

ARTICLE

# Differences by Race and Ethnicity in Title IX's Effect on Women's Health

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## Abstract

Title IX greatly expanded adolescent females' participation in athletic activities, which may have led to health benefits that extend into later life. Previous research has not explored whether health benefits arising from Title IX differ by race or ethnicity and has not examined women at older ages when health problems become more evident. This article examines the effect of Title IX on racial and ethnicity disparities in health outcomes by considering women aged 42–52 years. White women in these age groups exhibit declines in their self-assessed health status and increases in many health-related ailments, consistent with other evidence on temporal trends in health for women in this age range. Compared to white women, both Black and Hispanic women report the opposite pattern, as there is greater improvement in the post-Title IX period in overall health status. Black and Hispanic women also exhibit greater declines relative to white women in smoking rates post-Title IX, which should confer a broad range of risk reductions. The more favorable impact of Title IX on Black and Hispanic women indicates that investments in women's sports may enhance both equity and efficiency.

## 1 Introduction

Title IX of the Educational Amendments of 1972 prohibits sex discrimination in any federally funded education program or activity. The passage of Title IX quickly led to increased participation of girls in sports. This athletic activity not only provided contemporaneous consumption benefits to participants but also conferred long-term health benefits. This article examines a broad set of health outcomes for older women and finds evidence of the beneficial effects of Title IX on adult women's health for Black and Hispanic women.

Title IX did not explicitly mention sports participation, and whether it would also apply to athletic opportunities was extremely controversial.<sup>1</sup> At the time of Title IX's passage, few high school girls participated in sports, while participation was common among high school boys. Meeting a mandate of equivalent athletic opportunities by gender could imply a reallocation of resources from boys' sports to girls' sports. And although sports were popular among boys, there was no evidence that expanding athletic access for girls would provide benefits of any type, whether in consumption, education, employment, or health.

In fact, athletic participation among girls who were high school students at the time of Title IX's passage increased rapidly, from approximately 5 to 26% between 1970–1971 and 1977–1978 (Kaestner & Xu, 2007). This rapid rise in participation suggests that the consumption benefits to girls of athletic access were considerable. Boys' participation showed little change over the same period, so the predictions of dire consequences to boys from expanding athletic access to girls did not materialize.

Although there is a substantial literature that examines the impact of Title IX on various outcomes, including employment and education, there is almost no information on whether the effects of Title IX differ by race and ethnicity. Furthermore, although the increase in access to athletic opportunities would be expected to lead to improved health outcomes, relatively few health outcomes have been considered, and those studies that examine health outcomes post-Title IX frequently find small effects.

The limited evidence of strong health effects overall, and the limited evidence of differential effects by race and ethnicity, may arise for at least two reasons. First, most previous studies are based on data from earlier periods, which of necessity examined women who were below the age in which many negative health effects arise. Second, sample sizes and other empirical limitations frequently hindered making reliable racial or ethnicity comparisons.

In this article, we use National Health Interview Survey (NHIS) data for the years 1993–2018 to expand on earlier studies of the effect of Title IX on health outcomes. Title IX provides an exogenous legal intervention that lowered the costs to athletic participation for adolescent girls and allows identification of a causal impact of a government policy on possible improvements to health outcomes. By using NHIS data from a recent time period, we are able to examine women when they have reached an age at which health problems are more likely to emerge and become more evident. In addition to providing information on numerous health outcomes, the large number of observations in the NHIS provides sufficient power to examine differences in health outcomes by race and ethnicity.

The overall temporal trend in women's reported health status has been adverse for the age range of 42–52 that we examined. Hudomiet et al. (2022) document this downward temporal shift in measures of reported health conditions using data from the Health and Retirement Study. They find that in more recent time periods, women of any given age level are more likely to report lower self-assessed health status, are more likely to indicate that they are obese, and are more likely to report being diabetic.<sup>2</sup>

<sup>1</sup> Stevenson (2007) reviews the legislative history, political debate, and controversies over Title IX's applicability to sports.

<sup>2</sup> These age-adjusted comparisons are for the reported values for different age groups from 2012–2016 compared to the reported values in 1992–1996. See the following figures in Hudomiet et al. (2022), Figure 1, Panel B; Figure 2, Panel B; and Figure 2, Panel D. For other age groups beyond the age of 70, there has been an improvement in women's reported health status at different ages over this time period.

Hudomiet et al. (2022) find a temporal decline in the health status of whites, Blacks, and Hispanics. But to the extent that there are baseline differences in health status or access to health care, the health-enhancing benefits of Title IX may differ by race. Given the overall decline in women's health measures over time, the empirical issue we examine is whether there has been a beneficial effect of Title IX that differs by race or ethnicity.

Using a set of measures of health status from the NHIS, we find in the post-Title IX period that, consistent with previous results, there was an overall temporal trend in which white women were less likely to report their health status as being either excellent or the broader category of excellent or very good. Women overall were also more likely to report being obese, overweight, diabetic, or diabetic or pre-diabetic. However, Black women and Hispanic women experienced greater beneficial differential health effects from Title IX. Such a differential effect fosters the equity concerns embodied in President Biden's Executive Order 13985 and subsequent efforts to operationalize the promotion of racial equity in policies such as Justice40 (Kniesner & Viscusi, 2023).<sup>3</sup> The greater beneficial effect on the overall health status of Black women and Hispanic women is also consistent with what one would expect from efforts to target policy efforts in an efficient manner. If the costs of providing access to athletic activities are the same for all women, greater marginal improvements in health status for Black women and Hispanic women will also be relatively more cost-effective.

## 2 Empirical motivation

### 2.1 Previous studies of Title IX

Passed in the Nixon administration, Title IX was lauded as a transformative law that greatly expanded opportunities for girls to participate in sports. As an exogenous legal intervention, Title IX offers a natural experiment to examine whether a government policy that lowered the costs of sports participation during the teen years generates later life health consequences. A simple comparison of later life health outcomes between those who did and did not participate in sports during high school would result in biased estimates if the participation decision is correlated with unobservable factors that influence later life health. Substantial research has verified that Title IX provides a plausibly exogenous instrument (e.g., Kaestner & Xu, 2010; Stevenson, 2010). However, there were racial differences in athletic opportunities following Title IX in favor of high schools predominantly attended by white girls (Theune, 2019).

Physical activity is an investment in health and longevity, and past participation in sports lowers the costs to engaging in current physical activity. Research shows that physical activity is protective against obesity and cardiovascular disease (e.g., coronary heart disease, stroke, and hypertension) (Lee et al., 2012). The economic benefits in both mortality and labor market non-participation derived from reducing racial disparities in health are substantial (Nanney et al., 2019).

In the context of Grossman's (1972) model of investment in health capital, by lowering the costs to female adolescents of physical activity, Title IX could lead to long-term positive

<sup>3</sup> E.O. 13985, Executive Order on Advancing Racial Equity and Support for Underserved Communities Throughout the Federal Government," 20 January 2021.

health effects through two main avenues: through the increase in athletic opportunities in high school, which could lead to increased habits of exercise, and through an increase in education levels since education and health outcomes are positively correlated.

In addition to racial disparities in health outcomes, there are also racial disparities in physical activity (Williams et al., 2018; Hawes et al., 2019; Callison & Lowen, 2022). The reasons for these racial disparities in physical activity are manifold and relate to factors such as poverty, access to resources, and risk exposure.<sup>4</sup> The benefits to investment in physical activity are larger for those with longer life expectancy because the longer life expectancy raises the return to this investment. The racial gap in life expectancy thereby would indicate that all else equal, Black women would invest less in physical activity. However, the marginal benefits to investment in physical activity may be greater for Black women if they start with lower levels of health capital (possibly caused by limited access to health care providers). In combination, we may see racial disparities in sports participation arising from Title IX, with more white adolescents participating, but larger returns to Black women from increased access to athletic participation.

Some of the health benefits of Title IX are potentially observable in the near term, but most studies show relatively modest short-term effects. Research by Kaestner and Xu (2007, 2010) examines physical activity and measures of body composition, finding some reduction in obesity among girls or women from exposure to Title IX. Callison and Lowen (2022) found some evidence of a beneficial link between high school sports participation and improvement in both physical and mental health among adult women.

A substantial literature documents that the effects of Title IX passage are not limited to possible health benefits. The passage of Title IX was followed by an increase in women's labor force participation (Stevenson, 2010) and in graduate education (Rim, 2021). Title IX also prohibited a common school policy of excluding pregnant teens from attending school with their peers; educational outcomes also improved for teen mothers following Title IX (Guldi, 2016). Schulkind (2017) shows that babies born to mothers impacted by Title IX as teens were healthier at birth. Clarke and Ayres (2014) found an increase among women in secularism and single motherhood, which they interpret as indications of independence from patriarchal institutions.

There has been little investigation of whether the effect of Title IX differed by race, but evidence provided by Guldi (2016) suggests that Black teen mothers benefited more than white teen mothers. In contrast, using a time period earlier than in our analysis, Callison and Lowen (2022) found that increased athletic opportunities improved adult health outcomes only for white women and not for those of other races or ethnicities.

## 2.2 *Empirical model structure*

We use difference-in-differences (DID) estimation to identify a potential causal effect of Title IX on women's health outcomes at the ages of 42–52 years.<sup>5</sup> We examine this age range

<sup>4</sup> Using data from the 1979 National Longitudinal Survey of Youth, Stevenson (2007) finds that those who are Black were less likely to participate in sports in high school than those who are white, but this disparity is eliminated for girls after controlling for socioeconomic characteristics of families.

<sup>5</sup> Many studies use an IV approach. This procedure requires a variable that is correlated with girls' sports participation but does not itself directly affect the outcome (in this case, later life health status), after controlling for other determinants of later life health status. Stevenson (2010) used boys' state-level sports participation rate as an

because it is the oldest age range that allows us to compare women at the same age in the pre-Title IX and post-Title IX periods. In recognition that Title IX was implemented gradually and federal regulations were not issued until 1975, with compliance not required until 1978, we separate out two periods to allow for a clearer comparator group for the before and after Title IX samples. Specifically, we consider five-year ranges for two groups: the pre-Title IX group born between 1951 and 1955 and the post-Title IX group born between 1966 and 1970.

Equation 1 provides the specific form of our DID equation for the groups of interest. White women provide the reference point, and we use either Black women or Hispanic women as the comparator group using the following equation:

$$Health_i = B_0 + B_1 Treated_i + B_2 White_i + B_3 Treated_i \times White_i + B_4 X_i + \gamma_b + \delta_s + \varepsilon_i, \quad (1)$$

where  $Health_i$  is an indicator variable that takes the value of 1 if individual  $i$  had the health outcome being measured;  $Treated_i$  is an indicator variable that takes the value of 1 if individual  $i$  was of high school age post-Title IX's enactment (born from 1966 to 1970);  $White_i$  is an indicator variable equal to 1 for white women;  $Treated_i \times White_i$  is the interaction term between the treated and white indicator variables for individual  $i$ ;  $X_i$  is a vector of individual characteristics such as age, marital status and education level;  $\gamma_b$  accounts for fixed effects for individual  $i$ 's year of birth;  $\delta_s$  accounts for survey year fixed effects; and  $\varepsilon_i$  is the error term. Our main coefficient of interest is  $B_3$ , which captures the difference in effects that the implementation of Title IX had on the health outcome for the different groups of interest (white vs. Black females, and white vs. Hispanic females).

Consider the use of the equation to estimate the effect of Title IX on Black women relative to white women. The structure of the model is parallel for analysis of Hispanic women. In the analysis of the impact of Title IX on Black women, the sample consists of non-Hispanic white females and non-Hispanic Black females. The coefficient  $B_3$  captures the difference in effects that the implementation of Title IX had on the health status of white females versus Black females. Suppose the health outcome variable pertains to whether the respondent's self-assessed health is excellent. If  $B_3$  has a negative value, then Title IX had a comparatively greater beneficial effect on Black women than white women. For health outcome measures that are adverse, such as being a smoker, a positive  $B_3$  coefficient for whites indicates that Black women exhibited a greater drop in smoking rates in the post-Title IX period. Based on evidence regarding declining reported health status of women in more recent time periods, one would expect the coefficient  $B_1$  to be negative for favorable health outcome variables such as being in excellent health, and positive for unfavorable health outcome variables such as being diabetic.

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instrument for expanded athletic opportunities for girls caused by Title IX. The reasoning is that Title IX placed higher regulatory burdens on states that had higher rates of boys' participation in sports, because those states had to entice substantially more girls to participate in sports to achieve the gender equivalence required by Title IX. Studies that use an IV approach with state identifiers have since followed Stevenson's method. Callison and Lowen (2022) used this IV approach but found significant results only for white women. Their interpretation of their nonsignificant results for nonwhite women or Hispanic women is that the instrument based on changes in male participation at the state level without accounting for race is not suitable for identifying effects for nonwhite women. For this reason, we opted to conduct our estimates using national data and a DID approach instead of an IV approach.

### 3 NHIS data

We use data from 1993 through 2018 from the NHIS on female respondents who are ages 42 through 52 at the time they were surveyed. The NHIS is a nationally representative survey designed to monitor the health of the US population. In addition to reporting demographic information, respondents report information on a broad range of health topics. We use weights throughout to account for the sample design, which oversamples some populations. We include in our analysis those who are non-Hispanic white, non-Hispanic Black, and Hispanic of any race. Other racial groups are too small for reliable analysis. We report results only for women in this paper because Title IX had almost no effect on sports participation of boys (Kaestner & Xu, 2007).

We examine nine health outcomes, with descriptions for all health variables provided in the Appendix. We consider two self-assessed measures of overall health, whether excellent or whether excellent or very good. Smoking status is reported as whether the respondent had smoked at least 100 cigarettes in their lifetime. Obesity is defined as a BMI of 30 and more, and obese or overweight is defined as a BMI of 25 or more. Individuals report whether they had been told that by a doctor that they have diabetes, are borderline diabetic, had hypertension, or had a heart condition or disease. The NHIS asks different health questions of different populations in different years, and the number of observations available in the analyses varied by health outcome examined.

The regressions control for marital status and mutually exclusive categories of less than high school education, high school education, some college education, and a Bachelor's degree or higher. We also include fixed effects controlling for each age, year born, and year of the survey.

### 4 Descriptive statistics

Table 1 summarizes the sample characteristics both pre-Title IX and post-Title IX for respondents who are white, Black, or Hispanic. Even with the age restrictions to have parallel samples in the pre-Title IX and post-Title IX periods, the NHIS produce substantial samples for all groups. The characteristics of the demographic groups are similar on dimensions such as age and year born, but differ in the expected ways otherwise. White women have the highest levels of education, followed by education levels for Blacks and Hispanics. White women are most likely to be married, and Black women are least likely to be married. The changes in the sample from the pre-Title IX period to the post-Title IX period are most substantial with respect to education levels. All three groups experienced a substantial increase in receiving a bachelor's degree or higher. Subsequent regressions control for all the demographics listed in Table 1.

The DID regressions focus on the changes in various health outcomes between the pre-Title IX and post-Title IX period. Before turning to the regression results, Table 2 reports the mean values of the health outcome variables for the pre-Title IX period, the post-Title IX period, and the difference for the three sample groups. The mean values of these differences within these demographic groups exhibit changes that preview the regression results. For both measures of overall health status, excellent health and excellent or very good health, there is a significant decline in the self-assessed health for white women, with a percentage point decline in excellent health of 2.3. In contrast, both Black women and Hispanic report a statistically significant improvement in whether their health is excellent,

**Table 1.** Descriptive statistics for demographic characteristics

	White women		Black women		Hispanic women	
	Pre-Title IX	Post-Title IX	Pre-Title IX	Post-Title IX	Pre-Title IX	Post-Title IX
Age	46.98 (3.15)	46.11 (2.78)	46.99 (3.15)	46.17 (2.76)	47.11 (3.17)	46.10 (2.74)
Year born	1953.06 (1.41)	1967.78 (1.42)	1953.06 (1.41)	1967.72 (1.40)	1953.11 (1.41)	1967.83 (1.40)
High school graduate	32.30	24.38	34.70	30.86	27.94	28.20
Some college	29.79	31.07	29.32	33.87	19.94	21.78
Bachelor's or higher	30.19	39.38	18.79	24.83	12.06	17.10
Education missing	2.37	1.07	3.60	1.79	3.72	2.29
Married	73.04	69.21	43.35	40.04	65.43	65.80
<i>N</i>	25,289	16,767	5,559	4,168	6,190	6,148

*Note:* Authors' calculations from National Health Interview Survey (NHIS) data survey years 1993–2018. Sample includes women aged 42–52 years when surveyed. Pre-Title IX observations were born in the years 1951–1955. Post-Title IX observations were born in the years 1966–1970. Standard deviations for continuous variables are given in parentheses. All other variables are percentages. All values are calculated using the NHIS person weight.

with percentage point increases in excellent health of 3.4 for Black women and 2.6 for Hispanic women. The pattern is the same, but the magnitudes are muted when the self-assessed health status measure is expanded to also include the category of whether the health status is very good.

All three groups report substantial declines in the rate of smoking in the post-Title IX period, but the 15.4 percentage point decline in smoking rates for Black women and the 8.2 percentage point decline in smoking rates for Hispanic women substantially exceed the more modest 3.4 percentage point decline for white women. For both the overall self-assessed health measure and the smoking measure, the more favorable performance of Black women and Hispanic women relative to white women is suggestive of a likely favorable impact of Title IX. Being classified as obese or as either obese or overweight is on the rise for all three groups, with Hispanic women exhibiting the smallest increase. Diabetes rates are up for all three groups, and the patterns for hypertension are more mixed. The reporting of heart conditions is down for all three groups in Table 2, but there is no evident difference in the performance of Black women and Hispanic women compared to that of white women.

The comparator group for our analysis is white women, who indicate a decrease in the percentage reporting that they were in excellent health during the post-Title IX period. Using males in the NHIS data of the same age and born in the same years as the comparator reference group of white women similarly indicates a decline in the percentage reporting that they are in excellent health. In the pre-Title IX period, our calculations find that the percentage of males who reported that they are in excellent health was 31.9%, and the excellent health percentage declined to 27.8% post-Title IX, or a drop of around 4 percentage points (significant at the 0.01 level). Women also experienced a decline in excellent health ratings, but the decline is less for women. Overall, women in our sample had an excellent

**Table 2.** *Pre-Title IX and Post-Title IX health outcomes*

White	Pre-Title IX	Post-Title IX	Difference	N
Excellent health	31.46	29.18	-2.28**	41,909
Excellent or very good health	66.16	64.75	-1.42**	41,909
Ever smoked	46.54	43.17	-3.37**	17,308
Obese	20.74	29.10	8.37**	19,294
Obese or overweight	47.71	57.87	10.16**	19,294
Diabetes	3.26	5.88	2.62**	20,895
Diabetes or borderline	3.95	7.45	3.50**	20,895
Hypertension	21.56	21.92	0.35	17,013
Heart condition	8.23	7.04	-1.20**	16,535
Black	Pre-Title IX	Post-Title IX	Difference	N
Excellent health	17.57	20.93	3.36**	9,685
Excellent or very good health	46.55	48.29	1.74+	9,685
Ever smoked	42.77	27.41	-15.36**	4,243
Obese	35.24	47.58	12.34**	4,435
Obese or overweight	69.53	80.59	11.07**	4,435
Diabetes	7.63	9.78	2.16**	4,978
Diabetes or borderline	8.55	12.35	3.80**	4,978
Hypertension	40.43	43.16	2.73+	4,224
Heart condition	8.45	6.31	-2.14**	4,130
Hispanic	Pre-Title IX	Post-Title IX	Difference	N
Excellent health	22.11	24.70	2.58**	12,311
Excellent or very good health	49.49	50.92	1.42	12,311
Ever smoked	29.49	21.28	-8.21**	4,542
Obese	28.66	32.46	3.81**	4,839
Obese or overweight	64.71	67.04	2.33+	4,839
Diabetes	6.38	8.85	2.46**	5,279
Diabetes or borderline	7.07	10.72	3.65**	5,279
Hypertension	25.12	21.89	-3.24**	4,461
Heart condition	4.58	3.61	-0.97+	4,413

*Note:* Authors' calculations from National Health Interview Survey (NHIS) data survey years 1993–2018. Sample includes women aged 42–52 years when surveyed. Pre-Title IX observations were born in the years 1951–1955. Post-Title IX observations were born in the years 1966–1970. All values are calculated using the NHIS person weight. Significant differences between pre-Title IX and post-Title IX health outcomes are indicated as follows:

\*significant at 10%;

\*significant at 5%;

\*\*significant at 1%.

health percentage of 28.8% pre-Title IX and 27.3% post-Title IX, for a decline of less than 2 percentage points (significant at the 0.01 level). These results for our NHIS sample are consistent with the findings using the Health and Retirement Study in Hudomiet et al. (2022), who also find a decrease over time in both men's and women's overall health status.

**Table 3.** Difference-in-differences regressions

Dependent variables	White-Black		White-Hispanic	
	Post-Title IX	Post × White	Post-Title IX	Post × White
Excellent health	−0.063* (0.021)	−0.057** (0.014)	−0.082** (0.017)	−0.049** (0.011)
Excellent or very good health	−0.036** (0.010)	−0.029* (0.012)	−0.049* (0.018)	−0.023+ (0.010)
Ever smoked	−0.203** (0.019)	0.120** (0.012)	−0.094** (0.016)	0.048** (0.013)
Obese	0.207** (0.017)	−0.038** (0.010)	0.142** (0.017)	0.045** (0.013)
Obese or overweight	0.240** (0.031)	−0.006 (0.023)	0.153** (0.024)	0.077** (0.018)
Diabetes	0.034* (0.012)	0.004 (0.009)	0.040** (0.006)	−0.0002 (0.008)
Diabetes or borderline	0.080** (0.011)	−0.004 (0.006)	0.083** (0.010)	−0.004 (0.010)
Hypertension	0.115** (0.017)	−0.022+ (0.011)	0.038* (0.012)	0.030* (0.013)
Heart condition	−0.031** (0.009)	0.010 (0.008)	−0.015 (0.014)	−0.003 (0.008)

Note: Sample is comprised of female respondents to the NHIS who were aged 42–52 years when surveyed and were born in the years 1951–1955 or 1966–1970. All regressions include indicators for married and education, as well as year born, survey year, and age fixed effects. All values are calculated using the NHIS person weight. Robust standard errors clustered by year born are reported in parentheses.

\*significant at 10%;

\*significant at 5%;

\*\*significant at 1%.

## 5 Regression results

The regression results in Table 3 report the key coefficients with respect to the temporal post-Title IX shift in the various health outcomes and the interaction of the post-Title IX variable with whether the respondent was white. The group being compared to white women is non-Hispanic Blacks in the first two columns of estimates and Hispanics in the final two columns.

Consider first the overall post-Title IX temporal shift variables, which are mostly consistent with the general deterioration in reported values for women's health in the post-Title IX period for this age group. A notable exception to such an adverse trend in health status is the reduction in the rate of smoking. The negative coefficient for the variable pertaining to whether the respondent has smoked more than 100 cigarettes in their lifetime mirrors the general downward societal trend in smoking rates. In terms of the temporal trend, this change is the most favorable development in terms of promoting women's health.

The DID interaction terms for Whites and the post-Title IX period are instructive in indicating that in most instances there have been comparatively greater gains for Black women and for Hispanic women than for white women. Although respondents overall are less likely to report excellent health or excellent or very good health, white women were even

less likely to report these favorable health outcomes than are Black or Hispanic women. Relative to white women, Black women are 6 percentage points more likely to report excellent health and 3 percentage points to report excellent or very good health. When Hispanic women are compared to white women, the estimates reflect the same pattern but with slightly smaller magnitudes, with a 5 percentage points difference for excellent health and 2 percentage point difference for excellent or very good health.

The most consistently strong result for other health outcomes is that for smoking status. Compared to white women, the post-Title IX decline in smoking behavior is greater for women who are Black or who are Hispanic. The Black-white difference is 12 percentage points, and the Hispanic-white difference is 5 percentage points. Smoking is perhaps the most well documented risky behavior, boosting the probability of a diverse array of health outcomes, increasing mortality risks by one-sixth to one-third, and shortening life expectancy by 3.6–7.2 years (Viscusi, 2002). Smoking behavior generally begins when people are in high school or of college age. Few people start smoking in middle age. The age groups most directly affected by Title IX are consequently well timed in terms of promoting athletic activities that will lead to the healthier long-term behavior of being a nonsmoker.

The post-Title IX interaction effects for the other health outcomes are more mixed in terms of whether there are greater gains for Black and Hispanic women relative to white women. Compared to white women, Black women show a greater reduction in being obese, with a 4 percentage point differential. But Hispanic women show a greater increase in being obese or being obese or overweight. The estimated Hispanic-white differential is 5 percentage points for obesity and 8 percentage points for being obese or overweight. There are no differential effects for being diabetic or for being diabetic and borderline diabetic. Compared to Black women, white women show a small relative reduction in hypertension, but an increase relative to Hispanic women.

The most consistent differential impacts of Title IX on Black and Hispanic women compared to white women are with respect to decreased smoking and increased measures of self-assessed health status, both in terms of whether health is excellent or whether health is excellent or very good. There is less consistent evidence of impacts of Title IX on specific health conditions of obesity, diabetes, or hypertension, which are ailments related to overall health status. The pronounced decrease in smoking rates should, however, have a consequential long-term impact on health given the increased rates of cancer, heart disease, and other ailments due to smoking.

The regression estimates in [Table 3](#) control for a detailed set of personal characteristics but do not include controls for personal characteristics that one might view as comorbidities. The regressions in [Table 4](#) add as explanatory variables whether the respondent has ever smoked and whether the respondent is obese, which are two health measures that may also reflect in part the influence of Title IX. The inclusion of these variables in the regressions in [Table 4](#) results in an overall temporal shift in the post-Title IX period that no longer indicates an overall decline in health status once trends in smoking rates and obesity are taken into account. For the comparisons of Black women and Hispanic women with white women, the principal health status measure of interest is whether the respondent reports being in excellent health. Those coefficients show statistically significant improvements in excellent health relative to white women, with a 7 percentage point difference for Black women and a 6 percentage point difference for Hispanic women. The estimates for excellent or very good health follow the same pattern but with smaller coefficients. The results in [Table 4](#) indicate

**Table 4.** Difference-in-differences regressions controlling for obese and smoking

Dependent variables	White-Black		White-Hispanic	
	Post-Title IX	Post×White	Post-Title IX	Post×White
Excellent health	0.010 (0.018)	−0.072** (0.019)	−0.026 (0.015)	−0.062** (0.012)
Excellent or very good health	0.029* (0.011)	−0.042* (0.014)	0.013 (0.022)	−0.034+ (0.016)
Diabetes	0.012 (0.012)	0.013 (0.010)	0.019* (0.007)	0.009 (0.011)
Diabetes or borderline	0.054** (0.010)	0.005 (0.005)	0.054** (0.010)	0.007 (0.015)
Hypertension	0.078** (0.019)	−0.010 (0.015)	0.017 (0.015)	0.025+ (0.013)
Heart condition	−0.036* (0.013)	0.011 (0.009)	−0.013 (0.015)	−0.008 (0.008)

Note: Sample is comprised of female respondents to the NHIS who were aged 42–52 when surveyed and were born between 1951–1955 or 1966–1970. In addition to indicators for obese or ever smoked, all regressions include indicators for married and education, as well as year born, survey year, and age fixed effects. All values are calculated using the NHIS person weight. Robust standard errors clustered by year born are reported in parentheses.

+significant at 10%;

\*significant at 5%;

\*\*significant at 1%.

no other statistically significant changes in health compared to white women during the post-Title IX period.

The health conditions frequently overlap and jointly contribute to how one assesses overall health status. A useful parsimonious approach to assessing the implications of the various results in these tables is to consider the summary measures of health status, whether the respondent rates her health status as excellent or rates it as either excellent or very good. While the differential effect of Title IX on minorities' overall health status cannot be monetized readily, they do serve as a prominent measure of health status in the literature. The greater beneficial effects of Title IX for Black women and Hispanic women are consistent with policy efforts to ensure that policies benefit historically disadvantaged groups and address health disparities, so that these impacts are supportive of equity concerns. The greater marginal effects of Title IX on the health status of minorities are also attractive from an efficiency standpoint if the cost of providing access to athletic opportunities to Black and Hispanic women do not differ by race or ethnicity.

## 6 Cost implications of Title IX's effect on smoking

The reduction in smoking rates resulting from Title IX has potential cost implications with respect to both health care expenditures and the valuation of health status. Smoking rates were reduced more for Black women and Hispanic women relative to white women, with Title IX reducing Black women's smoking rate by an additional 12 percentage points and Hispanic women's smoking rate by an additional 8 percentage points. Given the substantial

health risks posed by smoking, these reductions have implications for both medical cost outlays and the valuation of health loss due to smoking. The following calculations quantify the benefits of smoking reduction. However, we are not able to fully take into account race-specific differences in the benefits of the greater reduction in smoking among Black and Hispanic women, as race-specific values of the financial and health costs of smoking are not available.

The proper assessment of the cost of smoking involves a comparison between the trajectory of lifetime costs for smokers and nonsmokers. The appropriate nonsmoker reference point is what has been termed the nonsmoking smoker (Manning et al., 1991). In particular, the task is to assess the present value of the trajectory of costs for a person who has the same personal characteristics as smokers, such as education and income. The personal health care costs of smoking are unambiguous in that smoking increases a wide range of health risks and, on balance, has an expected adverse effect on health. The financial cost implications of smoking are less clear-cut, since cigarette smoking has financial cost implications that are both positive and negative. Because of their shorter lifetimes, the trajectory of medical costs ends sooner, as does their receipt of pension benefits and social security payments.

Consider first the expected health loss internality associated with smoking. The traditional valuation of these costs in the public health literature had been to assign an arbitrary value on each year of lost life, such as \$100,000, and use that figure to monetize the health loss. The mortality cost assessment used by Viscusi and Hersch (2008) monetized the health risks after estimating the value of a statistical life (VSL) and the VSL year (VSLY) for men and women smokers. They then applied these values to the change in the lifetime mortality rate trajectory due to smoking.<sup>6</sup> Based on a discount rate of 3%, the present value of the mortality cost per pack for a female smoker is \$80.09 (USD 2000), or \$136.61 (USD 2022). For a woman who smokes an average of 250 packs per year for 50 years, the lifetime mortality cost of smoking is \$1.7 million.

The financial savings from reduction in smoking differ depending on the study, but are certainly much more modest given the competing financial implications of cigarettes. Estimates reported by Viscusi (2002) indicate that there are some financial externalities associated with smoking, the most important of which are for medical care (\$0.58 per pack), along with cost increases for sick leave, group life insurance, forgone taxes on earnings, and fires. Smoking also generates cost savings in terms of reduced retirement and pension benefits of \$1.26 per pack, as well as lower costs for nursing home care. Based on these estimates, the financial externalities of smoking generate cost savings of \$0.32 per pack.

This result would seem to be inconsistent with the conclusion by Sloan et al. (2006) that the financial cost of smoking for a 24-year-old woman would be \$86,000 (USD 2000). The largest component of their cost calculation is the estimated mortality cost of smoking of \$52,385, which is not a financial cost and does not incorporate the use of the VSL. The financial cost categories of medical care costs, social security outlays, social security taxes, defined benefit private pensions, and life insurance lead to a net lifetime financial cost of \$1,465, which is a negligible amount. This value is not too different from the estimate in Viscusi (2002) using a somewhat different set of financial categories. The main cost

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<sup>6</sup>The statistics used for the mortality risk differences over a smoker's lifetime are the same as in Sloan et al. (2006), discussed below, but the use of the VSL and VSLY led to much greater estimates of the mortality cost than in the Sloan et al. study.

reduction associated with decreased smoking rates is in terms of reducing the considerable health cost of smoking.

## 7 Conclusion

Greater participation in athletic activities promoted by Title IX should provide consumption benefits, should enhance the physical fitness of participants in the short term, and should lead to subsequent greater participation in physical activities and better long-term health. Previous assessments to date of the impact of Title IX on the health status of women who benefited from the expanded athletic opportunities have typically found some but fairly muted evidence of health benefits. These studies have focused on relatively immediate gains, but most of the deterioration in health occurs in the later years that are analyzed in our study. Our analysis is also distinctive in that it addresses the differential health impacts for women who are either Black or Hispanic, compared to the performance of white women. These differences are quite pronounced, particularly with respect to overall self-assessed health and smoking status.

Distinguishing the effect of Title IX is consistent with the types of concerns embodied in the Biden administration's Justice40 policies and under the 2023 Office of Management and Budget guidance document Circular A-4.<sup>7</sup> The differential benefits for Blacks and Hispanics may also be efficiency enhancing to the extent that the marginal health benefits of any given policy intervention are greater for these groups. While this evidence does not resolve the issue of whether overall Title IX has produced benefits exceeding costs, it does indicate that assessment of the long-term impacts on participants' health status should be a component of such an assessment.

**Competing interest.** The authors declare none.

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## Appendix: Health outcome definitions

Health outcome	Definition
Excellent health	Self-reported health status as excellent
Excellent or very good health	Self-reported health status as excellent or very good
Ever smoked	Has ever smoked 100 cigarettes in life
Obese	BMI greater than or equal to 30
Obese or overweight	BMI greater than or equal to 25
Diabetes	Has ever been told they have diabetes
Diabetes or borderline	Has ever been told they have diabetes or are borderline diabetic
Hypertension	Has ever been told they have hypertension
Heart condition	Has ever been told they have a heart condition or disease

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