Changes in Abortions and Births Following Texas's Parental Notification Statute: A Regression Discontinuity Approach.

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Abstract

We analyzes changes in abortions and births among teens in Texas after enforcement of a parental notification law in January 2000. The data are unique because they contain information on a teen's exact date of birth, which enables us to overcome an important source of the misclassification bias. Researchers in previous studies of parental involvement laws have measured a teen's age at the time of the birth or abortion. However, three quarters of all 17 years olds who conceive as minors, and who thus are exposed to the law, give birth as 18 year olds. This latter group of teens is often included among the comparison group, which results in biased estimates of the effect of the law on fertility and even abortion. Using age at conception to define exposure, we find that abortions in Texas to 17 year olds fell conservatively 12 percent after law. The decline in abortions is limited to White Non-Hispanics and Hispanics. We find a small increase in births of between 2 and 4 percent among the 17 year olds exposed to the law, but the change is sensitive to the statistical specification.

Introduction

Parental involvement laws require that an abortion provider notify a parent(s) of a minor's request for an abortion, or that the parent(s) provide written consent, before a procedure can be performed. Thirty-four states presently enforce a parental involvement statute, up from 13 states in 1988. Parental involvement laws in 10 other states have been enjoined by courts and seven states have no such requirement (NARAL and NARAL Foundation 2004).

The general Parental involvement laws have become an important focal point in the controversy over abortion. Although most voters support the right to abortion, there are large disagreements as to parental prerogatives with respect to minors, the information that should be provided prior to termination, and the types of procedures that are acceptable. The Supreme Court decision in *Planned Parenthood of Southeastern Pennsylvania v. Casey*, [1] established that state regulation of abortion is permissible as long as policies do not impose an "undue burden" on the right to abortion. The definition of an undue burden, however, remains contentious and evidence from social science research is used frequently in court briefs and proceedings to help assess the impact of a law on access and safety.[2]

Most courts have ruled that parental involvement laws with a judicial bypass do not impose an undue burden on a minor's right to an abortion. However, as more states enforce parental involvement laws, the impact of these laws on access to abortion services for minors

[1] Planned Parenthood of Southeastern Pennsylvania v. Casey 112 S.Ct. 2791 (1992).

[2] The timing and location of an abortion figured prominently is a recent decision by the Supreme Court of New Jersey, which struck down the state's parental involvement statute. Writing for the majority, Judge Poritz states:

…."Studies cited in plaintiffs' certifications indicate that the risk of death increases with each week of gestation from nine weeks to 20 weeks LMP, which explains why second trimester abortions are often performed in a hospital. We are troubled by the prospect, also advanced by the certifications, that in attempting to exercise their rights minors may elect to leave the State, or in cases where delay is significant, may use unlicensed

who do not want to involve their parents may increase. Moreover, there is federal legislation that would effectively close the borders for any minor who sought an abortion without parental involvement. The Child Custody Protection Act (CCPA) would make it a federal crime for a person other than a parent to transport a minor across state lines in order to circumvent a parental involvement statute in the minor's state of residence. The bill is currently pending in both the Senate (S 661) and the House of Representatives (H.R. 1218) and passage is expected this year.[3]

In this study we use individual data on births and abortions to residents of Texas to analyze the effect of the state's parental notification statute on reproductive choices. Our data are unique in that we have information on a teen's exact date of birth, which enables us to overcome key limitations from previous work. In past studies of parental involvement laws, researchers have measured a teen's age at the time of the birth or abortion. This introduces a potentially significant form of misclassification bias in the assignment of teens who are exposed and unexposed to the law. For instance, approximately three-quarters of minors who conceive at 17 years of age, give birth at 18. As a result, births to 18 year olds—a common counterfactual—include many teens who were exposed to the law as minors during pregnancy. A more subtle form of misclassification occurs among abortions.[4] Consequently, estimates of the effect of parental involvement laws on abortions are upwards biased and estimates of changes in births are downward biased. The bias with respect to births diminishes power to detect statistically significant changes in fertility. In this study,

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doctors or unorthodox procedures in procuring an abortion." (*Planned Parenthood v. Farmer*. 2000 N.J. Lexis 1024.)

[3] Sheryl Gay Stolberg, "Bankruptcy Bill is Arena for Abortion Fight." *New York Times*, March 8, 2005.

[4] Some minors who conceive as 17 year olds are able to terminate their pregnancy as 18 year olds. As we show below, some teens delay their terminations until they are 18 years of age in response to the law. As a result, there is a dip in abortions to 17 year olds and a rise among 18 year olds associated with the law. This tends to increase the estimated decline in abortions due to the law.

we are the first to accurately distinguish teens who are exposed and unexposed to the law from the point of conception.

Another advantage of our data is that Texas is geographically the largest and most populous state to enforce a parental involvement law. Thus, we analyze changes in births and abortions by race and ethnicity as well as region of the state and proximity to abortion providers. In addition, there is limited access to out-of-state abortion providers that do not enforce a parental involvement law, especially for minors in the heavily populated southeastern region of the state. Thus, Texas offers a potentially useful test of the likely impact of the Child Custody Protection Act should it be enforced. Finally, given the detailed nature of our data we are able to use a regression discontinuity design to compare minors who conceive just before they turn 18 to teens who have just turned 18. Pregnancy rates rise rapidly as teens age. Nineteen year olds may be a questionable comparison group for 17 year olds given the large difference in birth and abortion rates. However, pregnant teens around the threshold of 18 years provide an inherently more convincing test of parental involvement laws than has been possible in previous analyses.

Background

The literature on parental involvement laws divides broadly into two types of studies: analyses based on state aggregate data and single or multiple-state studies that use individual-level data from the relevant state health departments. Both have their strengths and weaknesses. Studies based on state aggregates use data from either the Centers for Disease Control and Prevention (CDC) or the Alan Guttmacher Institute (AGI). The CDC collects data from the state health departments in aggregate form. Data are available annually by

state and generally one other characteristic such as age or race. CDC data are reported by state of occurrence (Koonin et al. 1999). The Alan Guttmacher Institute surveys abortion providers periodically as to the total number of abortions by state of occurrence performed in a specific year. State totals based on the survey are widely considered the most accurate estimate as to the number of abortions performed (Jones and Forrest 1992). Importantly, however, the AGI survey collects no information on the characteristics of women or teens who abort, although periodically AGI publishes estimates of abortion by age and state of residence (Henshaw 1997; Henshaw and Feivelson 2000). However, AGI researchers explicitly state that these data should not be used to evaluate parental involvement laws because abortions performed out of state are underestimated in states with parental involvement statutes.[5]

The advantage of the aggregate data is that most states are represented. This permits analyses based on pooled time-series cross-sections with state fixed effects. Results from these studies report a decline in abortions to minors of roughly 10 to 25 percent associated with the law (Ohsfeldt and Gohmann 1994; Haas-Wilson 1996; Levine 2003). Effects are greatest when analysts use abortions by state of occurrence (Haas-Wilson 1996) and less when based on abortions by state of residence (Ohsfeldt and Gohmann 1994; Levine 2003). There is less consistency with regard to the effect of parental involvement laws on births. Ohsfeldt and Gohmann (1994) report that parental involvement laws increase births to minors by 14 percent whereas Kane and Staiger (1996) and Levine (2003) find no effect.

[5] Stanley Henshaw, who directed the AGI abortion survey for many years, writes, …."Thus, the estimated abortion and pregnancy rates should not be used to assess the impact of parental involvement laws on minors' abortion and pregnancy rates" (Henshaw 1997. p. 116).

There are several limitations to analyses based on state aggregate data. First, as noted, data are collected by state of occurrence and not state of residence. Effects of parental involvement laws based on abortions by state of occurrence overestimate the impact of the law. Non-resident minors may stop coming into the state for an abortion and resident minors may leave the state for an abortion in the wake of a parental involvement law (Cartoff and Klerman 1986; Henshaw 1995; Joyce and Kaestner 1996; Ellertson 1998). As a result, part of the observed decline in abortions may be spurious. The Alan Guttmacher Institute provides estimates of abortion by age and state of residence for selected years. As noted, however, these estimates are considered unreliable for analyses of parental involvement laws (Henshaw 1997). Moreover, AGI provides only four years of data on teen abortions by state of residence between 1985 and 1996. Consequently, there can be several years between the year a law is implemented and the year in which abortions are recorded (Levine 2003).

The other major type of study uses individual-level data from one or several states. These analyses are based on more refined research designs, but are by definition limited in their generality. For instance, researchers with individual-level data are able to aggregate data by month of conception and thus can identify which pregnancies were conceived just before and after the law. In addition, researchers in several such studies have secured some information on abortions to minors performed in other states (Cartoff and Klerman 1986; Joyce and Kaestner 1996a; Henshaw 1995; Ellertson 1997). The general finding from these studies is that abortions by state of occurrence fall significantly, but that the decline by state of residence is much less.

Despite the growing literature, all previous studies suffer from a potentially serious form of misclassification bias. Most minors who conceive at age "t" measured in years will give

birth, and some will abort at age "t+1". For example, most 17 year olds exposed to a parental involvement statute will give birth as 18 year olds. However, in most analyses of parental involvement laws, researchers use teens 18 years of age, or teens 18 and 19 years of age at the time of the abortion or birth, as the "control group" for minors (Rogers et al. 1991; Oshfeldt and Gohmann 1994; Haas-Wilson 1996; Ellertson 1997; Joyce and Kaestner 1996a; Kane and Staiger 1996; Levine 2003). As a result, the control group is contaminated, which may not only obscure a rise in births, but may lead to the erroneous conclusion that births among minors have fallen or remain unchanged as a result of the law (Rogers et al. 1991; Kane and Staiger 1996; Ellertson 1998; Levine 2003).

The magnitude of the misclassification bias is not known because it depends on how many minors carry the pregnancy to term as a result of the law.[6] Nevertheless, the bias is probably greatest among 17 year olds, who are the most likely to become pregnant and the least likely to tell their parents (Henshaw and Kost 1992). An advantage of the regression discontinuity design described below is that we can identify effects of the law for minors at the cusp of turning 18 at the time of conception. This group of minors has the highest pregnancy rate, is the least likely to involve their parents, and is the group for whom both births and abortions are most likely to have been misclassified in previous analyses. If there is a meaningful effect of parental involvement laws on abortions and unintended births, it is likely to be found among the oldest minors.

[6] If we assume that the decline in abortions associated with a parental involvement law results in a rise in births, then roughly three-quarters of the increase in births among 17 year olds will be attributed to 18 year olds when measured by age at the date of delivery. The same occurs among minors that conceive as 16 year olds but deliver at age 17. However, the pregnancy rate among 16 year olds is only 60 percent that of 17 year olds. In addition, the parents of 16 year olds are more likely to know about the abortion than are parents of 17 year olds, which implies that the rise in births among those who conceive at age 16 will be substantially less than at age 17 (Henshaw and Kost 1992). Both factors suggest that the inability of previous researchers to detect a change in births associated with parental involvement laws may be due to this misclassification between minors and older teens.

Research Design and Methods

1. Theoretical considerations

Parental involvement laws raise the psychic cost of abortion for minors who would not have consulted their parents in the absence of such laws. These statutes also increase the monetary cost of abortion, if they force minors to travel further, seek a judicial bypass, and delay abortions longer than they would have had such requirements not been imposed. Thus, as a first approximation we expect parental involvement laws to decrease abortions, increase births and increase the gestational age of fetus at termination.

Parental involvement laws may also affect the likelihood of becoming pregnant if they induce substitution from abortion to contraception. Pregnancies, for instance, may fall if minors who were willing to abort, but unlikely to inform their parents, increase contraceptive efforts in response to the law. If there is perfect substitution, then pregnancies are avoided that would have been terminated in absence of the law. In this case, births remain unchanged. However, if substitution from abortion to contraception is not complete, then births will rise after the law, but the increase in births should be less than the fall in abortions. In sum, births should not fall and may rise depending on the degree of substitution between abortion and contraception among teens who are willing to abort. Teens who are unwilling to abort, or who would involve their parents should they become pregnant, will be unaffected by the law.

Evidence suggests that the substitution of contraception for abortions is unlikely to be complete. Teen birth and abortion rates have fallen substantially over the 1990s, but the decline has been smooth and seems unrelated to specific policy changes such as welfare

reform (Henshaw and Feivelson 2000; Joyce, Kaestner, Korenman and Henshaw, 2004). Moreover, the information that exists suggests that minors are not well-informed as to the legality of abortion or abortion policies. A focus-group study of adolescents from selected cities in the United States found that only a few teenagers knew whether their state required parental involvement for minors seeking abortion (Stone and Waszak 1992). Similarly, Blum, Resnick, and Stark (1987) report that over half the teenagers surveyed in four Minnesota abortion clinics were unaware of laws related to abortion prior to scheduling their appointments, and less than 25 percent knew of the parental notification statute. These studies do not imply significant feedback from state laws to sexual activity and contraception. In sum, we expect abortions to fall and births to rise in the months immediately after enforcement of a parental involvement law. Effects of the law may diminish over time as minors and providers adapt to the statute.

2. Data

We use individual birth and induced termination files from Texas. We limit the analysis to Texas for several reasons. First, Texas is the most populous state to enforce a parental involvement law and sample size is important. Table 1A shows number of abortions and births to teens who resided in Texas in 1999 for whom we have data on the teen's exact date of birth. There were over 15,061 abortions and 53,000 births to teens 15 to 19 years of age in 1999. Second, Texas records the mother's and patient's date of birth (mm/dd/yy) on both the birth and induced termination certificate, an important advantage for our study as we describe below. This is rare as best as we can determine.[7] Finally, many states near Texas

[7] We have not surveyed all states with individual-level data on induced abortions as to the availability of the patient's exact date of birth. However, we know that Virginia and North Carolina, two states with relatively recent parental involvement laws do not record the patient's date of birth on the induced termination certificate.

enforce parental involvement laws, which should lessen the likelihood that minors go out of state to avoid compliance.

Abortion surveillance by the Texas Department of State Health Services appears to have deteriorated over time. In 1996, reports of abortion appeared complete when compared to estimates obtained from the Alan Guttmacher Institute (AGI). In that year the Texas Department of State Health Services (DSHS) reported 91,470 abortions and AGI reported 91,270 (Henshaw 1998). However, totals for Texas fell to 84,680 in 1997, 81,686 in 1998, 80,739 in 1999 and 76,121in 2000 (http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5212a1.htm). AGI, by contrast, reported 87,880 in 1999 and 89,160 in 2000 (Finer and Henshaw 2003), the only survey years available from AGI after 1996. Thus, the disparity between AGI and the Texas DOH began in 1997 and has somewhat leveled off. Table A1 of the Appendix shows the distribution of abortion by patient characteristics in 1996 and 1999 as reported by the Texas DSHS. There are no glaring differences between 1996 and 1999, which is some evidence that the underreporting is not systematically related to these characteristics.

We use abortions to residents of Texas that are performed in Texas. The Texas Department of State Health Services lacks data on abortions to Texas residents performed in other states. Travel to another state for an abortion is potentially important. The lack of data on minors who leave Texas for an abortion would bias upwards estimated effects of the law. Fortunately, vital registries in Arkansas, New Mexico and Oklahoma collect information on the state of residence of women who obtain abortions in their state. In 1999, there were 10 abortions to minors performed in New Mexico who were residents of Texas and only 13 in

2000.[8] In Oklahoma and Arkansas, the numbers were similarly small.[9] There are no data from Louisiana, since they do not report information on the state of residence on the induced termination certificates. However, Louisiana has enforced a parental consent law since 1978, which makes it unlikely that minors would seek abortions in Louisiana in response to the parental notification law in Texas.

The most important aspect of our data is the mother's or patient's exact date of birth (mm/dd/yy). As a result, we can define those exposed to the parental involvement statute with greater precision than in previous work. For instance, of the 13,334 minors 17 years of age who conceived in 1999 and carried the pregnancy to term, 10,136 or 76 percent delivered the birth when they were 18 years of age.[10] This simple fact has significant consequences for an analysis of parental involvement laws. Consider the situation in which the researcher only has information on age in years at the time of the birth. Assume that the researcher uses a difference-in-differences (DID) estimate and compares changes in births to 17 year olds before and after the law to changes in births among 18 year olds over the same period. However, most of the 18 year olds who gave birth were subject to the law during pregnancy. If a parental notification statute causes an increase in births, then the comparison group—births to 18 year olds—is contaminated by the increase in births to teens who were 17 years old at the time of conception.

The other advantage of exact date of birth is that we can compare changes in births and abortions among exposed minors and unexposed teens who are very close in age. Figures 1 and 2 show annual birth and abortion rates by age and year at conception. The difference in

[8] Personal communications with Stanley Henshaw from the New Mexico Department of Health.
[9] In 2000 there were five abortions performed in Oklahoma and five abortions performed in Arkansas to minors from Texas. Authors' tabulations of induced termination files from the Oklahoma and Arkansas Departments of Health.

rates between 15 and 19 year olds is an order of magnitude. Even differences between 17 and 18 year olds are large. One consequence is that DID estimates are sensitive to functional form. It is not clear *a priori* if differences in logs is more appropriate than differences in levels. More fundamentally, large differences in the pre-intervention outcomes between the exposed and comparison groups suggest that other factors, possibly unobserved, may explain not only differences in levels but differences in trends. For instance, pregnancy rates increase rapidly as teens age. Eighteen year olds, as compared to minors, are more likely to be married and to have experienced a previous pregnancy. With the exact date of birth, we can narrow the age difference between the exposed and comparison group to several months. In the regression discontinuity design described below, we compare minors who are 17 years and between 6 and 8 months to 18 year olds and between 0 and 2 months.

We are limited to five years of data by year of conception. Texas did not record exact date of birth on the induced termination certificate until 1997. We define the conception year for 1998 from August, 1997 to July,1998 and the conception year 1999 from August 1998- July 1999. We are concerned that minors who conceived in say, November of 1999, were exposed to the law in January of 2000. The five month "buffer" minimizes such misclassification. For the years after the law we use the calendar years 2000-2002. We have data on abortions and births for 2003, which provides us the census of conceptions in 2002.

Another data issue is the number of observations on the induced termination certificates with missing date of birth. Table A1 in the Appendix shows the number and percent of abortions with missing date of birth. Twenty-four percent and 13.1 percent of abortion certificates in 1997 and 1998, respectively, lacked information on the patient's exact date of

[10] Authors' calculations based on age at conception.

birth. Reporting improves in 1999 and in 2000, but then deteriorates in 2001. Fortunately, the percent of observations with missing date of birth is distributed relatively evenly by age of the patient (not shown). Missing data are a significant concern. Thus, we will estimate models for all available years and then for 1999 and 2000 only. The latter two years are both close to the intervention and have relatively few observations without the date of birth.

3. Empirical Analyses

Responses to the law are likely to vary by age. In a survey of teens who had an abortion, researchers reported that 51 percent of parents to teens 17 years of age, 59 percent of parents to teens 16 years of age and 74 percent of parents to teens 15 years of age knew about the pregnancy (Henshaw and Kost 1992). Differences in parental communication by age suggest that the impact of the law may vary. Thus, we estimate separate effects by single-year of age at conception. We also examine differences within single-year of age as well, given the detailed nature of our data.

Much of our analysis is presented graphically. We begin the statistical analysis with simple difference-in-differences (DID) estimates of annualized abortion and birth rates by single year of age. Population estimates are Centers for Disease Control and Prevention's Bridge Race Estimates (www.cdc.gov/nchs/about/major/dvs/popbridge/datadoc.htm). As noted above, the law went into effect on January 1, 2000. We contrast DID in levels with DID in logarithms.

The regression analysis exploits our data more fully. To make the discussion concrete, let the unit of observation be age in months at conception and limit the age groups to teens 15 to 19 years of age at the time of conception. Thus, age in months at conception

varies from 180 (15 years and zero months) to 239 (19 years and 11 months). As noted we have at most five years of data (1998-2002). Let A_{at} be the number of abortions to age group "a" (a=180, 181, ….239), that are conceived in year "t".[9] Thus, we have 300 observations (60 age groups times 5 years). A simple illustration of the regression model is follows. We suppress notation for the full set of age indicators in order to reduce notation

$$(1) \quad A_{at} = \alpha_0 + \beta_1 A17\_q3 + \beta_2 A17\_q4 + \beta_3 A18\_q2 + \beta_4 A18\_q3 + F(a) + \sum_{i=t} \gamma_t Yr_t + \sum_{k=1} \alpha_k (A_k * After) + e_{at}$$

The variable *A17_q3* is one if the minor conceived when she was 17 years and between 6 and 8 months of age; similarly, A17_q4 is one for minors who conceived at 17 years and between 9 to 11 months of age. The reference category is teens 18 years and between 0 and 2 months of age. The model includes, F(a), a cubic function in age, a set of year dummies and the last term, (A_k*After) is the interaction between the age dummies and the years for which the law is enforced. If we drop the last set of interactions, then equation (1) is a conventional RDD specification that relies on the cubic in age to control for the smooth relationship between age and abortions. When we include the last set of interactions, we add a DID format that uses changes in abortions between minors and teens in the years just before the law to net out increases in abortions that occur with age and that are unrelated to the parental notification law (Card and Shore-Sheppard 2004).

Ideally, we would like to compare minors who conceive at 17 years and between 9 and 11 months with minors who conceived at 18 years and between 0 and 2 months. However, minors who conceive just before their 18th birthday are able terminate as 18 and

[9] We will analyze the number of abortions and or births per month. We will experiment with specifications in which we include annual population estimates as controls on the right hand side. We anticipate, however, that

thus, are essentially unaffected by the law. Indeed, the law appears to increase the proportion of minors who conceive as 17 year olds but who abort when they are 18 years of age. To illustrate, Figure 9 shows the average number of abortions by age in months at the time of the termination. One series shows the average for all abortions to teens performed in 1997-1999 and the other series displays the average for abortions performed between 2000-2003. Age in months is on the horizontal access. We have normalized to zero the age of teens who are exactly 18 years and zero months. The sharp discontinuity at age 18 is apparent. There are, on average, 162 abortions to teens 17 years and 11 months between 2000 and 2003 and 332 abortions to teens one month older. If we look at the three years prior to the law, we find no such break or discontinuity by age. However, the jump of 170 abortions overstates the change associated with law because minors at the cusp of 18 years of age have some control over when they terminate. Consequently, there is a noticeable dip among minors 17 years and 11 months and a commensurate jump among those 18 years and zero months.

Figures 10 and 11 make this behavior more apparent. Figure 10 shows abortions by age in weeks at the time of the termination. As before we normalize to zero the age of teens 18 years and zero weeks. There are noticeably more abortions in 2000-2003 to teens 18 years and between 4-6 weeks than to teens slightly older.[11] Similarly, Figure 11 shows the proportion of second trimester abortions or abortions greater than 12 weeks gestation by age in months at conception. There is a substantial spike in second-trimester abortions among minors who are 17 years and between 8 and 9 months of age at conception (-4 or -3). This suggests that the law induces minors who conceive a few months before their 18th birthday to

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they will add little to the model given that they vary only annually and change relatively slowly.

[11] It also appears in Figure 10 that a similar spike occurs at the zero point in 1997-1999. Part of this is due to the fact that the law went into effect on January 1, 2000; thus, teens 17 years and 11 months in say, November

delay the termination. The result is a temporary jump in second trimester terminations. As a result of this behavior, we use minors 17 years and between 6 to 8 months at conception as the relevant group of exposed minors and we compare their behavior to teens 18 years and between 0 and 2 months at conception.

The sharp discontinuity in abortions at 18 years of age (Figure 9) is based on age as measured at the time of the termination. As noted, this comparison overstates the change in abortions associated with the law. The more appropriate measure is abortions by age at conception as shown in Figure 12. As before, the horizontal axis displays age in months normalized to zero for teen 18 years and zero months. Although there is a noticeable gap in abortions between 17 years olds before and after the law, the sharp discontinuity evident in Figure 9 is noticeably more smoothed. The RDD model in equation (1) uses a cubic in age [F(a)] to capture the continuous relationship between age and abortion. However, if we rely exclusively on the cubic in age, we may not fully capture the growth in abortions by age. Thus, we use two forms of differencing to eliminate the increase in abortions that occurs with age. The first estimate, based on sum of the coefficients β_1 and β_4 from equation (1), uses changes in abortions among teens just above the 18-year-old threshold to approximate the change in abortion associated with age [see Jacobs and Lefgren 2004].[12] Alternatively, we

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and December of 1999 could also have waited until they turned 18 to terminate. Recall also that we give double the weight to abortion in 1999.

[12] The sum can be expressed as follows: (2) $\beta_1 + \beta_4 = (A_{t,17:6-8mo} - A_{t,18:0-2mo}) - (A_{t,18:0-2mo} - A_{t,18:6-8mo})$. Let A be abortions. The first subscript is the year and the second subscript the age in years and months.

use a DID approach that exploits changes in the abortions between minors and teens in the year(s) before the law to net out trends (see Card and Shore-Sheppard 2004).[13]

We also note that the dependent variable is the number of abortions and not the abortion rate. Population data are only available annually whereas age is measured in months. Thus, annual population figures add little variation. We follow Card, Dobkin and Maestas (2004) and assume that F(a) captures the smooth change in population. Figure A1 in the Appendix lends support to this assumption. Each series shows the annual population in logs in Texas by single year of age from 1992 to 2002. Population is trending upwards throughout the period but the rate of growth appears to slow down near the later years. For instance, between 1998 and 2002, the number of teens grew roughly five percent or approximately one percent per year.

We extend the analysis in several ways. First, we estimate separate models for White non-Hispanics, Black non-Hispanics and Hispanics. Texas has the second largest Hispanic population in United States and there has been little analysis of abortion among Hispanic teens. More importantly, there is evidence that communication between minors and parents varies by race and ethnicity. A parent of approximately 60 percent of minors who had an abortion knew of the termination. However, parents of Black non-Hispanics were much more likely to know about the pregnancy (Henshaw and Kost 1992). A similar difference was obtained in a recent survey of minors seeking reproductive health services. Seventy-five percent of the parents of Black non-Hispanic minors were aware that their daughter used the clinic as compared with 58.1 percent among White non-Hispanics and 53.1 percent among Hispanics (Jones et al. 2005).

[13] This would be coefficient α_1 in equation (1). Continuing with the notation from footnote 11,

We also undertake separate analyses by region of state. The Texas Department of State Health Services divides the state into 11 health service regions. We group them into three major areas based on the access a minor would have to other states with and without parental involvement laws. New Mexico has no parental involvement law. Colorado began enforcement of a notification statute in 2003. Oklahoma enforced a law for nine months in 2000 that was then enjoined; the injunction was subsequently voided in 2002 and the law went into effect. The law is vague and states that any provider who performs an abortion on a young woman without parental consent is liable for any subsequent medical care that may be required as a result of the abortion. The on-off-on status of the law and its unusual liability may have created sufficient uncertainty even when not enforced so as to push providers to insist on parental involvement. In Kansas, a parental notification law has been in effect since 1992 and a two-parent notice statute has been enforced in Arkansas since 1989. Finally, Louisiana enforces a one-parent consent statute that was enacted in 1978 and amended in 1997.[14] In sum, our three regions broadly divide the state among the western and northwestern regions centered around the cities of Lubbock and El Paso; the north-central regions clustered around Dallas –Fort Worth and the southeastern regions, which include Houston, San Antonio and Austin. Travel distance to the nearest state with no parental involvement statute is greatest in the southeastern region. Finally, we estimate models for residents who live in a county with no major abortion provider, those that perform more than at least 395 abortions per year. Data on abortion providers are from the Alan Guttmacher Institute.

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(3) $\alpha_1 = (A_{t,17:6-8mo} - A_{t,18:0-2mo}) - (A_{t-1,17:6-8mo} - A_{t-1,18:0-2mo})$

[14] The following website maintained by NARAL Pro-Choice America has an interactive listing of all state laws regarding abortion. http://www.naral.org/yourstate/whodecides/index.cfm

Results

Teen abortion rates by single year of age from 1998 to 2002 are displayed in Figure 1. Texas's parental notification statute went into effect on January 1, 2000. We use the 12 months from August 1998 to July 1999 and August 1997-July 1998 as the pre-law years. The most notable change occurs among minors 17 years of age at the time of the termination. Between 1999 and 2000, the abortion rate falls from 17.5 per 1000 to 13.1 among 17 year olds and from 11.1 to 9.0 among 16 year olds. The decline among 18 years olds, arguably a reflection of ongoing trends, is more modest, from 27.0 to 26.1.

We present the simple difference-in-differences (DID) in Table 2. The abortion rate of minors 15 to 17 years of age falls by 2.4 abortions per thousand as compared to 1.5 among older teens (column 3). The DID of 0.8 is not statistically significant at conventional levels. If measured as a relative change, however, we find that the abortion rate falls 18.1 percent more among minors relative to older teens between 1999 and 2000, a statistically significant decline. Comparisons by single year of age confirm what is apparent in Figure 1. There are statistically significant changes among 17 relative to 18 years olds associated with the law in both absolute and relative terms (Table 2, row 5), but changes among younger minors are sensitive to the functional form.

Figure 2 shows the comparable change in birth rates. Age is measured at the time of delivery. Birth rates among minors 17 years of age fall from 66.7 to 62.0 between 1999 and 2000. Declines among 18 years olds are smaller. There is no evidence from these data that the relatively large decline in the abortion rate associated with the law, especially among 17 years olds, has resulted in a rise in births. Indeed, the DID estimates in the lower panel of Table 2 suggest the contrary: that the fall in the abortion rate among 17 year olds has been

accompanied by a statistically significant *decline* in the birth rates of 4.6 per thousand, or 7.3 percent, relative to 18 year olds (Table 2, row 5). A further unexpected result is the statistically significant fall in birth rates among 19 relative to 18 years olds. As we show next, the relative decline in birth rates among 17 and 19 year olds is caused by the misclassification of births to teens who conceive as minors but who deliver at 18 years of age.

The results in Figures 1-2 and Tables 2-3 are consistent with the literature. Parental involvement laws are associated with a relative decline of between 15 to 25 percent in abortion rates with little or no change in birth rates (Levine 2003). However, misclassification of minors based on age at delivery biases the results. Figures 3 and 4 again show abortion and birth rates respectively, but by age at conception instead of age at termination or delivery. The change in abortion rates is qualitatively similar. Abortion rates among teens who conceive as minors fall relatively more than the rates of older teens. Exact changes and standard errors are summarized in Table 3. The abortion rate of minors falls 15.1 percent more than that of teens 18 and 19 years of age (Table 3, row 1). There are, however, no differences if measured in levels.

The sensitivity of the DID estimates to functional form reflects the large disparity in abortion rates between minors and older teens (Meyer 1995). Thus, our preferred comparison is between 17 and 18 year olds as measured by age at conception. As in the comparisons by age at termination, the abortion rate of 17 year olds measured by age at conception falls more in both absolute and relative terms than do abortion rates among 18 year olds (Table 3, row 5). The change in birth rates by age at conception, however, contrasts importantly with similar changes when measured by age at delivery. As shown in

the lower panel of Table 3, the birth rate of 17 year olds rises by 2.8 per thousand or 2.3 percent more than that of 18 year olds one year after the law. Neither estimate is statistically significant, although t-ratios are greater than one.

The simple DID estimates underscore two points. First, changes in birth rates as estimated by age at delivery yield misleading inferences. Three-quarters of minors who conceive as 17 years olds give birth at 18 years of age. Consequently, 18 year olds are an inappropriate comparison group when measured by age at birth. The second point pertains to the sensitivity of estimates to functional form. In most studies of parental involvement laws, changes in birth and abortion rates among minors are compared to changes among older teens. As we show in Tables 2 and 3, however, inferences are sensitive to whether differences are measured in levels or logarithms. The sensitivity to functional form reflects the more general issue of who is an appropriate comparison group for minors in the evaluation of parental involvement laws. One possible solution to the misclassification problem associated with births to 18 years olds at the time of delivery, is to use 19 year olds as the comparison group. But this is also problematic. Most births conceived by 17 year olds are dropped from the analysis, which diminishes power to detect statistically significant changes. Second, birth rates of 19 year olds are approximately double that of 17 year olds. This reflects observed differences with respect to sexual activity, pregnancy rates, marital status, schooling and more. Any yet, even if we could adjust for all observable differences, and assume unobserved differences were time-variant, results might still be sensitive to differences in functional form. The sensitivity of the DID estimates to functional form likely worsens in comparisons between minors as a group and older teens.

Our solution is to narrow the age difference in the comparisons. We emphasize contrasts between minors who are 17 years and 6 to 11 months of age and 18 year olds between 0 and 6 months of age at the time of conception. Figures 5-6 illustrate. In each figure, we compare abortion or birth rates for minors 17 years and at least 6 months of age and to abortion and birth rates of teens who recently turned 18. In the year before the law, abortion rates are 22.0 among minors 17 years and between 6-8 months and 26.1 among teens at least 18 years and between 0-2 months.[15] Figure 6 displays the comparative birth rate series. In Figures 5 and 6 we have greatly narrowed the difference in rates between those exposed and unexposed in the year before the law. As shown in Figure 5, abortion rates fall among minors relative to 18 years olds but the differences are not great. Importantly, however, we show a rise in birth rates among these same minors relative to the 18 year olds (Figure 6).

We continue with the same narrow age comparisons in Figures 7 and 8. The important difference in these figures is that age is measured at the time of the abortion or birth. The abortion series in Figure 7 suggests that the effect of the law on abortion rates has been substantial in contrast to the decline observed when abortion is measured by age at conception (Figure 5). The results for birth rates in Figure 8 nicely illustrate the misclassification bias that occurs when 18 years olds as measured by age at birth are used as a comparison group for changes in birth rates among 17 year olds. We observe a rise in births rates to teens 18 years and between 3-8 months of age at the time of delivery, the vast majority of whom were minors at the time conception.

[15] Abortion and birth rates have been "annualized" to make them comparable to published rates.

Regression Discontinuity Analysis

We use equation (1) to estimate the monthly change in abortions and births associated with the law to minors 17 years and between 6 and 8 months. The first two rows in Table 6 use only the post-law years and are estimates of the sum of β_1 and β_4 from equation (1). In rows 3 and 4 we show DID estimates which use changes in abortions and births between minors and teens in the years prior to law to identify effects associated with the law (see footnote 12).

There are between 25 and 57 fewer abortions per month, a decline of between 12 and 26 percent, among minors 17 years and between 6 to 8 months associated with the parental notification statute in Texas. Six of the eight estimates are statistically significant. Changes in births are sensitive to the specification. If we use only post-law years we obtain a small decline in births and if we use the pre-law years we obtain a modest increase in births. None of the 8 estimates for births is statistically significant.

In Table 7 we show changes by race and ethnicity. Abortions are between 18 and 20 percent lower per month and births are between 3 to 7 percent higher per month among white non-Hispanics in the years in which the law is enforced. The 7 percent rise in births is statistically significant. There is a less consistent change in abortions among Black non-Hispanics. If we use only the post-law years (2000-2002), we obtain a statistically significant change in abortions. However, once we use the pre-law years to adjust for the growth in abortions by age, we find no change in abortions. Among Hispanics, we show a relatively large decline in abortions of between 23 and 30 percent in the months after the law, but a negative and statistically insignificant change in births.

Estimates by region of the state or by counties with and without a major abortion provider are presented in Table 8. The relative change in abortions associated with the law is quite consistent across the three major regions, but only in the most populous Southeastern part of the state are the declines in abortion precisely estimated. Six of the 10 changes in births are negative and 4 are positive. None are statistically significant. Abortions fall between 21 and 30 percent in counties with at least one major abortion provider, but changes in abortions in counties without a major provider are measured imprecisely.

Overall, we find a substantial decline in abortions associated with the law. Changes are greatest for Hispanics and non-Hispanic Whites, which are consistent with variations in the proportion of minors who communicate with their parents concerning abortion and the use of reproductive health services. Neither access to local abortion providers or distance from states without parental involvement laws affects our estimates appreciably.

Our preferred specification uses the change between minors and older teens in the years before the law to adjust for the growth in abortions and births with age. The pure RDD fails to fully adjust for these trends by age. For instance, in results not shown we find that the decline in abortions for minors as young as 15 years of age are greater than those of older minors if we rely exclusively on the cubic in age to control for the continuous relationship between age and abortions. Yet, it is apparent from Figures 9 and 12 that there is little change in abortions to 15 years olds in the years before and after the law. We experimented with higher-order polynomials in age but the results were similar. As an alternative, we use the change in abortions and births for teens 18 years and between 0 and 2 months and teens 18 years and between 6 and 8 months as an additional means by which to "detrend" the growth in abortion between minors and pregnancies by age. However, as is evident in Figure

12, abortions rise rapidly with age and thus changes among the older teens may still not fully capture the change between older minors and teens unassociated with the law.

We appear to lack power to detect changes in births. For instance, even if we assume a one-to-one relationship between the fall in abortions and the rise in births, we would still lack the precision to detect a statistically significant change in monthly births. Figure 14 underscores the difficulty. The plot shows births by age in months at conception in 1999 and 2000. Age is normalized to zero at 18 years and zero months. Unlike with abortions, there is no obvious difference in births among 17 year olds between the series before (1999) and after the law (2000). Consider, for instance, the difference in births to minors who conceive at 17 years and 6 months (-6 on the graph). In 2000, there were 1189 births to such minors and 1106 births in 1999, a difference of 83 births. This rise in births is very similar to the fall in abortions for approximately the same age group (see Figure 12), but it is visually unconvincing given the lack of difference in births before and after the law among minors just older and younger.

In an effort to obtain more precision we undertake an alternative test of the relationship between parental involvement laws and unintended births. We estimate probits in which the dependent variable is one if a teen conceived at age "t" but gave birth at age "t+1." We hypothesize that the parental involvement law induces some minors to carry a pregnancy to term that would have been terminated in absence of the law. Our specification differs from a pregnancy resolution equation in which the dependent variable is one if the teen gives birth conditional on being pregnant. At the aggregate level, pregnancy resolution is the ratio of births to births plus abortions. However, this ratio will rise if abortions fall without any change in births. One concern is that the fall in abortions is partly spurious, the result of

unrecorded terminations that occur in other states or because some abortions are incorrectly attributed to 18 year olds by minors with false identification. The regression that we propose uses only births. If teens increase the use of contraception or abstain from sex as a result of the law, as some have proposed, then births should fall.[16] If, on the other hand, parental involvement laws cause a rise in unintended childbearing, then the probability that a pregnancy conceived at age "t" results in a birth at age "t+1" should rise in the years a parental involvement law is enforced relative to the years before the law. One advantage of this regression is that we can adjust for characteristics of the teen. Thus, we control for previous live births, previous induced abortions, marital status, region of the state or the availability of abortion providers in the teen's county of residence.

Results are reported in Table 9. We use maximum likelihood probit to obtain the estimates. Marginal effects are shown in brackets. There are two samples. The top panel uses only teens who conceived in 1999 and 2000; the bottom panel expands the sample and compares 1998-99 to 2000-2002. We find a consistent increase in births in the year immediately after the law went into effect (top panel). The increase, however, is small. The probability that a 17-year-old minor gives birth as an 18-year-old increases by 1.3 percentage points, or about 1.7 percent evaluated at the mean. This represents an increase of approximately 227 births based on the 13,334 births to 17-year-old that were conceived in 1999. Estimates by race and region do not differ substantially. White Non-Hispanics and minors who reside in the southeastern regions of Texas are the most likely to deliver as 18-year-olds. If we expand the before and after periods to include more years (Table 9, bottom panel), we find no change in births associated with the law.

[16] For a portion of teens, the relationship between conception at age t and birth at age t+1 is mechanical. Teens

The increase in approximately 227 births in 2000 appears reasonable in both its magnitude and impermanence. Our best estimate is that abortions to 17 year olds fall by approximately 300 in the year after the law.[17] Not all these pregnancies would have resulted in live births had they not been aborted. A small proportion would have ended spontaneously. In addition, not all abortions to minors may have been recorded due to the falsification of age or because some abortions may have been obtained in other states.[18] The lack of a more permanent effect of the law on births may be to due to several reasons. First, it may be too difficult to identify small increases in births from the downward trend in teen fertility. Second, the state judicial system, abortion providers and teen advocates may have adjusted to law in ways that could have lessened its impact on unintended births. For instance, the Texas State Department of Health Services has created a detailed website that provides a list of options to the query, "So You're Pregnant, Now What?" (http://www.tdh.state.tx.us/bvs/abortion/nowhat.htm). The judicial bypass procedure is outlined step by step. Support organizations such as Jane's Due Process were formed in response to the law. (http://www.tdh.state.tx.us/bvs/abortion/nowhat.htm). Jane's Due Process (JDP), for instance, provides free counseling to minors as to their options; JDP also supports a user- friendly website with detailed information on the judicial bypass process (http://www.janesdueprocess.org/).[19] In addition, many abortion providers have readily

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who conceive when they are 17 years and one month, for example, will naturally give birth while still 17. Thus, our estimates pertain to minors who are at least 17 years and three months at conception.

[17] This is based on the estimate in Table 6, column 1, row 3 that there were 25 fewer abortions per month in 2000 relative to 1999.

[18] Janet Elliott. "Loopholes found in abortion law/Teens avoid telling parents panel told." *Houston Chronicle* April 8, 2003, Section A, p. 15

[19] Whether more minors attempt to use the judicial bypass option over time is not known. The Texas Department of State Health Services reported approximately 250 judicial bypass cases per year from 2000-2004. This is a lower bound since a case is only recorded when the Department of State Health Services is required to pay for the guardian *ad litem* assigned by the court. If a lawyer volunteers his or her time or fails to bill the state, then the procedure would not be counted.

accessible websites with information on Texas laws, fees and location (http://www.abortion.com/abortion_clinics_state.php?country=United%20States&state=Texas). All totaled, pregnant minors may have become better informed as to their choices and more able to act in a timely manner.

Conclusion

We have presented evidence that Texas's parental notification statute is associated with a decline in abortions of between 10 to 20 percent. Estimates depend on the age of the minor and whether age is measured at the time of conception or at the time of the termination. The decline in abortion is greatest for Hispanics and we find modest or no association between the law and abortion rates among Black non-Hispanics. We find less consistent associations between the law and births. If we compare minors 17 years and between six and eight months of age with teens 18 years and between zero and two months of age, then the decline in abortions is matched by a rise in births. The rise is births, however, is not always statistically significant.

Our analysis is the first to correct the misclassification bias that arises because many 17 year olds who are exposed to the law during pregnancy give birth when they are 18 years of age. Previous studies either drop births to 18 year olds, or use them as the comparison group. In either case, outcomes of the potentially most important pregnancies are lost or misclassified. The misclassification can lead to highly misleading inferences. We found, for example, that birth rates to 17 year olds fall by 7 percent when measured by age at delivery, but rise by two percent if measured by age at conception.

Second, we are the first to narrow the age difference between those exposed to the law and the comparison group. There are large differences in abortion and birth rates between

minors and older teens. These reflect observed differences in sexual activity, education, and maturity. They may also reflect unobserved differences which could undermine the appropriateness of older teens as a counterfactual.

The fall in abortions is subject to several caveats. Evidence from earlier studies suggests that minors, especially 17 year olds, will leave their state of residence to avoid compliance with a parental involvement law (Cartoff and Klerman 1986; Joyce and Kaestner 1996; Henshaw 1995; Ellertson 1997). If these abortions go unrecorded, then we will overestimate the decline in abortions associated with the law. However, past studies may be less relevant today, since access to out-of-state providers has fallen substantially over the past decade. Minors in the southeastern region of Texas, for example, would have to travel hundreds of miles to obtain an abortion in a state without a parental involvement law. Moreover, data from the state health departments that border Texas suggest that few minors from Texas travel to neighboring states for an abortion either before or after the law. We will also overestimate the decline in abortions if minors lie about their age and providers are not aggressive at investigating identification fraud.[20] Third, the collection of induced abortion certificates may not be complete. Finally, some minors may take greater precautions against pregnancy in response to the law. The upshot is that the number of unintended births that were carried to term as a result of the law is likely less than the observed decline in abortions.

Despite the ambiguity with respect to births, the law had clear behavior effects. We provide evidence that minors on the cusp of turning 18 years of age appear to delay the termination until they are 18. There is a spike in second trimester abortion for teens who just turned 18, which is further evidence of that terminations are deliberately delayed. We

intend to analyze the effect of Texas's parental notification statute on the timing of abortion in subsequent work.

[20] Janet Elliott. "Loopholes found in abortion law/Teens avoid telling parents panel told." *Houston Chronicle* April 8, 2003, Section A, p. 15

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Table 1A. Abortions and Births to Teens in Texas by Age in 1999

	Abortions		Births	
	Number	Percent	Number	Percent
15	881	5.8	2,913	5.5
16	1,853	12.3	6,214	11.6
17	2,837	18.8	10,582	19.8
18	4,334	28.8	14,741	27.6
19	5,156	34.2	18,890	35.4
Total	15,061	100	53,340	100

Table 1B. Abortions and Births to Teens in Texas by Race/Ethnicity in 1999

	Abortions		Births	
	Number	Percent	Number	Percent
White NH	6,164	40.9	15,205	28.5
Black NH	2,819	18.7	8,195	15.4
Hispanics	5,178	34.4	29,432	55.2
Other	452	3.0	508	1.0
Unknown	448	3.0		
Total	15,061	100	53,340	100

Table 2. Teen Abortion & Birth Rates by Age at Event and Year of Conception, Texas Residents 1999-2000[#]

	1999	2000	(1)-(2)	Ln(1)-Ln(2)	DID (se)	Ln DID (se)
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Abortion Rates:						
				Minors vs Older Teens		
1. Minors 15-17	11.4	9.0	-2.4	-0.23	-0.8 (0.47)	-0.18** (0.025)
2. Teens 18-19	29.5	28.1	-1.5	-0.05		
				Minors vs 18 Year Olds by Single Year of Age		
3. 15	5.6	5.0	-0.6	-0.12	0.2 (0.63)	-0.09 (0.054)
4. 16	11.0	9.0	-2.0	-0.20	-1.2 (0.68)	-0.17** (0.042)
5. 17	17.5	13.1	-4.4	-0.29	-3.5** (0.73)	-0.26** (0.037)
6. 18	27.0	26.1	-0.9	-0.03		
7. 19	32.1	30.0	-2.1	-0.07	-*1.2 (0.85)	-0.04 (0.030)
Birth Rates:						
				Minors vs Older Teens		
1. Minors 15-17	41.1	38.8	-2.30	-0.058	-0.9 (0.88)	-0.04** (0.013)
2. Teens 18-19	108.1	106.1	-2.02	-0.019		
				Minors vs 18 Year Olds by Single Year of Age		
3. 15	18.4	17.0	-1.3	-0.07	-1.2 (1.15)	-0.07 (0.029)
4. 16	38.4	37.4	-1.0	-0.03	-0.9 (1.25)	-0.03 (0.022)
5. 17	66.7	62.0	-4.7	-0.07	-4.6* (1.37)	-0.07** (0.018)
6. 18	94.1	94.0	-0.1	-0.00		
7. 19	122.1	118.1	-4.0	-0.03	-3.9* (1.57)	-0.03* (0.016)

[#]Conception year 1999 is from August, 1998-July 1999.

[+] p<.10;* p<.05; ** p<.01

Table 3. Teen Abortion & Birth Rates by Age at Conception and Year of Conception, Texas Residents 1999-2000[#]

	1999	2000	(1)-(2)	Ln(1)-Ln(2)	DID (se)		Ln DID (se)	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*		*(6)*	
Abortion Rates:								
				Minors vs Older Teens				
1. Minors 15-17	12.5	10.1	-2.4	-0.208	-0.65	(0.48)	-0.15**	(0.024)
2. Teens 18-19	30.4	28.7	-1.7	-0.057				
				Minors vs 18 Year Olds by Single Year of Age				
3. 15	6.4	5.6	-0.9	-0.15	0.60	(0.65)	-0.09	(0.051)
4. 16	12.3	9.5	-2.8	-0.26	-1.33	(0.70)	-0.21**	(0.041)
5. 17	18.7	15.3	-3.4	-0.20	-1.91*	(0.75)	-0.15**	(0.035)
6. 18	28.4	26.9	-1.5	-0.05				
7. 19	32.5	30.5	-1.9	-0.06	-0.46	(0.86)	-0.01	(0.030)
Birth Rates:								
				Minors vs Older Teens				
1. Minors 15-17	58.8	57.3	-1.5	-0.026	0.38	(1.00)	-0.01	(0.011)
2. Teens 18-19	122.6	120.7	-1.9	-0.016				
				Minors vs 18 Year Olds by Single Year of Age				
3. 15	32.4	31.3	-1.1	-0.030	1.80	(1.31)	-0.01	(0.023)
4. 16	58.3	54.9	-3.4	-0.060	-0.50	(1.41)	-0.04	(0.018)
5. 17	86.0	85.8	-0.1	-0.002	2.80+	(1.52)	0.02	(0.016)
6. 18	116.8	113.9	-2.9	-0.030				
7. 19	128.4	127.5	-1.0	-0.010	1.90	(1.66)	0.02	(0.015)

[#] Conception year 1999 is from August, 1998-July 1999.

+ p<.10;* p<.05; ** p<.01

Table 4. Abortion & Birth Rates to Teens 17 Years 6 months through 18 Years and 2 months by Age at Conception and Year of Conception , Texas Residents

	1999	2000	(1)-(2)	Ln(1)-Ln(2)	DID (se)	Ln DID (se)
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Abortion Rates:						
1. 17, 6-8 months	18.7	15.8	-2.9	-0.17	-1.4 (1.46)	-0.11 (0.071)
2. 17, 9-11 months	22.0	20.0	-2.0	-0.09	-0.5 (1.52)	-0.03 (0.067)
3. 18, 0-2 months	26.1	24.6	-1.5	-0.06		
Birth Rates:						
1. 17, 6-8 months	87.6	91.1	3.5	0.04	5.0 (3.01)	0.05 (0.032)
2. 17, 9-11 months	93.4	95.9	2.4	0.03	3.9 (3.05)	0.04 (0.032)
3. 18, 0-2 months	107.5	105.9	-1.5	-0.01		

	1998-99	2000-02	(1)-(2)	Ln(1)-Ln(2)	DID (se)	Ln DID (se)
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Abortion Rates:						
1. 17, 6-8 months	19.6	14.4	-5.3	-0.31	-2.0* (0.95)	-0.18** (0.046)
2. 17, 9-11 months	21.8	18.7	-3.1	-0.15	0.2 (0.98)	-0.02 (0.044)
3. 18, 0-2 months	26.0	22.7	-3.3	-0.13		
Birth Rates:						
1. 17, 6-8 months	90.1	88.0	-2.1	-0.02	4.8* (1.96)	0.04^{+} (0.021)
2. 17, 9-11 months	96.1	92.3	-3.8	-0.04	3.2 (1.99)	0.02 (0.021)
3. 18, 0-2 months	111.4	104.4	-6.9	-0.06		

Conception year 1999 is from August, 1998-July 1999 and conception year 1998 is from August 1997-July 1998.

$^{+}$ p<.10;* p<.05; ** p<.01

Table 5. Abortion & Birth Rates to Teens 17 Years 6 months through 18 Years and 2 months by Age at Conception and Year of Conception and by Race/Ethnicity, Texas Residents 1998-99 vs. 2000-02

	1998-99	2000-02	(1)-(2)	Ln(1)-Ln(2)	DID (se)	Ln DID (se)
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
White-NH:						
Abortion Rates:						
1. 17, 6-8 months	18.5	12.8	-5.7	-0.37	-1.7 (1.32)	-0.18 (0.072)
2. 17, 9-11 months	19.8	16.6	-3.2	-0.18	0.8 (1.35)	0.01 (0.069)
3. 18, 0-2 months	23.2	19.2	-3.9	-0.19		
Birth Rates:						
1. 17, 6-8 months	57.1	51.4	-5.7	-0.11	8.1** (2.35)	0.09* (0.039)
2. 17, 9-11 months	60.6	54.4	-6.2	-0.11	7.7** (2.38)	0.09* (0.038)
3. 18, 0-2 months	77.4	63.5	-13.9	-0.20		
Black-NH:						
Abortion Rates:						
1. 17, 6-8 months	27.5	21.4	-6.1	-0.25	2.5 (3.17)	-0.01 (0.106)
2. 17, 9-11 months	28.1	27.4	-0.6	-0.02	7.9* (3.24)	0.22* (0.103)
3. 18, 0-2 months	40.4	31.8	-8.6	-0.24		
Birth Rates:						
1. 17, 6-8 months	105.2	94.5	-10.7	-0.11	-0.7 (5.77)	-0.03 (0.055)
2. 17, 9-11 months	114.3	100.9	-13.4	-0.12	-3.5 (5.86)	-0.04 (0.054)
3. 18, 0-2 months	127.7	117.7	-9.9	-0.08		
Hispanics:						
Abortion Rates:						
1. 17, 6-8 months	15.7	13.5	-2.2	-0.15	-3.5* (1.44)	-0.21* (0.080)
2. 17, 9-11 months	19.0	17.2	-1.8	-0.10	-3.1* (1.51)	-0.16* (0.076)
3. 18, 0-2 months	21.7	23.0	1.3	0.06		
Birth Rates:						
1. 17, 6-8 months	130.6	135.7	5.1	0.04	4.0 (3.74)	0.03 (0.028)
2. 17, 9-11 months	138.8	140.4	1.6	0.01	0.5 (3.78)	0.00 (0.028)
3. 18, 0-2 months	153.3	154.5	1.1	0.01		

See notes to Table 4

Table 6. Changes in Abortions and Births Associated with Texas Parental Notification Statute Among Minors 17 Years and 6-8 Months as Compared to Teens 18 Years and 0-2 Months

	Abortions		Births	
	Levels	**Logs**	**Level**	**Logs**
1. RDD in 2000	-57*	-0.256*	-5	-0.005
	(20.2)	(0.100)	(59.01)	(0.058)
2. RDD in 2000-02	-45**	-0.240**	-37	-0.029
	(13.3)	(0.071)	(35.1)	(0.035)
3. RDD in 1999-00	-25	-0.123	43	0.041
	(19.4)	(0.091)	(42.6)	(0.044)
4. RDD in 1998-02	-36**	-0.201**	26	0.021
	(13.2)	(0.065)	(31.4)	(0.032)

Each Figure is from a separate regression. Standard errors are in parentheses. The dependent variable is the number or the natural logarithm of abortions or births by age in months at conception for teens between the ages of 15 years and 0 months and 19 years and 11 months. There a 60 observations per year. Each regression includes a cubic function of age in months. The estimates in rows 1-2 are of the form $(A_{t,c-1} - A_{t,c}) - (A_{t,c} - A_{t,c+1})$ where subscript "t" refers to the year(s) and "c" the age cutoff. Teens just below the cutoff are 17 years and between 6-8 months at conception. Teens at the cutoff are 18 years and between 0 and 2 months and teens above the cutoff are 18 years and between 6 to 8 months. The estimates in rows 3-4 are of the form $(A_{t,c-1} - A_{t,c}) - (A_{t-1,c-1} - A_{t-1,c})$. * p<.05; ** p<.01

Table 7: Changes in Abortions and Births Associated with Texas Parental Notification Statute by Race/Ethnicity among Minors 17 Years and 6-8 Months as Compared to Teens 18 Years and 0-2 Months

	Abortions		Births	
	Levels	**Logs**	**Level**	**Logs**
White-NH:				
1. RDD in 2000-02	-13^{+}	-0.183	12	0.027
	(7.3)	(0.118)	(16.4)	(0.059)
2. RDD in 1998-02	-14^{+}	-0.204*	37*	0.073
	(7.3)	(0.104)	(14.6)	(0.055)
Black-NH:				
1. RDD in 2000-02	-12*	-0.308*	-23	-0.124
	(5.6)	(0.142)	(10.6)	(0.073)
2. RDD in 1998-02	2	-0.057	-7	-0.049
	(5.3)	(0.126)	(9.7)	(0.070)
Hispanic:				
1. RDD in 2000-02	-21*	-0.303*	-23	-0.030
	(8.4)	(0.117)	(23.4)	(0.043)
2. RDD in 1998-02	-21*	-0.235*	-2	0.008
	(7.6)	(0.109)	(20.8)	(0.038)

Each figure is from a separate regression. The dependent variable is the number of abortions or births by age in months at conception for teens between the ages of 15 years and 0 months and 19 years and 11 months. There are 60 observations per year. Each regression includes a cubic function of age in months. The estimates in row 1 are of the form $(A_{t,c-1} - A_{t,c}) - (A_{t,c} - A_{t,c+1})$ where subscript "t" refers to the year(s) and "c" the age cutoff. Teens just below the cutoff are 17 years and between 6-8 months at conception. Teens at the cutoff are 18 years and between 0 and 2 months and teens above the cutoff are 18 years and between 6 to 8 months. The estimates in rows 2 are of the form $(A_{t,c-1} - A_{t,c}) - (A_{t-1,c-1} - A_{t-1,c})$.

$^{+}$ p<.10;* p<.05; ** p<.01

Table 8: Changes in Abortions and Births Associated with Texas Parental Notification Statute by Health Region and Abortion Availability among Minors 17 Years and 6-8 Months as Compared to Teens 18 Years and 0-2 Months

	Abortions		Births	
	Levels	**Logs**	**Level**	**Logs**
North & West:				
1. RDD in 2000-02	-4	-0.247	13	0.068
	(3.5)	(0.290)	(8.8)	(0.078)
2. RDD in 1998-02	-7	-0.388	6	0.028
	(3.2)	(0.245)	(8.4)	(0.071)
North & Central:				
1. RDD in 2000-02	-12	-0.226	-20	-0.044
	(7.2)	(0.131)	(17.3)	(0.058
2. RDD in 1998-02	-8	-0.205^{+}	22	0.058
	(7.2)	(0.116)	(15.8)	(0.055)
South & East:				
1. RDD in 2000-02	-31**	-0.262*	-30	-0.044
	(10.3)	(0.088)	(25.3)	(0.048)
2. RDD in 1998-02	-21*	-0.177*	-1	-0.001
	(9.6)	(0.083)	(22.0)	(0.041)
Major provider in county:				
1. RDD in 2000-02	-43**	-0.300**	-45	-0.054
	(10.9)	(0.087)	(27.2)	(0.041)
2. RDD in 1998-02	-26*	-0.210*	7	0.013
	(11.1)	(0.079)	(23.4)	(0.037)
No major provider in county:				
1. RDD in 2000-02	-2	-0.073	8	0.012
	(5.9)	(0.110)	(17.9)	(0.053)
2. RDD in 1998-02	-9	-0.171	19	0.035
	(5.9)	(0.106)	(16.3)	(0.046)

See notes to Table 7.

Table 9. The Change in the Probability that a Minor Conceives at 17 Years of Age but Gives Birth at 18, Texas Residents.

1999-2000	All	Race/Ethnicity			State Regions		
		Wh_NN	Bl-NH	Hisp	NW	NC	SE
Coeff	.055*	.061	.054	.051	.042	.059	.057+
SE	(.022)	(.041)	(.059)	(.030)	(.062)	(.040)	(.030)
dP/dz	[.013]	[.018]	[.016]	[.015]	[.013]	[.018]	[.017]
Mean P	.769	.776	.767	.766	.764	.767	.771
N	90,461	24,959	13,284	51,368	11,438	27,419	51,604

1998-2002	All	Race/Ethnicity			State Regions		
		Wh_NN	Bl-NH	Hisp	NW	NC	SE
Coeff	.005	.003	-.006	-.012	-.022	.008	.010
SE	(.014)	(.027)	(.038)	(.019)	(.041)	(.026)	(.019)
dP/dz	[.002]	[.001]	[-.002]	[.004]	[-.007]	[.003]	[.003]
Mean P	.769	.768	.757	.760	.760	.764	.761
N	323,976	92,030	48,095	180,597	39,781	99,219	184,976

Coefficients are estimated by maximum likelihood probit. Standard errors are in parentheses. Race/ethnicity includes White-Non-Hispanics (Wh-NH), Black Non-Hispanics (Bl-NH) and Hispanics (Hisp). State regions represent the North and West Health Regions (NW), the North-Central Health Regions (NC) and the Southeastern Health Regions (SW). We show only the coefficient on the interaction between 17 year olds and year. The specification for all women includes dummy variables for age at conception, year, interactions of age and year, dummy variables for race/ethnicity (2), previous live births, previous induced abortion, marital status, and state Health Region indicators (10).

*p<.05; + p<.10

Table A1: Distribution of Characteristics of Women Who Obtain Abortions in Texas in 1996 and 1999

	1996	1999
Age		
15-19	14.86	13.21
20-24	34.04	34.69
25-29	25.85	25.39
30-34	14.01	14.58
35-40	8.46	8.90
40-44	2.79	3.23
Race/Ethnicity		
White NH	42.08	38.47
Black NH	22.29	21.20
Hispanic	30.91	35.54
Other	4.72	4.79
Marital Status		
Married	22.11	21.65
Single	77.89	78.35
Region of State		
North/West	6.62	6.45
North/ Central	33.60	33.57
South/ East	59.77	59.99

Table A2: Number (Percent) of Records with Missing Data on the Patients' Exact Date of Birth and Exact Date of Termination on the Induced Abortion Certificates, 1997-2003

Year	Date of Birth Missing	Date of Abortion Missing
1997	3419 (24.1)	0 (0.0)
1998	1278 (9.86)	1 (0.0)
1999	389 (3.0)	0 (0.0)
2000	44 (1.0)	0 (0.0)
2001	912 (8.5)	1 (0.0)
2002	4 (0.0)	2 (0.0)
2003	2 (0.8)	0 (0.0)

Figure 1: Abortion rates by Single Year of Age (15-19), by Age at Termination & Year of Conception, Texas 1998-2002

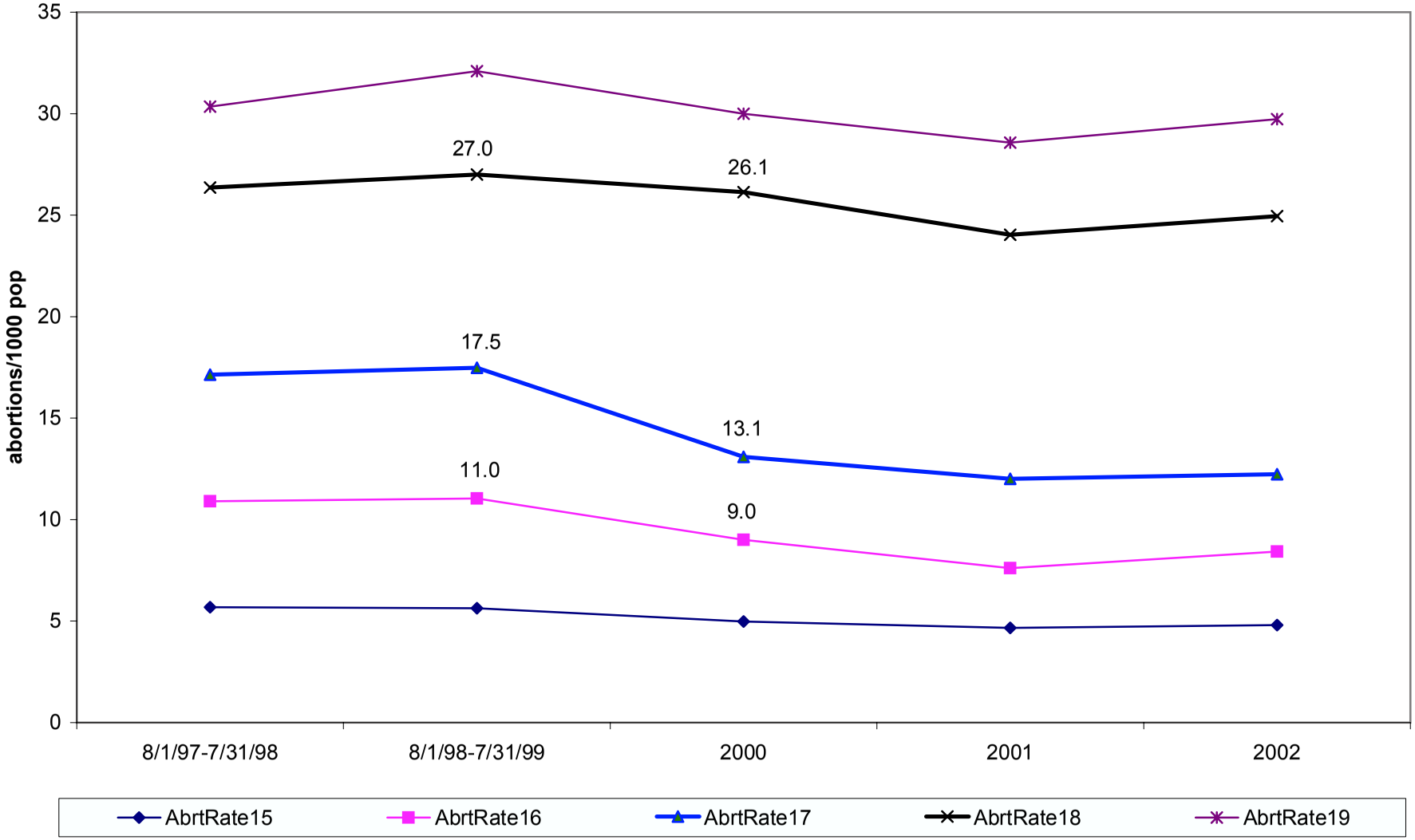

Figure 2: Birth rates by Single Year of Age (15-19), By Age at Birth and Year of Conception, Texas 1998-2002

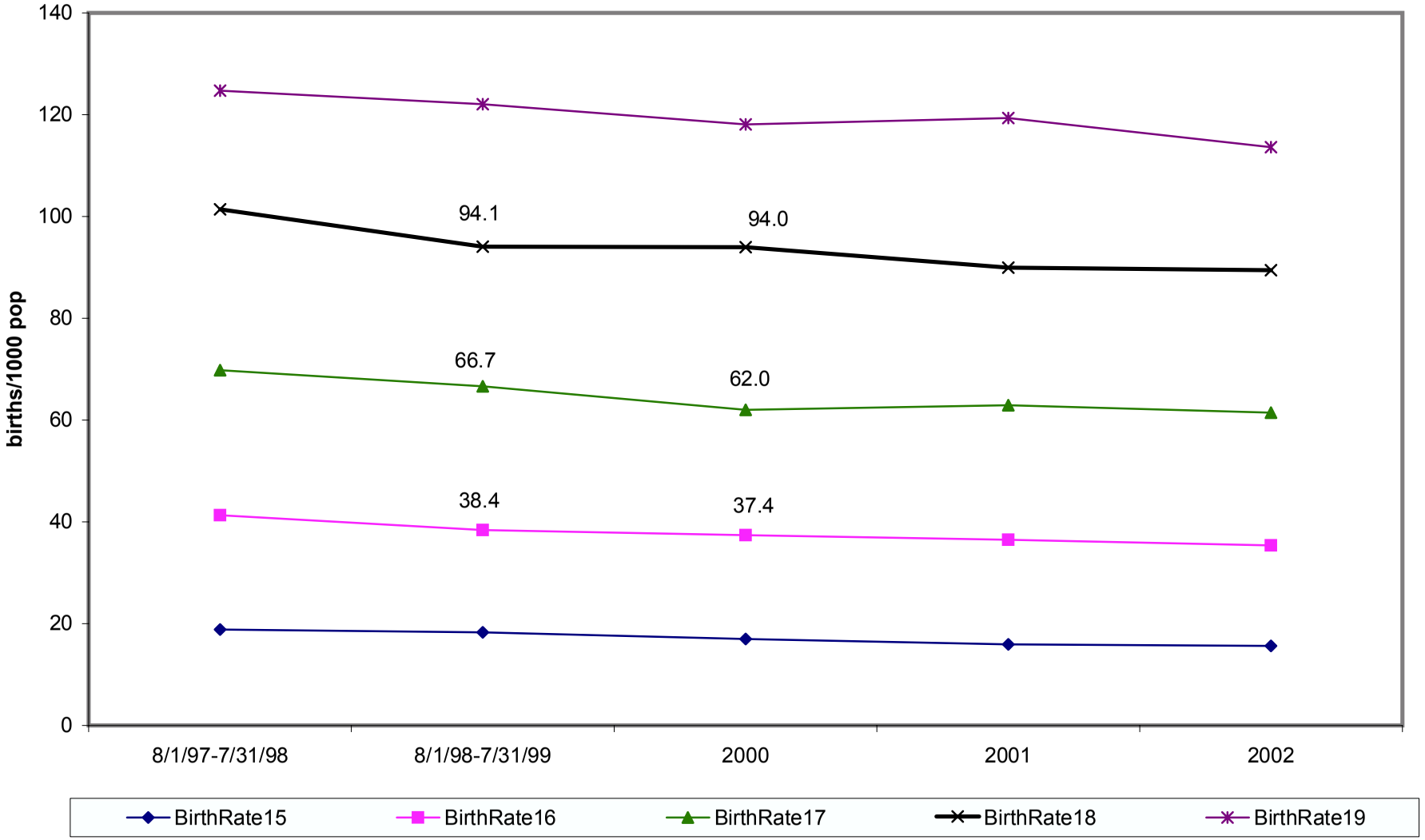

Figure 3: Abortion rates by Single Year of Age (15-19), by Age and Year of Conception, Texas 1998-2002

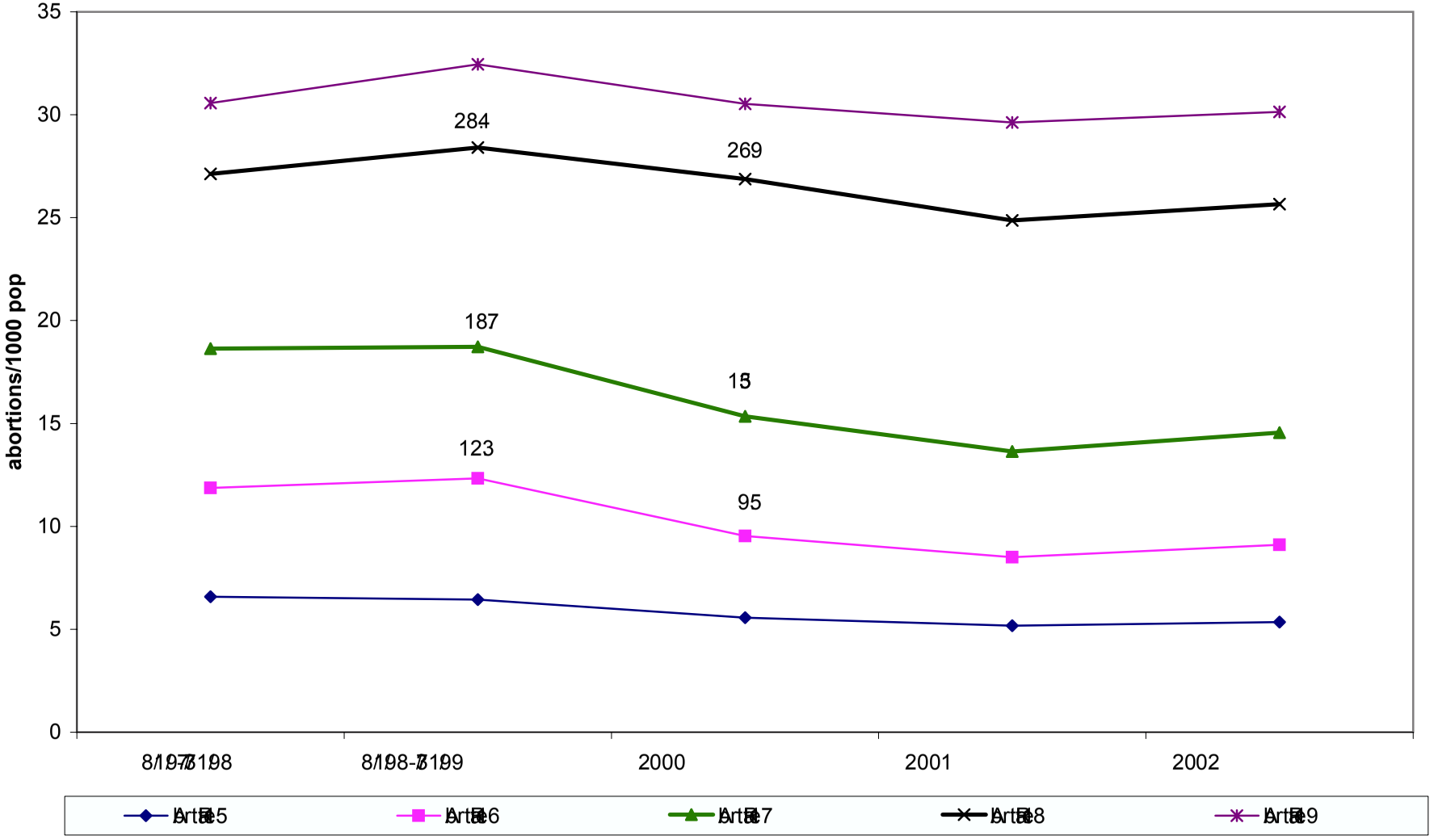

Figure 4: Birth rates by Single Year of Age (15-19) by Age & Year of Conception, Texas 1998-2000

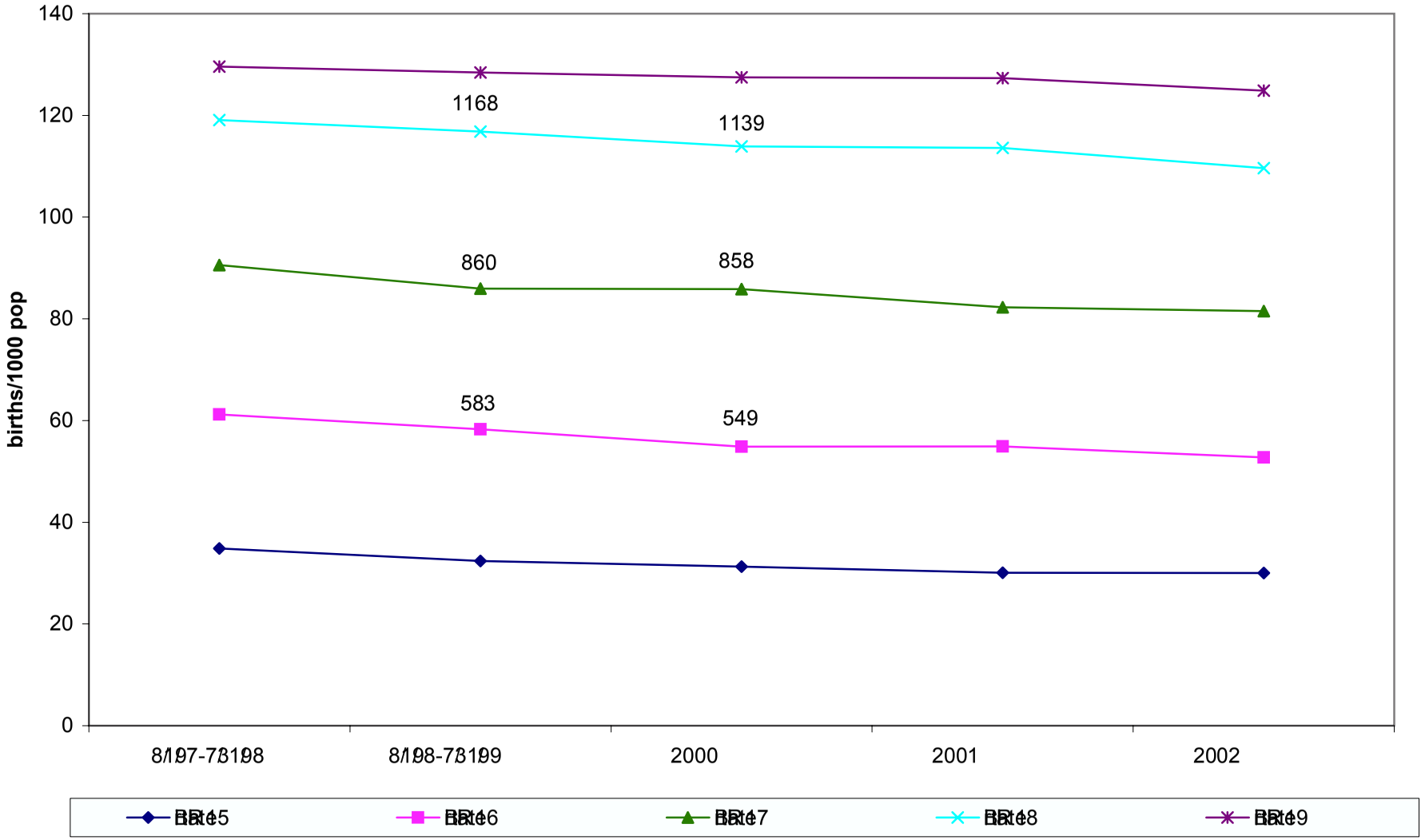

Figure 5: Annualize Abortion Rates by Year of Conception and for Teens between 17 & 6-8 months and 18 & 3-5 months of Age at Conception, 1998-2002

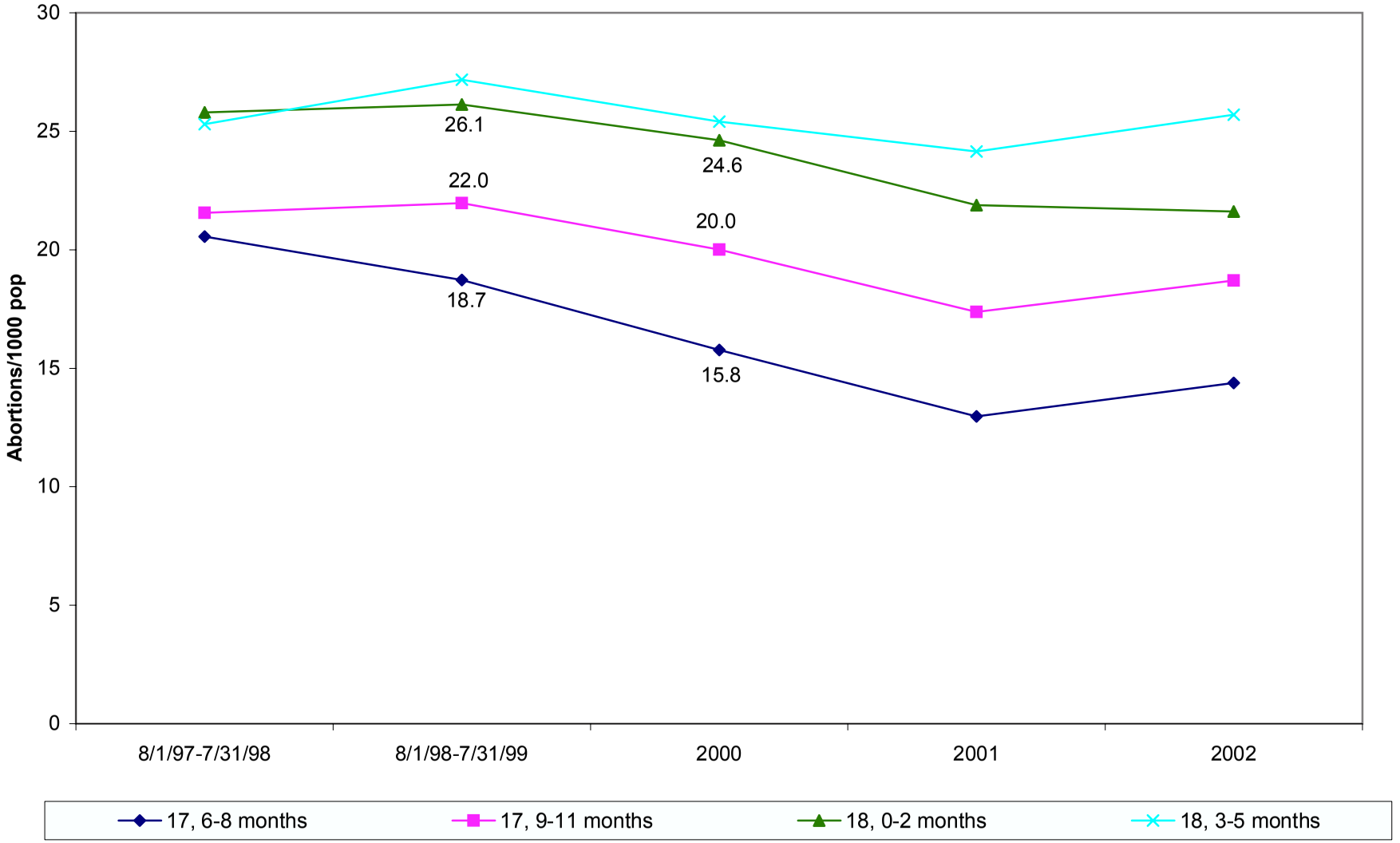

Figure 6: Annualized Birth Rates by Year of Conception for Teens between 17 & 6-8 months and 18 & 3-5 months of Age at Conception, 1998-2002

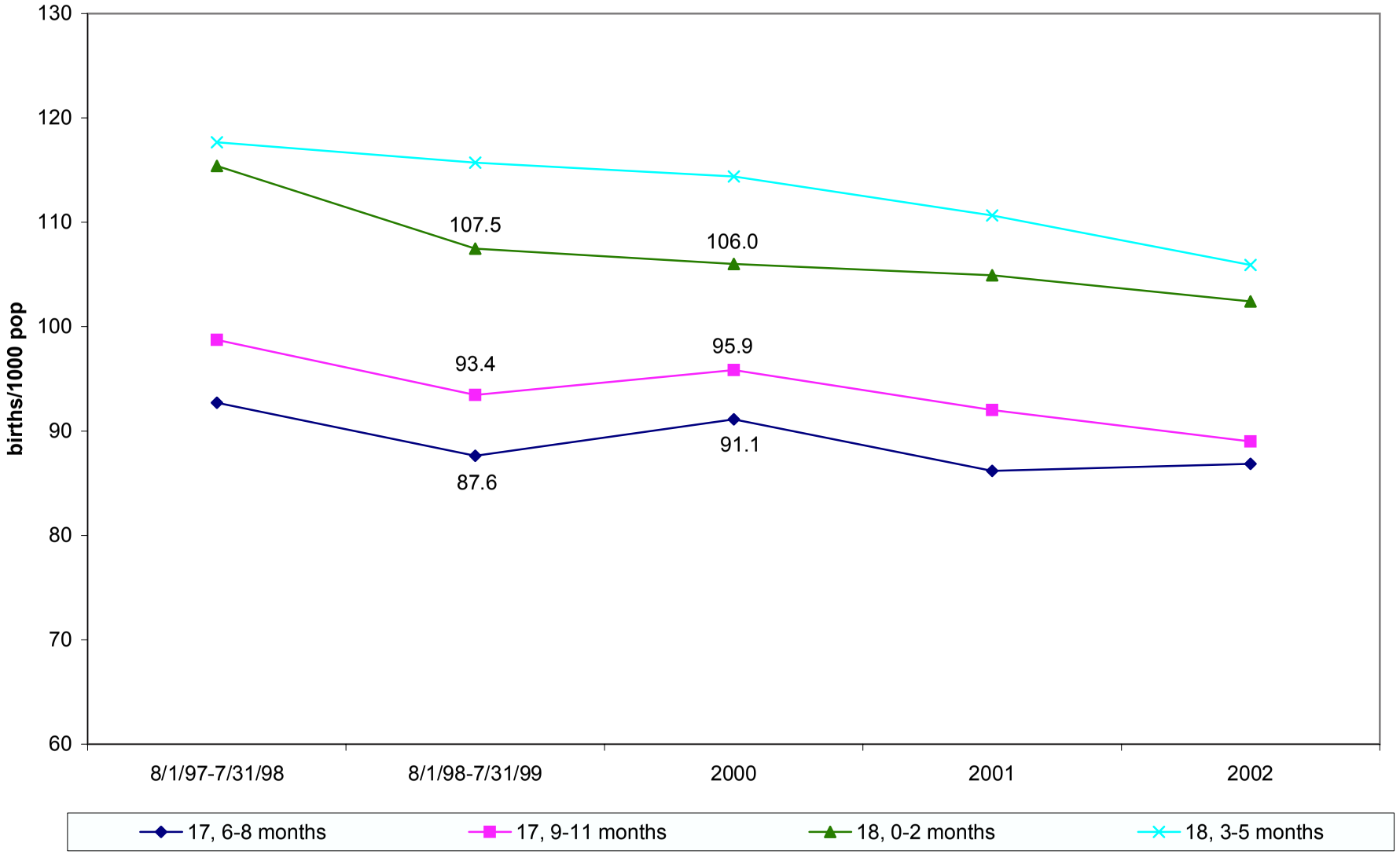

Figure 7: Annualized Abortion Rates by Year of Conception for Teens between 17 years & 6-8 months and 18 year & 3-5 months of Age at Termination

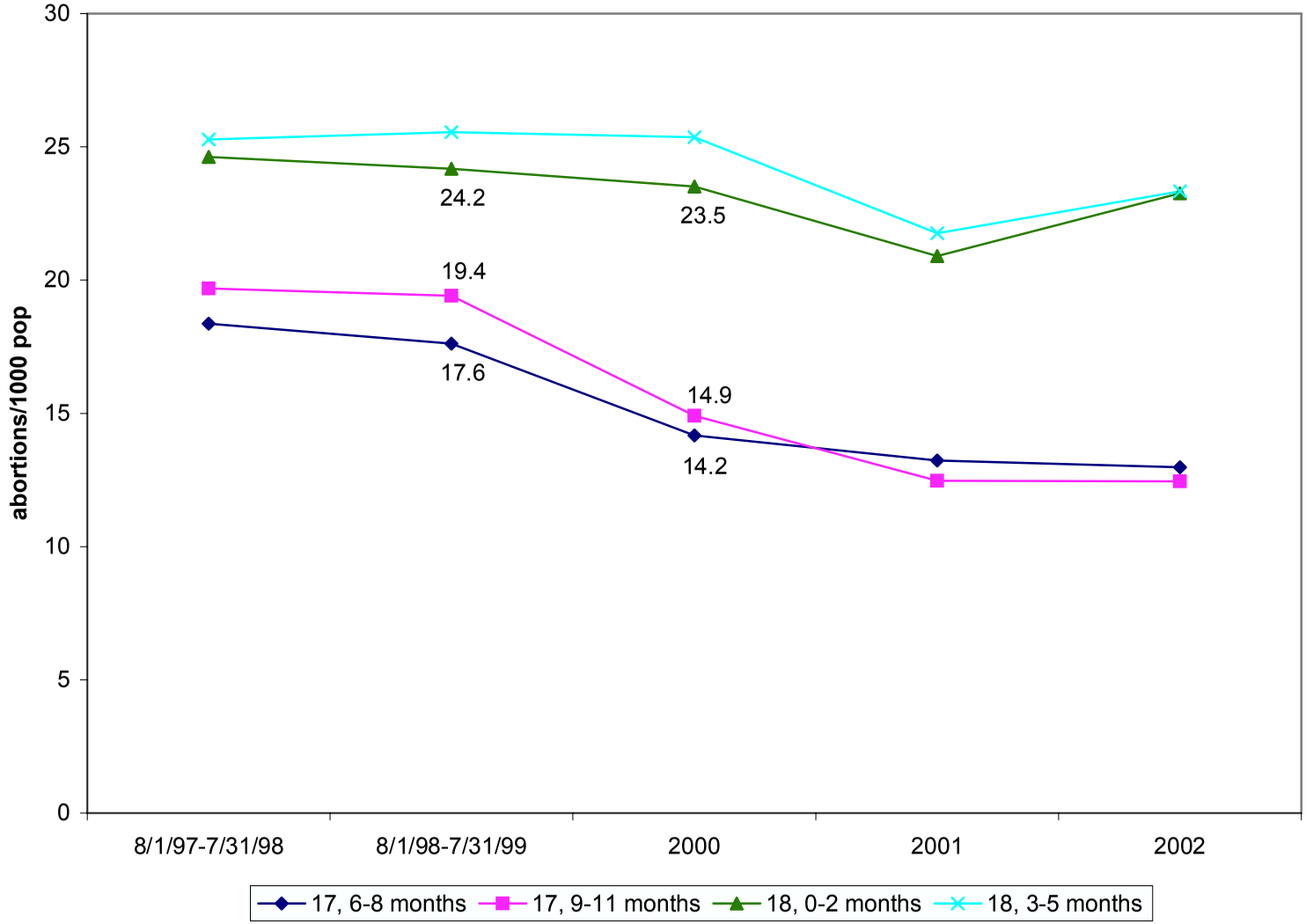

Figure 8: Annualized Birth Rates by Year of Conception for Teens between 17 & 9-11 months and 18 & 9-11 months of Age at Delivery, 1998-2002

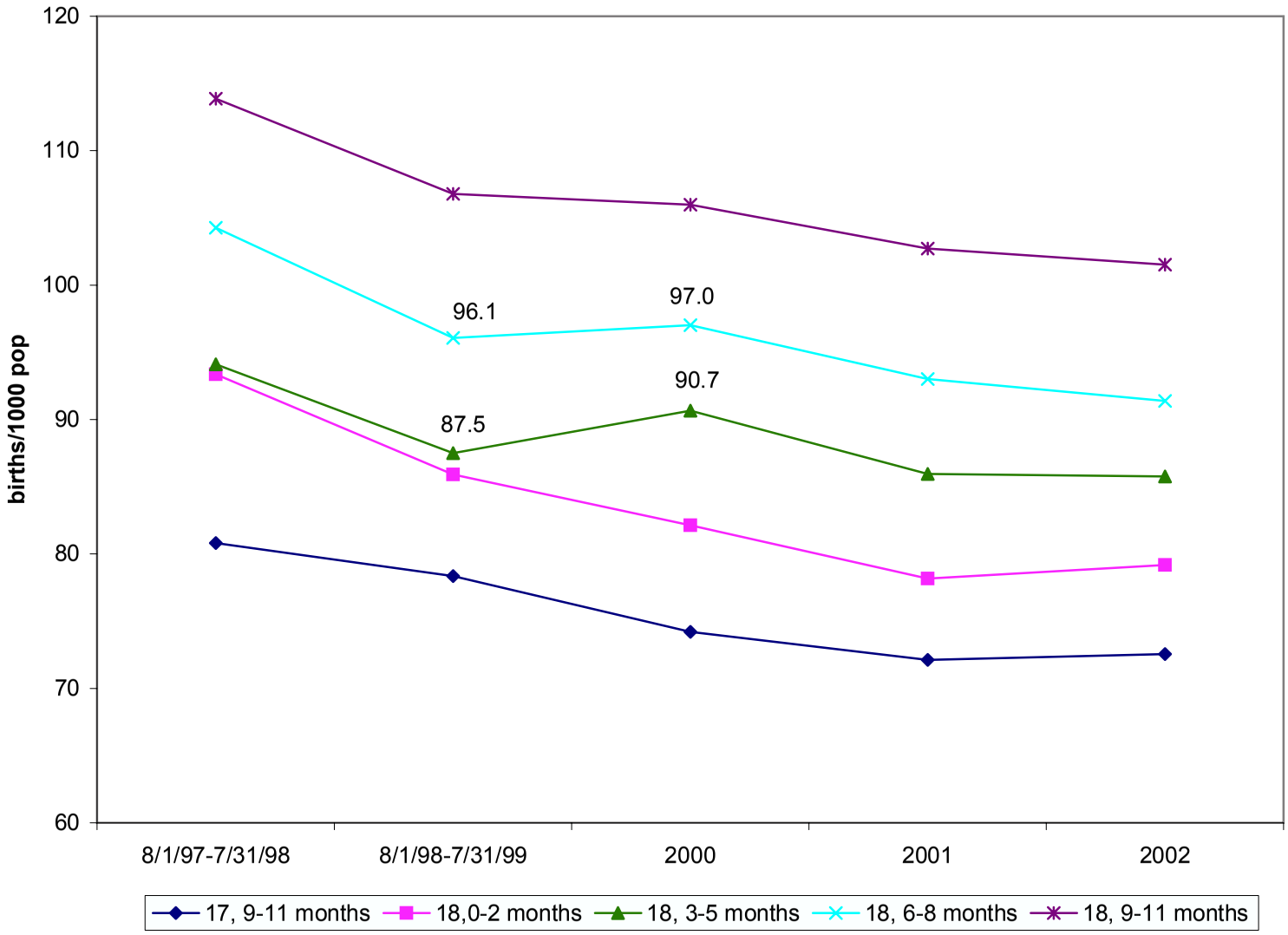

Figure 9: Average Number of Abortions by Age in Months at Termination and Year of Conception, 1998-99 vs. 2000-02

(Age is normalized to zero at 18.0 years of age)

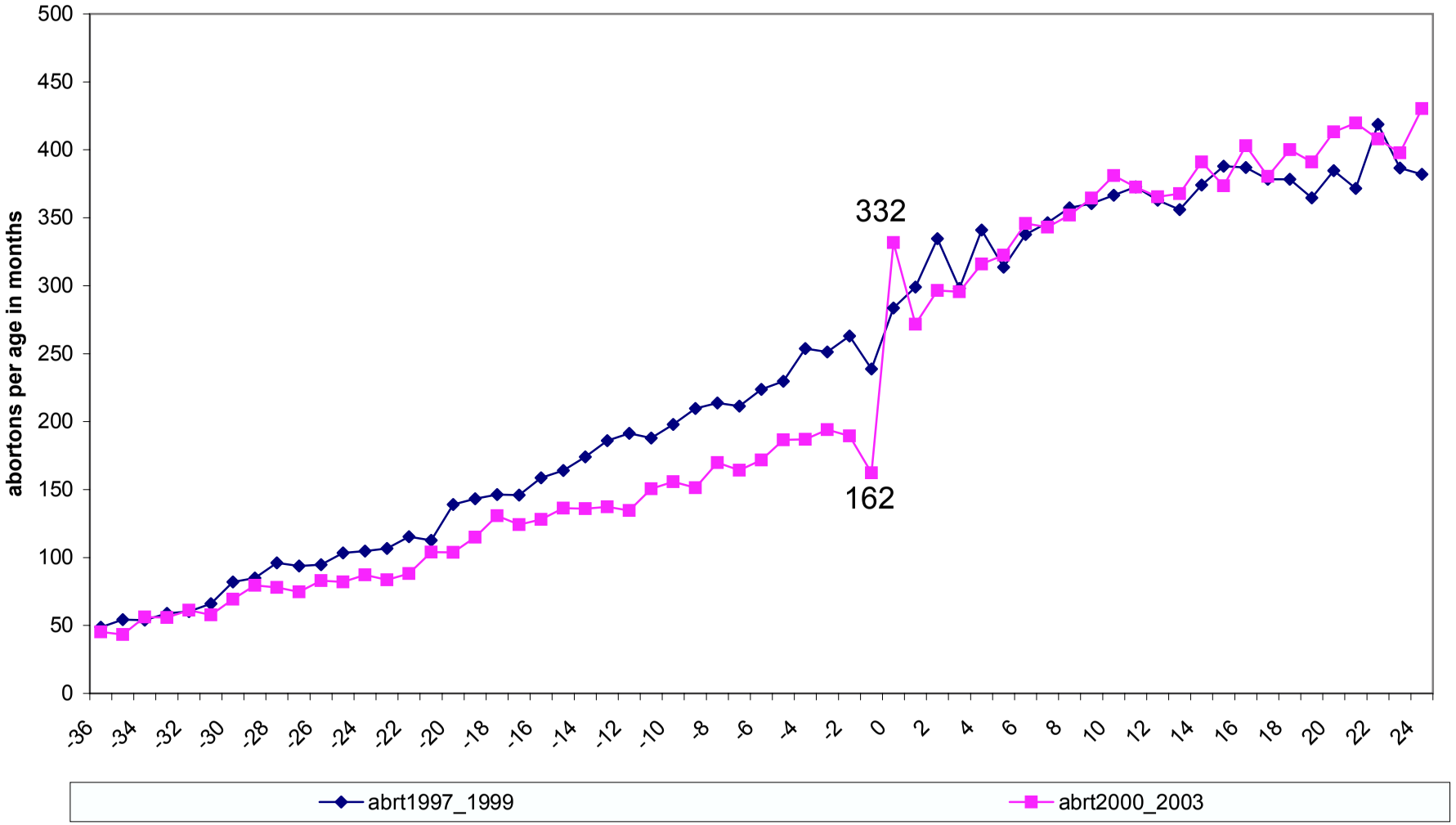

Figure 10: Average Number of Abortions by Age in Weeks at Termination and Year of Termination: Texas 1998-1999 vs. 2000-2003

(age normalized to zero at 18.0 years of age)

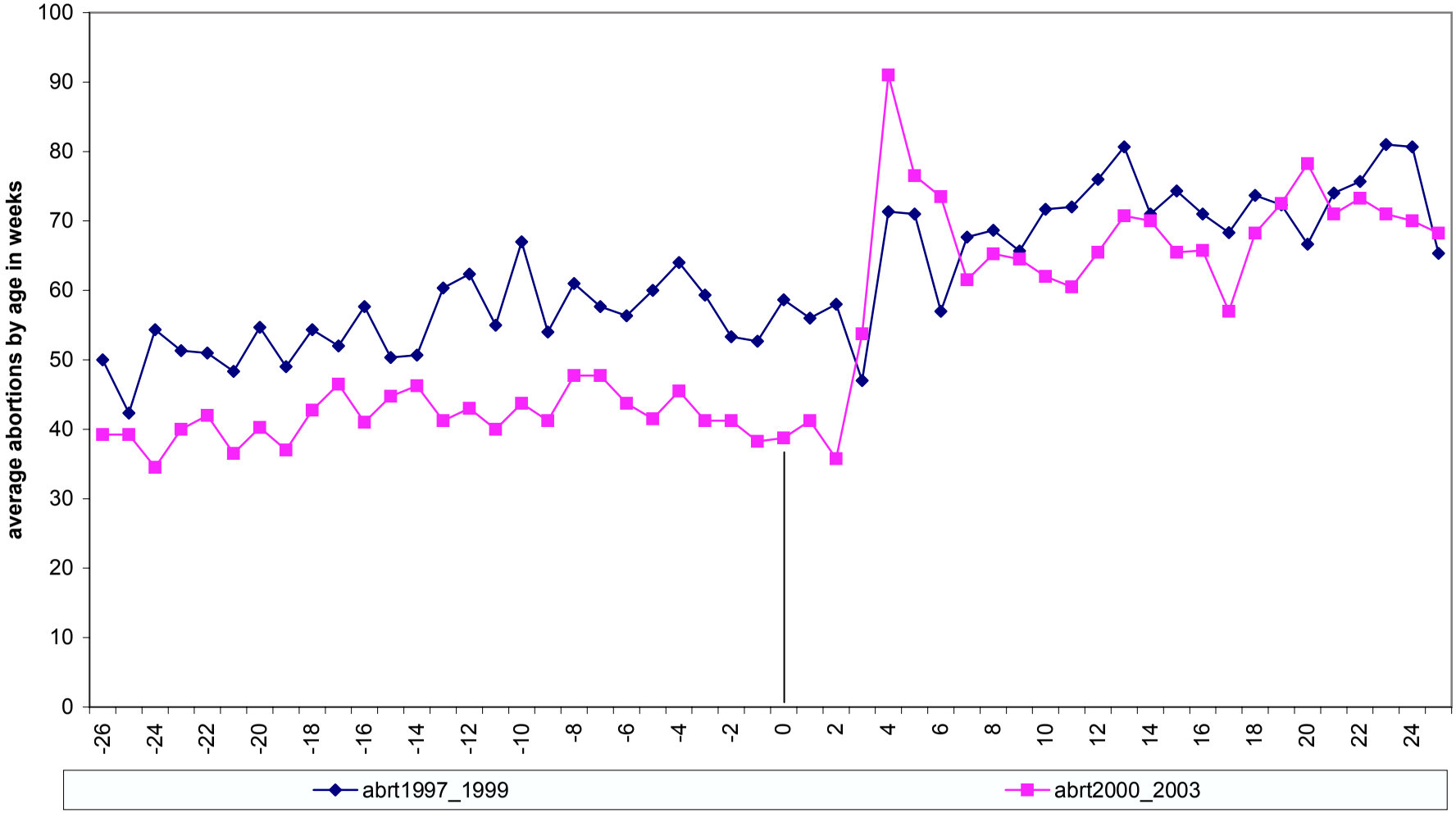

Figure 11: Percent of Abortions with Gestation Longer than 12 Weeks by Age at Conception and Years of Conception, Texas 1998-99 vs. 2000-02

(Age normalized to zero at 18.0 years of age)

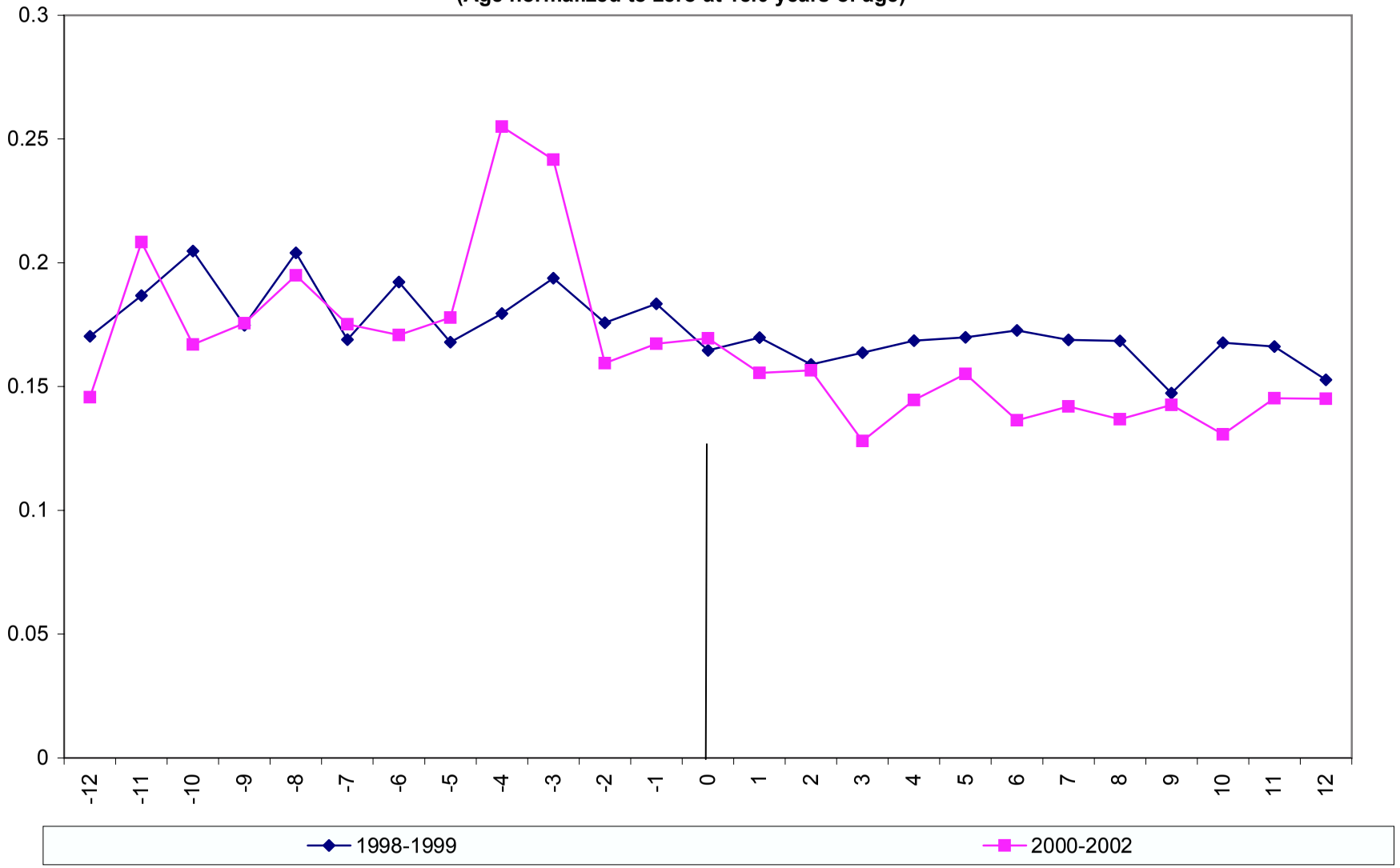

Figure 12: Average Number of Abortions by Age in Months by Age and Year of conception, Texas 1998-99 vs. 2000-02

(Age normalized to zero at 18.0 years of age)

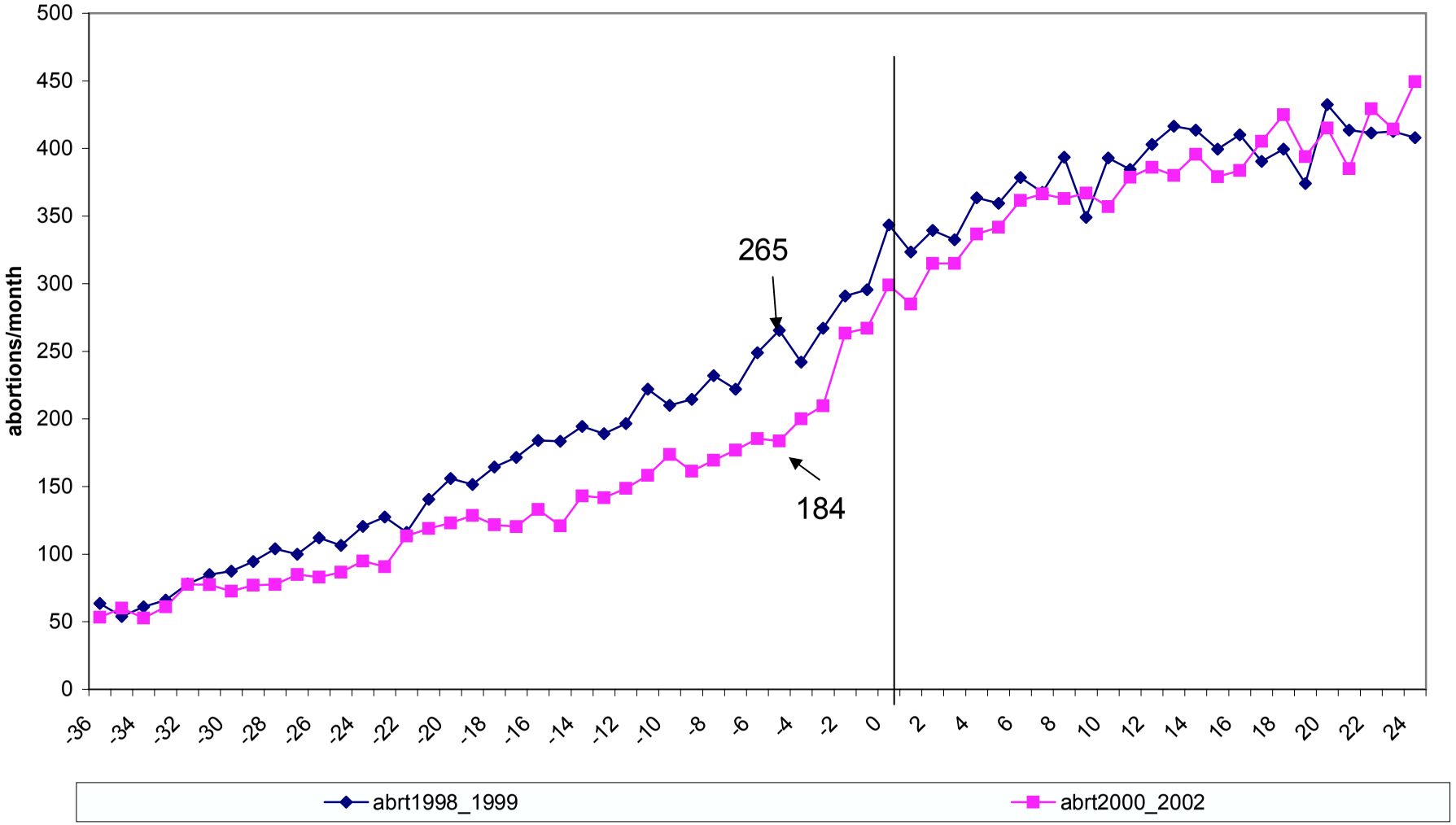

Figure 13 Births by Age in Months at Conception and Years of Conception Years,Texas 1999 & 2000

(Age normalized to zero 18.0 years of age)