The Impact of Legal Abortion on Maternal Health: Looking to the Past to Inform the Present*

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Abstract: From 1959 to 1980, abortion-related mortality declined by 97%, and maternal mortality fell by 86%. In this study, we question whether the legalization of abortion over 1969-1973 explains a portion of this maternal mortality decline. Our results suggest that legal abortion reduced non-white maternal mortality by 30-40%, with little impact on overall or white maternal mortality. We also find that early state-level legalizations were crucial, and explain more of the observed mortality decline than the *Roe v. Wade* decision itself. Overall, our findings suggest that legal abortion substantially improved maternal health for disadvantaged groups.

JEL codes: I18, J13, K38, H75

Keywords: Abortion, legal abortion, maternal mortality, *Roe v. Wade*, maternal health

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1 Introduction

During the late 1960s and early 1970s, individual states began reforming and repealing their long-standing 1800s-era anti-abortion legislation.[1] Closely following these state-level reforms, in 1973, the Supreme Court handed down its landmark *Roe v. Wade* decision. The *Roe v. Wade* decision overturned restrictive state-level abortion laws, legalizing abortion nationally. The importance of legal abortion has been studied widely, with notable effects on family formation, fertility, crime, schooling, female labor force participation and other economic outcomes.[2] However, despite this broad literature studying legal abortion, fewer studies have considered the direct short-run health benefits on maternal health. While several studies have speculated over the importance of abortion for maternal mortality[3] (examining differential trends between states) few studies have considered the causal impact of legal abortion on maternal mortality.[4]

In this study, we consider whether the legalization of abortion is responsible for a portion of the substantial reduction in maternal and abortion-related mortality over 1959-1980. In 1960, abortion remained a major cause of maternal mortality (NCHS, 1960), with significant variation in access to safe abortion depending on class and race. In the early 1960s in New York City, "one in four childbirth-related deaths among white women was due to abortion; in comparison, abortion accounted for one in two childbirth-related deaths among nonwhite and Puerto Rican women" (Gold, 2003, pg. 10). And while abortions of the nineteenth and early twentieth-century had been quite dangerous, in 1973 when *Roe v. Wade* was decided, the Supreme Court itself noted that legal abortion "is now relatively safe" (Roe v Wade, 1973). In fact, the Court documents state that "mortality rates for women undergoing early abortions, where the procedure is legal, appear to be as low as or lower than the rates for normal childbirth" (Roe v Wade, 1973).

Based on the safety of legal abortion (relative to the illegal procedures of the past), we question whether legal abortion can explain the profound declines in maternal and abortion-

[1]See Gold (2003); Lahey (2014a,b); Myers (2021a).

[2]See Zabin et al. (1989); Angrist and Evans (1996); Levine et al. (1999); Donohue III and Levitt (2001); Kalist (2004); Guldi (2008); Foote and Goetz (2008); Donohue and Levitt (2008); Ananat and Hungerman (2012); Lahey (2014b); Myers (2017); Fischer et al. (2018); Jones et al. (2021); Lindo et al. (2020b).

[3]Studies include Cates et al. (1978); Bauman and Anderson (1980); Grossman and Jacobowitz (1981); Miller et al. (1988); Coble et al. (1992); CDC (1999); Krieger et al. (2015). Several studies also present evidence of fiscal and legislative changes restricting women's access to family planning and reproductive health services contributing to rising maternal mortality rates (Jarlenski et al., 2017; Hawkins et al., 2020; Verma and Scott, 2020; Addante A.N and M.H., 2021).

[4]Betancourt (2017); Clarke and Mühlrad (2021) examine the impact of abortion reforms in Mexico City on maternal/women's health.
We are also aware of the existence of an unpublished manuscript, Dow and Ronan (1997), that examines the impact of legal abortion on maternal mortality. However, we have been unable to track down a copy of this manuscript and cannot comment on the findings or empirical strategy included in Dow and Ronan (1997).

specific mortality from 1959 to 1980. Our primary analysis focuses on states that repealed their criminal abortion laws and provided legal abortion access, including five states plus the District of Columbia (DC), as well as the *Roe v. Wade* decision in 1973. Using an event-study design, we assess whether the changes to legal abortion impacted maternal and abortion-related mortality (and to what extent).[5]

Our results suggest that legal abortion reduced non-white abortion-related mortality by 30-60% and non-white maternal mortality by 30-40%. However, our main findings suggest little impact of legal abortion on white mortality (abortion-related or maternal). Instead, white abortion-related mortality appears to have been on a preexisting decline before national legalization. This pre-legalization decline aligns with historical narratives, suggesting that white women were better poised to navigate the medical system and obtain a therapeutic abortion (an abortion to prevent medical harm) before formal legalization (Law et al., 1989; Rubin, 1994). Women with more resources at their disposal were also able to travel cross-state and even overseas to obtain a legal abortion (Law et al., 1989; Rubin, 1994; Gold, 2003). For this reason, over "1972 to 1974, the mortality rate due to illegal abortion for nonwhite women was 12 times that for white women" (Gold, 2003, pg. 4). Put together, our findings indicate that legal abortion was crucial for non-white women, who struggled to obtain a safe abortion before the procedure was legal (Coble et al., 1992; Gold, 2003; Joyce et al., 2013; Solinger, 2017).

Then, we perform a battery of robustness checks, including accounting for spillovers, using *de facto* dates, considering the separate impact of *Roe v. Wade*, implementing a difference-in-differences specification, testing a Goodman-Bacon decomposition, addressing interactions of various state-level policies, and considering several sensitivity analyses (within the difference-in-differences). Within these robustness checks, we document one surprising result, the main mortality impact of legal abortion arises primarily from early legalizations. When we separately test the impact of *Roe v. Wade*, we find a less noticeable effect of the national decision.[6]

Together, our findings show that early legal abortion substantially improved maternal health for disadvantaged groups. These findings add to a broad literature studying the effects

[5] While we focus on full abortion legalizations (over 1970-1973), we also consider early reforms to the abortion criminal codes (over 1966-1972).

[6] Because we lack a never-treated group to compare *Roe v. Wade* states against–we use three different alternative methods. These specifications include using early-treated states as controls, considering year-over-year changes, and accounting for differential abortion demand.
We suspect that a combination of travel to early legal states and looser therapeutic abortion laws (allowing *de facto* access) led to mortality declines prior to the national *Roe v. Wade* decision, especially for white women. This hypothesis is supported by prior findings in Joyce et al. (2013) and narratives of the period, which suggest that many women traveled to obtain abortions. For instance, "in 1971, just over 100,000 women left their own state to obtain a legal abortion in New York City" (Gold, 2003, pg. 10). However, this inter-state travel was limited by economic means, where access was "really only available to the small proportion of women who were able to pay for the procedure plus the expense of travel and lodging" (Gold, 2003, pg. 4). A remaining limitation of our analysis is that we are unable to determine exactly *why* the *Roe v. Wade* decision was less important for mortality.

of access to fertility control through the pill (Goldin and Katz, 2002; Bailey, 2006, 2010; Bailey et al., 2012; Ananat and Hungerman, 2012; Zuppann, 2012; Steingrimsdottir, 2016; Myers, 2017) and legal abortion (Bitler and Zavodny, 2001; Hock et al., 2007; Oreffice, 2007; Guldi, 2008; Myers, 2017). Studies in this literature have also examined contemporary supply-side restrictions to abortion access (Fischer et al., 2018; Lindo et al., 2020a) as well as laws surrounding parental consent and notification requirements (Kane and Staiger, 1996; Levine, 2003; Klick and Stratmann, 2008; Sabia and Rees, 2013; Sabia and Anderson, 2016; Myers and Ladd, 2020); and mandatory waiting period requirements (Joyce et al., 1997; Lindo and Pineda-Torres, 2021; Myers, 2021b). One notable related study, Clarke and Mühlrad (2021), finds that decriminalization of abortion in Mexico City reduced maternal morbidity, with some evidence of declines in maternal mortality.

The present study also adds to the literature that has studied the maternal mortality declines over the 20th century (Thomasson and Treber, 2008; Jayachandran et al., 2010; Albanesi and Olivetti, 2014, 2016; Anderson et al., 2020b). The majority of this work has focused on pre-1940 maternal mortality declines, with our study being one of the few to consider the contribution of public policies past 1940. While our findings suggest that legal abortion played no direct role in reducing overall and white maternal mortality, legal abortion does appear essential for the non-white maternal mortality declines.

The remainder of this study proceeds as follows. Section 2 describes the background on maternal mortality and abortion laws in the United States. Section 3 describes the data used throughout the analysis. Section 5 presents the main findings for maternal mortality and abortion-related mortality. Section 6 tests several robustness checks on the event-study specification. Section 7 presents additional robustness checks within a difference-in-differences specification. Then, Section 8 examines delivery characteristics. Finally, Section 9 concludes.

2 Background

2.1 The 20th Century Maternal Mortality Decline

From 1900 to 1982, maternal mortality declined substantially. At the beginning of the twentieth century, between six and nine mothers died for every 1,000 births (CDC, 1999). By 1982, the U.S. maternal mortality rate had declined to 7.5 deaths per *100,000 live births* (Koonin et al., 1988). This 100-fold decline in maternal mortality over the course of 80 years has been attributed to several achievements in medical technology and public health. Examples of notable improvements in maternal mortality include better sanitary standards and regulatory reforms over 1900-1940 (CDC, 1999), such as the occupational licensing of midwives (Anderson et al., 2020b). Blood banks also improved survival from maternal hemorrhage (Albanesi and Olivetti, 2016). Though the most notable technological progress came in the form of sulfa drugs, which lowered the incidence of sepsis (Thomasson and Treber, 2008; Jayachandran et al., 2010). For a complete discussion of the maternal mortality decline before 1960, see Appendix Section D.

Declines in Maternal Mortality, 1960-1980 By 1960, the start of our study, maternal mortality had declined to 97.1 per 100,000 births for non-white mothers and 26 per 100,000 for white women (NCHS, 1960). 1960 was also the first year that maternal deaths were reported per 100,000 births, indicating a significant decline in the maternal mortality rate (NCHS, 1960). From 1960 to 1980, legal abortion has been suggested as a major contributor to the decline in maternal deaths, primarily from abortion-related sepsis (Coble et al., 1992; CDC, 1999). During the 1960s, when abortion was illegal, septic abortion remained common. One account from an obstetrician who practiced in New York and Pittsburgh before 1967 describes that the "complications of illegal abortion were so common that a septic ward was set aside for the infections. Surgery for hemorrhage was a common night duty" (Rubin, 1994, pg. 76).

As abortion became legal and available, septic abortions declined. Atrash et al. (1987) reports that deaths from legal abortion dropped "from 4.1 per 100,000 abortions in 1972 to 0.8 in 1982." Another study focused on a single medical center in California reported similar trends–while the number of legal abortions over 1966 to 1971 increased from zero to three thousand (per year), the number of septic abortions dropped from 646 to under 150 (per year) (Seward et al., 1973). Further, CDC (1999) reports that "the legalization of induced abortion beginning in the 1960s contributed to an 89% decline in deaths from illegal septic abortions during 1950-1973."

However, legal abortion was not the sole change during this period, and other potential drivers of the decline exist. For example, during the 1960s and 1970s, perinatal care was regionalized and specialized, which produced advancements in identifying and monitoring high-risk pregnancies (Cutler and Meara, 2000; Rowe and Rowe, 2000). Further, advancements in the method of inducing abortions also occurred. Between 1972 and 1981 vacuum aspiration replaced sharp curettage procedures (Kleinman and Senanayake, 1993; Rubin, 1994). This improvement in technology resulted in safer and less expensive abortions (Kleinman and Senanayake, 1993). These factors combined likely led to the profound reduction in maternal mortality over 1960-1980.[7] The passage of the Civil Rights Act in 1964 and the onset of federal hospital desegregation campaigns are also conceivably important drivers of the decline

[7]The pill was another major innovation over this period, we explore the impact of the pill in robustness checks (see B.3 and Tables B.4).

in maternal mortality post-1960s.[8]

By the 1980s, abortion was no longer a major cause of maternal death (Lawson et al., 1994), a notable change from earlier decades. The leading causes of maternal death had shifted to "embolism, indirect causes, hypertension in pregnancy, sequelae from ectopic pregnancy, hemorrhage, stroke, and anesthesia-related complications" (Koonin et al., 1988), with abortion and sepsis from abortion notably absent. By 1982, maternal mortality reached its lowest point and held steady at 7.5 maternal deaths per 100,000 live births (Koonin et al., 1988). Since 1982, maternal mortality has not continued to decline (CDC, 1998, 1999).

2.2 A Brief History of Abortion Laws in the United States

Abortion at the founding of the United States was legal until quickening (the first fetal movement felt by the mother) (Roe v Wade, 1973; Law et al., 1989; Rubin, 1994). This focus on abortion only until quickening was a practice based on English common law (Mohr, 1979; Gold, 2003). After quickening, abortion was considered a criminal offense (Mohr, 1979; Gold, 2003; Lahey, 2014a). The 1830s and 1840s brought the first U.S. laws regulating abortion. The new laws restricting abortion started as medical malpractice laws that targeted abortion practitioners instead of the mothers (Rubin, 1994; Lahey, 2014a,b). Connecticut was the first state to pass an anti-abortion law, and "made it a crime to give a poisonous substance to a woman in order to cause a miscarriage" (Rubin, 1994, pg. 2). States that followed over the early 1800s passed "anti-poisoning statutes" (Law et al., 1989, pg. 66) and it became a crime to "administer such remedies" (Law et al., 1989, pg. 66).

As the 1800s progressed, state regulation became more stringent so that by the 1860s, many states were actively outlawing abortion (Mohr, 1979; Lahey, 2014a). Still, over the nineteenth century, abortion was common enough that performing "abortions became one of the first specialties in American medical history" (Law et al., 1989, pg. 63). But as the American Medical Association (AMA) grew in influence, physicians attempted to distinguish themselves from non-physician providers (Mohr, 1979; Lahey, 2014a). Thus, the AMA became the "single most important factor in altering the legal policies towards abortions in this country" (Law et al., 1989, pg. 63).

State laws outlawing abortion spanned 1840 to 1899, with women facing potential prosecution for obtaining an abortion (Mohr, 1979; Lahey, 2014a,b). As these criminal abortion laws went into effect, the years spanning 1880 to 1960 were "labeled 'the silent decades"' for

[8]While there was a noticeable upturn in hospital births among black mothers post-1965 (Chay and Greenstone, 2000); Anderson et al. (2020a) found little evidence of the federal hospital desegregation campaign appreciably accelerating the trend towards in-hospital births among Southern Black mothers or significantly explaining the decline in black maternal mortality.

abortion (Rubin, 1994, pg. 2). During this period, abortion was forced underground and ill-reported in public records. However, a substantial number of abortions still occurred, with some estimates suggesting as many as "one million illegal abortions a year" (Rubin, 1994, pg. 2). In fact, in 1871 NYC, the city's population of less than a million " supported two hundred full-time abortionists, not including doctors who sometimes performed abortions" (Law et al., 1989, pg. 64). The legal restrictions on abortion, "did not stop abortion, but made it furtive, humiliating, and dangerous" (Law et al., 1989, pg. 66).

Abortion remained a crime in state legal statutes until the 1960s (Gold, 2003; Myers, 2021a). In 1967, abortion was a felony in the 49 states and DC (Lewis et al., 1981), with 42 states having legal exceptions to preserve the mother's life, and the remaining states having somewhat looser language, enabling doctors and courts more scope for the application of abortion (Lewis et al., 1981).[9] States began reforming and repealing their anti-abortion legislation in the mid-to-late 1960s (see Table E.1 and E.2). The repeal (early-legal) states removed their criminal abortion laws and passed clear legal abortion over 1969-1971, the period just before the *Roe v. Wade* decision. Repeal states made explicit that the decision to obtain an abortion was a matter for the woman in consultation with her physician (Roemer, 1971). Repeal states include California in 1969 and Alaska, Hawaii, New York, and Washington in 1970 (Roemer, 1971; Merz et al., 1996; Myers, 2021a).[10] The District of Columbia also allowed legal abortion beginning in 1971 (based on a court case), with formal abortion outpatient clinics available prior to *Roe v. Wade* (CDC, 1972; Myers, 2021a).[11]

In addition to the broad legalizations, states also reformed their legal abortion code over the 1960s and 1970s (see Table E.2). The first state to pass an abortion reform was Mississippi in 1966. However, Mississippi passed a relatively weak reform, and only legalized abortion in the case of rape (Merz et al., 1996). Two other states, Vermont and New Jersey, had court rulings overturning their abortion laws in 1972. However, these states had less clear allowances for legal abortion after the court rulings. We code these court rulings in New Jersey and Vermont as abortion reforms. We also omit New Jersey and Vermont in the robustness checks (see Section 6.1 and Section 7).[12]

[9] Other States allowed abortion to save a woman from "serious and permanent bodily injury" or her "life and health." Three States allowed abortions that were not "unlawfully performed" or that were not "without lawful justification", leaving interpretation of those standards to the courts'. (Lewis et al., 1981, pg. 2).

[10] Viewpoints differ on whether California repealed its then existing anti-abortion laws in 1969 or 1970. To address this, we consider an alternate coding of the year to be 1970 in the difference-in-differences results in Section 7.

[11] DC had the second-highest abortion to live birth ratio in the 1970, as reported by place of occurrence in CDC (1970). 1970's data is based on voluntary information from all but two hospitals in DC (CDC (1970) Table 2).

[12] Including or excluding Vermont and New Jersey from the results, or including them as repeal states has little impact on the takeaways from the main results.
For New Jersey, the US District Court ruled that the New Jersey statute violated the 1st, 9th, and 14th Amendments (CDC (1972) Table 22). According to Myers (2021a) at least one physician began performing abortions publicly in 1972, which could be important for mortality declines.
For Vermont, the Vermont Supreme Court ruled that the law in place only to allow abortion to save the life

Thirteen other states also adopted provisions from the Model Penal Code (MPC).[13] MPC provisions decriminalized abortion procedures in cases of (Merz et al., 1996; Roemer, 1971):[14]

1. A pregnancy threatening the mother's physical or mental health
2. When a fetus had a serious defect (physical or mental)
3. A pregnancy that occurred due to rape or incest

Then, after these early reforms and early legalizations, the *Roe v. Wade* decision overturned restrictive abortion laws, legalizing abortion throughout the United States on January 22, 1973.

2.3 Abortion in the 1970s

Women were able to obtain abortions before national legalization through illegal abortion, travel to legal states, international travel, and by appealing to physicians (in their own residence state) for a therapeutic abortion. The distribution of access was described in one account (by an individual based in Massachusetts) as, "*forty percent of those women in the pre-New York era went to London and had abortions there. Ten percent decided to continue with their pregnancy or had no option but to continue with their pregnancy. Ten percent got abortions under therapeutic laws that were beginning to loosen up in Massachusetts, California and Washington, D.C., although it cost more to go to California than it did to fly to London. Forty percent of that caseload went illegally or, as people say euphemistically, extra legally*"' (Rubin, 1994, pg. 50).

International travel in the pre-legalization era also appears to have been available to those with financial resources. Women traveled to London, Japan, Sweden, and in other cases, to Mexico (Rubin, 1994, pg. 50). In the years before abortion became legal in London (in 1968), a Massachusetts Planned Parenthood directly referred women to Japan. This referral process opened "*a flood gate of people who felt that they could somehow manage $800 and who came to Planned Parenthood for help and information.*" However, this access was only available for those with financial resources, as suggested by the same account, which goes on to describe, "*even more frustrating, the ones who when you said $800, sat there in utter silence and bewilderment, with tears in their eyes because there was nothing they could do. These were the people who went back out of that office and started the hunt for classic illegal abortions*" (Rubin, 1994, pg. 50). Further, women with economic means were able to obtain legal and therapeutic abortions, with private hospitals performing more abortions than public hospitals (Calderone, 1960). These historical accounts suggest that pre-legalization, safe abortion access was divided by socioeconomic status, with many women (likely to be white) having access to therapeutic

of the mother was discriminatory, and the law should be broadened (CDC (1972) Table 22).

[13]These MPC statutes were proposed in 1962 by American Law Institute (ALI) in the publication "Model Penal Code on Abortion."

[14]When performed by a licensed physician (Merz et al., 1996; Roemer, 1971).

abortion in the United States or legal abortion overseas.

In 1969, the Centers for Disease Control and Prevention (CDC) began separately compiling, analyzing and disseminating statistics on legal abortion from each reporting area throughout the United States in the form of periodic surveillance reports, under the Abortion Surveillance Program (Smith and Bourne, 1973; Cates et al., 1977). By 1972, the abortion surveillance program included data from 20 states (plus DC) with state-wide abortion data, as well as abortion data from single hospitals in eight non-reporting states (CDC, 1972).[15] An important relevant limitation of the data from the CDC abortion surveillance reports is that it does not span the nation, and thus, may depict incomplete and undercounted information (Koonin et al., 1993; Henshaw and Feivelson, 2000; Kortsmit et al., 2020; Myers, 2021b).[16] Still, this data provides the best historical picture of abortions occurring in the early 1970s. We digitize this CDC abortion surveillance program data to demonstrate that in the years before *Roe v. Wade*, abortion was still quite prevalent.

In 1972 there were 586,760 known cases of legal abortion (versus 1,864,064 births) in 27 states and DC, and the legal abortion to live birth ratio was 0.18 (CDC, 1972).[17] As shown in Panel A of Figure I abortions per reproductive-age female were highest in repeal (fully legal) states (both before and after *Roe v. Wade*). While abortion rates were more similar between reform states and states that never adopted any legal changes, reform states had slightly higher abortion rates. States without repeals or reforms also had the highest share of abortion occurring outside of the women's state of residence (as demonstrated by the dashed line in the darkest shade of blue in Figure I). In 1972, just before *Roe v. Wade*, 43% of all abortions occurred outside the individual's state of residence (CDC, 1972). The prominence of out-of-state abortions is also demonstrated clearly by the 1972 abortion counts by the known state of residence shown in Figure II.[18]

[15]Reporting states with legal abortion include: Alaska, California, District of Columbia, Hawaii, New York, and Washington. Reporting States with abortion reforms include Arkansas, Colorado, Delaware, Georgia, Florida, Kansas, Maryland, North Carolina, Oregon, South Carolina, Virginia, Vermont, and Mississippi. Other reporting states include Massachusetts. Single hospitals reporting include Alabama, Arizona, Connecticut, Nebraska, New Mexico, Pennsylvania, Tennessee, and Wisconsin.

[16]The CDC abortion surveillance program, by design, relies on the voluntary cooperation of the state and local health departments to report the data on legal induced abortions (Smith and Bourne, 1973). This leaves scope for a wide range of variation in the reporting mechanism - some states may choose not to survey or report abortions, while some states may not require all abortion providers to report data, leading to underreporting (Saul, 1998).

[17]The data on legal abortions is reported by place of occurrence as shared by state health departments or one or more hospitals in a state.

[18]New York City and the District of Columbia had the highest ratio of abortion to live births. In New York City, there were 299,891 abortions versus 253,439 live births, a ratio of 1.2 abortions to live birth (CDC (1972) Table 2). In the District of Columbia, there were 38,868 abortions to 21,5793 births, a ratio of 1.8 abortions per live birth (CDC (1972) Table 2). These high volume cities also performed a high percentage of out-of-state abortions, 61.2% in the case of New York City, and 74.5% in the case of the District of Columbia (CDC (1972) Table 4).

Then, in 1973, the year of the *Roe v. Wade* decision, the abortion rate gradually increased in all states (Figure I). The number of legal abortions reported by the CDC increased to 616,000 in 1973 (in all 50 states and DC). By 1974, there were 763,476 legal abortions per year. By 1979, 1,251,921 legal abortions were performed in the United States (CDC, 2011)–an abortion to live birth ratio of 0.35. The fact that almost one abortion occurred for every three live births by 1979 suggests that abortion was an important fertility control method over this period.

3 Data

3.1 Maternal and Abortion-Related Mortality

We use the Mortality Data from the Vital Statistics *National Center for Health Statistics Multiple Cause of Death Files* available through the *Centers for Disease Control and Prevention (CDC)* and the *National Bureau of Economics (NBER)* to calculate mortality rates. The mortality data includes all deaths in the United States from multiple causes of death. These national records incorporate the information from the death certificates of each U.S. state beginning in 1959 and continuing to the present. However, we conclude our study in 1980, seven years after the *Roe v. Wade* decision.

For maternal and abortion-related mortality, we rely on the primary noted underlying cause of death (ucod). In Section E.1, we discuss each of the individual causes included in maternal and abortion-related deaths. In addition to the broad measure of maternal causes of death and the specific abortion-related causes of death, we also include a medium measure of plausibly abortion-related deaths. This broader classification of abortion-related deaths accounts for any potential misclassification of abortion-related deaths into general maternal deaths. We view potential misclassification as more plausible under illegal abortion as physicians may be less likely to categorize abortion-related deaths and women may be less likely to report an attempt to procure an abortion (Cates et al., 1978; Shah and Åhman, 2009).[19] Thus, causes of death from illegal abortions or self-induced abortions, may be more likely to be coded under general pregnancy-related deaths. To account for this potential issue, we reclassify abortion deaths from the general categories of maternal death most likely to be miscategorized. These categories include pregnancy/postpartum sepsis, hemorrhage, and ectopic pregnancies (Meyer and Buescher, 1994; Walker et al., 2004; Hansen, 2010). In the results, we report all-cause maternal mortality, narrow abortion-related mortality (based on the ICD codes for abortion-related deaths), and broad abortion-related mortality (with the recategorized sepsis, hemorrhage, and ectopic pregnancies plus the narrow abortion-related deaths).

[19] Cates and Rochat (1976) suggests, deaths from causes relating to illegal procedures were, on average, more likely to be that of non-white women.

To calculate mortality rates, we use the number of maternal deaths and abortion deaths per 100,000 females aged 15-44. For non-white and white mortality, we use the measures per 100,000 white and non-white reproductive-age females, those between 15 and 44. We choose per female instead of the traditional measure of per birth because abortion legalization also may affect the fertility rate (which we demonstrate in Appendix Section I, but this is also supported by Roht et al. (1974); Ananat et al. (2007); Levine and Staiger (2004); Guldi (2008)). Moreover, as highlighted by Roht et al. (1974) and Clarke and Mühlrad (2021) *per live birth* denominator does not fully capture the risk associated with conception and all of its possible terminations.

Figures I (Panel B) and A.1 demonstrate the declines in maternal and abortion-related mortality for the study period (1959-1980). Figure I Panel B presents the decline in narrowly-defined abortion-related mortality grouped by state-level legal changes. The rightmost graph illustrates that repeal states had the largest declines in abortion-related mortality over the study period. The vertical dashed lines (in red) in the sets of graphs in Figure I mark the years of first reform to anti-abortion legislation, first complete legalization by repeal states, and national legalization by *Roe v. Wade*, respectively. The most precipitous decline in abortion-related mortality occurred between 1969 and 1973 when states began to legalize abortion. For non-white women, after 1970, there is a clear break in the abortion-related mortality series, with most of the observed decline occurring before 1973, the year of the *Roe v. Wade* decision.

Then, in Figure A.1 we show the substantial nationwide reductions in both abortion-related and all-cause maternal deaths over 1959-1980. As depicted in Panel A, the most significant drop in maternal mortality occurs for non-white mothers, where maternal deaths fall from 15.6 per 100,000 to 1.7 per 100,000 or an 89% reduction. In Panel B, we see abortion-related mortality for non-white women falls from 3.4 deaths to 0.12 deaths per 100,000 reproductive-age females, a 96% reduction.[20]

3.2 Population Data and Policy Controls

For population data covering the state-level size of the population, the number of births, and additional controls, we add several other data files. First, we obtain the state-level population composition and income measures from the U.S. Census data for the years 1950 to 1990.[21]

[20] To show the general decline in the counts or number of abortion deaths, we plot abortion deaths per year in Figure A.2 and show the number of abortion deaths by age and year in Figure A.3. Figure A.3 shows that despite the importance of abortion for young women's fertility, abortion deaths appear normally distributed by age. The composition does not appear disproportionately driven by young or older women. Both figures illustrate the profound reduction in the number of abortion deaths over time, falling from a high of 324 deaths per year in 1961 to a low of 13 deaths per year.

[21] We linearly interpolate the years between census decades to form annual estimates. Data available from IPUMs data (Ruggles et al., 2021).

We combine the population composition data from the Census with state totals from Wolfers (2006) to obtain the total number of reproductive-age females (all, white, and non-white). We also add births from the *US County-Level Natality and Mortality Data, 1915-2007* from Bailey et al. (2016). Here we aggregate births to the state level from the county level. Because there are some missing observations for Alaska and Hawaii in particular, we add data from the Natality Detailed File (NCHS, 1968-1980).

We also include a number of state-level policy controls due to several changes in family and fertility control policies. First, we control for the passage of unilateral divorce, which may affect family dissolutions (dates are taken from Wolfers (2006)). Second, we control for general access to the pill and access to the pill by minors (Bailey, 2006; Myers, 2021a),[22] which may affect pregnancy and fertility. Finally, we control for state-level equal pay laws with dates from Myers (2017).

3.3 Summary Statistics

Table 1 shows the summary statistics for our primary measures of mortality and the controls. We separate states into those without early-legal changes (only treated by the *Roe v. Wade* decision), those with early abortion reforms, and states that repealed their anti-abortion legislation. All mortality measures are displayed per 100,000 reproductive-age females, including all-cause maternal mortality, broad abortion-related mortality, and narrow abortion-related mortality.

Table 1 suggests differential state-level characteristics by legal access to abortion. Non-white maternal mortality is highest in states that reformed their abortion laws (rather than completely legalized), while non-white abortion-related mortality is highest in early-legal states (before national legalization). Repeal (early-legal) states also differ in other characteristics, including having the largest state-level population and the highest incomes.

4 Empirical Strategy

We primarily rely on an event-study design to consider the impact of legal abortion on maternal mortality and abortion-specific maternal mortality. We prefer the event study to other approaches, such as a difference-in-differences specification, for four reasons (see Section 7 for the difference-in-differences results). First, the event study directly tests whether mortality rates follow pre-existing trends (or pre-trends) leading up to the passage of legal

[22] Specific dates are from Myers (2021a).

abortion. Testing for pre-existing declines in mortality is essential to directly test in our context for two reasons. First, maternal and abortion mortality were already following secular declines before the enactment of legal abortion. Second, changes in mortality may have been correlated with the passage of legal abortion (see Section G for a formal test of this possibility). The event study directly visualizes whether the state and year fixed effects eliminate these trends.

Second, and related to the first point, the event study enables us to observe whether there is a clear break in mortality with the passage of legal abortion. The difference-in-differences specification provides a single point estimate, reflecting the average impact over the post-period, but reveals little about how clear and immediate the impact of legal abortion is. Third, the event study allows us to consider whether the treatment effect varies after the passage of legal abortion (Wolfers, 2006; Goodman-Bacon, 2021). As compared with a single grouped post-period from the difference-in-differences specification, the event study tracks the evolution of outcomes over the post-period. Tracking the evolution of the treatment effect helps to alleviate concerns over time-varying treatment effects biasing the observed impact of legal abortion.

Fourth, the canonical two-way fixed effects estimator has the potential to make improper comparisons between treated groups (e.g., already-treated groups acting as controls). These unclear comparisons may produce estimates outside of the bounds of the true treatment effect (Sun and Abraham, 2020; Callaway and Sant'Anna, 2020; Goodman-Bacon, 2021). Thus, to account for the issues with the canonical TWFE estimator, we present an alternative to two-way fixed effects throughout the findings. We choose to test the Interaction-Weighted (IW) estimator from Sun and Abraham (2020) as our alternative estimator. However, since we lack a never-treated group, we use the last-treated group as the comparison group in the IW specification.[23]

More formally, we estimate the following equation:

$$\text{Mortality}_{st} = \alpha + \sum_{m=-7}^{6} \beta_m \text{ Legal Abortion}_{sm} + \mathbf{X}'_{st}\gamma + a_s + \eta_t + \epsilon_{st} \tag{1}$$

where Mortality_{st} reflects the mortality rate in state s during year $t = 1959, \ldots, 1980$. As is common in the literature (e.g., Jayachandran et al. (2010); Alsan and Goldin (2019); Anderson et al. (2020b)), we would prefer to measure the proportional changes in mortality, rather

[23] Sun and Abraham (2020) demonstrates that TWFE event studies can reveal (spurious) pre-trends due to contamination from the post-treatment dummy variables. Sun and Abraham (2020) calculates the cohort-specific dynamic effect and then computes the average cohort effect or the "cohort- specific average treatment effects on the treated" (Sun and Abraham, 2020; Baker et al., 2021) . Baker et al. (2021) show that Sun and Abraham's IW estimator performs similarly to Callaway and Sant'Anna (2020).

than the linear changes. Thus, ideally we would take the natural log of the mortality rate.[24] However, in our setting, maternal and abortion-related mortality each include zeros, and to maintain the zero observations we rely on the inverse hyperbolic sine of the mortality rate.[25] Still, we demonstrate in Section F that our general conclusions hold if we use the log of mortality plus one or the log of mortality (though we lose data, especially with abortion deaths) as well as in a Poisson model (with linear mortality counts). For our main measures of mortality, we use the number of maternal and abortion-specific deaths per 100,000 reproductive-age females, those between 15 and 44. We choose the mortality rate per reproductive-age female, as legal abortion has been shown to affect the birth rate (Guldi, 2008), a fact we also demonstrate in Section I.

The passage of legal abortion is captured by the indicator variables Legal Abortion$_{sm}$. Legal Abortion$_{sm}$ represents the state-level passage of legal abortion in state s during period $m = 0$, where m ranges from seven years before to six years after legalization. More formally, m represents the difference between the observation year (t) and the year legal abortion went into effect (T), where $m = t - T$. The main impact of legal abortion (our 'treatment' effect) is captured by the six post-treatment dummy variables, $m = 0, 1, ..., 6$, which are relative to the pre-legalization year, $m = -1$.

As all states eventually legalized abortion, we lack a never-treated comparison group. To address the lack of a proper control group, we take two approaches. First, in the main TWFE specification, we must either omit two pre-periods or bin the endpoints to avoid collinearity (Borusyak et al., 2018; Schmidheiny and Siegloch, 2020). In the TWFE specification, we choose to bin the left endpoint at $m = -7$ and bin the right endpoint at $m = 6$. Binning, as opposed to excluding two pre-treatment periods, allows us to capture the effect of legal abortion extrapolated from the secular linear trend in maternal (and abortion-related) mortality over our study period (Schmidheiny and Siegloch, 2020).[26] Second, we use the IW specification to compare the effect of early-legalizations relative to the last-treated cohort, *Roe v. Wade* states. Because the IW specification provides a control cohort (the last-treated group), in the IW specification, we leave the event-study fully saturated (unbinned).

[24]Using the log of mortality instead of linear rates, captures the proportional decline in mortality associated with legal abortion. If a linear specification of mortality is implemented, the declines in mortality associated with legal abortion will need to be similar across states in each year after legal abortion passes, instead of the proportional change (based on original levels of mortality).
Further, as shown in Figure F.1 the log distribution and inverse hyperbolic sine distribution normalize the skewed distribution of linear rates.

[25]The inverse hyperbolic sine produces results that approximate the natural log of mortality while maintaining zero observations (Bellemare and Wichman, 2020). The inverse hyperbolic sine has the advantage of including zeros, and is potentially preferred to more crude measures of including zeros, such as taking the natural logarithm of mortality plus a constant. Though we show both the direct natural log and the log of mortality plus one in Appendix Section F.

[26]We have also performed the analysis using -4 and -1 as reference groups and the findings are similar to the binning, the main impact appears to be for non-white women, with pre-trends for white and potentially overall mortality.

$\mathbf{X}_{st}$ contains state-level controls. The main set of state-level demographic controls includes the share of reproductive-age females 15-19 who are white, the share of reproductive age females who are non-white, and the log of the mean family income. We choose these controls to account for state-level differences in the risk and demand for an abortion. We include family income as a control to address socioeconomic status by state. We avoid including controls for the share married, the reproductive-age income, the population under five, and education level of reproductive-age females as these controls may be affected by abortion itself (e.g., based on the findings in Myers (2017) and Guldi (2008) these would be "bad controls" (Angrist and Pischke, 2008)).

We also control for several policies that coincided with legal abortion over this period. First, we control for states that passed pre-legalization abortion reforms. Because the legalization of abortion is fundamentally different than the MPC abortion reforms, we focus on full legalization while controlling for other abortion reforms (similar to Myers (2017)). However, in subsequent results, we directly test the effect of either passing legal abortion or an abortion reform and find only minimal impacts of legal changes that were not direct legalizations (see Section 7 and Figure C.2). Second, we control for the passage of unilateral divorce, which may affect family dissolutions. Third, we control for general access to the pill and access to the pill by minors. Access to the pill may affect who becomes pregnant during the period. Fourth, we control for equal pay laws, which may affect women's income and labor supply.

Finally, α_s accounts for the state fixed effects or time-invariant state characteristics. η_t captures the year fixed effects. ϵ_{ijst} is the regression error. We cluster the standard errors at the state level. All regressions are weighted by the denominator of the rate, which is reproductive-age females for the main specification. We choose to weight the regressions so that the estimates reflect the size of the population impacted by the legal framework. In the robustness checks, we also report the unweighted results (see Section 7).

4.1 Potential Threats to Validity.

There are two main potential threats to our primary specification that are worth outlining upfront. First, we assume that the timing of legal abortion is exogenous. Violation of this assumption would be particularly relevant if states with the worst mortality conditions uniformly adopted early legal abortion. If this were the case, early-adopting states might have converged to the average level of mortality without ever passing legal abortion. Thus, in Appendix Section G, we test whether abortion mortality and maternal mortality predict the adoption of legal abortion in a Cox proportional hazard model. The results suggest that mortality does not significantly predict the timing of adoption.

Second, our empirical strategy also assumes that timing of legal abortion is not correlated with other public policies that might affect mortality. As outlined above, legal abortion occurred during a time of enormous social change, where a number of other policies were adopted. In addition to directly controlling for these policies in the main specification, we also test the interaction of these policies and legal abortion in Section 7. In the case that these policies directly impact abortion or maternal mortality, we should see an interacting impact of these alternative policies and legal abortion.

5 Main Results

We begin by testing whether legal abortion affects maternal mortality or abortion-specific mortality in an event-study design. Figure III presents maternal mortality in green (left graphs), broad abortion-related mortality in blue (middle graphs), and narrow abortion-related mortality in purple (right graphs). In each graph, the plotted diamonds/circles/squares connected by solid lines reflect point estimates, and the dashed lines reflect the 95% confidence intervals. The vertical line indicates the excluded period, $m = -1$. The graphs show the coefficients from both a canonical two-way fixed effects (TWFE) estimation of Equation 1 and an Interaction-Weighted (IW) estimator from Sun and Abraham (2020). Each plotted point estimate leading up to the change in legal abortion (at time $t = 0$) represents the evolution of mortality over the pre-legalization time frame. Post-periods represent the mortality response in each year following the passage of legal abortion (at time $t = 0$). In the IW specification, the early-treated cohorts are compared against states that were treated by the passage of *Roe v. Wade*, and to avoid improper comparisons between treated and already-treated, for the IW specification, we only estimate the effect over the years leading up to *Roe v. Wade* (1973 and beforehand). We also only show the coefficients in the main event window, even though the TWFE specification includes the binned endpoints $m = -7$ and $m = 6$ and the IW specification is fully saturated.

Beginning with maternal mortality (green, left graphs), only non-white maternal mortality declines after abortion legalization, with slightly more noticeable declines in the TWFE specification. In the TWFE specification, the decline in non-white maternal mortality appears consistently statistically significant at the 5% level until the last post-period, and also shows a relatively flat pre-period. For overall maternal mortality, there is a slight dip in period two, but the confidence intervals include zero again beginning three years after legalization. Finally, white maternal mortality fails to show any evident decline after legalization.

Broad and narrow abortion-related mortality each show clear declines (in the center and right graphs of Figure III). However, the most apparent decline again appears for non-white women. Across both definitions of abortion-related mortality, there is a clear and significant decline in non-white abortion-related mortality. By contrast, the plotted points for white abortion-related mortality suggest evidence of a preexisting decline before formal legalization. While the TWFE specification for white abortion-related mortality does show a post-period reduction, this decline appears inextricable from the pre-legalization trend. In the IW specification, white abortion-related mortality fails to show a clear significant drop post-legalization.

The results in Figure III reveal both all-cause maternal and abortion-related maternal mortality decline primarily for non-white women. To interpret the size of the reduction, we must transform the coefficients into percentage-change effects (see Bellemare and Wichman (2020), Equation (12)). The percentage reductions in mortality are displayed in Table B.1 and B.2. For the main effect on non-white maternal mortality, beginning one year after legalization, legal abortion reduces non-white maternal mortality by 30-40%. For broad non-white abortion-related mortality, the reduction is 15-56%. For the narrowest definition of non-white abortion-related mortality, the reduction is 30-60%.

The importance of legal abortion for non-white maternal and abortion-related mortality aligns with the historical narratives of the time, indicating that poor and non-white women faced the most significant hurdles to obtaining abortions before legalization. Physicians (particularly those in public hospitals) "saw women who needlessly suffered and died as a consequence of illegal abortion" (Rubin, 1994, pg. 71) with these physicians "disturbed that most of those women were poor and black" (Rubin, 1994, pg. 71). Another account describes, "in the first half of the twentieth century, a two-tiered abortion system emerged in which service depended on the class, race, age and residence of the woman. Poor and rural women obtained illegal abortions, performed by people, physicians and others, who were willing to defy the law out of sympathy for the woman or for the fee. More privileged women steadily pressed physicians for legal abortions and many obtained them" (Law et al., 1989, pg. 18).

These period-specific observations also suggest a potential explanation for why we observe a preexisting decline in white abortion-related mortality. White and more privileged women were more likely to obtain a therapeutic abortion or travel to early-legal states and international destinations before formal legalization (Joyce et al., 2013; Rubin, 1994). Therapeutic abortion, in particular, had a clear "class bias inherent in the psychiatric indications for therapeutic abortions" (Rubin, 1994, pg. 71). Thus, in the next section, we attempt to test whether white women experienced early-legal access through travel or early-*de facto* access through therapeutic abortions, which may have lowered mortality before full legalization.

6 Issues in Identifying the Effect of Abortion Legalization

We next perform several essential checks on the main findings. First, as described in the background section, women frequently traveled between states (and internationally) to obtain abortions (see Figure II). This early-legal access through travel may create beneficial spillovers to later-treated states, effectively lowering deaths from illegal abortion in the control group (states with criminal abortion legislation). Second, states began allowing abortions before full legalization through abortion reforms and therapeutic abortions. Thus, the state-level *de facto* date of abortion legalization may be more critical for improvements in mortality than the formal *de jure* legalizations. Third, we test a placebo test, and consider whether general medical progress is correlated with legal abortion. Fourth, because we primarily focus on early legalizations (1969-1971), we attempt to separate the effect of later legalizations (court-instituted through *Roe v. Wade*), which may have differential treatment effects.

6.1 Addressing Spillovers from Early-Legal States

First, we focus on whether early (voluntary) legalizations by the repeal states over the period 1969-1971 created spillovers that pollute our primary control group. Women frequently traveled to legal states, outside their state of residence, to obtain an abortion before *Roe v. Wade*. These states acted as hubs for women to obtain an abortion and may have produced regional declines in mortality that also affected abortion mortality in nearby states. To limit beneficial spillovers from early-legal states, we eliminate both (1) states within 500 miles of the primary early-legalization states (CA/NY/DC, Myers (2017)) and (2) states with early abortion reforms but not legalizations. Figure C.1 displays the findings removing the potential states affected by these spillovers. The results are similar to the baseline, where non-white mortality clearly declines while white mortality appears to be on a preexisting downward trend.

6.2 Early Abortion Reforms

In the primary analysis, we focus on legal abortion. However, before full legal abortion, some states had adopted abortion reforms, mostly through MPC provisions. In some cases, states with MPC reforms had higher abortion rates than even repeal (full legalization) states (Myers, 2017). Thus, we next explore the possibility that abortion reforms lowered mortality before abortion was legalized within each state. To test abortion reforms, we based the year of legalization on when the state adopted either an early MPC reform (plus Mississippi, Vermont, and New Jersey's reforms) or full legalization.

Figure C.2 shows a decline only in non-white maternal mortality in the IW specification.

There is a brief decline in abortion-related mortality, but the decline disappears after two years. This muted impact is not surprising. While certain reform states, such as Maryland, North Carolina, and Colorado, allowed a substantial number of legal abortions to occur, other states had relatively restrictive access. Thus, *on average* the impact in reform states (either due to doctors or lawmakers) appears weaker than the baseline findings.

6.3 *De Facto* Abortion Reforms

Even aside from MPC reforms, certain states allowed abortion to occur before the full formal legalization (see gray bars in Figure II). For example, Pennsylvania and Massachusetts allowed legal abortions to occur despite never adopting an MPC reform or legalization (as seen in the bottom part of Figure II). This observation opens up the possibility that early *de facto* (in practice) legalizations impacted mortality before the *de jure* legalizations took effect,[27] especially for white women, who may have had better access to therapeutic abortions.

To test whether *de facto* legalizations affected maternal mortality, we adjust the year of legalization to when states began to report a substantial number of legal abortions, as depicted in abortion ratio (abortions-to-live-births).[28] We use two different measures of *de facto* access, when states began reporting an abortion ratio of more than 0.15 (results shown in Figure C.3) and more than 0.10 (results in Figure C.4). The results are similar across each specification but slightly stronger in the specification using the abortion-to-live-birth ratio of 0.15.[29] These results suggest that widespread access to informal abortion reduces maternal mortality, both overall and non-white. However, compared to the baseline specification, non-white abortion-related mortality shows less of a decline over the post-period. The impact on maternal but not abortion-related mortality indicates that broader legal access may have indirectly influenced maternal mortality through changes to the characteristics of pregnant mothers, rather than only directly through abortion-related deaths.

[27]The importance of *de facto* dates has been shown previously in the divorce literature, where Hoehn-Velasco and Penglase (Forthcoming, 2021) find an impact of unilateral divorce primarily with *de facto* instead of *de jure* reforms.

[28]One limitation of the CDC abortion surveillance reports (source material for the data used here) is that legally induced abortions are reported by place of occurrence, and the data on birth and population are recorded by place of residence. Thus, the abortion-to-live-birth ratio might be inflated for states with higher legal abortions and underreported for states with restricted or no access to legal abortions (Gamble et al., 2008). The inflated abortion ratio are for states in which a high percentage of abortions are obtained by out-of-state residents, whereas the underestimation of abortion ratio happens for states whose residents frequently obtain abortions out of their state of residence, due to the higher access to and availabiity of legal and safe abortion in the earlier (Kortsmit et al., 2020). This observed phenomenon has two possible explanations in the historical context of the late 1960s and early 1970s - interstate travel, and *de facto* access.

[29]We censor the final year at 1974. Thus, in the IW specification, states that passed *de facto* reforms are compared against states that did not have a substantial number of abortions in 1973.

6.4 Placebo Test and Test for Misclassification

We then implement a placebo test to confirm our main findings. Over this period, general technological progress delivering medical advancements may have appeared first in major U.S. cities (NYC and DC), thereby being correlated with abortion legalizations. If this is the case, our main mortality decline would be spuriously correlated with legal abortion through the omitted variable of general medical progress. To test whether this concern is plausible, we consider the impact of legal abortion on all-cause male mortality for those aged 15 to 44. Legal abortion should have had no apparent effect on male mortality over this period. The results are presented on the left side of Figure C.5. As expected, the plotted points suggest little impact of legal abortion on all-cause male mortality for men aged 15-44.

In the same figure (right side), we also test the possibility that legal abortion may have impacted broader female mortality for those 15-44. A general impact on all-cause mortality for females could be possible if maternal mortality were a primary driver of female mortality during this period. Or if there were substantial misclassification of abortion-related deaths into other categories of death (especially early in pregnancy). The results in Figure C.5 suggest no general decline in overall all-cause mortality for women 15-44. These findings indicate that the declines in abortion-related deaths were not large enough to impact overall female mortality during the period, or instead, there were offsetting factors.

6.5 *Roe v. Wade* versus Early Legalizations

The baseline specification heavily relies on the sample of early-legalization states, especially in the IW specification, which reflects the effect of early legalizations relative to *Roe v. Wade*. In this section, we attempt to test the separate effect of *Roe v. Wade*.

Baseline Specification with Already-Treated States as Controls First, in Figure C.6 we compare the impact of *Roe v. Wade* to already-treated early-legalization states or states that legalized abortion in 1969 and 1970. For this specification, we use the TWFE estimator because there is no staggered treatment timing. We also limit the pre-period to only consider the period after early legalizations, 1970-1980.

The results in Figure C.6 show little impact of *Roe v. Wade*, with a flat post-period for all measures of mortality. While the plotted point estimates show no apparent impact, these results reflect an imperfect comparison. The few early-adopting states that serve as a control group may experience heterogeneous effects over their own post-period, making it difficult to gauge the parallel trends for *Roe vs. Wade* states.

Impact Based on Abortion Demand Second, due to the lack of a (never-treated) control group for the states affected by the national *Roe v. Wade* decision, we turn to an alternative specification to estimate the impact of *Roe v. Wade*. To address the challenge of measuring the impact of *Roe v. Wade* apart from the preexisting decline in abortion-related mortality, we assume that states with higher demand for illegal (or unsafe) abortion should experience a greater benefit from the legalization of abortion.[30] Formally, this specification appears as:

$$\text{Mortality}_{st} = \alpha + \phi_t \times \text{Illegal Abortion Demand}_s^{Pre} + \alpha_s + \eta_t + \epsilon_{st} \tag{2}$$

where we replace our staggered event study from Equation 1 with a pre-*Roe v. Wade* measure of abortion demand (Illegal Abortion Demand$_s^{Pre}$) interacted with year indicators (ϕ_t) for the years directly surrounding *Roe v. Wade*, 1967-1977.

Illegal Abortion Demand$_s^{Pre}$ is a fixed measure of demand for illegal (or unsafe) abortion from the pre-*Roe v. Wade* period. We proxy demand for an illegal/unsafe abortion using abortion-related deaths because we cannot observe illegal abortion counts. For our proxy, we take the abortion-related mortality from the year just before the first state-level change in abortion legislation (1965). This pre-reform mortality level captures the state-level demand for illegal abortions, as illegal abortions are presumed to be the main driver of high levels of abortion-related mortality. We use the 1965 mortality rate that is specific to each rate being considered. In other words, when we focus on non-white mortality, we use 1965 non-white abortion mortality. We then interact state-level demand for an unsafe abortion with year indicators, allowing us to test the before and after effect of *Roe v. Wade*. When we estimate Equation 2 we exclude the year just before *Roe v. Wade* ($\phi_{1972} \times$ Illegal Abortion Demand$_s^{Pre}$). Further, α_s accounts for the state fixed effects or time-invariant state characteristics. η_t captures the year fixed effects.

Figure IV plots the results. In this specification, we only include states that were treated by the *Roe v. Wade* decision and omit early-legalization states. Across all three measures of mortality, the plotted point estimates suggest little impact of *Roe v. Wade* on any measure of mortality.

Year-over-Year Changes in Mortality Third, we implement one final test of the impact of *Roe v. Wade* to ensure the benefit of the national change is not underestimated. We draw on recent related empirical strategies that compare year-over-year changes in settings where there is no control group (Leslie and Wilson, 2020; Hoehn-Velasco et al., 2021). In this case, we

[30] This follows related work such as Alpert et al. (2018) and Callison and Pesko (2020).

test whether mortality changed year-over-year in states affected by *Roe v. Wade* from 1972 to 1973, and in case 1973 is too preliminary to see a benefit, 1973 to 1974. This strategy effectively compares the latter year (1973 and 1974) to the former year (1972 and 1973), where the early years are used as the control group. Formally this appears as:

$$\text{Mortality}_{st} = \alpha + \beta \text{ Roe v. Wade}_{st} + \mathbf{X}'_{st}\gamma + \alpha_s + \epsilon_{st} \quad (3)$$

where all features of Equation 3 reflect Equation 4 except for the following. First, we limit the sample to two year-over-year specifications. In our primary specification, $t = 1972, 1973$. In this case, the dummy variable Roe v. Wade_{st} is equal to one in 1973 and zero in 1972.[31] Thus, Roe v. Wade_{st} captures the year-over-year change in mortality. We also modify the controls ($\mathbf{X}'_{st}$) to only include our main demographic controls as many of the policy controls fail to change over the two-year period. A primary concern with this specification is that we will overstate the benefits of *Roe v. Wade* due to existing secular trends in mortality. For this reason (the trend in mortality), we only include the two-year spans of data. We also limit the sample to *Roe v. Wade* states and exclude the five early legalization states plus DC.

The results are shown in Table B.5. Here the findings suggest no significant decline in any measure of mortality. While the coefficients are negative on non-white abortion-related mortality, the effect is insignificant. Thus, it appears that the majority of the significant declines in mortality occurred before *Roe v. Wade*, or outside of states treated by the national *Roe v. Wade* decision.

To put the pre-Roe decline into specific numbers–in 1959, abortion-related mortality was 0.78 per 100,000 reproductive-age females. Before any reforms or legalizations, in 1965, abortion-related mortality reached 0.59 per 100,000 reproductive-age females (nationally). However, by 1973 abortion-related mortality fell to 0.079. This decline represents a 90% reduction from the height of abortion-related mortality in 1959 and an 87% decline from 1965 (the period just before reforms began). Then, following the *Roe v. Wade* decision, abortion-related mortality hovered at 0.058 in 1974 and 0.056 in 1975. These facts illustrate that the majority of the decline in abortion deaths occurred before *Roe v. Wade*, and combined, help to explain why we observe little benefit of national legalization.

7 Difference-in-Differences

We next turn to a difference-in-difference specification to consider the impact of abortion legalization in a single grouped post-period. Within this alternative specification, we

[31] In case 1973 is too early to see a change, we also estimate the same equation over 1973-1974.

also show a number of different tests, including adding additional controls and subsetting to alternative treatment states. Formally, our difference-in-differences specification is expressed as:

$$\text{Mortality}_{st} = \alpha + \beta \text{ Legal Abortion}_{st} + \mathbf{X}'_{st}\gamma + \alpha_s + \eta_t + \epsilon_{st} \tag{4}$$

where Legal Abortion$_{st}$ captures the effect of legal abortion and includes both the early legalization of abortion in repeal states as well as the 1973 passage of Roe v. Wade. Legal Abortion$_{st}$ is a dummy variable that is equal to one in the year following the passage of a legal abortion law in state s and year t, and zero in the year the abortion law passed and beforehand. All other features of Equation 4 reflect Equation 1.

7.1 Difference-in-Differences Results

We plot the impact of abortion legalization (Legal Abortion$_{st}$ from Equation 4) in Figure V. Throughout Figure V we show both maternal mortality (left), broad abortion mortality (middle), and narrow abortion mortality (right) for all women (gray circles), white women (purple triangles), and non-white women (green squares). We plot the coefficients on legalization in a single graph to simultaneously display how our sensitivity analyses impact the main coefficient. However, we show the baseline findings in Tables B.3 and B.4 (see Column 1 and 5).

The general theme of the coefficients in Figure V indicates that abortion legalization consistently reduced non-white maternal mortality and all measures of abortion-related mortality. However, two caveats to this statement exist. First, in the results without weights, the coefficient on non-white maternal mortality becomes insignificant (though non-white abortion-related mortality still significantly falls). Second, white abortion-related mortality fails to significantly decline without weights. These findings without weights are not surprising, as California and New York are the main states treated by early-legal abortion. These states also have the largest population of non-white women. When we remove population weights, we are considering the average-state-level effect instead of the population-based effect. Combined with the lower average impact in *Roe v. Wade* states, which will compose a larger portion of the estimate when weights are removed, these findings suggest further evidence that the impact in *Roe v. Wade* states is relatively lower in magnitude. Though we further decompose the estimate in Section H without population weights (and without *Roe v. Wade* states).

The exact robustness checks included in Figure V are as follows. First, we show the specification with only fixed effects (no controls or trends). Then, we add controls, and in the third specification, the same results without weights. Then, we add trends to the baseline specification in the fourth set of results. Fifth, we add additional controls (e.g., AFDC benefits).[32] Sixth, we drop DC, then seventh, we omit NJ/VT, and eighth, we add controls for states neighboring legal abortion states. Ninth, we omit MPC states. Tenth, we adjust California to pass legal abortion in 1970 instead of 1969. Overall, these findings suggest that abortion legalization produced declines in non-white maternal mortality, and white and non-white abortion-related mortality (with the caveat noted above). However, the results suggest a less noticeable impact on white maternal mortality.

Then, we also show the results are robust to alternative functional forms. The natural log of mortality and the natural log of mortality plus one (shown in Figures F.3 and F.4). In addition, we present the impact of legal abortion using the linear mortality rates assuming a Poisson distribution in Section F.2, which show similar (if not slightly stronger) findings.

Finally, we break out the difference-in-difference results by age and by rural versus urban status in Figure C.7.[33] We show maternal and abortion-related mortality for those less than 20 (per female population 15-19), 20-29 (per female 20-29), 30-29 (per female 30-39), and over 40 (per female population 40-44). We strongly caution over-interpreting these findings, as abortion-related deaths are already close to zero in the 1970s. Thus, breaking our abortion-related deaths by age group (and race) may be problematic. Still, understanding the primary age group of benefit is crucial for maternal mortality in particular.

Figure C.7 shows the most apparent decline in non-white maternal mortality is for younger women, those under 30. For broad abortion mortality, the clearest drop in mortality is for those under 20. Narrow abortion mortality fails to show a significant decline, but the coefficients display the most apparent negative magnitude for the under-20 age group. These results indicate that the most significant benefit to legal abortion was for younger women, aligning with expectation.

7.2 Interaction of State-level Policies

Finally, in addition to the difference-in-differences results, to test whether our focus on abortion is misdirected away from other family and fertility policies, we also show the findings for interactions of state-level policies in Tables B.3 and B.4. In Column (1), we begin by

[32] Additional controls include AFDC benefits, from Jordan and Grossmann (2020) cigarette taxes from the Tobacco Institute's annual Tax Burden on Tobacco data (inflation-adjusted using CPI data from Bureau of Labor Statistics (2021), the state-level economic conditions measured by the unemployment rate from Cohen and Land (1999), and a binary variable capturing state-level access to public health insurance through initial Medicaid implementation (Boudreaux et al., 2016).

[33] For urban and rural, we use deaths that occurred in a city versus not in a city.

outlining our baseline difference-in-differences specification. In Column (2), we add an interaction with unilateral divorce and minor's access to the pill in Column (3). Then in Column (4) we show the additional controls.

The findings suggest little interacting impact of the state-level policies. Though, there is some interaction between maternal mortality and minor's access to the pill for non-white women. However, this effect does not appear in abortion-related mortality. These findings indicate that lower fertility rates may have pushed down non-white maternal mortality during this period.[34]

8 Changes in Delivery Characteristics

Finally, we conclude by testing the impact of legal abortion on delivery characteristics for all available U.S. births reported in the Natality Detail Files from 1968 onward. These findings help contextualize our main results by showing whether pregnancies became healthier in the wake of legal abortion. These records collected through the Centers for Disease Control (CDC) and the National Center for Health Statistics (NCHS) include microdata of U.S. deliveries for all U.S. states. The data consists of maternal characteristics, including age, education, and marital status, as well as infant health measured by birth weight. We also show additional results measuring infant health, including infant mortality, neonatal mortality, and the fertility rate in Appendix Section I.[35]

Figure VI shows the main change in delivery characteristics with the passage of legal abortion. First, we consider the effect of legal abortion on the average maternal age. Teen mothers and younger mothers should be the most likely to obtain an abortion post-legalization. We expect younger mothers to have the most limited access to abortion pre-legalization, and we anticipate that this group will have the largest share of unwanted pregnancies. In Figure VI, the results reflect expectation and reveal a decline in teen births with a corresponding increase in the average maternal age. As anticipated, in light of existing evidence in works like Cates et al. (2003); Donohue III et al. (2009); Ananat et al. (2009), the

[34] Tamura et al. (2016) and Thompson (2019) posit a strong association of the Civil Rights movement with black fertility decline in the 1960s, especially for Southern black women.

[35] Two limitations of this data exist for our sample time frame. First, the microdata is only available from 1968 onward, limiting our ability to consider an extensive pre-period. Still, since all legalizations occurred from 1970 onward, the data allows us at least one pre-period for each state. Thus, due to the limited pre-legalization years in the sample, we consider the impact of early legalizations relative to *Roe v. Wade* using the IW specification (rather than TWFE). Second, the data are based on a 50% sample for specific years, with states gradually expanding from 1973 onward. To account for these changes, we take the average delivery characteristics by state for each year. When considering the delivery characteristics, we focus on infant health measured by birth weight, maternal marital status (dubbed legitimacy in the Natality Files), and maternal age.

clearest prevention of unwanted pregnancies is for younger mothers. The increase in average age and decline in teenage pregnancy is symmetric across both white and non-white mothers.

Then we turn to marital status. Until 1978, the birth certificates record whether the newborn was born 'legitimate,' and in 1978 and onward the certificates report whether the newborn was born to a married mother. For white births, following legalization, unmarried white births decline. However, the drop in unmarried births also shows evidence of a preexisting decline before legalization. Finally, we turn to birth weight, our best measure of infant health. Following legal abortion, there is an increase in birth weight. However, with only one pre-period, it is difficult to ensure the results are not driven by pre-existing changes in birth weight.

Overall, these findings suggest that abortion legalization led to a change in delivery characteristics. Primarily, shifting births to older mothers. While there also may have been changes in other characteristics such as infant health and marital status, these results look less likely to be causal in our available data.

9 Conclusion

In this study, we question whether abortion reforms that occurred over the 1960s and 1970s led to declines in maternal or abortion-related mortality over 1959-1980. Our findings suggest that legal abortion reduced non-white abortion-related mortality by 30-60%. Non-white abortion-related mortality declines are so apparent that non-white maternal mortality also fell by 30-40%. Despite these substantial impacts for non-white women, white abortion-related mortality fails to clearly decline. Instead, white abortion-related mortality appears to have been on a preexisting decline before legalization. While we cannot fully explain this early decline for white women, historical accounts suggest that these women likely had better access to abortion through informal means before formal legalization.[36]

We also observe less of an impact of *Roe v. Wade* and find the main effect in states that passed early legalizations. While this finding may appear unexpected at first, this observation is less surprising after examining the period-specific trends in mortality. In 1973 abortion-

[36]For example, through travel. In one account from Massachusetts, the author describes, "with the advent of the New York law, it was extraordinary what a difference it made. Within 1 month there was not one more illegal case that came through the office. There was not one more trip to London" (Rubin, 1994, pg. 50). For example, prior work examining travel to New York during the pre-*Roe v. Wade* period (Joyce et al., 2013) finds that the non-white abortion rates were more sensitive to distance to an abortion provider than white abortion rates. However, other factors such as technological improvements may also explain the preexisting declines for white women (Kleinman and Senanayake, 1993; Rubin, 1994; Cutler and Meara, 2000; Rowe and Rowe, 2000). A limitation of this study is that we cannot explain exactly what led white maternal and abortion-related mortality to decline.

related mortality had already fallen by 90% from the start of our period (in 1959) and 87% from the pre-reform period (1965). Thus, most of the decline in abortion-related mortality occurred before the national decision.

Still, our findings have implications for public policy today, in both the United States and worldwide. First, worldwide each year, approximately 4-13% of maternal deaths result from unsafe abortions (Singh and Ratnam, 1998; Haddad and Nour, 2009; Say et al., 2014). Our results suggest that abortion restrictions may produce higher than necessary abortion-related deaths, especially for disadvantaged groups who cannot advocate for themselves in the medical system or travel to obtain an abortion. However, we caution that our findings may not fully apply in the modern context when abortion technologies have improved and antibiotics may be more widely available.

Second, if *Roe v. Wade* were overturned in the United States today abortion access would depend on each individual's financial resources to travel to states that continue to protect legal abortion. Many states may also revert to a system of therapeutic abortions. In this case, in-state abortion would depend on the individual's autonomy to advocate for themselves in the medical system. While we cannot say how prevalent illegal or self-administered abortions would become, our research instead suggests that the disadvantaged would be the most affected by such a decision. In this light, our study adds to a literature that has similarly demonstrated that abortion restrictions affect the most disadvantaged groups (Gold, 2003; Joyce et al., 2013; Myers, 2017). We contribute to this literature by showing that legal abortion not only affects life-long economic outcomes (Myers, 2017) but also substantially impacts non-white maternal mortality. Today, U.S. maternal mortality is already notably higher than comparable developed settings (Carroll, 2017; Artiga et al., 2020), and non-Hispanic black women suffer three times the maternal mortality of white women (Carroll, 2017; Artiga et al., 2020). Thus, if legal abortion access were reversed, our research suggests that the racial gap in maternal mortality has the potential to widen further.

10 Tables

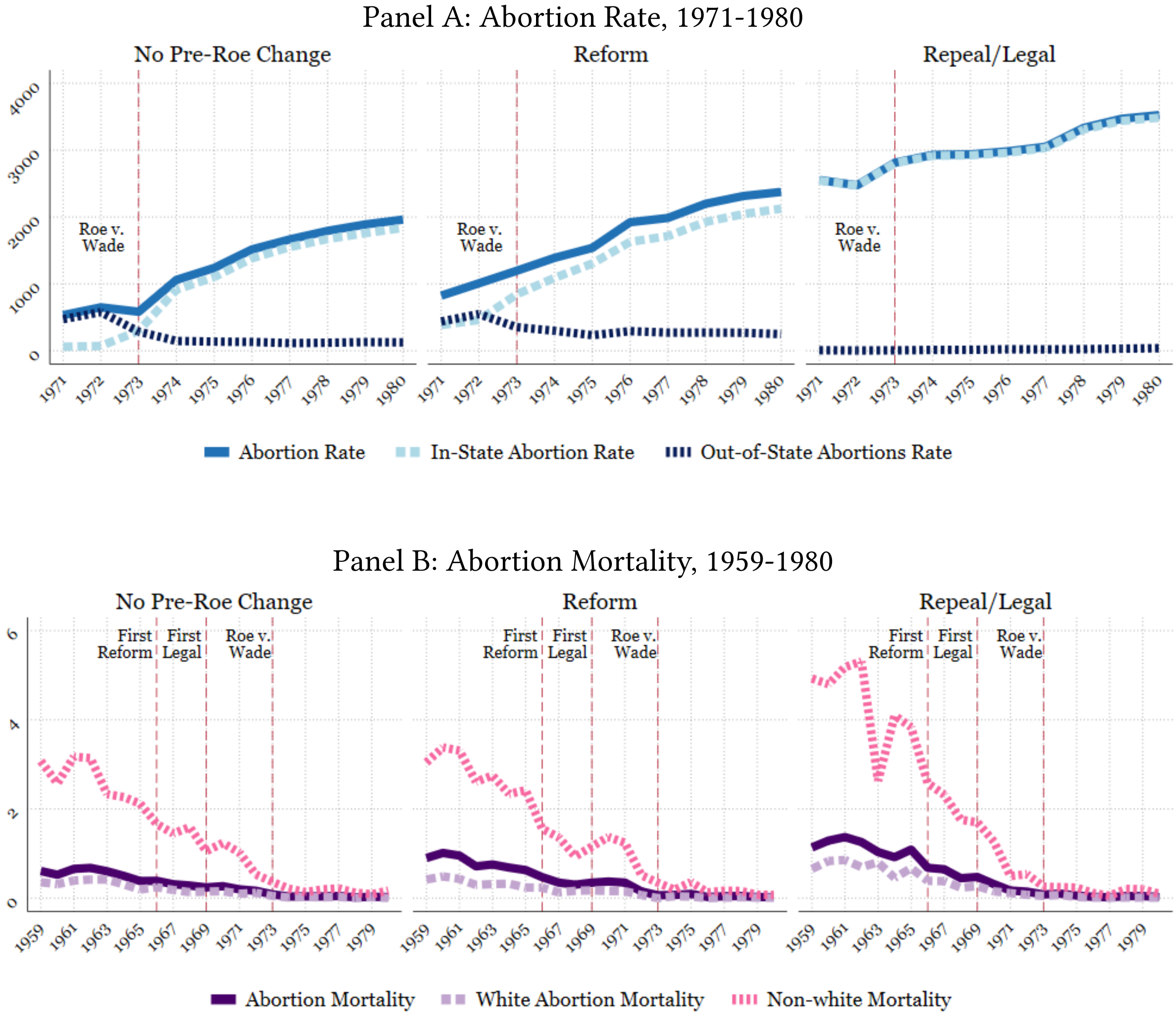
Table 1: Summary Statistics, by Legal Status

	Roe v. Wade Pre	Roe v. Wade Post	Reform Abortion Pre	Reform Abortion Post	Legal Abortion Pre	Legal Abortion Post
	Mean	Mean	Mean	Mean	Mean	Mean
Maternal						
Maternal Mortality	2.600	0.778	3.785	1.226	3.506	0.770
White Maternal Mortality	1.972	0.585	2.061	0.737	1.777	0.602
Non-white Maternal Mortality	9.304	2.312	13.206	2.797	8.720	1.343
Broad Abortion						
Broad Abortion Mortality	0.692	0.182	1.010	0.262	1.273	0.212
Broad White Abortion Mortality	0.486	0.122	0.538	0.145	0.511	0.159
Broad Non-white Abortion Mortality	2.835	0.858	3.243	0.655	3.381	0.399
Narrow Abortion						
Narrow Abortion Mortality	0.347	0.042	0.586	0.089	0.779	0.071
Narrow White Abortion Mortality	0.240	0.028	0.332	0.041	0.319	0.044
Narrow Non-white Abortion Mortality	1.546	0.235	1.853	0.237	2.080	0.137
Controls						
Share Reproductive-Age 15-19 White	0.196	0.192	0.170	0.170	0.124	0.128
Share Reproductive-Age 15-19 Non-white	0.017	0.021	0.036	0.043	0.059	0.063
Log of Family Income	9.002	9.733	8.895	9.583	9.124	9.801
1(Abortion Reform)	0.000	0.000	0.000	1.000	0.028	0.183
1(Access to the Pill)	0.740	0.992	0.708	1.000	0.792	1.000
1(Minor Access to the Pill)	0.031	0.317	0.006	0.649	0.000	0.467
1(EPL)	0.548	0.733	0.399	0.557	0.819	0.850
1(Unilateral)	0.033	0.579	0.022	0.362	0.000	0.450
Population						
State population	3.601	3.981	3.745	4.732	6.466	7.899
Share Reproductive-Age Females	0.202	0.221	0.205	0.223	0.212	0.233
Share White Reproductive-Age Females	0.186	0.201	0.174	0.184	0.145	0.159
Share Non-white Reproductive-Age Females	0.015	0.020	0.031	0.039	0.067	0.074
Births						
Fertility Rate	100.990	72.339	103.383	72.374	99.256	70.452
White Fertility Rate	97.474	69.543	95.831	66.806	87.997	60.041
Non-white Fertility Rate	150.491	103.284	140.546	96.096	124.576	88.488
N	420	240	178	174	72	60

Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980. State population characteristics are from Ruggles et al. (2021) and Wolfers (2006). See data section for sources of each reported covariate.
Notes: Unweighted means reported. State population are shown in millions. Maternal mortality and abortion mortality are per 100,000 females 15-44. Non-white maternal mortality and non-white abortion mortality are per 100,000 non-white females 15-44. White maternal mortality and white abortion mortality are per 100,000 white females 15-44. Fertility rates are measured similarly, but are per 1,000 females 15-44.

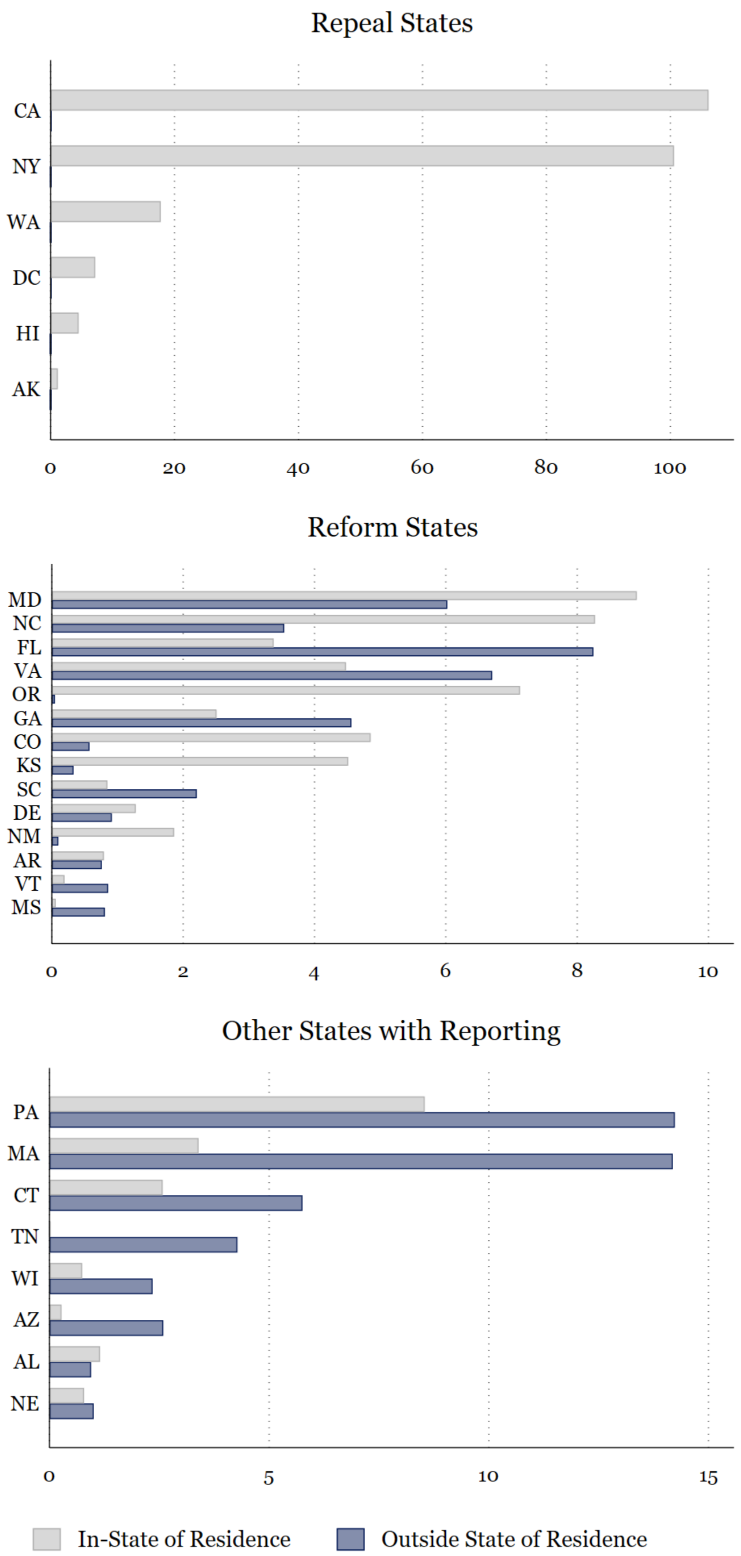
11 Figures

Figure I: Abortion Rate and Abortion-related Mortality, by Legal Abortion Status



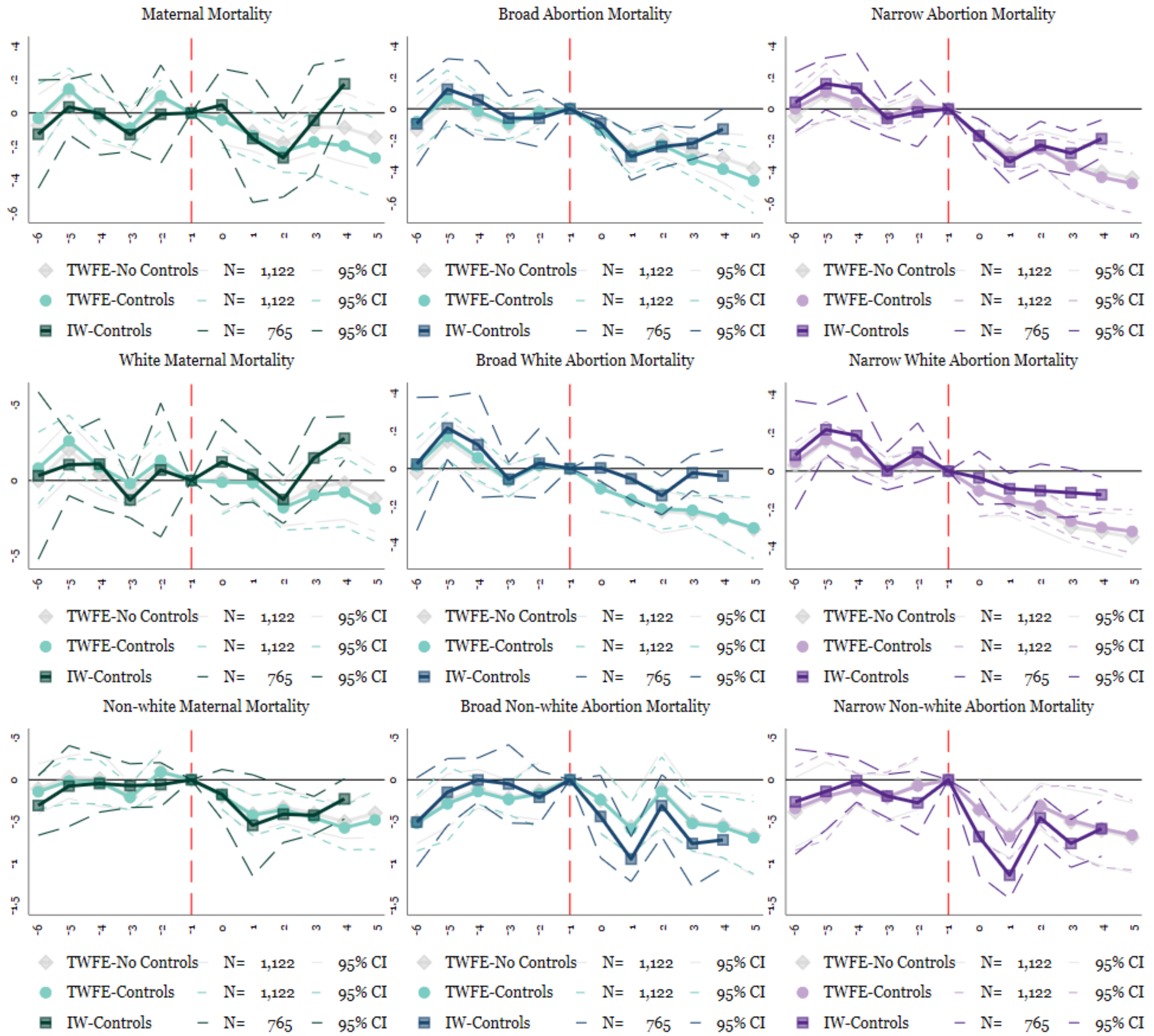
Source: CDC Abortion Surveillance Program, 1971-1980. NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: Rates are 100,000 reproductive-aged females in each population (all, white, and non-white).

Figure II: Abortion Counts by Known State of Residence in 1972–CDC (1972) *Reported Legal Abortions with State of Residence Known*



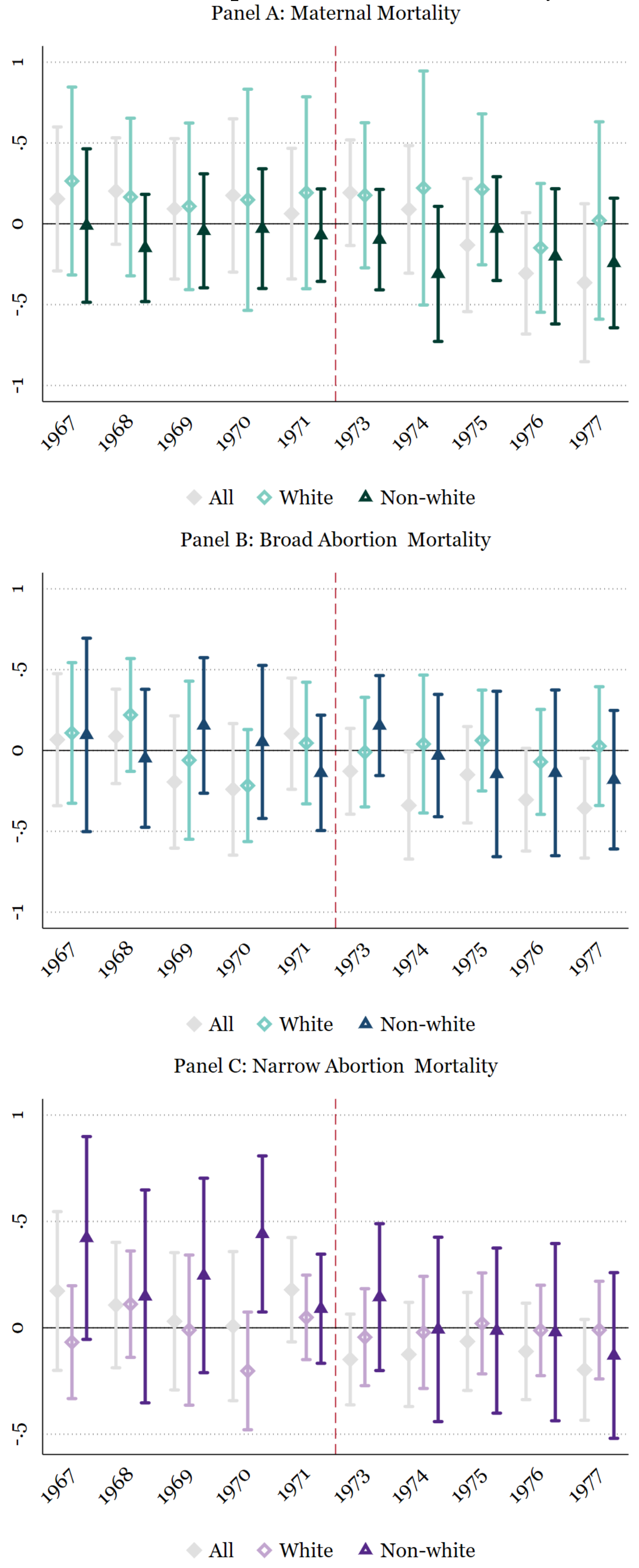
Source: CDC (1972).
Notes: States sorted by total reported abortions, note the scaling differences between state groups. Reporting states with legal abortion include: Alaska, California, District of Columbia, Hawaii, New York, and Washington. Reporting States with abortion reforms include Arkansas, Colorado, Delaware, Georgia, Florida, Kansas, Maryland, North Carolina, Oregon, South Carolina, Virginia, Vermont, and Mississippi. Other reporting states include Massachusetts. Single hospitals reporting include Alabama, Arizona, Connecticut, Nebraska, New Mexico, Pennsylvania, Tennessee, and Wisconsin.

Figure III: Main Event Study: Effect of Legal Abortion on Maternal and Abortion-Related Mortality



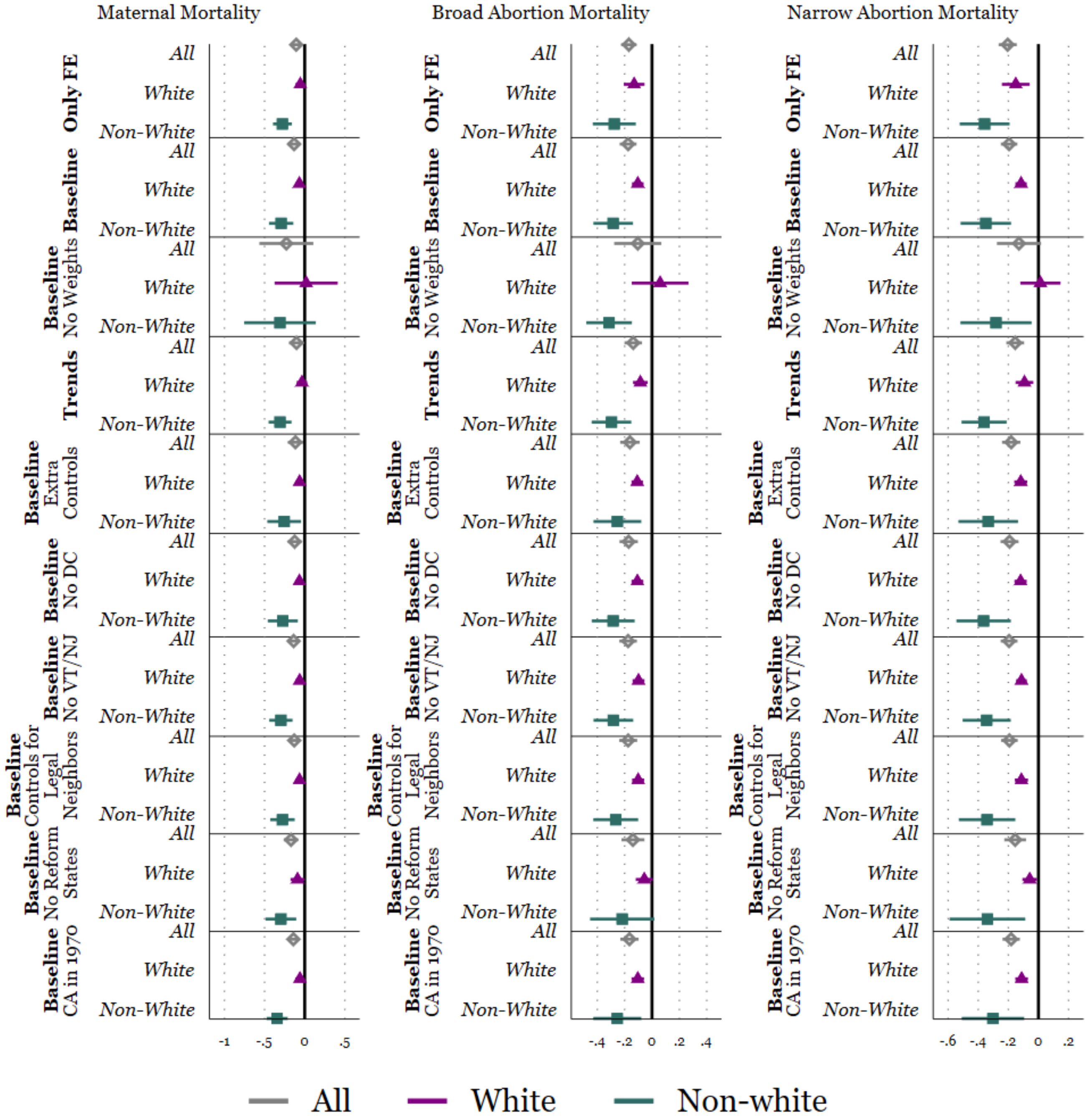
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

Figure IV: Impact of *Roe v. Wade* in 1973 by Preexisting Demand for Unsafe/Illegal Abortions
Year x 1965 Race-Specific Abortion Mortality Rate



Source: NVSS/CDC Multiple Cause of Death Files, 1967-1977. Only states treated by *Roe v. Wade* are included.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the 1973 *Roe v. Wade* decision interacted with abortion demand (see Equation 2). The abortion demand interaction with 1972 is excluded. The vertical line indicates the excluded period. Lines reflect 95% confidence intervals for robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate.

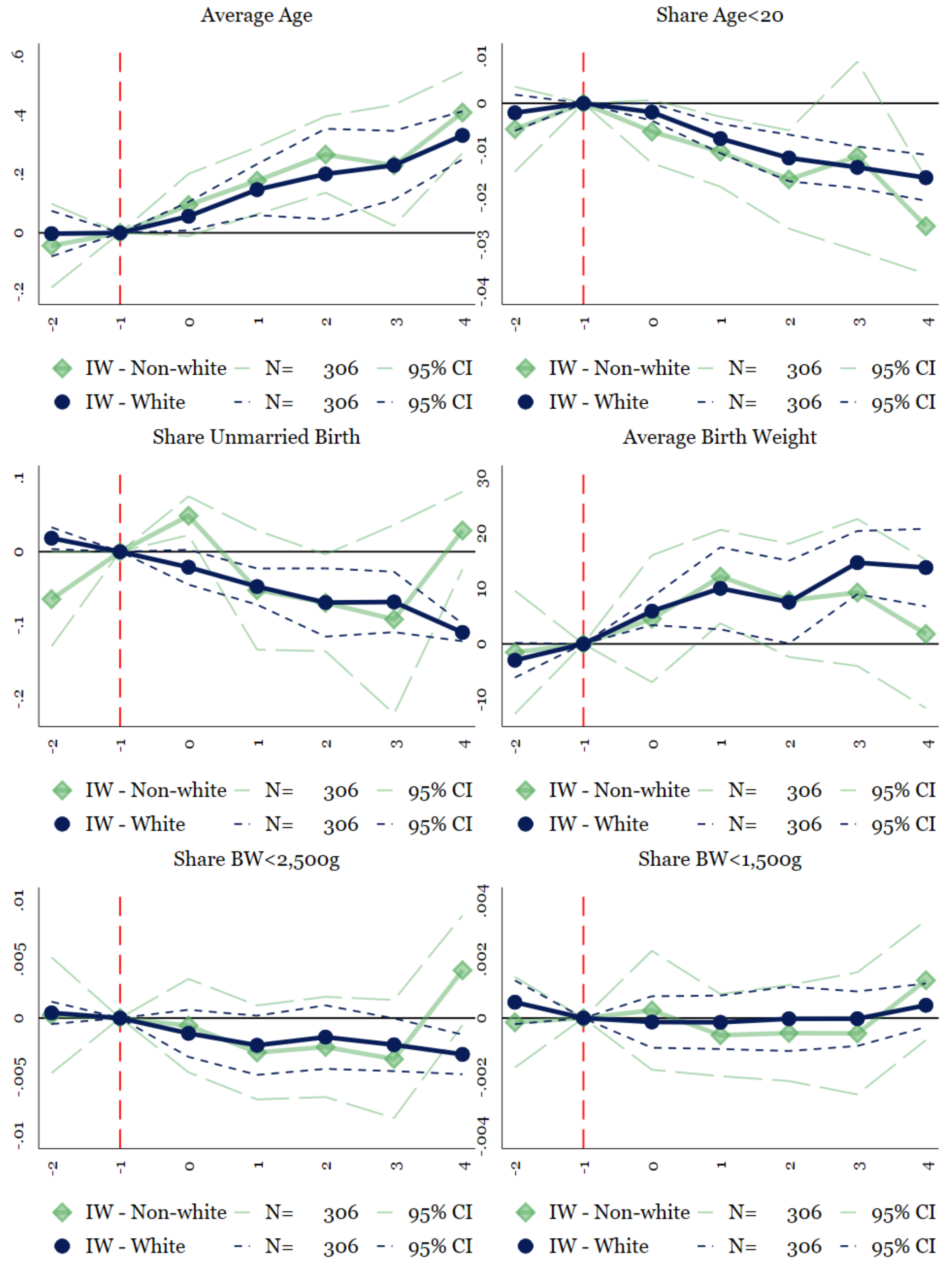
Figure V: Difference-in-Differences Results: Maternal and Abortion-related Mortality



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. The main binary variable represents legalized abortion, which captures the effect of early legal abortion as well as the 1973 *Roe v. Wade* decision (see Equation 4). We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Additional controls include the log of the state-level AFDC benefit, the cigarette tax, the unemployment rate, Medicaid access, and the log of the per-pupil education spending. Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

Figure VI: Additional Results: Effect of Legal Abortion on Delivery Characteristics



Source: Natality Detailed File or Birth Certificate Records, 1968-1973.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. Event study is fully saturated, except we bin the left endpoint at -2 to include a singleton observation. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. Estimates are weighted by the births (white and non-white). Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

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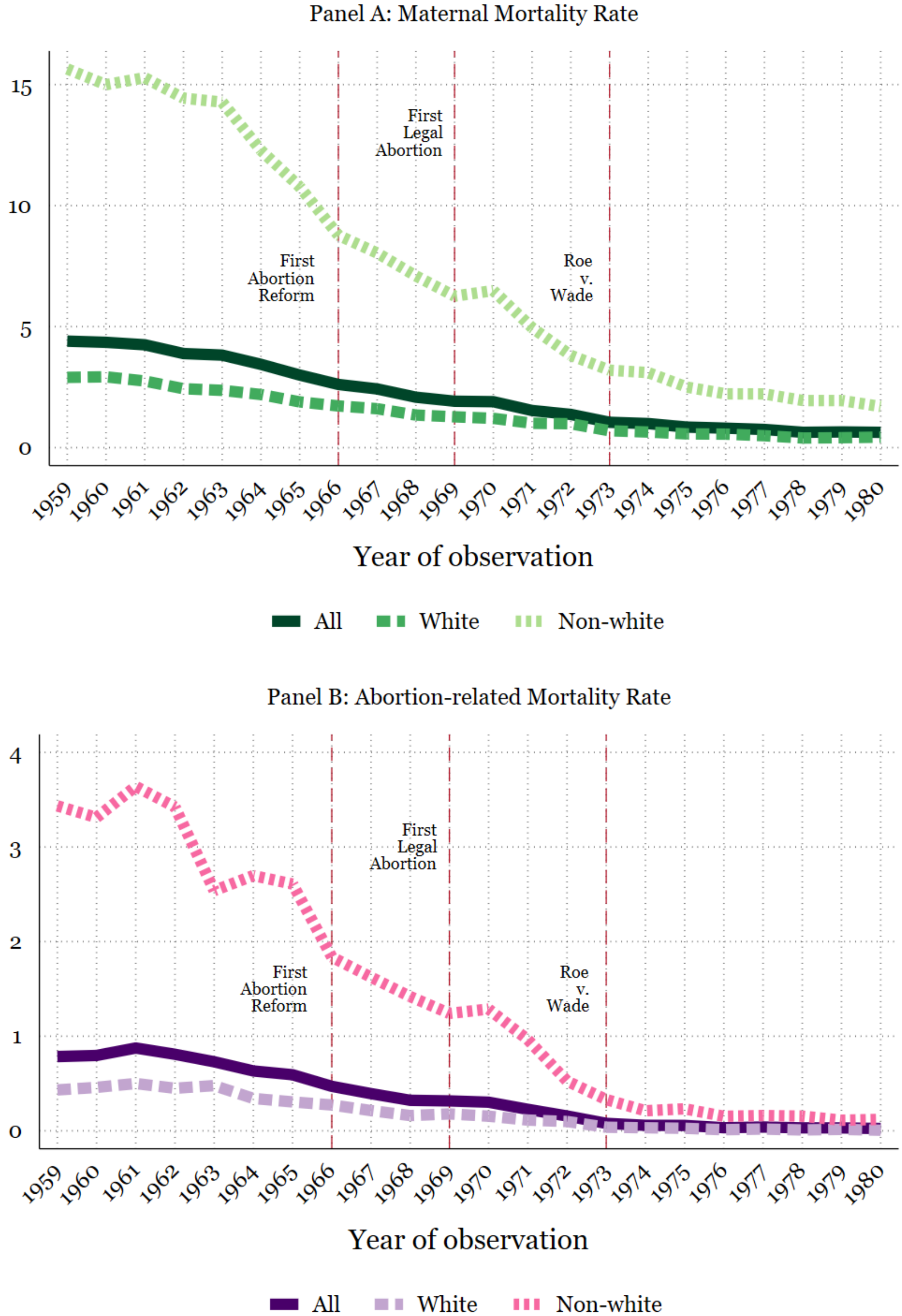
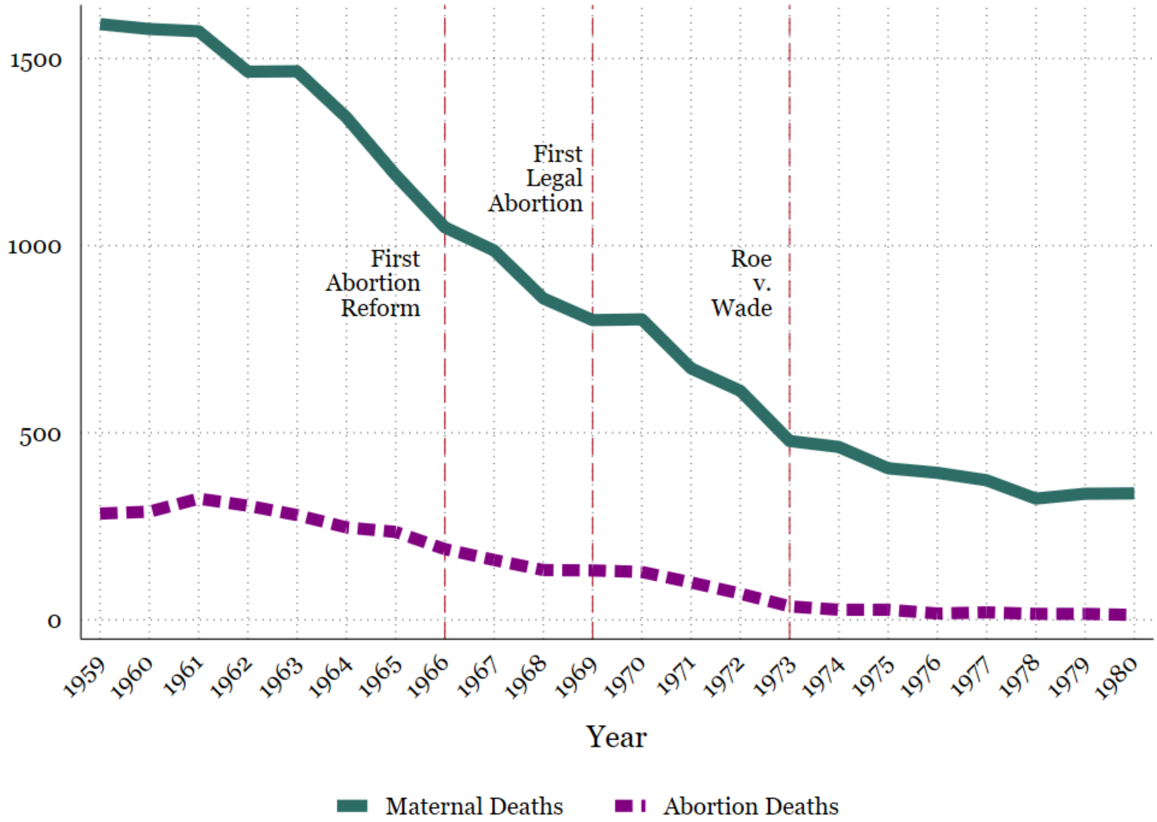
A Additional Descriptive Figures

Figure A.1: Trends in Maternal and Abortion-Related Mortality, 1959-1980



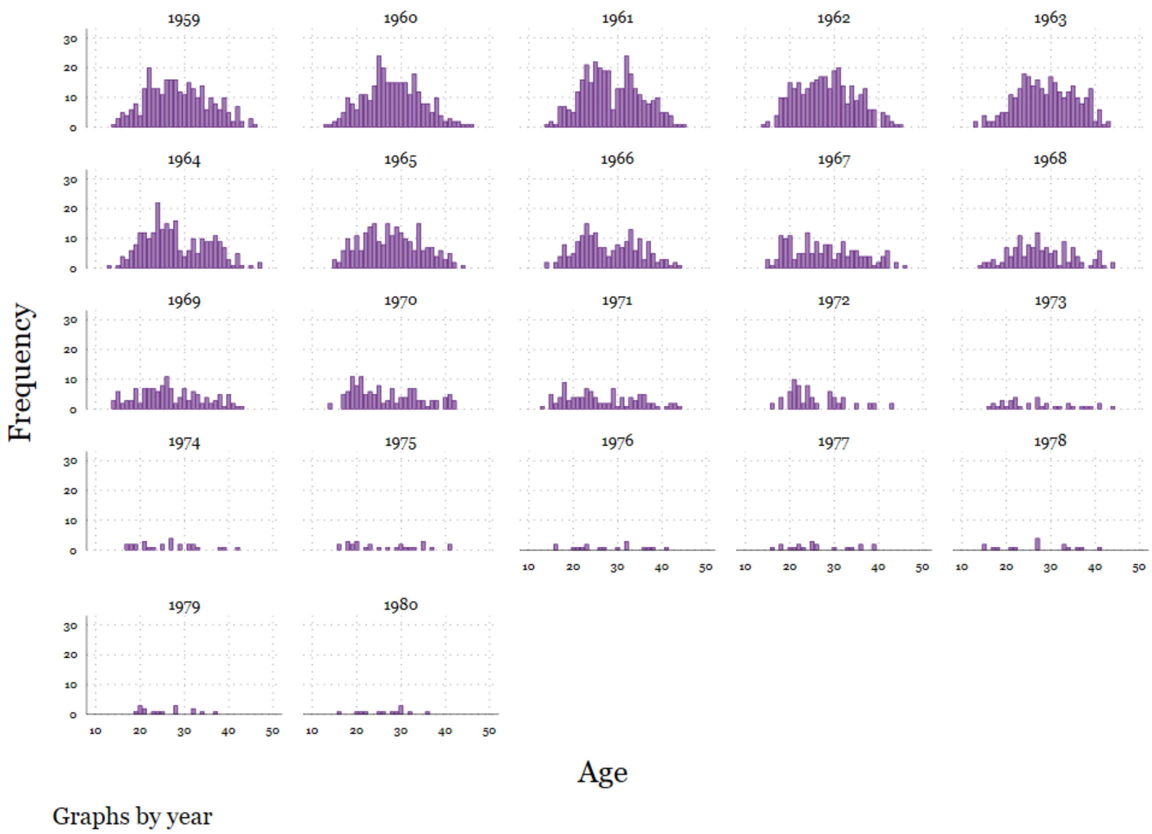
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: Rates are 100,000 reproductive-aged females in each population (all, white, and non-white).

Figure A.2: Trends in the Number of Maternal and Abortion-Related Deaths, 1959-1980



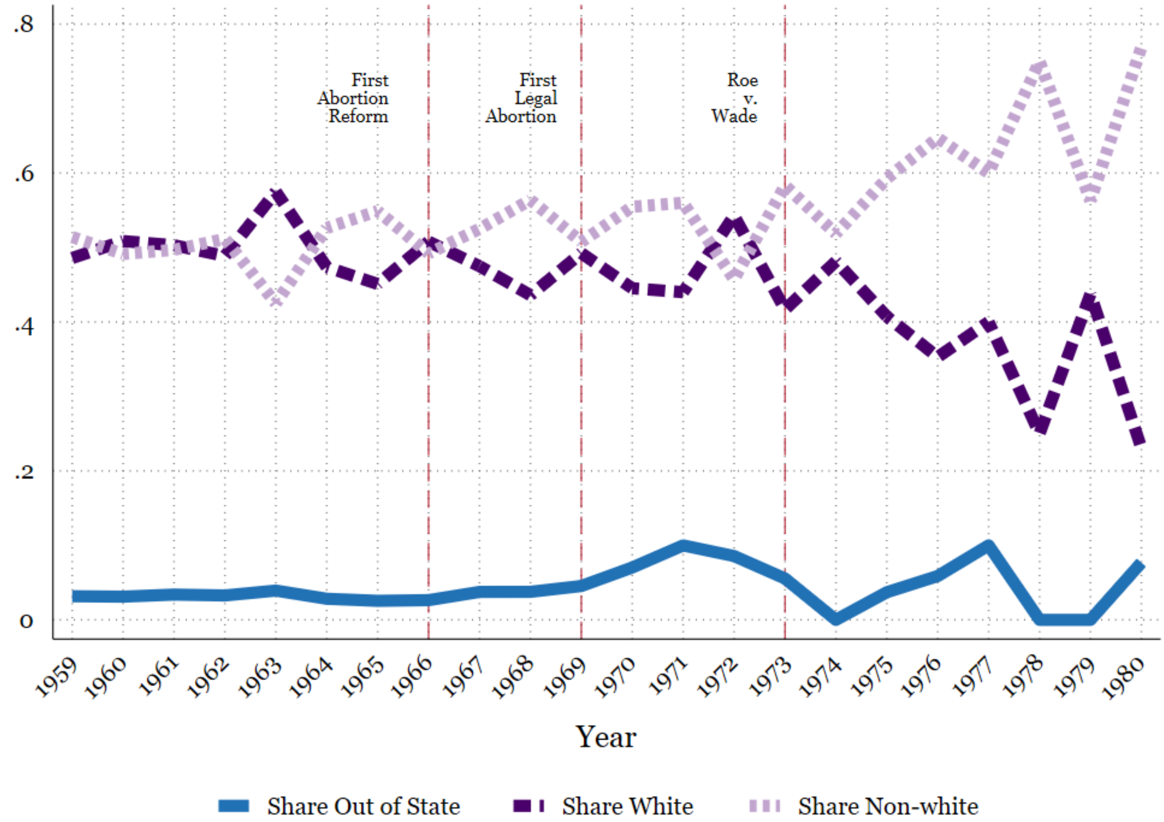
SOURCE: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Figure A.3: Abortion Deaths: Counts and Age Distribution



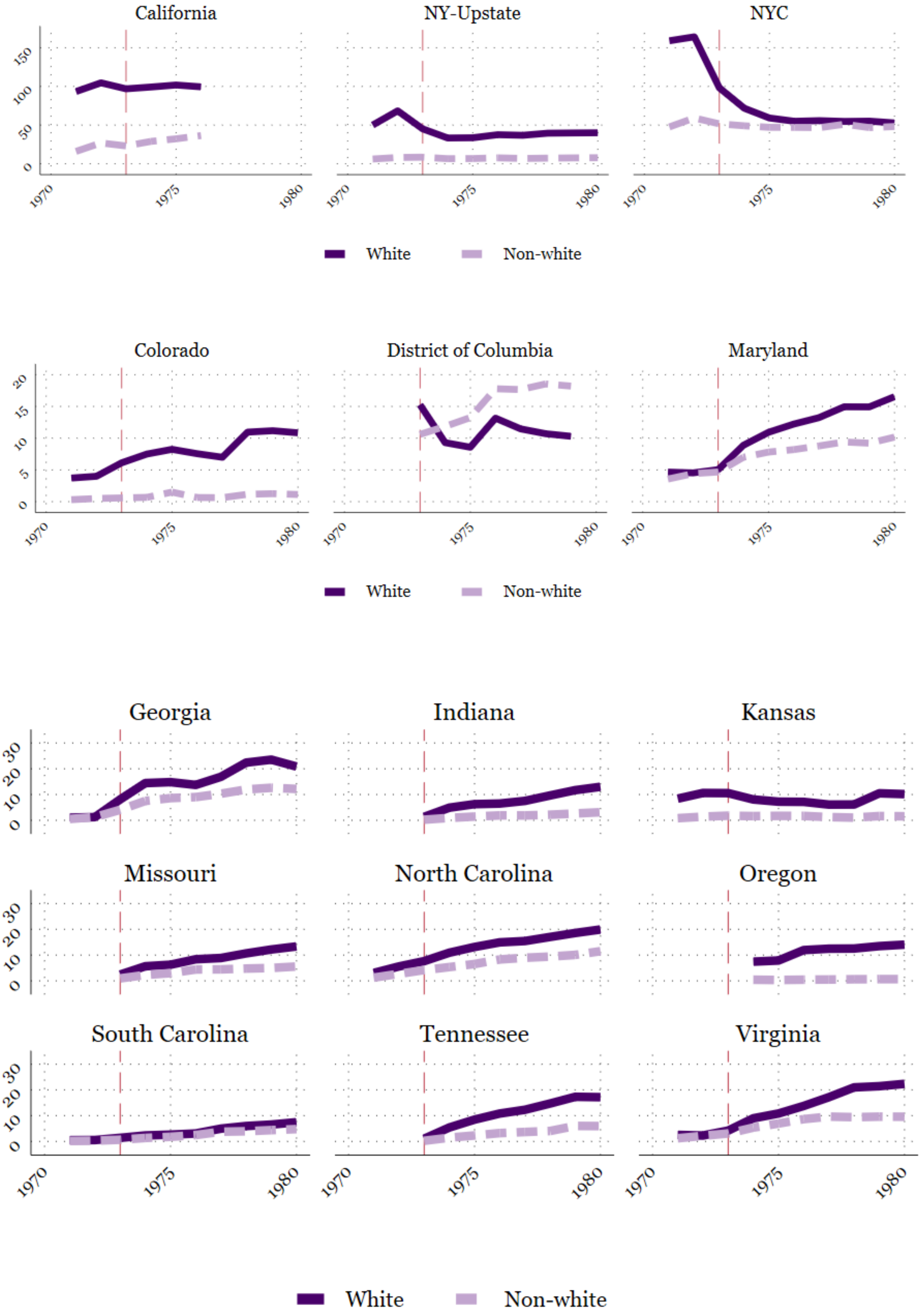
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Figure A.4: Abortion Deaths: Composition by Race and Non-Residents



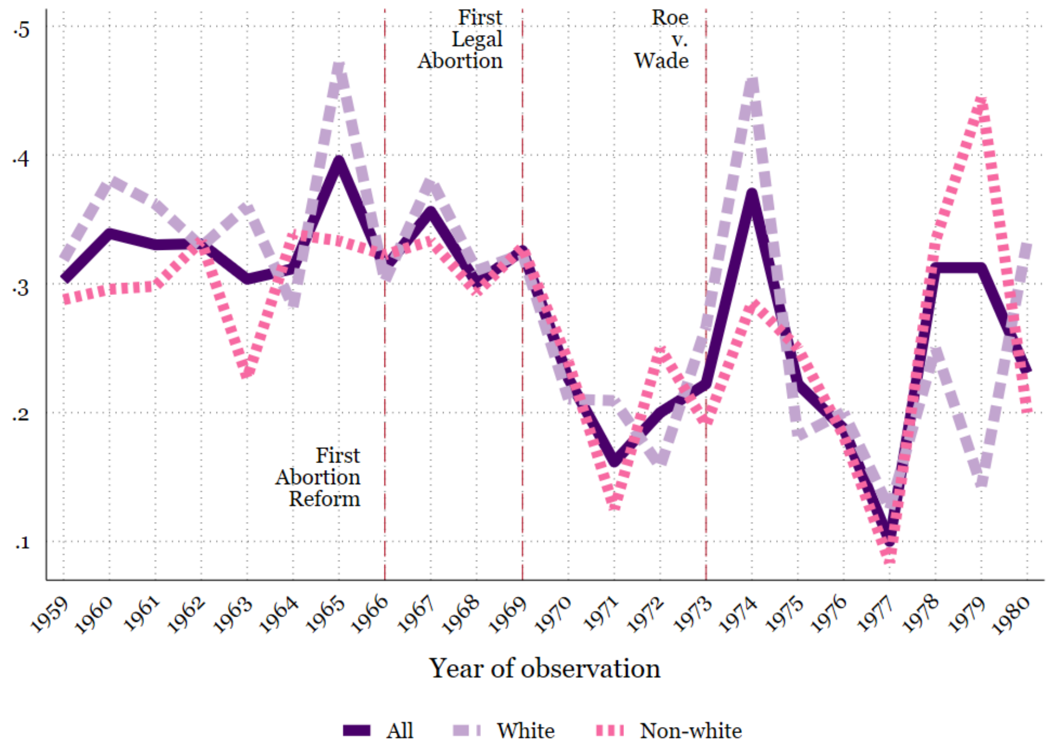
SOURCE: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Figure A.5: Abortion Counts by Race and State



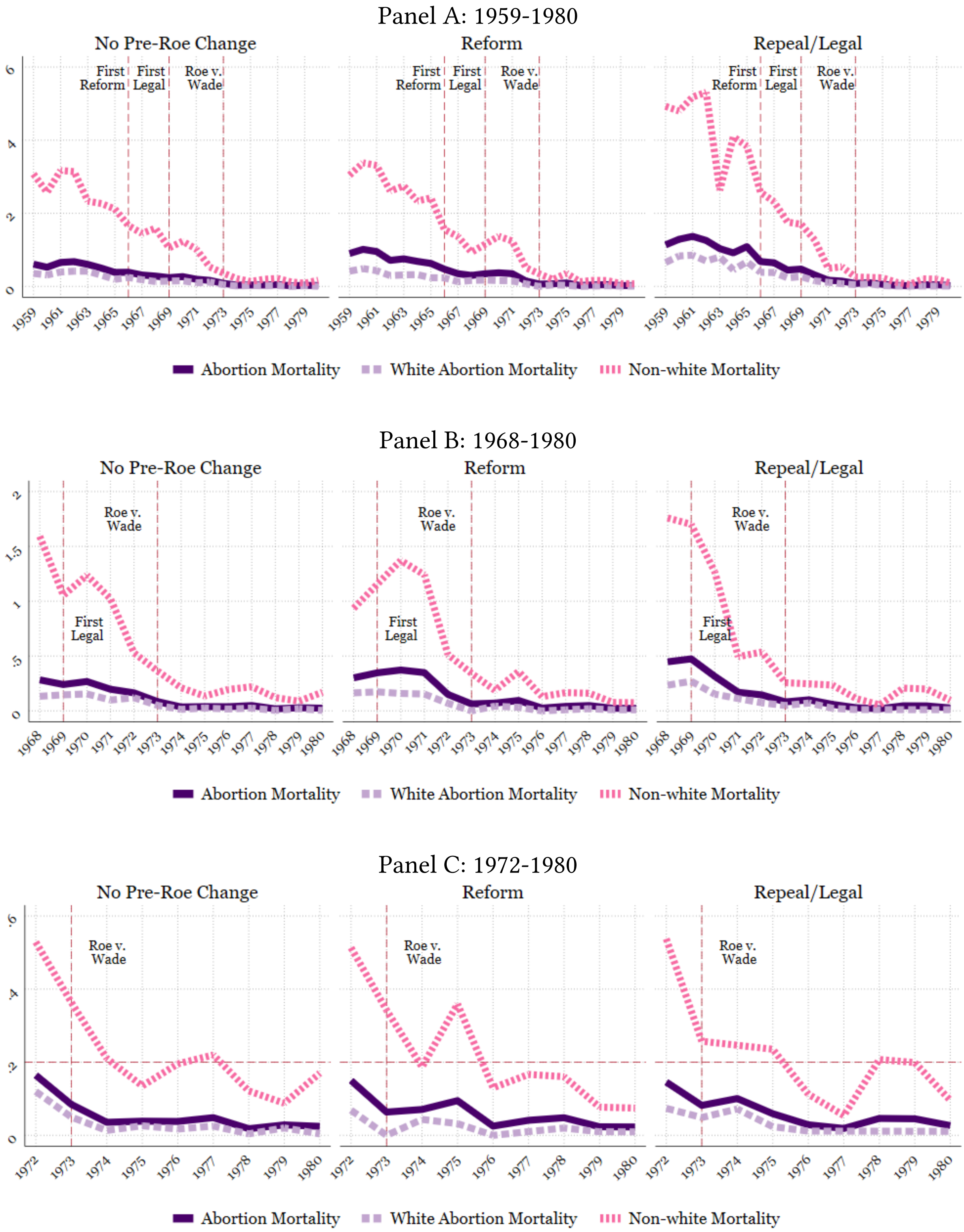
SOURCE: CDC Abortion Surveillance 1971-1980.
NOTES: Abortion counts in thousands and reported by the state of occurrence. Note the scaling differences between state groups.

Figure A.6: Share of Maternal and Abortion-Related Mortality in Repeal States Compared to the Rest of the United States, 1959-1980



SOURCE: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Figure A.7: Abortion-related Mortality, by Legal Abortion Status



Source: CDC Abortion Surveillance Program, 1971-1980. NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: Rates are 100,000 reproductive-aged females in each population (all, white, and non-white).

B Additional Tables

Table B.1: Percent Reduction - Non-white Mortality from Figure III

	(1) *Non-white Maternal Mortality* **TWFE**	(2) *Non-white Maternal Mortality* **IW**	(3) *Broad Non-white Abortion Mortality* **TWFE**	(4) *Broad Non-white Abortion Mortality* **IW**	(5) *Narrow Non-white Abortion Mortality* **TWFE**	(6) *Narrow Non-white Abortion Mortality* **IW**
0	-0.172	-0.169	-0.228	-0.374	-0.311	-0.507
1	-0.351	-0.445	-0.449	-0.616	-0.497	-0.683
2	-0.304	-0.347	-0.150	-0.279	-0.271	-0.371
3	-0.370	-0.350	-0.415	-0.548	-0.395	-0.538
4	-0.441	-0.209	-0.441	-0.519	-0.456	-0.450
5	-0.391		-0.511		-0.495	

Table B.2: Percent Reduction - Abortion-Related Mortality from Figure III

	(1) *Narrow Abortion Mortality* **TWFE**	(2) *Narrow Abortion Mortality* **IW**	(3) *Broad White Abortion Mortality* **TWFE**	(4) *Broad White Abortion Mortality* **IW**	(5) *Narrow Non-white Abortion Mortality* **TWFE**	(6) *Narrow Non-white Abortion Mortality* **IW**
0	-0.161	-0.157	-0.102	0.002	-0.311	-0.507
1	-0.265	-0.287	-0.152	-0.054	-0.497	-0.683
2	-0.226	-0.208	-0.194	-0.135	-0.271	-0.371
3	-0.307	-0.246	-0.199	-0.024	-0.395	-0.538
4	-0.354	-0.174	-0.233	-0.041	-0.456	-0.450
5	-0.380		-0.272		-0.495	

Table B.3: Interaction of Policies: Narrow Abortion-Related Mortality

	White Abortion Mortality				Non-white Abortion Mortality			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1(Legal Abortion)=1	-0.1153***	-0.1052***	-0.1117***	-0.1175***	-0.3495***	-0.3652***	-0.3742***	-0.3337***
	(0.0188)	(0.0179)	(0.0206)	(0.0215)	(0.0835)	(0.0972)	(0.1020)	(0.0987)
1(Unilateral)=1	-0.0633*	-0.0342	-0.0649*	-0.0562*	0.0438	-0.0134	0.0550	0.0243
	(0.0361)	(0.0276)	(0.0360)	(0.0283)	(0.1081)	(0.1104)	(0.1112)	(0.0994)
1(Abortion Reform)=1	-0.0687	-0.0679	-0.0687	-0.0667	-0.1744	-0.1767*	-0.1735	-0.2221**
	(0.0519)	(0.0512)	(0.0516)	(0.0473)	(0.1045)	(0.1041)	(0.1049)	(0.1004)
1(Access to the Pill)=1	0.0316	0.0319	0.0302	0.0317	0.1066	0.1055	0.1144	0.1197
	(0.0420)	(0.0421)	(0.0425)	(0.0393)	(0.1396)	(0.1396)	(0.1431)	(0.1325)
1(Minor Access to the Pill)=1	-0.0058	-0.0070	0.0044	0.0021	0.0092	0.0117	-0.0455	0.0250
	(0.0263)	(0.0260)	(0.0268)	(0.0252)	(0.0786)	(0.0769)	(0.0919)	(0.0671)
1(EPL)=1	0.0624	0.0630	0.0632	0.0700*	0.0601	0.0605	0.0540	0.1094
	(0.0389)	(0.0388)	(0.0389)	(0.0393)	(0.1452)	(0.1449)	(0.1443)	(0.1348)
Share Reproductive-Age 15-19 White	0.7020	0.5313	0.6781	1.3376	-9.3908	-9.1148	-9.1055	0.3565
	(1.8882)	(1.9079)	(1.8746)	(1.8677)	(7.2770)	(7.2276)	(7.3411)	(6.9821)
Share Reproductive-Age 15-19 Non-white	-9.7337*	-9.7309*	-9.8248*	-10.4491**	-19.6086	-19.3491	-19.1883	-30.8501*
	(4.9688)	(4.9231)	(5.0021)	(4.9339)	(14.3032)	(14.2852)	(14.5021)	(17.2446)
Log of Family Income	0.1377	0.1372	0.1264	0.2900	0.8225	0.8462	0.8726	-0.2147
	(0.5068)	(0.5044)	(0.5012)	(0.4560)	(1.3590)	(1.3624)	(1.3935)	(1.5463)
1(Legal Abortion)=1 × 1(Unilateral)=1		-0.0376				0.0707		
		(0.0292)				(0.1159)		
1(Legal Abortion)=1 × 1(Minor Access to the Pill)=1			-0.0140				0.0765	
			(0.0236)				(0.0925)	
1(Medicaid)=1				-0.0183				-0.0644
				(0.0348)				(0.1156)
Log AFDC Benefit				0.0568				-0.2686
				(0.0668)				(0.1788)
Log Per Pupil Spending				0.2003				-0.3102
				(0.2038)				(0.4365)
% Unemployment				0.0140				-0.1076***
				(0.0155)				(0.0389)
State Cigarette Tax (inflation-adjusted)				0.0075				-0.0213
				(0.0052)				(0.0168)
N	1,122	1,122	1,122	1,069	1,122	1,122	1,122	1,069
Adjusted R-squared	0.598	0.598	0.597	0.606	0.698	0.698	0.698	0.706
1965-1968 Mean Dependent	0.337	0.337	0.337	0.337	1.465	1.465	1.465	1.465
Post-Roe Mean Dependent	0.017	0.017	0.017	0.017	0.150	0.150	0.150	0.150
State FE and Year FE	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X

Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. The main binary variable represents legalized abortion, which captures the effect of early legal abortion as well as the 1973 *Roe v. Wade* decision (see Equation 4). We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Additional controls include the log of the state-level AFDC benefit, the cigarette tax, the unemployment rate, Medicaid access, and the log of the per-pupil education spending. Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

Table B.4: Interaction of Policies: Maternal Mortality

	White Maternal Mortality				Non-white Maternal Mortality			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1(Legal Abortion)=1	-0.0662***	-0.0768***	-0.0680**	-0.0635**	-0.2932***	-0.3057***	-0.2271***	-0.2558**
	(0.0245)	(0.0281)	(0.0292)	(0.0259)	(0.0755)	(0.0860)	(0.0798)	(0.1046)
1(Unilateral)=1	-0.0712*	-0.1015*	-0.0704*	-0.0717**	0.1078	0.0620	0.0780	0.0678
	(0.0393)	(0.0521)	(0.0365)	(0.0347)	(0.0657)	(0.0933)	(0.0674)	(0.0758)
1(Abortion Reform)=1	0.0834**	0.0826**	0.0834**	0.0804**	-0.1806***	-0.1824***	-0.1829***	-0.1796**
	(0.0351)	(0.0353)	(0.0352)	(0.0366)	(0.0653)	(0.0643)	(0.0665)	(0.0757)
1(Access to the Pill)=1	0.1610*	0.1607*	0.1617*	0.1680*	-0.0454	-0.0462	-0.0664	-0.0207
	(0.0869)	(0.0871)	(0.0877)	(0.0837)	(0.1134)	(0.1140)	(0.1120)	(0.1145)
1(Minor Access to the Pill)=1	-0.0055	-0.0043	-0.0105	0.0087	-0.0320	-0.0300	0.1144	-0.0509
	(0.0282)	(0.0284)	(0.0423)	(0.0265)	(0.0584)	(0.0584)	(0.0788)	(0.0629)
1(EPL)=1	0.0072	0.0066	0.0068	0.0166	0.0269	0.0272	0.0431	0.0100
	(0.0527)	(0.0527)	(0.0527)	(0.0436)	(0.0650)	(0.0646)	(0.0637)	(0.0701)
Share Reproductive-Age 15-19 White	-4.7080**	-4.5301*	-4.6964**	-5.2898**	-8.4425	-8.2215	-9.2057*	-14.4568***
	(2.3132)	(2.3582)	(2.3094)	(2.5034)	(5.1444)	(5.1026)	(5.1057)	(5.1910)
Share Reproductive-Age 15-19 Non-white	-7.4325	-7.4354	-7.3885	-7.3466	-5.0516	-4.8439	-6.1761	1.1146
	(4.7963)	(4.8233)	(4.7893)	(5.5767)	(8.6284)	(8.6339)	(8.3900)	(13.5792)
Log of Family Income	-0.9557*	-0.9552*	-0.9503*	-0.7557	-0.9538	-0.9348	-1.0878	-0.3837
	(0.4865)	(0.4874)	(0.4782)	(0.4983)	(0.9508)	(0.9592)	(0.9104)	(1.3528)
1(Legal Abortion)=1 × 1(Unilateral)=1		0.0392				0.0566		
		(0.0440)				(0.1184)		
1(Legal Abortion)=1 × 1(Minor Access to the Pill)=1			0.0068				-0.2047*	
			(0.0461)				(0.1128)	
1(Medicaid)=1				-0.0133				0.0886
				(0.0650)				(0.0782)
Log AFDC Benefit				0.1103				0.1175
				(0.1034)				(0.1505)
Log Per Pupil Spending				0.0009				-0.3608
				(0.2692)				(0.4143)
% Unemployment				-0.0006				-0.0073
				(0.0197)				(0.0356)
State Cigarette Tax (inflation-adjusted)				0.0136**				0.0036
				(0.0066)				(0.0132)
N	1,122	1,122	1,122	1,069	1,122	1,122	1,122	1,069
Adjusted R-squared	0.787	0.787	0.787	0.789	0.773	0.773	0.774	0.767
1965-1968 Mean Dependent	1.457	1.457	1.457	1.457	3.016	3.016	3.016	3.016
Post-Roe Mean Dependent	0.463	0.463	0.463	0.463	1.400	1.400	1.400	1.400
State FE and Year FE	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X

Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. The main binary variable represents legalized abortion, which captures the effect of early legal abortion as well as the 1973 *Roe v. Wade* decision (see Equation 4). We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Additional controls include the log of the state-level AFDC benefit, the cigarette tax, the unemployment rate, Medicaid access, and the log of the per-pupil education spending. Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

Table B.5: Roe v. Wade: Annual Changes over 1972-1973 and 1973-1974

Panel A: 1972-1973

	Maternal Mortality			Broad Abortion Mortality			Narrow Abortion Mortality		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	White	Non-White	All	White	Non-White	All	White	Non-White
1(Roe v. Wade)	-0.5622	-0.8322	1.2008	0.3858	0.5191	-0.7413	-0.2480	0.0838	-2.3502
	(0.7312)	(0.8897)	(1.5364)	(0.6682)	(0.6191)	(2.2747)	(0.5123)	(0.4803)	(1.5785)
N	90	90	90	90	90	90	90	90	90
Controls	X	X	X	X	X	X	X	X	X

Panel B: 1973-1974

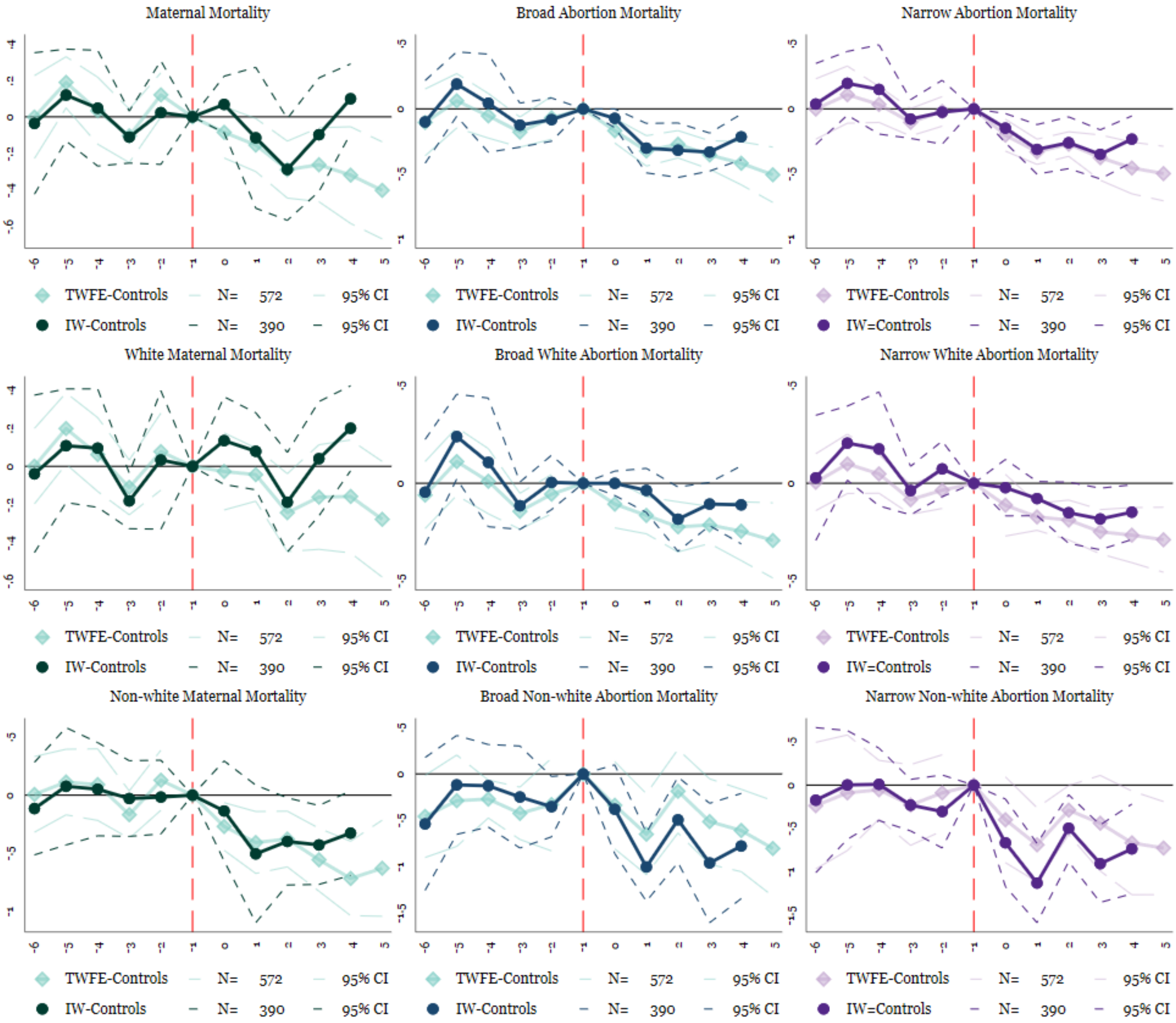
	Maternal Mortality			Broad Abortion Mortality			Narrow Abortion Mortality		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1(Roe v. Wade)	-0.3809	-0.2824	-0.7232	-0.3107	0.1300	-2.8947	0.0205	0.3494	-2.5939
	(0.7345)	(1.0890)	(1.6853)	(0.4942)	(0.4393)	(2.5873)	(0.2395)	(0.2782)	(1.5527)
N	90	90	90	90	90	90	90	90	90
Controls	X	X	X	X	X	X	X	X	X

Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Notes: OLS coefficients reported. Baseline fixed effects include state fixed effects. The binary variable of interest captures the impact of *Roe v. Wade* in 1973 (Panel A) and 1974 (Panel B). The estimates represent the decline in mortality relative to the prior year. Only demographic controls are included in this specification. We omit policy controls due to lack of variation over the two-year span (though the results are similar with policy controls). Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

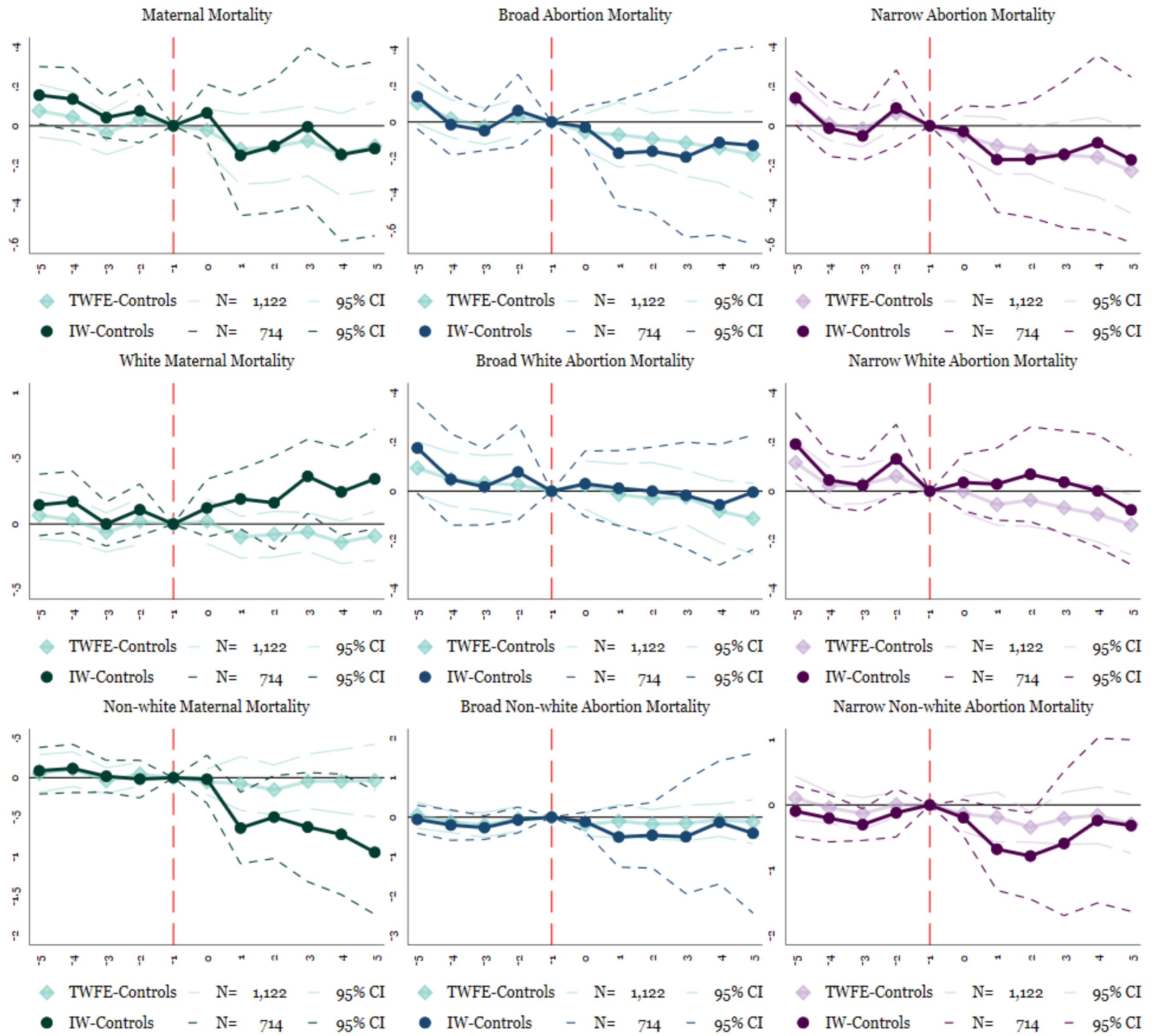
C Additional Main Figures

Figure C.1: Effect of Legal Abortion Dropping States within 500 Miles of NY/DC/CA and Reform States



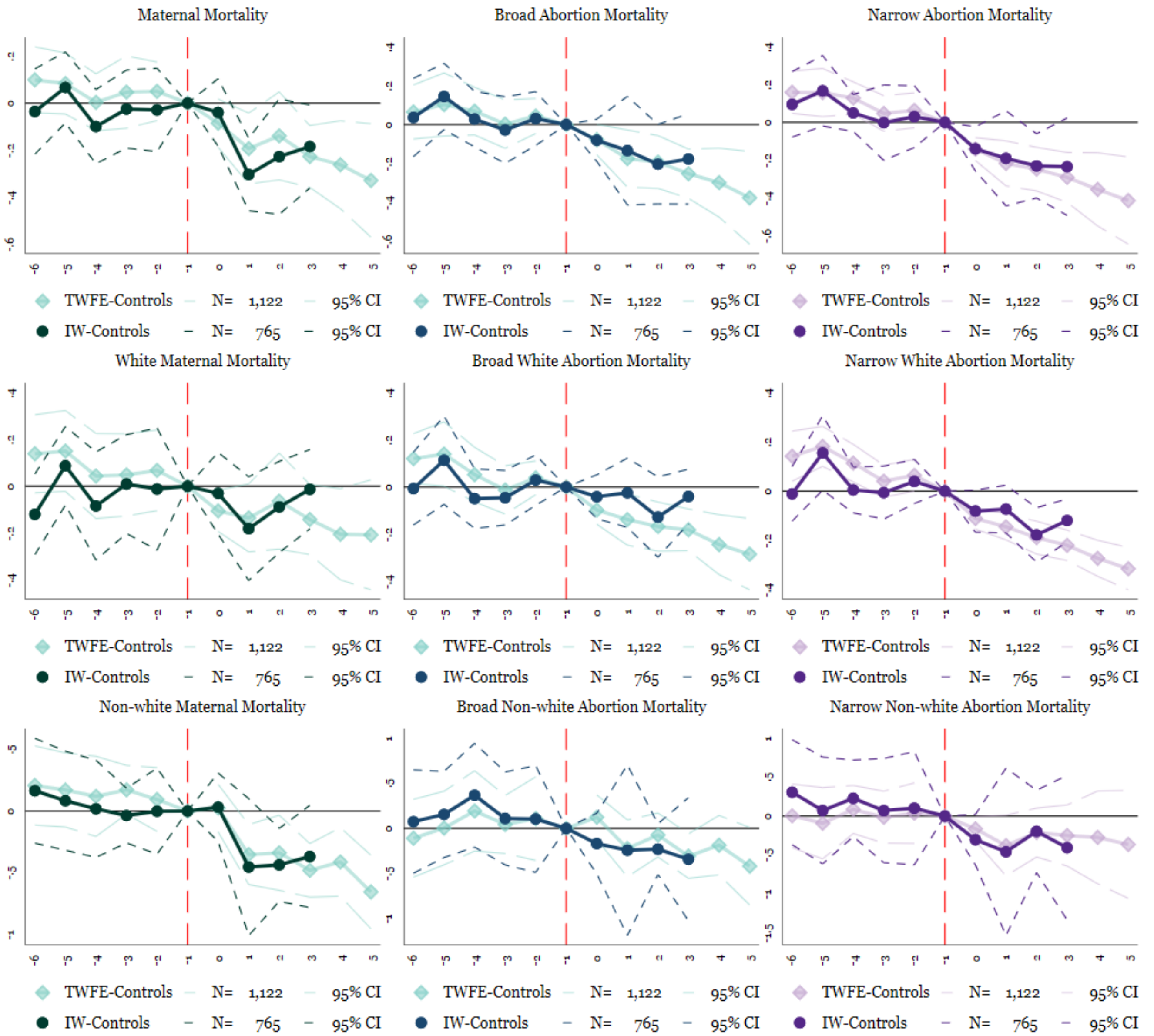
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

Figure C.2: Effect of Adoption of Abortion Reforms or Abortion Legalization



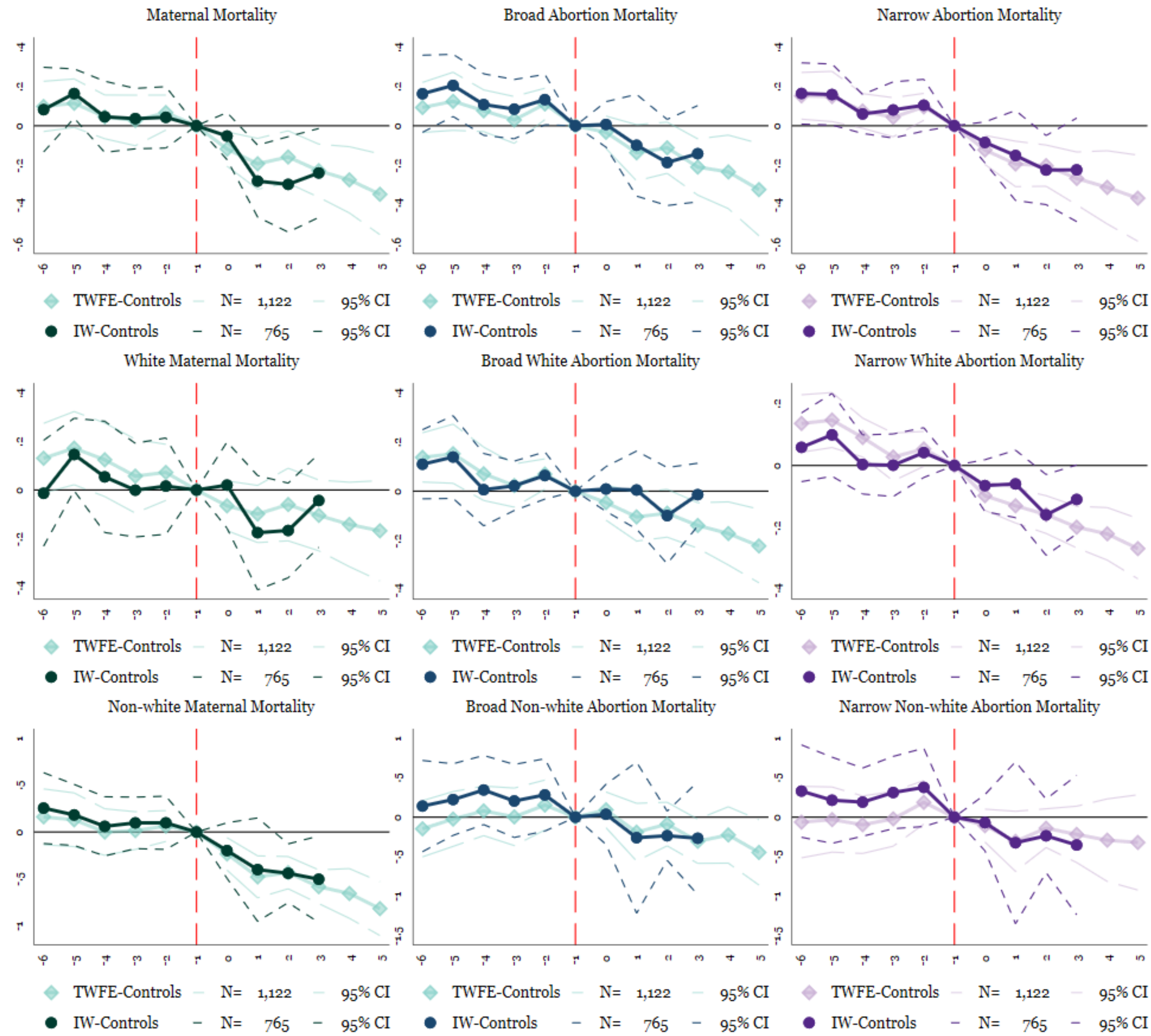
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

Figure C.3: *De Facto* Legalizations: Date of Legalization from the First Year Abortion-to-Birth Ratio Greater than 0.15



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

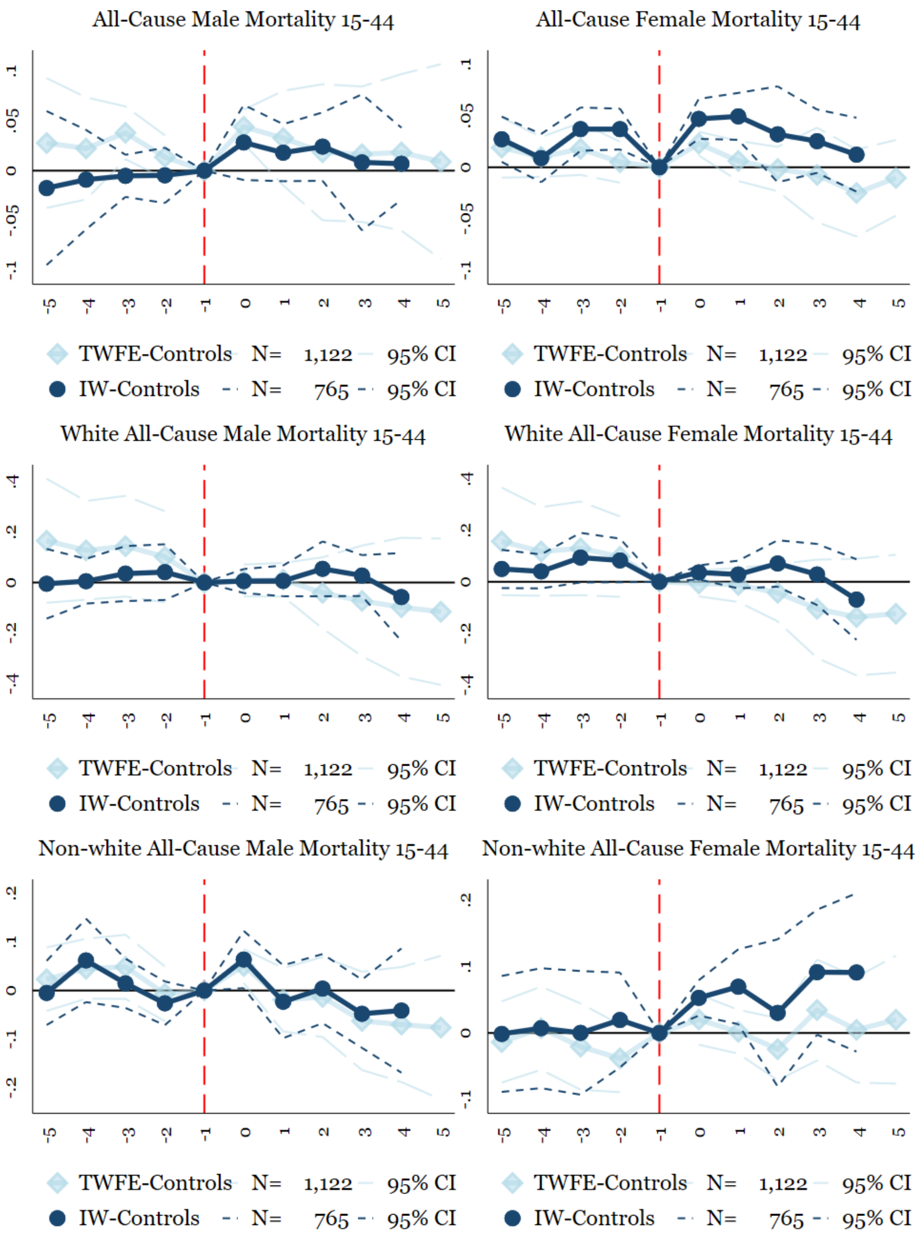
Figure C.4: *De facto* Legal Abortion: Legalizations: Date of Legalization from the First Year Abortion-to-Birth Ratio Greater than 0.1



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

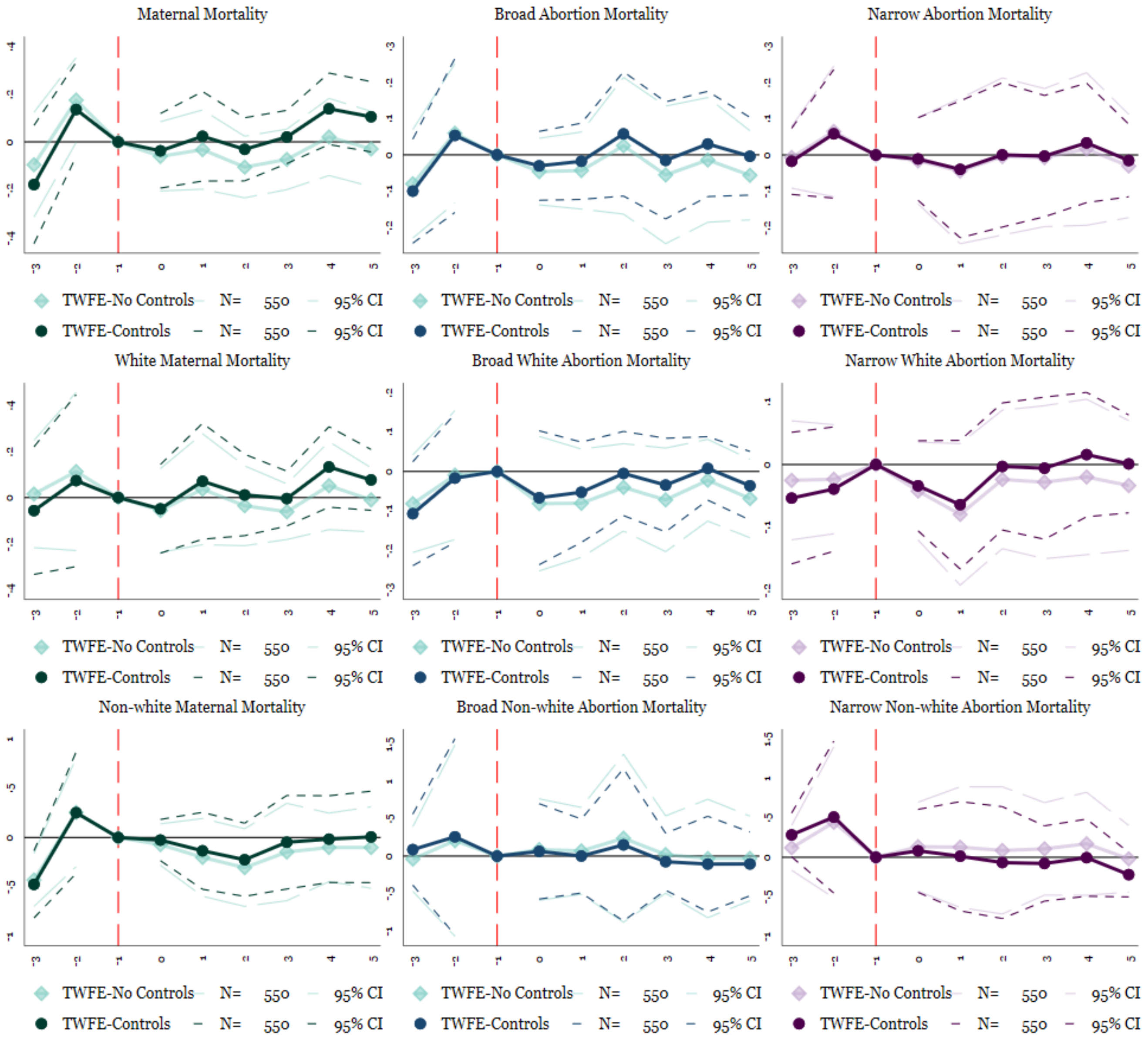
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

Figure C.5: Placebo Test and Misclassification Test



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

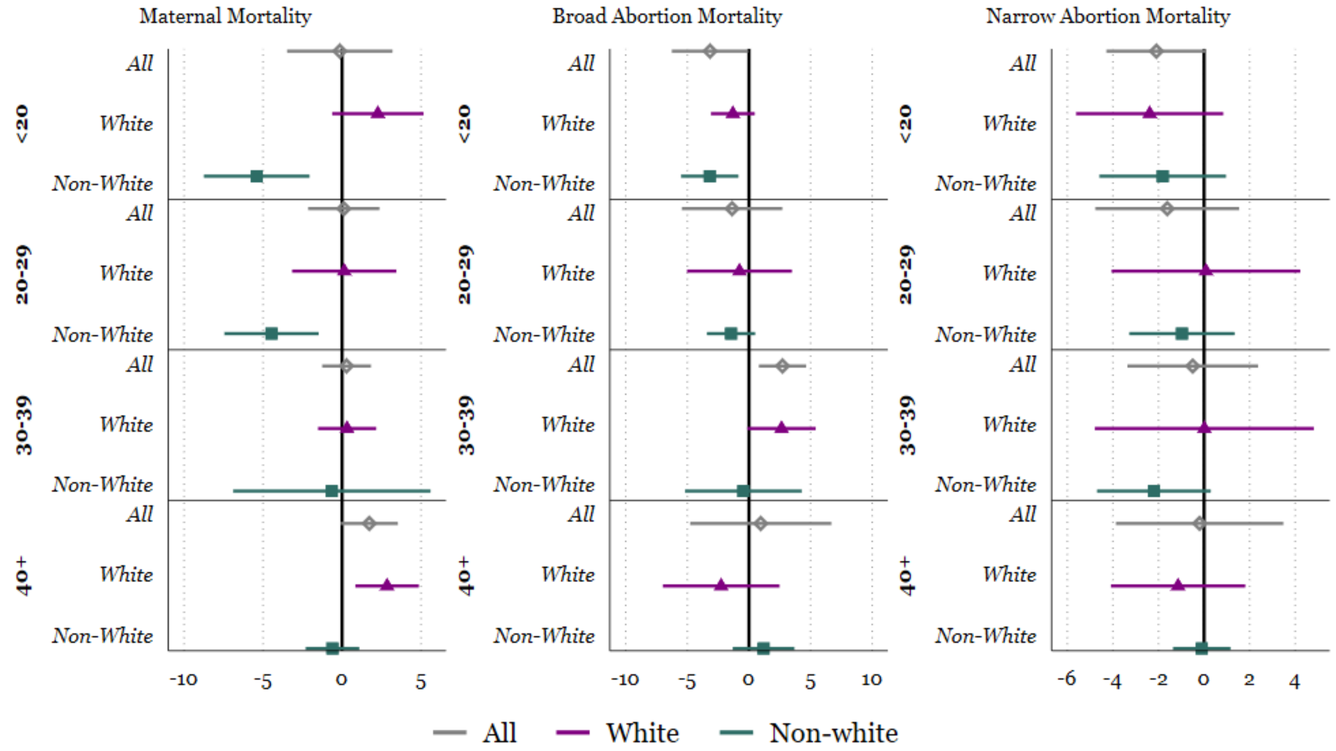
Figure C.6: Effect of Roe v. Wade Relative to Early-Treated



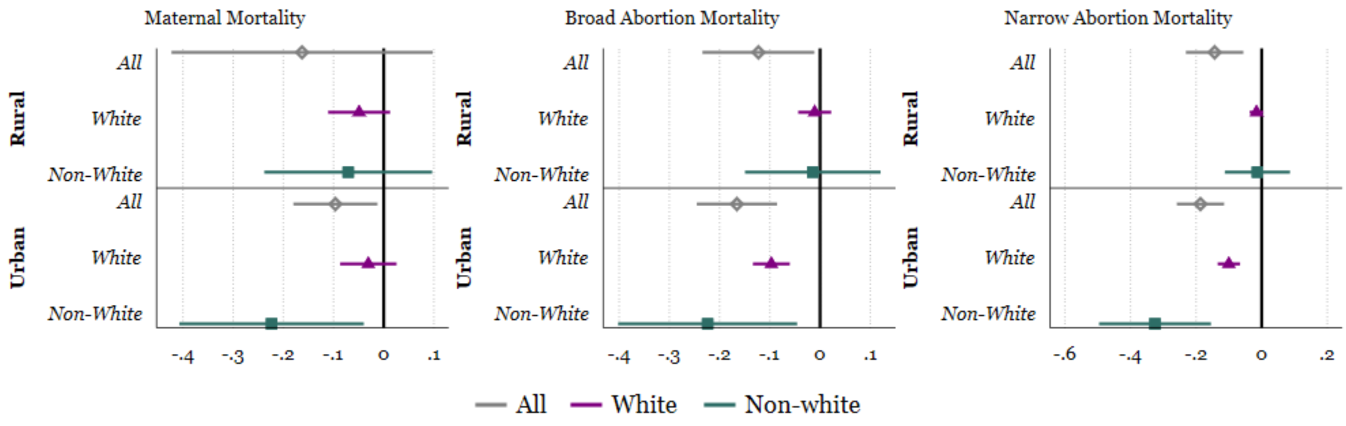
Source: NVSS/CDC Multiple Cause of Death Files. The years included in the sample are 1970-1980. States omitted include DC, NJ, and VT.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. Event study is fully saturated with endpoints unbinned. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

Figure C.7: Difference-in-Differences Results: Maternal and Abortion-related Mortality By Age Group and Urban Status

Panel A: Age



Panel B: Urban v. Rural



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. The main binary variable represents legalized abortion, which captures the effect of early legal abortion as well as the 1973 *Roe v. Wade* decision (see Equation 4). We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels. Note that we use the age-specific rates per the correct populations. However, the rural versus urban counts are per the total females 15-44 population multiplied by the share urban in Haines (2010), though pre-1960 data is unavailable.

D Declines in Maternal Mortality, 1900-1960

The leading cause of maternal mortality at the start of the twentieth century was "childbed" or puerperal fever (Anderson et al., 2020b). Until 1937 (with the advent of sulfa drugs), there was no cure for puerperal fever, only preventative measures through hand-washing and the cleaning of instruments. In 1920, 40% of maternal mortality was caused by puerperal sepsis (or septicemia) (CDC, 1999; Albanesi and Olivetti, 2016). CDC (1999) reports that half of the cases of sepsis occurred directly following delivery while the other half occurred after an illegal abortion. The remaining major causes of maternal deaths included hemorrhage, toxemia, and obstructed labors (CDC, 1999; Albanesi and Olivetti, 2016). Over 1900-1930, maternal mortality showed few improvements, hovering around seven deaths per 1,000 (or 700 deaths per 100,000) (Albanesi and Olivetti, 2016).

Before the medical advancements of the 1930s and onwards, the largest contributor to improved maternal mortality occurred through public health preventive measures. Public health measures include the advent of prenatal care, which starting in the 1920s lowered deaths from toxemia (Albanesi and Olivetti, 2016). Regulatory reforms also targeted maternal mortality over this period. Hospital and state maternal mortality review boards helped to monitor maternal health conditions (CDC, 1999). Further, state-level occupational licensing of midwives led to a reduction in maternal mortality by 6-7% over 1900-1940 (Anderson et al., 2020b).

Then, between 1930 and 1950, significant medical progress produced substantial reductions in maternal mortality. In 1936, the establishment of blood banks allowed mothers to survive maternal hemorrhage for the first time (Albanesi and Olivetti, 2016). The most significant contributor to the decline in maternal mortality occurred through the discovery of sulfa drugs (between 1937 to 1943) (Thomasson and Treber, 2008; Jayachandran et al., 2010; Albanesi and Olivetti, 2016). Jayachandran et al. (2010) shows that the discovery of sulfa drugs reduced maternal mortality by 24-36%. Sulfa drugs not only lowered deaths from puerperal fever, but they also improved the survival rate from live-saving medical procedures such as cesarean section (Thomasson and Treber, 2008). Finally, the medical advancement of penicillin in the early 1940s helped further reduce maternal deaths from sepsis (Albanesi and Olivetti, 2016).

E Data Appendix

E.1 Abortion and Maternal Causes by ICD Code

We include deaths that occurred due to maternal causes (including abortion) and abortion-related causes over the period of our analysis. Due to two revisions in the ICD codes over our study period, multiple measures of maternal mortality were used to obtain maternal deaths. During the seventh revision, in place for 1958–67, maternal causes of death included ICD-7 codes 640–689 (Hoyert, 2007). In the eighth revision, applicable for 1968–78, maternal causes of death included ICD-8 codes 630–678. In the ninth revision, occurring in 1979–1998, maternal causes of death come from ICD-9 codes 630–677. In addition to the underlying causes of death, the data includes grouped causes of death, which can also be used to ascertain maternal mortality (separately from the ICD codes).

For abortion-specific causes of death, during the 7th revision, abortion includes ICD-7 codes 650–652. During the 8th revision, abortion-related deaths include ICD-8 codes 640–645. Finally, in the ninth revision, abortion-related deaths include 634–639 (Hoyert, 2007; World Health Organization , WHO). Abortion classifications change slightly between revisions to reflect the changing nature of abortion. To account for these adjustments, we take the larger header of "abortion deaths" as encompassing these changes in finer causes of abortion-related deaths.

Due to the changes in the specific causes of death, it is difficult to follow classifications of legal versus illegal abortion over time. For instance, in the ICD-9 version of the causes of death, abortion is separated into "spontaneous abortion," "legally induced abortion," and "Illegally induced abortion". However, in the ICD-7 codes, abortion is classified only as "Abortion without mention of sepsis or toxaemia," "Abortion with sepsis," "Abortion with toxaemia, without mention of sepsis." These changes in the classifications of abortion deaths are a limitation of this data, making it difficult to track individual causes of abortion deaths.

Another important feature of the multiple causes of death data is the difference between death by residence and death by occurrence. For our main results, we show the results by residence instead of occurrence. If women traveled from their residence to obtain an abortion, we would want to capture the decline in these deaths based on the residence state due to their residence states' illegal status. Despite the concern over differences between deaths in the state of residence versus occurrence, the results are similar between the use of both. We suspect this is due to the fact that only a small share of deaths occur outside the resident state (Figure A.4).

In addition to the maternal and abortion-related deaths, we also show the effect of abortion on infant and neonatal mortality. We use the age at the time of death reported on the death certificates to compute the infant and neonatal rates. Infant mortality is measured as any death occurring to infants under one year of age. Neonatal mortality is defined as the death of an infant in the first 28 days of life.

E.2 Sources

Table E.1: Abortion Legalizations–States that Repealed their Anti-abortion Statutes

	Year	State	ACTION
1	1969	California	Legalized abortion
2	1970	New York	Legalized abortion
3	1970	Alaska	Legalized abortion
4	1970	Hawaii	Legalized abortion
5	1970	Washington	Legalized abortion
6	1971	District of Columbia	Legalized abortion
	January 22, 1973	All states	Supreme Court decisions in Roe v. Wade

SOURCES: CDC (1969-1980), Rubin (1994), Merz et al. (1996), Myers (2021a)

Table E.2: Abortion Reforms pre-Roe v. Wade

	Year	State	Action
1	1966	Mississippi	Legalized abortion in cases of rape.
2	1967	Colorado	MPC reform
3	1967	North Carolina	MPC reform
4	1967	California	MPC reform
5	1968	Maryland	MPC reform
6	1969	Arkansas	MPC reform
7	1969	Delaware	MPC reform
8	1969	New Mexico	MPC reform
9	1969	Georgia	MPC reform
10	1969	Oregon	MPC reform
11	1970	South Carolina	MPC reform
12	1970	Kansas	MPC reform
13	1970	Virginia	MPC reform
14	1972	Florida	MPC reform
15	1972	Vermont	Court case on abortion
16	1972	New Jersey	Court case on abortion

SOURCES: CDC (1969-1980), Rubin (1994), Merz et al. (1996), Myers (2021a)
NOTES: MPC decriminalized abortion in cases of: danger to the mother's physical or mental health, a fetus with a physical or mental defect, and a case of rape or incest.

F Functional Form

In our main findings, we take the inverse hyperbolic sine of the mortality rate. We choose the inverse hyperbolic sine as it approximates the natural log of mortality while maintaining zero observations (Bellemare and Wichman, 2020). In this section, we motivate why a log transformation is important. We also show that our general conclusions are similar if we use alternative functional forms (the natural log of mortality plus one or with the direct natural log of mortality) or if we use linear rates and assume a Poisson distribution.

First, Figure F.1 shows that the natural log of mortality, the inverse hyperbolic sine, and the log of mortality plus one all are closer to a normal distribution while the linear mortality rates are skewed towards zero. We prefer the natural log distributions, which are closer to normal, and will perform better in our OLS specification. Second, when using the natural log, our estimates reflect proportional changes in mortality rather than mean absolute levels. As maternal and abortion mortality vary substantially from state to state and over time, a specification that accounts for proportional changes rather than linear changes will be preferred in our context.

Third, the inverse hyperbolic sine performs better in cases where the transformed variable of interest is non-zero (Ravallion, 2017) and (roughly) more than one-third of the observations are greater than zero (Bellemare and Wichman, 2020). In our case, all measures of mortality clearly satisfy the non-zero condition. However, for abortion-related mortality, more than 1/3 of observations are zero (e.g., Figure F.2). Thus, for abortion-related mortality (in particular), a Poisson model may be preferred.

To demonstrate that our main conclusions do not hinge on the use of the inverse hyperbolic sine, we show (1) alternative functional forms and (2) implement a Poisson model as an alternative to OLS (particularly relevant for abortion-related deaths).

F.1 Alternative Functional Form

First, we show the findings using the natural log of mortality and the natural log of mortality plus one. The event study is shown in Figure F.3 and the difference-in-differences findings in Figure F.4.[37] These alternative functional forms largely reflect the baseline results for maternal mortality. Thus, our main conclusions are robust to alternative functional forms, even those that exclude zeros.

[37] In Figure F.3 we focus on non-white mortality because white mortality drops to zero faster than non-white mortality and results in omitted post-periods.

F.2 Poisson Model

Second, due to the substantial number of zeros in abortion-related mortality, we also show the difference-in-differences results assuming a Poisson distribution following related work (Myers and Ladd, 2020; Myers, 2021b,c). Thus, we estimate:

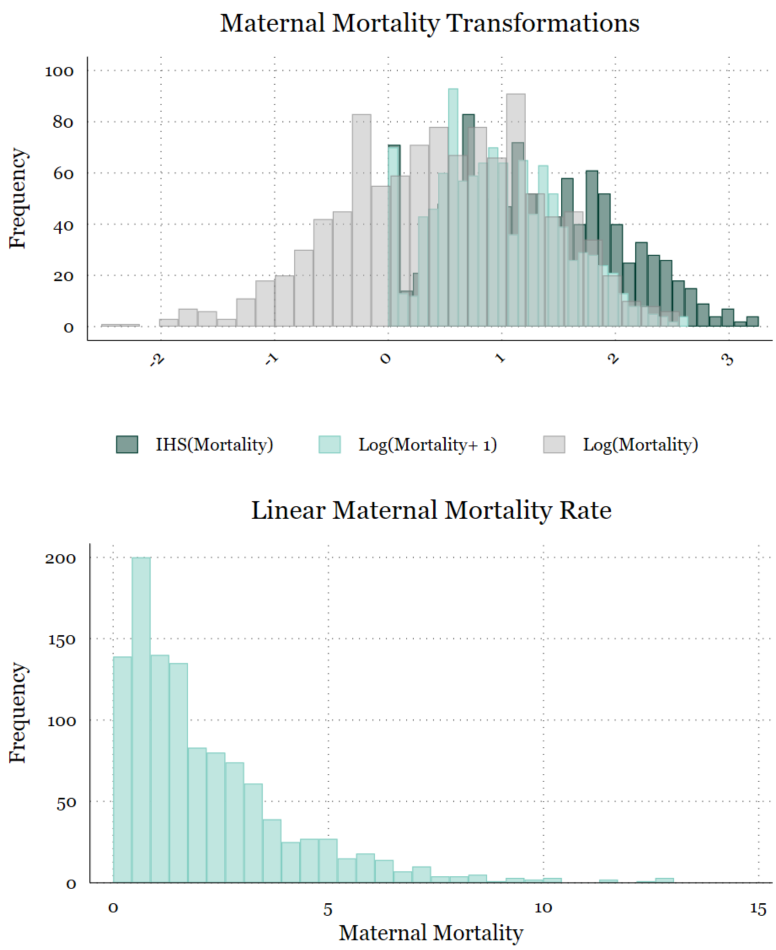
$$E[M_{st}|\text{Legal Abortion}_{st}, \mathbf{X}_{st}, \alpha_s, \eta_t] = exp(\beta \text{ Legal Abortion}_{st} + \mathbf{X}'_{st}\gamma + \alpha_s + \eta_t) \tag{5}$$

where all notation reflects Equation 4, except we model the mortality M_{st} deaths (as a count) based on the population of exposure (females 15-44). Table F.1 shows these results for the full sample in Panel A and the findings focusing on early reforms (by limiting years to pre-1974) in Panel B. The coefficients are presented as incident rate ratios or the incidence rate under legal abortion relative to illegal abortion. Thus, a coefficient of less than one will suggest a reduction in mortality, while a coefficient greater than one would suggest an increase in mortality under legal abortion.

Across Panels A and B, for maternal mortality, non-white maternal mortality shows the most apparent reduction. All maternal mortality and white maternal mortality only display significantly lower death rates under the early reforms. For abortion-related mortality, the coefficients on legal abortion indicate that abortion legalization reduced the death rate from abortion by 50% (at least).

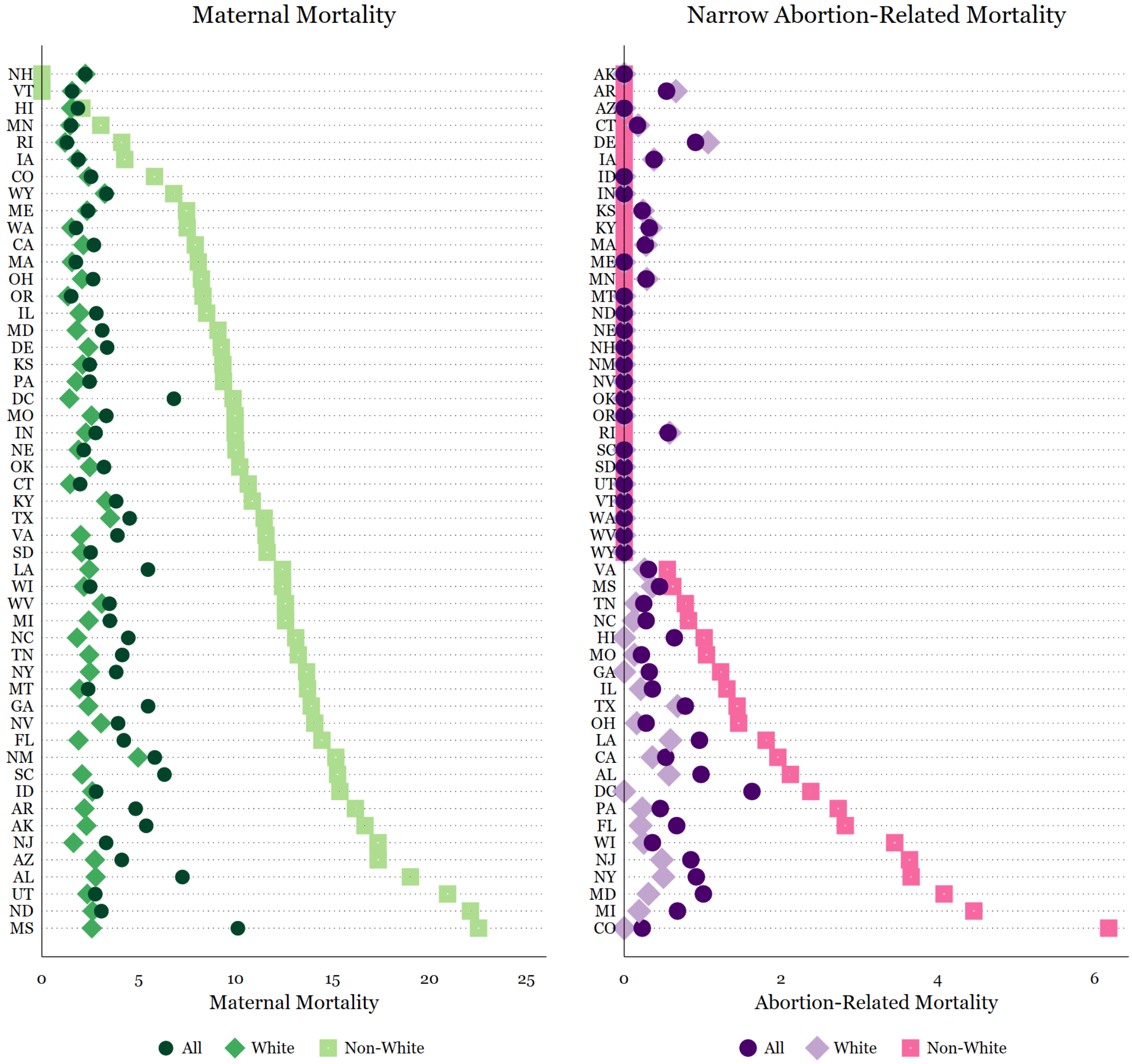
Overall, these findings suggest that the baseline conclusions are robust to alternative specifications, including alternative function forms and a Poisson model (instead of OLS). Though the results accounting for the substantial number of zeros in abortion-related deaths are slightly stronger than the baseline.

Figure F.1: Distribution of Maternal Mortality



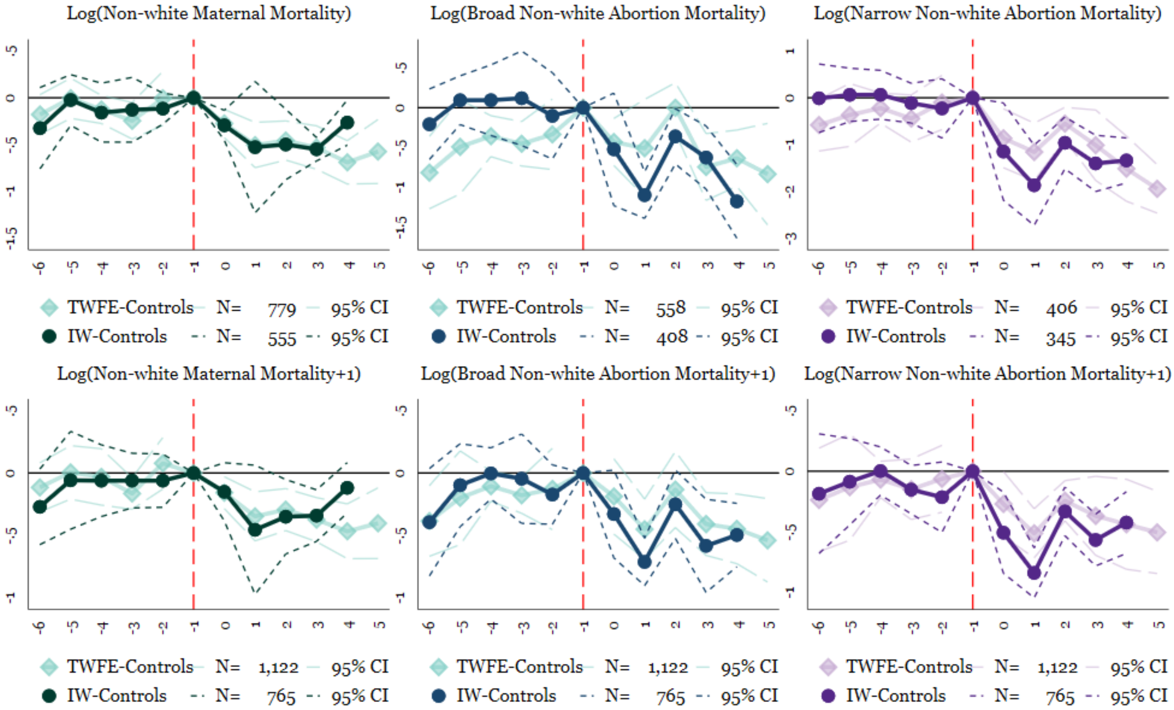
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: Rates are 100,000 reproductive-aged females in each population (all, white, and non-white).

Figure F.2: Average (Linear) Maternal and Abortion-Related Mortality by State, 1959-1968



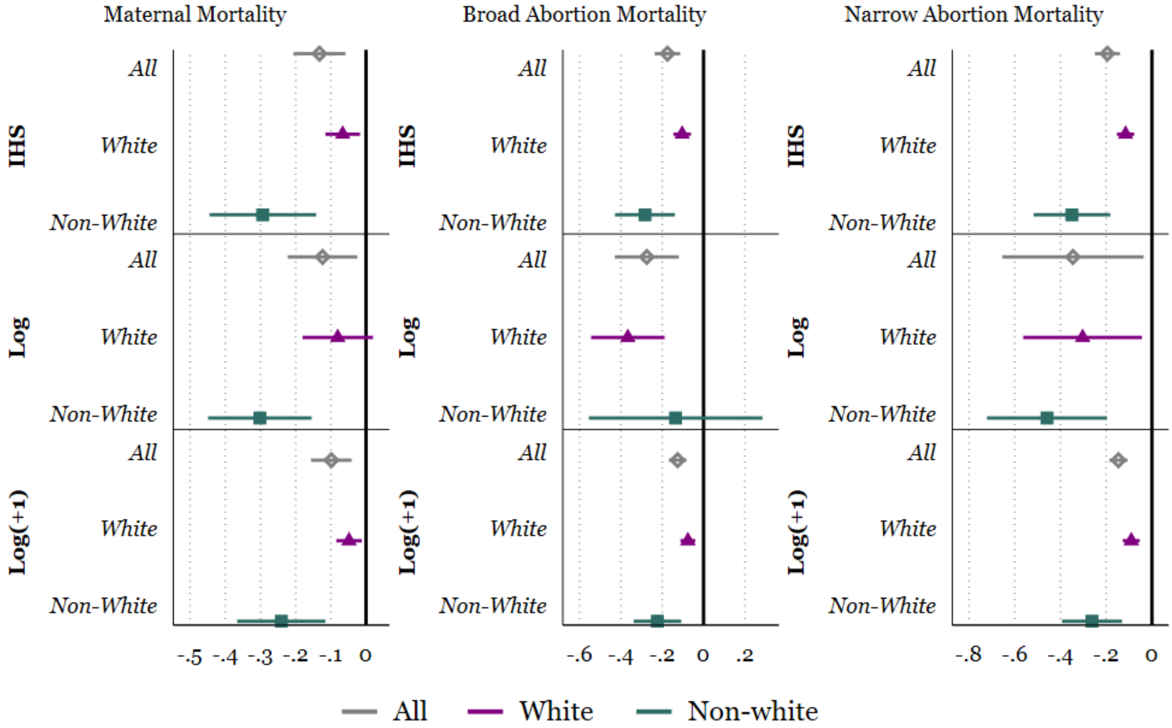
Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: Rates are 100,000 reproductive-aged females in each population (all, white, and non-white).

Figure F.3: Event Study with Alternative Functional Form: Non-white Maternal Mortality



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

Figure F.4: Difference-in-Differences Results: Alternative Functional Form



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. The main binary variable represents legalized abortion, which captures the effect of early legal abortion as well as the 1973 *Roe v. Wade* decision (see Equation 4). We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

Table F.1: TWFE Poisson Model: Linear Mortality and Legal Abortion

Panel A: All Legal Abortion, 1959-1980

	Maternal Mortality			Broad Abortion Mortality			Narrow Abortion Mortality		
	(1) All	(2) White	(3) Non-White	(4) All	(5) White	(6) Non-White	(7) All	(8) White	(9) Non-White
1(Legal Abortion)	0.833***	0.839***	0.722***	0.678***	0.632***	0.628***	0.439***	0.457***	0.375***
	(0.0434)	(0.0465)	(0.0725)	(0.0490)	(0.0654)	(0.0820)	(0.0435)	(0.112)	(0.0653)
N	1,122	1,122	1,100	1,100	1,100	1,056	1,100	1,056	968
State FE and Year FE	X	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X	X

Panel B: Pre-Roe Legal Abortion, 1959-1973

	Maternal Mortality			Broad Abortion Mortality			Narrow Abortion Mortality		
	(1) All	(2) White	(3) Non-White	(4) All	(5) White	(6) Non-White	(7) All	(8) White	(9) Non-White
1(Legal Abortion)	0.809***	0.936	0.582***	0.630***	0.830	0.456***	0.472***	0.584**	0.361***
	(0.0617)	(0.0571)	(0.0625)	(0.0486)	(0.103)	(0.0487)	(0.0767)	(0.156)	(0.0373)
N	765	765	750	750	750	690	750	720	645
State FE and Year FE	X	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X	X

Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.

Notes: Results from a Poisson fixed effects model with linear mortality rates and full abortion access. State and year fixed effects included. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Robust standard errors reported. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

G Adoption

In this section, we use a Cox proportional hazard model to test whether changes in mortality predict the state-level implementation of legal abortion. To consider this, we take a similar specification to Equation 4. However, we use a Cox Proportional Hazard model and consider whether the lag of mortality predicts the adoption of legal abortion. We use the lag of mortality to avoid capturing the effect of legal abortion on mortality. We also include our standard set of controls.[38]

Table G.1 shows the hazard rate of adoption of legal abortion by state and over time. The prior year's mortality fails to significantly predict future adoption of legal abortion. This analysis bolsters our primary empirical strategy, by validating that adoption is not conditional on mortality. States did not systematically adopt legal abortion based on the evolution of mortality. While states with higher mortality overall may have adopted abortion earlier, this time-invariant level of mortality is accounted for by the state fixed effects.

Table G.1: Cox Proportional Hazard Model

Panel A: Maternal Mortality

	Adoption of Legal Abortion								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.Maternal Mortality	0.0833	-0.1430	0.0303						
	(0.0532)	(0.1741)	(0.2375)						
L.White Maternal Mortality				0.0085	-0.0574	0.0254			
				(0.1020)	(0.1791)	(0.3823)			
L.Non-white Maternal Mortality							0.0234	-0.1087	-0.1768
							(0.0268)	(0.0820)	(0.2378)
N	747	747	747	747	747	747	747	747	747
Controls		X	X		X	X		X	X
Weights			X			X			X

Panel B: Narrow Abortion Mortality

	Adoption of Legal Abortion								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.Narrow Abortion Mortality	0.0788	0.0417	0.1388						
	(0.2234)	(0.2457)	(0.4546)						
L.Narrow White Abortion Mortality				-0.0225	0.2430	0.6240			
				(0.1482)	(0.1663)	(0.6390)			
L.Narrow Non-white Abortion Mortality							-0.1253	-0.4350	-0.3691
							(0.2370)	(0.3465)	(0.5145)
N	747	747	747	747	747	747	747	747	747
Controls		X	X		X	X		X	X
Weights			X			X			X

SOURCE: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
NOTES: Results from a Cox Proportional Hazard model over the panel of analysis, until all states have adopted legal abortion. The Cox Proportional Hazard expressed above uses the 'failure year' as the year after legal abortion passes (goes into effect) in each state (reflecting Equation 4). We take the inverse hyperbolic sine of the mortality rate as the main mortality rate of focus (unless otherwise noted). Maternal mortality and abortion-specific mortality are per 100,000 females 15-44. Non-white (white) rates are per 100,000 non-white (white) reproductive-age females. Estimates are weighted by the denominator of the rate. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.

[38] Note that the *stcox* in Stata does not accept average weights. Thus we use pweights, but have also tested fweights which returns similar results.

H Goodman-Bacon Decomposition

Based on the importance of early-legalization states in the main results, we decompose our main difference-in-differences results by treatment timing using a Goodman-Bacon decomposition (Goodman-Bacon, 2021) in Table H.1. The results presented are without weights or controls.

The findings in Table H.1 illustrate that, as suspected, the general conclusions on the impact of abortion legalization depend on the comparison being made. For non-white maternal mortality, the main effect is through early abortion legalization, with later legalization having a positive coefficient. For white maternal mortality, the reverse is true, with later-treated showing a reduction while early-treated fails to show a decline in maternal mortality. However, the effect on white maternal mortality is relatively small in magnitude.

Then, focusing on abortion-related mortality, the results suggest similar heterogeneous treatment effects to maternal mortality. Abortion-related mortality declines are highest in early-treated states, with the impact most apparent for non-white abortion-related mortality. White abortion-related mortality actually is higher after legalizations in later-treated states.

These heterogeneous effects across comparison groups align with the findings from Section 6.5, suggesting that early legalizations were more important than Roe v. Wade itself, with the effect most pronounced for non-white rather than white women. To more explicitly test the separate effect of all legalization states, we present the heterogeneous treatment effects from the Goodman-Bacon Decomposition excluding states treated by *Roe v. Wade* in Table H.2. The results indicate that all voluntary abortion legalizations produced declines in non-white maternal and non-white abortion-related mortality, where the effect appears symmetric in early versus later-treated states.

Table H.1: Goodman-Bacon et al. (2019) Decomposition

DD Comparison	(1) Weight	(2) DD Estimate
Maternal Mortality		
Earlier Treated v. Later Control	0.628	-0.236
Later Treated v. Earlier Control	0.372	-0.148
Average DD Estimate		-0.203
White Maternal Mortality		
Earlier Treated v. Later Control	0.628	0.069
Later Treated v. Earlier Control	0.372	-0.054
Average DD Estimate		0.023
Non-white Maternal Mortality		
Earlier Treated v. Later Control	0.628	-0.409
Later Treated v. Earlier Control	0.372	-0.047
Average DD Estimate		-0.274
Narrow Abortion Mortality		
Earlier Treated v. Later Control	0.628	-0.198
Later Treated v. Earlier Control	0.372	-0.035
Average DD Estimate		-0.137
Narrow White Abortion Mortality		
Earlier Treated v. Later Control	0.628	-0.005
Later Treated v. Earlier Control	0.372	0.045
Average DD Estimate		0.013
Narrow Non-white Abortion Mortality		
Earlier Treated v. Later Control	0.628	-0.364
Later Treated v. Earlier Control	0.372	-0.146
Average DD Estimate		-0.283
Notes: controls and weights excluded		

Table H.2: Goodman-Bacon et al. (2019) Decomposition - Excluding *Roe v. Wade*

	(1)	(2)
DD Comparison	**Weight**	**DD Estimate**
Maternal Mortality		
Earlier Treated v. Later Control	0.548	-0.050
Later Treated v. Earlier Control	0.452	-0.386
Average DD Estimate		-0.202
White Maternal Mortality		
Earlier Treated v. Later Control	0.548	-0.049
Later Treated v. Earlier Control	0.452	0.049
Average DD Estimate		-0.005
Non-white Maternal Mortality		
Earlier Treated v. Later Control	0.548	-0.455
Later Treated v. Earlier Control	0.452	-0.569
Average DD Estimate		-0.507
Narrow Abortion Mortality		
Earlier Treated v. Later Control	0.548	0.140
Later Treated v. Earlier Control	0.452	-0.175
Average DD Estimate		-0.003
Narrow White Abortion Mortality		
Earlier Treated v. Later Control	0.548	-0.177
Later Treated v. Earlier Control	0.452	0.153
Average DD Estimate		-0.028
Narrow Non-white Abortion Mortality		
Earlier Treated v. Later Control	0.548	-0.208
Later Treated v. Earlier Control	0.452	-0.249
Average DD Estimate		-0.226
Notes: controls and weights excluded		

I Fertility Rates, Infant Mortality, and Neonatal Mortality

In this section, we test the impact of abortion policy on infant deaths, neonatal deaths, and the fertility rate. We measure the fertility rate as the number of births per reproductive-age female, however, for infant and neonatal mortality, we compute these measures per 1,000 births (the standard measure). We maintain the infant and neonatal deaths per birth since these deaths are a direct function of the number of infants born in a given year. Thus, for infant and neonatal mortality, both the numerator and denominator will be affected by any change to the fertility rate.

I.1 Fertility Rates

We test the effects of abortion legalization on the state-level fertility rate, which has been studied previously (e.g., in Guldi (2008)). While these effects have been previously documented, we present the fertility effects to emphasize two points. First, the fact that we consider abortion and maternal deaths per reproductive-age female instead of traditional measures of abortion and maternal deaths per birth. If we use births, mortality may change as a result of the denominator (births) adjusting in response to the passage of legal abortion. Second, the characteristics of pregnancies themselves may be changing due to a reduction in the fertility rate. Thus, without examining the fertility rate and delivery characteristics, the main reduction in maternal deaths for non-white women is not clearly interpretable.

Figure I.1 in the right-purple specification shows the impact of abortion legalization on the number of births per 1,000 females 15-44. Following abortion legalization, there is a substantial reduction in the fertility rate, especially for non-white women. White women show a more transient decline. The clear reduction in the fertility rate is also robust to alternative specifications in the difference-in-differences specification shown in Figure I.2.

Given the magnitude of the number of abortions performed in the wake of Roe v. Wade (discussed in Section 2), the importance of abortion for the fertility rate is not surprising. Over 1973 to 1980, abortions appear to have doubled in counts, rising from 616,000 in 1973 to 1,298,000 abortions in 1980 (CDC, 2011). Based on the increase in abortions over this time period, the substantial decline in the fertility rate is quite plausible and aligns with prior findings.[39]

I.2 Infant and Neonatal Mortality

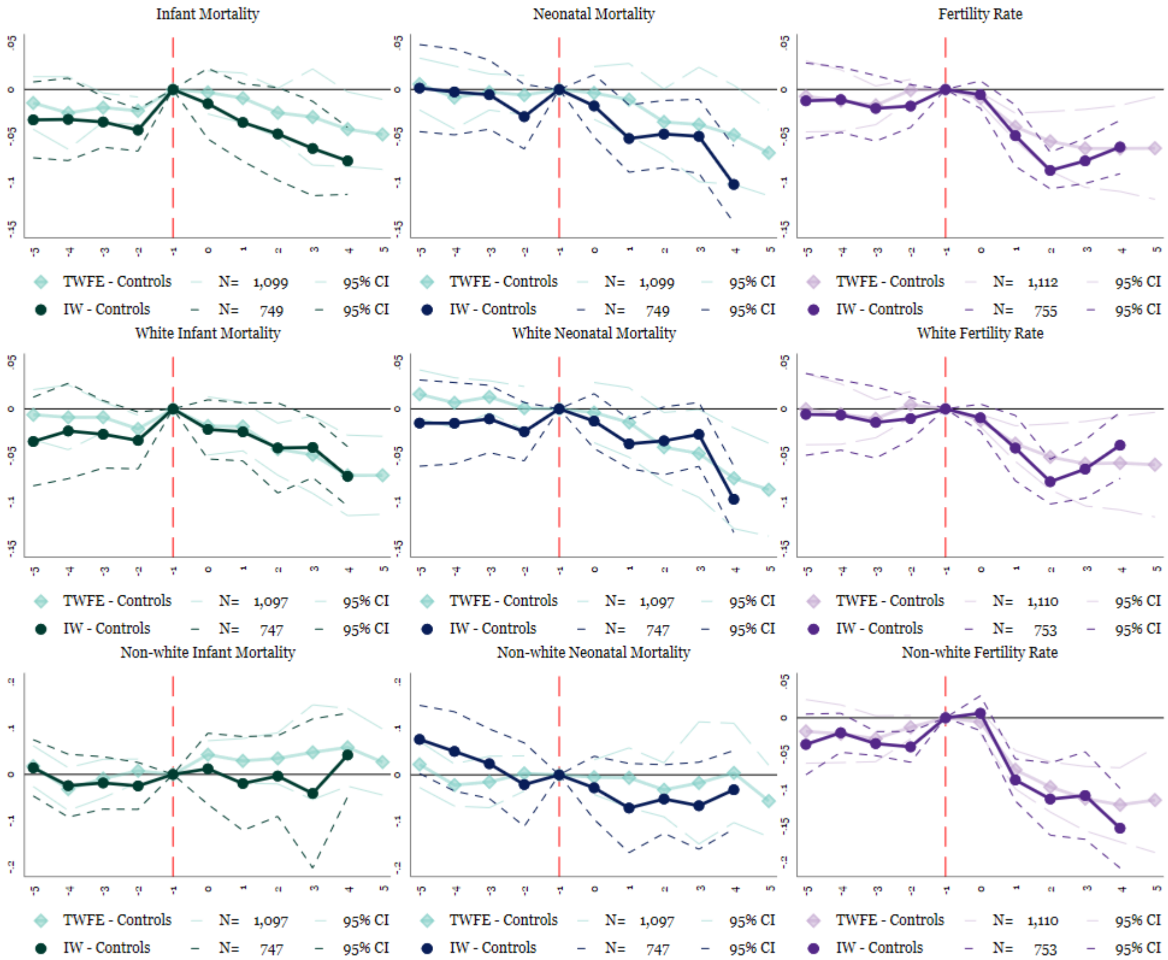
Based on evidence suggesting that access to abortion may have impacted infant mortality (Krieger et al., 2015), we consider the effect of legal abortion on infant mortality and neonatal mortality. We show the event-study results in Figure I.1 on the left (in green) for infant mortality and in the middle graphs (blue) for neonatal mortality. The results only show some reduction in white infant and neonatal mortality, with the effect clearer for infant mortality as compared to neonatal mortality. There is no impact on non-white infant or non-white neonatal mortality.

We also show neonatal and infant mortality in a difference-in-differences specification plotted in Figure I.2. Over the first specification, the results indicate that legal abortion led to declines in white neonatal and infant mortality. However, the results are not robust to alternative specifications. These

[39] In addition to Guldi (2008), Our findings align with Myers (2017), though we consider different outcomes.

findings place skepticism on the conclusions in (Krieger et al., 2015), indicating little causal impact on infant or neonatal mortality.[40]

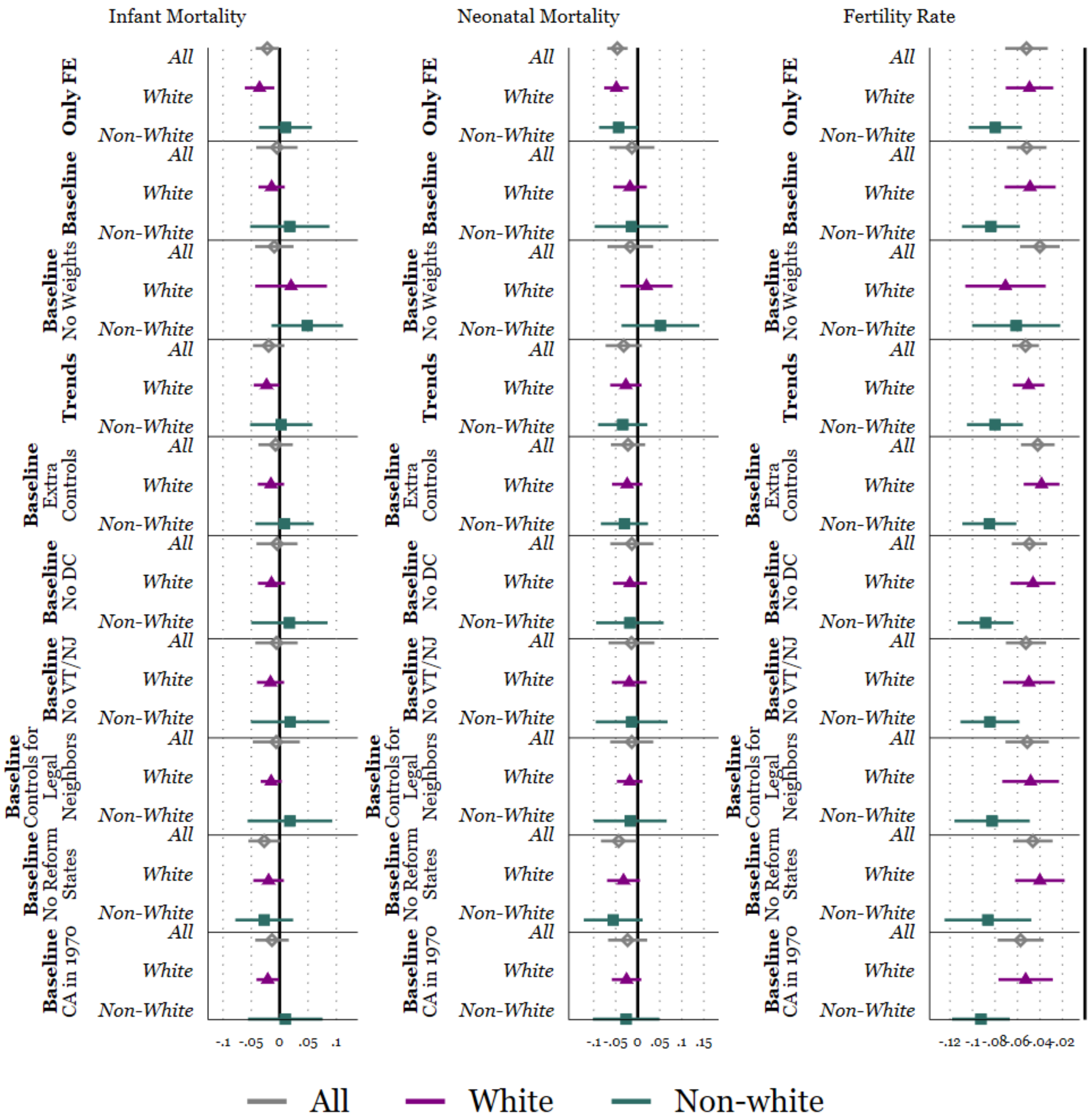
Figure I.1: Additional Results: Effect of Legal Abortion on Infant and Neonatal Mortality



Source: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
Notes: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. Plotted coefficients are dummy variables on each year before and after the change to abortion policy (see Equation 1). The period just before the reform is the excluded period (-1)–indicated by the vertical line. For the two-way fixed effects specification (TWFE), the left endpoint is binned at $m = -7$, and the right endpoint is binned at $m = 6$. For the Interaction-Weighted (IW) specification, the event study is fully saturated. In the IW specification, we only consider the years 1959-1973, with *Roe v. Wade* states as the last-treated comparison group. Only the point estimates in the main event window are displayed. Dashed and dotted lines reflect 95% confidence intervals. Robust standard errors clustered at the state level. In the main specification, we use the inverse hyperbolic sine of the mortality and fertility rates. Infant and neonatal mortality are per 1,000 births. The fertility rate is per 1,000 reproductive-age females. Non-white (white) rates are per non-white (white) 1,000 births (infant/neonatal) or 1,000 reproductive-age female (births). Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation.

[40] These results also fall somewhat in line with previous work in Bauman and Anderson (1980); Miller et al. (1988), where each study found no discernible impact on neonatal mortality or infant mortality. However, Bauman and Anderson (1980) did find a modest and brief contribution of the 1970s legalizations to reducing fetal deaths.

Figure I.2: Difference-in-Differences Results: Infant and Neonatal Mortality



SOURCE: NVSS/CDC Multiple Cause of Death Files, 1959-1980.
NOTES: OLS coefficients presented above. Baseline fixed effects include year fixed effects and state fixed effects. The main binary variable represents legalized abortion, which captures the effect of early legal abortion as well as the 1973 *Roe v. Wade* decision (see Equation 4). In the main specification, we use the inverse hyperbolic sine of the mortality and fertility rates. Infant and neonatal mortality are per 1,000 births. The fertility rate is per 1,000 reproductive-age females. Non-white (white) rates are per non-white (white) 1,000 births (infant/neonatal) or 1,000 reproductive-age female (births). Estimates are weighted by the denominator of the rate. Our main set of state-level demographic controls includes the share of reproductive-age females 15-19 who arem and the share of reproductive age females who are 15-19 and non-white, and the log of the average family income. We also include policy controls for state-level abortion reforms, access to the pill for minors, access to the pill generally, unilateral divorce legislation, and state equal pay legislation. Additional controls include the log of the state-level AFDC benefit, the cigarette tax, the unemployment rate, Medicaid access, and the log of the per-pupil education spending. Robust standard errors clustered at the state level. ***, **, * represent statistical significance at 1, 5 and 10 percent levels.