Department of Economics
Trinity College
Hartford, CT
06106 USA

http://www.trincoll.edu/depts/econ/

TRINITY COLLEGE DEPARTMENT OF ECONOMICS
WORKING PAPER 13-05

Getting a Sporting Chance: Title IX and the Intergenerational Transmission of Health

Lisa Schulkind

March 2013

Abstract

We know that healthier mothers tend to have healthier infants, but we do not know how much of that relationship reflects the intergenerational transmission of genetic attributes versus environmental influences. From a policy perspective, it is crucial to understand which environmental influences are important, and whether investments in one generation affect outcomes for the next. I use variation in the implementation of Title IX to measure the effects of increased athletic opportunities on the health of infants. Babies born to women with greater thletic opportunities as teenagers have babies that are healthier at birth. They are less likely to be born of low or very low birthweight, and have higher Apgar scores.

J.E.L. Codes: I12, J62
Keywords: Intergenerational Transmission, Infant Health, Title IX

1 Introduction

The link between mothers' health and that of their infants is well documented but not well understood. We know that healthier mothers tend to have healthier infants, but the question remains: to what extent does that relationship reflect the intergenerational transmission of genetic attributes versus environmental influences? And if environmental influences matter, which ones are important, and can investments in one generation affect outcomes for the next?

In this paper, I exploit a natural experiment provided by Title IX of the Education Amendments of 1972 to disentangle these forces, focusing on the causal impact of mothers' athletic opportunities on the health of their children. Prior to Title IX's implementation, athletic opportunities for girls were very limited. However, during the 1970's, mandated increases in these opportunities led to a five-fold increase in high school sports participation among girls. This paper builds on related work on Title IX, whose results help frame my findings: Kaestner & Xu (2010) find that cohorts of girls with access to more athletic opportunities have a lower probability of being overweight when evaluated as adolescents, and Kaestner & Xu (2006) find that these same cohorts are healthier as adults.

To what extent did this improvement translate to improvements in the next generation? We do know that health inputs during pregnancy matter.[1] However, this is the first paper to look at the causal effect of long-term maternal fitness and exercise on infant health. The research design uses variation in the implementation of Title IX to examine the effect of increased athletic opportunities on the health of infants born to the cohort of affected women. I employ an instrumental variables approach, which takes advantage of differences, across states, in the required increase in girls' athletic opportunities. I estimate the relationship between athletic opportunities and within state changes in infant health, comparing a cohort of women who completed high school before Title IX (born 1956-1960) and a cohort of women who benefited from the increased opportunities (born

[1] See, for example, Almond et al. (2011), Hoynes et al. (2011), Almond & Mazumder (2008), Almond (2006) and van Ewijk (2009)

1964-1968).

I find that maternal athletic participation is an important determinant of infant health, as measured in the Vital Statistics Natality Files. The infants born to women who had access to greater athletic opportunities as teenagers are healthier at birth. High school athletic participation rates for girls increased from 5% in 1970 to 24% by the end of the decade, and I find that an increase of this size results in a 6% decrease in low birthweight infants (<2500 grams) and an 8% decrease in the incidence of very low birthweight infants (<1500 grams). I find little evidence that increased education or a change in observed behavior during pregnancy is the primary driver. At the same time, I do find evidence that selection into motherhood is affected.

When examined separately, the magnitudes of the estimated infant health effects are smaller for white women, but larger for black women. This difference likely reflects the fact that the black adolescents who participated in athletics as a result of Title IX are more disadvantaged, and have more to gain, than their white counterparts. In fact, the disparity in family background between black and white athletes is even larger than for non-athletes.

2 Title IX and Relevant Literature

The Title IX legislation, part of the Education Amendments of 1972, banned discrimination on the basis of gender for any educational program or activity that receives federal aid. While the original law was passed in 1972, it was not until 1975 that provisions specifically prohibiting gender discrimination in athletics were passed (Curtis & Grant). Title IX did not apply only to athletics, but since this was a prominent area with large disparities and official segregation by gender, the legislation has become associated primarily with athletics.[2] Schools were given a three-year window, until the 1978-79 school year, to be in compliance. As shown in Figure 1, girls' participation rates in high school sports increased significantly during the 1970's, from 5% at the

[2] It is only very recently that Title IX is being applied in other settings, such as the sciences (http://www.nytimes.com/2008/07/15/science/15tier.html)

beginning of the decade to 24% by the end. At the same time, boys' participation rates remained relatively stable. [3]

Importantly, this increase in girls' participation rates varied across states, and the size of the increase is correlated with boys' participation rates prior to the passage of Title IX. While the actual rules for being in compliance with the legislation are quite complicated and somewhat vague, [4] Stevenson (2010) points out that attaining equal participation rates for boys and girls is a reasonable way to interpret the rules. In effect, the legislation mandated an increase in athletic opportunities for girls that was proportional to boys' participation in each school. Figure 2 shows the variation in boys' sports participation rates in 1971, prior to Title IX, and Figure 3 shows how this initial level of boys participation rates is related to the increases in girls' participation rates between the passage of Title IX and the deadline for compliance. States with higher pre-Title IX boys' sports participation rates experienced larger increases in opportunities for girls during the 1970s.

Females who graduated high school prior to 1972 had few athletic opportunities, but girls who were born after 1972 reaped the full benefit of the increased opportunities required by Title IX. Although older cohorts (especially those who entered high school after 1978) were able to take advantage of the increase in high school teams, girls who were born after the law was passed knew about the increased opportunities their entire lives. The opportunity to play on a varsity team in high school or college may have encouraged them to in invest in their athletic abilities at younger ages. In order to fully capture the effect of Title IX, the analysis would compare the pre-Title IX cohort (girls born prior to 1954) to the post-Title IX cohort (those born after 1972). However, there are data and estimation advantages to looking at cohorts that are closer together. While it will not capture the full effect of the increased opportunities, the main analysis for this paper will

[3]Note that while there is a drop in 1978-79 for both girls and boys, Kaestner & Xu (2010) investigate this drop in participation and conclude that it stems from changes in reporting, rather than changes in actual participation. In particular, a few states report drops in participation, for both genders, that are implausibly large. If it had been a case of schools dropping boys teams to add girls teams, we would not see a drop for both genders.

[4]Schools must meet any one of the "three prongs": (1) Providing athletic participation opportunities that are substantially proportionate to the student enrollment, (2) Demonstrate a continual expansion of athletic opportunities for the underrepresented sex, (3) Full and effective accommodation of the interest and ability of underrepresented sex.

compare a pre-Title IX cohort of women who were born in 1956-1960 and graduated high school prior to 1978, to a sample of women who were born in 1964-1968 and entered high school after 1978. Other cohorts that were born further apart and experienced larger differences in athletic opportunities are also examined in Section 9, but the results are qualitatively similar to the main results.

The estimation strategy for this paper takes advantage of the fact that the intensity of treatment varies according to the state where a girl attended high school. This is an artifact of the fact that boys' participation rates varied across states at the time Title IX was passed [5] and that states with high boys' participation rates were required to increase athletic opportunities by a lot, while states with low participation rates required a smaller increase in girls' participation to be in compliance. In the instrumental variables regressions, the size of the required increase in opportunities will be used to instrument for girls' participation rates.

There are a number of potential mechanisms through which we might expect the link between mothers' athletic participation and infant health to operate. First, we know that exercise is beneficial in many ways. Among other benefits, exercise improves body composition, reduces blood pressure and is associated with reduced stress, anxiety and depression. As a result of these benefits, regular exercise is important in the prevention of many chronic diseases and is associated with a reduced risk of premature death (Warburton et al. 2006).

Within the context of Title IX, Kaestner & Xu (2010) use the legislation as a natural experiment for looking at the link between athletic participation and girls' health. Specifically, they use a difference-in-differences analysis to look at changes in body mass index (BMI). They compare high school girls in 1971-75 with those in 1976-80 and use boys as a comparison group, as they were not directly affected by Title IX. [6] They find that in states that experienced a large increase in

[5] While compliance is measured at the school level, data on participation is available at the state level. While there may be schools in high participation states that do not have high participation rates, on average this will not be the case.

[6] It is important to note that opponents of Title IX often argue that the legislation gave increased opportunities to girls at the expense of boys' opportunities. However, as illustrated in Figure 1, at least over the time period studied, the boys high school athletic participation rate remained relatively flat.

athletic opportunities, the probability of being obese declined for adolescent girls. In other words, the states that needed larger increases in high school athletics in order to be in compliance with Title IX also saw an improvement in girls' body mass index (BMI).

Using a similar empirical design Kaestner & Xu (2006), investigate whether the health benefits associated with Title IX are persistent. They use a sample of adult women with a mean age of 39, and examine whether women who were more affected by Title IX as teenagers are healthier than their less affected counterparts as adults. Although the magnitudes of the effects are small, they do find that women who were more affected are less likely to be obese, have lower BMIs and are more likely to be physically active.

This is important for my study, because it suggests that the health benefits of athletic opportunities as a teenager persist throughout womens' childbearing years. That these healthier women are expected to give birth to healthier infants, is supported by a large body of medical literature which documents a strong correlation between maternal and infant health. However, most medical studies of this relationship are based on non-causal correlations, not on controlled experiments (Pivarnik 1998). In this paper, I provide causal estimates of the role of mothers' athletic participation in determining infant health, while keeping in mind that maternal fitness is not the only potential pathway for this link.

The economics literature has provided some causal evidence on the impact of prenatal health inputs by taking advantage of natural experiments where mothers were exposed to nutritional deprivation during pregnancy. They find that infant health suffers as a result. Stein A.D. (1995) look at the effects of the "Dutch Hunger Winter" on the birthweights of infants who were exposed to the famine in utero. They find that for infants whose mothers were exposed to the drastically reduced nutrition birthweights were significantly decreased. [7] Similarly, a number of studies find that babies born to mothers who fasted, while pregnant, during the Islamic holy month of Ramadan, had

[7]The Dutch Hunger Winter is a period of time during World War II, that was characterized by very small food rations in the Netherlands. During the winter of 1944-1945, rations per day were reduced rapidly, falling below 1,000 kcal per day.

lower birthweights and reduced gestational length. Most recently, Almond & Mazumder (2008) look at a sample of births to Muslim women in Michigan, and find that in utero exposure to fasting results in worse adult health, particularly for learning disabilities.

In addition, there are papers that examine the effect of exogenous income transfers during pregnancy, and find causal evidence that these transfers improve infant health. Almond et al. (2011) utilize variation in the timing of the rollout of the Food Stamp Program during the 1960s and 1970s, and find that the infants born to mothers who had access to the program during pregnancy were healthier at birth. Similarly, Hoynes et al. (2011) take advantage of the rollout of the Supplemental Program for Women Infants and Children, and find that the program increases average birthweight and decreases the number of low birthweight births.

A second potential channel through which Title IX may have affected birth outcomes is through its impact on mothers' educational attainment and income. Using an estimation strategy similar to the one in this paper, Stevenson (2010) examines the effect of women's athletic participation on educational attainment and labor market outcomes. She finds that a 10 percentage point increase in a state's female athletic participation rate leads to a 0.3% increase in the entire state's average schooling for females and a 1.5 percentage point increase in the female labor force participation rate. Furthermore, there is an extensive literature linking parental education and income with infants' health at birth. Evidence on the causal relationship is mixed, however. Currie & Moretti (2003) use the change in college availability in a girl's county at age 17 as an instrument for maternal education, and find that higher maternal educational attainment increases birthweight and gestational age. They also find that more educated women are less likely to become mothers. In contrast, McCrary & Royer (2011) use age-at-school-entry policies as an instrument for maternal education and they do not find substantial differences in infant health or selection into motherhood. In this paper, I find little evidence to suggest that the improved infant health is driven by maternal education.

3 Data

The sports participation data come from an annual survey published by the National Federation of State High School Associations (NFHS). The publication contains information, by state and gender, on the number of high school participants in each sport. Data exist for all academic years after the 1969-70 school year, except for 1970-71, 1974-75, and 1976-77. After Title IX, all states except for Iowa provided reports of female participation. For years where participation data are unavailable, participation is imputed. For years prior to the collection of data, girls' participation is set equal to what it was in the first available year: 1969-1970. For the three missing years in the 1970's participation is set equal to the average of the year on either side.

These NFHS data give a raw number of total participants,[8] but do not provide participation rates. In order to calculate participation rates, I divide the total number of participants by the population of 14-17 year olds in each state, year and gender.[9] The population data come from the National Cancer Institute's Survey of Epidemiology and End Results (SEER).

The data on infant health outcomes are obtained from the National Center for Health Statistics' Vital Statistics Natality Files (Natality Data). These data are constructed using birth certificate information from each state, and include detailed information about the birth and demographic characteristics of the mothers. The files contain a 50% sample of birth certificate data from all states prior to 1972, a mix of either a 50% or 100% sample between 1973 and 1985, and a 100% sample for all states after 1985. Important for this study, the data include information on the mother's state of birth and her age when giving birth. This information is used to calculate her year of birth, and to match her athletic opportunities to the appropriate year and state. I use the Natality files from 1970-2004. Files prior to 1970 and after 2004 are excluded because they do not include

[8]When interpreting the participation rates, it is important to note that the total number of participants counts each player on each team. For example, an individual who plays on three teams adds three to the total.

[9]Stevenson (2010) uses state level high school enrollment data from the National Center for Education Statistics to get an estimate of the number of high school students in each state, and the 5% Public Use Micro Sample of the 1990 census to estimate the gender division within the state in order to come up with enrollment, by gender for each state. I also try this method, but the results are very similar. Columns 5 and 6 of Table 9 show the main results using this alternative method of constructing the participation rates.

the mother's state of birth. The data also include information on early infant health outcomes, additional demographic information about the mother and information about the mothers' behavior during pregnancy. The infant mortality rates are constructed from linked birth/infant death data sets, that are also compiled by the National Center for Health Statistics and are available from 1983-1991 and from 1995-2002. For estimation, all data are collapsed down to a cell level, where the cell is defined by the mother's state and year of birth, mother's race, and mother's age, year and parity when giving birth.

Table 1 shows summary statistics for both the pre- and post- Title IX cohorts, women born 1956-1960 and 1964-1968, respectively. It is important to note that while there is considerable overlap in the years when the babies of these women are born, on average the post-Title IX cohort babies are born seven years later than those born to mothers in the pre-Title IX cohort. On its own, this is not a problem for my analysis because it includes birth year fixed effects. The only reason that birth year differences would lead to biased estimates of the impact of Title IX would be if state level trends in infant health vary in a way that is correlated with boys' levels of sports participation in 1971.

As a first look at this potential issue, which will be explored further in Section 6, Table 2 shows the relationship of the instrument to pre-Title IX trends of the main infant health outcome variables. Each row of the table shows the β coefficient estimated from Equation 1. Column 1 shows the coefficient from a regression that includes only white mothers, and column 2 includes only black mothers. I estimate the following equation:

$$\text{Outcome}_{sap,1969} - \text{Outcome}_{sap,1960} = \alpha + \beta \text{ BoysPart}_{s,1971} + \phi_s + \phi_a + \phi_p + \epsilon_{sap} \quad (1)$$

where $\text{BoysPart}_{s,1971}$ is the boys' sports participation rate for each state in 1971, and is scaled so that the estimated β indicates the effect of a 10 percentage point increase in boys participation rates. Each regression includes a full set of fixed effects for the mother's state of birth (ϕ_s) and her age (ϕ_a) and parity at child's birth (ϕ_p). The dependent variable is the difference between the average birth outcome for mothers who entered high school in 1969 and those who entered high school in 1960.[10] Ideally, all of the estimated coefficients would be statistically insignificant. This is the case for white mothers, but for black mothers who entered high school during the 1960s, changes in average birthweight and Apgar score are positively correlated with boys' pre-Title IX sports participation. This underscores the importance of estimating the main results separately by race, as it is harder to argue the exogeneity of the instrument for black mothers.

4 Estimation Strategy

In order to estimate the effect of an increase in athletic opportunities on infant health, I estimate the following equation, first for the full sample and then separately for white and black mothers:

$$\text{Outcome}_{bsrap} = \alpha + \beta \text{ SportPart*}_{sb} + \mathbf{X}_{bs} + \phi_b + \phi_s + \phi_r + \phi_a + \phi_p + \epsilon_{bsrap} \quad (2)$$

$$\text{SportPart*}_{sb} = \alpha + \gamma \text{ RequiredInc}_{sb} + \mathbf{X}_{bs} + \phi_b + \phi_s + \phi_r + \phi_a + \phi_p + \epsilon_{bsrap} \quad (3)$$

where SportPart_{sb} is the participation rate in state *s* for women who where born in year *b*, measured when they were 14 and entering high school. The estimated β indicates the effect of a 10 percentage point increase in participation rates. Outcome_{bsrap} is the average outcome for women born in year *b* in state *s* and of race *r*,[11] who gave birth at age *a* and at parity *p*.

We might be worried that increases in girls' athletic participation are endogenously related to changes in infant health. For that reason I estimate β using two stage least squares. The first stage of the two stage least squares analysis is equation 3, where the excluded exogenous regressor, RequiredInc_{sb}, is the the size of the increase needed in order to be in compliance with Title IX. For

[10] Infant mortality is not included, because the data start for babies born in 1983. This means that for mothers who entered high school in 1960, the data are only available for births when the mother is older than 37.

[11] Regressions include only white and black mothers.

the "pre" cohort, this is equal to zero, as there is no required increase in participation prior to Title IX. For the "post cohort" it equals the boys' participation rate in 1971 for that state.

All regressions include a full set of fixed effects for mother's year of birth ϕ_b (yob) , mother's state of birth ϕ_s (sb), mother's race ϕ_r, mother's age at (child's) birth ϕ_a, and parity ϕ_p.[12] Regressions which pool white and black mothers also include a set of black$\times$yob and black$\times$state fixed effects.

The state of birth fixed effects are particularly important, as they control for any time invariant differences between states. However, it is still important to control for state-specific variables in case there are changes over time that might be correlated with improvements in infant health.[13] $\mathbf{X}_{bs}$ is vector of economic variables measured at age 18, when the individual was graduating from high school and choosing to either enter the labor market or go to college. It includes the state unemployment rate and state per capita real income.[14] Standard errors are clustered by mother's state of birth and the regressions are weighted by the number of observations making up each cell.

The infant health outcomes examined are birthweight, Apgar score and the infant mortality rate. In addition to looking at average birthweight, I look at the probability of birthweight falling below what is considered a critical threshold. Equation 2 is estimated for low birthweight births per 1000 and very low birthweight births per 1000. Low birthweight is defined as less than 2500 grams, while very low birthweight is defined as less than 1500 grams. The five minute Apgar score comes from a test given five minutes after birth that quickly assesses the infant's health through activity, pulse, grimace (reflex irritability), appearance, and respiration. Each category is scored from 0-2, and the total score ranges from 0-10. The infant mortality rate is measured as the number of deaths within the first year, per 1000 births.

[12]The regression does not control separately for the year of the child's birth, since this is uniquely identified by the combination of mother's year of birth and mother's age at child's birth.

[13]As shown in the summary statistics included in the previous section, the post-Title IX group has children, on average, seven years later than the pre-Title IX cohort. For this reason, state-specific time trends are not included, as they would soak up a lot of the variation I am trying to measure.

[14]The state unemployment rate comes from the Bureau of Labor Statistics, and state per capita income comes from the Bureau of Labor Statistics. The state specific unemployment rate begins in 1976, so for years prior to that, unemployment is imputed using variation in the national unemployment rate.

5 Infant Health Results

Before presenting the main regression results, I first include a series of figures that show, for the outcome variables of interest, the correlation between the boys' participation rate in 1971 and the unconditional differences in means between the pre- and post-Title IX cohorts. This offers a visual representation of the patterns, though the figures do not control for any of the variables that we think are important to include in the full model.

Figures 4 - 8 show this relationship separately for births to white mothers and births to black mothers. In most cases, we see the expected patterns. Figure 4 shows that in states where boys' pre-Title IX sports participation rates were the highest, the increase in average birthweight between the pre and post cohorts is the largest. Similarly, Figure 5 shows that, on average, states with the largest increase in athletic opportunities experience the largest drops in the number of low birthweight babies per 1000 between the pre and post cohorts. Figure 6 shows the same relationship for the number of very low birthweight babies, at least for black babies. Figure 7 shows that there does not appear to be any affect on the infant mortality rate. Finally, Figure 8 shows a positive relationship between athletic opportunities and Apgar scores for white babies, but a negative one for black babies.

Next, I present the regression results. The first row of Table 3 shows the first stage results for the full sample, as well as the samples comprised of only white mothers and only black mothers. The estimated coefficient shows the estimated relationship between the required increase in girls' participation rates, and the actual increase. In all cases, the coefficient is statistically significant at the 1% level. The rest of Table 3 presents the results from estimating equation 2 for the infant health outcomes of interest. Each panel contains the regression results and summary statistics for the dependent variable listed in bold in the first row. Each column represents the results from a different regression, with the estimated coefficient on the girls' participation rate listed in the first row, and the estimated standard error in parenthesis below.

Columns (1)-(3) present the results from OLS regressions, while columns (4)-(6) show the results from two stage least squares regressions. In general, the estimated coefficients in columns (4)-(6) tell the same qualitative story as the OLS coefficients, but the point estimates are larger. This suggests that the local average treatment effect captured by this estimation is higher than the average effect. In other words, those girls who decide to play sports because of the exogenously increasing opportunities gain more than those who would have blazed the trail on their own.

I find evidence of a strong relationship between athletic participation and the probability of having a baby whose birthweight falls below one of the critical thresholds. Panel one shows the estimated relationship between sports participation and the likelihood of having a baby that weighs less than 2500 grams. The coefficient listed in column (5) tells us that for white mothers a 10 percentage point increase in girls' sports participation results in 1.6 fewer babies per 1000 births that fall below this threshold. With a mean of 60, this represents a 3% decrease. The relationship for black mothers, shown in column (6), is larger in magnitude and as a percentage of the mean, but less precisely estimated. While the coefficient of -6.1 is not statistically significant, it represents a decrease of 4%.

Panel two shows how sports participation affects the likelihood of having a baby that weighs less than 1500 grams. For white mothers, a 10 percentage point increase in sports participation translates into 0.4 fewer very low birthweight babies per 1000 births. For black mothers, the coefficient is, again, larger and less precise, but statistically significant. Overall, black mothers in this sample are three times as likely as white mothers to have a very low birthweight baby. The decrease of 2.8 babies per 1000 represents a 10% decrease. I also find some evidence of a positive relationship between athletic participation and mean birthweight for black women, but these differences are too imprecise to be statistically different from zero, and show up only for black mothers.

The results for Apgar score suggest that athletic participation leads to gains in Apgar scores among infants born to both white and black mothers. In both cases 10 percentage point increase in athletic participation leads to a 1/3 standard deviation improvement in Apgar scores. The results for the infant mortality rate are mixed. The OLS regressions show slightly higher mortality rates, while the instrumental variable regressions show a negative relationship. In all cases, the estimated magnitudes are extremely small, so it is hard to draw any conclusions.

In general, the infant health results have the same sign for both white and black mothers, but the magnitude of the coefficients is larger for black women, even when measured as a percent of the mean. At the same time, the coefficients are less precisely measured for black women, with only the estimated coefficients in the Apgar score and "very low" birthweight regressions being statistically different from zero. In order to put these differing results, by race, into perspective, I provide the results from additional analysis that use data from the National Longitudinal Survey of Youth (NLSY79). Unlike the natality data used for the main analysis, the NLSY79 includes a direct measure of whether a woman was a high school athlete. The NLSY79 surveyed nearly 13,000 individuals who were ages 14-22 in 1979. In 1984, the survey asked whether the respondent had participated in athletics during high school.[15] This allows us to look at differences between white and black high school athletes. Knowing something about how these women differ, an average, helps understand why we might expect to see different effects of Title-IX on the health of their infants.

Table 4 shows summary statistics for the women surveyed. Row 1 highlights the fact that white women are much more likely to have participated in athletics during high school. This might help explain why aggregate participation rates are less relevant for explaining outcomes for the children of black women. The rest of the table shows that black women were more disadvantaged during high school, and that these disparities are even larger among those women who identified themselves as high school athletes. Columns (1) and (2) show summary statistics, by race, for athletes and column (3) shows the difference. The parents of black athletes have fewer years of education, are less likely to have graduated from high school, and were less likely to be living

[15]In the NLSY79, athletics includes cheerleading and pep clubs. In the NFHS sports data, these activities are not included.

together in the same household in 1979. They were also more likely to be living in poverty in 1978, 1979 or 1980. Similarly, columns (4)- (6) show the same relationship for non-athletes. Column (7) displays the difference in differences, and shows that while athletes, in general, are more advantaged than their non-athlete counterparts, the racial disparities are even larger among athletes. The fact that the black women who were affected by the increase in athletic opportunities are more disadvantaged than their white counterparts might help explain the larger improvements in measurements of infant health. It could be that they have a larger potential to gain from athletic participation.

6 Robustness Checks

Table 9 presents the results of a number of robustness checks. Column (1) displays the results from the main specification for comparison. In order to test whether the results are robust to different cohort selections, column (2) shows the results from estimating equation 2 using an alternate set of cohorts. The pre-Title IX cohort consists of women who were born between 1946 and 1955 and entered high school between 1960 and 1969, entirely before Title IX was passed. The post-Title IX cohort consist of women who were born between 1966 and 1975 and entered high school between 1980 and 1989, after schools were required to be in compliance. These cohorts were born further apart than the ones used in the main specification.[16] The differences in athletic opportunities are even larger, both in terms of participation rates when entering high school, and the age at which they became aware of the required equality. The results are robust to the alternate cohort design.

The next column experiments with different a construction of the main right hand side variable: sports participation rates. It could be that athletic opportunities when entering high school do not fully capture the change in opportunities on their own. In case the benefit of increased availability is cumulative, girls' participation is constructed as the average of athletic opportunities at age 14

[16]Here, the cohorts are the same as the ones used in Section 7.1 when looking at selection into motherhood, and are also the ones used in Stevenson (2010).

and at age 15. To test this, column (3) shows the results using a two year average of participation rates. Again, the estimated coefficients remain largely unchanged.

Another potential concern is that the results are driven by the southern states, especially because the cohorts examined came of age during the civil rights era. In addition, of the five "deep south" states – defined here as Alabama, Georgia, Louisiana, Mississippi and South Carolina – all but one fall in the bottom quartile of pre-Title IX boys' participation, and all five are in the bottom half of the distribution. Column (4) shows regression results excluding these five states. There are no notable differences.

Finally, column (5) presents a placebo test that splits the pre-Title IX cohort into two groups. This tests whether sports participation rates have any power in explaining differences in the outcomes for infants born to mothers who entered high school in the 1960's. Here, the "pre" cohort consists of women who entered high school in 1960-1964 and the "post" cohort is comprised of women who entered high school in 1965-1969. Since both the "pre" and "post" cohorts enter high school prior to Title-IX, they should not be affected by Title IX, and we would not expect the increases required by the legislation to have any explanatory power for changes in infant health. Girls participation rates from 1970-1979 are assigned to the years 1960-1969.[17] In the instrumental variables regressions, the instrument remains the boys' participation rate from 1971. As expected, nearly all of the coefficients are statistically indistinguishable from zero, and are much smaller in magnitude than the main results.[18] The one exception is the coefficient for "very low" birthweight, which is significant at the 10% level.

[17]For example, girls entering high school in 1960 are assigned the participation rate from 1970, and girls entering high school in 1961 are assigned the participation rate from 1971.

[18]Infant mortality is not included, because the data start for babies born in 1983. This means that even for the youngest of the "pre" cohort, the data are only available for births when the mother is older than 33.

7 Mechanisms

My results strongly suggest that women who had access to more athletic opportunities when entering high school produced healthier infants later in life. Which mechanisms drive this effect? This section examines the available evidence, and shows that the results are not driven by changes in education or behavior during pregnancy. At the same time, there is evidence of negative selection into motherhood, That is, those cohorts of women who experienced larger increases in athletic opportunities and became better educated,[19] are less likely to enter into motherhood and have fewer children. Thus the average characteristics of those giving birth declines. This suggests that the estimates from this paper represent a lower bound of the true effect, as the more advantaged women, who are expected to have the healthiest infants, select out of the sample of mothers.

7.1 Selection into Motherhood

This section presents evidence that increased athletic opportunities have an effect on selection into motherhood. The vital statistics natality data are not ideal for this question, since observations in that dataset are conditional on having given birth. Instead, I use of census data from the 5% samples of the 1980 and 2000 censuses. In order to compare treatment and control women at the same ages, I use slightly different cohorts from the main analysis.[20] Women classified as pre Title-IX are 25-34 years old when they are surveyed for the 1980 census, were born between 1946 and 1955, and entered high school between 1960 and 1969. Women classified as post Title-IX are 25-34 years old when they are surveyed for the 2000 census, were born between 1966 and 1975, and entered high school between 1980 and 1989.

It is important to keep in mind that due to the timing of the censuses in relation to the birth years of the cohorts, I am only able to assess selection into motherhood between the ages of 25

[19] Stevenson (2010) finds that a ten percentage point increase in athletic opportunities causes leads to 0.039 extra years of education

[20] These are the same cohorts used by Stevenson (2010). Section 6 includes a robustness check which shows the results of the main analysis using these cohorts. The results are very similar to the main results.

and 34. This means I can not distinguish between women's decisions to select out of motherhood altogether versus their decision to delay childbearing past the age of 34. However, as I will show, I do not find any evidence of an effect of athletic participation on the average age at first birth within the natality data.

Table 5 shows the results from the selection analysis.[21] The first panel shows the results of regressions where the dependent variable is an indicator variable equal to 1 if the individual reports that she has a child of her own living in her household. The coefficient in column (1) suggests that for a 10 percentage point increase in girls' sports participation, there is a 0.7 percentage point decrease in the likelihood of having a child. This decrease appears to be driven by white women. The estimated coefficient in column (2) (including only white women), is very similar to the one for the pooled sample, though it is not statistically different from zero. The results in column (3) suggest that selection into motherhood is unchanged for black women.

Panel two displays results of regressions where the dependent variable is the number of own children living with an individual at the time of survey. The results are qualitatively similar to those in the first panel, and suggest that women who experienced the largest increases in athletic opportunities had fewer children by age 34. However, the point estimates are not precise enough to be distinguishable from zero.

The results in Table 6 suggest that treatment and control women experienced no differences in age at first birth. The table displays estimated coefficients from estimating a version of Equation 2 where mother's age is the dependent variable. Only first births are included. If we thought that increased athletic opportunities cause women to delay childbearing, we would expect to see positive and statistically significant coefficient estimates. However, the estimated coefficients are negative and not distinguishable from zero.

[21] These regressions are estimated at the individual, rather than the cell, level.

7.2 Education

Previous literature shows that Title-IX induced athletic participation leads to higher educational attainment, and provides mixed evidence about whether or not more maternal education improves the health of infants. Stevenson (2010) finds that a ten percentage point increase in athletic opportunities leads to 0.039 extra years of education and Currie & Moretti (2003) find that an increase of 0.09 years of education causes a 1% decrease in the incidence of low birthweight babies. Combining these figures, one would expect that a ten percentage point increase in athletic opportunites would cause a 0.4%[22] decrease in the number of low-birthweight babies. This suggests that increased education would explain approximately 1/8 of the 3.4% decrease I find from a 10 percentage point increase in athletic participation for the pooled sample.[23] This suggests that there is a lot of room for alternate explanations.

Another way to examine education's potential role in explaining the main results is to estimate the main specification, but split the sample based on educational attainment. Columns (1)-(3) of Table 7 present the results from two stage least squares estimation of equation 2 for women without a high school degree at the time they give birth, while columns (4)-(6) present the results for women with high school degree or higher. For both subsets of the population, increased athletic opportunities results in healthier infants. If extra educational attainment were a main driver of improved infant health, we might expect to see limited improvement among the children of mothers who did not finish high school. However, the point estimates for these women are even larger than for women with more education. This is more consistent with an explanation like improved maternal health, where infant health is improved across socioeconomic spectrum, but where the infants of lower socioeconomic mothers have more to gain.

[22] .039/.09*1%=0.43%

[23] At the same time, combining the Stevenson (2010) with McCrary & Royer (2011), which found no effect of education on infant health, would suggest that this mechanism would not be important for explaining any of the estimated improvements in infant health.

7.3 Behavioral Changes

An alternative explanation is that women exposed to greater athletic opportunities change their health behaviors in ways that also improve their fetus' health. A common explanation for the link between maternal education and infant health is that better educated women are able to afford better prenatal care and are also more likely to make smart choices about their health related behavior during pregnancy (Currie & Moretti 2003, McCrary & Royer 2011). While I find little evidence that increased education is a main driver, I still look at these potential explanations, as it is possible that women who played sports in high school make smarter choices for reasons other than higher educational attainment. It could be that they are used to thinking about how things like smoking, drinking and unhealthy weight gain affect their bodies, and apply that experience to healthy behaviors during pregnancy.

In order to examine the likelihood of these channels, I examine a number of "behavioral" variables available in the natality data. I estimate the two stage least squares version of equation 2 for indicator variables equal to one if the mother received pre-natal care, if she experienced "low" weight gain during pregnancy and if she experienced "high" weight gain during pregnancy. The actual recommended weight gain depends on a mother's pre-pregnancy BMI. Mothers with a lower BMI are encouraged to gain more weight, while mothers with higher a BMI should gain less weight during pregnancy. Mother's BMI is not available in the natality data, so for this study, "low" weight gain is defined as gaining less than 15 pounds during pregnancy, the bottom end of the recommended range for a mother who is "overweight" pre-pregnancy. "High" weight gain is defined as gaining more than 35 pounds, the upper end of the recommended range for a mother who is "normal weight" pre-pregnancy.[24] I also examine whether there is any effect on the number of cigarettes she smoked per day while pregnant or the number of alcoholic drinks she had per week while pregnant. With the exception of prenatal care, which is available throughout the entire sample, these behavioral variables are available in the natality data starting in 1989.

[24] Committee on Nutritional Status During Pregnancy and Lactation (1990)

The results in Table 8 do not suggest that changes in the behavior of women during pregnancy are the main driver of the healthier infants. If increased athletic opportunities, caused women to make healthier decisions during pregnancy, we would expect to see a positive relationship between athletics and the acquisition of prenatal care during the first trimester. At the same time, we would expect to see a negative relationship with smoking, drinking alcohol and low or high weight gain. However, the coefficients shown in Table 8 are mixed and are generally statistically insignificant.

8 Conclusions

This paper provides evidence that an investment in the athletic opportunities for one generation improves health for the next generation. I find that for the average increase in girls' athletic participation during the 1970's – 20 percentage points – the incidence of low birthweight births to the affected women declined by 6%, the incidence of very low birthweight births declined by 12% and there were small increases in apgar scores. These benefits are slightly smaller when looking only at white mothers, and larger, but less precisely estimated when looking only at black mothers. The decrease in low birthweight births is slightly more than half the magnitude of Currie & Moretti (2003)'s estimate of the decrease resulting from one additional year of education.[25] I find little evidence to support the theory that the improved infant outcomes are caused by an increase in maternal educational attainment or by changes in behavior during pregnancy, suggesting that improved maternal fitness is a viable explanation.

This sizable benefit in terms of infant health, is particularly important in light of the increasingly tight budgets faced by school administrators. Funding for high school athletics is often an easy target as administrators decide where to cut spending.[26] However, this paper adds to the grow-

[25] Currie & Moretti (2003) estimate that a one year increase in education leads to a 0.5 percentage point, or 10% decrease in the incidence of "low" birthweight births.

[26] News stories are all around. See, for example:
http://www.annarbor.com/news/ann-arbor-schools-slashing-freshman-sports-teams-cutting-funding-to-several-other-programs/
http://www.usatoday.com/sports/preps/2009-09-02-budget_sports_cuts_N.htm

ing body of literature that points out the less obvious benefits of athletic participation, and shows that these benefits translate into improvements for the next generation.

A quick back-of-the-envelope calculation demonstrates that the monetary benefits stemming from improved infant health might more than cover the cost of funding high school athletics, even without considering the other documented benefits. For a sample of 1000 high school age girls, a 20 percentage point increase in participation rates translates into 200 additional athletes. At an average cost of $426 per year, per person, it would cost $340,800 to fund one sports team for each athlete for four years of high school. [27] If we assume that each of these 1000 students eventually gives birth to two children, we would expect to see 9.6 fewer “low” birthweight babies. [28]

A report for the March of Dimes estimates that during the first year of life a low birthweight (and/or premature) infant accumulates nearly $50,000 in medical costs, more than ten times the cost of a healthy infant.[29] At savings of $45,000 per averted “low” birthweight baby, this decrease saves $432,000 in just the first year of life. At the same time, we know that relative to their counterparts, low birthweight infants tend have lower IQ, lower educational attainment, poorer self-reported health status, lower earnings as adults, and lower birthweight children (Behrman & Rosenzweig 2004, Currie & Hyson 1999, Black et al. 2007). This suggests that the availability of athletic opportunities for teenagers are more important than they might appear, and that providing them might be a cost effective way of improving a wide range of outcomes.

---

http://www.npr.org/2011/03/16/134533821/budget-cuts-put-school-sports-on-chopping-block
http://rivals.yahoo.com/highschool/blog/prep_rally/post/Jacksonville-plans-to-cut-all-school-sports-in-2?urn=highschool-wp26
(All accessed on August 25, 2011)

[27]This number comes from taking the average of 2 schools’ per athlete costs. The Montgomery, Maryland school district’s annual operating budget for athletics is $7,094,574 and serves a total of 22,076 athletes. The average cost is $321 each. (http://www.montgomeryschoolsmd.org/departments/budget/FY2012/budget-questions.aspx) Nutley, New Jersey high school estimates that the average cost per female athlete is $540 (http://blog.nj.com/hssportsextra/2011/10/how_nutley_high_school_budgets.html).

[28]The main estimates point to a decrease of 2.4 “low” birthweight births per 1000 births as a result of a 10 percentage point increase. This estimate looks at the average increase, which is 20 percentage points. This brings the expected decrease to 4.8. In addition, if each individual gives birth to 2 children, the expected decrease is 9.6.

[29]Thompson Reuters (October 29, 2008)

References

Almond, D. (2006), 'Is the 1918 influenza pandemic over? long-term effects of ¡i¿in utero¡/i¿ influenza exposure in the post-1940 u.s. population', *Journal of Political Economy* **114**(4), 672–712. http://ideas.repec.org/a/ucp/jpolec/v114y2006i4p672-712.html.

Almond, D., Hoynes, H. W. & Schanzenbach, D. W. (2011), 'Inside the war on poverty: The impact of food stamps on birth outcomes', *The Review of Economics and Statistics* **93**(2), 387–403.

Almond, D. & Mazumder, B. (2008), Health capital and the prenatal environment: The effect of maternal fasting during pregnancy, NBER Working Papers 14428, National Bureau of Economic Research, Inc. http://ideas.repec.org/p/nbr/nberwo/14428.html.

Behrman, J. R. & Rosenzweig, M. R. (2004), 'Returns to birthweight', *The Review of Economics and Statistics* **86**(2), 586–601. http://ideas.repec.org/a/tpr/restat/v86y2004i2p586-601.html.

Black, S. E., Devereux, P. J. & Salvanes, K. G. (2007), 'From the cradle to the labor market? the effect of birth weight on adult outcomes', *The Quarterly Journal of Economics* **122**(1), 409–439. http://ideas.repec.org/a/tpr/qjecon/v122y2007i1p409-439.html.

Committee on Nutritional Status During Pregnancy and Lactation (1990), Nutrition during pregnancy: Part i: Weight gain, part ii: Nutrient supplement, Technical report, Institute of Medicine.

Currie, J. & Hyson, R. (1999), 'Is the impact of health shocks cushioned by socioeconomic status? the case of low birth weight', *AEA Papers and Proceedings* .

Currie, J. & Moretti, E. (2003), 'Mother's education and the intergenerational transmission of human capital: Evidence from college openings', *The Quarterly Journal of Economics* **118**(4), 1495–1532. http://ideas.repec.org/a/tpr/qjecon/v118y2003i4p1495-1532.html.

Curtis, D. M. & Grant., D. C. H. (n.d.), 'Landmark title ix cases in history', Accessed May 21, 2011. http://bailiwick.lib.uiowa.edu/ge/historyRE.html.

Hoynes, H., Page, M. & Stevens, A. H. (2011), 'Can targeted transfers improve birth outcomes?: Evidence from the introduction of the wic program', *Journal of Public Economics* **95**(7-8), 813–827.

Kaestner, R. & Xu, X. (2006), *Effects of Title IX and Sports Participation on Girls Physical Activity and Weight*, Vol. 17, Emerald Group Publishing Limited.

Kaestner, R. & Xu, X. (2010), 'Title ix, girls sports participation, and adult female physical activity and weight', *Evaluation Review* **34**(1), 52–78.

McCrary, J. & Royer, H. (2011), 'The effect of female education on fertility and infant health: Evidence from school entry policies using exact date of birth', *American Economic Review* **101**(1), 158–95. http://ideas.repec.org/a/aea/aecrev/v101y2011i1p158-95.html.

Pivarnik, J. (1998), 'Potential effects of maternal physical activity on birth weight: brief review.', *Medicine & Science in Sports & Exercise* **30**(3), 400–406.

Stein A.D., Ravelli, L. (1995), 'Famine, 3rd-trimester pregnancy weight-gain, and intrauterine growth - the dutch famine birth cohort study', *Human Biology* **6(1)**, 135–150.

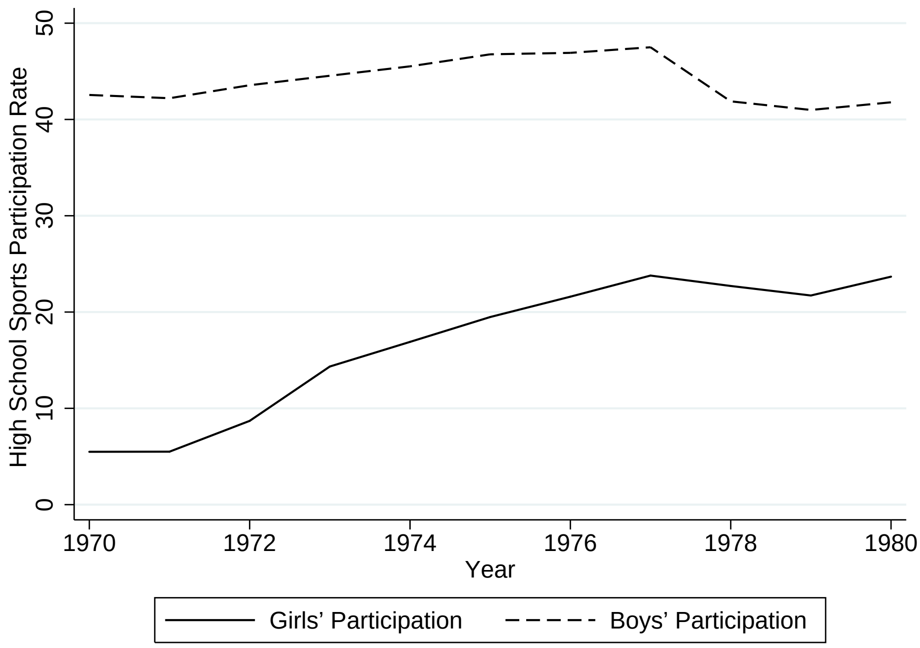
Stevenson, B. (2010), 'Beyond the classroom: Using title ix to measure the return to high school sports', *The Review of Economics and Statistics* **92**(2), 284–301.

Thompson Reuters (October 29, 2008), The cost of prematurity and complicated deliveries to u.s. employers., Technical report, Report prepared for the March of Dimes.

van Ewijk, R. (2009), Long-term health effects on the next generation of ramadan fasting during pregnancy, CEP Discussion Papers dp0926, Centre for Economic Performance, LSE. http://ideas.repec.org/p/cep/cepdps/dp0926.html.

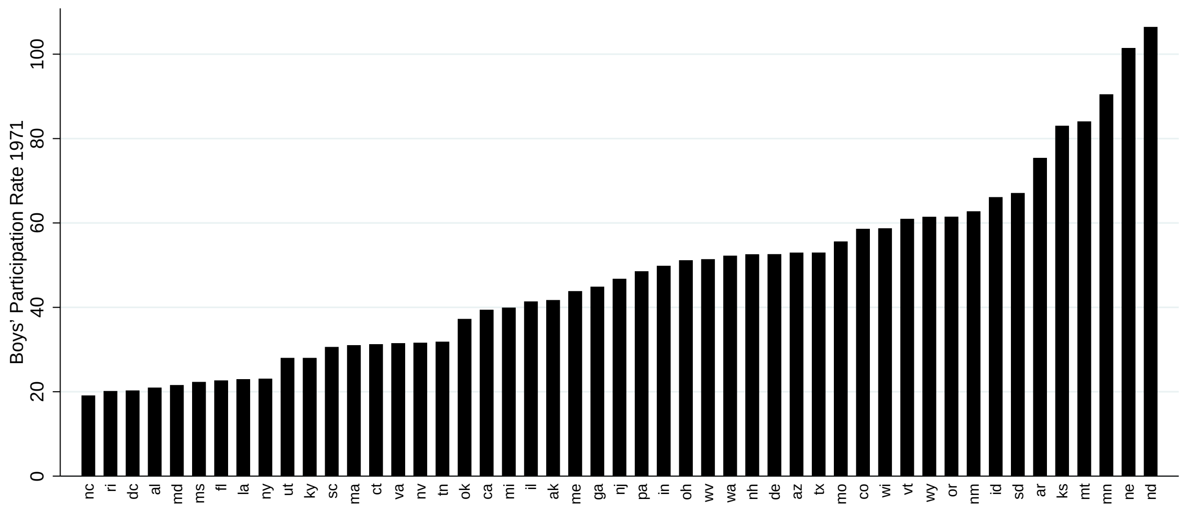
Warburton, D., Nicol, C. W. & Bredin, S. (2006), 'Health benefits of physical activity: the evidence', *Canadian Medical Association Journal* **174**, 747–749.

Figure 1: Participation Rates Over Time



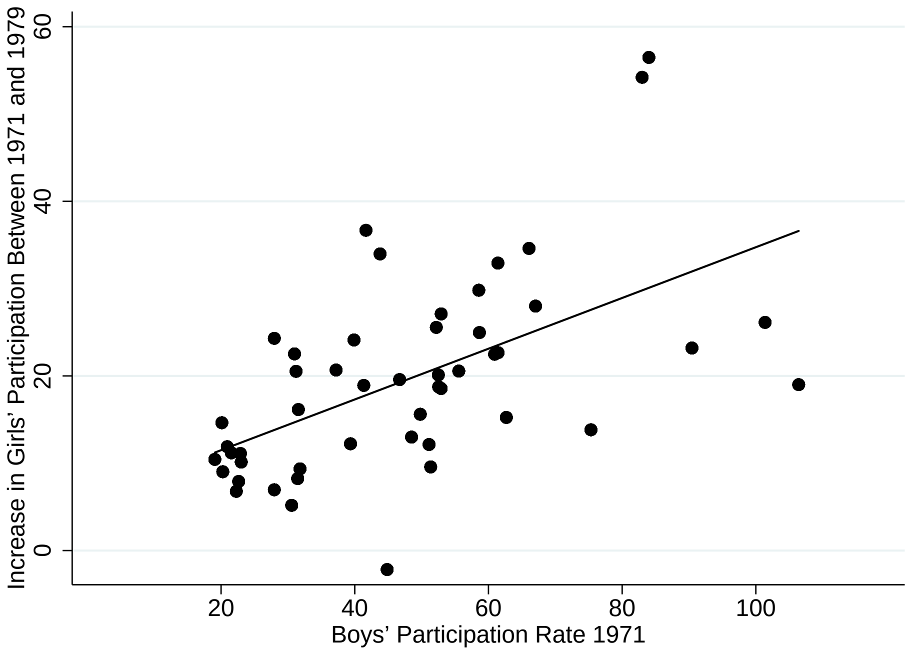
The sports participation data come from an annual survey published by the National Federation of State High School Associations. These NFHS data give a raw number of total participants, which is then divided by the population of 14-17 year olds to create a participation rate.

Figure 2: Boys' Participation Rates 1971-72



The sports participation data come from an annual survey published by the National Federation of State High School Associations. These NFHS data give a raw number of total participants, which is then divided by the population of 14-17 year olds to create a participation rate.

Figure 3: Correlation of Post-Title IX Increases in Girls' Participation and Boys' Pre-Title IX Participation



The sports participation data come from an annual survey published by the National Federation of State High School Associations. These NFHS data give a raw number of total participants, which is then divided by the population of 14-17 year olds to create a participation rate.

Figure 4: Birthweight

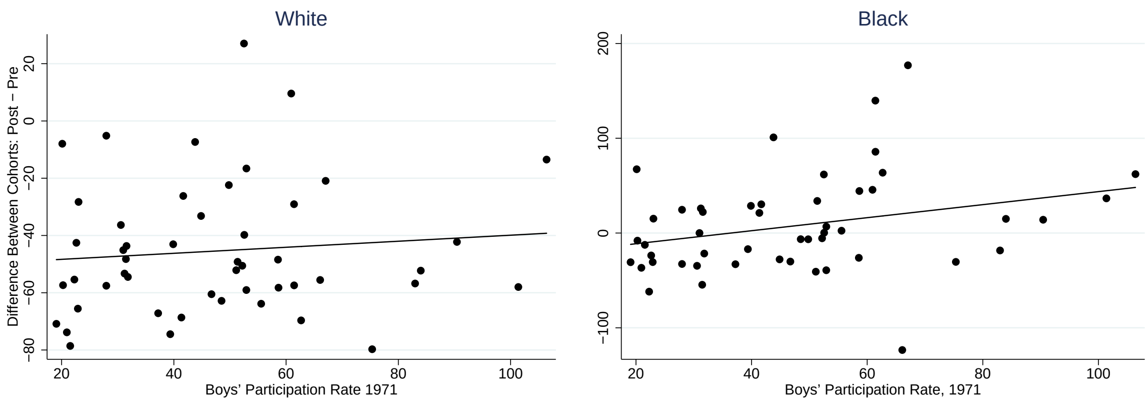


Figure 5: Low Birthweight Births per 1000

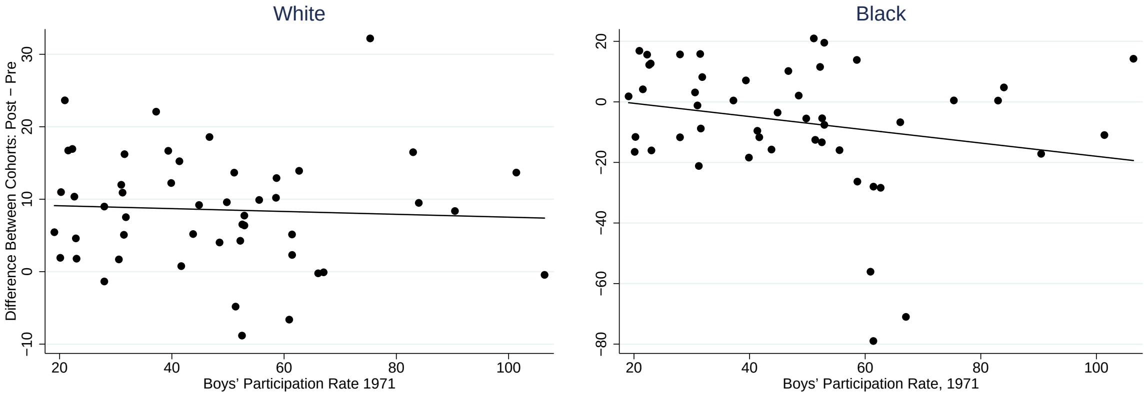


Figure 6: Very Low Birthweight per 1000

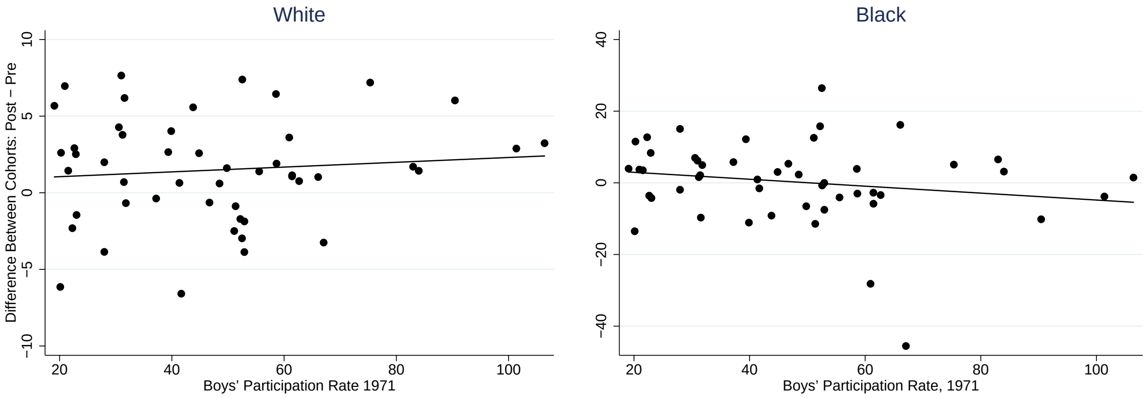


Figure 7: Mortality Rate per 1000

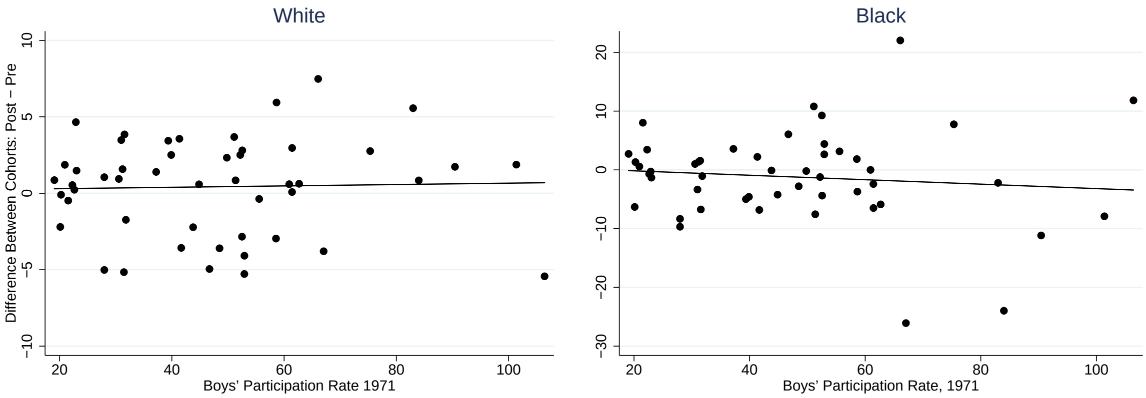


Figure 8: Apgar Score

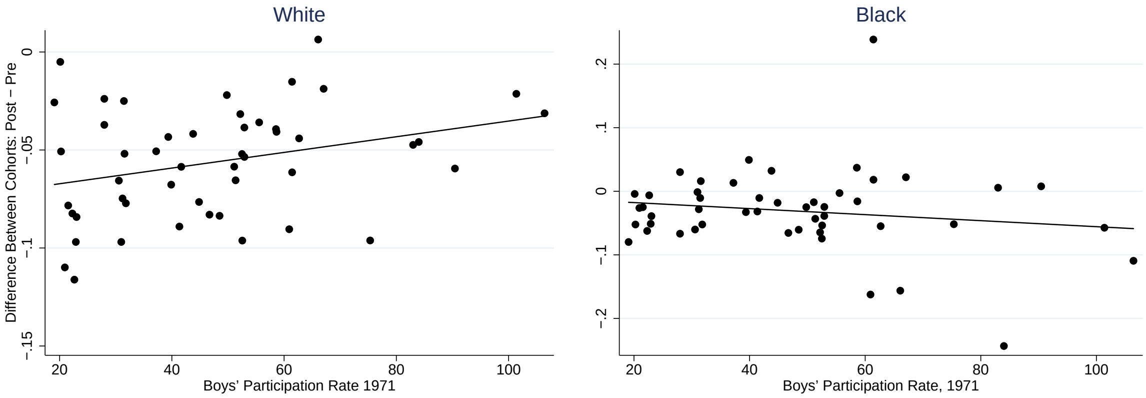


Table 1: Summary Statistics

	Pre-Title IX			Post-Title IX		
	Mean	Min	Max	Mean	Min	Max
Mother's Year of Birth	1958.06	1956	1960	1965.90	1964	1968
Child's Year of Birth	1984.67	1971	2004	1991.91	1979	2004
Girls' Sports Participation Rate	10.58	0.13	52.64	23.04	6.48	65.35
Required Increase in Participation	0.00	0	0	42.10	19.07	106.41
Birthweight (grams)	3345.27	227	7371	3334.37	227.00	5660
Low Birthweight (<2500g)	71.43	0	1000	74.06	0.00	1000
Very Low Birthweight (<1500g)	12.31	0	1000	13.50	0.00	1000
Apgar Score	9.02	0.00	10	8.95	0.00	10
Mortality rate (per 1000 births)	8.06	0.00	1000	7.53	0.00	1000
Mother's Age	26.62	15	45	26.01	15	40
Years of Education	12.83	0.00	17	12.90	0.00	17
High School Degree	0.82	0.00	1	0.81	0.00	1
Some College	0.40	0.00	1	0.43	0.00	1
College Degree	0.19	0.00	1	0.21	0.00	1
Prenatal Care	0.99	0.00	1	0.98	0.00	1
Number of Cigarettes per Day	1.90	0.00	60	1.80	0.00	80
Number of Drinks per week	0.07	0.00	98	0.04	0.00	40
Low Weight Gain (<15 lbs)	0.09	0.00	1	0.10	0.00	1
High Weight Gain (>35 lbs)	0.27	0.00	1	0.30	0.00	1

Notes: The pre-Title IX cohort consists of women born between 1956 and 1960, while the post-Title IX cohort consists of women born between 1964 and 1968. Means are weighted by the number of births per cell

Table 2: Pre-Trends

	White	Black
Birthweight	-.0958	26.8*
	(.225)	(15.01)
Low Birthweight	-.036	-1.01
	(.079)	(7.720)
Very Low Birthweight	-.0568	-.262
	(.042)	(3.296)
Apgar Score	-.0000	.011***
	(.0006)	(.004)

Notes: This table presents the results of Equation 1, which estimates the relationship between pre-trends in the main dependent variables of interests and boys' pre-Title IX sports participation. Each row contains the regression results for the dependent variable listed in the first colunm. The first column of results consists of white mothers and the second column examines the pre-trends for black mothers. All regressions include fixed effects for mother's state of birth, mother's age, and parity. Regressions are weighted by the number of observations in each cell.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Results: Health

	OLS			IV		
	All	White	Black	All	White	Black
First Stage				0.169***	0.173***	0.133***
				(0.032)	(0.033)	(0.046)
F–Stat				158755	143676	299066
Low BW (<2500g)	-0.781***	-0.604***	-1.535*	-2.434***	-1.610***	-6.136
	(0.178)	(0.162)	(0.831)	(0.744)	(0.599)	(4.355)
Mean	72.48	59.67	137.66	72.48	59.67	137.66
SD	40.78	21.95	50.82	40.78	21.95	50.82
N	153315	83496	69819	152323	82863	69460
Very Low BW (<1500g)	-0.117*	-0.087	-0.220	-0.709***	-0.373**	-2.783*
	(0.059)	(0.057)	(0.183)	(0.255)	(0.162)	(1.667)
Mean	12.84	9.71	28.74	12.84	9.71	28.74
SD	13.68	7.54	23.39	13.68	7.54	23.39
N	153315	83496	69819	152323	82863	69460
Birthweight (grams)	1.608**	1.206	3.255	1.878	-0.461	14.345
	(0.781)	(0.735)	(2.101)	(2.439)	(2.218)	(11.190)
Mean	3340.32	3390.87	3083.33	3340.32	3390.87	3083.33
SD	141.55	79.88	102.14	141.55	79.88	102.14
N	153315	83496	69819	152323	82863	69460
Apgar Score	0.007***	0.007**	0.006*	0.043***	0.042***	0.056*
	(0.003)	(0.003)	(0.004)	(0.012)	(0.012)	(0.033)
Mean	8.98	9.00	8.88	8.98	9.00	8.88
SD	0.15	0.12	0.20	0.15	0.12	0.20
N	141524	77994	63530	140594	77388	63206
Mortality Rate (per 1000)	0.149*	0.152**	0.224	-0.138	-0.057	-0.113
	(0.079)	(0.071)	(0.167)	(0.230)	(0.214)	(1.132)
Mean	7.76	6.59	14.20	7.76	6.59	14.20
SD	9.29	6.25	17.30	9.29	6.25	17.30
N	101539	55364	46175	100802	54901	45901

Notes: The first panel shows the results from the first stage of the instrumental variables regressions. The coefficient displayed shows the relationship between the required increase in girls' sports participation and actual girls participation rates. Each subsequent panel contains the regression results and summary statistics for the dependent variable listed in bold in the first column. Each column represents the results from a different regression, with the coefficient on the girls' participation rate listed in the first row, and the (se) below. Columns (1)-(3) present the results from OLS regressions, while columns (4)-(6) show the results from a regression where girls' participation is instrumented with the size of the required increase. All regressions include fixed effects for mother's year of birth (yob), mother's state of birth (sb), mother's age, and parity. Columns (1) and (4) also include a set of black×yob and black×sb fixed effects. Standard errors are clustered by mother's sob and regressions are weighted by the number of observations in each cell.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Characteristics of Athletes

	Athlete			Not Athlete			Diff in Diffs
	White	Black	Difference	White	Black	Difference	
Percent Athlete	38.94	30.38	8.56***				
Mother's Years of Ed.	12.21	11.22	-0.99***	11.22	10.46	-0.75***	-0.24
Father's Years of Ed.	12.57	10.85	-1.72***	11.27	9.84	-1.43***	-0.29
Father Has HS Degree	0.75	0.54	-0.21***	0.59	0.44	-0.15***	-0.06*
Mother Has HS Degree	0.78	0.53	-0.26***	0.60	0.42	-0.18***	-0.08**
Poverty	0.27	0.53	0.26***	0.38	0.64	0.27***	-0.01
Parents Together	0.77	0.55	-0.22***	0.70	0.45	-0.25***	0.04

Notes: Data come from the National Longitudinal Survey of Youth. Athletes are defined as those who reported that they had participated in athletics during high school.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Selection into Motherhood

	All	White	Black
Have Child	-0.0068**	-0.0067	0.0006
	(0.0034)	(0.0041)	(0.0056)
Mean	0.63	0.63	0.68
SD	0.48	0.48	0.47
N	1616063	1336699	215494
Number Children	-0.0162	-0.0207	0.0282
	(0.0126)	(0.0128)	(0.0363)
Mean	1.28	1.24	1.51
SD	1.25	1.21	1.43
N	1616063	1336699	215494

Notes: Each column represents the results from a different regression, with the coefficient on the girls' participation rate listed in the first row, and the (se) below. All columns present the results from a regression where girls' participation is instrumented with the size of the required increase and include fixed effects for mother's year of birth (yob), mother's state of birth (sb), mother's age, and parity. Column (1) also include a set of black×yob and black×sb fixed effects. Standard errors are clustered by mother's sb and regressions are weighted by the number of observations in each cell.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Mother's Age at First Birth

	All	White	Black
Age at First Birth	-0.050	-0.005	-0.397
	(0.195)	(0.195)	(0.386)
Mean	24.22	24.63	21.80
SD	5.44	5.38	5.15
N	23099	12236	10863

Notes: Only first births are included. Each column represents the results from a different regression, with the coefficient on the girls' participation rate listed in the first row, and the (se) below. All columns present the results from a regression where girls' participation is instrumented with the size of the required increase and include fixed effects for mother's year of birth (yob), mother's state of birth (sb), mother's age, and parity. Column (1) also include a set of black×yob and black×sb fixed effects. Standard errors are clustered by mother's sb and regressions are weighted by the number of observations in each cell.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Health: Split by Mother's Education

	Less Than High School			More Than High School		
	All	White	Black	All	White	Black
Low BW (<2500g)	-4.656**	-4.005***	-7.325	-2.339***	-1.488***	-8.118*
	(1.830)	(1.315)	(8.297)	(0.696)	(0.516)	(4.860)
Mean	108.31	87.61	162.78	65.14	54.69	127.47
SD	70.15	48.29	87.40	38.29	21.18	54.76
N	125460	71537	53923	139645	77349	62296
Very Low BW (<1500g)	-1.044*	-0.931**	-0.731	-0.687***	-0.364**	-3.454
	(0.545)	(0.398)	(2.487)	(0.263)	(0.173)	(2.125)
Mean	18.06	13.49	30.09	11.76	9.01	28.13
SD	28.19	19.66	40.86	13.91	7.63	26.21
N	125460	71537	53923	139645	77349	62296
Birthweight (grams)	8.679*	6.192	22.572	1.958	0.226	16.683
	(4.697)	(3.900)	(18.809)	(2.749)	(2.665)	(12.587)
Mean	3188.19	3258.34	3003.58	3373.97	3416.94	3117.75
SD	165.98	107.71	149.94	131.4	73.01	108.51
N	125460	71537	53923	139645	77349	62296
Apgar Score	0.028**	0.021**	0.075	0.046***	0.045***	0.071
	(0.013)	(0.010)	(0.062)	(0.012)	(0.012)	(0.044)
Mean	8.97	9.01	8.89	8.99	9.00	8.88
SD	0.24	0.20	0.32	0.14	0.12	0.21
N	113757	65781	47976	131428	73700	57728
Mortality Rate (per 1000)	-1.269	-1.031	-1.964	-0.691	-0.384	-4.826
	(0.948)	(0.726)	(4.080)	(0.607)	(0.481)	(3.620)
Mean	10.32	9.16	13.52	7.39	6.35	13.89
SD	23.26	18.49	32.88	13.48	9.98	25.41
N	85675	49511	36164	101981	57192	44789

Notes: Each panel contains the regression results and summary statistics for the dependent variable listed in bold in the first column. Each column represents the results from a different regression, with the coefficient on the girls' participation rate listed in the first row, and the (se) below. All columns present the results from a regression where girls' participation is instrumented with the size of the required increase. Columns (1)-(3) present the results for the subsample of women with less than a high school degree, while (4)-(6) show the results for women with a high school degree or more. All regressions include fixed effects for mother's year of birth (yob), mother's state of birth (sb), mother's age, and parity. Columns (1) and (4) also include a set of black×yob and black×sb fixed effects. Standard errors are clustered by mother's sb and regressions are weighted by the number of observations in each cell.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Behavior During Pregnancy

	All	White	Black
Prenatal Care	-0.001	0.000	-0.008
	(0.001)	(0.000)	(0.007)
Mean	0.99	0.99	0.96
SD	0.03	0.02	0.05
N	145538	78838	66700
Cigarettes Per Day	0.002	0.04	-0.459
	(0.072)	(0.077)	(0.324)
Mean	1.84	1.85	1.73
SD	1.32	1.29	1.50
N	92273	51786	40487
Drinks Per Week	0.010	0.011**	-0.020
	(0.006)	(0.005)	(0.040)
Mean	0.05	0.04	0.13
SD	0.14	0.07	0.33
N	92553	51933	40620
Low Wt. Gain (<15 lbs)	-0.002	-0.001	-0.008
	(0.001)	(0.001)	(0.008)
Mean	0.10	0.09	0.17
SD	0.05	0.04	0.08
N	91552	51636	39916
High Wt. Gain (>36 lbs)	-0.009*	-0.010*	0.003
	(0.005)	(0.006)	(0.009)
Mean	0.29	0.29	0.27
SD	0.06	0.05	0.09
N	91552	51636	39916

Notes: Each panel contains the regression results and summary statistics for the dependent variable listed in bold in the first column. Each column represents the results from a different regression, with the coefficient on the girls' participation rate listed in the first row, and the (se) below. All columns present the results from a regression where girls' participation is instrumented with the size of the required increase and include fixed effects for mother's year of birth (yob), mother's state of birth (sb), mother's age, and parity. Column (1) also includes a set of black×yob and black×sb fixed effects. Standard errors are clustered by mother's sb and regressions are weighted by the number of observations in each cell.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Robustness Checks

	(1) Original	(2) Alt. Cohort	(3) Two Year	(4) No South	(5) 1960's
Low BW (<2500g)	-2.434***	-2.377***	-3.405***	-1.462*	-0.737
	(0.744)	(0.750)	(1.125)	(0.747)	(0.496)
Very Low BW (<1500g)	-0.709***	-0.700***	-1.003**	-0.524**	-0.288*
	(0.255)	(0.256)	(0.391)	(0.259)	(0.155)
Birthweight (grams)	1.878	1.717	2.46	-1.086	0.296
	(2.439)	(2.404)	(3.426)	(2.914)	(2.348)
Apgar Score	0.043***	0.041***	0.061***	0.039***	0.001
	(0.012)	(0.012)	(0.018)	(0.012)	(0.004)
Mortality Rate (per 1000)	-0.138	-0.16	-0.241	-0.098	–
	(0.230)	(0.225)	(0.343)	(0.242)	–

Notes: This table includes the regression results from all of the robustness checks described in Section 6. Each row contains the regression results and summary statistics for the dependent variable listed in bold in the first column. Each column represents the results from a different regression, with the coefficient on the girls' participation rate listed in the first row, and the (se) below. The first column shows the original IV results, and each subsequent column presents the IV results for the robustness check listed at the top of the table. All regressions include fixed effects for mother's year of birth (yob), mother's state of birth (sb), mother's age, and parity. They also include a set of black×yob and black×sb fixed effects. Standard errors are clustered by mother's sb and regressions are weighted by the number of observations in each cell.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$