HHS Public Access

Author manuscript

*Popul Res Policy Rev*. Author manuscript; available in PMC 2024 December 01.

Published in final edited form as:

*Popul Res Policy Rev*. 2023 December ; 42(6): . doi:10.1007/s11113-023-09831-w.

# Race, gender, and cohort differences in the educational experiences of Black and White Americans

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## Abstract

Federal legislation and judicial intervention led to significant transformation in the U.S. education system during the early to mid-20th century. These changes may differentiate older adults in their experiences of aging, particularly at the intersection of race, gender, and cohort, but are not well documented among current cohorts of older adults. Our study addresses this gap by providing rich, descriptive information on the educational experiences of U.S. adults who attended primary or secondary school between 1915 and 1977. We used data from the Health and Retirement Study (HRS), a nationally representative, prospective study of U.S. adults over age 50 years. The HRS collected information on respondents' schooling history and experiences through a Life History Mail Survey (LHMS). We restricted our sample to age-eligible HRS-LHMS respondents who self-identified as non-Hispanic White or non-Hispanic Black and completed at least 75% of their primary or secondary schooling in the U.S. (n=10,632). Educational experiences, defined as pre-k to post-secondary education, varied across cohort, regardless of race or gender. Greater course offerings, improvements in learning support, and increasing exposure to integrated schools occurred across successive cohorts. We found the highest rates of enrollment in college preparatory curriculum and foreign-language courses as well as diagnosed learning differences in cohorts born after 1948. Among White adults, many of the gender differences in educational experiences documented in the oldest cohort were still found among the most recent cohort. Few gender differences, however, were found for Black adults regardless of cohort. Conversely, most race inequities in educational experiences persisted. Such inequities may be an important source of continued differences in experiences of aging observed across demographic groups.

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Statements and Declarations

The authors have no competing interests to declare that are relevant to the content of the article.

Ethics approval

This is an observational study using publicly available data and declared exempt from ethical approval.

**Keywords**

educational experiences; life history; life course; schools

## Introduction

Education is a key determinant of social, economic, and health outcomes at older ages. Compared to individuals with less education, older adults with more education have better relationship quality (Smock & Schwartz, 2020), higher earnings and more wealth (Crystal et al., 1992), and greater advantages with respect to health literacy (Clouston et al., 2017) and technology use (Kämpfen & Maurer, 2018). More education is also associated with better physical and cognitive function (Lövdén et al., 2020; Townsend & Mehta, 2021), less morbidity (Ding et al., 2019), and longer lives (Sasson, 2016).

Despite its role as one of the most robust predictors of aging-related outcomes, including social, economic, and health conditions, we have a limited understanding of how education matters for later life. Most research on the role of education in aging-related outcomes examines educational attainment, typically measured using years of schooling or credentials (McLaughlin et al., 2010; Mejía et al., 2017). Education, however, may shape aging not only via attainment, but also through individuals' experiences within schools. Federal legislation and judicial intervention led to significant transformation in the U.S. education system during the early to mid-20th century, including the expansion of science, technology, and mathematics (STEM) curriculum, the implementation of school desegregation, and the provision of resources for children with learning differences, among other changes ("About IDEA," n.d.; Johnson, 2019; Malcom-Piqueux, 2020; McGuinn, 2006). Studies document independent associations between these educational experiences – including type of coursework, per-pupil spending, and school segregation – and educational (Borghans et al., 2015; Campbell et al., 2002; Carr et al., 2019), economic (Johnson, 2019), and health-related outcomes (Dudovitz et al., 2016; Frisvold & Golberstein, 2011; Kim et al., 2022; Walsemann et al., 2008, 2009; Walsemann & Ailshire, 2020), all of which are important contributors to successful aging. Importantly, given the timing of federal legislation and judicial decisions affecting the U.S. education system, older adults' educational experiences – defined for purposes of our study as those experiences occurring from preschool through post-secondary school – likely varied across race, gender, and cohort, but these experiences are not well documented among current cohorts of older adults.

Thus, heterogeneity in educational experiences may differentiate older adults with equivalent educational attainment in their experiences of aging. This study addresses a key limitation in the literature by providing a rich description of educational experiences across race, gender, and cohort to better understand how these experiences changed for U.S. adults who attended primary or secondary school between 1915 and 1977. We use the Health and Retirement Study's Life History Mail Survey (HRS-LHMS) – a subsample of the HRS respondents who retrospectively reported on an extensive set of educational experiences – to answer 2 key questions. First, how did educational experiences change over

the 20th century? Second, are there notable differences in educational experiences across race, gender, and cohort?

## Background

Secularization and the implementation of federal and state educational policies profoundly changed the U.S. education system over the course of the 20th century and most likely shaped variation in educational experiences across race, gender, and cohort. Documenting the impact these policy changes had on educational experiences is therefore critical to understanding how structural factors influenced and reinforced inequalities across demographic groups, with potential implications for aging-related outcomes.

Figure 1 provides an overview of key policies and legal decisions affecting the U.S. education system from 1915 to 1975, a period spanning the education of cohorts who are now entering midlife and older adulthood. During the early 20th century, states enacted compulsory schooling laws. In 1900, only 31 states required school attendance through age 14. By 1918, all American children were required to attend primary school. Following the enactment by states of school compulsory laws, investment in and access to public education in the United States increased significantly and, over time, school term length became standardized across states.

The introduction of early educational programs during the 20th century meant students started school at younger ages and extended the amount of time they could spend in school. By 1914, all urban school systems offered public kindergarten, but universal access did not occur until 1986 (Passe, 2010). The first publicly funded preschool program – Head Start – was created in 1965 as part of the Elementary and Secondary Education Act (ESEA) with the goal of addressing the social, emotional, health, nutritional, and educational needs of low-income students and improving their social and cognitive development (Head Start History, n.d.). Early educational programs - like preschool and kindergarten - can improve social, behavioral, educational, and health outcomes in adulthood; outcomes that are important life course pathways to successful aging (Carneiro & Ginja, 2014; Deming, 2009). For example, one study found that children who attended Head Start were 8% more likely to graduate from high school, 6% more likely to attend college, and 7% less likely to be in poor health as young adults than their siblings who did not attend Head Start (Deming, 2009). Given that publicly funded preschool was not offered until the 1960s, it is likely that older cohorts had lower enrollment in preschool than more recent cohorts – an early educational experience with implications for educational, social, and health trajectories.

Prior to the early 1950s, high school curriculum often emphasized vocational skills, with fewer opportunities to enroll in advanced coursework, including mathematics, science, and foreign language. For example, in 1954–55, only 11% of high schoolers were enrolled in geometry classes and 2.6% in trigonometry. Calculus was not introduced into the high school curriculum until after 1958 (Klein, 2003), the year the U.S. Congress passed the National Defense Education Act of 1958 (NDEA) in response to Cold War concerns that U.S. students were falling behind the USSR and other industrialized nations academically (U.S. Senate: Sputnik Spurs Passage of the National Defense Education

Act, n.d.). The NDEA invested $1 billion dollars over seven years in public education to bolster education in science, mathematics, and foreign languages. It also implemented programs to identify gifted students and provided low-cost loans to students to attend college and additional funding to states for vocational training originally established in the Smith-Hughes Vocational Education Act (1917) and the Vocational Education Act of 1946. Federal investment in academic preparation, vocational training, and college loans may have resulted in better math and reading skills, greater access to foreign language classes and college preparatory or vocational training, and higher rates of post-secondary degree enrollment and completion among persons born in the 1950s and 1960s. These cohort differences may have also varied by gender. Prior to the 1960s, girls were often directed into courses like home economics, whereas boys were directed into vocational or academic studies (Sadker et al., 1991). After 1960, more boys than girls enrolled in math and science courses in high school and scored higher on subject matter tests (Campbell et al., 2000; Gamoran, 2001). Not until the passage of the 1964 Civil Rights Act that prohibited discrimination by sex (Sadker, 1989) and Title IX of the 1972 education amendments did educators and scholars begin to focus on these gender inequities within schools, document them, and attempt to address them (Bailey & Graves, 2016). Among the few scholars that studied gender inequities, almost none considered how they varied by race (Bailey & Graves, 2016; Grant & Sleeter, 1986). Thus, we have limited information on the course taking of older cohorts of Americans overall or as it pertains to specific demographic groups.

One of the most notable changes in U.S. classrooms was racial desegregation. Before 1954, all Southern states legally mandated racially segregated schools, which provided significantly fewer resources to Black segregated schools. In the 1920s, for example, Southern states spent 5–8 times more on White schools than Black schools (Tushnet, 1987) and provided school terms that were 50–100% longer (Walsemann et al., 2022). In 1954, *Brown v. Board of Education* (1954) struck down the ‘separate but equal’ legal doctrine that allowed for race-segregated school systems. In combination with the Civil Rights Act of 1964 and the Elementary and Secondary Education Act of 1965 (ESEA), inequality in school resources and academic outcomes were reduced. Black children born in or after the 1950s, especially those in the U.S. South, experienced improvements in education quality, which led to improved academic outcomes for Black children as well as improvement in other long-term social and health outcomes associated with successful aging (Frisvold & Golberstein, 2011; Johnson, 2019). Even so, school desegregation often resulted in the firing of Black teachers and the reassignment of Black students to formerly all-White schools where they were taught by White teachers who held lower expectations of them (Beady & Hansell, 1981; Bell, 2004) and provided them with fewer academic opportunities such as access to advanced coursework (Arnez, 1978). Importantly, between 65 to 80% of Black older adults grew up in the U.S. South (Ruggles et al., 2022), depending on their cohort, pointing to the importance of school desegregation for changing the educational experiences of students across cohorts and by race.

During the 1960s and 1970s, federal policies to improve access to education for children with disabilities were also enacted, including the Elementary and Secondary Education Act of 1965, the 1970 Education of the Handicapped Act, and The Education for All Handicap Act of 1975 (Wright & Wright, 2007). Prior to these policy changes, being diagnosed with

a learning difference often restricted the educational and career opportunities of students (Dunn, 1968), but after their passage, more resources were available to mitigate the learning difference. As schools gained access to resources provided by this federal legislation, it is likely that parents of children who were struggling academically or had learning differences would have availed themselves of these resources, increasing the number of students diagnosed. Access to diagnosis and resources are often shaped by race and gender. Among current cohorts, diagnosis occurs more frequently in well-resourced, predominantly White schools, and when diagnosed, White children receive more intervention resources than Black children (Shifrer & Fish, 2020). Boys are also more likely to be diagnosed with reading difficulties, attention disorders, dyslexia, stuttering, and delayed speech than girls (Buchmann et al., 2008; Halpern, 1989). Thus, patterns in diagnoses of learning differences may represent differential access to resources and interventions that could improve educational outcomes and have long-term implications for social, economic, and health outcomes across the life course in ways that intersect across race, gender, and cohort (Liptak et al., 2008).

Federal policies to improve public primary and secondary schooling also coincided with efforts to broaden access to post-secondary education in The Higher Education Act of 1965 (HEA). The HEA set out to improve access to postsecondary education for low- and middle-income families and strengthen the infrastructure of colleges and universities in the United States. A key component of the original HEA included the provision of funds to colleges and universities to identify and recruit students with significant financial need (Umbricht, 2016). Student loans, Pell grants, and work study programs – i.e., direct aid to students – were added to the 1972 reauthorization of the HEA. While there is some debate as to the extent to which financial aid increased access to college among low- and middle-income students (Hansen, 1983), trends in postsecondary degree completion demonstrate a significant increase in the percentage of Americans completing college (Baum et al., 2013). In 1910, 2.7% of adults aged 25 or older had completed college, but by 1975, 13.5% had. And while Black women have always completed college at a higher rate than Black men, this female advantage was not seen among White adults until the mid-1980s (McDaniel et al., 2011).

As a result of these policy changes in public education, cohorts who attended school in the 1920s and 1930s experienced a different educational landscape than cohorts who completed their education in the 1960s and 1970s (Fig. 2). In this short time frame, per-pupil spending increased 7-fold (Fig. 2a), the percent of school revenue provided by the federal government increased from a median of <1% to 9% (Fig. 2b), and median pupil-teacher ratios decreased from 24:1 to 19:1 (Fig. 2c). In the South, many Black students who were once exclusively attending segregated schools were, by 1969, attending desegregated schools. In 1955, a year after *Brown*, the median percentage of Black students in the South who were attending schools with White students was 0% (Fig. 2d). By 1969, it was 66%.

Given what we know about the various policies and programs that shaped the U.S. education system during the 20th century as well as the importance of education for the social, economic, and health of older adults, it is critical to document the educational experiences of older Americans and situate these patterns in the sociohistorical context in which they

occurred. Moreover, it is particularly important to consider how these patterns vary at the intersection of race, gender, and cohort, since almost no empirical work has done so for cohorts born prior to the 1960s. Our study, thus, addresses a key limitation in the research by documenting and examining the educational experiences of several birth cohorts of midlife and older adults and how these educational experiences differed at the intersection of race, gender, and cohort.

## Method

### Data and Sample

Data came from the Health and Retirement Study (HRS), a nationally representative, longitudinal study of U.S. adults over age 50 years (Sonnega et al., 2014). Since 1992, the HRS has conducted core interviews with age-eligible respondents and their spouses approximately every 2 years. Starting in 2015, HRS began collecting information on respondents' residential and schooling history and other childhood events through a Life History Mail Survey (LHMS). The HRS-LHMS was initially sent to 11,256 HRS respondents and their spouses from the 2014 core interview who were not selected for the 2015 Consumption and Activities Mail Survey (CAMS) and who completed their most recent core interview in English. Just over half of contacted individuals (n=6,481; 58%) responded. Three additional samples were selected for the LHMS in the spring and fall of 2017 and the spring of 2019, respectively. These samples included respondents not initially selected for the 2015 LHMS data collection (e.g., Spanish speakers, 2015 CAMS sample, and the Late Baby Boom cohort). Response rates ranged from 28% to 74% for the three samples and resulted in an additional 6,879 LHMS respondents. A total of 13,360 HRS respondents have completed the HRS-LHMS (Health and Retirement Study 2019 Spring Life History Mail Survey (LHMS) Release Version: Version 1, 2023; Larkina et al., 2021).

We restricted our sample to age-eligible HRS-LHMS respondents who self-identified as non-Hispanic White or non-Hispanic Black and completed at least 75% of their primary or secondary schooling in the United States (n=10,946). Approximately 38% of the HRS-LHMS sample had missing data on at least 1 of the variables of interest. Item nonresponse ranged from <1% (highest degree) to 12% (learning differences). To address item nonresponse, we employed multiple imputation (details below). Our final sample included n=10,632 respondents.

## Measures

### Educational Experiences

We assessed several educational experiences prior to and during primary school. Respondents were asked if they attended a *preschool* (yes/no) before primary school. Respondents self-assessed their *reading and writing ability* and *math ability* at age 10 in comparison with class peers on a 5-point scale (1=much worse to 5=much better). We classified respondents as having *learning differences* if, during primary school, they were told by a professional that they had a problem learning in any of 4 subjects (i.e., reading,

writing, mathematics, speaking/language) or they were diagnosed with attention deficit hyperactivity disorder, dyslexia, or another learning disorder.

We included four indicators of educational experiences during secondary school. Respondents reported whether they *attended high school* (yes/no). Those that did attend high school described their *high school curriculum* as primarily 1) vocational (i.e., courses or classes that were intended to prepare them for a job after high school), 2) college preparatory (i.e., special courses or classes to better prepare them for college); or 3) general (i.e., did not take any vocational or college preparatory courses). Respondents reported if they studied a *foreign language* (yes/no) or *participated in creative arts* when they were in high school (yes/no), including playing a musical instrument, singing, dancing, or painting/drawing.

Three measures span the duration of respondents' primary and secondary schooling. For each school attended, respondents were asked if the school was public or private and if most children in the school were White, Hispanic, Black, or other. We used this information to create two variables – the proportion of respondents' schooling spent in a *private school* (range: 0 to 1) or in a *majority non-White* school (range: 0 to 1). We also created a variable that measured if the respondent had *ever attended a race discordant school* (yes/no). For White adults this measure was defined as having ever attended a majority non-White school. For Black adults, this measure was defined as having ever attended a majority White school.

Finally, we included three self-reported measures of educational attainment – number of *years of schooling* completed (range: 1 to 17), any *post-secondary education* (yes/no) defined as attending any college, professional, or technical school, and *bachelor's degree attainment* (attained at least a bachelor's degree vs did not).

## Demographics

Demographic variables included *cohort*, *gender* (women, men; determined from the household roster and confirmed by the interviewer at the baseline interview), *race/ethnicity* (non-Hispanic White or non-Hispanic Black), and *census region of birth* (Northeast, Midwest, South, West, or another country or U.S. Territory). We used HRS classifications of cohorts for comparability to other studies using HRS data and collapsed the two oldest and two youngest cohorts due to small sample sizes and because those born after 1959 have yet to be fully sampled in the LHMS: AHEAD/CODA (<1931), HRS (1931–1941), War Babies (1942–1947), Early Baby Boomers (EBB; 1948–1953), and Mid to Late Baby Boomers (MLBB; ≥1954).

## Analytic Approach

To address item nonresponse, we imputed data using the mi impute command with chained equations in Stata, version 17 (Stata-Corp LP, College Station, TX). Imputation models included all analytical variables as well as well as variables that were theoretically related to item nonresponse (e.g., childhood measures, parents' highest education) (Heeringa et al., 2017). Prior to imputation, we excluded respondents who were not age-eligible (n=219), missing data on highest degree (n=2), or missing data on more than 10 variables in our imputation equation (n=93). The final imputation sample included 10,632 respondents (8,382 White respondents and 2,250 Black respondents). For variables

measuring secondary school experiences (i.e., high school curriculum, foreign language courses, arts participation), we estimated conditional imputation equations, restricting imputations to respondents who attended high school. Imputation models were performed separately for White and Black respondents. We produced 50 datasets as recommended by Graham and colleagues (2007). Analyses were replicated across the 50 datasets and combined using mi estimate.

Our analysis proceeded as follows. First, we described the demographic characteristics of the HRS-LHMS sample. Next, we estimated the prevalence of educational experiences across four race and gender groups: non-Hispanic White men and women and non-Hispanic Black men and women. Then, we estimated educational experiences by race, gender, and cohort, but restricted our analysis to four cohorts (i.e., HRS, War Babies, Early Baby Boomers, Mid to Late Baby Boomers) given concerns about selective mortality among the AHEAD/CODA cohort (described in the Sensitivity Analysis section). Next, we use the mlincom post-estimation command in Stata 17 to calculate point estimates, standard errors, and statistical significance for multiple linear combinations of coefficients (Long & Freese, 2014). Using these estimates, we assessed whether educational experiences significantly differed by gender (within race) and race (within gender). We then assessed gender (within race) and race (within gender) differences within each cohort as well as cohort differences (within race and gender). We used a threshold of $p<0.025$ to determine statistical significance and account for multiple comparisons. We applied person-level weights from the interview year prior to when respondents completed their LHMS survey to account for the complex sampling design of the HRS and attrition (HRS Staff, 2019).

## Results

### Sample characteristics

Table 1 presents the demographic characteristics of our sample. Over 90% were White adults, most were women (55%), and almost 34% were from the MLBB cohort. Few respondents were foreign-born or born in a U.S. Territory per our sample restrictions (1.0%) and almost 36% were born in the Midwest. The sample had a mean education of 13.8 years, with 32.8% holding a bachelor’s degree or higher.

### Educational experiences by race and gender

Next, we considered how the educational experiences of older adults in the HRS-LHMS sample varied across race and gender (Table 2). Online supplemental tables present descriptive statistics by race (Table A1) and gender (Table A2), separately.

Among White adults, educational experiences followed established gender norms in schools (Henderson et al., 2018; Mau & Lynn, 2000). Men were more likely than women to attend preschool (15.6% vs 12.8%), rate their math ability higher (3.5 vs 3.4), and rate their reading ability lower (3.4 vs 3.8). Among those who attended high school, there were no gender differences in high school curriculum, but women were more likely to take a foreign language course (59.3% vs 52.5%) and to participate in the arts (63% vs 45.2%). Men also had higher rates of post-secondary education and bachelor’s degree completion than women.

Among Black adults, fewer gender differences in educational experiences emerged. Compared to women, men rated their reading ability lower (3.4 vs 3.7) and had higher rates of being diagnosed with learning differences (21.0% vs 15.1%). Among those who attended high school, women reported higher rates of taking a foreign language (44.3% vs 33.9%) than men. As expected, based on historical estimates, women were more likely than men to have post-secondary education (61.1% vs 51.8%).

We also found significant differences in educational experiences by race (within gender). Compared to White men and women, Black men and women spent less of their schooling in private schools (4% vs 14%) and more of their time attending predominantly non-White schools (~82% vs 2%). Around 40% of Black men and women ever attended a predominantly White school, whereas about 9–10% of White adults ever attended a predominantly non-White school. Black adults were also less likely to take college preparatory coursework or foreign language courses or have post-secondary education or a bachelor's degree than White adults. We also found that more Black women than White women were diagnosed with a learning difference, whereas Black men reported their math ability as lower than White men. Additional group comparisons can be found in Table 2.

### Race, gender, and cohort

Figure 3 plots estimates and confidence intervals for several educational experiences that were likely responsive to U.S. Supreme Court decisions and federal policies enacted in the 1950s and later. We report estimates at the intersection of race, gender, and cohort, restricting our analysis to later cohorts due to the selective mortality of the AHEAD/CODA cohort (as described in the sensitivity analysis section). We provide estimates for all variables in Supplemental Table A3 as well as indicate when group differences (i.e., gender differences within race and cohort; race differences within gender and cohort; cohort differences within race and gender) were statistically significant at $p<0.025$.

Access to early educational programs increased for all race/gender groups, with greater increases among White men and women. For example, only about 9–10% of White women and men in the HRS cohort attended preschool, but 18–22.6% did so among the MLBB cohort – an increase of 106% and 128% for White women and men, respectively. Baseline rates of preschool attendance were higher among Black men and women (around 16% for the HRS cohort) compared to their White counterparts, but the rate of increase in preschool attendance between the HRS and MLBB cohorts was smaller (around 33–50%) for Black adults. Similarly, diagnosed learning differences also increased across cohorts for all race/gender groups, with the greatest increases among White men – 12.5% in HRS and 22.6% in MLBB, an 81% increase – and White women (6.8% in HRS and 15.4% in MLBB, a 127% increase). Black men in the MLBB cohort had the highest absolute rate of diagnosed learning differences (27%).

We also found increasing rates of curricular opportunities across successive cohorts. For example, among those who attended high school, over half of White men (55%) and almost two-thirds of White women (63%) in the MLBB cohort reported taking foreign language courses compared to just 38% and 49% in the HRS cohort, respectively. More Black men and women were also taking foreign language courses in later cohorts, but the absolute

percentage of those doing so in the MLBB cohort (37% and 46%, respectively) was akin to the percentage of White men and women in the HRS cohort. Similarly, enrollment in college preparatory coursework during high school increased between the HRS and MLBB cohorts, with the largest increase among Black men (174% increase from HRS cohort when 12.6% took college preparatory courses to 34.5% in MLBB cohort). By the MLBB cohort, the race disparity in college preparatory coursework for men was only 1.8 percentage points but was still large and significant for women (10.3 percentage points).

Access to diverse school settings also changed significantly for all race/gender groups across cohorts. The proportion of time White adults spent in majority non-White schools increased from 1% in the HRS cohort to 4% in the MLBB cohort. Thus, a White man or woman who completed 12 years of schooling would have attended a majority non-White school for approximately 22 days, on average (assuming 180 days for each school year), if in the HRS cohort and 86 days if in the MLBB cohort. Black men and women saw a decline in the proportion of schooling spent in majority non-White schools from about 89–91% in the HRS cohort to 74–75% in the MLBB cohort. This translates to 1,965 days spent in majority non-White schools for Black women in the HRS cohort who completed 12 years of schooling to 1,598 days spent in majority non-White schools in the MLBB cohort - a decline of 367 days or 2 school years. In Supplemental Table A3, we also show that the percentage of White men and women who ever attended a majority non-White school increased from 7–8% in the HRS cohort to around 13% in the MLBB cohort, an increase of 70–76%. Black men and women were also more likely to have ever attended a majority White school across successive cohorts – from 24–31% in the HRS cohort to around 51% in the MLBB cohort. Thus, we find increasing exposure to integrated school settings across cohorts for both White and Black adults.

Black women were more likely than Black men to have post-secondary education across cohorts (51–65% vs 33–59%, respectively), though the gender disparity diminished (17.4% in HRS cohort to 5.8% in the MLBB cohort). Conversely, White men were more likely than White women to have post-secondary education in the HRS cohort (62% vs 54%), but the gender disparity declined with each successive cohort and reversed by the MLBB cohort. In this most recent cohort, White women were more likely to have post-secondary education by, on average, 4 percentage points (75% vs 71%). The race disparity, however, remained for both men and women – a disparity of 20 percentage points for men and almost 16 percentage points for women.

## Sensitivity Analysis

Since data collection for the LHMS did not begin until 2015, we examined how the LHMS sample differed from the core HRS sample. First, we created a comparable sample from the core HRS sample – non-Hispanic White and Black respondents who were interviewed in 2014, 2016, or 2018 and completed at least 75% of their schooling in the United States. Next, we examined bivariate and multivariable associations between variables of interests (excluding educational experiences, which were only collected in the LHMS) for the pooled sample (Supplemental Table A4) and across cohorts (Supplemental Tables A5–A6). Compared to the core HRS sample, the LHMS sample included slightly more

non-Hispanic White adults (91% vs 89%) and women (55.5% vs 53.4%). The LHMS sample also included fewer respondents from the AHEAD/CODA and Mid/Late Baby Boomer cohorts than the HRS sample, differences likely resulting from two factors: the timing of the LHMS survey, which occurred after most of the respondents in the earlier cohorts had died or were no longer able to complete a self-administered questionnaire, and the fact that the MLBB cohort has yet to be fully sampled for the LHMS. The LHMS sample was also slightly more educated (33% vs 31% have at least a bachelor's degree) and in better health (M=2.29 vs 2.21). Most bivariate differences remained statistically significant after adjustment for socio-demographic and health variables, except for region of birth, which was not statistically associated with inclusion in the LHMS sample. In cohort-stratified analysis, bivariate associations indicated that across all cohorts the LHMS sample was generally more educated, healthier, and had higher proportions of women and White adults than the core HRS sample (Supplemental Table A5). Education differences between the two samples were relatively small (1–2 percentage points) for most cohorts except AHEAD/CODA. In logistic regression models, however, education was not significantly associated ($p<0.025$) with inclusion into the LHMS for all cohorts except AHEAD/CODA (Supplemental Table A6).

## Discussion

Educational policy, practice, and experiences changed significantly for Americans throughout the 20th century. These changes, however, were not universally or uniformly experienced, leading to considerable population heterogeneity. Using data from the HRS-LHMS, our study not only provides rich descriptive information on the educational experiences of older cohorts of Black and White Americans but also showed that while Black-White inequities shifted over time most were maintained even with significant advancements in legal, political, and economic support. Similarly, we found reductions in gender inequities in post-secondary education and bachelor's degree attainment for Black and White adults, but other gender inequities in educational experiences persisted across cohorts.

Exposure to early educational programs, including preschool attendance and diagnosed learning differences, increased across cohorts, regardless of race or gender. Still, these improvements were generally larger for White than Black adults. For example, we found increasing rates of diagnosed learning differences across cohorts that coincided with the passage of federal legislation designed to improve access to education for children with disabilities (Wright & Wright, 2007). Diagnosis, however, increased much faster among White men and women than their Black counterparts, though Black men in the MLBB cohort had the highest rate of diagnosis of any group while White men in this cohort had the second highest rate of diagnosis. The higher rates of diagnosis among men in our sample mirror evidence that consistently finds that boys are more likely to be diagnosed with reading difficulties, attention disorders, dyslexia, and delayed speech (Buchmann et al., 2008; Halpern, 1989). Our findings for White adults also align with recent research that documents higher rates of diagnosed learning difficulties in well-resourced schools with large White student populations and greater access to intervention resources among White children in these schools upon diagnosis (Shifrer & Fish, 2020). Thus, federal policies that

provided enhanced resources for students with learning difficulties may have incentivized White parents in the MLBB cohort to have their children assessed/diagnosed.

Gender differences in self-reported reading and math ability persisted across cohorts, with women more likely to report higher self-assessed ability in reading and writing at age 10 than men, regardless of race, and White men more likely to report higher self-assessed ability in math at age 10 than White women. Our descriptive findings align with prior work that finds boys generally score higher on math achievement tests than girls, whereas girls generally score higher on reading achievement tests than boys – a phenomenon that tends to emerge and increase as students progress through school (Buchmann et al., 2008). Further, the persistence of these gender disparities across cohorts is consistent with prior work that finds relatively stable gender gaps in test scores during the 1960s–1990s (Hedges & Nowell, 1995).

We found the highest rates of enrollment in college preparatory curriculum and foreign-language courses in cohorts born after 1948. While all race/gender groups experienced increasing enrollment in college preparatory curriculum during high school, the largest gains were among Black men. In part, this is because Black men in the HRS cohort had very low rates of enrollment in college preparatory curriculum. Importantly, these gains reduced the Black-White disparity in college preparatory curriculum for men, although the race disparity remained for women – a finding that may reflect prior evidence that Black girls are often overlooked by teachers for educational opportunities (Lewis, 2003; Morris, 2007). Black and White women in the post-1948 cohorts also had the highest enrollment in foreign language courses, often a prerequisite for enrollment in 4-year colleges (What Is a College Foreign Language Requirement?, n.d.), with White women having higher rates of enrollment than White men. These patterns most likely reflect changes in federal investment in public education stemming from the National Defense of Education Act of 1958 that aimed to increase enrollment in foreign languages, STEM, and college as well as the 1964 Civil Rights Act that prohibited discrimination by sex and race.

Consistent with prior work (Jackson & Holzman, 2020), we find increasing post-secondary education and college completion across successive cohorts for all race/gender groups. We also find that Black women reported post-secondary education at higher rates than Black men, whereas White women surpassed White men in post-secondary education in the MLBB cohort, trends that others have previously documented (Buchmann et al., 2008; DiPrete & Buchmann, 2013; Jackson & Holzman, 2020). Our descriptive findings coincide with federal policy changes and investment that aimed to improve access to postsecondary education for low- and middle-income families (Rose, 2018) and increase readiness for college.

The significant transformation in the U.S. education system during the early to mid-20$^{th}$ century did not lead to the eradication of race inequities in educational opportunities, however. Specifically, we found that among those who attended high school, Black adults in the MLBB cohort had levels of foreign language course enrollment, art participation (among women), and post-secondary education comparable to those found among the earlier White cohorts (i.e., HRS or War Babies). We also documented large race inequities in time

spent attending majority non-White schools. White older adults spent almost none of their schooling attending majority non-White schools, whereas Black adults spent almost all their schooling attending majority non-White schools. Although recent cohorts of White adults spent marginally more time (4% vs 1%) and recent cohorts of Black adults spent less time (74% vs 91%) attending majority non-White schools, most older Black adults, regardless of cohort, spent most of their schooling attending majority non-White schools. Even so, over half of Black adults in the most recent cohort had attended at least *one* school where most of the students were White. Importantly, the greatest reduction in school segregation occurred after the 1964 Civil Rights Act and the 1965 ESEA, when federal funding was tied to school desegregation (Johnson, 2019), corresponding to when the MLBB cohort would have been attending school. School desegregation reached its peak in the late 1980s, when 45% of Black students were enrolled in majority-White schools, but slowly reversed in subsequent decades to levels found prior to *Brown* (Orfield & Eaton, 1996). Thus, as younger cohorts of adults enter mid-life, their educational experiences may look more like older adults who attended school prior to or immediately after the passage of *Brown*.

Our results may inform recent findings that document that the educational gradient in health has widened over time (Everett et al., 2013; Lynch, 2003; Masters et al., 2012). Some have posited that these trends are related to cohort compositional changes in who attains more education (i.e., increasing educational attainment across cohorts and more selectivity among those individuals who complete fewer years of school) – a hypothesis that has been supported in the literature (Masters et al., 2012). For example, Lynch (2003) documented both life course and cohort effects on the relationship between education and health and mortality, whereas Masters et al. (2012) show that widening educational disparities in mortality were solely attributed to cohort effects. Others, however, have found no cohort effects on the relationship between education and health and mortality (c.f., Everett et al., 2013), possibly because cohort differences in the educational gradient in health may be further complicated not only by compositional changes in who obtains more education, but also because the effect itself may vary at the intersection of race, gender, and cohort. For example, Everett et al. (2013) found that the shape and magnitude of change in the education-mortality gradient was most significant for women and White men across all cohorts. However, for Black men, the shape and magnitude of the education-mortality gradient showed little change in the younger cohorts.

The shifting dynamics of the education-health association have garnered more attention in recent scholarship and will likely continue to grow in importance (Hayward & Farina, 2023). Educational attainment has leveled off, with high rates of high school completion (91%) and college degree attainment (38%) among U.S. adults over age 25 (Census Bureau, 2022). Yet, as educational attainment improved at the population-level, individual and group differences continued to exist within educational categories, leading some to consider aspects of education beyond attainment. For example, recent studies have shown differences in returns to education by college major (Montez et al., 2018). Less attention has been given to differences in educational experiences that precede college education, even though over half of Americans only obtain a high school diploma (Census Bureau, 2022). Additionally, the education-health literature has shown a larger variation in health outcomes for less educated compared to more educated adults, most notably through mortality risk (Brown et

al., 2012). This suggests that the less educated may be more influenced by exposures that further differentiate their life course pathways, including educational experiences such as course-taking, desegregated schooling, and access to early educational programs. While this study does not explicitly evaluate how educational experiences are related to aging-related outcomes, the descriptive results speak to the importance of understanding the shifting dynamics of educational experiences that undoubtedly have shaped older adults' life course pathways. Future research that considers both attainment and other types of educational experiences will provide a deeper understanding of the ways that education shapes aging at the intersection of race, gender, and cohort.

## Limitations

The study is subject to limitations. Educational experiences were from retrospective self-reports, which are prone to recall bias. The LHMS, however, used a life history calendar method that can reduce recall bias and increase accuracy (Axinn et al., 1999). Relatedly, because the LHMS relied on self-reports, we do not have access to transcript data on course taking (in high school) or college major, which would provide more detailed information on respondents' educational experiences.

Another important limitation is differential selection into the LHMS sample. The LHMS sample included slightly more White adults, women, and educated individuals than the comparable HRS full sample, though education was only associated with inclusion in the LHMS sample among the AHEAD/CODA cohort. Because older adults in the AHEAD/CODA cohort were largely deceased prior to the administration of the LHMS, those that completed the LHMS survey were also healthier. As such, we excluded AHEAD/CODA from results describing cohort patterns since their educational experiences would not be representative of their cohort and would produce potentially misleading conclusions about cohort patterns. Additionally, the youngest cohort was less likely to be in the LHMS sample due to timing of data collection. Although we used the 2019 LHMS data that included respondents from the Late Baby Boom (LBB) cohort, data collection is ongoing and not all this cohort has been sampled. We elected to combine the Mid and Late Baby Boomers in our cohort analysis to account for this feature of the current LHMS sample. Although many of the major policy changes in the education system occurred around the time the Mid Baby Boom (MBB) cohort was entering school, some policies would have occurred while they were in elementary school (e.g., 1964 Civil Rights Act) or high school (e.g., Title IX), but prior to or shortly after the LBB cohort entered school. Thus, the educational experiences of the LBB cohort may be slightly different than the MBB cohort. As more respondents complete the LHMS, it will be important to examine potential cohort differences between the MBB and LBB cohorts.

Although supplemental analysis indicated that bachelor's degree attainment was unrelated to selection into the LHMS for all cohorts except AHEAD/CODA after adjustment for socio-demographics and health (Supplemental Table A6), we also compared the rate of bachelor's degree attainment for each race/gender/cohort group to national data using IPUMS (restricting to those in the cohort who survived to 2015–2019). We found comparable results across all groups, except for non-Hispanic White men and women in

the EBB cohort; these two groups had higher rates of bachelor's degree attainment in the LHMS sample than in IPUMS. The differences appear to be driven by health selection into the LHMS (see Supplemental Table A6). Even so, it is possible that White adults in the EBB cohort had more advantaged educational experiences than would be expected for their cohort. Our cohort comparisons focus on the oldest (HRS) and youngest (MLBB) cohorts; thus, the overall patterns we report would not be affected by this potential selectivity issue. Still, caution should be taken when interpreting the educational experiences of White adults in the EBB cohort.

Finally, our sample is restricted to non-Hispanic White and Black adults because the LHMS sample of Latinos is very small and selective since the 2015 LHMS data collection did not sample Spanish-speakers. As the LHMS continues data collection, a larger and more representative sample of Latinos will be available that will allow for a rich description of their educational experiences.

## Conclusions

The U.S. education system changed dramatically throughout the 20$^{th}$ century. Older adults today were impacted by these changes, but not equally. Although greater course offerings, improvements in learning support, and school desegregation broadly transformed the experience of schooling across successive cohorts, race inequities in schooling persisted. Such inequities may be an important source of continued differences in aging-related outcomes observed among demographic groups and are critical to consider when evaluating such outcomes. Given the widespread use of the HRS by population and aging researchers, innovations in data collection on childhood experiences, such as those offered by the LHMS, can enrich our understanding of the life course experiences of older adults and the public policies that may have shaped them.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Funding

This work was supported by the Alzheimer's Association (AARG-NTF-20-684252) and the National Institute on Aging (R01AG067536; K02AG075237; T32AG000037; T32AG0352374; P30AG042073; K99AG076964).

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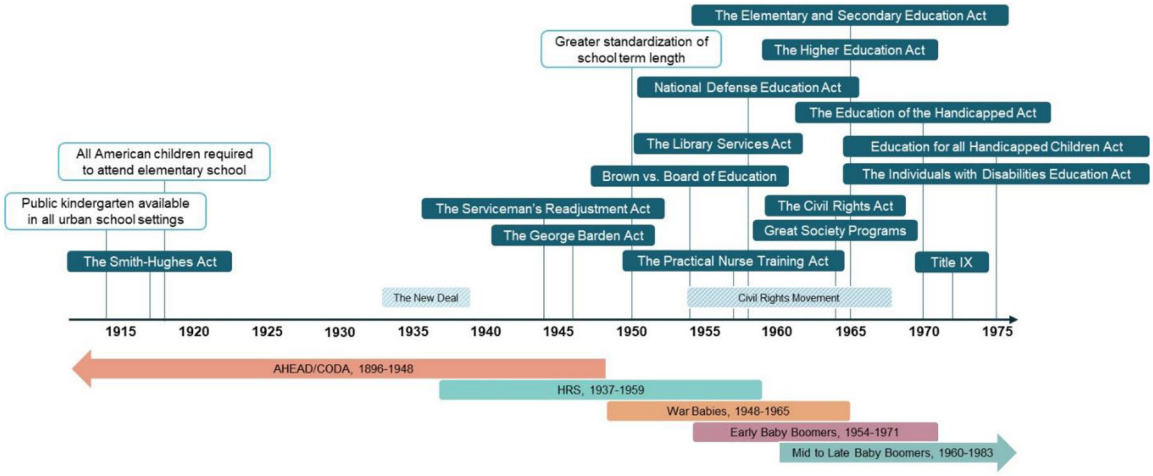


**Fig. 1.**

Selected education policies and federal programs from 1910 to 1975 and potential years spent attending school for HRS cohorts

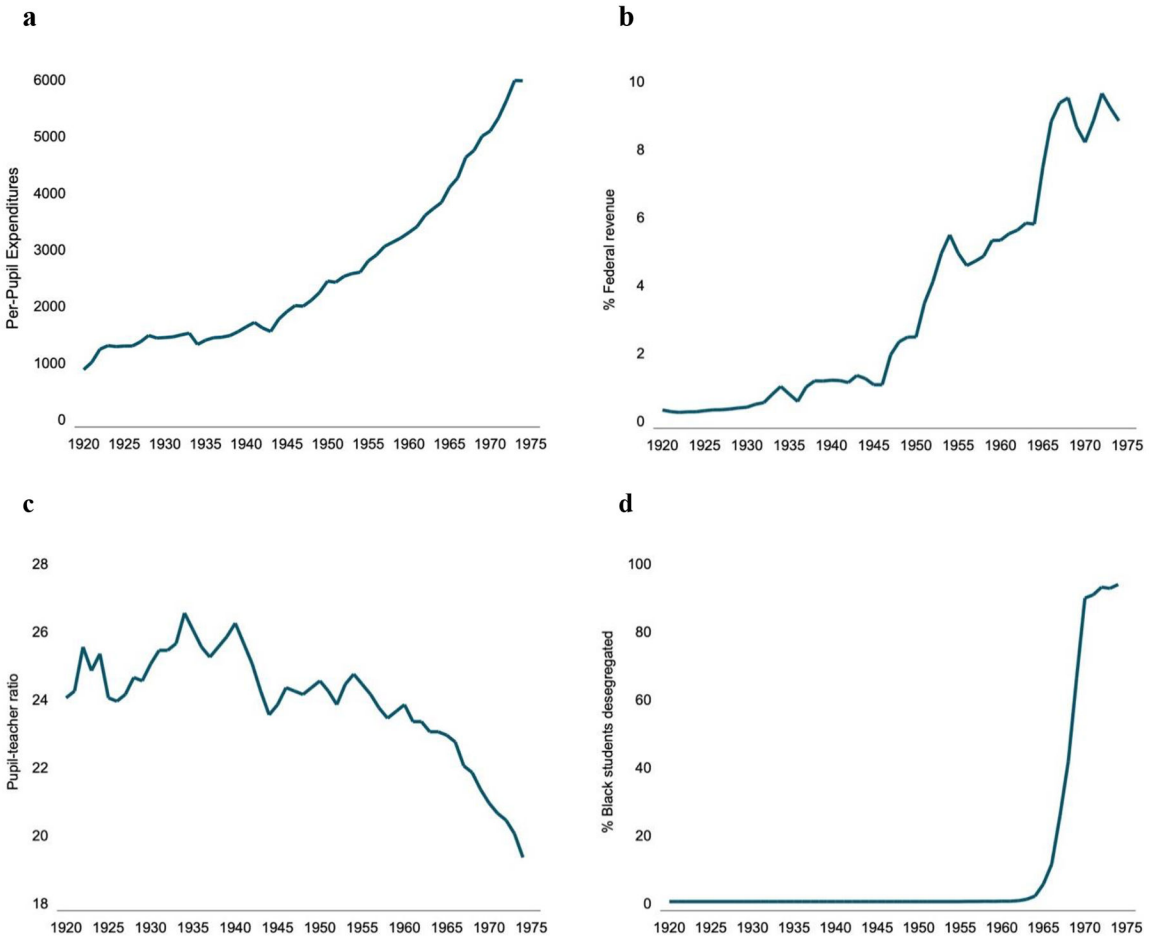


**Fig 2.**

Median (a) Per-pupil expenditures, (b) Percent of school revenue from federal government, (c) Pupil-teacher ratio, and (d) Percent of Black students in the US South attending desegregated schools from 1920 to 1974

Data for a, b, and c come from the Biennial Survey of Education (1920–1958) and Statistics of State School Systems (1960–1974) and exclude Alaska and Hawaii. Per-pupil expenditures adjusted to 2021 dollars. Data for d come from the Southern Education Reporting Service (1954–1967) and U.S. Census Abstracts (1968–1974) and include data from 17 southern states, including the District of Columbia (DC). All southern states and DC had *de jure* segregated schooling prior to 1954. Desegregated schools defined as schools with Black and White student enrollment.

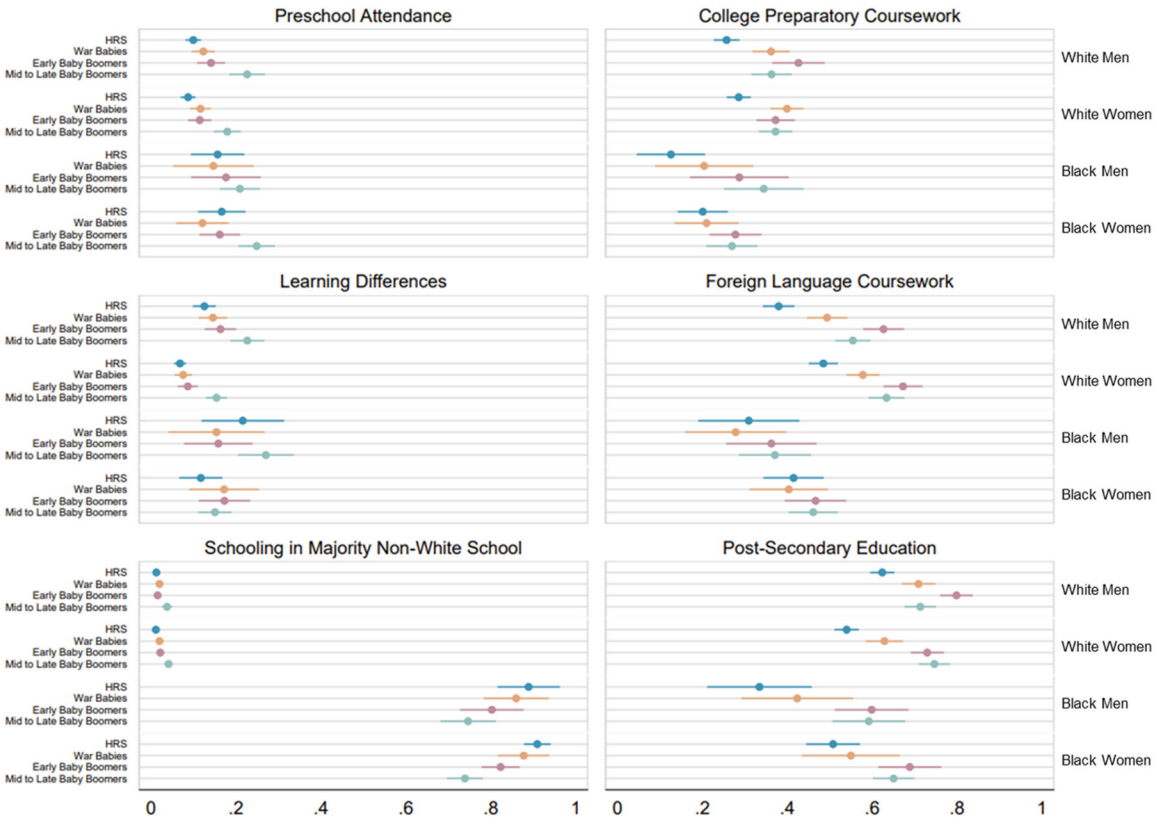


**Fig. 3.**

Proportion of HRS-LHMS respondents reporting selected educational experiences by race, gender, and birth cohort (n=10,632 full sample, n=9,099 respondents that attended high school (college preparatory coursework and foreign language coursework))

**Table 1.**

Sample characteristics of HRS-LHMS respondents, weighted estimates (N=10,632).

| | Mean (SE) or % | Weighted Ns |
|---|---|---|
| Race, % | | |
| White, non-Hispanic | 90.3 | 9,600 |
| Black, non-Hispanic | 9.7 | 1,031 |
| Gender, % | | |
| Male | 44.7 | 4,753 |
| Female | 55.3 | 5,879 |
| Birth Cohort, % | | |
| AHEAD/CODA, <1924–1930 | 5.7 | 606 |
| HRS, 1931–1941 | 17.6 | 1,871 |
| War Babies, 1942–1947 | 18.9 | 2,009 |
| Early Baby Boomers, 1948–1953 | 24.1 | 2,562 |
| Mid/Late Baby Boomers, 1954–1965 | 33.7 | 3,583 |
| Census Region at Birth, % | | |
| Northeast | 25.0 | 2,658 |
| Midwest | 35.6 | 3,785 |
| South | 29.7 | 3,158 |
| West | 8.7 | 925 |
| Foreign country or U.S. territory | 1.0 | 106 |
| Years of Schooling | 13.8 (0.05) | 10,632 |
| Post-secondary Education, % | 67.6 | 7,187 |
| Bachelor’s Degree or Higher, % | 32.8 | 3,487 |

**Table 2.**

Educational experiences of HRS-LHMS respondents by race and gender, weighted estimates (N=10,632).

| | White, non-Hispanic | | Black, non-Hispanic | |
|---|---|---|---|---|
| | **Men** | **Women** | **Men** | **Women** |
| | **n=3,462** | **n=4,920** | **n=802** | **n=1,448** |
| | **Mean (SE) or %** | **Mean (SE) or %** | **Mean (SE) or %** | **Mean (SE) or %** |
| Attended preschool, % | 15.6 | 12.8* | 17.8 | **18.8** |
| Learning differences, % | 17.2 | 10.3* | 21.0 | **15.1*** |
| Math ability | 3.52 (0.02) | 3.37 (0.02)* | **3.33 (0.04)** | 3.37 (0.03) |
| Reading ability | 3.37 (0.02) | 3.76 (0.02)* | 3.43 (0.05) | 3.74 (0.03)* |
| Proportion of schooling attending | | | | |
| Private schools | 0.14 (0.01) | 0.14 (0.01) | **0.04 (0.01)** | **0.04 (0.00)** |
| Majority non-White schools | 0.02 (0.00) | 0.02 (0.00) | **0.81 (0.02)** | **0.82 (0.01)** |
| Ever race discordant school, % | 9.8 | 9.0 | **40.9** | **37.7** |
| Did not attend high school, % | 3.2 | 2.5 | **7.7** | **7.7** |
| Rs that Attended High School | n=3,041 | n=4,329 | n=606 | n=1,150 |
| High school Curriculum, % | | | | |
| Vocational | 16.5 | 18.6 | **23.6** | 20.1 |
| General | 48.0 | 46.0 | 49.1 | **55.3** |
| College preparatory | 35.5 | 35.4 | **27.3** | **24.6** |
| Foreign language courses, % | | | | |
| No | 47.5 | 40.7* | **66.1** | **55.7*** |
| Yes | 52.5 | 59.3* | **33.9** | **44.3*** |
| Art participation, % | | | | |
| No | 54.8 | 37.0* | 48.5 | **43.0** |
| Yes | 45.2 | 63.0* | 51.5 | **57.0** |
| Years of schooling | 14.06 (0.06) | 13.72 (0.06)* | **12.71 (0.14)** | **12.92 (0.11)** |
| Post-secondary education, % | 71.5 | 66.4* | **51.8** | **61.1*** |
| Bachelor's degree, *%* | 39.0 | 30.5* | **15.3** | **19.3** |

Notes: Math and reading ability ranged from 1 to 5 with higher values indicating better ability. Proportion of schooling in majority non-White schools and private schools ranged from 0 to 1. Ever attended a race discordant school defined for White respondents as ever attended a majority non-White school and for Black respondents as ever attended a majority White school. Percentages for high school curriculum, foreign language courses, and arts participation reported only for respondents who attended high school. Observations are reported for each group. Estimates for years of schooling, post-high school education and bachelor's degree are reported for all respondents.

* Significantly different from men at p<0.025 level, within race differences, mlincom command in Stata 17.

**Bolded estimates**, Significantly different from non-Hispanic White respondents at p<0.025 level, within gender differences, mlincom command in Stata 17.