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Decreased births among black female adolescents following school desegregation

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ABSTRACT

Although the socioeconomic impact of school desegregation in the U.S. has been well documented, little is known about the health consequences of this policy. The purpose of this study was to quantify the associations between school desegregation and adolescent births among black and white females. We compared the change in prevalence of adolescent births in areas that implemented school desegregation plans in the 1970s with areas that implemented school desegregation plans in other decades, using difference-in-difference methods with 1970 and 1980 Census microdata. School desegregation policy in the U.S. in the 1970s was associated with a significant reduction of 3.2 percentage points in the prevalence of births among black female adolescents between 1970 and 1980. This association was specific to black female adolescents and was not observed among white adolescents.

Introduction

The landmark Brown vs. Board of Education (1954) case declared segregated schools unconstitutional, initiating a series of court cases and desegregation plans in school districts throughout the United States. The implementation of school desegregation was associated with increased access to educational resources, increased achievement on standardized tests, and decreased high school dropout rates among black students (Boozer, Krueger, & Wolkon, 1992; Crain & Mahard, 1982; Guryan, 2004). Yet, despite extensive research on the social and economic consequences of school desegregation policy, its health consequences have not been widely examined.

School desegregation instigated major changes in the academic environment, such as increased school funding (Reber, 2007); it altered the educational experience for black students via increased interracial contact (Clotfelter, 2004), as well as improving their overall educational opportunities. Such changes may have, in turn, led to changes in students' health norms and behaviors. The purpose of this study was to examine whether school desegregation was associated with any changes in teen pregnancy.

Adolescent pregnancy is a serious public health concern associated with multiple adverse outcomes for both mother and child, including premature birth, neonatal mortality, and lower rates of secondary school completion for the mothers (Chen et al., 2007; Fergusson & Woodward, 1999; Fraser, Brockert, & Ward, 1995). Racial disparities in teenage pregnancy have persisted in the U.S.; among 15–19 year-olds, the pregnancy rate for black females is more than two times higher than for white females (Hamilton, Martin, & Ventura, 2010). Individual-level factors cannot fully account for these differences (Browning, Leventhal, & Brooks-Gunn, 2004; Fortenberry, 1998). Emerging research suggests that social conditions and larger contextual factors may influence teen pregnancy rates, even if they do not seem directly related to sexual behavior (Santelli & Melnikas, 2010). For example, increased school ethos (Bonell, Fletcher, & McCambridge, 2007) and increased school engagement are associated with decreased pregnancy rates (Kirby, 2002). A separate study reported an association between high social capital and low teenage pregnancy rates (Crosby & Holtgrave, 2006). Moreover, adolescent birth rates for socially disadvantaged groups may be especially sensitive to macro-level, upstream factors such as socioeconomic and educational opportunity and adolescent pregnancy. A previous study found that higher employment rates in the 1990s were associated with declining birth rates among black women aged 15–24, but were not related to birth rates among white women of similar ages (Colen, Geronimus, & Phipps, 2006).

This paper quantified the effect of school desegregation on black and white adolescent females. We hypothesized that school desegregation between 1970 and 1980 led to decreases in adolescent births for black females who resided in school districts that desegregated during this time period.

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Methods

Sample

To compare the prevalence of adolescent births in 1970 and 1980 according to whether or not the area desegregated in the 1970s, we merged historical information on the timing of desegregation from 125 school districts with information on adolescent births from Census microdata. The Census microdata used in this study consisted of the 1970 one-percent Metro sample, the 1980 one-percent Metro sample, and the 1980 five-percent State Census Integrated Public Use Microdata Series (IPUMS) sample (Ruggles et al., 2009). These Census micro-samples have detailed information for a national random sample of the US population for that year. The 1970 1% metro sample and the 1980 1% metro sample is a 1 in 100 national random sample of the US population for the respective year. The smallest identifiable geographic units in the 1970 1% metro sample are metropolitan areas, county groups or combination of counties of at least 250,000 population. For the 1980 1% metro sample, the smallest identifiable geographic unit is the county group, which can be any combination of counties or portions of counties of at least 100,000 population. Questions regarding parity history were not included in the "short-form" of the decennial Census given to everyone in the population, so we relied on data from the micro-samples. In the Census microdata, all females 15 years and older report their number of live births, regardless of whether or not the children were still living. By restricting our sample to women 15–19 years old, we were able to ensure that all women who reported having had a birth were adolescent mothers. We assumed the respondent attended a school district within her county of residence. School assignment may be based on a variety of factors including place of residence, parental preferences, local school capacity and, to some extent, family resources. However, the norm for students in the US at this time period was to attend local neighborhood schools. According to 1969 National Personal Transportation Survey, almost 70% of students between the ages of 5 and 18 years old in the US lived less than 3 miles from the school they attended (Beschen, 1972). Each person in our Census sample to a school district was matched using the consolidated county group of residence. The matching program was provided by Jon Guryan (2004).

Measures

The Census asked females 15 years and older to report their number of live births, regardless of whether or not the children were still living. We restricted our sample to women 15–19 years old, so that all women who reported having had a birth were adolescent mothers.

Historical information on school desegregation plans came from the Welch and Light (1987) report for the U.S. Commission on Civil Rights (Welch & Light, 1987). The 125 school districts in the Welch & Light sample were predominantly large and located in urban areas. From this sample, we matched 106 identifiable school districts with known desegregation dates to 101 county group areas from the Census IPUMS data. Because the consolidated county group of residence is a larger geographical unit than a school district, a county group can have several school districts. When this was the case, the earliest year reported was used ($n = 5$). Our final analytical sample consisted of 218,014 females 15–19 years of age from the 1970 or 1980 Census IPUMS data who resided in 88 consolidated county groups.

Since our study compared the prevalence of adolescent births in 1970 and 1980, we considered black female adolescents residing in areas that implemented a school desegregation plan during this period (1970–1979) as "exposed" and black female adolescents residing in areas that desegregated in other decades as "unexposed" to desegregation during the 1970s. We hypothesized no changes in the prevalence of black adolescent births between 1970 and 1980 for areas that initiated school desegregation either in the 1960s (which would have already experienced any expected decrease in these pregnancies) or in the 1980s (where the impact of desegregation would not yet be evident).

Risk factors for teenage pregnancy operate on both the individual and community-level. Social disadvantage such as low educational level and low family socioeconomic status has been consistently shown to be associated with adolescent pregnancy (Harden, Brunton, Fletcher, & Oakley, 2009; Imamura et al., 2007). In addition, the birthrate among older teens is higher than younger teens (Singh & Darroch, 1999). Based on this evidence, we included the following individual-level sociodemographic characteristics: family income, education, age, and current marital status. Family income was logged to adjust for nonlinearity and adjusted to 1980 dollar value using the consumer price index (BLS, 2008). We also adjusted for the following area-level characteristics: 1) a binary variable to indicate whether or not the county group was in a state where adolescents had legal access to contraceptives in the 1970s to control for area-level social trends; 2) a binary variable to indicate whether the county group was in the South to control for larger regional trends; and 3) county-group-level fixed effects. According to historical records, adolescents residing in Alaska, Arkansas, California, Georgia, Idaho, Kentucky, Mississippi, Nevada, Oklahoma, and Utah (Goldin & Katz, 2002) had legal access to contraceptives, and according to Census convention, individuals residing in Delaware, Washington D.C., Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Alabama, Kentucky, Missouri, Tennessee, Arkansas, Louisiana, Oklahoma, and Texas were considered to be living in the South. Additionally, we included county-group fixed effects that focused only on within-area differences to help adjust for unobservable area-level characteristics. We tested interaction terms between the year of Census sample and the following variables: education, marital status, residence in the South, and residence in an area with legal access to contraceptives. These were omitted from the final models because the effect estimates associated with desegregation were similar in models with or without the interaction terms.

Analysis

We used difference-in-differences (DID) models, an econometric technique (Wooldridge, 2010), to compare the change in the prevalence for the "exposed" group with an "unexposed" group. In our study, the exposed group is adolescent females who reside in areas that desegregated during the 1970s. These young women are compared with adolescent females who live in the areas that desegregated during other time periods.

This research design assumes school desegregation does not influence area composition and that trends in birth rates were similar before desegregation occurred. To check this assumption, we compared population characteristics stratified by decade of desegregation and by Census year. We found that overall population characteristics of the desegregated and segregated areas (Table 1) and detailed comparisons by race did not change substantially between largely 1970 and 1980 (Electronic Appendices 1 and 2 available only with the online version of the paper). Additionally, we examined the race-specific birth rates for 15–19 year-olds from 1970 to 1986 for 55 counties and found similar trends in black and white adolescent birth rates in the years leading up to school desegregation (Electronic Appendix 3 available only with the online version of the paper).

Table 1
Means and percentage of selected sociodemographic variables by decade of desegregation and year of census, Census Integrated Public Use Microdata Series 1970–1980 data.[a]

Variables	Full sample	1970 Census data		1980 Census data	
		Desegregated 1970s	Desegregated other decades	Desegregated 1970s	Desegregated other decades
Age 15	20.0 (19.6, 20.3)	20.7 (20.2, 21.2)	21.7 (21.2, 22.2)	18.5 (18.2, 18.9)	19.3 (18.7, 20.0)
Age 16	20.0 (19.7, 20.2)	20.3 (19.9, 20.7)	20.0 (19.2, 20.8)	19.6 (19.3, 19.9)	20.1 (19.7, 20.4)
Age 17	19.9 (19.7, 20.2)	20.0 (19.5, 20.4)	20.3 (19.7, 20.9)	19.8 (19.5, 20.1)	19.9 (19.3, 20.5)
Age 18	20.0 (19.7, 20.3)	19.9 (19.5, 20.3)	19.4 (18.7, 20.2)	20.5 (20.1, 20.8)	19.8 (19.2, 20.3)
Age 19	20.1 (19.7, 20.5)	19.2 (18.6, 19.7)	18.6 (17.8, 19.4)	21.7 (21.2, 22.1)	20.9 (20.0, 21.9)
Resides in the South	36.8 (24.0, 49.5)	41.2 (25.3, 57.0)	23.5 (5.5, 41.4)	43.1 (27.2, 59.0)	24.6 (5.8, 43.3)
Married	8.9 (8.1, 9.8)	11.7 (10.6, 12.7)	8.8 (7.5, 10.1)	7.2 (6.3, 8.2)	5.3 (3.9, 6.7)
Mean family income (1980 dollars)	26317 (25399, 27235)	26615 (25505, 27725)	27731 (25602, 29860)	25294 (24346, 26241)	26213 (24658, 27768)
Attending public school	85.7 (83.8, 87.6)	85.5 (83.0, 88.0)	81.5 (77.4, 85.6)	87.4 (85.5, 89.2)	84.8 (82.0, 87.7)
Highest grade: 1–8	12.6 (11.6, 13.6)	13.2 (11.6, 14.8)	13.3 (11.6, 15.0)	12.1 (11.1, 13.1)	11.5 (10.5, 12.4)
Highest grade: 9–12	81.8 (81.0, 82.7)	81.7 (80.3, 83.0)	81.1 (79.4, 82.7)	82.2 (81.5, 82.9)	82.6 (81.6, 83.7)
Highest grade: >12	5.5 (5.1, 5.9)	5.1 (4.7, 5.6)	5.7 (5.1, 6.3)	5.7 (5.1, 6.4)	5.9 (5.2, 6.6)
Number of counties	88	64	24	64	24
N	218,041	44,452	18,197	109,874	45,518

[a] All variables except age and family income are dummy-coded. Weighted means and percentages are presented in the table below with 95% confidence intervals given in parentheses. Robust standard errors were used to account for clustering by districts. Percentage reported for attending public school is restricted to those who are currently in school.

Difference-in-differences (DID) analyses first compared adolescent births among black females in 1970 with those in 1980 in areas that desegregated during that decade. This difference was then compared with the corresponding change in areas that desegregated in decades other than the 70s. The statistical significance of the differences was calculated using the following linear regression model:

$$Y_{ist} = B_0 + B_1\ \text{CensusYear1980}_t + B_2\ \text{Desegregated1970}_s + B_3(\text{CensusYear1980}_t{}^*\text{Desegregated1970}_s) + e_{ist},$$

where Y_{ist} indicates whether the individual living in area s at time t reported ever having a child; CensusYear1980_t is an indicator set to 1 if the data was from the 1980 Census and 0 otherwise; $\text{Desegregated1970}_s$ is an indicator set to 1 if the individual resided in an area that desegregated in the 1970s and 0 otherwise; B_0 is the average proportion of 15–19 year-olds who gave birth for areas that did not desegregate in the 1970s; B_1 is the change in 1970 and 1980 in the proportion of adolescents who reported a history of childbirth for areas that did not desegregate in the 1970s; B_2 is the time-independent difference in the proportion of adolescents who reported a history of childbirth between the areas that desegregated in the 1970s and those that did not; B_3, the coefficient on the interaction term CensusYear1980_t * $\text{Desegregated1970}_s$, is the difference-in-difference estimate of the impact of desegregation on the prevalence of adolescent births.

We extended the model described above to a difference-in-difference-in-difference approach (DIDID) by including white adolescent females residing in the same area as an additional control group, with the goal of adjusting for any area-specific trends affecting both black and white adolescent birth rates. We anticipate that effects of desegregation on birth rates should have been specific to black adolescents, whereas other factors affecting trends in teen birth rates, e.g. contraceptive access, sexual mores, may have affected both black and white adolescents. Previous research on historical fertility rates for 15–19 year-old girls from 1925 through 1970 suggests similar time trends in adolescent births for both races (Mare, 1997), providing support for using white adolescents as a valuable comparison group. DIDID models therefore estimate the effect of desegregation on black adolescent childbirth prevalence by contrasting the estimated change from 1970 to 1980 in desegregating areas versus non-desegregating areas among black adolescents compared to white adolescents. The assumptions underlying these analyses are further discussed in detail in the conclusion.

Finally, subanalyses were conducted to examine whether the larger decreases in school desegregation were associated with larger decreases in black adolescent birth rates. The Welch and Light report includes the baseline school districts' dissimilarity index (DI) in 1968 and the change in the dissimilarity index in the year prior to implementation and the year after the implementation of area-specific school desegregation plans. The dissimilarity index is a measure of how evenly distributed black and white students are in the area: the larger the number, the more segregated the district. Under standard definitions, a baseline DI of 60 and above is considered high, a baseline DI between 30 and 60 is considered moderate, and a baseline DI below 30 is considered low amount segregation (Massey & Denton, 1993). Because the distribution of baseline DI in our sample was heavily skewed, we included an additional category we considered to be extreme baseline segregation, districts with a baseline DI of 80 and above. We used a median split for the change in dissimilarity index in areas that desegregated in the 1970s (greater than or equal to 15 categorized as a large decrease and less than 15 as a small decrease) before and after the implementation of school desegregation plans. We created a new variable combining the information on baseline dissimilarity and the pre-post change in dissimilarity. The categories of this variable were: extreme baseline-large decrease (e.g. baseline DI of 80 and above and a change in DI of 15 or more), high baseline-large decrease (baseline 60DI); high baseline-small decrease; moderate baseline-large decrease; moderate baseline-small decrease; low baseline-large decrease; and low baseline-small decrease. Standard errors for all models were adjusted for clustering at the county group level (Bertrand, Duflo, & Mullanianathan, 2004). All bivariate analyses were prepared using SAS (version 9.1, SAS Institute) and all regression models were prepared using Stata (version 9.2, StataCorp). The weight variable in models using IPUMS data was adjusted to account for combining multiple samples from the same year. For example, when analyzing the pooled data combining observations from the 5% sample with observations from the 1% sample, a 5/6 weight was applied to individuals in the 5% sample and a 1/6 weight was applied to individuals in the 1% sample. Results from unweighted models were similar to estimates from weighted models. The study was determined by the Harvard School of Public Health Institutional Review Board to be exempt from IRB review.

Results

Sixty-four districts in the sample implemented school desegregation plans during the period 1970–1979. Twenty-four districts implemented school desegregation plans in other decades (16 in the 1960s and 8 in the 1980s). The difference in teen birth rates between 1970 and 1980 varied by racial group and by the time of desegregation. At baseline in 1970, the prevalence of births among black female adolescents was 18.2% in areas that desegregated in the 1960s, compared to 21.4% in areas that desegregated in the 1970s and 20.8% in areas that desegregated in the 1980s. Between 1970 and 1980, the prevalence of births among black female adolescents was unchanged in areas that desegregated in the 1960s (18.2% vs. 18.5%) and decreased 2 percentage points for areas that desegregated in the 1980s (20.8 vs. 18.9%). In areas that desegregated in the 1970s, the prevalence of births among black female adolescents decreased approximately 4 percentage points between 1970 and 1980 (21.4% vs. 17.4%, Fig. 1). By comparison, births for white adolescent females decreased only 1 percentage point (6.5% vs. 4.9% in areas that desegregated in the 1960s, 6.8% vs. 5.6% in areas that desegregated in the 1970s, and 4.5% vs. 3.6% for areas that desegregated in the 1980s, Fig. 1).

Estimates from the regression models also suggest that a significant decrease in birth rates for black teenage girls is tied to the implementation of school desegregation, which was associated with a 3.2 percentage point (95% confidence limits (CL) = −5.3, −1.0 percentage points) decrease in the prevalence of births in the DID model. Among white female adolescents, school desegregation was not associated with any significant decrease in the prevalence of births. Estimates were consistent with the inclusion of area-level fixed effects (Models 3, Table 2) and the inclusion of white female adolescents as a control for any area-specific trend did not change the estimated decrease in black female adolescent births. According to the DIDID model, school desegregation was associated with a 3.2 percentage point (95% CL = −5.4, −1.0 percentage points, Model 1, Table 3) decrease in the prevalence of births among black female adolescents.

We conducted various subanalyses to address possible sources of bias. "White flight," where white students moved to other geographical areas that were not desegregated or transferred to private schools in response to desegregation in their district (Clotfelter, 2004), may have led to biased estimates if white adolescents who moved systematically differed from the individuals in our sample in their pregnancy risks. For example, if white adolescents who stayed were at higher risk of pregnancy, then the birth rates among white adolescents would be artificially higher post-desegregation. Therefore, comparing this change in white adolescent birth rates against the change in birth rates among black teenagers would lead to difference-in-difference-in-difference estimates that would underestimate the impact of school desegregation. Conversely, if white teenagers who stayed were at low risk of adolescent pregnancy, then the birth rates among white adolescents would be artificially lower post-desegregation and comparing this change against changes in birth rates among black teenagers would lead to an overestimate of the impact of school desegregation. To address whether our estimates may have been biased because individuals moved in response to desegregation, we re-ran our models in a sample restricted to individuals who reportedly did not move in the 5 years prior to the census. Desegregation was associated with a decrease in birth prevalence among black adolescents of approximately 2.8 percentage points in the subsample of individuals who were in this category (95% CL = −5.6, 0.0 percentage points, Table 3, Model 3). Secondly, our estimates may have been biased if some of the adolescents were unaffected by the implementation of school desegregation because they were attending private schools. For this reason, we re-ran our models in a sample restricted to females attending public schools and found that desegregation was associated with an estimated decrease of approximately 3.0 percentage points (95% CL = −5.8, −0.3 percentage points, Table 3, Model 4) among black females. In addition, there may have been bias due to unobservable area-level confounders such as social norms correlated with the timing of desegregation. For example, areas that desegregated earlier may have implemented more progressive social reforms that differentially affected the ratio of black–white teen births. To examine this potential bias, we stratified our analysis according to whether or not the state of residence offered legalized abortion prior to 1970 and found minimal differences in the estimated decrease in prevalence between these two samples: −2.5 percentage points for states with legalized abortion pre-1970 (95% CL = −6.2, 1.1 percentage points) vs. −2.7 percentage points for states with no legalized abortion before 1970 (95% CL = −5.3, −0.1 percentage points, Models 4–5, Table 3).

Moreover, additional analyses suggest that the baseline level of segregation coupled with the subsequent change in levels of school segregation may modify the association between desegregation and black adolescent birth rates. Large decreases in school

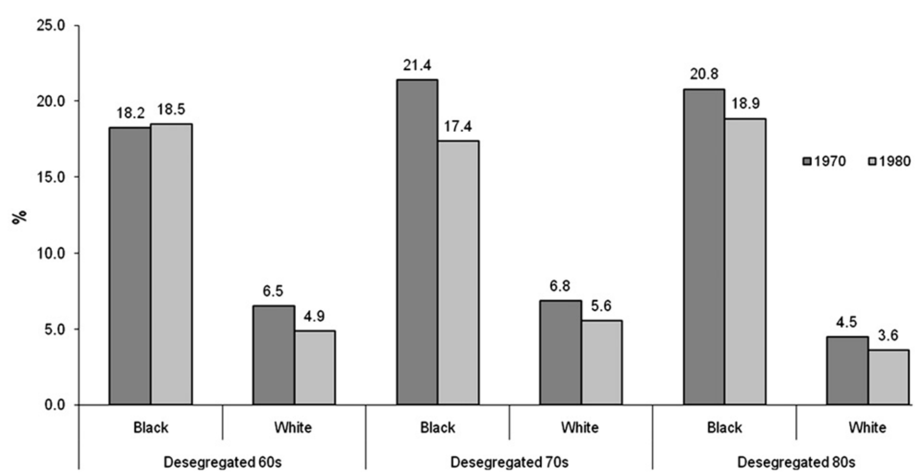

Fig. 1. Prevalence (%) with 95% CI of female adolescents 15–19 years old with births, by race and desegregation decade, Census Integrated Public Use Microdata Series 1970 & 1980 data.

Table 2
Difference-in-difference (DID) estimates for the association between school desegregation and adolescent birth rates by race, Census Integrated Public Use Microdata Series 1970 & 1980 data.[a]

	Black			White		
	(1) Unadjusted	(2) Adjusted	(3) Fixed effects	(1) Unadjusted	(2) Adjusted	(3) Fixed effects
DID estimate[b]	−0.031 (−0.055, −0.008)	−0.032 (−0.053, −0.010)	−0.028 (−0.051, −0.007)	−0.001 (−0.009, 0.006)	0.002 (−0.003, 0.008)	0.003 (−0.002, 0.008)
Desegregated 1970s[c]	0.018 (0.001, 0.036)	0.021 (0.002, 0.040)	–	0.015 (0.005, 0.025)	0.001 (−0.004, 0.005)	–
Census 1980[d]	−0.009 (−0.029, 0.011)	0.015 (−0.002, 0.033)	0.013 (−0.004, 0.031)	−0.011 (−0.017, −0.006)	−0.003 (−0.007, 0.001)	−0.004 (−0.007, 0.000)
R-squared	0.002	0.182	0.186	0.001	0.275	0.276
Degrees of freedom	3	13	10	3	13	10
Num. of observations	48,103	45,758	45,758	169,938	159,173	159,173
Num. of county areas	88	88	88	88	88	88

[a] Models 2–3 adjusted for age, log family income, marital status, current grade level, currently residing in the South, and residing in a state with contraceptive access for adolescents. Model 3 included fixed effects for county. All models included robust standard errors adjusted for clustering at the county level and were weighted using adjusted IPUMS sampling weights.
[b] The DID estimate is the change in the prevalence of female adolescents with children in areas that desegregated in the 1970s compared to the change in areas that desegregated in other decades adjusting for all other variables in the model.
[c] The coefficient for "Desegregated 1970s" is the difference in prevalence of adolescent births between areas that desegregated in the 1970s and areas that desegregated in other decades adjusting for all other variables in the model.
[d] The coefficient for "Census 1980" is the difference in the prevalence of adolescent births from 1970 to 1980 adjusting for all other variables in the model.

segregation in areas that desegregated in the 1970s with extremely high baseline segregation were not associated with any changes in black adolescent birth rates. Models where the exposed group was restricted to areas with a moderate baseline dissimilarity index and large decreases in dissimilarity index after the implementation of school desegregation plans had the largest decrease in black adolescent birth rates (Table 4).

Additional analyses stratified according to year desegregated suggest that the largest effect on black adolescent birth rates occurs soon after school desegregation is implemented (Electronic Appendix 4 available only with the online version of the paper.). No decrease in black adolescent birth rates was noted when the exposure group was restricted to areas that desegregated in 1970–1971. The effect estimates were generally largest for the areas that desegregated later in that decade (i.e. 1978–1979).

Discussion

To the best of our knowledge, this is the first study to examine the effect of school desegregation on teen births. The prevalence of births among black female adolescents decreased from 21% in 1970 to 17% in 1980 in desegregated areas. In other words, school desegregation during the 1970s was associated with a significant decrease of more than 3 percentage points for this group, although no statistically significant difference was noted in adolescent births among white females 15–19 years old. These estimates were robust to the inclusion of individual-level characteristics and state and district fixed effects.

Contextual conditions may influence how school desegregation relates to black adolescent birth rates. Results from the subanalyses where the exposed group was restricted to areas with an extreme baseline dissimilarity index and subsequently experienced large decreases in DI did not show any decrease in black adolescent birth rates associated with school desegregation. Large decreases in school desegregation in areas with extreme baseline segregation—including areas such as Little Rock, Arkansas and Mobile, Alabama—were often highly contentious. The social conflict related to desegregation may have had negative consequences that obscured or offset the potential benefits of integrated schools for black teens. Moreover, black adolescent birth rates may be most affected in the years immediately after the implementation of school desegregation, suggesting that there may be a decline in desegregation's impact over time.

Our study had several limitations. The difference-in-difference research design assumes that the timing of the desegregation is random or associated only with time-invariant characteristics. A previous study showed that areas that differed in year of desegregation experienced similar trends in median income and

Table 3
Difference-in-difference-in-difference (DIDID) estimates for the association between school desegregation and black-white difference in adolescent births, Census Integrated Public Use Microdata Series 1970 & 1980 data.[a]

	(1)	(2) Did not move in last 5 years	(3) In public schools	(4) Legalized abortion pre-1970	(5) No legalized abortion pre-1970
DIDID estimate[b]	−0.032 (−0.054, −0.010)	−0.028 (−0.056, 0.000)	−0.030 (−0.058, −0.003)	−0.025 (−0.061, 0.011)	−0.027 (−0.053, −0.001)
Desegregated 1970s	–	–	–	–	–
Census 1980[c]	−0.005 (−0.009, −0.002)	−0.006 (−0.011, −0.001)	−0.002 (−0.004, 0.001)	−0.005 (−0.011, 0.000)	−0.005 (−0.011, 0.000)
R-squared	0.249	0.234	0.097	0.247	0.251
Degrees of freedom	14	14	14	14	14
Num. of observations	204,931	142,732	114,909	78,641	126,290
Num. of county areas	88	88	88	34	54

[a] All models in Table 3 adjusted for race, age, log family income, marital status, current grade level, currently residing in the South, residing in a state with contraceptive access for adolescents, and were weighted using adjusted IPUMS sampling weights. In addition, all models in Table 3 included county-fixed effects and white female adolescents as an additional control adjusting for any area-specific trends. Robust standard errors adjusted for clustering at the county level.
[b] The DIDID estimate can be interpreted as the decrease in births among black female adolescents after adjusting for individual-level characteristics and any area-specific trends in adolescent births.
[c] The coefficient for "Census 1980" is the difference in the prevalence of adolescent births from 1970 to 1980, adjusting for all other variables in the model.

Table 4
Difference-in-difference-in-difference (DIDID) estimates for the association between school desegregation and adolescent birth rates among females 15–19 by dissimilarity index levels, Census Integrated Public Use Microdata Series 1970 & 1980 data.[h]

	(1) Extreme baseline DI – large decrease	(2) Extreme baseline DI – small decrease	(3) High baseline-large decrease	(4) High baseline-small decrease	(5) Moderate baseline-large decrease	(6) Moderate baseline-small decrease
DIDID estimate	0.001 (−0.027, 0.028)	−0.026 (−0.055, 0.003)	−0.045 (−0.098, 0.008)	−0.050 (−0.074, −0.027)	−0.077 (−0.142,-0.012)	−0.037 (−0.083, 0.010)
Desegregated 1970s	–	–	–	–	–	–
Census 1980	−0.005 (−0.009, −0.001)	−0.005 (−0.009, −0.001)	−0.005 (−0.009, −0.001)	−0.005 (−0.009, −0.001)	−0.005 (−0.009, −0.001)	−0.005 (−0.009, −0.001)
R-squared	0.250	0.249	0.251	0.249	0.248	0.254
Degrees of freedom	14	14	14	14	14	14
No. of obs	88,332	84,164	77,781	111,917	62,953	80,199
No. of county areas	40	32	33	41	27	35

[h] Areas with a baseline DI of 80 or greater which experienced a decrease in DI of 15 or more was classified as extreme baseline DI followed by a large decrease. Areas with a baseline DI of 80 or greater which experienced a decrease in DI of less than 15 was classified as extreme baseline DI followed by a small decrease. Areas with a baseline DI of 60 or more but less than 80 which experienced a decrease in DI of 15 or more was classified as high baseline DI followed by a large decrease. Areas with a baseline DI of 60 or more but less than 80 which experienced a decrease in DI of less than 15 was classified as high baseline DI followed by a small decrease. Areas with a baseline DI of less than 60 which experienced a decrease in DI of 15 or more was classified as moderate baseline DI followed by a large decrease. Areas with a baseline DI of less than 60 which experienced a decrease in DI of less than 15 was classified as moderate baseline DI followed by a small decrease.

fraction of residents employed in manufacturing between 1960 and 1970, supporting the assumption of random timing (Guryan, 2004). Additionally, we found little evidence of pre-existing trends for black or white adolescent birth rates pre and post-desegregation for 49 counties that desegregated after 1972 (results not shown). Second, there may be measurement errors in matching school districts to county and metropolitan areas. Although the consolidated county area was generally larger than the school district, the "amount" of geographic mismatch between the two varied. Furthermore, our study sample consisted of mostly large, urban school districts (Welch & Light, 1987). Since these may differ from others in several key characteristics (i.e., size of population, racial composition, etc.) our results may have limited generalizability. Moreover, there may be unmeasured area and population-level potential confounders that are not accounted for in our models and research design. The fixed-effect models in our study account for time-invariant, area-level factors and models with white adolescents as an additional comparison group (i.e. DIDID models) account for specific area-level trends that affect for both black and white adolescents. However, there may still be residual confounding because macro-level factors may differentially affect socially disadvantaged groups (Colen et al., 2006; Yang & Gaydos, 2010). Conceptually, it is possible that other time-variant, district-specific factors differentially affecting black female adolescents are responsible for the decrease in birth rates noted in our study. Finally, due to data limitations, we were unable to examine whether mean reversion—whereby the greater decrease noted in areas that desegregated in the 1970s compared to areas that desegregated in other decades—was due to an unusually higher prevalence at baseline. However, the proportion of black female adolescents who were teenage mothers residing in areas that desegregated in the 1970s was similar to the proportion in the areas that desegregated in the 1980 at baseline (21.4% vs. 20.8%, Fig. 1). This suggests that the timing of desegregation was not associated with earlier high adolescent-pregnancy rates.

It is important to recognize the complexity of factors that contribute to the black–white difference in adolescence births within the U.S. This study attempts to do so by analyzing school desegregation's relationship to the phenomenon. Further research is needed to better understand the mechanisms by which school desegregation leads to a decrease in adolescent births. Potential mechanisms of interest include changes in the physical school environment, higher levels of graduation rates, and a diverse socioeconomic mix in the student body associated with the implementation of such policies.

Since the 1990s, a series of court decisions releasing districts from desegregation orders may have contributed to the rise of resegregation in schools across the country (Orfield & Lee, 2007). The impact of school desegregation on a spectrum of outcomes should be fully explored to understand how this policy affected past and current generations. As the story of school segregation in the U.S. continues to unfold, we need to investigate the social impact of *Brown vs. Board of Education* (1954) in far more depth in order to apply lessons learned to solving the problems of the present and future. Opportunities to further reduce racial disparities in teen pregnancy may need to effectively address the underlying disparities in both macro-structural and community-level factors.

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Appendix. Supplementary material

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.socscimed.2011.12.029.

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