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ABSTRACT

We investigate possible explanations for the large decline in U.S. teen childbearing that occurred in the twenty years following the 1991 peak. Our review of previous evidence and the results of new analyses presented here leads to the following main set of observations. First, the observed decline in teen childbearing is even more surprising given the increasing share of Hispanic teens, who have higher birth rates. Second, we find that a reduction in sexual activity and an increase in contraceptive use contributed to the decline roughly equally. Third, we are able to identify a statistically discernible impact of declining welfare benefits and expanded access to family planning services through Medicaid, but combined they can only account for 12 percent of the observed decline in teen childbearing between 1991 and 2008. We are unable to find any impact of other policies (including abstinence only or mandatory sex education) or labor market conditions. In the end we conclude that the standard factors which are claimed to be related to the rate at which teens give birth appear to explain little of the recent trend.

I. INTRODUCTION

Over the past two decades, the teen birth rate in the United States has witnessed a stunning decline. Figure 1 plots the teen birth rate, which is commonly reported as the number of births to women between the ages of 15 and 19. In 1991, the teen birth rate in the U.S. peaked at 61.8, before falling 45.5 percent to reach a low of 34.3 in 2010. The decline for black, Non-Hispanic teens has been even more dramatic, falling from a rate of 118.9 in 1991 to 51.5 in 2010, a 57 percent decline.[1] For all teens, the birth rate fell a stunning 19 percent just between 2007 and 2010.

What are the factors that are driving these recent trends? Over this time period, teenagers experienced reduced sexual activity and greater use of contraception, both of which are mechanical contributors to the decline in birth rates.[2] In terms of factors that led to the behavioral changes, observers and researchers have pointed to economic conditions and targeted policies. Some analysts have cited the Great Recession as a potential cause of the decline in the 2000s.[3] Others reference the success of newer types of sex education programs.[4] Still others point to abstinence only education programs.[5] Improved access to contraception is also cited as a factor.[6]

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[1] Aggregate teen birth rates are obtained from the National Center for Health Statistics. Estimates by race and ethnicity are provided in bound volumes of *Vital Statistics of the United States: Volume I, Natality*, for years up through 1993. After that, they are available electronically from annual reports, *Report (or Advance Report) of Final Natality Statistics*, for 1994 through 1996 and from *Births: Final Data* beginning ever since 1997. Race and ethnicity are not separately identified in birth data prior to 1989.

[2] Sarah Brown, CEO of the National Campaign to Prevent Teen and Unplanned Pregnancy (NCPTUP), states "The magic formula of less sex and more contraception is responsible for this great good news" (NCPTUP press release, 11/17/2011, available at: http://www.thenationalcampaign.org/press/press-release.aspx?releaseID=219, accessed 1/4/2012.

[3] Carl Haub of the Population Reference Bureau told CBS News: "I don't think there's any doubt now that it was the recession. It could not be anything else" (Jaslow, 2011)

[4] Leslie Kantor, Vice President of Education for the Planned Parenthood Federation of America takes this view, stating: "Whether it's in the public school system or community-based venues, we've really learned over the last 20 years what kinds of programs help young people to really change their behavior." (Tulumello, 2011)

[5] Valerie Huber, executive director of the National Abstinence Education Association in Washington, states "The one thing we know for certain is more teens are waiting to have sex, which tells us 'abstinence only' is a message that's resonating with them" (Tulumello, 2011).

In other words, there are a host of potential explanations, almost all of which has some set of proponents or advocates arguing for its importance in driving the recent decline. Yet past research has had difficulty verifying the empirical importance of any of these factors in explaining changes in teen birth rates.

It is important to understand what factors have driven past trends because the rate of teen childbearing in the U.S. is still extremely high. Despite the dramatic decline in the rate of teen childbearing since the early 1990s, the United States still stands as an outlier in this dimension in international comparisons among developed countries (Kearney and Levine, 2012). Rates of teen childbearing in the United States are almost twice as large as in England, nearly three times what they are in Canada, and more than nine times as high as rates in Switzerland, for example. Understanding the factors that contributed to the past decline in the U.S. can provide insights into policies that might productively contribute to a sustained downward trend.

The purpose of this paper is to explore what factors can account for the decline in U.S. teen childbearing that occurred over recent decades. First, we explore the role of changing demographic composition. Second, we decompose the decline into the proximate determinants of sexual activity and contraceptive use. Third, we explore the environmental factors – that is, the various policies and economic conditions -- that may have altered the decisions teens made with regard to sexual activity and/or contraceptive use. We review prior evidence on the role these factors may play and conduct our own empirical analysis using panel data methods on state/year level data on teen birth rates.

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[6] Kathryn Kost of the Guttmacher Institute states: "The recent declines in teen pregnancy rates are great news … It is time to redouble our efforts to ensure that all teens have access to the information and contraceptive services they need to prevent unwanted pregnancies" (Guttmacher Institute press release, 2/8/2012, available at: http://www.guttmacher.org/media/nr/2012/02/08/index.html, accessed 3/14/2012.

Our paper yields the following set of conclusions. First, the observed decline in teen childbearing over the past twenty years is even more surprising given the demographic changes that have taken place. With a growing share of Hispanic teenagers with higher rates of teen childbearing, we would have expected a substantial rise in the aggregate rate rather than the observed decline. Second, we find that the mechanistic cause of the decline can be roughly equally attributable to a reduction in sexual activity and an increase in contraceptive use. Improvements in contraceptive technology do not appear to have played much of a factor over this time period. Third, we find little evidence that public policy played much of a role in the decline. Declining welfare benefits and expanded access to family planning services through the Medicaid program each had a statistically discernible, albeit quite small effect. We are unable to provide evidence that abstinence only education or mandatory sex education had any role in driving teen birth rates over this period. Fourth, we are unable to find a link between higher rates of unemployment and lower teen birth rates, calling into question the role that the Great Recession is playing in the recent sharp decline in teen childbearing. In the end, we are forced to conclude that none of the standard factors that are claimed to be related to the rate at which teens give birth appear to explain recent trends.

II. Demographic Composition and the Teen Birth Rate

When a population outcome such as teen childbearing is considered over a long period of time, it is crucial to consider the changing demographic composition of the population. Even if behavior remained constant for individuals in different demographic groups, the fact that the size of those groups has changed over time may alter the aggregate outcome. We consider two features of the composition of the female teen population: the racial/ethnic composition as well as the specific age distribution of the teen population.

The share of the teenage population that falls into a minority racial/ethnic category has increased steadily between 1980 and 2010. Figure 2 shows clearly the upward trends in the share of the female teen population that is Hispanic and the share that is "other race" and non-Hispanic (this group includes American Indian or Alaska Native, Asian, or Native Hawaiian or Pacific Islander – Asian is the subgroup that is driving this increase). Using statistics from the U.S. Census Bureau, we calculate that the percentage of women between the ages of 15 and 19 who are white, non-Hispanic decreased from 76 percent in 1980 to 56 percent in 2010. This trend is largely attributable to a growing Hispanic population: the percentage of the female teen population that is Hispanic rose from 8 percent to 20 percent over this period. An increasing share of other race, non-Hispanic women (again, mostly Asian) from 2 percent to 8 percent explains most of the remainder of the drop among white, non-Hispanic teen women. The size of the black population has not appreciably changed over this period.

These demographic changes are important to consider because different racial/ethnic groups tend to have different rates of teen childbearing. In particular, during the time period that we focus on, the Hispanic teen birth rate has been consistently around 2.5 to 3 times the rate of the white, non-Hispanic birth rate. Therefore, as Hispanics make up an increasing share of the teenage population, all else held constant, we would expect the overall teen birth rate to increase. This suggests that the decrease in the teen birth rate that we observe during the 1990-2010 period is actually even more of a puzzle. In other words, based on racial/ethnic projections, the counterfactual trend would have been a rising birth rate. The black, non-Hispanic teen birth rate is also 2.2 to 2.7 times the white, non-Hispanic birth rate over this time period, but the black share of the teen population has not changed that much, making this difference less relevant to explaining trends.

Another important component of demographic change is the precise age distribution of the female teen population. Birth rates to women between ages 15 and 17 are one-third the level of that for women who are 18 or 19 years old (Martin, et al. 2011). As broader population trends move through the teenage years, this could have a sizeable impact on the overall teen birth rate. In particular, Figure 2 shows a blip in the share of teens age 18-19 around 1990.[7] This pattern may be relevant in explaining at least some of the increase in teen childbearing that took place around 1990.

We explore these hypotheses more formally by conducting a straight-forward econometric analysis relating state/year level variation in teen birth rates, measured in natural logs, to the demographic shares of the teenage population. This exercise is not meant to be an exhaustive exploration of factors affecting teen birth rates. This is simply intended to provide an econometric exploration of the relationship between the demographic trends seen in Figure 2 to the overall birth rate trend seen in Figure 1. We estimate the following equation:

$$\ln(teenbrate_{st}) = \beta_0 + \beta_1 \cdot share1819_{st} + \beta_2 \cdot shareBNH_{st} + \beta_3 \cdot shareOTHNH_{st} + \beta_4 \cdot shareHisp_{st} + \gamma_s + \gamma_y + \epsilon_{sy}$$

The relationships of primary interest are captured by β_1 through β_4, which relate state-year teen birth rates (measured in natural logs) to the share of the teen population that is 18 and 19 years old, the share that is black, non-Hispanic (BNH), the share that is other race, non-Hispanic (OTHNH), and the share that is Hispanic. Teen birth rates were calculated from Vital Statistics natality files (the numerator) and intercensal population estimates of women age 15-19 (the

[7] Abortion legalization in the early 1970s is an important contributor to this pattern (Levine, et al., 1999). Birth rates in the mid to late 1960s were reasonably flat, but then fell considerably during the early 1970s as abortion was legalized throughout the United States. As birth rates fell starting around 1971, the fraction of 15 year olds in the 15-19 age group would begin to decline around 1986. By 1988, the fraction of teens who were 15-17 year olds would be relatively low. This "disequilibrium" would continue until birth rates stopped falling, which took place by, say, 1975. These earlier demographic trends would explain the age pattern in Figure 2.

denominator) were obtained from the U.S. Census Bureau.[8] These Census data were also used to construct the explanatory variables. We use panel data methods, including both state and year fixed effects. The equation is estimated using 28 years of data, from 1981 to 2008 inclusive. The regression is weighted by the size of the female population age 15-19 in each state. Reported standard errors are adjusted for clustering at the state level.

The results of this exercise are reported in Table 1. As suspected, we see that the percentage of the teen population (15 to 19) that is 18 or 19 has a statistically significant positive impact on the overall teen birth rate. As that percentage rises by one point, the teen birth rate rises by 2.27 percent. In tracking trends in the percentage of teens who are 18 or 19, we see the percentage of teens who are 18 or 19 dropped from 42 percent to 40 percent between 1984 and 1987. It then rose to 44 percent in 1989 and 1990 before returning to steady state at around 40 by 1993. The estimated relationship implies that the 4 point increase in this percentage leading up to 1990 would be associated with a roughly 9 percent increase in teen birth rates. With a baseline teen birth rate of around 52 leading up to this period, a predicted 9 percent increase around 1990 would lead to almost a 5 unit increase in the teen birth rate. In reality, the actual level rose by around 10 units, meaning that this one component of demographic change can explain around half of the spike in teen birth rates around 1990. To the best of our knowledge, this is the only factor that has been identified which can explain any portion of this spike. The fall back to a steady state in the percentage of teenagers who are 18 and 19 by around 1994 can completely explain the fall in the teen birth rate in the early 1990s. We view this is a very useful new insight to come out of this simple analysis of demographic factors.

The percentage of the female teen population that is Hispanic also has a statistically significant and economically meaningful impact on the aggregate level of teen fertility. Our

[8] These data are available at http://www.census.gov/popest/data/historical/index.html, last accessed March 14, 2012.

estimates in Table 1 indicate that a one percentage point increase in the percentage of the female teen population that is Hispanic is predicted to result in a 2.2 percent increase in the teen birth rate. With a rapidly growing Hispanic population, this suggests that the teen birth rate should have risen, not fallen. Consider the period beginning in 1994, after the impact of a changing age composition ran its course, and running through 2010, a period over which the teen birth rate fell from 58.2 to 34.3, indicating a drop of 41 percent. As dramatic as that drop is, we should have expected that rate to rise by around 15.4 percent over this period if nothing else changed other than the percentage of Hispanic teens, which jumped from 13 percent to 20 percent. This means that the teen birth rate actually was cut almost in half to 34.3 from a baseline rate of 67.2 (58.2*1.154) if we incorporate the higher share of Hispanic teens. In other words, the change in teen childbearing behavior that needs to be explained is even greater than that indicated by the raw numbers.

Demographics can be important if the composition of the population changes or if the behavior of particular population subgroups changes. Even if there were no change in population shares, if one specific demographic group experienced, say, a 50 percent decline in its rate of teen childbearing, the overall teen birth rate would fall by 50 percent times that group's share of the population.

To some extent, an issue like this arises with teen birth rates. Figure 1 plots the trend in teen birth rates separately for non-Hispanic whites, non-Hispanic blacks, and Hispanics beginning in 1990, when data by Hispanic origin became available. The data show very clearly that all groups experienced the same general downward trends in teen childbearing over the past two decades. This implies that the factors which caused these movements were not specific to one racial/ethnic group in particular. That said, the post-1990 rate of decrease in the birthrate

among black, non-Hispanic teenagers was particularly large. U.S. vital statistics data report that the non-Hispanic black teen birth rate fell from 118.9 in 1991 to 51.5 in 2010; that is a remarkable 118.9 – 51.5 = 67.4 point drop. The overall teen birth rate fell from 61.8 to 34.5 over these same years, a 61.8 – 34.5 = 27.3 point drop. As shown in Figure 2, black, non-Hispanic teens account for a roughly steady 15 percent of the population. This means that the falling teen birth rate among this group can account for 67.4*.15 = 10.1 point drop out of the overall 27.5 point drop, indicating black, non-Hispanics can account for 37 percent of the overall decline for a group that only makes up 15 percent of the population. Needless to say, this is a significant finding. On the other hand, the majority of the decline can still be attributable to other groups, indicating that a broader focus on all teens regardless of race/ethnicity is warranted for this study.[9]

To summarize the discussion in this section, we highlight four key findings. First, if nothing else changed, trends in the ethnic composition of the teenage population between 1991 and 2010 would have led to increases in teen childbearing over this period, which leaves us with an even greater decline to explain. Second, the specific age composition of the teenage population has roughly been constant over the 1981 to 2008 period, except for a bulge in the share age 18-19 around 1990. This transitory change in the age structure can explain roughly half of the spike in the overall teen childbearing rate that occurred around 1990. Third, white, black, and Hispanic teens *all* saw their rates of teen childbearing decline substantially between 1991 and 2010. Fourth, black teens saw their rates of teen childbearing fall especially rapidly, and the decrease in the teen birth among this group can account for a disproportionate share of the decline in the overall teen birth rate.

[9] This does not preclude subsequent investigation into the particular experience of black, non-Hispanic teens, but that such an investigation is outside the scope of the present paper. We would encourage others to pursue this issue further in subsequent research.

III. PROXIMATE CAUSES OF THE DECLINE

The falling teen birth rate has to be associated with a decline in sexual activity, greater contraceptive use, or an increase in the use of abortion. Of the three, we can rule out abortion as a contending explanation. Historical statistics reported by Kost and Henshaw (2012) on pregnancies, abortions, and births indicate that abortions among teens have dropped considerably, largely because pregnancies have fallen. The percentage of pregnancies that were aborted stood at 32 percent in 1991. The comparable rate in 2008 (the most recent year available) is 26 percent. Teens are actually less likely to abort their pregnancies than they used to be, indicating the decline in teen childbearing cannot be attributable to abortion. A reduction in sexual activity and/or increased use of contraception must be responsible.

In comparing patterns in these behaviors over time, it turns out that both moved in a direction consistent with declining teen fertility. Figure 2 plots trends from two sources: the National Survey of Family Growth (NSFG) and data from the Youth Risk Behavior (YRBS) system. The NSFG includes data on all women between the ages of 15 and 44, but we restrict our attention to those between 15 and 19. The YRBS focuses on those still enrolled in high school and who are mostly between the ages of 14 and 18.

First, as seen in the figure, both sources of data indicate that teenage girls were less likely to report sexual activity in the three months preceding the survey over the past two decades.[10] In the YRBS, the rate of sexual activity fell from 40 percent in 1995 to 36 percent in 2009. In the NSFG, it fell from 38 percent in 1995 to 31 percent in the 2006 through 2010 period.[11] Second,

[10] Sources for these data are Abma and Sonenstein (2001) and Martinez, et al. (2011) for the NSFG and *Youth Online: High School YRBS*, available at http://apps.nccd.cdc.gov/youthonline/App/Default.aspx, and accessed on 1/6/2012.

[11] In 2006, the NSFG switched from including larger samples being surveyed once every several years to smaller samples being surveyed annually. Using the more recent approach, data across years are aggregated to generate larger sample sizes.

the data also show an increase in the likelihood of contraceptive use among "sexually active women" (i.e. those who engaged in sexual activity in the past three months). In the NSFG, the percentage using some form of contraception at last intercourse among sexually active women rose from 71 percent in 1995 to 86 percent in 2006-2010 (Abma and Sonenstein, 2002; and Martinez, et al., 2011). In the YRBS, the data show an increase from 83 percent in 1995 to 86 percent in 2009. One can therefore conclude that reductions in teen childbearing over the past two decades reflects both a decrease in the rate of sexual activity and an increase in the use of contraception.

Another potential contributing factor is that contracepting teenagers switched to more effective methods of contraception. Newer methods including Depo Provera and emergency contraception ("Plan B") have become available over this period. Indeed, some advocates point to the introduction of newer, more reliable methods as one reason for the falling teen birth rate (cf. Guttmacher 2011). Yet our analysis of the data suggests that innovations in this area may be having some impact, but probably are not responsible for a large share of the aggregate decrease in teen childbearing over the past two decades.

Table 2 presents detailed data from the NSFG on contraceptive methods used among sexually experienced teen women. The top panel of the table presents the methods that teens have ever used. We see that almost all of them report having used some method at some point; indeed 96 percent report having used condoms. Pill use is the next most common form, with 56 percent of teens reporting having used the pill. A roughly comparable share report having used the withdrawal method. Newer methods – including the contraceptive patch, contraceptive ring, and emergency contraception (EC) – appear to be gaining some users. In 2002, 8 percent of teens report use of EC and 1.5 percent report having used the contraceptive path; these numbers are up

to 14 percent and 10 percent by the latest round of data. These are still relatively small shares of this population, as compared to pill and condom use.[12]

To investigate whether there were substantial rates of switching to more reliable forms of contraception in the aggregate, it is useful to focus on the choice of method used at last intercourse among those who are sexually active (intercourse in the past three months), which is displayed in the bottom panel of the table. This is a more reliable indicator of "usual" form of contraception. By this measure, condoms are still the most popular form of "usual" contraception, and increasingly so. In 2006-10, 52 percent of sexually active respondents report using the condom at last intercourse, as compared to 38 percent in 1995. Pill use rose from 25 percent in 1995 to 34 percent in 2002 before falling back to 31 percent in 2006-2010. That fall in pill use in the most recent period was completely compensated by the use of other hormonal methods, which rose from 9 to 12 percent. Our interpretation of these data is that older, highly effective methods of contraception (the pill) were being substituted for new, very highly effective methods of contraception (i.e. Depo Provera) over the past decade. Between 1995 and 2002, however, the increased use of condoms and the pill is commensurate with the increase in the share using any methods (in fact, some are using dual methods), suggesting this is more likely to represent new users.

The other major change that occurred over this period is the large advance in the share reporting dual methods: 8.4 percent in 1995, up to roughly 20 percent in the latter two surveys. The impact of dual use depends on what women were using before. If women who adopted dual

[12] Existing studies suggest that the introduction of and expanded access to emergency contraception (EC) has generally not led to discernible changes in pregnancy, abortion, or birth outcomes. Girma and Paton (2011, 2006), report such findings in the context of England. Durrance (2012) examines county-level data from Washington State and finds that access to EC is associated with increased rates of STD but no change in abortion or birth rates. Raymond et al. (2007) review 23 studies of emergency contraception access and conclude that the evidence points against there being an effect of EC on pregnancy or abortion rates.

methods would have otherwise used no method, it will have a large impact on pregnancy probabilities. If they would have used a moderately effective method otherwise (e.g. a condom), this will have some effect on pregnancy probabilities, albeit a smaller one. If they would have used a highly effective method (e.g. the pill) and added an additional moderately effective method (e.g. a condom), this will have a minimal effect on pregnancy probability (although it may have other benefits in terms of STD reduction). These conclusions can be seen more formally in our numerical simulation presented subsequently.

To more rigorously investigate the role of reduced sexual activity and greater contraceptive use to the overall decrease in teen birth rates, we conduct an econometric analysis that relates rates of these activities to teen birth rates.[13] To do this, we link reports of sexual activity and contraceptive use at the state level from the YRBS to the observed state level teen birth rate in the subsequent year.[14] Again, the universe of YRBS respondents is high school students mainly between the ages of 14 and 18. Decisions made regarding sexual activity and contraceptive use could not result in a teen birth until roughly nine months later. The vast majority of these students will be 15 to 19 at that point and the teen birth, if it occurs, would most likely fall in the subsequent calendar year. As such, the behavior reported in the YRBS represents the antecedents to the teen birth rate in the following year, suggesting our approach is a sensible one.[15]

[13] Past exercises that have attempted to untangle this issue have utilized simulation methods that require a number of assumptions about precise behaviors and probabilities that are not observed in available data (cf. Santelli, et al., 2007). Such exercises are required to simulate hypothetical changes in alternative scenarios, and we will conduct such an exercise below. But, to explore what has happened in the past, we are much more inclined to believe the results of econometric methods that estimate relationships observed in the data, as compared to a method that is entirely dependent on unverifiable assumptions.

[14] This analysis also appears in Kearney and Levine (2012).

[15] One limitation to this approach is that the YRBS focuses on those still enrolled in school. Those who have dropped out are not included in the sample and may represent a group with a higher likelihood of a teen birth.

State level YRBS data, however, is only available for a subset of states and all YRBS data is only available for odd numbered years. We use all the available state-level, biennial data on rates of sexual activity and contraceptive use from 1991 through 2007 to link to Vital Statistics aggregated state-level teen birth data every other year between 1992 and 2008.[16] In total, 167 state/year cells are available for this analysis. With these data, we estimate regression models that link the natural log of the teen birth rate to aggregate measures of sexual activity and contraceptive use along with state and year fixed effects.

Table 3 reports the results of this regression analysis. In the left panel, we focus on the rate of sexual activity along with the rate of any form of contraceptive use at last intercourse among sexually active teens. In the right panel, we break down contraceptive use by the form used. When we aggregate forms of contraception, the results indicate a 1 percentage point reduction in the rate of sexual activity in the preceding three months reduces the teen birth rate by 3.6 percent. Similarly, a 1 percentage point increase in contraceptive use among sexually active teens reduces the teen birth rate by 4.2 percent. Taken literally, these point values do not make sense since greater use of abstinence must have no less of an impact than greater use of contraception. One shortcoming of this analysis is that we have no way to measure the frequency of sexual activity, which may be higher among those using contraception. Besides, the two point estimates are statistically indistinguishable.

The results in the right panel indicate that use of the pill among sexually active teens has the largest effect on the teen birth rate, as compared to use of other forms of contraception. This implies that take-up of the pill is the most effective contraceptive advance, although it could be that use of the pill is associated with a lower frequency of sexual activity. Condom use is also

[16] 2009 YRBS data are available, but 2010 teen birth rates at the state level have not yet been released at the time of this analysis.

found to be statistically significantly related to a decrease in teen birth rates, but the estimated relationship is about three-quarters (2.64/3.59) the size as that of the pill. This likely reflects the fact that the condom is a less effective method of birth control. The data do not indicate a statistically significant relationship between the percent using Depo Provera and teen birth rates. This finding might at least in part be attributable to the very low rates of its use in these data, which could lead to measurement error in the variable.[17] Use of the withdrawal method is not found to be related to a reduction in teen fertility.

We apply the results in the left panel of the table to determine the relative contribution of reduced sexual activity and increased contraceptive use (at all) on the decline in teen fertility over the past two decades. We simulate the predicted effect of a 2.5 percentage point reduction in the rate of sexual activity in the past three months and a 4.1 percentage point increase in contraceptive use at last intercourse among sexually active teens, which corresponds to changes in the observed relevant values in the YRBS data between 1991 and 2007. Applying these changes to our coefficient estimates, leads to a prediction that reduced sexual activity can explain 2.5*3.57 = 8.93 percent reduction in teen births whereas increased contraceptive use can explain a 4.1*4.18 = 17.14 percent reduction in teen births. Combining the two effects, these two factors would lead to a 26.1 percent reduction in teen births. The observed decline between 1992 and 2008 (the relevant years of teen births relative to measured sexual activity and contraception in 1991 through 2007) was 32.8 percent, so our simplified approach predicts 80 percent of the observed decline.[18] These estimates suggest that 35 percent of the predicted decline in teen

[17]In the question regarding methods of contraceptive use, Depo Provera was not included in the list of options until 1999. Prior to that year, we coded rates of use in all states/years as zero.

[18] There are two main reasons why we may not have captured the entire decline. First, our statistical model is only based on 167 state/year pairs over the nine waves of the data, so several states in several years are missing from this analysis. This means our coefficient estimates may not be nationally representative. Second, we are using relatively crude measures of sexual activity and contraceptive use that may not fully capture the intensity of either activity.

births is attributable to the reduction in sexual activity and 65 percent is attributable to the increase in contraceptive use. Relevant standard errors on each estimate, however, suggest that we are unable to conclusively determine that the two components have differential effects.

If teens continue to have lower rates of sexual activity and increased rates of contraceptive use, we can expect to see continued decreases in teen childbearing rates. But is there also a useful role for policies targeted at moving women to more effective forms of contraception? One benefit of new contraceptive technologies is to make it more convenient for women to use contraception, even if it does not lower the probability of a pregnancy. We do not discount this advantage, but our focus is on the likelihood of a pregnancy. The analysis we reported in Table 3 used historical data on the use of different contraceptive methods and their role in reducing teen childbearing. That exercise, however, is not necessarily representative of what may happen in the future. The relevant question as we go forward is how much should we emphasize technological improvements over greater take-up of existing methods, if our goal is to maximize the reduction in teen childbearing?

To pursue this question, we use reasonable estimates of pregnancy probabilities to simulate the effectiveness of changes in contraceptive use and improvements in contraceptive techniques. Suppose that teens engaging in sexual activity without contraception have a 20 percent probability of getting pregnant in a month.[19] Over the course of a year, the probability of avoiding a pregnancy would be $.8^{12} = 7$ percent, so that 93 percent of sexually active teens who were having unprotected sex would become pregnant. They would reduce the monthly

[19] For a fact sheet summarizing pregnancy probabilities and the effectiveness of various forms of contraception, see the information provided by the American Pregnancy Assocation at: http://www.americanpregnancy.org/preventingpregnancy/birthcontrolfailure.html (accessed 1/6/2012). We have increased the likelihood of pregnancy using no contraception because the likelihood of pregnancy for teens is higher than for older women. We have also reduced the effectiveness of condoms since teens may be less likely to use them properly.

probability of pregnancy to 4 percent if they adopted a contraceptive method that reduced the likelihood of pregnancy by, say, 80 percent. (Note that consistent use of a condom is generally thought to have an effectiveness rate of about 85 percent). The probability of avoiding a pregnancy over an entire year would fall to $.96^{12}$ = 61 percent, so that 39 percent of the time they would become pregnant. Suppose instead that they used a new method or a second method that reduced the likelihood of pregnancy by 95 percent, lowering their pregnancy probability to .05*.2 = 1 percent. Now over the course of a year of being sexually active and contracepting in this manner, they would avoid a pregnancy $.99^{12}$ = 89 percent of the time, so that 11 percent of teens in this scenario would become pregnant. For women making this contraception switch from 80 percent effectiveness to 95 percent effectiveness, they would lower their probability of getting pregnant in a given year from 39 percent to 11 percent, or by 28 percentage points.

To summarize these calculations, sexually active women using no contraception over the course of the year would become pregnant 93 percent of the time. If she used moderately effective contraception, that would fall to 39 percent and then fall again to 11 percent if she used very effective contraception. In other words, we can reduce pregnancy probabilities by 54 percentage points by getting women to use any form of contraception as opposed to 28 percentage points by switching women who already use contraception to use more effective forms. Clearly, the benefit of moving women to using any form of contraception has a bigger relative impact. Of course, the best outcome is getting women who would otherwise use no form of contraception to use very effective contraception; if technological advances can accomplish that goal, then it is clearly preferable. If new methods just lead to substitution from other forms of contraception, they will have less of an impact than increasing take-up of existing methods, even if existing methods are less effective.

IV. The Role of Public Policy and Labor Market Conditions

It is not uncommon for discussions on teen fertility to discuss the mechanical role of abstinence and contraception and then make the leap into the role of policies that are designed to directly encourage these activities.[20] Of course, decisions regarding these activities are likely attributable to a whole host of influences beyond just the policies that directly target them. Any relevant factor must operate through sexual activity or contraceptive use (or abortion). Identifying links between teen childbearing and these proximate determinants, therefore, provides no information regarding the cause of those behavioral changes. What we really want to know is whether we can identify these broader influences, and particularly those that are policy related, so that we can further the public discussion regarding ways to further reduce teen fertility.

In this section, we econometrically investigate the role of state-level policies and economic conditions in driving state-year variation in teen birth rates. We take guidance from the existing literature in choosing our set of explanatory policies and variables, and we focus on abstinence and contraception policies.[21] Most, if not all, past research has focused on a single or limited number of factors that may matter. An important contribution of our analysis is an integrated approach that simultaneously considers the role of a wide array of relevant policies

[20] Boonstra (2002, p. 8) provides an example: "If recent declines in teen childbearing are the result of fewer teens getting pregnant in the first place, the obvious next question is: why? Are fewer teens avoiding pregnancy by abstaining from sex, or are those who are having sex using contraception more successfully? Not surprisingly, the answer is: both. But deconstructing that answer is critical, because it goes to the heart of a number of relevant and timely public policy questions, among them the debate over public funding for abstinence-only education and for more-comprehensive approaches." Santelli et al. (2007) express similar views.

[21] Lopoo and Raissian (forthcoming) provide an excellent overview of the research addressing public policies in the United States that may have an impact on fertility more broadly, without focusing on teen outcomes.

and economic conditions. To the extent that our findings are consistent with past research, this will enable us to draw stronger conclusions.

Data and Methods

To identify the effect of individual policies and economic conditions on teen birth rates, we exploit the variation in the timing of policy implementation and movements in economic conditions across states. This approach allows us to identify the causal relationship between a policy or economic conditions and teen birth rates provided that we have adequately controlled for other factors that might be correlated with them. We accomplish this by employing panel data methods, regressing the teen birth rate in a particular state and year against all of these policy indicators, economic factors, and state-level demographic characteristics, along with a vector of year fixed effects along with nonlinear state-specific trends.[22]

Our analysis uses birth data from the Vital Statistics Natality files between the years of 1981 and 2008 aggregated to the state/year level.[23] We combine these data with the intercensal population estimates from the U.S. Census Bureau to construct teen birth rates, as described above in our analysis of demographic factors. We then estimate ordinary least squares regression models relating state-year teen birth rate to a large set of state-year level policies and two measures of state-year economic conditions. The specific factors that we consider are described in the following section. A data appendix describes the sources used to construct these policy variables and an appendix table displays the years in which the relevant policies were introduced in each state.

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[22] We allow state-specific effects to vary nonlinearly by including up to a cubic in state-specific trends. Figure 1 provides the motivation for this specification. Over the sample period used in this analysis, national trends were roughly flat through the 1980s, spiked in the early 1990s and then have been declining ever since. Year fixed effects would capture this nonlinear pattern at the national level, but presumably these patterns differed across states. A cubic is required to capture the two observed turning points.

[23] We restrict our sample period to this window because of the difficulty of documenting variation in some of the policies in earlier years.

Our regression models include control variables for the demographic composition of the state female teenage population in each year using data from the U.S. Census Bureau, as described above for the analysis reported in Table 1. These controls include the percent of the population that is white/non-Hispanic, black/non-Hispanic, percent that is Hispanic, and percent that is age 18-19. We also include measures of the state population that might affect general social norms and therefore have an indirect effect on teen childbearing rates. These variables are constructed from Current Population Survey Outgoing Rotation Group files. These controls includes the percent of the state population that is: age 15-19, of childbearing age (15-44), married, and with a college degree.

We estimate this model first for all teen births. We then estimate these models separately for females age 15-17, females age 18-19, nonwhite teens, Hispanic teens, unmarried teens, and married teens.[24] Our motivation for doing this is twofold. First, it is informative to see if the estimated impact of policies varies across population subgroups to think about whether there are important differences in treatment effectiveness. Second, it is often useful to check whether the estimates vary in expected ways in order to determine whether the statistical estimates we obtain can be interpreted as causal. For example, some policies, like parental consent for abortion for instance, should only affect younger teens and unmarried teens, so if we obtain estimates that indicate an impact of these laws that are not concentrated on these groups, then it is likely that those results are spurious, not causal.

A. Policies Considered

We begin with policies that directly target proximate determinants. First, we consider whether a state accepts federal Title V-510 abstinence education funding. This provision was

[24] In models focusing on Hispanic fertility, we are restricted to using data beginning in 1990, when Vital Statistics data began separately identifying births to Hispanic women, regardless of race. In models focusing on nonwhite women, we use the full set of data going back to 1981, so Hispanic ethnicity is not separately identified.

passed as part of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) and expanded federal funding for programs that emphasize abstinence curricula, mentoring, counseling, and adult monitoring to promote abstinence from sexual activity outside of marriage. States that accept these funds are required to match 75 percent of the federal funding. Past research has had difficulty finding much of an impact of programs like these (cf. Trenholm, Devaney, Fortson, Clark, Quay, and Wheeler, 2008).

We also include two measures of state-level policies on sexual education programs – an indicator for whether the state requires sexual education programs and an indicator for whether state law requires contraception education be included in any sexual education program. Although past research has had difficulty identifying a causal impact of sex ed in any form on teen births (cf. Sabia, 2006 and Kirby, 2007), we consider this possibility here as well.[25]

In terms of contraceptive access, we focus on increases in family planning services that took place within the context of the Medicaid program. Medicaid has traditionally provided comprehensive access to family planning services to its clients, but participation was largely restricted to mothers who received welfare. For the past two decades or so, states have had the ability to request waivers from the federal government to provide family planning coverage to a broader group of women. As of January 2012, 28 states have done so.[26] The expanded services have generally applied to the following groups of women: (1) women whose pregnancy-related care, including post-partum family planning, would otherwise expire; (2) women who would lose their Medicaid eligibility status for any reason; and (3) women whose income is below a

[25] Kirby (2007) reports evidence that sex ed is found to be effective in reducing aspects of risky sexual behavior among teens, but that the impact is not large. This may translate into difficulty finding effects on teen childbearing itself. When we combine a small change in risky behavior with the probability of pregnancy even in the presence of risky behavior, the expected impact of these programs on childbearing would be small as well. Statistical power in these analyses then becomes an important issue, as Kirby points out. Nevertheless, the relevant conclusion is that these programs are unlikely to have a substantial effect on teen childbearing based on this evidence.

[26] For a list of states that have instituted these policies as of 1/1/2012, see the report by the Guttmacher Institute, http://www.guttmacher.org/statecenter/spibs/spib_SMFPE.pdf, accessed 1/9/2012.

specified income threshold (typically 185 percent or 200 percent of the federal poverty threshold), but above the eligibility threshold for the state's regular Medicaid program, regardless of whether they meet the categorical requirement of having a child or being pregnant. Some of these waivers only apply to the population of women age of 19 and over, so they would presumably have limited effectiveness for the teen population. Kearney and Levine (2009) found that these income-type expansions led to statistically significant reductions in teen childbearing, on the order of a four percent reduction.

Another policy change with a family planning component is the introduction of the State Children's Health Insurance Program (S-CHIP), now known as the Children's Health Insurance Program (CHIP). This federal program provides matching funds to states to provide health insurance coverage to families whose incomes are low, but too high to qualify for traditional Medicaid. The program was implemented during the late 1990s, with some variation across states in exact year of implementation. Adolescents have access to family planning services through the SCHIP program and this could have contributed to a reduction in the teen birth rate, at least at that time. The take-up rate of this provision among adolescents, however, is observed to be quite low, perhaps in part because of the lack of confidentiality in their provision (Gold and Sonfield, 2001). This suggests we are unlikely to find a strong relationship between this policy and teen birth rates.

Moving away from factors that are directly targeted at proximate determinants, we explore the role that changing welfare policies may have played. There is a large literature on the incentive effects of welfare benefit levels on non-marital and teen childbearing. Moffitt (1998, 2003) review the evidence on the link between welfare benefits and non-marital childbearing, including teen childbearing. His summary view is that the general consensus is that more

generous welfare benefits likely have a modest positive effect on rates of non-marital childbearing. We include in our analysis a measure of welfare generosity at the state-level: the maximum AFCD/TANF benefit amount for a family of three (in year $2009, measured in natural logs).

Beyond welfare generosity, a substantial literature also examines the role that welfare reform has played on women's, and particularly teens', childbearing decisions. Welfare reform was implemented at the national level with the passage of the 1996 PRWORA legislation; an explicit goal was to reduce rates of teen childbearing. Before PRWORA, many states received waivers from the federal government allowing them to experiment with the rules of welfare. Many of the changes implemented under these state waivers would become permanent under the implementation of the state's TANF policy. For instance, family cap policies were instituted beginning in 1992; these policies limit either in part or completely any additional benefit for having an additional child while participating in the program. Grogger and Karoly (2005) provide comprehensive reviews of the research on the impacts of welfare reform on a range of outcomes, including birth rates. Kearney (2004) conducted a study focusing specifically on the impact of family caps. Taken as a whole, the literature to date suggests that at most, welfare reform had only minor effects on rates of teen childbearing. In our analysis, we include indicators for whether the state has in place a welfare waiver policy or if it implemented TANF and another indicator representing whether a family cap policy is in place.

Changes in abortion policies also have the potential to alter individual decisions regarding sexual activity, contraceptive use, and childbearing decisions. There are three general sets of restrictive abortion policies at the state level – parental notification laws, mandatory delay periods, and restrictions on Medicaid funding. Parental involvement laws either require minors to

notify a parent or guardian or obtain explicit consent before they can obtain an abortion. Mandatory delay laws require a specified period of time after her initial inquiry before a woman can receive an abortion. In some states, these laws require pregnant women to receive abortion counseling. The policy of restricting federal Medicaid funding for abortions means that federal Medicaid funds cannot be used to cover abortion services. However, states can pay the full cost of the abortion, and a number of states have a policy of doing so. Levine's (2004) summary of this body of research concludes that these forms of restrictive abortion policies are not found to be associated with higher rates of teen childbearing.[27] We include in our analysis measures of whether a state's Medicaid program restricts funding for abortion, along with indicators of the presence of mandatory delay and parental notification laws.

In addition to these policy variables, we also consider the role of state-level economic conditions, focusing mainly on the unemployment rate. Labor market conditions actually have an ambiguous effect on the teen birth rate. A stronger labor market may lead to higher income, which would make having a child more affordable. Alternatively, a stronger labor market increases the opportunity cost of having children, reducing one's willingness to give birth. Shaller (2011) provides a recent empirical examination of this issue. She finds that birth rates are negatively related to the aggregate unemployment rate. Focusing specifically on teens, Colen, et al. (2006) find little support of an overall effect of labor market conditions on teen birth rates.[28] In our analysis, we include standard measures of the state/year unemployment rate from the Bureau of Labor Statistics to examine this issue ourselves. We also include a state-year measure

[27] Joyce, et al. (2006) is a more recent entry into this literature that provides some evidence of a reduction in births associated with a parental consent law using a case study approach applied to a Texas law.

[28] For blacks, they obtain marginally statistically significant results indicating that higher unemployment leads to more births whereas for whites they are unable to find a statistically significant impact, although the point estimate is the opposite of that for blacks. Collectively, these findings would not support an impact of labor market conditions on teen birth rates.

of lower-tail wage inequality: the ratio of household income at the 50th percentile versus the 10th percentile, constructed using CPS data on total household income.

B. Empirical Results

Table 4, column 1 reports the detailed regression findings for all teens between the ages of 15 and 19. Statistically significant results are highlighted with an asterisk. To summarize these findings, it appears that just a few public policies have had a statistically significant impact on teen birth rates.[29] Our analysis detects an effect of two policies in particular. More generous welfare benefits are associated with higher rates of teen births and income-based Medicaid family planning waivers are associated with lower rates of teen births. The fact that the impact of welfare generosity on teen births is driven entirely by unmarried women supports a causal interpretation since welfare eligibility is largely restricted to this group. A finding of a discernible effect of these two policy measures is consistent with previous literature. We discuss the magnitudes of these estimated effects below.

The absence of statistically significant relationship between some of these measures and teen births can be just as informative as their presence. Importantly, the data do not support the claims of those who attribute declining teen births to abstinence only or any type of sex education programs. Failure to find a statistically significant result is not conclusive evidence that these programs have no effect for any group or in any context. However, the estimated coefficients and associated standard errors do rule out any sizable effect in the aggregate.

We are similarly unable to identify a significant relationship between labor market conditions and teen childbearing. Despite the correlation of high unemployment and falling teen

[29] One potential concern with this analysis is that we are considering a large number of factors, potentially lessening the power of the analysis. We have also estimated the model focusing on subsets of factors and obtained qualitatively similar results.

births in the past few years, we are not surprised by this finding. There have been four other recessions (one a double-dip) of varying magnitudes since the early 1980s years and no noticeable incremental drop in teen births took place during any of them. At a more intuitive level, it is not surprising to us that women who are on the margin of giving birth as a teen are not very responsive to short-term labor market conditions. There is also no evidence that state-year teen birth rates respond to year to year fluctuations in income inequality as measured by lower-tail inequality, which is arguably more relevant to those on the margin of a teen birth than other measures of income inequality. This finding also does not surprise us, as the effect of inequality is more likely to be about long-standing rates of inequality, not year to year deviations.[30]

The remaining columns in the table report the results for subgroups. As we move to smaller groups, the analysis loses statistical precision so some of the estimated effects become statistically insignificant, even though point estimates remain fairly far from zero. The whole of the evidence suggests that the positive effect of welfare benefits and the negative effect of Medicaid family planning expansions affected the birth rates among both younger and older teens. The effect of the Medicaid expansions is not observed for non-white and Hispanic teens. It does appear to be driven by married teens. With regard to welfare benefits, the data suggest that birth rates among nonwhites are not as responsive as among whites and Hispanics.

In a noticeable departure from previous studies, here we also see some evidence that the family cap is potentially associated with reduced rates of teen childbearing among older teens and married teens. These concentrated effects are consistent with the fact that only higher order births should be affected a family cap. We find this result regarding the family cap very

[30] Kearney and Levine (2011) considers the role of income inequality in explaining perpetual differences in teen childbearing rates across states and countries. That research finds that in places with greater levels of income inequality, young women of low socioeconomic status are more likely to give birth when young and unmarried, all else equal.

intriguing because previous studies found no effect of the family cap (including Kearney 2004 and Levine 2001). Those studies were limited to years through 1998, however, and it is possible that in later years the family cap had more of an impact. This finding warrants more extensive, focused research attention. There is also a suggestion that parental consent notification laws regarding abortion lead to an increase in birth rates among Hispanic teens. This too deserves additional focused research attention. As we describe subsequently, however, the magnitude of these effects is too small to explain any sizable share of the recent decline in teen childbearing, especially in the aggregate.

C. Magnitude of the Estimated Effects

Although some policies seem to have an impact on teen childbearing, our back-of-the-envelope calculations suggest that the magnitude of these effects relative to the total decline in teen births is rather small. We first consider the role of welfare benefits. The estimate effect as reported in Table 4 indicates that a 10 percent reduction in welfare benefits reduces the teen birth rate by 0.87 percent. In the period between 1991 and 2008, the average fall in the maximum monthly benefit for a family of three, weighted by state teen population, was 31.3 percent. We calculate the predicted decline due to this policy variable by multiplying this reduction by the estimated effect in Table 4 by the realized percent decline (.087*31.3), yielding an estimated reduction of 2.7 percent in teen births over this period attributable to average declining welfare benefits.

With regard to income–based Medicaid family planning expansions, the regression analysis finds that the implementation of such a policy leads to an average reduction in teen birth rates of 4.2 percent (an estimate that is quite comparable to that in Kearney and Levine, 2009). As of 2008, income-based waiver policies that include teenagers had been implemented in 12

states, representing 44.1 percent of the teen population. Based on our regression estimates, this would lead to a reduction in teen birth rates of 1.9 percent (0.042*44.1). That constitutes less than six percent of the total decline since 1991.

In summary, we estimate that the combined effect of reduced welfare generosity and income-based Medicaid family planning waivers – the only two policies that show a statistically significant association with state-year teen birth rates – can account for a combined 4.6 percent reduction in teen childbearing between 1991 and 2008. The teen birth rate fell over this period from 61.8 to 39.1, a decline of 37 percent. This means that these policy changes can account for approximately 12 percent of the decline in teen fertility since 1991.

V. DISCUSSION

We began this paper by recognizing the stunning decline in the teen birth rate between 1991 and 2010. We first considered the role of demographic trends in driving this decline, and observed that the changing ethnic composition of the teen population would have actually led to an increase in teen childbearing rates, making this drop all the more difficult to explain. This is because the Hispanic population has become a larger share of the population and Hispanic women have higher than average teen birth rates. The only demographic movement that works to explain any of the trends in recent decades is the blip in the share of the female teenage population comprised of 18-19 year olds around 1990, which can potentially explain about half of the corresponding spike in teen births at that time.

We then considered the mechanical determinants of the fall in teen childbearing. Teen abortion rates fell along with childbearing rates, so the decline in teen childbearing is clearly not due to an increased reliance on abortion. Nor do the data provide any evidence that increased take-up of more reliable or newer methods of contraception played a major role in driving

aggregate rates of teen childbearing over the period being examined. We document that the reduction is attributable to both reduced sexual activity and increased use of contraception. The data are consistent with both behaviors being roughly equally responsible for the overall decline in teen birth rates, though point estimates suggest a somewhat larger role for increased contraceptive use among sexually active teens.

Perhaps more important from a policy perspective is to understand the policy and environmental factors that led to these observed changes in behavior. We have considered a large number of policies, including those that observers have alleged contributed to the decline. Based on our review of past research along with the results of the empirical analyses we have conducted here, we find no support for claims that the decline in teen childbearing can be attributed to improved sex education, the introduction of abstinence only programs, or, more recently, in the dramatic jump in the unemployment rate.

In fact, the data give little indication as to what factors did drive the bulk of the decline. Consistent with past research, we are able to identify that falling welfare benefit levels and the expansion of family planning services through income-based waivers to the Medicaid program both appear to be causally linked to a reduction in teen births. However, combined these factors can account for about 12 percent of the total fall in teen birth rates from 1991 to 2008. In the end, we are left with the conclusion that no policy or other environmental factor can be pinpointed as contributing substantially to the decline. It is clear that teenagers made a different set of choices in the period 1991 to 2008 with regard to teen childbearing, but not in response to targeted policies. New hypotheses and additional research is required to explain recent trends. What we have learned is that none of the relatively easy explanations work well.

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Table 1: Impact of Demographic Composition on Teen Birth Rate

Variable	Coefficient (x 100)	Standard Error (x 100)
% of Teen Population Age 18-19	2.27	0.77
% of Teen Population Black, Non-Hispanic	0.73	1.10
% of Teen Population Other Race, Non-Hispanic	1.65	2.02
% of Teen Population Hispanic	2.23	0.77

Note: Estimates are obtained from a regression model where the dependent variable is the natural log of the teen birth rate and the list of independent variables also includes state and year fixed effects. It is weighted by the size of the female population between the ages of 15 and 19 in each state. Reported standard errors are clustered at the state level.

Table 2: Methods of Contraception Used by Sexually Active Teens

	1995	2002	2006-2010
Methods Ever Used (conditional on ever having sex)			
Any Method	96.2	97.7	98.9
Condom	93.5	93.7	95.9
Pill	51.6	61.4	55.6
Withdrawal	42.3	55.0	57.3
Injectable	9.7	20.7	20.3
Rhythm	13.2	10.8	15.0
Emergency Contraception	---	8.1	13.7
Contraceptive Patch	---	1.5	10.3
Contraceptive Ring	---	---	5.2
Female Condom	1.1	1.7	1.5
Other	14.5	9.9	7.1
Methods Used at Last Intercourse (conditional on having sex in last 3 months)			
Any Method	70.7	83.2	85.6
Condom	38.2	54.3	52.0
Pill or Other Hormonal	32.0	43.3	42.7
Pill	25.0	34.2	30.5
Other Hormonal	7.0	9.1	12.2
All Other Methods	9.6	5.1	11.0
Dual Methods	8.4	19.5	20.1

Sources: Abma and Sonenstein, 2001; and Martinez, et al., 2011.

Table 3: Mechanical Correlations with Teen Fertility
(standard errors in parentheses)

% Any Sexual Activity in past 3 months	3.569 (0.387)	% Any Sexual Activity in past 3 months	3.309 (0.355)
% Used Any Contraception if Sexually Active	-4.181 (0.661)	% Used Pill if Sexually Active	-3.585 (0.706)
		% Used Condom if Sexually Active	-2.638 (0.528)
		% Used Depo or Other if Sexually Active	0.386 (1.061)
		% Used Withdrawal if Sexually Active	0.948 (1.560)
R^2	0.59	R^2	0.69
Number of States/Years	167	Number of States/Years	167

Notes: The dependent variable in each model is the natural log of the percentage of teens giving birth in a state/year (that is, the teen birth rate divided by 10). All coefficients and standard errors are multiplied by 100. Each model is weighted by the population of women age 15 to 19 in each state/year. Reported standard errors are clustered at the state level.

Table 4: Impact of Public Policies and Economic Conditions on Teen Birth Rates
(standard errors in parentheses)

	Age 15-19	Age 15-17	Age 18-19	Nonwhite	Hispanic	Unmarried	Married
Abstinence Education Funding	-0.001	0.001	0.002	0.008	0.003	0.011	-0.062
	(0.012)	(0.013)	(0.014)	(0.015)	(0.012)	(0.016)	(0.040)
Mandatory Sex Education	-0.009	-0.008	-0.011	-0.007	0.002	0.004	-0.035
	(0.008)	(0.011)	(0.009)	(0.012)	(0.015)	(0.012)	(0.023)
Mandatory Sex Ed with Contraception Counseling	0.005	-0.010	0.018	-0.002	0.004	0.005	0.007
	(0.010)	(0.010)	(0.014)	(0.015)	(0.013)	(0.012)	(0.021)
Medicaid Income-Based Family Planning Waiver	-0.042*	-0.036*	-0.048*	-0.005	-0.005	-0.002	-0.153*
	(0.015)	(0.010)	(0.020)	(0.011)	(0.011)	(0.014)	(0.074)
Medicaid Income-Based Fam. Plan. Waiver Age 19+	0.024	0.007	0.023	0.030	0.020	0.036*	-0.023
	(0.024)	(0.021)	(0.031)	(0.029)	(0.016)	(0.016)	(0.075)
Medicaid Duration-Based Family Planning Waiver	0.027*	0.031*	0.028	0.005	0.004	0.010	0.007
	(0.011)	(0.014)	(0.015)	(0.012)	(0.014)	(0.018)	(0.040)
SCHIP Implemented	0.003	-0.005	0.003	-0.005	-0.001	-0.001	0.014
	(0.006)	(0.008)	(0.009)	(0.012)	(0.014)	(0.009)	(0.018)
LN(max. AFDC/TANF benefit, family of 3)	0.087*	0.071	0.103*	0.000	0.150	0.172*	0.002
	(0.032)	(0.038)	(0.034)	(0.075)	(0.101)	(0.055)	(0.076)
TANF Implemented	-0.001	0.005	-0.002	-0.005	0.013	-0.020	0.053
	(0.008)	(0.007)	(0.009)	(0.021)	(0.013)	(0.012)	(0.027)
Family Cap Implemented	-0.014	-0.006	-0.021*	-0.002	-0.019	-0.004	-0.070*
	(0.009)	(0.010)	(0.010)	(0.018)	(0.014)	(0.015)	(0.029)
Parental Consent	-0.023	-0.023	-0.023	-0.017	0.059*	-0.041	-0.016
	(0.017)	(0.017)	(0.017)	(0.014)	(0.024)	(0.024)	(0.035)
Mandatory Delay	-0.004	0.002	-0.008	-0.019	-0.020	-0.039	0.064
	(0.008)	(0.011)	(0.009)	(0.016)	(0.012)	(0.019)	(0.045)
Medicaid Funding Restriction	0.018	0.020	0.015	0.035	0.033	0.024	0.037
	(0.028)	(0.024)	(0.030)	(0.038)	(0.030)	(0.032)	(0.036)
Unemployment Rate	-0.002	0.001	-0.003	-0.004	-0.006	0.013	-0.020
	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.009)	(0.011)
50/10 Ratio	-0.019	-0.024	-0.020	0.200	-0.166	-0.238	0.042
	(0.169)	(0.179)	(0.172)	(0.160)	(0.176)	(0.292)	(0.356)
Sample Size	1428	1428	1428	1428	968	1428	1428

Notes: The dependent variable in all regression models is the natural log of the birth rate for the relevant demographic group. All models control for the demographic characteristics of the state's population and also include state and year fixed effects along with state-specific linear, quadratic, and cubic trends. Regressions are weighted by the population for the relevant demographic group. Standard errors are clustered at the state level.

Figure 1: Trend in the Teen Birth Rate

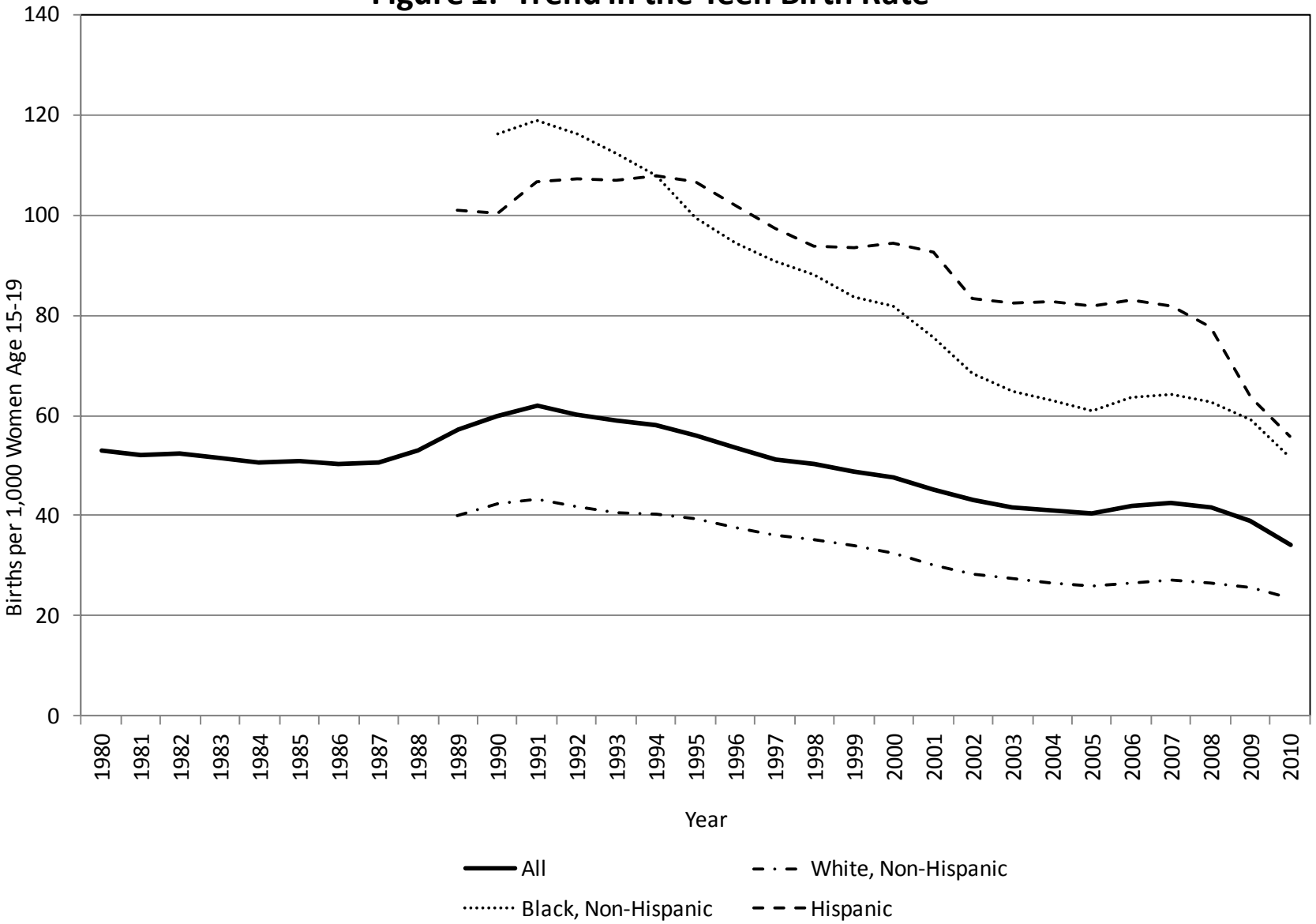


Figure 2: Demographic Composition of Teen Female Population

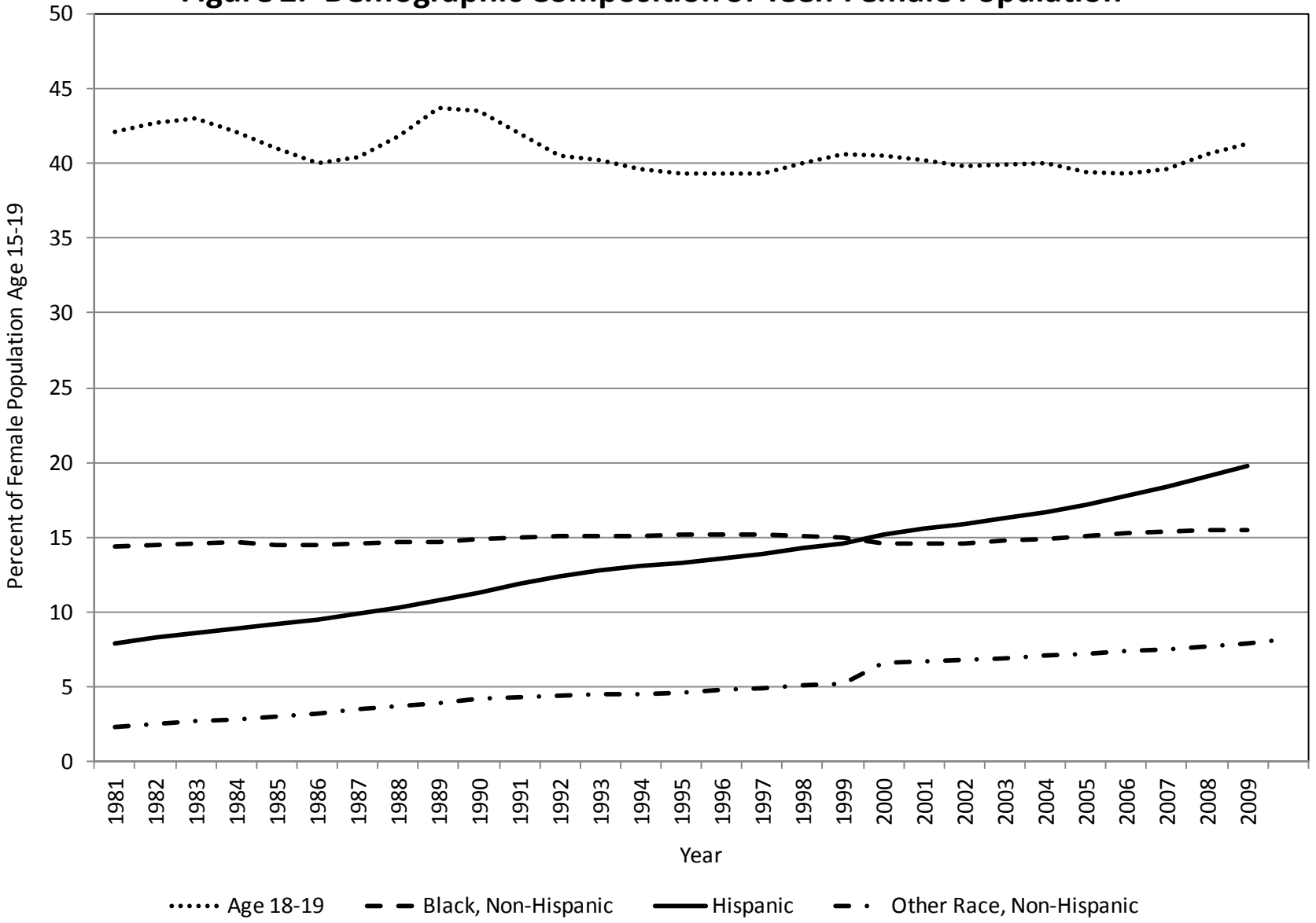
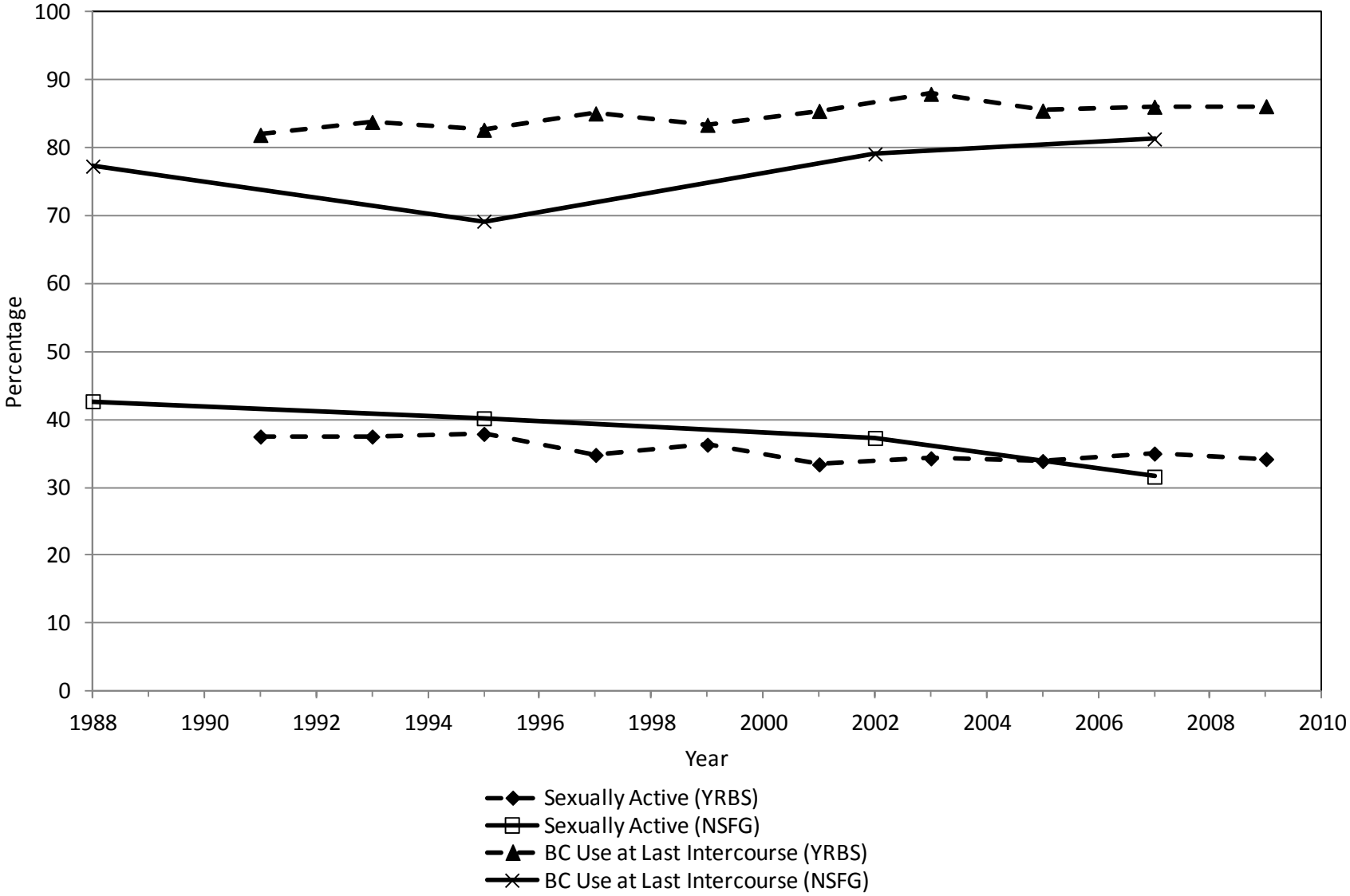


Figure 3: Sexual Activity and Birth Control Use of Female Teens



note: NSFG values for 2007 are 2006-2008 averages.

APPENDIX: DATA SOURCES

- Maximum AFDC/TANF benefit plus food stamps for a family of three. We obtained these data from the public-use database of state policies provided by the University of Kentucky Center for Poverty Research. These data are available on the Center's website: http://www.ukcpr.org/EconomicData/UKCPR_National_Data_Set_12_16_10_Public(1).xlsx That source contains detailed lists of sources that they used to compile these data.

- Welfare reform and "family cap" indicators. Information on welfare reform policies through 2002 were obtained from three sources: (1) a technical report of the Council of Economic Advisers (1999); (2) an Urban Institute report written by Gallagher, Gallagher, Perese, Schrieber, and Watson. (1998); and (3) a report by Crouse (1999), prepared for the U.S. Department of Health and Human Services, which summarizes information contained in a report of the U.S. Department of Health and Human Services (1997). We updated this series for more recent years using information from the Urban Institute Welfare Rules Database.

- Legal abortion restrictions, including parental notification/consent laws and mandatory waiting periods. Levine (2004) includes a detailed description of these restrictions and how the variables are coded. We updated Levine's earlier series by comparing changes in legal status between 2004 and what is reported by Guttmacher as 2010 law. For the set of states with reported changes, we searched the state websites for information about dates of implementation: http://prochoiceamerica.org/government-and-you/state-governments/.

- Medicaid funding of abortion. Levine (2004) includes a detailed description of these restrictions and how the variables are coded. We updated Levine's earlier series using information from NARAL – "Restrictions on Low Income Women's Access to Abortion", accessed 10/15/10. This website reports when any new legislation was enacted in states: http://www.prochoiceamerica.org/what-is-choice/fast-facts/low-income-women.html

- Indicator variables for a poverty-based or duration-based Medicaid family planning waiver. Kearney and Levine (2008) provides details about these policies and implementation dates. We updated that series for more recent years using information from the CMS website: http://www.cms.gov/MedicaidStWaivProgDemoPGI/MWDL/list.asp (Accessed 9/14/10),

- S-CHIP implementation. Information is obtained from public documents of the Centers for Medicare and Medicaid Services (CMS).

- State HIV/sex education policies. We use a series of Guttmacher States in Brief reports (ex: http://www.guttmacher.org/statecenter/spibs/spib_SE.pdf, January 2011). For those years with reports not available on-line, we requested and received hard copy documents directly from the Guttmacher Institute.

- Federal abstinence education funding. We create a state level indicator based on whether a state accepted Abstinence Education (SS Title V Section 510) funding. These data come from the following on-line documents, accessed Jan 2011:

(1) US Dept Health and Human Services, HRSA, MCHB, 2000 Annual Report for the Abstinence Education Provision of US Welfare Reform Law P.L. 104-193 Table 1b (July 2002) ftp://ftp.hrsa.gov/mchb/abstinence/annualrpt00.pdf (1998-2002)

(2) States' Implementation of Title V, FY 1999 (Sonfield and Gold , 1999)

(3) SIECUS Funding by State 2003, 2004, 2005, 2006, 2007, 2008, 2009 http://www.siecus.org/index.cfm?fuseaction=Page.ViewPage&PageID=1260

SIECUS Fact Sheet: State by State Decisions: The Personal Responsibility Education Program and Title-V Abstinence Only Education
http://www.siecus.org/index.cfm?fuseaction=Page.ViewPage&PageID=1272

Appendix Table 1: Year of Implementation of Various Policies, by State

State	Welfare waiver/ TANF	Welfare Family Cap	Medicaid Abortion Funding Restriction	Abortion Parental Consent/ Notification	Abortion Mand Wait Period	Medicaid Family Planning Waiver, Income Based[+]	Medicaid Family Planning Waiver, Duration Based	SCHIP	Accepted Title V-510 Abstin. Funding	Mand Sexuality Educ	Sex Educ must cover contra-ception
Alabama	1997	-	1986	1987	-	2000[+]	-	1999	-	1998	2001
Alaska	1998	-	-	-	-	-	-	2000	2008	2001	-
Arizona	1996	1996	1986	-	-	-	1995	1999	-	-	-
Arkansas	1995	1995	1986	1989	2001	1997	-	1999	-	1998	-
California	1993	1998	-	-	-	1997	-	1999	1998	-	2001
Colorado	1998	1998	1986	1998	-	-	-	1999	2008	-	2007
Connecticut	1996	1996	-	-	-	-	-	1999	2006	-	-
Delaware	1996	1996	1986	1995	-	-	1996	2000	2008	1998	2001
District of Columbia	1998	--	1991	-	-	-	-	1999	1999	1998	2003
Florida	1997	1997	1986	2005	-	-	1998	1999	-	2001	-
Georgia	1994	1994	1986	1991	2005	-	-	1999	-	1998	-
Hawaii	1998	--	-	-	-	-	-	2001	-	1998	2001
Idaho	1998	1998	1986	2001	1995	-	-	1998	2008	-	-
Illinois*	1994	1996/ 2004	1986	-	-	2004[+]	2004	1999	-	1998	2004
Indiana	1996	1996	1986	1986	1997	-	-	1998	-	-	-
Iowa	1994	-	1986	1996	-	2006	-	1999	-	1998	-
Kansas	1997	-	1986	1992	1992	-	-	1999	-	1998	-
Kentucky	1997	-	1986	1994	2000	-	-	1999	-	2001	-
Louisiana	1997	-	1986	1986	1995	2006[+]	-	1999	-	-	-
Maine	1997	-	1986	1989	-	-	-	1999	2005	2001	2002
Maryland	1997	1997	1991	1992	-	-	1995	1999	-	1998	2001
Massachusetts	1996	1996	-	1986	-	-	-	1998	2008	-	-
Michigan	1993	-	1989	1991	1999	2006[+]	-	1999	-	-	-
Minnesota	1998	2003	1986	1986	-	2006	-	1999	2008	1998	-

Mississippi	1996	1996	1986	1993	1992	2003	-	1999	-	-	-
Missouri	1996	-	1986	1986	1986	-	1999	1999	-	-	2001
Montana	1997	-	1986	-	-	-	-	1999	2007	2006	-
Nebraska	1996	1996	1986	1991	1993	-	-	1999	-	-	-
Nevada	1997	-	1986	-	-	-	-	1999	-	1998	-
New Hampshire	1997	-	1986	-	-	-	-	1999	1998	-	-
New Jersey	1993	1993	-	-	-	-	-	1999	2007	1998	2001
New Mexico	1998	1998	1986	-	-	1998+	-	2000	2008	-	-
New York	1998	-	-	-	-	2002	2002	1999	2008	-	-
North Carolina	1997	1997	1996	1995	-	2005+	-	1999	-	1998	-
North Dakota	1998	1998	1986	1986	1994	-	-	1999	-	-	-
Ohio	1997	-	1986	1986	1994	-	-	1998	2008	-	-
Oklahoma	1997	1997	1986	2001	2005	2005+	-	1998	-	-	-
Oregon	1994	-	-	-	-	1999	-	1999	-	2008	2001
Pennsylvania	1998	-	1986	1994	1994	2007	-	1999	2004	-	-
Rhode Island	1998	-	1986	1986	-	-	1994	1998	2007	1998	2001
South Carolina	1997	1997	1986	1990	1995	1994	1994	1998	-	1998	2001
South Dakota	1995	-	1986	1997	1994	-	-	1999	-	-	-
Tennessee	1997	1997	1986	1995	-	-	-	1998	2008	1998	-
Texas	1997	-	1986	1999	2003	-	-	1999	-	-	-
Utah	1993	-	1986	1986	1994	-	-	1999	-	1998	-
Vermont	1995	-	-	-	-	-	-	1999	2007	1998	2001
Virginia	1996	1996	1986	1997	2001	2002	2002	1999	2008	-	2001
Washington	1996	-	-	-	-	2001	-	2001	2008	-	2006
West Virginia	1997	-	-	1986	-	-	-	1999	-	1998	2001
Wisconsin	1996	1996	1986	1986	1997	2003	-	2000	2007	-	-
Wyoming	1997	1997	1986	1989	-	-	-	2000	2007	2001	-

Notes:

+ State Medicaid family planning waiver specifically excluded teenagers.

* Illinois repealed its family cap policy in 2004