

# **Changes in Teen Fertility Following Access to the Pill and Abortion in the Early 1970s**

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We show that recent studies on the “power of the pill” have not adequately accounted for the role of abortion on teen fertility in the years between 1970 and 1973. We use rediscovered data on abortions performed in New York State in 1971 and 1972 by age, race and state of residence to demonstrate the impact of legal abortion services in New York on teen fertility rates as far away as Montana prior to *Roe v. Wade*. Our results strongly suggest that it was access to legalized abortion services and not policies allowing young, unmarried women access to the pill that caused birth rates of young women to fall in the early 1970s. Our findings do not refute the impact of the pill on the well-being of women, but they do call into question the identification strategy upon which recent estimates are based.

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## I. Introduction

The impact of fertility control on the well-being of families has received a great deal of attention in the economics literature. Early work focused on the association between abortion and infant health but was limited to cross-sectional analyses (Grossman and Jakobowitz 1981; Joyce 1987; Grossman and Joyce 1990). Later work used robust changes in fertility associated with the legalization of abortion in the early 1970s to analyze cohort effects on infant, child and adult outcomes (Berkov and Sklar 1974; Joyce and Mocan 1990; Levine et al. 1999; Angrist and Evans 1999; Gruber, Levine and Staiger 1999; Donohue and Levitt 2001). Although positive sentiment towards legal abortion had been growing in the late 1960s and early 1970s, the swiftness with which legalization arrived was breathtaking and provided a credible source of exogenous change that facilitated causal inferences (Garrow 1998).

Changes in access to and use of the birth control pill were not as sharply delineated as was legalized abortion, even though its impact on fertility and well-being may be greater. The pill was first available nationally in 1960 but was limited almost exclusively to married women. By 1965 23.9 percent of all married couples that contracepted used the pill. Five years after the 1965 U.S. Supreme Court decision in *Griswold* the pill's use among married couples that practiced contraception had increased to 34.2 percent (Westoff 1972). Coincident with these changes was a dramatic decline in fertility. The birth rate of women 15 to 49 years of age fell from 89.1 births per 1000 in 1960 to 68.3 in 1970. And yet, the contribution of the pill to this decline remained in dispute. The post War baby-boom had peaked in 1957 and birth rates fell each year prior to the availability of the pill. Becker (1981) argued that improved methods of birth control such as the pill are primarily an

“induced response to other decreases in the demand for children rather than an important cause of the decreased demand” (p. 101). The empirical challenge in sorting out the relative contribution of the pill has been the lack of a clear identification strategy. The use of the pill appears to have grown steadily after its introduction, which makes identifying its impact difficult amidst other changes associated with the evolving role of women in society.<sup>1</sup>

In an effort to evaluate the pill’s role in women’s marriage and career decisions, Goldin and Katz (2002) used variation in the age of majority and the expanded rights of minors across states and cohorts to explain the diffusion of the pill among young, single women. With a focus on college graduates, they found that access to pill among unmarried women was associated with a delay in marriage and a rapid increase in women in professions such as law and medicine. Goldin and Katz’s work stimulated a series of additional studies. Bailey (2006) extended Goldin and Katz’s work by using cross-state and cohort variation in access to the pill among unmarried women to analyze age at first birth and labor force participation. Guldi (2008) used a similar identification strategy to evaluate the relative contribution of access to the pill and legalized abortion on the birth rates of women 15 to 21 years of age. Ananat and Hungerman (2008) have pushed the framework to evaluate the well-being of the “marginal” child of women exposed to the pill and Hoch (2008) has focused on the college graduation rates among these same cohorts. The general finding is that access to the pill in the late 1960s and early 1970s had a significant impact on the reproductive, marital, educational and occupational choices of young women as well as the well-being of their offspring.

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<sup>1</sup> Bailey (forthcoming) uses state-variation in Comstock laws and the Supreme Court decision in *Griswold v. Connecticut* to identify effects of the pill on fertility in the 1960s.

The estimated “power of the pill” is obtained from the reduced-form association between state laws and policies regulating access to the pill among young, unmarried women and outcomes related to the fertility and well-being of its users. Evidence as to the relationship between states laws and use of the pill rests largely on a single cross-section of women in 1971. However, most changes that resulted in expanded access to the pill among single, young women occurred between 1970 and 1973, a period of seismic change in access to legalized abortion. Each study attempts to control for the availability of legalized abortion within each state but none adequately accounts for access to abortion services in primarily New York and to a lesser extent California and the District of Columbia in the years prior to *Roe v. Wade*. As a result, decreases in teen fertility that are attributed to changes in legal access to the pill may be more appropriately attributed to the availability of abortion.

In this study we show that recent studies on the “power of the pill” have not adequately accounted for the role of abortion in the years between 1970 and 1973 on teen fertility. We use re-discovered data on abortions performed in New York State in 1971 and 1972 by age, race and state of residence to demonstrate the impact of legal abortion services in New York on teen fertility rates as far away as Montana. Our results strongly suggest that access to legalized abortion services and not policies allowing access to the pill caused birth rates of young women to fall in the early 1970s. Our findings do not refute the impact of the pill on the well-being of women, but they do undermine the identification strategy upon which recent estimates are based.

## **II. Background.**

## II.A. Pill Access and Use

Goldin and Katz (2002) make a compelling case that use of the pill before age 21 among college-educated women rose rapidly for cohorts born between 1945 and 1950. Whether there was more use of the pill among states with more lenient laws regarding access is more difficult to demonstrate. The only micro-level data that can address the question is the National Survey of Young Women 1971 (NSYW71), a single cross-section of 4,611 teens 15 to 19 years of age interviewed about sexual activity, contraceptive use and abortion in 1971. Goldin and Katz (2002) regress pill use on a dichotomous measure of whether a state had lenient pill use policies for women 16 years of age or less. The dependent variable is one if the teen answers yes to the question, “Did you ever use birth control pills?” and zero otherwise. According to the survey, 6.5 percent of all teens 15-19 years of age and 24.5 percent of sexually active teens had ever used the pill. Based on their regressions, Goldin and Katz find that pill use was 2 percentage points greater among all teens and 8.1 percentage points greater among sexually active teens in the 12 states with lenient policies in which teens 16 years of age and older had access to the pill relative to states in which access was limited to teens at least 17 years of age. The estimates represent about a 33 percent increase and are robust to stratifying the sample by age and college attendance.

Goldin and Katz’s results from the NSYW71 become an important point of departure in subsequent analyses of the pill. Bailey (2006), Guldi (2008), Ananat and Hungerman (2008) and Hoch (2008) all use the Goldin and Katz findings to justify their use of pill access laws to identify effects of the pill on fertility, marriage, educational attainment and child well-being. However, none re-estimate Goldin and Katz’s (2002) regressions with the NSYW71, even though their coding of the laws that restrict access to the pill among

unmarried, young women differs. For instance, Goldin and Katz (2002) characterize 12 states as having lenient laws or policies that allow teens 16 years of age or older to obtain the pill without parental involvement. Guldi's (2008) interpretation of these laws and policies suggests that teens in 14 states had access to the pill without parental consent. Nine of Guldi's 14 states are the same as Goldin and Katz's. Ananat and Hungerman (2008) use Guldi's coding of the laws with the NSYW71, but their measure of access varies by age and state whereas Goldin and Katz's measure varies by state only.<sup>2</sup> Finally, Bailey's (2006, 2009) measure of early legal access to the pill treats any state that allowed unmarried women less than 21 to obtain the pill without parental consent as liberal and all others as restricted. According to Bailey, 14 states could be characterized as liberal prior to 1971, of which only 3 states (in the NSWY71) overlap with Goldin and Katz (2002). The differences matter. In Table 1 we replicate Goldin and Katz's regressions from columns 1 and 2 of Table 3 of their article.<sup>3</sup> As reported above, the proportion of teens that have ever used the pill is greater in states with lenient policies regarding access to the pill for teens 16 years or older. In columns 3 and 4 we run the same regressions but substitute Guldi's 14 states with lenient laws as used by Ananat and Hungerman (2008) in place of Goldin and Katz's 12 states; in columns 5 and 6 we show results using Bailey's (2006, 2009) coding. As is apparent in columns 3-6, there is no association between access to the pill and its use with these variations in coding. Indeed, the coefficient is negative in all four cases.

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<sup>2</sup> Ananat and Hungerman's coding is based on which women had access to the pill at age 16. Thus, a 19-year old in 1971 from the NSYW71 is considered as having access if her state had lenient policies in 1968 when she was 16 years of age. The coding represents a conservative measure of access. If a state allowed an unmarried 18-year olds access to the pill in 1970, then the same 19 year old in 1971 would be coded as living in a state with restrictive laws even though she had access to the pill in 1970 and 1971. Ananat and Hungerman never regress pill use on pill access but instead regress use of abortion on this measure of pill access. Goldin and Katz's (2002) coding does not vary by age but instead characterize states that allowed unmarried girls 16 years or older to obtain the pill in 1971 as lenient.

<sup>3</sup> We thank Claudia Goldin and Larry Katz for graciously sharing their data and programs.

The NSYW71 is but a single cross-section and provides only limited evidence as to the impact of state laws granting access to the pill on its use. Nevertheless, the lack of a robust “first-stage” is inconsistent with the very large association between laws regulating access to the pill and teen birth rates reported in recent studies. Ananat and Hungerman (2008), for example, find that access to the pill among unmarried teens is associated with a 21 percent decline in teen fertility rates, a decrease roughly twice as large as the decline associated with the legalization of abortion (Levine et al. 1999). Guldi (2008) reports that access to the pill is associated with an 8.5 percent decline in the birth rates of white women 15 to 21 years of age, but is unassociated with birth rates of non-whites. Bailey (2006) finds that the access to the pill among young unmarried women is associated with a 9 percentage point drop in the probability that a woman had a first birth before age 22, an 18 percent decline evaluated at the mean. However, Bailey had to retract her estimates because of coding errors. In her erratum, she finds that liberal laws are associated with only a 0.9 percentage point drop in the probability of a first birth before age 22 (Bailey 2009).<sup>4</sup>

A second concern is that 36 states increased access to the pill for young women from 1970 to 1973, a period of rapid growth in legalized abortion (Guldi 2008). And yet, none of the recent studies of the pill have accounted for the number of teens who traveled to New York, California or Washington DC for an abortion prior to *Roe*. Consequently, changes in fertility associated with access to the pill during this period may be picking up the effect of abortion, an issue we turn to next.

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<sup>4</sup> Bailey (2009) argues that the probability of a first birth before age 21, 20 or 19 is a more appropriate outcome with which to assess the effect of access to the pill on fertility. In these regressions, she finds that liberal laws are associated with a 1.4 percentage point decline (Table III).

## II.B. The legalization of abortion

Five states and the District of Columbia effectively legalized abortion between 1969 and 1970.<sup>5</sup> Skalar and Berkov (1974) estimated that abortion reform in 1970 reversed an upward trend in non-marital fertility as well as a short up tic in marital fertility that had occurred between 1969 and 1970. However, changes in fertility were not limited to states that reformed their laws or legalized abortion outright. Fertility rates also fell after 1970 in states that made no changes to their abortion laws. Levine et al. (1999) showed that the closer a woman lived to a state that legalized abortion before *Roe*, the greater the decline in the birth rate of that state between 1971 and 1973. The obvious conclusion is that many women traveled to primarily New York and California in the years before *Roe* to terminate an unwanted pregnancy. Data from the Center for Disease Control (CDC) support this. In 1971 there were 441,367 legal abortions performed in the US. However, 186,058 were to women who obtained an abortion outside their state of residence. Seventy-nine percent or 158,704 of abortions to non-residents were performed in New York, 132,006 or 61 percent in New York City alone (Center for Disease Control 1972). Surprisingly, only 13,071 or 7.1 percent of abortions to women obtained outside their state of residence were performed in California in 1971. In fact, the next most important destination was Washington, D.C. in which there were 6,399 abortions to non-residents. By 1972, Washington D.C. had replaced

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<sup>5</sup> The California Supreme Court case in *People v. Belous* (September , 1969) resulted in *de facto* legalization in California. This decision was followed repeals in Hawaii (effective March 1970), New York (July, 1970), Alaska (July, 1970) and Washington State (December 1970). Abortions became available at outpatient clinics in Washington DC in 1971 following the decision in *US v. Vuitch* (April 1971). For details, see Garrow (1998) and Lader (1973).



California as the second most frequented destination for an abortion among non-residents: 21,101 in Washington D.C. as compared to 20,201 in California (CDC 1973, Table 4).<sup>6</sup>

Authors of the recent studies on the impact of the pill on the reproductive, marital and labor market decisions of young women generally include a dichotomous indicator for whether or not abortion was legal in the state when a woman was of a specific age (Goldin and Katz 2002; Bailey 2006; Guldi 2008; Ananat and Hungerman 2008; Hoch 2008). Goldin and Katz (2002) also specify regressions that include the state abortion rate of the year in which the woman was 18 years of age in their analysis of age at first marriage. But Goldin and Katz (2002) use abortions by state of occurrence, not state of residence, and they assume that the abortion rate was zero in all states but Alaska, California, Hawaii, New York and Washington prior to 1973.<sup>7</sup> Goldin and Katz find that legalized abortion lowers the likelihood that a college woman will marry before age 23 but the estimates are not robust to the inclusion of state-linear trends. Bailey (2006) also includes a dummy variable for whether the state legalized abortion. However, Bailey's coding differs somewhat from Goldin and Katz. She assumes that New Jersey and Vermont legalized abortion in 1972, the year before *Roe*. Although both states passed legislation that legalized abortion, impact was minimal (see Garrow 1998). According to the CDC there were no reported legal abortions

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<sup>6</sup> The importance of D.C. as a location for legal abortions prior to *Roe v. Wade* has not been appreciated by many researchers (Levine et al. 1999; Angrist and Evans 1999; Donohue and Levitt 2001, 2004). The Preterm abortion clinic in Washington D.C. began performing abortions in March of 1971. According to its Medical Director, Jane Hodgson, they performed approximately 60 abortions per day or over 12,000 annually in the first two years that she was in charge (Joffe 1995. p.18). Published analyses of complication rates at the Preterm clinic attest to the caseload (Margolis et al. 1974; Hodgson and Portman 1973; Hodgson 1975).

<sup>7</sup> This is incorrect as the CDC data make clear, but even in the 5 early legalizing states Goldin and Katz underestimate the abortion rate. Goldin and Katz (2002) use the abortion rate from Donohue and Levitt (2001). Donohue and Levitt use abortions by state of occurrence as reported by the Guttmacher Institute beginning in 1973. They use a linear backcast from 1973 to 1970 to estimate abortions in the 5 early legalizing states. Thus the abortion rate in New York in 1971 is estimated at 50 percent of its 1973 level. However, according to the CDC there were more abortions performed in New York in 1971(264,339) than in 1973 (203,358) (CDC 1972, 1975).

performed in New Jersey in 1972, but 10,047 one year later. In Vermont, there were 193 in 1972 and 1,401 the following year (Centers for Disease Control 1974, 1975).

Guldi (2008) directly compares the effect of access to abortion and the pill on birth rates of women 15 to 21 by single year of age from 1968 to 1979. Like Bailey (2006), she assumes abortion was legal in 7 states in 1972. However, Guldi creates age-state-year variation in her abortion measure by further coding states as to whether minors could obtain an abortion without parental consent. The dividing line is generally age 18. As a result, access to abortion among minors in many states was coded differently from that of women 18 to 20 years of age. The age-year-state coding of abortion access may explain why Guldi finds that abortion availability had a more consistent association with lower birth rates among whites than did access to the pill. Yet Guldi finds a weak association between abortion access and nonwhite birth rates, a result at odds with many previous studies of abortion legalization (Sklar and Berkov 1974; Joyce and Mocan 1990; Levine et al. 1999; and Angrist and Evans 1999).

A closer look at Guldi's coding reveals a questionable characterization of abortion access. Guldi treats women as having access to abortion in state  $j$  and year  $t$  if abortion is legal and if there is no parental consent requirement for a girl of a specific age. However, she equates a regime under which there is no effective legal abortion in the entire country with one constrained only by parental consent. To give a concrete example, consider a 17-year old in Massachusetts in 1968 and 1974. In both years Guldi considers the minor to have no legal access to abortion. This is obvious in 1968 as abortion is effectively illegal nationally but to equate access in that year to 1974 is misleading because parental consent

laws were not considered binding.<sup>8</sup> In fact, there are three distinct periods of access to legalized abortion—1967-1969, 1970-1972 and 1973 and later—and none of the recent studies of pill capture this complexity.

For example, the legalization of abortion in New York in July of 1970 dramatically increased the availability of legal abortion services almost overnight.<sup>9</sup> Literally thousands of women and teens travelled to New York to obtain an abortion in the years preceding *Roe*. Many women continued to go to New York in the years immediately after *Roe*, since the State had a well-established network of abortion providers. Figure 1 shows the teen abortion rate by state of residence in 1971. These data are based solely on abortions performed in New York. In Florida, for example, there were 10.5 abortions per 1000 teen residents of Florida obtained in New York in 1971. In absolute numbers, 3,198 teens from Florida traveled approximately 1,200 miles to terminate an unwanted pregnancy in 1971. To appreciate the magnitude of Florida's teen abortion rate in 1971—a state and year in which abortion was illegal—note that in 2002 the teen abortion rate in the entire U.S. was 21.7. Figure 2 updates Figure 1 to 1973. The abortion rate in Florida based solely on terminations obtained in New York has fallen from 10.5 to 1.0 but the teen abortion rate among residents of New England in 1973 based solely on abortions obtained in New York remains over 50 percent of its 1971 level.

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<sup>8</sup> For instance, 60 percent of minors involve their parents in their decision to abort in states that have no consent or notification requirements (Henshaw and Kost 1992). In other words, only 40 percent of minors on average would be affected by a law that required parental consent for an abortion. Second, many minors who did not involve their parents obtained an abortion in a nearby state. The seminal study of Massachusetts' parental consent law revealed that abortions to minors obtained in Massachusetts fell 43 percent after enforcement. However, there was no change in abortions to minor when measured by state of residence (Cartoff and Klerman 1986), since minors from Massachusetts went to New Hampshire, New York and Rhode Island to terminate a pregnancy.

<sup>9</sup> The law passed by one vote when a representative switched his vote from negative to positive after an emotional conversation with his son. The vote was not only close but many considered its passage implausible. The Catholic Church, for example, had been preparing to contest a much less liberal bill and complete legalization caught the Church by surprise (Garrow 1998; Lader 1974).

The accessibility and obvious utilization of abortion services in New York undermines the identification strategy relating access to the pill to the reproductive outcomes of young, unmarried women. As noted previously, many laws granting access to the pill for women less than 21 changed between 1970 and 1973. Figure 3 shows the years in which access to the pill for unmarried women less than 21 changed in the 48 coterminous states using Guldi's (2008) coding. The lightest shaded states changed before 1970, the darkest states changed after 1972 and the remaining states changed from 1970 to 1972. The circles show the resident teen abortion rate averaged over 1971-1972. We show two versions: one that uses only data on abortions obtained in New York State (Figure 3) and the other that uses our estimates of resident teen abortion rates (Figure 4). The first point is that 30 of the 48 states changed their policies from 1970 to 1972. Most of these states are in the east and west. Teen abortion rates are also greatest in the eastern and pacific coast states, which is consistent with New York and California as destinations for non-residents. Recall that Goldin and Katz (2002), Bailey (2006), Guldi (2008), Ananat and Hungerman (2008) and Hoch (2008) assume that abortion is illegal in all 48 states but California, New York and Washington.<sup>10</sup> If the actual abortion rate is a good proxy for pregnancies that would have been carried to term in absence of legalized abortion in California, New York and Washington, then some portion of the decline in teen birth rates associated with access to the pill is likely attributable to abortion.

Misclassification of abortion access on estimates of the effect of the pill on fertility is potentially lessened by the inclusion of interactions of state and year fixed effects (Ananat and Hungerman 2008; Guldi 2008). Measures of abortion legalization and state abortion

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<sup>10</sup> Note that the Washington State had a residency requirement and based on data from the CDC there appears to have been few abortions to non-residents prior to 1973 (Center for Disease Control 1974, 1975, 1976).

rates vary only by state and year. Inclusion of state-year fixed effects removes confounding from state and year variation in the abortion rate.<sup>11</sup> As a result, identification of the effect of pill access laws on teen fertility in a model with state-year fixed effects is obtained from comparisons across age within each state and year. For example, differences in fertility rates of 18- and 16-year olds in a state in which both have access to the pill in 1972 are contrasted to differences in fertility rates of the same age groups in the same year but in a states in which 18-year olds have access to the pill and 16-year olds do not. The identifying assumption would be violated, however, if abortion rates of minors and older teens between 1970-1973 differ by distance to New York, and if distance to New York is correlated with access to the pill. For example, Figure 5 shows differences in the resident abortion rates of older teens (18-19) and minors (15-17) by distance to the New York. Data on abortions by state of residence are based solely on abortions obtained in New York State in 1971-72. There is a clear negative relationship between the difference in abortion rates and distance to New York. However, it must also be the case that distance to New York is related to access to the pill. As a possible example, consider Illinois, Michigan and Ohio. Minors in the three states had access to the pill by 1972. In the same year the abortion rate of minors 15-17 years of age based solely on abortions obtained in New York were 5.3, 2.1 and 7.0, respectively.<sup>12</sup> Contrast these states with Iowa, Nebraska and Texas. None allowed minors access to the pill in 1972; all are further away from New York than Illinois, Michigan and Ohio and the abortion rate of 15-17 year olds based on terminations obtained in New York is substantially less: 3.3, 2.1 and 0.6 in Iowa, Nebraska and Texas, respectively.

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<sup>11</sup> As noted above, Guldi (2008) uses parental consent laws for minors seeking an abortion to create variation in her measure of abortion access by age, state and year.

<sup>12</sup> The abortion rate is the number of abortions to 15 to 17 year olds per 1000 teens of the same age.

To summarize, two issues undermine the use of laws granting access to pill among unmarried teens to identify effects of the pill on changes in fertility, marriage, schooling, health and labor force participation. First, it is difficult to establish the first-stage association between access to the pill and its use. Data are limited. Nevertheless, the estimated association between access and use of the pill in the data that exist is sensitive to how laws or policies are interpreted and coded. Second, most policies regarding access to the pill among unmarried teens changed in the early years of *de facto* and *de jure* legalization of abortion in Alaska, California, the District of Columbia, Hawaii, New York and Washington. However, many teens traveled to California, the District of Columbia and New York for an abortion in the years before *Roe* and yet, none of the studies on the “power of the pill” adequately account for this behavior. In this study, we revisit the association between early access to the pill and teen fertility.

### **III. Empirical Framework and Results**

Goldin and Katz (2002) provide a simple model with which to understand the effect of the pill on marriage and career choices and Bailey (2006) summarizes the conceptual link between access to the pill and its impact on fertility and labor supply. However, any model that relates the price of fertility control to human capital and labor market choices must begin with its first-order effect on fertility. Unless increasing access to the pill or abortion results in delayed childbearing and marriage, it is difficult to describe a mechanism by which the cost of fertility control could have a major effect on investments in schooling and careers among women. Thus, the goal of this study is to re-examine the association between the

availability of legalized abortion and access to the pill on abortion and birth rates among primarily young women.

We begin with an analysis of birth rates from 1968 to 1979 by single year of age for women 15 to 21 years old following Guldi (2008). We show that the time-series pattern of birth rates for teens 15-18 years of age differs substantively from that of women 19 to 21, which has significant implications for estimates of the association between access to the pill and abortion on birth rates.

In the second set of analyses, we bring to bear re-discovered data on abortions obtained in New York by age, race and state residence in the years prior to *Roe*. We estimate the reduced-form association between age-specific abortion rates and distance to New York controlling for access to the pill. We do the same for age-specific birth rates. We then use distance from a woman's state of residence to legal abortion services in New York State as an instrument for abortion rates in regressions of age-specific birth rates in the years prior to *Roe*.

### **III.A. Data**

We use the national natality files from 1968 to 1979 and the SEER population data from 1969 to 1979 to create birth rates by year, state, race (white and nonwhite) and single year of age for women 15 to 21. We use Guldi's measure of access to the pill and abortion, both of which vary by age, state and year.

As a proxy for access to legal abortion services we use distance from the population centroid in each state to the location of the nearest legal abortion services. For New York State we used Buffalo and New York City as the two sites for 1970-72 and in California we

used Los Angeles and San Francisco.<sup>13</sup> We ignore distance to the State of Washington in the pre-*Roe* years despite the legalization of abortion in December of 1970, because the state had a 90 day residency requirement for an abortion (Garrow 1998).<sup>14</sup> The District of Columbia poses a more difficult problem. As noted, the number of abortions to non-residents in Washington DC exceeded the number in California in 1972. However, unlike New York, the District of Columbia did not report the distribution of abortions by state of residence. Thus, we use distance from the population centroid of Delaware, Maryland and Virginia to Washington DC instead of New York for those three states.<sup>15</sup> From 1973 to 1979 we use the Guttmacher survey of abortion providers by county and measured distance to the nearest abortion provider regardless of whether the provider was in the state of residence or in a neighboring state. To obtain a summary measure at the state level, we compute the average distance from the population centroid of each county to the nearest county with an abortion provider weighted by population of women 15 to 44 years of age in the county. We assume distance is zero if the county had an abortion provider.

The most novel and illuminating data that we analyze are abortions performed in New York State by age, race and state of residence from 1971 to 1975. As noted previously, New York was the most frequented destination for women seeking an abortion from states in which abortion was illegal prior to *Roe*. Seventy-nine percent of the 396,405 legal abortions to women in the U.S. obtained outside their state of residence in 1971-72 were performed in New York as compared to 8.4 percent in California and 6.9 percent in the District of

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<sup>13</sup> For states in which abortion was legal we used average distance from the population centroid of each county based on the distribution of abortion providers in 1973, the first year the Guttmacher Institute collected such information. For Hawaii and DC we used minimum distance in 1973.

<sup>14</sup> Further evidence that relatively few non-residents obtained an abortion in Washington prior to *Roe* can be seen by the absence of a decline in abortions between 1972 and 1973 (from 17,767 to 17,319). In both New York and California, the number of abortions performed in the state fell substantially between 1972 and 1973 as non-residents were able to obtain legal abortions in their own state.

<sup>15</sup> We create distance measures ignoring DC in order to test the sensitivity of this assumption.



Columbia.<sup>16</sup> New York was not only the most frequented destination for women seeking an abortion, but the state recorded the patient's age and state of residence for each termination performed in the state. The age breakdown includes 15-17, 18-19, 20, 21-24, 25 and older. We also have abortions by age and race for whites and nonwhites. However, the age-breakdown is not as refined for younger women. We have abortions to women less than 20, 20-29, 30-29 and 40 years and older.

Although residents from almost every state obtained an abortion in New York, we focus on two sub-samples of states. One consists of the 28 most eastern states and including Minnesota, Iowa, Missouri, Arkansas and Louisiana but excluding Delaware, the District of Columbia, Maryland and Virginia. The goal is to include states for which New York was the most likely destination for a resident of that state who sought an abortion. However, in some of these 28 states there were a sizeable number of abortions performed in the state prior to *Roe* due to reforms, but which fell well short of abortion on demand (Centers for Disease Control 1973, 1974). Thus, we created a second sample that consisted of states in which at least 70 percent of all legal abortions to residents of the state were performed in New York prior to *Roe*. Under this criterion, we added Montana, Nebraska, North Dakota, South Dakota, Texas and dropped Alabama, Arkansas, Georgia, Iowa, North Carolina and Pennsylvania for a total of 25 states.

We use the abortion data from New York State, the CDC and the Guttmacher Institute to estimate resident teen abortion rates from 1970 to 1979. The methodology is described in detail in the Appendix. In brief, we multiplied resident abortion rates from 1970 to 1979 by the ratio of teen to total abortion rates by state and year. We used the ratios of teen to total abortion rates based on New York State data in 1971 and 1972 and the CDC data

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<sup>16</sup> Center for Disease Control 1972, Table 3; Center for Disease Control 1972 1974, Table 4).

from 1973-1979. We use these data to assess the bivariate association between distance to the nearest abortion provider and teen abortion rates from 1970-1979.

### **III.B. Access to and Use of Legal Abortion Services**

There are three distinct phases to the availability of legal abortion services in the United States that are relevant to the present study. The first are the years from 1967 to 1969 in which nine states reformed their abortion statutes as proposed by the American Law Institute.<sup>17</sup> In 1969, there were 12,417 legal abortions reported to the CDC. This relatively small number of abortions is not associated with any substantive impact on birth rates (Levine et al. 1999). The second phase is from 1970 to 1972 in which abortion became *de facto* legal on demand in California and the District of Columbia and *de jure* legal in Alaska, Hawaii, New York and Washington. In 1970, there were over 180,000 legal abortions reported to the CDC, an order of magnitude more than in the previous year. By 1972 the total number of abortions had risen to 780,000 (Centers for Disease Control 1975). The third phase occurs with the Supreme Court decision in *Roe* in January of 1973.

In Figures 6-8 we show the bivariate association between the resident teen abortion rate in 1971-1972, 1973-74, and 1975-76 and distance to nearest legal abortion provider over the same period. The fitted line is from a regression of the abortion rate on the natural logarithm of distance. Two points are noteworthy. First, teen abortion rates are substantial in states in which abortion on demand was illegal. There were 10.2 abortions per 1000 teens in 1971-72 in the 45 states that did not legalize abortion until *Roe*. Second, there is a consistent inverse relationship between the teen abortion rates and distance to the nearest

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<sup>17</sup> Arkansas, California, Colorado, Delaware, Georgia, Maryland, New Mexico, North Carolina and Oregon (Centers for Disease Control 1973).

legal provider. This relationship is most apparent in the years prior to *Roe* given the large variation in distance. Both observations suggest that measuring the availability of abortion with a dichotomous indicator of legality is inadequate. However, distance to nearest provider is also limited, since it doesn't capture differences in access by age. Younger teens, for example, may have been less able to travel to states in which abortion was legal than older teens. Third, there is a dramatic change in distance to the nearest legal abortion provider in the years just before and after *Roe*, but no variation within state overtime in the years prior to *Roe*, and relatively modest variation within states in years after *Roe*. This makes it difficult to identify effects of distance on abortion and birth rates in models with state and year fixed effects. In contrast, access to the pill varies by state, year and age. However, from 1970 to 1973, 36 states lowered the age at which an unmarried woman could obtain access to the pill without parental involvement, a period of momentous change in legalized abortion (Guldi 2008). Thus, one explanation for why pill laws appear robust in regressions of teen fertility is that they are picking up changes in access to abortion. The next set of figures offers evidence to this effect.

In Figure 9 we show the birth rates of teens 15-18 years of age from 1968 to 1979. We stratify states by the years in which unmarried women 17 years or less could obtain access to the pill without parental involvement (Guldi 2008). There is no clear break associated with any period except for states that granted access in 1970-72. But a causal interpretation is not convincing given coincident declines in birth rates in all states between 1970-72. To see this more clearly, we plot first differences in teen birth rates in order to eliminate disparities in levels (Figure 10). There is no evidence of any discontinuity to suggest that access to the pill lowered birth rates.

The difference between older and younger teens is also revealing. Figure 11 shows birth rates of 19-21 year olds stratified by when states granted access to the pill for unmarried women less than 21. The sharp decline in birth rates begins right after 1970 among all three groups of states. Again, first differences of the same plot offer no evidence that differential access to the pill mattered (Figure 12). A story that emerges is that birth rates of older teens and young women who were not residents of early legalizing states responded almost immediately to the availability of abortion services in California, New York, and DC. This is less true among minors. The decline in birth rates of minors is muted until after 1972 suggesting that the local availability of abortion services following *Roe* was the more important change in access.

As noted previously, Guldi (2008) bases access to abortion on two conditions: legality and a lack of parental consent. If abortion was illegal, or if the state enforced a parental involvement law or the state prohibited minors from obtaining medical treatment without parental consent, then Guldi considers abortion to be inaccessible to minors. Figure 13 shows our estimate of resident teen abortion rates stratified by years and states in which a teen 17 years or less could obtain an abortion without parental consent. There is little evidence that parental consent requirements were binding.

### **III.C. Access to the pill, abortion and birth rates**

Guldi's (2008) reduced form regressions test whether access to the pill and abortion are associated with teen birth rates. Data consist of birth rates by race (white and nonwhite)

and single year of age for women 15 to 21 from 1968 to 1979. The basic model is as follows:

$$(1) B_{ajt} = \alpha_0 Abor_{ajt-1} + \alpha_1 Pill_{ajt-1} + \sum \varphi_a A_a + \lambda_{st} + e_{ajt}$$

where  $B_{ajt}$  is the birth rate of age-group  $a$ , in state  $j$  and year  $t$ .  $Abor_{ajt-1}$  and  $Pill_{ajt-1}$  are lagged measures of access to abortion and the pill that vary by age, state and year;  $A_a$  represents a set of age dummies and  $\lambda_{st}$  are interactions of state and year fixed effects. Estimates of equations (1) are shown in Table 2. In columns (1) and (4) we essentially replicate Guldi's (2008) results which serve as her basic specification.<sup>18</sup> In the four other columns we estimate the same model for two age groups: 15-18 and 19-21, which roughly coincides with pregnancies of minors and older teens.

Stratification by age completely changes Guldi's results. Access to abortion has no association for either age group of whites but has a *positive* and statistically significant association for nonwhites. Access to the pill also loses significance among whites and we obtain contradictory results for nonwhites. The results are not surprising given the time-series plots in Figures 9-13 and they underscore the importance of stratifying by age.

In the next set of regressions we re-estimate Guldi's model but substitute distance to the nearest legal abortion provider for Guldi's access to abortion. We begin with Guldi's basic specification in columns (1) and (6) and re-show results from Table 2 with birth rates of women 15 to 21 year of age. Guldi emphasizes results based on specifications with interactions of state and year fixed effects. However, distance only varies by state and year and is unidentified in a model with state-year fixed effects. Thus, in columns (2) and (7) we use Guldi's basic specification, but we include only state and year fixed effects instead of

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<sup>18</sup> We thank Melanie Guldi for sharing the coding of the laws. Our results differ slightly. We use the SEER population data instead of the census data, which affects both the rates and the weights slightly.

their interactions. We include state per capita income, the insured unemployment rate, and the percent nonwhite population in the state to adjust for within-state variation over time.<sup>19</sup> As can be seen in columns (2) and (7), the coefficients on Guldi's measure of access to the pill and abortion are somewhat smaller in absolute value than those in columns (1) and (6), but consistent with her essential conclusions.

In the remaining regressions we substitute the natural logarithm of distance to the nearest legal abortion provider interacted with the period before *Roe* (1971-73) and the period after (1974-79). As before, the coefficient on the pill loses any association with birth rates (columns 4, 5, 9 & 10). However, there is a strong positive association between distance to the nearest abortion provider and birth rates of young women. Estimates for both whites and nonwhites are also robust to whether we stratify the regressions by age. Because of the double-logarithmic specification, coefficients are interpretable as elasticities. An increase of 500 miles in distance to the nearest abortion provider in 1971-73, an approximate increase of 116 percent evaluated at the mean, would raise birth rates between 1.5 and 3.0 percent across age and race. Levine et al. (1999) found that women who lived between 250 and 750 miles for legal abortion services in the same years had birth rates that were 4.5 percent greater. Mean distance to the nearest provider falls dramatically after 1973. Thus a 100 percent increase in distance evaluated at the mean (12 miles) is associated with an increase in birth rates of between 1.6 and 5.0 percent. These seem implausibly large for such small distances and suggest that we are failing to control for within-state differences in abortion rates and the endogenous location decisions of providers. In results not shown we re-estimated the model but limited it to the years 1968-75. Changes in legalization and thus

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<sup>19</sup> We thank Phillip Levine for the data on the insured unemployment rate, per capita income and the percent nonwhite.

availability might be more plausibly exogenous over this shorter period, but our estimates did not differ substantively.

#### **III.D. Abortions, births and access in New York: 1971-72**

The legalization of abortion in New York in July of 1970 had the greatest impact on the availability of services to nonresidents around the country. The large number of abortion providers in the state, its proximity to the population centers in the east and Midwest, and the lack of a residency requirement greatly facilitated access for those who did not live in New York State. Another advantage of the pre-*Roe* period is that women had to travel substantial distances, which aids in identifying effects of access on abortion. We begin with plots of the bivariate relationship between the natural logarithm of distance to the nearest abortion provider in New York State and age-specific abortion rates by state of residence for the years 1971-1972. We have five age groups: 15-17, 18-19, 20, 21-24 and 25 and older. We only use abortions obtained in New York State, since these were collected by age and state of residence. We also limit the sample to states in which 70 percent or more of all abortions to residents of the state were obtained New York. We exclude Delaware, the District of Columbia, Maryland, and Virginia.<sup>20</sup> There is an obvious negative association between resident abortion rates and distance from New York for each age group (Figures 14-18). The slopes are roughly similar among women 18 to 24 years of age (Figures 15-17), which in turn are almost three times as steep as those for minors and women 25 years and older

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<sup>20</sup> The 70% criteria eliminates reform states such as Arkansas, Delaware, Maryland, and North Carolina. Another reason to drop Delaware and Maryland and Virginia is their proximity to DC, an important center of abortion services for women in 1971-72. Relatively few women from Delaware, Maryland and Virginia traveled to New York for an abortion.

(Figures 14 and 18). The slope for teens is also similar to those in Figure 6 based on national data.

A unique aspect of the New York data is that they are age-specific. Thus, we pair abortion rates with birth rates of the same age in order to estimate the direct effect of abortion on birth rates using distance to New York as an instrument. The reduced form specification is as follows:

$$(2) \text{Abrate}_{ajt} = \alpha_0 \text{LnDis}_j + \alpha_1 \text{Pill}_{ajt} + \sum \varphi_a A_a + \sum \delta_a (A_a * \text{LnDis}_j) + \mathbf{X}\boldsymbol{\beta} + \lambda_s + \tau_t + e_{ajt}$$

Let  $\text{Abrate}_{ajt}$  be the abortion rate for age group  $a$ , in state  $j$  and year  $t$ ; let  $\text{LnDis}_j$  be the natural logarithm of distance to New York which varies only by state. Let  $\text{Pill}_{ajt}$  be one if age group  $a$  had access to the pill in state  $j$  and year  $t$  (Guldi 2008). Let  $A_a$  be a set of age dummies (15-17, 18-19, 20, 21-24) with women 25 and older as the omitted category. The next set of variables,  $A_a * \text{LnDis}_j$  is interactions between age and distance followed by three controls ( $\mathbf{X}$ ) for state characteristics: the insured unemployment rate, per capita income and the percent of the population that was nonwhite. Finally, we include state fixed effects and a year dummy. Several points should be noted. First, we cannot estimate the main effect of distance in models with state fixed effects given that distance is time invariant. Second, we lag both distance and access to the pill by one year in regressions of birth rates. Thus, we regress birth rates in 1972 and 1973 on distance to New York in 1971 and 1972 and its interactions with age. Finally, we use equation (2) as the first stage in a model of birth rates regressed on lagged abortion rates. Distance to New York and its interactions with age serve as the instruments. The second stage regression is as follows:

$$(3) B_{ajt} = \beta_0 \text{Abrate}_{ajt-1} + \beta_1 \text{Pill}_{ajt-1} + \sum \varphi_a A_a + \mathbf{X}\boldsymbol{\pi} + \lambda_s + \tau_t + e_{ajt}$$



Where *Abrate* is the predicted abortion rate by age, state and year. The results are displayed in Table 4. Reduced-form estimates of equation (2) in columns (1) and (2) exclude state fixed effects where as columns (3) and (4) include them.

Results for the abortion rate are largely unchanged from the simple regressions fitted in Figures 12-16. There is a strong, negative association between distance and abortion rates of women 18 to 24 years of age relative to adults 25 and over (the omitted category). As to the magnitude of the association, consider teens 18 and 19 years of age. Holding age constant, the partial effect is the sum of main and interacted terms or -5.47 (-2.16+-3.31). Thus, every unit increase in distance or 100 miles is associated with a decline in the abortion rate of 18-19 year olds of 0.95 abortions per 1000 population.<sup>21</sup> The same calculation for the birth rate of 18-19 year olds indicates that every 100 hundred miles of distance from New York is associated with 0.92 increase in the birth rate or approximately 4.6 births per 500 miles or 4.8 percent given a mean birth rate of 96.0.

The coefficients on the age-distance interactions change trivially in the specifications with state fixed effects. However, they should be interpreted with care. Coefficients on the interaction terms measure the relative differences in birth or abortion rates between teens 18 and 19 years of age and women 25 or older. However, the main effect of distance is absorbed by the state fixed effects. Consequently, the absolute effect of a 100 mile increase in distance on abortion and birth rates cannot be identified in models with state fixed effects.

The two reduced forms allow us to contrast the impact of distance on birth and abortion rates. If a decrease in the abortion rate is the sole cause of the increase in the birth rate, then there should be roughly a one-to-one correspondence between the coefficients.

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<sup>21</sup> Distance is measured in logs. Thus  $\delta y / \delta \ln x = (\delta y / \delta x) * x$ . Using the coefficients in column (1) of Table 4 a one unit change of distance, or 100 miles, is associated with a decline of 0.95 abortions per 1000 population [i.e.,  $((-2.16 + -3.31) / 5.73)$ ] where the denominator is the mean of distance in hundreds of miles].

Estimates from the specification without state fixed effect come close this symmetry. A 100 mile increase in distance is associated with a decline in the abortion rate of 18-19 year olds of 0.95 per thousand and an increase in the birth rate of 0.92 per thousand. We measure this association directly in column (5) by regressing birth rates on lagged abortion rates (see equation 3). The one-to-one correspondence between the abortion and birth rate persists. An increase in the abortion rate of 1.0 per thousand in year  $t-1$  is associated with a decrease in the birth rate of 1.26 per thousand in year  $t$ . The 95 percent confidence interval  $[-1.96, -0.56]$  includes  $-1.0$ .

A great advantage of the abortion rate is that unlike distance it varies by age, state and year. The additional variation makes it superior to distance as a proxy for access to abortion. (see Goldin and Katz 2002). But the decision to abort is clearly endogenous to choices regarding sexual activity and contraception. Thus, we instrument for the abortion rate while acknowledging that equation (3) does not represent an appropriately specified structural equation. We use estimates in column (3) to predict the lagged abortion rate with interactions of distance and age as instruments. The validity of the IV estimates rests on several assumptions. First, distance to New York must be randomly assigned. This is probably not met. Nevertheless, it is plausible that two teens both 250 miles from New York but in different states have a similar likelihood of obtaining an abortion in New York conditional on state characteristics. The second assumption requires that distance to New York operates on birth rates only through the abortion rate. We are confident that we meet the exclusion restriction, since there would be no reason to include distance to New York in a model of state fertility rates except during this period. Third, the F-statistic on the set of instruments and the partial R-square easily pass tests for weak instruments. Finally, there

have been general equilibrium effects of early legalization that violate SUTVA (Angrist, Imbens and Rubin 1996). For example, demand for abortion services in New York may have exceeded capacity, which would prevent some women from obtaining “treatment.”

With these caveats in mind, we display the IV estimate in column (6) of Table 4. We show standard errors clustered at the state level (in parentheses) as well as robust standard errors un-clustered (in brackets). The IV estimate differs inconsequentially from the OLS coefficient in column (5). Again, we cannot reject the null that an increase in the abortion rates of 1 per thousand is associated with decrease in the birth rate of a similar magnitude.

We re-estimated the regressions in Table 4 using 28 eastern states instead of the 25 states in which most resident abortions were obtained in New York. We also re-ran the regressions weighted by the female population. Our results were not altered in any substantive manner.

### *Differences by race*

Another advantage of the New York State abortion data is a breakdown by race. However, the age groupings that were made available are aggregated differently in the file stratified by race. Race-specific estimates of equations (2) and (3) are displayed in Tables 5 and 6. Not unexpectedly, the results for whites are similar to those of all women. An increase of 100 miles is associated with a decrease in of 0.5 abortions per 1000 teens and an increase of 0.6 births among white teens (less 20 years of age).<sup>22</sup> The effect of distance among nonwhites is much greater. A 100 mile increase in distance to New York is associated with decline of 1.6 abortions per 1000 population while births are expected to rise

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<sup>22</sup> As before, we use the results from the models without state fixed effects. For white teens, we compute the effect of an increase of 100 miles on abortion rates as follows:  $(-0.31 + 2.32) / 5.73 = 0.46$ , where 5.73 is the mean distance from New York State in hundreds of miles.

by 2.0 per thousand. The coefficients on the lagged abortion rate in the both the white and nonwhite birth rate regressions suggest that an increase in the abortion rate in 1972 is associated with a decrease in the birth rate in 1973 of roughly the same magnitude [see column (6) in Tables 5 and 6].

Access to the pill is never associated with birth or abortion rates in any specification whether races are pooled or estimated separately (Tables 4-6). One explanation is that there is insufficient variation in laws governing access to the pill to identify its impact. From 1971 to 1972, 8 of the 25 states in our sample lowered the age at which young, unmarried women could obtain the pill. Nevertheless, there may be insufficient variation in use of the pill within states during this two-year window to identify an effect.

#### **IV. Conclusion**

The legalization of abortion in New York had a major effect on the abortion and birth rates of young women in the years before *Roe*. The association between abortion legalization and teen birth rates is not new, but we are the first to link increases in age- and race-specific abortion rates to declines corresponding birth rates during this period (Sklar and Berkov 1974; Joyce and Mocan 1990; Levine et al. 1999; Angrist and Evans 1999). We also showed that distance from a woman's state of resident to New York predicted both abortion and birth rates the pre-*Roe* years. We used this association to instrument for lagged abortion rates in regressions of age-specific birth rates and found a one-to-one correspondence between abortion and birth rates in the years before *Roe*. The average woman in the New York sample traveled over 500 miles to terminate a pregnancy before 1973. Our findings

suggest that teen birth rates would increase if *Roe* were overturned and authority to regulate abortion was returned to states.

We are less confident of the association between distance to the nearest abortion provider and changes in birth rates in the years after *Roe*. We reported that an increase of only 12 miles from the nearest abortion provider was associated with declines of upwards of 5 percent in teen birth rates, an implausibly large change given how far women traveled in the years prior to *Roe*. Moreover, we consider distance to New York prior to national legalization to be more credibly exogenous than distance to nearest provider after *Roe*, given the endogeneity of provider location.

Our results call into question the findings from recent studies in which laws and policies that allowed young, unmarried women to obtain the pill without parental consent in that late 1960s and early 1970s had a significant impact on teen birth rates and age at first marriage (Goldin and Katz 2002, Bailey 2006; Guldi 2008; Ananat and Hungerman 2008; Hock 2008). We contend that much of the association is confounded by inadequate control for access to abortion. Our results do not refute the “power of the pill,” but they call into question the identification strategy supporting those claims. Today, 82 percent of pregnancies to teens are estimated to be unintended. Twenty-seven percent of teen pregnancies are voluntarily terminated (Guttmacher Institute 2010). Our results are a reminder that legal abortion services remain, to this day, a significant option for teens who become pregnant but who do not want to give birth.

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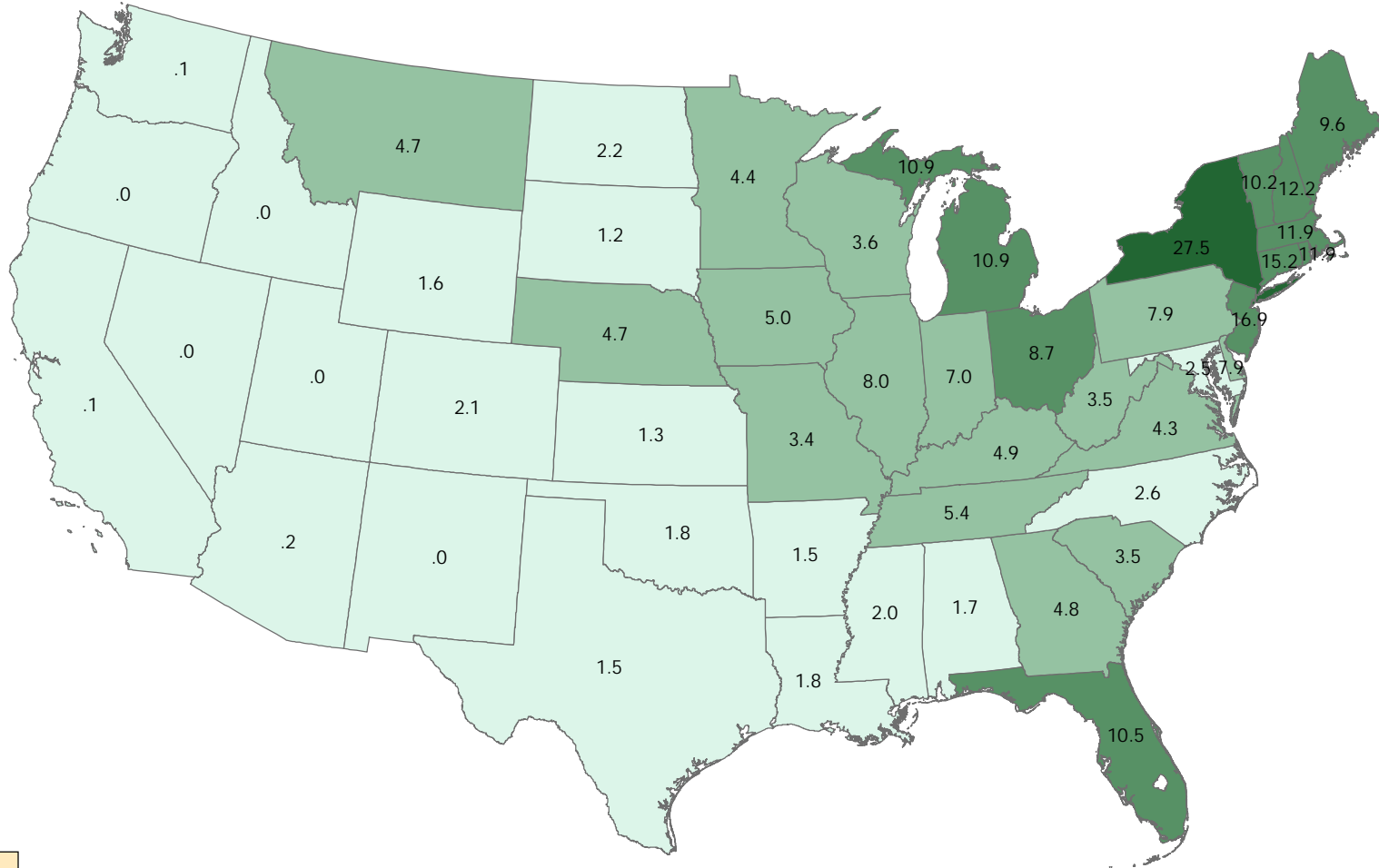
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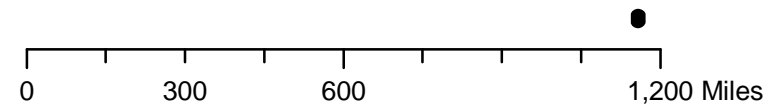
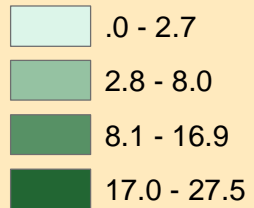


# Figure 1: Resident Teen Abortion Rates for Abortions Performed in NY, 1971

Abortions per 1000 teens 15-19



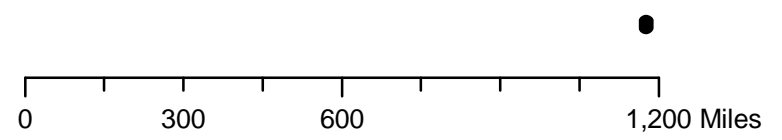
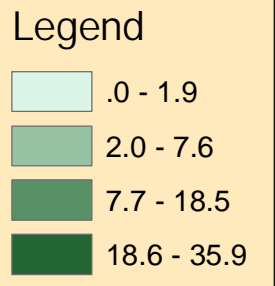
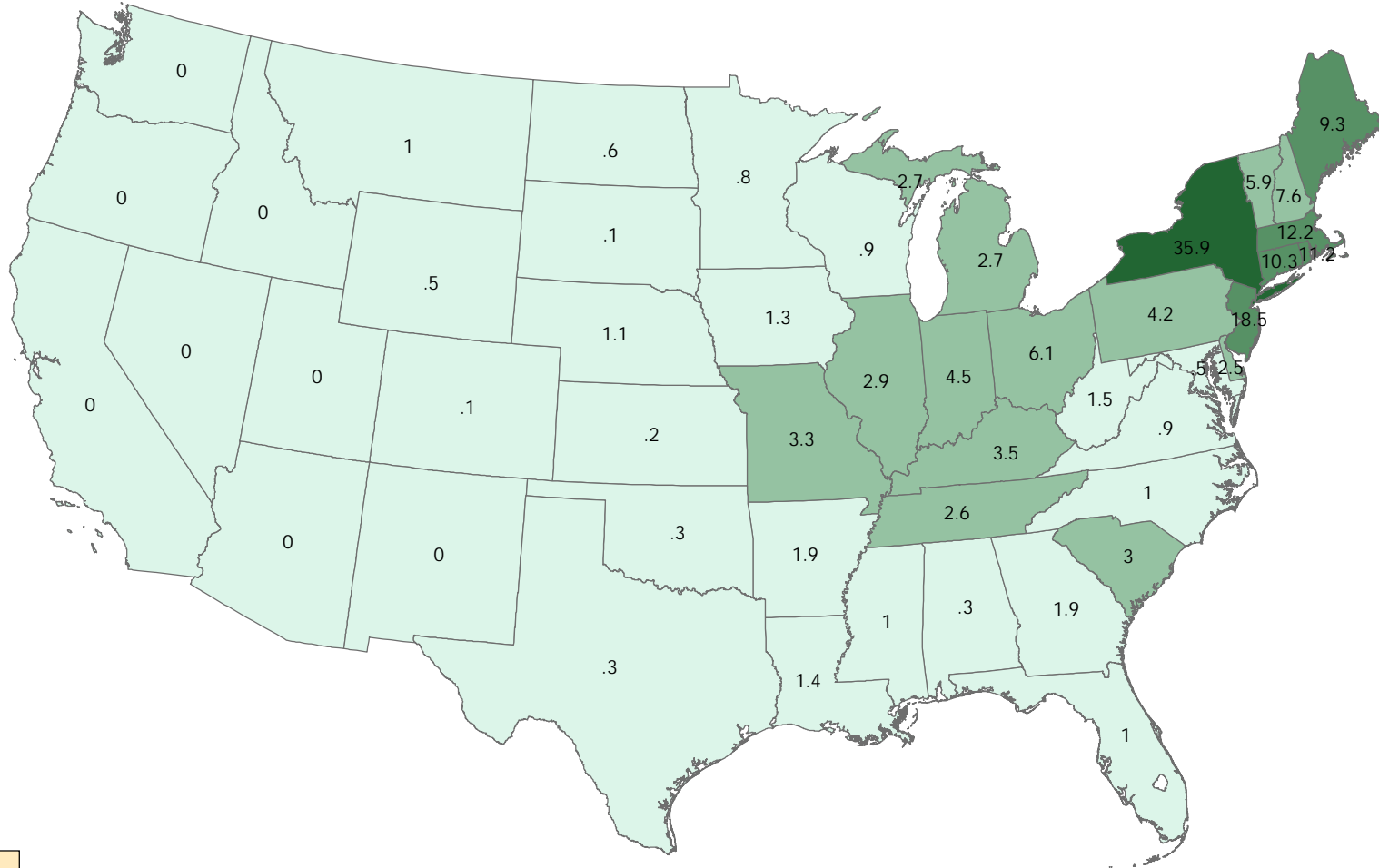
## Legend



Source: NY State Department of Health

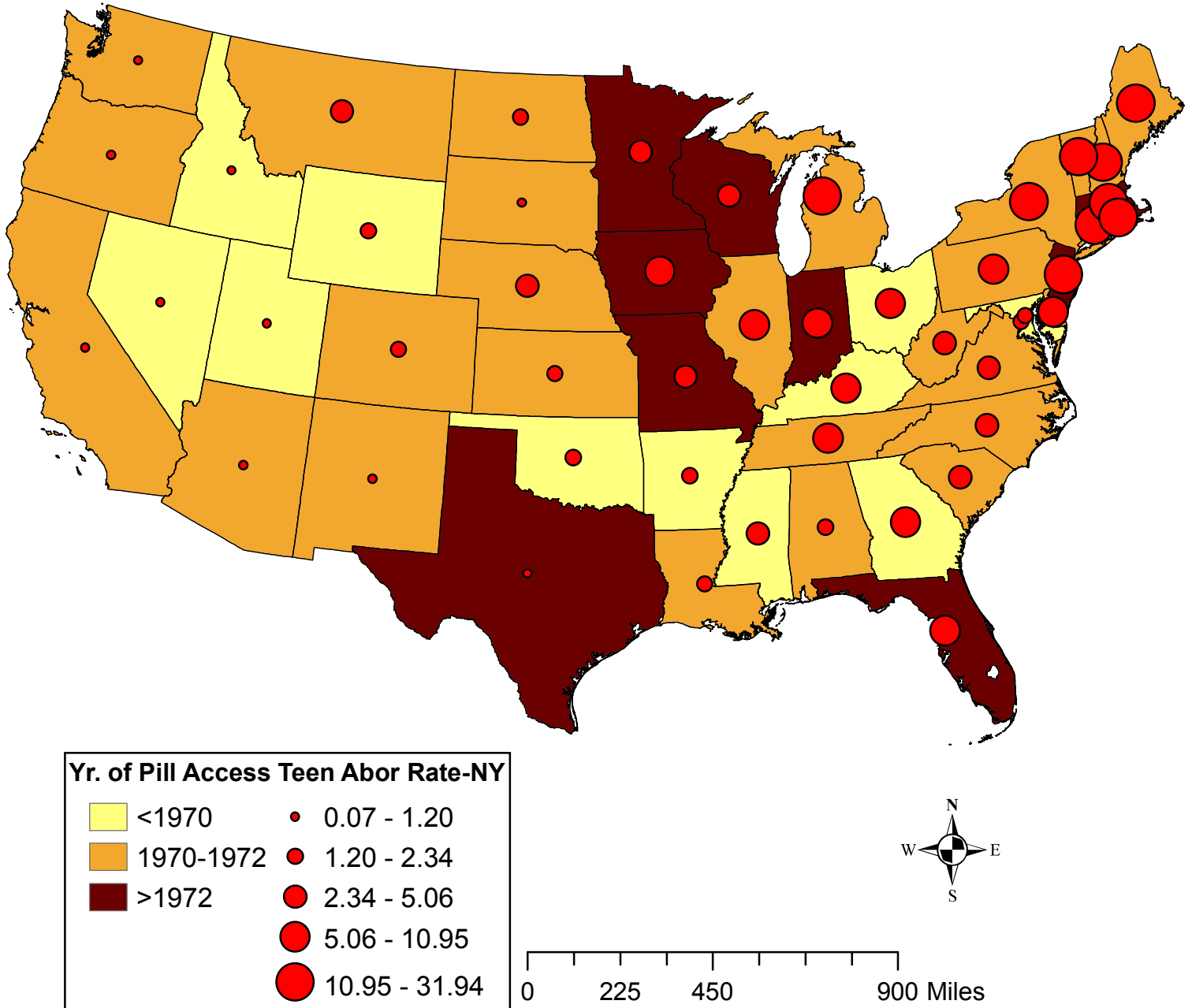
# Figure 2: Resident Teen Abortion Rates for Abortions Performed in NY, 1973

Abortions per 1000 teens 15-19



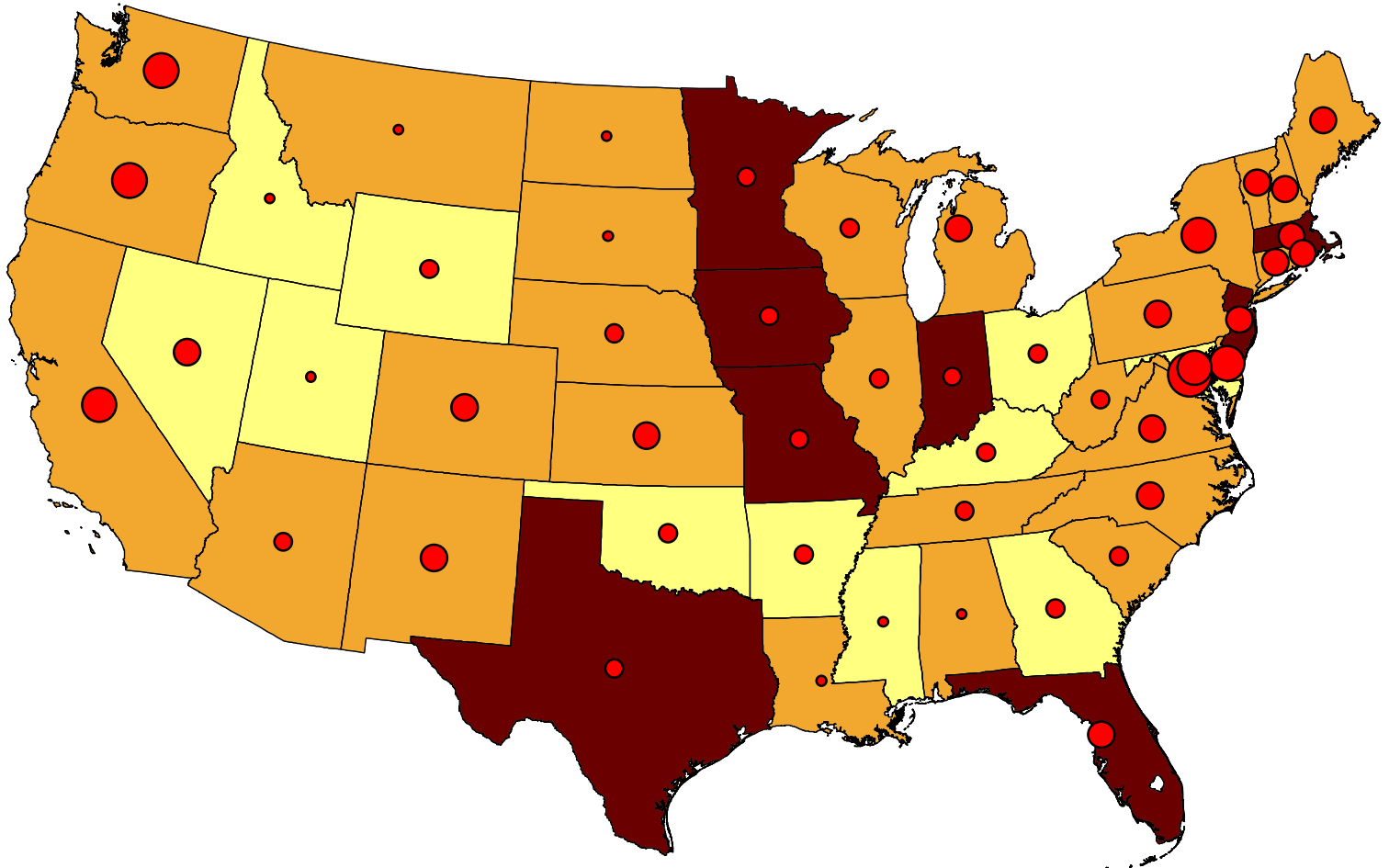
Source: NY State Department of Health

Figure 3: Year Access to the Pill Provided to Those Younger than 21 Years of Age and Teen Abortion Rates in 1971-72; NY \*



\* Abortion rate by states of residence for abortions obtained only in NY state.

Figure 4 :Year Access to Pill Provided to Those Younger than 21 Years of Age and Teen Abortion Rates in 1971-72



Yr. of Pill Access Teen Abor Rate	
<1970	• 0.24 - 3.34
1970-1972	• 3.34 - 9.95
>1972	• 9.95 - 18.12
	• 18.12 - 35.65
	• 35.65 - 74.46

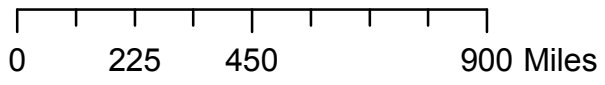


Figure 5: Difference in Resident Abortion Rates of 18-19 vs 15-17 Year Olds in 1971-72 in 25 States Based on Abortions Obtained in New York by Distance to the Nearest NY Legal Abortion Provider

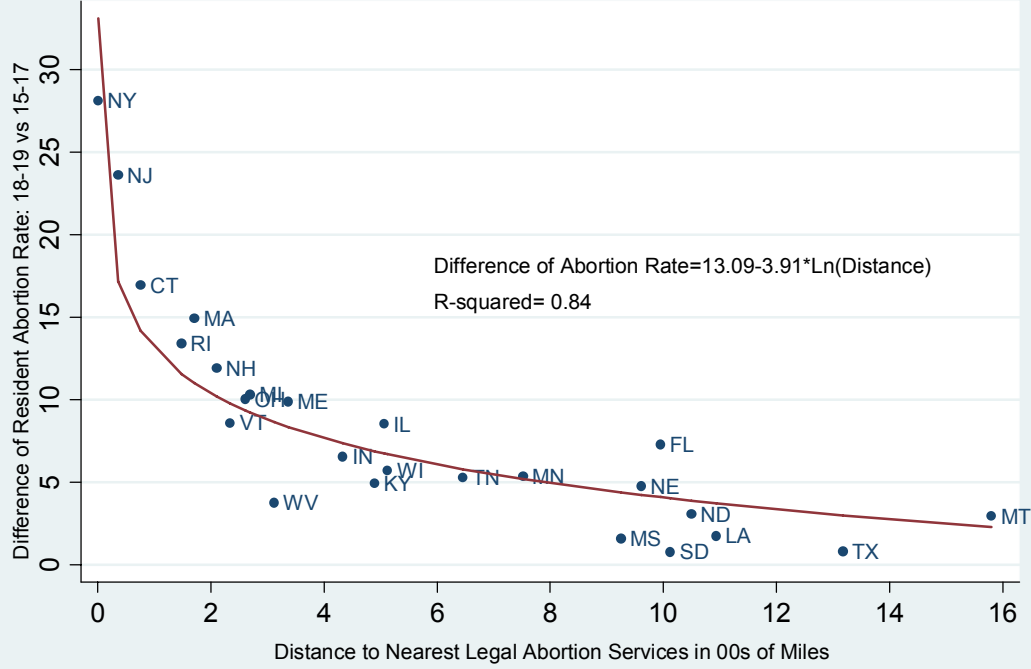


Figure 6: Resident Teen Abortion Rates in 1971-72 by Distance to Nearest Legal Abortion Provider, 50 States+DC

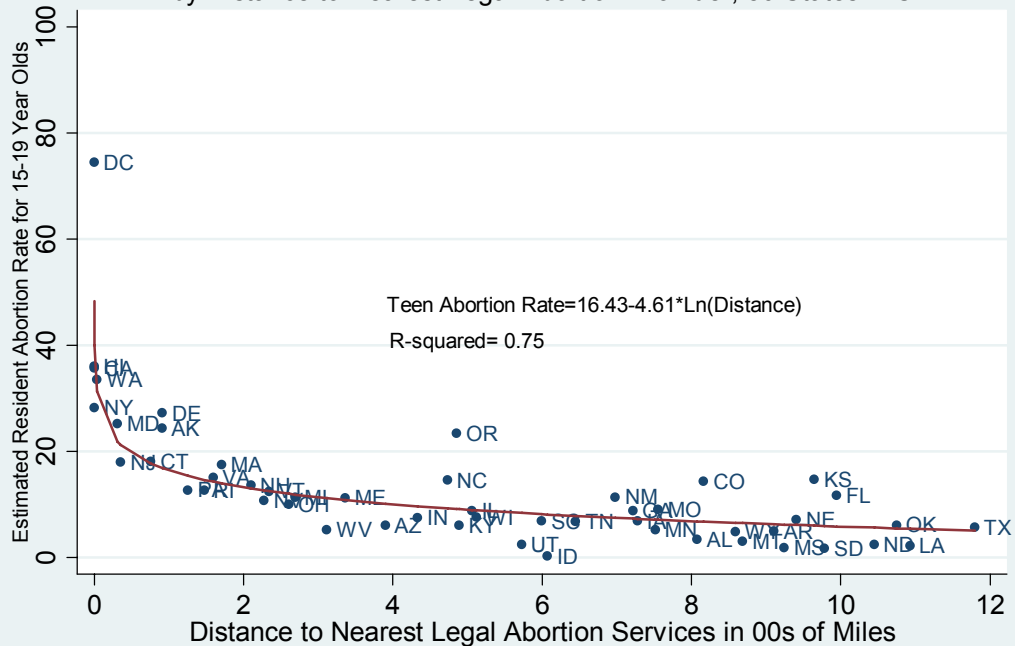


Figure 7: Resident Teen Abortion Rates in 1973-74 by Distance to Nearest Legal Abortion Provider, 50 States+DC

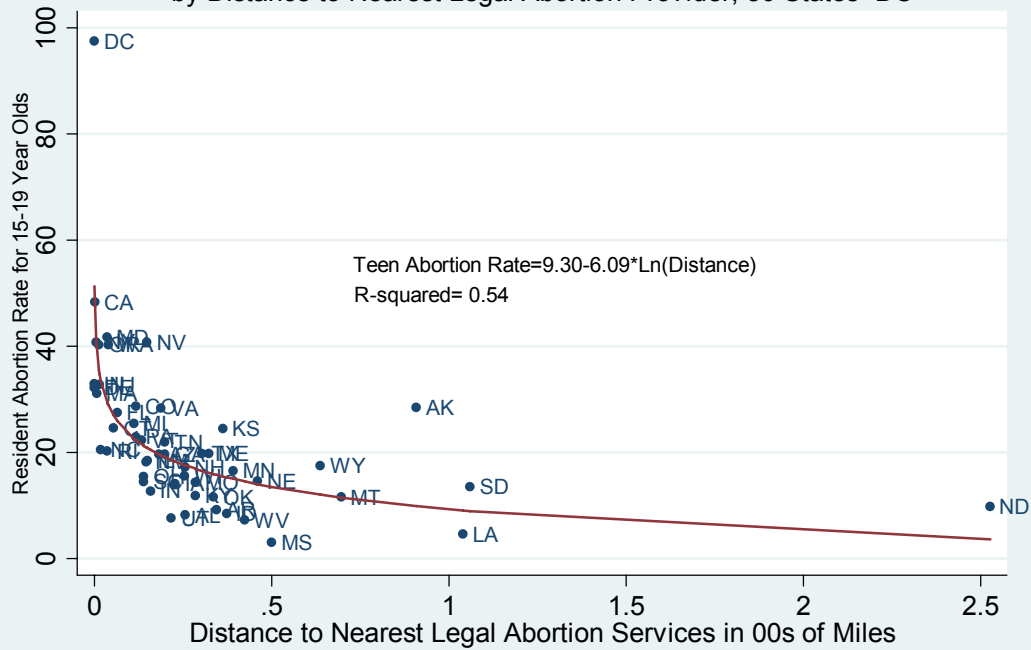


Figure 8: Resident Teen Abortion Rates in 1975-76 by Distance to Nearest Legal Abortion Provider, 50 States+DC

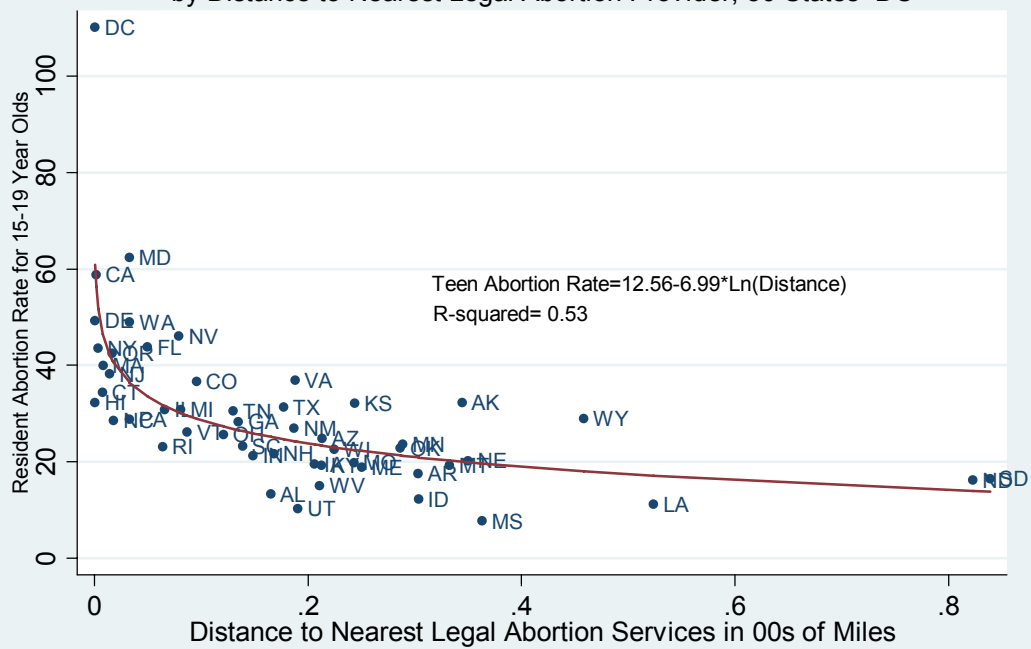


Figure 9: Birth Rate of 15-18 Year Olds by Year of Access to the Pill without Parental Consent  
Early Legalizing States AK, CA, DC, HI, NY and WA not Included

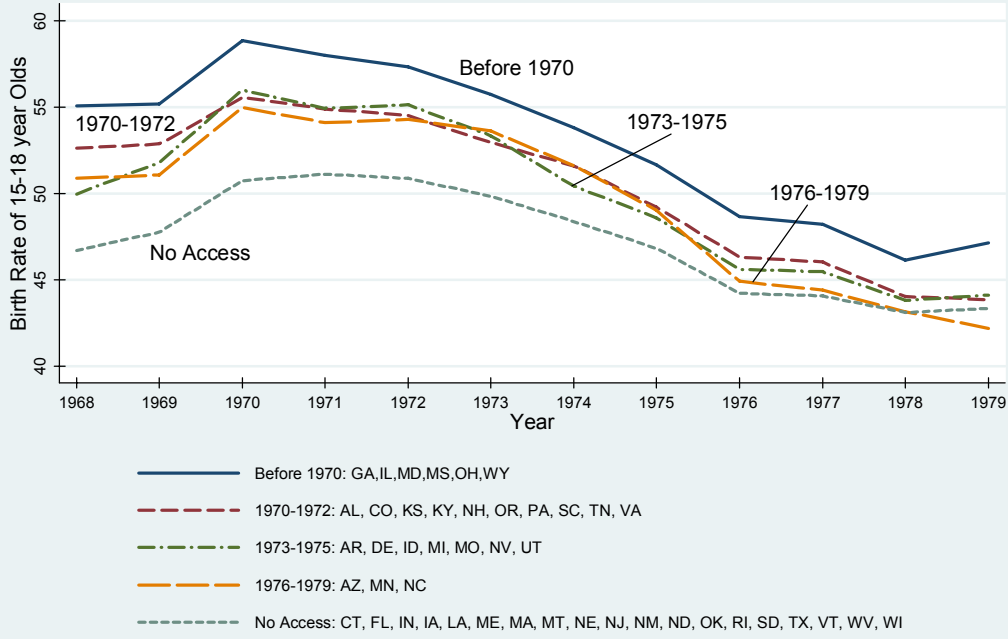


Figure 10: First Difference of Birth Rate of 15-18 Year Olds by Year of Access to the Pill without Parental Consent  
Early Legalizing States AK, CA, DC, HI, NY and WA not Included

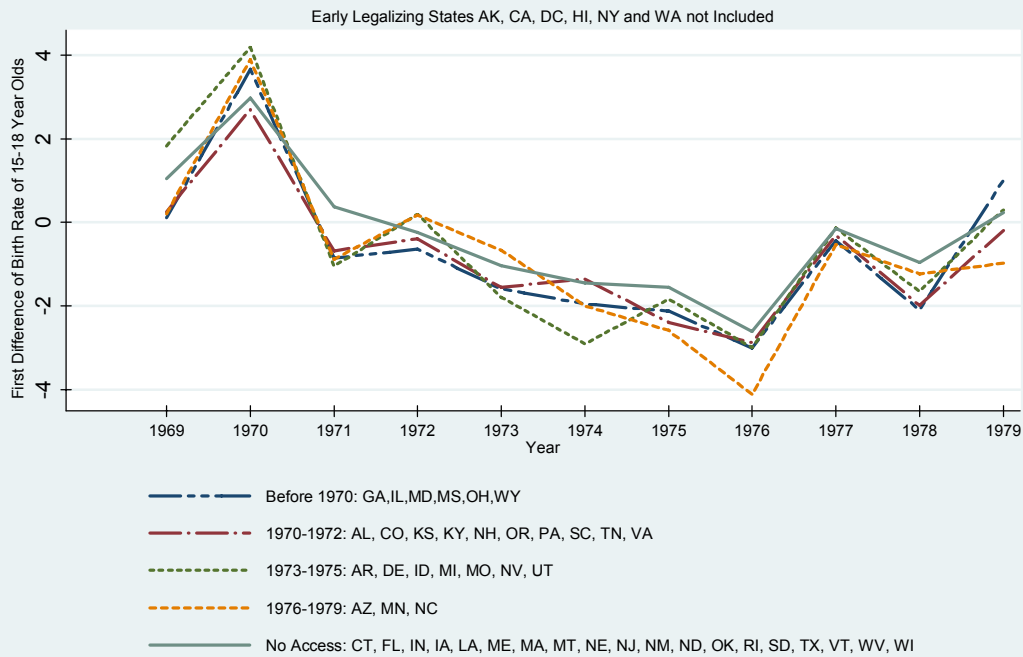


Figure 11: Birth Rate of 19-21 Year Olds by Year of Access to the Pill without Parental Consent  
Early Legalizing States AK, CA, DC, HI, NY and WA not Included

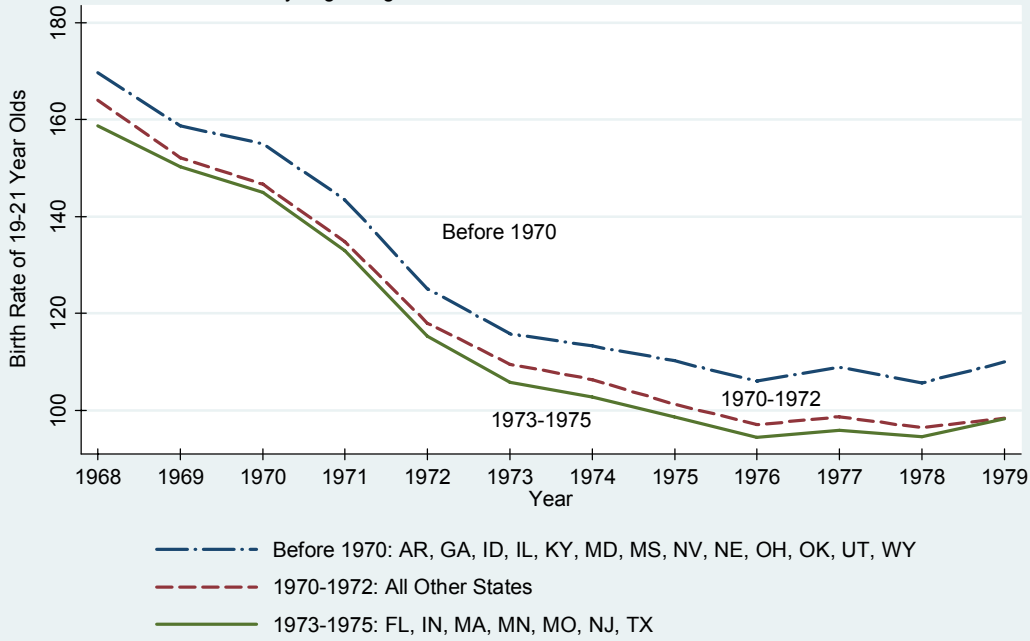


Figure 12: First Difference of Birth Rate of 19-21 Year Olds by Year of Access to the Pill without Parental Consent  
Early Legalizing States AK, CA, DC, HI, NY and WA not Included

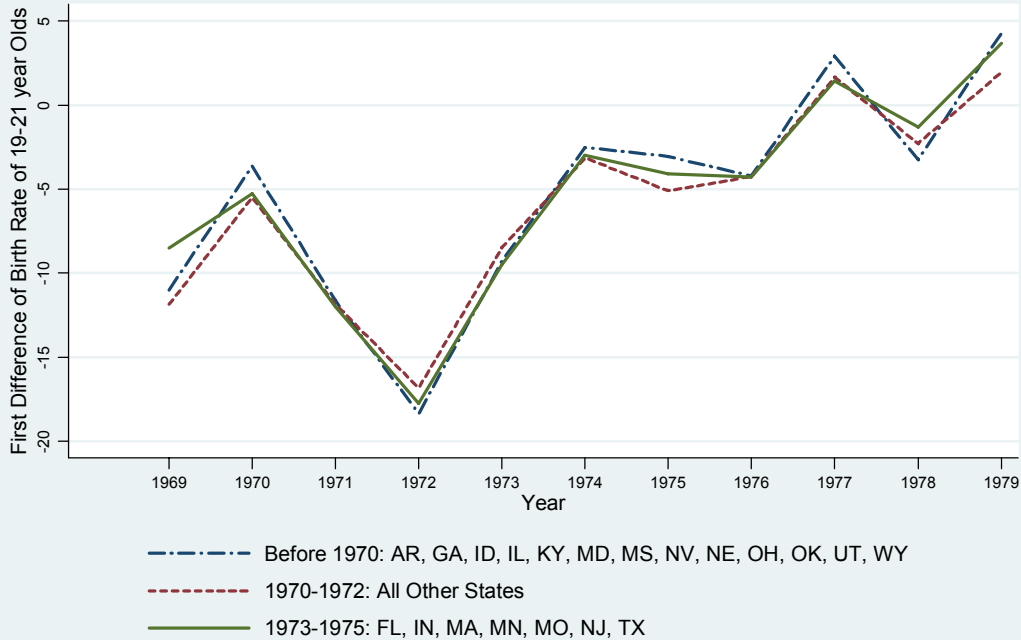




Figure 13: Teen Resident Abortion Rate (Age 15-19) by Timing of Abortion Access Change for 15-17 Year Olds, Early Legalizing States AK, CA, DC, HI, NY and WA not Included

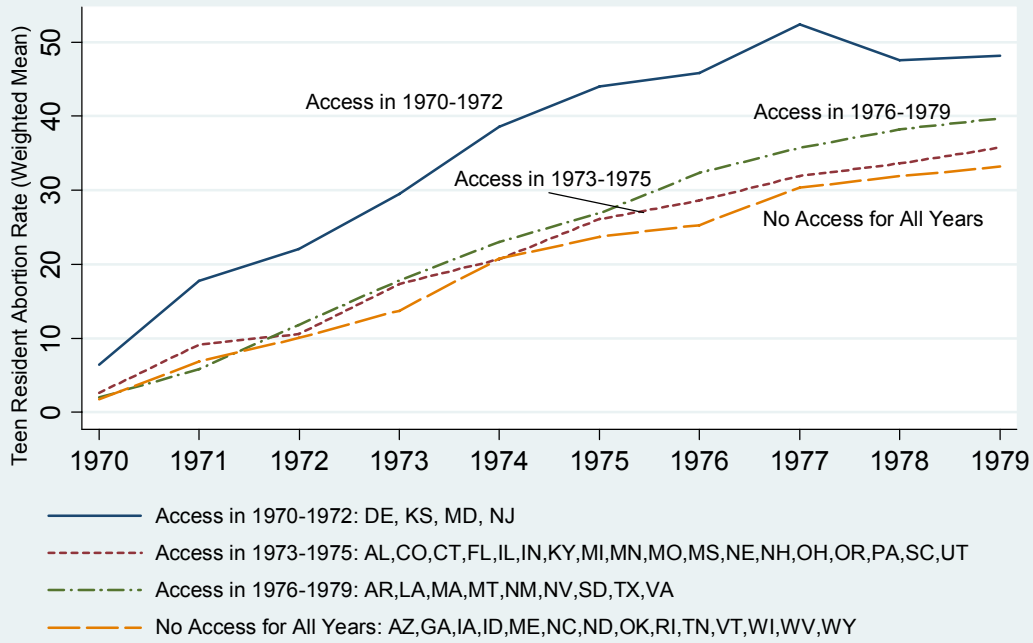
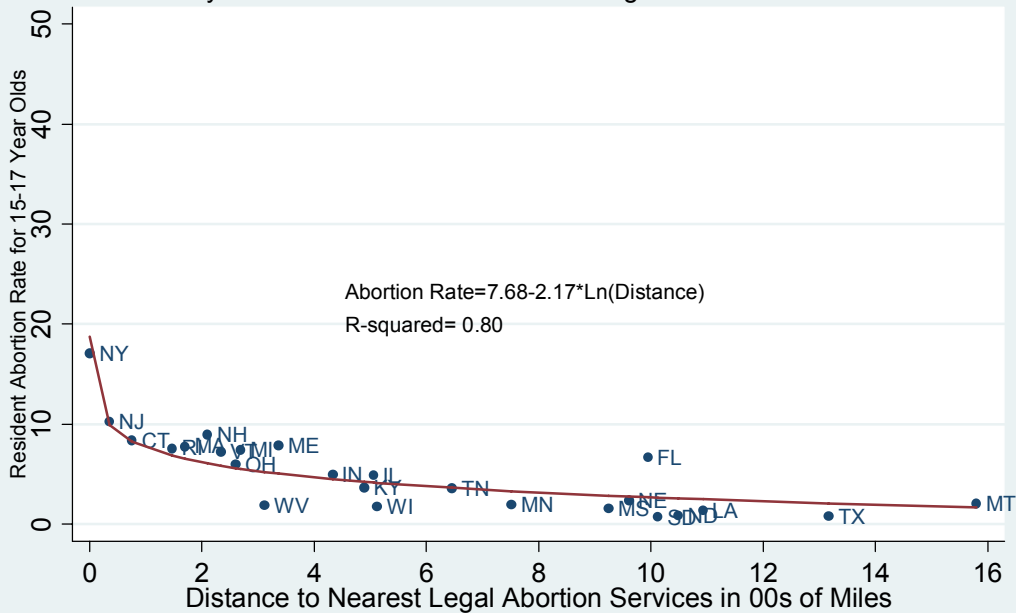


Figure 14: Resident Abortion Rates of 15-17 Year Olds in 25 States by Distance to Nearest New York Legal Abortion Provider\*



\*All abortions performed in New York State

Figure 15: Resident Abortion Rates of 18-19 Year Olds in 1971-72 in 25 States by Distance to Nearest New York Legal Abortion Provider\*

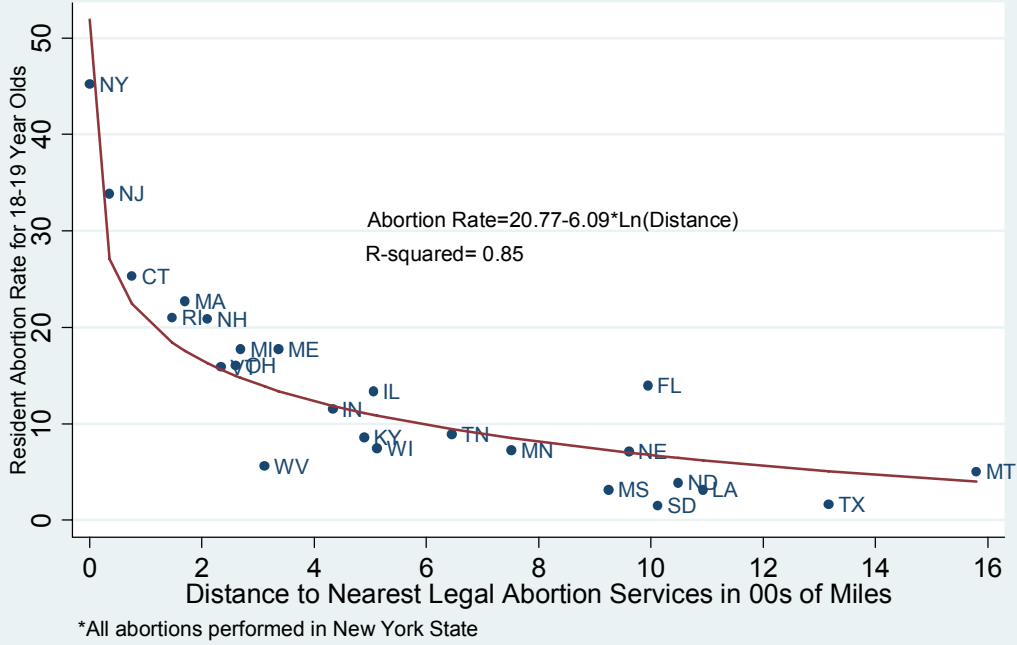


Figure 16: Resident Abortion Rates of 20 Year Olds in 1971-72 in 25 States by Distance to Nearest New York Legal Abortion Provider\*

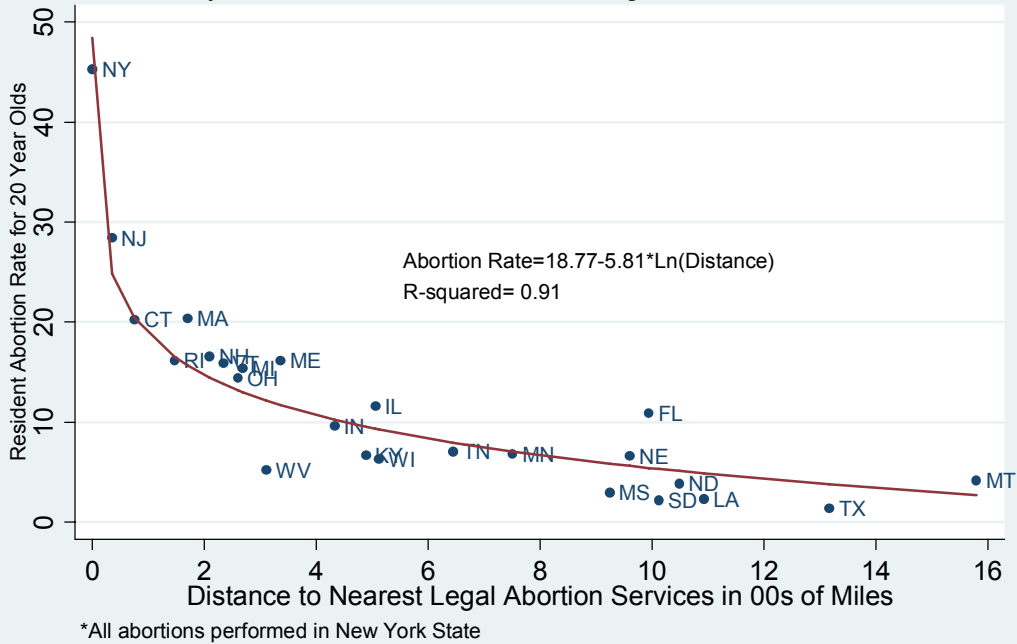


Figure 17: Resident Abortion Rates of 21-24 Year Olds in 1971-72 in 25 States by Distance to Nearest New York Legal Abortion Provider\*

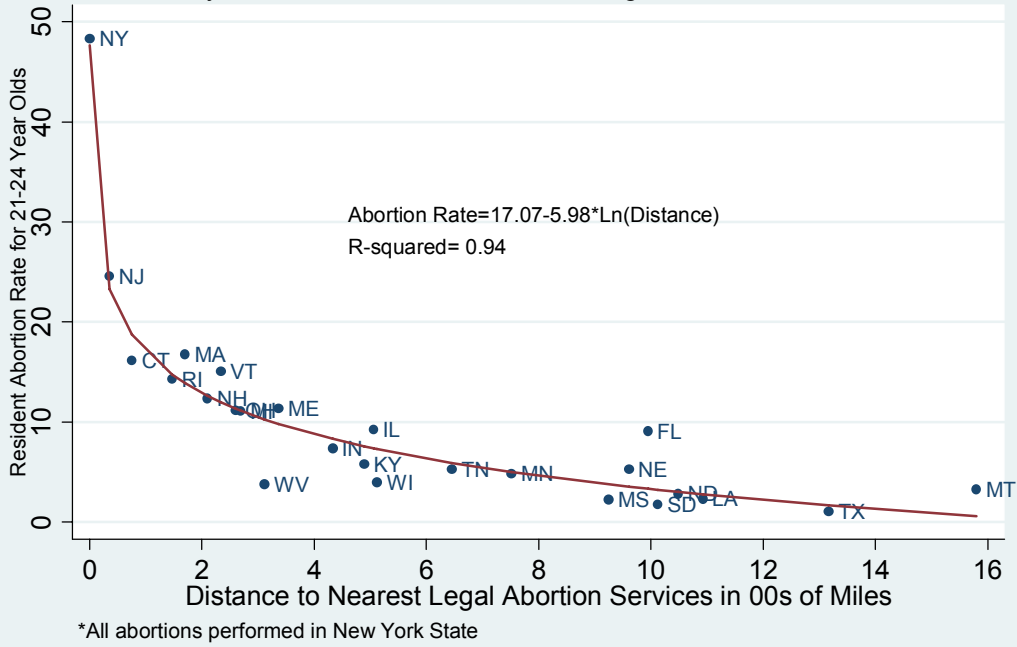
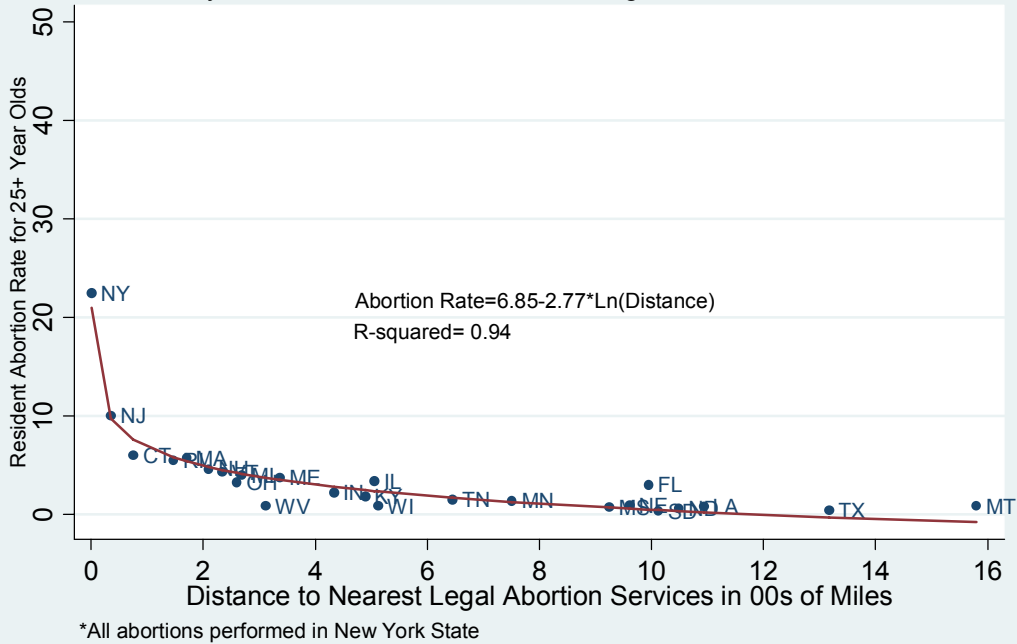


Figure 18: Resident Abortion Rates of 25+ Year Olds in 1971-72 in 25 States by Distance to Nearest New York Legal Abortion Provider\*



**Table 1 : Pill Access and Pill Use in 1971 by Various Coding of Pill Policies**

	Goldin and Katz(2002)		Ananat and Hungerman(2008)≠		Bailey(2006)	
	All (1)	Sexually Active (2)	All (3)	Sexually Active (4)	All (5)	Sexually Active (6)
Pill access	0.023** (0.009)	0.081** (0.028)	-0.006 (0.013)	-0.03 (0.037)	-0.020* (0.010)	-0.055 (0.032)
Age variables:						
15	-0.140** (0.021)	-0.259** (0.064)			-0.138** (0.021)	-0.256** (0.064)
16	-0.119** (0.019)	-0.175** (0.052)	-0.114** (0.021)	-0.170** (0.056)	-0.118** (0.019)	-0.173** (0.052)
17	-0.095** (0.016)	-0.106* (0.044)	-0.092** (0.019)	-0.102* (0.047)	-0.094** (0.016)	-0.105* (0.045)
18	-0.062** (0.013)	-0.094** (0.033)	-0.062** (0.015)	-0.092** (0.035)	-0.062** (0.013)	-0.093** (0.033)
Catholic	-0.013 (0.009)	-0.027 (0.029)	-0.014 (0.011)	-0.022 (0.032)	-0.012 (0.009)	-0.023 (0.029)
African-American	0.078** (0.011)	0.066* (0.028)	0.098** (0.014)	0.068* (0.032)	0.076** (0.011)	0.061* (0.029)
Currently attends school	-0.082** (0.016)	-0.070 (0.036)	-0.083** (0.018)	-0.069 (0.040)	-0.083** (0.016)	-0.073* (0.037)
Observations	4211	1314	3214	1142	4211	1314
R-squared	0.085	0.113	0.074	0.088	0.085	0.109

≠ Sample is limited to 16 -19 year olds

Guldi's (2008) coding differs from that of Goldin and Katz (2002). Guldi treats Kansas, Maryland, Ohio, Pennsylvania and Virginia as having lenient policies towards the pill. Goldin and Katz (2002) consider policies toward the pill in Arkansas, California and Michigan as lenient. Guldi (2008) and Goldin and Katz (2002) are concordant on 9 states: Alabama, D.C., Georgia, Illinois, Mississippi, New Hampshire, New York, Oregon, and Tennessee.

Bailey's (2006) coding characterizes 10 states in NYSW71 as allowing early legal access to the pill among young, unmarried women less than 21 years of age prior to 1971. Only 3 out of 10 states are consistent with Goldin and Katz (2002): Arkansas, Georgia and Mississippi. Seven other states are treated as lenient in Bailey (2006): Kansas, Kentucky, Maryland, Nevada, Ohio, Oklahoma and Utah.

According to Ananat and Hungerman's (2008) coding, 17.6% of unmarried women 19 years of age in NYSW71 had access to the pill while 18.5% of 18-year-olds, 24.3% of 17-year-olds and 37.8% of 16-year olds had access.

\* p<0.05, \*\* p<0.01.

**Table 2: Regressions of Age- and Race-specific Birth Rates on Access to the Pill and Abortion, 1968-79**

Ages	Ln Birth Rates Whites			Ln Birth Rates Non-whites		
	15-21	15-18	19-21	15-21	15-18	19-21
	(1)	(2)	(3)	(4)	(5)	(6)
Abortion access	-0.116* (0.050)	-0.007 (0.022)	-0.019 (0.017)	-0.031 (0.061)	0.092** (0.025)	-0.058 (0.049)
Pill access	-0.092* (0.040)	-0.060 (0.038)	0.046 (0.030)	0.023 (0.057)	-0.047* (0.020)	0.121** (0.032)
N	4284	2448	1836	4284	2448	1836
Adj. R-sq	0.969	0.977	0.959	0.932	0.950	0.918

The dependent variable is the natural logarithm (Ln) of the race-specific birth rate by single year of age for women 15 to 21. Standard errors in parentheses are clustered at the state level. Models include interactions of state and year fixed effects. Measures of access to abortion and the pill are from Guldi (2008). Coefficients in columns (1) and (4) attempt to replicate Guldi (2008). Coefficients in columns 2, 3, 5 & 6 are from regressions run separately for the designated ages. \* p<0.05, \*\* p<0.01.

**Table 3: Regressions of Age- and Race-specific Birth Rates on Access to the Pill and Abortion, 1968-79**

Ages	Ln birth rates Whites					Ln birth rates Nonwhites				
	15-21 (1)	15-21 (2)	15-21 (3)	15-18 (4)	19-21 (5)	15-21 (6)	15-21 (7)	15-21 (8)	15-18 (9)	19-21 (10)
Abortion Access	-0.116* (0.050)	-0.087** (0.023)				-0.031 (0.061)	-0.033 (0.029)			
Pill Access	-0.092* (0.040)	-0.064* (0.026)	-0.075** (0.024)	-0.010 (0.020)	-0.014 (0.015)	0.023 (0.057)	-0.001 (0.031)	-0.001 (0.030)	-0.038 (0.022)	0.015 (0.017)
Ln Distance*71-73 (mean=4.3 00s miles)			0.021** (0.003)	0.025** (0.003)	0.013** (0.002)			0.023** (0.003)	0.026** (0.004)	0.018** (0.002)
Ln Distance*74-79 (mean=0.12 00s miles)			0.035** (0.006)	0.041** (0.008)	0.029** (0.006)			0.038** (0.009)	0.050** (0.011)	0.016** (0.005)
N	4284	4284	4284	2448	1836	4284	4284	4284	2448	1836
Adj. R-sq	0.969	0.969	0.969	0.978	0.954	0.932	0.930	0.932	0.946	0.899
State*Year FE	yes					yes				
State & Year FE		yes	yes	yes	yes		yes	yes	yes	yes

See notes to Table 2. Standard errors in parentheses are clustered at the state level. \* p<0.05, \*\* p<0.01.

**Table 4: Reduced Form and IV Regressions of Birth and Abortion Rates in 25 States, 1971-73**

	Abortion OLS (1)	Birth OLS (2)	Abortion OLS (3)	Birth OLS (4)	Birth OLS (5)	Birth IV (6)
Ln distance 00 miles	-2.16** (0.37)	-2.51 (1.60)				
Ln distance *Ages 15-17	0.60 (0.34)	3.57* (1.47)	0.57 (0.34)	3.64* (1.58)		
Ln distance *Ages 18-19	-3.31** (0.93)	7.80* (2.79)	-3.32** (0.97)	7.85* (2.95)		
Ln distance *Age 20	-3.04** (0.53)	7.33** (2.29)	-3.04** (0.55)	7.35** (2.40)		
Ln distance *Ages 21-24	-3.21** (0.14)	6.08** (2.12)	-3.21** (0.14)	6.08* (2.23)		
Access to Pill	-0.03 (0.92)	5.13 (3.65)	-0.43 (0.66)	5.94 (4.17)	4.18 (4.36)	4.04 (3.99)
Abortion rate lagged 1 year					-1.26** (0.34) [0.23]±	-1.43** (0.35) [0.27]±
State fixed effects included	no	no	yes	yes	yes	yes
N	250	250	250	250	250	250
R-sq	0.91	0.91	0.96	0.94	0.94	0.94
F-stat, distance measures	254.25	6.55	262.94	5.85		
P-value	0.00	0.00	0.00	0.00		

Abortions performed in New York State in 1971-72 are by age and state of residence. Births are from the national natality files in 1972-73. There are 5 age groups from 25 states over 2 years (n=250). The omitted age category is women 25 years and older. Distance measures and pill access are lagged 1 year in the birth rate regressions. Standard errors are clustered at the state level. The mean abortion rate is 8.8 and mean birth rate (unweighted) is 86.4 per 1000 age-specific women. Mean distance is 5.73 in hundreds of miles. The partial R-square for the instruments in column (3) is 0.68. \* p<0.05, \*\* p<0.01; ± robust standard errors, not clustered.

**Table 5: Reduced Form and IV Regressions of Birth and Abortion Rates in 25 States, Whites 1971-73**

	Abortion OLS (1)	Birth OLS (2)	Abortion OLS (3)	Birth OLS (4)	Birth OLS (5)	Birth IV (6)
Ln distance 00 miles	-0.31 (0.16)	-1.12* (0.45)				
Ln distance * Age <20	-2.32** (0.52)	4.75** (1.36)	-2.32** (0.55)	4.79** (1.47)		
Ln distance * Age 20-29	-3.55** (0.14)	3.15** (0.89)	-3.55** (0.15)	3.15** (0.95)		
Ln distance * Age 30-39	-1.55** (0.08)	-0.57* (0.25)	-1.55** (0.08)	-0.57* (0.27)		
Access to the Pill	-0.28 (0.97)	6.27 (3.85)	-0.27 (0.76)	6.84 (4.84)	5.18 (5.21)	5.29 (4.65)
Abortion rate lagged 1 yr					-0.91* (0.34) [0.19]±	-1.16** (0.24) [0.22]±
State fixed effects included	no	no	yes	yes	yes	yes
N	200	200	200	200	200	200
R-sq	0.89	0.97	0.95	0.97	0.97	0.97
F-stat, distance measures	248.50	3.93	275.11	4.57		
P-value	0.00	0.01	0.00	0.01		

Abortions performed in New York State in 1971-72 are by age, race and state of residence. Births are from the national natality files in 1972-73. There are 4 age groups from 25 states over 2 years. The omitted age category is women 40 and older. Distance measures and pill access are lagged one year in the birth rate regressions. Each regression includes age dummies, a year dummy for 1972, state per capita income, the insured unemployment rate, and the percent non-white population in the state. Standard errors in parentheses are clustered at the state level. The partial R-square for the instruments in the first stage regression in column 3 is 0.71. The mean birth rate (unweighted) is 55.0 and the mean abortion rate is 4.2 per 1000 age-specific women. \* p<0.05, \*\* p<0.01; ± robust standard errors, not clustered.



**Table 6: Reduced Form and IV Regressions of Birth and Abortion Rates, Non-whites 1971-73**

	Abortion OLS (1)	Birth OLS (2)	Abortion OLS (3)	Birth OLS (4)	Birth OLS (5)	Birth IV (6)
Ln distance 00 miles	-1.51* (0.56)	3.38 (2.24)				
Ln distance *Age <20	-7.57** (0.60)	7.94** (2.17)	-7.58** (0.62)	7.61** (2.24)		
Ln distance *Age 20-29	-10.03** (0.73)	9.87* (4.62)	-10.03** (0.78)	9.87 (4.93)		
Ln distance *Age 30-39	-3.91** (0.29)	1.78 (1.28)	-3.91** (0.32)	1.78 (1.36)		
Access to the Pill	3.63 (2.32)	-0.47 (8.60)	3.22 (2.37)	-6.31 (7.90)	-5.23 (7.36)	-3.32 (6.68)
Abortion rate lagged 1 yr					-0.64** (0.19) [0.19]±	-1.05* (0.43) [0.24]±
State fixed effects included	no	no	yes	yes	yes	yes
N	200	200	200	200	200	200
R-sq	0.82	0.84	0.88	0.91	0.91	0.90
F-stat, distance measures	263.03	5.00	262.85	5.17		
P-value	0.00	0.00	0.00	0.01		

Abortions performed in New York State in 1971-72 are by age, race and state of residence. Births are from the national natality files in 1972-73. There are 4 age groups from 25 states over 2 years. The omitted age category is women 40 and older. Distance measures and pill access are lagged one year in the birth rate regressions. Each regression includes age dummies, a year dummy for 1972, state per capita income, the insured unemployment rate, and the percent non-white population in the state. Standard errors in parentheses are clustered at the state level. The partial R-square in the first state regression in column 3 is 0.53. The mean birth rate is 91.1 and the mean abortion rate is 7.7 age-specific women. \* p<0.05, \*\* p<0.01; ± robust standard errors, not clustered.