

The Impact of Legalized Abortion on Adolescent Childbearing in New York City

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Abstract: In this paper we estimate the impact on adolescent childbearing of the liberalization of the New York State abortion law in 1970. Using Box-Jenkins time series techniques to analyze monthly data on the number of births to White and Black adolescents from January 1963 to December 1987, we found that the level of births to Black adolescents living in New York City fell 18.7 percent, approximately 142 fewer births per month, after the law became

effective; the level of White births fell 14.1 percent, approximately 111 fewer births per month. Projections based on the fitted model suggest that a ban on legalized abortion today would have a major impact on adolescent childbearing in New York City as well as other parts of the country, although the magnitude of the change would vary according to local conditions. (*Am J Public Health* 1990; 80:273-278.)

Introduction

There has been great speculation in the popular press whether the US Supreme Court will overturn the 1973 decision in *Roe versus Wade*, the case which legalized abortion across the United States. A likely outcome of such a reversal is that the authority to regulate abortion will be given to individual states. To understand how a dramatic shift in the availability of legalized abortion might affect adolescent childbearing, we examined the changes in the number of births to New York City teenagers following the 1970 New York State law which liberalized abortion. It is our contention that the decline in teenage childbearing between 1970 and 1971 is a good approximation, in reverse, to what would occur today if legalized abortion were no longer available.

A number of studies have noted the decline in births after the New York State Law which liberalized abortion became effective.¹⁻³ However, the results in each of the studies were based on annual changes over a very short time span. Such unrefined estimates provide only a crude understanding of what might occur if the legalization of abortion were reversed. Pooled time-series, cross-sectional studies have examined the effect of liberalized abortion laws on annual, age-specific fertility rates within and across states.⁴⁻⁶ The findings suggest that the legalization of abortion had an important impact on fertility rates. Again, the variation over time was limited to at most seven years.

Our study differs substantially in that it is a time-series analysis with monthly data that spans 25 years. The large number of observations allows for a more sophisticated means of fitting the data. In particular, we used Box-Jenkins methods to determine the magnitude and statistical significance of the change in adolescent childbearing that followed the liberalization of abortion in New York City in 1970. Based on the fitted model, we estimate the number of unintended births that were averted due to the widespread availability of legalized abortion. The estimates shed light on the changes in adolescent childbearing that would occur if legal abortions were to become unavailable to New York City residents.

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Methods

Data

Monthly figures on the number of Black and White live births to New York City residents less than 20 years of age are from vital statistics maintained by the New York City Department of Health. Each year of individual birth records has been aggregated by month for Blacks and Whites separately. The number of birth records with unknown age in any one year was less than .03 percent; those records were deleted from the aggregation. The final series consisted of 300 monthly observations for Whites and Blacks from January 1963 to December 1987. Plots of the race-specific series are shown in Figures 1 and 2.

The analysis was limited to Whites and Blacks because ethnicity was not identified on New York City birth certificates until 1978. However, a substantial proportion of the adolescents who are White are of Hispanic origin or descent. Data from the 1970 Census indicate that 13.4 percent of all women 15 to 19 years of age were of Puerto Rican descent.⁷ The number of other Hispanic adolescents in 1970 is not known. By 1980 17.0 percent of adolescents 15 to 19 years of age were Puerto Ricans, while the total proportion of all Hispanic adolescents of the same age stood at 25.9 percent. Moreover, in 1984, the first year in which data on births to Hispanic women were published, 75 percent of the White adolescents who gave birth were of Hispanic origin.⁸

The number of births as opposed to birth rates were analyzed because monthly population figures for New York City were unavailable over the period under study. Census data could have been used to estimate monthly population figures between the census years, but such crude estimates would have introduced measurement error. Furthermore, month-to-month changes in the population are minor compared to the 10 to 20 percent drop in the number of adolescent births that were observed between 1970 and 1971.

Statistical Analysis

Two approaches were used to measure the impact of the 1970 legislation on adolescent childbearing. Both approaches used Box-Jenkins time-series analysis.⁹ The first approach fitted an autoregressive integrated moving average (ARIMA) model to the pre-legislation data (January 1963-June 1970). Based on the fitted model, we projected the number of adolescent births that would have been expected after July 1970 had abortion not become legal. The difference between the projected births and the actual births is one estimate of the number of births that were averted by the liberalization of abortion.

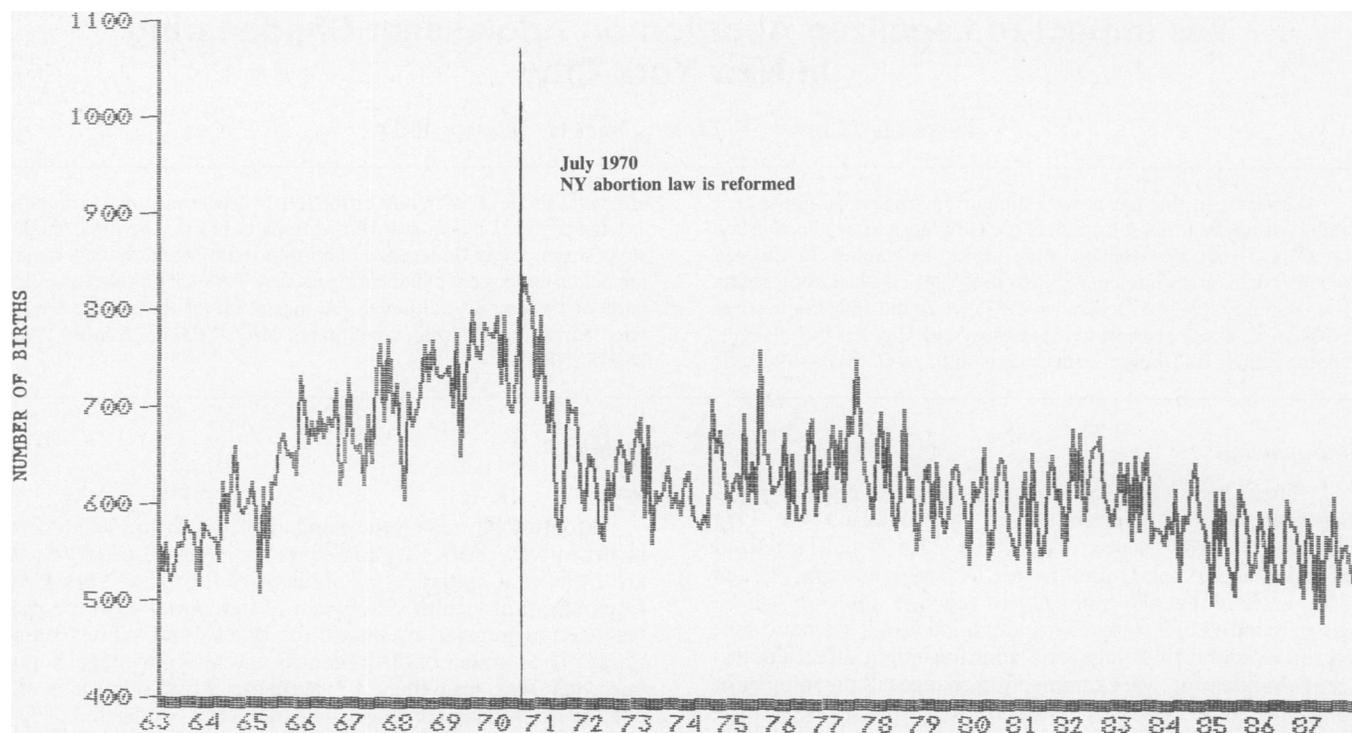


FIGURE 1—Monthly Number of Births to Black Adolescents Living in New York City, January 1963–December 1987

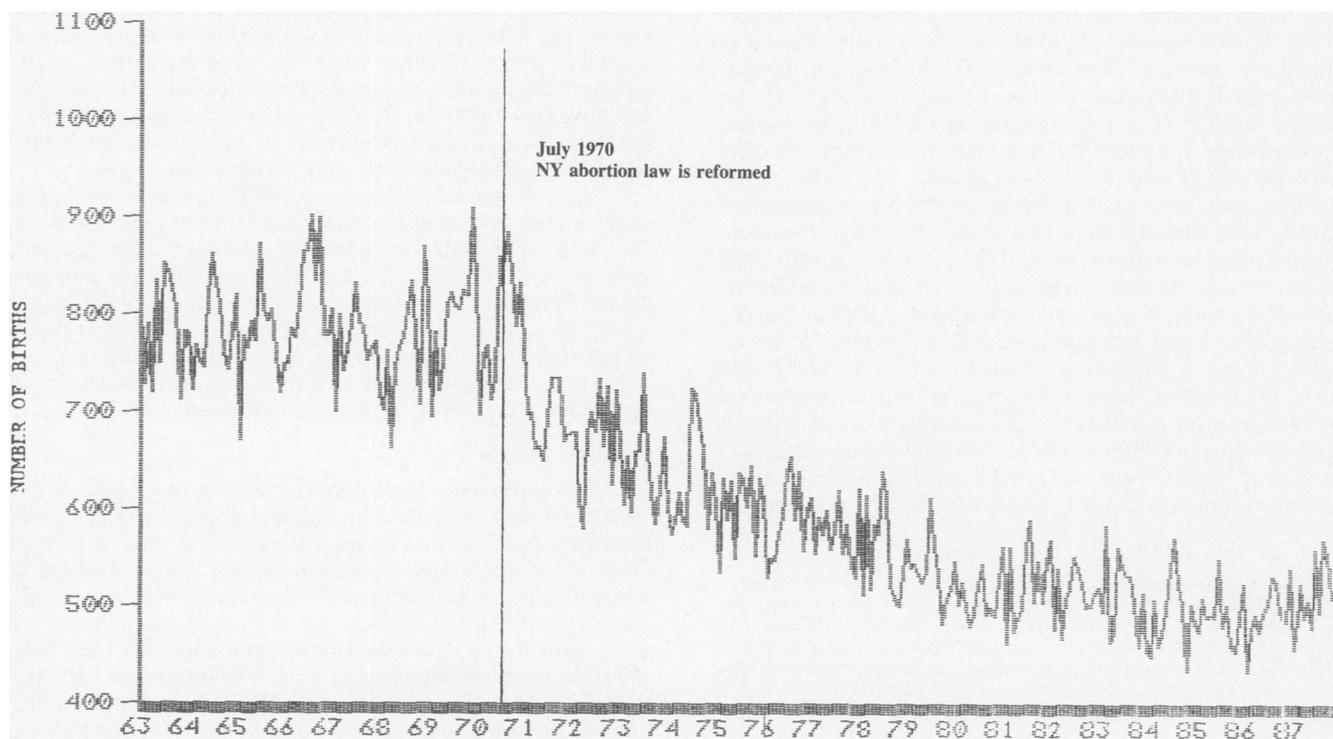


FIGURE 2—Monthly Number of Births to White Adolescents Living in New York City, January 1963–December 1987

The second approach used intervention analysis, an extension of the Box-Jenkins methodology, with the entire data set (January 1963–December 1987).^{10,11} The coefficient of the intervention component measures the change in the monthly level of births between the pre- and post-intervention series. The advantage of the intervention analysis is that it is a straightforward means of determining whether the change in the series was statistically significant. Another advantage is that the magnitude of the change is based on a fitted model from observed data over the entire range of the series. The first approach is based on projections generated by the pre-intervention data only. The advantage of the first approach is that if the data were trending prior to the intervention, then the projections would incorporate the trend. The implications of the differences between the two approaches are discussed below.

To successfully apply intervention analysis, it is necessary to know the starting point of the event as well as the general shape of the response of the series to the event. The hypothesis maintained in this study is that the 1970 New York State Law which liberalized abortion had an important impact on the number of adolescent pregnancies that resulted in live births. The law became effective on July 1, 1970. However, because the law did not apply to pregnancies greater than 24 weeks, the effect of the law on the number of live births would not be observed for at least 16 to 20 weeks later. Thus, November 1970 became the starting point of the intervention. Furthermore, the full impact of the law on births to adolescents would not be realized until April 1971 when the pregnancies of the first cohort of adolescents who conceived on or after July 1, 1970 reached term. Consequently, the intervention variable was specified in such a manner that the law's impact on the number of adolescent births increased gradually from November 1970 through April 1971.

The rate at which the law's impact grew between November and April was based on the distribution of abortions by gestational age to New York City residents the first year the law was in effect. For example, 6.1 percent of all abortions to New York City residents were to women whose pregnancies were beyond the twentieth week.² Assuming the distribution of abortion by gestational age was the same for every month in the first year, the proportion of the law's full impact that would be felt in November was .061. Thirty percent of all abortions performed in the first year were to women whose pregnancies were between 13 and 20 weeks gestation. We assumed that 15 percent were performed between 13 and 16 weeks gestation, and the other 15 percent were performed between 17 and 20 weeks gestation. Thus, in December, the proportion of the law's full impact would be .216. This accounts for the 6.1 percent of the women who aborted in August 1970 whose pregnancies were greater than 20 weeks gestation and for the 15 percent of the abortions in July 1970 to women whose pregnancies were between 17 and 20 weeks gestation. Following this algorithm and noting that 64 percent of all abortions were performed in the first trimester, the figures for the remaining months were as follows: .361 in January, .574 in February, .785 in March, and 1.0 in April and all months thereafter.

Results

Figures 1 and 2 present the monthly number of births to Black and White New York City adolescents from January 1963 through December 1987. For Blacks, the reversal of a

seven-year upward trend between 1970 and 1971 is dramatic. In the case of Whites, a relatively stationary series up to 1970 falls substantially between 1970 and 1971 and then continues downward until approximately 1986. Both figures suggest a major alteration in adolescent childbearing that is coincident with New York State's liberalized abortion law which became effective July 1970.

The ARIMA specification for the pre-intervention series is presented in Table 1. The data are expressed as natural logarithms in order to control for non-stationarity in the variance. A first-order difference transformation was applied to the logarithms of births in order to remove any trend; a twelfth-order difference was used to eliminate seasonality. Based on the autocorrelation and partial autocorrelation functions of the transformed series, Black and White births can be characterized as a first-order moving average with a first-order seasonal moving average. The coefficients of the models are displayed in Table 1. The Q-statistics in Table 1 indicate that the residuals from the estimated models are "white noise" (random variation) processes.¹² Another approach for determining if the errors are "white noise" is to test whether the first difference of the residuals follows a first-order moving-average process with the moving-average parameter equal to 1, and the first autocorrelation equal to -.5. For both Blacks and Whites this was confirmed (results not shown).

Based on the fitted model in Table 1, we projected the number of race-specific adolescent births 24 months beyond June 1970. The projections assume that abortion was not liberalized. A comparison of the actual number of births to the projected number of births is presented in Figures 3 and 4. Subtracting the actual number of births from the projected number and summing over the 24 months indicate that 4,091 Black births and 3,128 White births were averted by the legalization of abortion over the initial two-year period under the law. Note these figures include the months immediately following the new law in which the change in adolescent childbearing was relatively minor. If one estimates the monthly number of averted births based on the first year over which the liberalization realized its full impact (April 1971 through March 1972) then 226 Black births and 178 White births were averted per month.

To more formally test whether the 1970 law liberalizing abortion may have caused the precipitous drop in adolescent births, we used all the data to re-estimate the ARIMA structure of each series. As outlined in the previous section, an additional variable was added to the specification to

TABLE 1—Estimated ARIMA Equations for NYC Births to Black and White Adolescents 1964–1970

| | θ_1 | θ_1 | $Q^*(24)$ | R^2 |
|---|----------------|----------------|--------------|-------|
| BLACKS | | | | |
| $B_t = -\theta_1 e_{t-1} - \theta_1 e_{t-12} + e_t$ | .735 (9.16) | .801 (9.24) | 15.01 .92 | .63 |
| WHITES | | | $Q(24)$ | R^2 |
| $W_t = -\theta_1 e_{t-1} - \theta_1 e_{t-12} + e_t$ | .772 (9.38) | .644 (5.70) | 19.41 .73 | .56 |

B_t and W_t are the natural logarithms of the Black and White births respectively. θ_1 and θ_1 are the coefficients and e_{t-1} is the error term. The numbers in parentheses are the t-ratios. ¹²The Ljung-Box Q statistic determines the randomness in autocorrelations of residual errors, and has a Chi-square distribution. The numbers below the Q-statistics are the marginal significance levels; i.e., the probabilities of the null hypothesis that the autocorrelations of the errors are not different from zero.

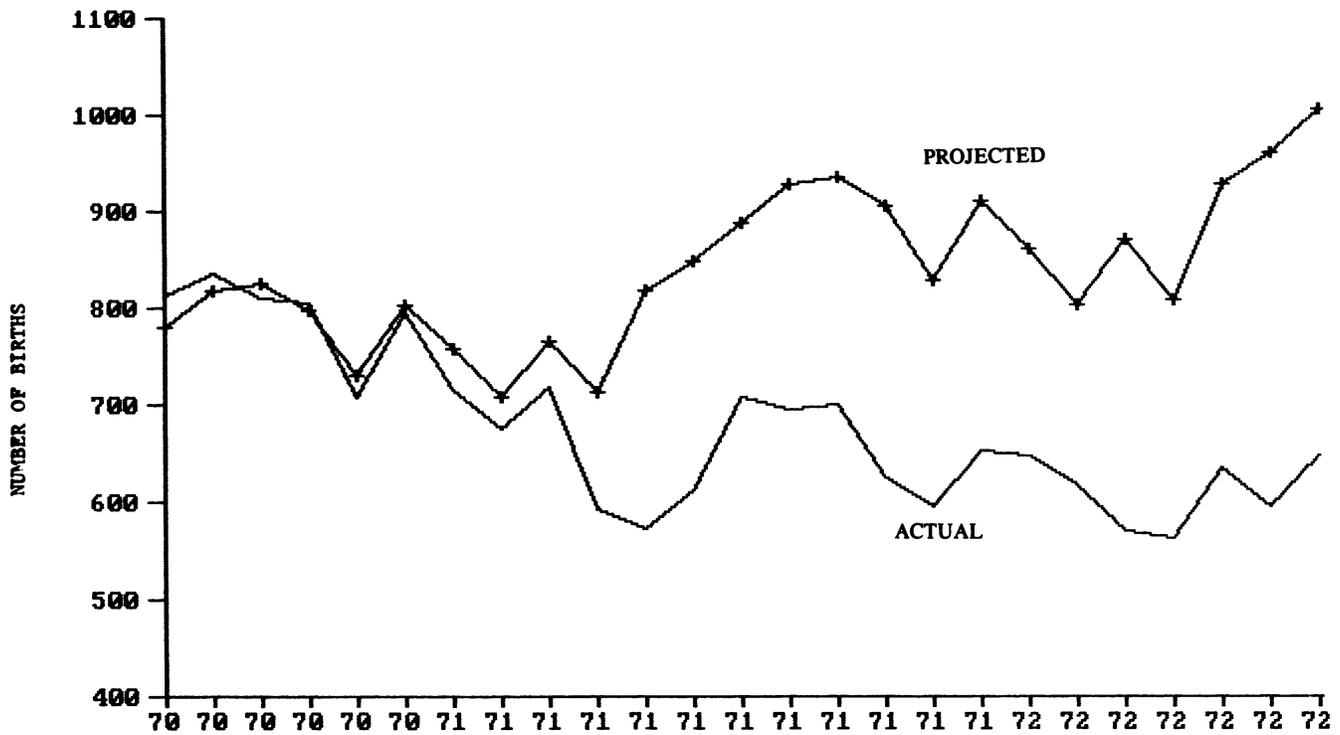


FIGURE 3—Monthly Number of Actual and Projected Births to Black Adolescents Living in New York City, July 1970–July 1972

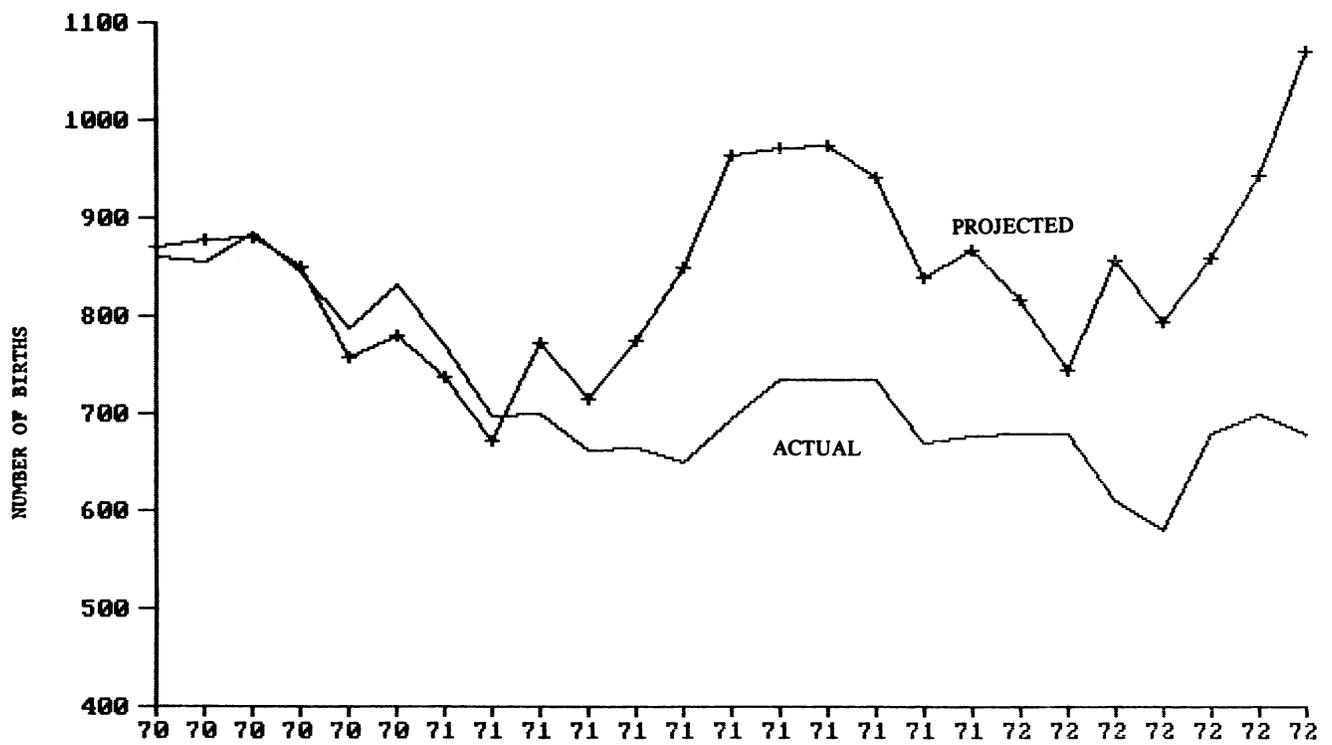


FIGURE 4—Monthly Number of Actual and Projected Births to White Adolescents Living in New York City, July 1970–July 1972

control for the impact of the law. The results are shown in Table 2. Except for the intervention component, the ARIMA structure is unchanged for Blacks. In the case of Whites, a second-order seasonal moving-average component improved the model's fit. The coefficient of the intervention variable, α , is statistically significant for Blacks and Whites. Thus, the data reveal that the decline in the level of births after October 1970 was a change that could not be explained by the normal variation in the series.

The magnitude of the change from the pre- to post-intervention level of the series can be obtained by exponentiating the coefficient on the intervention variable, α , and subtracting it from one. Expressed as a percentage, the level of Black adolescent births fell 18.7 percent after the liberalization of abortion in July 1970 (95% confidence interval = 25-12). White births fell 14.0 percent (95% CI = 20-8). If we use the average number of births over the 12 months prior to July 1970 as an estimate of the pre-intervention level of births, then 2,588 Black adolescent births and 1,998 White adolescent births were averted in the 24 months after July 1970. If the number of averted births is estimated over the first 12 months in which the law's full impact was realized (April 1971-March 1972), then 142 Black births and 111 White births were averted per month.

Discussion

Using monthly data on the number of White and Black births to New York City adolescents, we found that the liberalization of the New York State abortion law in 1970 had a substantial impact on adolescent childbearing. We also found that Blacks were more affected than Whites by the liberalization of abortion. The finding suggests that Whites may have had more access to illegal abortions than Blacks prior to the liberalization.

We used two approaches to estimate the number of births that were averted by the widespread availability of legalized abortion. We consider the estimates obtained from the intervention analysis to be conservative estimates for they do not take into account the upward trend in the number of births especially among Blacks prior to the 1970 liberalization (see Figure 1). The advantage of these estimates is that the level of births from which the changes are estimated is based on actual, as opposed to projected, data. The estimated number of averted births that were obtained by

subtracting the actual number of births from the projected number of births should be viewed with some caution. Although they incorporate underlying trends, the projections are based on only seven years of data.

Finally, it should be noted that the decline in births to adolescents in the two years after July 1970 would not necessarily lead to a decline in completed fertility if the teenagers having abortions simply delayed their childbearing until a later age. However, the evidence to date indicates that early childbearers have more children and more unwanted children than women who delay childbearing.¹³

The analysis was limited to New York City because of the special circumstances surrounding the liberalization of New York abortion laws in 1970. Prior to the change in 1970, pregnant adolescents had essentially no access to legal abortion. Although Hawaii, Alaska, and Washington State has laws similar to New York's by the end of 1970, each state had residency requirements. Consequently, the magnitude of the change in adolescent childbearing among New York City residents after the 1970 law became effective was not diminished by migration to other states. The same was not true for residents of other states after the passage of the New York State law. Between July 1970 and June 1971, 75.4 percent of the 33,964 abortions performed on adolescents in New York City were to out-of-state residents.²

To gain some insight into the impact on teenage childbearing if legal abortion were unavailable to New York City residents, we applied the coefficients on the intervention variable in Table 2 to the projected number of births in 1988 and 1989. We adjusted for the gradual impact of a ban by the gestational age distribution of abortions prevailing today. If legal abortion were banned January 1, 1988 there would have been 2,618 (18.7 percent) additional Black births and 1,223 (14.0 percent) White births to New York City adolescents in 1988 and 1989 above what would have been expected had the laws regarding abortion remained unchanged.*

The projections are based on a number of assumptions that should be made explicit. First, we assume that the reversal of *Roe versus Wade* would result in a nationwide ban of legalized abortion. Although such an outcome is unlikely, the projections remain instructive because they provide upper-bound estimates based on the most restrictive scenario possible. This scenario cannot be dismissed lightly given that President George Bush, US Attorney General Richard Thornburgh, and Health and Human Services Secretary Louis Sullivan have publicly stated their opposition to *Roe versus Wade*.

A more likely scenario if *Roe versus Wade* were overturned is that New York State will continue to permit legalized abortion. New York is one of only 13 states plus the District of Columbia that currently funds abortions to Medicaid-eligible women and one of only eight states that does so voluntarily.¹⁴ Nevertheless, New York's 1970 law passed the State Senate by five votes and the State Assembly by only one. The debate in both houses was tumultuous.¹⁵

A second assumption upon which the projections are based is that the use of abortion by adolescents in the early 1970s is unchanged. In fact, the percentage of pregnancies (live births plus induced abortions) terminated by induced abortion has risen from 40.2 percent for Whites and 47.1

TABLE 2—Estimated ARIMA Equations for NYC Births to Black and White Adolescents with the Intervention Component 1964-1987

| BLACKS $B_t = -\theta_1 e_{t-1} - 0_1 e_{t-12} + e_t + \alpha I_t$ | | | | | |
|---|-----------------|------------------|---------------------|----------------|----------------|
| θ_1 | 0_1 | α | Q ^a (48) | R ² | |
| .776 (20.68) | .838 (24.87) | -.207 (-5.32) | 34.20 .93 | .64 | |
| WHITES $W_t = -\theta_1 e_{t-1} - 0_1 e_{t-12} - 0_2 e_{t-24} + e_t + \alpha I_t$ | | | | | |
| θ_1 | 0_1 | 0_2 | α | Q(48) | R ² |
| .824 (23.94) | .740 (12.04) | .122 (1.95) | -.150 (-4.10) | 42.16 .71 | .61 |

B_t and W_t are the natural logarithms of the Black and White births respectively. θ_1 and 0_1 are the coefficients and e_{t-1} is the error term. I_t is the dummy variable for the intervention; α is its coefficient. The numbers in the parentheses are the t-ratios.

^aThe Ljung-Box Q statistic determines the randomness in autocorrelations of residual errors, and has a Chi-square distribution.¹² The numbers below the Q-statistics are the marginal significance levels; i.e., the probabilities of the null hypothesis that the autocorrelations of the errors are not different from zero.

*A detailed description of how the projections were obtained is reported in the National Bureau of Economic Research Working Paper No. 3002 by the authors.

percent for Blacks in 1972 to 54.8 and 59.2 percent, respectively, in 1986.** In this respect, our projections may underestimate the impact of a ban on legalized abortion.

One explanation for the increased use of abortion by adolescents is that the availability of abortion has engendered less effective contraceptive behavior; the more extreme version is that abortion has served as an alternative method of fertility control. Thus, if abortion were banned, the pregnancy rate may fall because of better contraceptive behavior. There is no evidence to support either explanation. A 1982 survey reported that only 0.4 percent of women at risk of an unintended pregnancy but using no contraception admitted doing so because they relied on abortion.¹⁶ And although little is known about the relationship between abortion availability and the effective use of contraceptives, a teenager who aborted a pregnancy was less likely to become pregnant again over the next 24 months than was a comparable adolescent who carried her first pregnancy to term.¹⁷

As noted above, the proportion of births to White adolescents of Hispanic descent is substantial. Based on the little data that exists, Hispanic adolescents are more sexually active than their White counterparts who are not Hispanic. At the same time, Hispanic adolescents are more likely to be married and less likely to abort.^{18,19} To the extent these tendencies offset each other, the proportion of Hispanics adolescents at risk of an unintended pregnancy may be similar to that of other Whites.

There is a voluminous literature on the social and economic consequences of adolescent childbearing. As the most recent and comprehensive review makes clear, adolescents who become parents will complete less schooling, have lower wages, experience greater marital instability, and be more dependent on welfare programs than their adolescent peers who delay childbearing.^{13,18} Moreover, the children of teenage mothers will experience greater health, cognitive, and socioemotional difficulties.

Nor would a ban on legalized abortion be costless to taxpayers. In 1986, 64.6 percent of all adolescent births in New York City were funded by Medicaid.²⁰ Assuming Medicaid eligibility is a good proxy for AFDC (aid to families with dependent children) eligibility, then applying this proportion to the number of unintended births reported above indicates that 790 White and 1,691 Black teenage mothers and their children will receive AFDC in the two years after the ban. Based on the methodology described by Burt,²¹ the present discounted cost in terms of Medicaid, AFDC, and food stamps of supporting a family headed by a teenager over a 20 year period is \$5,560 in 1985 dollars above what it would have cost to support the same teenager and her family had she delayed childbearing until after she was 20 years of age.²¹ Thus, the total marginal costs of supporting the 790 White and 1,691 Black births described above would be \$13.8 million.

The percentage changes in adolescent childbearing among Whites and Blacks following a prohibition of legal abortion are clearly speculative and cannot be applied to other parts of the country because the projections are based

on a set of circumstances specific to New York City in 1970. However, the number of unintended pregnancies among US adolescents strongly suggests that areas in which legal abortion is prohibited will experience substantial increases in the number of births to teenagers. The magnitude of the change will vary by area because of differences in the use of abortion prior to a ban, the proximity to areas where abortion remains legal, and the availability of illegal abortions.

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**The figures are based on data provided by the New York City Department of Health.