abortions due to changes in travel distances in two post-Roe policy scenarios

Panel A. Predicted changes in abortion rates if trigger bans take effect

Panel B. Predicted changes in abortion rates if abortion becomes illegal in high-risk states
Changes in abortion access and incidence in a post-Roe world: Appendix A

This appendix provides additional information about the methodology we use to predict reductions in abortion rates due to increases in travel distances in a hypothetical post-Roe world.

Evidence from the Texas natural experiment

On November 1, 2013, Texas began enforcing a new requirement that physicians providing abortions hold admitting privileges at a hospital within 30 miles of the facility where the abortion is performed. This requirement caused half of the abortion facilities in Texas to close, and increased the minimum one-way distance the average Texas resident must travel to obtain an abortion from 21 to 44 miles [1]. The increased travel distances were not experienced equally: residents of some of Texas’ 254 counties experienced no changes in travel distance because their nearest facility remained open, while residents of other counties experienced increases in distances ranging from a few miles to more than 100 miles.

These sudden and spatially varying changes in travel distance provide a natural experiment that Lindo et al. [1] exploit to estimate the causal effects of travel distance on resident abortion rates. The authors estimate difference-in-difference Poisson models with county and year fixed effects to credibly identifying and measuring the causal effects of changes in travel distance on county-level resident abortion rates in Texas. Let $D_{c,0}$ denote an initial (base) travel distance for County $c$, and let $D_{c,1}$ denote a new travel distance, both measured in hundreds of miles. Then, using Lindo et al.’s most flexible functional form, which enters travel
distance as a quadratic function, the predicted change in the resident abortion rate resulting from a change in travel distance is represented by the formula:

\[
(1) \quad \%\Delta\text{abortion}_{c} = 100\left[\exp\left(-0.427(D_{c,1} - D_{c,0}) + 0.073(D_{c,1}^2 - D_{c,0}^2)\right) - 1\right].
\]

Figure A1 provides an example, illustrating the predicted percent decline in abortions due to an increase in travel distance from a base of 0 miles to new levels ranging from 25 to 300 miles. The results illustrate that the effects of travel distance are nonlinear. For example, an increase in travel distance from 0 to 100 miles reduces resident abortion rates by an estimated 29.8% (95% C.I. 21.7 to 37.8%), while an increase from 0 to 200 miles reduces abortion rates by 42.9% (95% C.I. 34.6 to 51.2%). Hence, the marginal effect of increases in distance is declining. The intuitive explanation is that at higher base levels, those women who already have experienced distance as a barrier preventing them from obtaining an abortion are not affected by additional increase in distance. By 291 miles, Lindo et al. estimate no further reductions in abortions due to additional increases in travel distances.

Lindo et al. also explore the sensitivity of the estimated effects to excluding Texas counties within 100 miles of the border with Mexico, where misoprostol may have been more available to women seeking to self-manage abortions. As illustrated in Figure A2, the estimated effects of distance are slightly smaller than for the full sample, but not statistically significantly different. To the extent that this is evidence of larger effects of travel distance near the Mexican border, one cannot say whether it is explained by the greater availability of misoprostol, or by other socioeconomic factors such as higher poverty rates near the border. Given this uncertainty, we choose to use the results for the full Texas sample to predict changes in abortion rates in a post-Roe world. If we were to instead use the estimates excluding Texas border counties, the patterns and results described in our paper would be similar.
Applying the Texas evidence to a hypothetical post-Roe world

We use the results of this flexible functional form estimated by Lindo et al. to predict percent changes in county resident abortion rates due to hypothetical increases in distance under a series of post-Roe scenarios described in Section 2 of the paper.

In doing so, we consider both the internal and external validity of the evidence from Texas. Lindo et al. [1] provide extensive analyses of pre-trends in abortion rates in Texas counties experiencing varying levels of changes in access. The conclude that the common trends assumption holds, supporting the internal validity of the estimates of the causal effects of travel distance in Texas in the 2009 to 2015 period. In using these results to predict the effects of increased travel distances to a post-Roe world, we are assuming that they are externally valid and can predict how women in other regions of the country might respond to travel distances. At a minimum, one can regard this exercise as a thought experiment: How would abortion rates change if women experiencing increases in travel distances respond similarly to distances as Texas women? This does not seem an unlikely hypothetical. Lindo et al. observe similarly large effects of travel distances for different racial and ethnic groups, and previous authors also have observed evidence that abortion rates are responsive to travel distances [2–5].

In extrapolating the Texas evidence to a hypothetical post-Roe world, we additionally consider the distributions of distances in Texas and the United States. A Komolgorov-Smirnov test comparing distributions of travel distances indicates that such distances in the United States at present are not statistically significantly different than distances in Texas prior to the facility closures that followed the admitting privileges restriction (p=0.22). However, in our post-Roe scenarios, some counties experience potential increases in travel distance beyond 300 miles, levels which less than 2% of the Texas population experienced. Lindo et al. estimate no further
reductions in abortions due to distance increases beyond 291 miles, but this also is largely out-of-sample in Texas during the period they analyze. In adapting the Lindo et al. estimates to predicting the effects of post-Roe world, we adopt a conservative approach, assuming that any increases in distance beyond 291 miles have no effects on abortion rates. Hence, the formula we use to predict changes in county resident abortion rates due to an increase in distance from $D_0$ to $D_1$ (measured in hundreds of miles) is

\[
\% \Delta \text{abortions}_c = 
\begin{cases} 
100 \left[ \exp \left( -0.427 (D_{c,1} - D_{c,0}) + 0.073 (D_{c,1}^2 - D_{c,0}^2) \right) - 1 \right] & \text{if } D_{c,1} \leq 2.91, D_{c,0} \leq 2.91 \\
100 \left[ \exp \left( -0.427 (2.91 - D_{c,0}) + 0.073 (2.91^2 - D_{c,0}^2) \right) - 1 \right] & \text{if } D_{c,1} > 2.91, D_{c,0} \leq 2.91 \\
0 & \text{if } D_{c,0} > 2.91
\end{cases}
\]

We calculate standard errors using the delta method.

To aggregate these county-level predictions to average percent changes at the state, regional, or national level, we would ideally apply county-level resident abortion counts as weights. However, this information is not available for the entire country. Hence, we adopt an alternative strategy that weights by the population of women aged 15-44 [6] to estimate the aggregate percent change in abortions in a given region $r$:

\[
\% \Delta \text{abortions}_r = \sum_{c \in r} \left( \frac{\text{pop}_c}{\text{pop}_r} \right) \% \Delta \text{abortions}_c
\]

where the weight $\left( \frac{\text{pop}_c}{\text{pop}_r} \right)$ is the fraction of region $r$’s residents that reside in county $c$.

This weighting approach inherently assumes that abortion rates are proportional to populations. However, observational evidence on abortion rates and the distance results in Lindo et al. [1] suggest abortion rates are greater in urban areas with larger populations and lower travel distances. We estimate the greatest percent declines in abortions in urban areas, but likely
underweight them in our aggregation procedure. This is a second reason—in addition to the assumption that increases beyond 291 miles have no additional effect—that our estimated effects are likely to be conservative.
REFERENCES


Figure A1: Predicted decline in abortions due to increased travel distances from a base level of 0 miles

Estimates based on Lindo et al. (2018). Dashed gray lines represent 95% confidence intervals.
Figure A2: Predicted decline in abortions due to increased travel distances, from a base level of 0 miles: Alternative estimates excluding Texas counties near the border with Mexico.

Estimates based on Lindo et al. (2018). Dashed lines represent 95% confidence intervals.