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The Shifting Salience of Skin Color for Educational Attainment

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Abstract

Findings of an association between skin color and educational attainment have been fairly consistent among Americans born before the civil rights era, but little is known regarding the persistence of this relationship in later born cohorts. The authors ask whether the association between skin color and educational attainment has changed between black American baby boomers and millennials. The authors observe a large and statistically significant decline in the association between skin color and educational attainment between baby boomer and millennial black women, whereas the decline in this association between the two cohorts of black men is smaller and nonsignificant. Compared with baby boomers, a greater percentage of the association between skin color and educational attainment among black millennials appears to reflect educational disparities in previous generations. These results emphasize the need to conceptualize colorism as an intersectional problem and suggest caution when generalizing evidence of colorism in earlier cohorts to young adults today.

Keywords

skin color, race, education, colorism

The social meanings of particular aspects of the visible body have the potential to vary dramatically over time. Thinness, for example, became a consistent American ideal only around the turn of the twentieth century, before which the characteristics that defined an attractive body type shifted by decade (Stearns 1997). Although skin color has been a social cue in the U.S. context at least since slavery (Franklin 2000; Myrdal 1944), the idea of lighter skin as preferable was entirely absent from Greek and Roman historians' descriptions of regional differences in skin color (Snowdon 1995). Because any association between skin color and socioeconomic outcomes is expected to depend on contemporary social context, caution may be warranted when generalizing research on this subject beyond the birth cohort analyzed, particularly across periods of notable political and social change with respect to race and color, such as the decades following the civil rights movement.

Prior work on the relationship between skin color and social outcomes for African Americans has reached consensus on two main points: first, that skin color is indeed associated with a wide array of socioeconomic variables of interest and, second, that in the U.S. context, lightness is privileged (e.g., Goldsmith, Hamilton, and Darity 2006; Hill 2000; Hunter 2002; Keith and Herring 1991; Monk 2015; Thompson and McDonald 2016; Udry, Bauman, and Chase 1971). But despite a handful of studies on the subject, how and whether the importance of skin color changed over the latter half of the twentieth century remains an open question (Goldsmith et al. 2006; Gullickson 2005; Hughes and Hertel 1990). Those arguing for the persistent social significance of skin color frequently cite the long history of the association between color and social standing in the United States and downplay the likelihood that the civil rights era greatly reduced color disparities (Hughes and Hertel 1990). Those arguing for the declining social significance of skin color typically present specific details of civil rights–era politics that may have reduced the benefit of light skin, such as the "black is

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beautiful" movement (Goering 1972). However, to date, a lack of comparable samples and measures across potential comparison cohorts has hindered efforts to affirm either hypothesis.

Here we present an analysis of change in the association between skin color and educational attainment over time, comparing cohorts born two decades apart. With birth years ranging 1955 through 1967—late baby boomers—participants in the Coronary Artery Risk Development in Young Adults (CARDIA) study are a particularly relevant cohort for addressing this question, as they represent the first wave of Americans to be educated and employed in the post–Jim Crow era. Respondents in the National Longitudinal Study of Youth 1997 (NLSY97), born from 1980 through 1985—early millennials—are of an age range comparable with the older children of the CARDIA sample. In addition, the CARDIA study offers the unique property of having collected a mechanical measurement of skin color as the percentage of light reflected off the skin, and to our knowledge stands as the sole U.S. data source containing both skin reflectance and assessments of social outcomes over time. Skin color data in the NLSY97 are collected via interviewer coding, using a scale that has been used across a range of social surveys over the past decade.[1]

Following studies of the liberalization of racial attitudes in the aftermath of the civil rights era (Firebaugh and Davis 1988), we suggest that the social meaning of skin color within race may be shifting as well, with color operating as a weaker predictor of educational attainment in millennials compared with Americans born before discrimination by skin color was formally outlawed in 1964. From a theoretical standpoint, such a finding would additionally highlight the importance of temporal context for understanding the social relevance of the physical body and would suggest caution when generalizing results from studies of colorism—or of discrimination by other aspects of visible appearance—across cohorts.

Background

Although various authors have speculated about change in the socioeconomic relevance of skin color across cohorts, two studies are notable for their efforts to estimate it. Hughes and Hertel (1990) presented an early attempt to assess change over time in the association between skin color and social outcomes, comparing the association between skin color categories and education and occupation level in the National Survey of Black Americans (NSBA) with estimates from three previously published studies. As they noted, although the interviewer-coded skin color scales differed among the comparison samples, their estimates were nonetheless remarkably similar across cohorts, presenting plausible support for the argument that the relationship between skin color and occupation and educational attainment was stable over the years of their samples (1962 through 1980).

Gullickson (2005) took a different approach, noting that the NSBA and the 1982 General Social Survey (GSS) both collected interviewer-reported skin color data on respondents spanning a wide range of birth years. By splitting the samples into five-year comparison cohorts, he found a pronounced decline in the relationship between skin color and educational attainment beginning with cohorts in the mid-1940s. However, as Goldsmith et al. (2006) pointed out, the NSBA has extensive attrition, such that by the second survey wave, the number of light-skinned black respondents had already declined to fewer than 20, and by the final wave the number had declined to fewer than 15. Gullickson's article stands as the sole analysis arguing that the relationship between skin color and specific socioeconomic outcomes may be approaching nonsignificance, and his finding has failed to be replicated in cross-sectional analyses of contemporary samples. Rather, a majority of studies suggest that at least for Americans born up through the years of the civil rights era, skin color does appear to be a consistent predictor of socioeconomic outcomes (Goldsmith et al. 2006; Hersch 2008).

Far less is known regarding the relationship between skin color and socioeconomic outcomes for Americans born after the civil rights era. Respondent populations in the studies cited above were born in the 1960s or earlier; many were already of school age in 1954, when *Brown v. Board of Education* ended the legal segregation of public schools, and nearly all were born before the Civil Rights Act of 1964 outlawed discrimination on the basis of race and color. Mirroring such critical shifts in the American legislative climate, studies demonstrate a pronounced shift in racial attitudes over the latter half of the twentieth century (Hochschild, Weaver, and Burch 2011). The 1970s and 1980s marked a notable decline in antiblack prejudice, which Firebaugh and Davis (1988) attributed largely to younger, less prejudiced birth cohorts replacing older, more prejudiced cohorts. Opinion polls of Americans born from the 1980s onward (frequently termed "millennials") suggest that this trend has continued to the present, with young adults today consistently reporting more racially liberal opinions relative to older cohorts on issues such as interracial dating and marriage (Rosentiel 2010). As Hochschild et al. (2011) noted, although the destabilization of the racial order in the aftermath of the civil rights era has enabled subtler forms of racial domination to emerge (e.g., Bobo, Kluegel, and Smith 1996), the trend in racial liberalization overall merits a "guarded optimism" (Hochschild et al. 2011:162). Shifts in the American political and cultural landscape with respect to race do not necessarily imply that attitudes regarding skin color within race will have shifted as well but do provide reasonable grounds for caution when

[1]Originally developed for the New Immigrant Survey (Massey and Martin 2003), this coding scale has since been introduced in a number of other surveys, including the NLSY97, the General Social Survey, and the Fragile Families and Child Wellbeing Study.

generalizing evidence of colorism in earlier cohorts to young adults today.

With respect to educational outcomes in particular, however, the final decades of the twentieth century also marked a divergence within race among black Americans along the lines of gender. Black women have been graduating from college at higher rates than black men since as early as the 1940s (McDaniel et al. 2011), and black boys presently underperform relative to girls across a range of educational performance measures, beginning in grade school and persisting through the postgraduate level (Snyder and Dillow 2012). Black boys lag behind black girls in standard test-based measures of reading achievement (Lewis et al. 2010) and receive lower returns to higher math grades in terms of progression to more advanced math courses (Riegle-Crumb 2006). The black-white test score gap in math narrowed for girls over the last decades of the twentieth century, while it stagnated among boys (Vanneman et al. 2009). The divergence in academic performance by gender among black Americans over recent decades raises the possibility of gender differences in any shift in the known correlates of educational performance as well, including characteristics of the body such as skin color.

A key methodological challenge in assessing change over time in the social salience of skin color follows from limitations in available skin color measures, which have almost exclusively relied on interviewer coding. The difficulty posed by variation in color scales across studies has been largely ameliorated in recent years with the broad adoption of the 11-category scale developed for the New Immigrant Study (Massey and Martin 2003) in subsequent efforts to collect skin color in social surveys, but data collected using this scale remain subject to other standard critiques of interviewer-coded skin color measures (e.g., Hill 2002a).[2] For example, although perceived skin color may well reflect socially meaningful understandings of visible phenotype (Gravlee and Dressler 2005), is unclear whether an interviewer's perception can be considered a reasonable proxy for skin color perception by other relevant individuals outside the survey context (such as teachers, bosses, or prospective romantic partners). Interviewers have been found to be fairly inconsistent in their perceptions of skin color even within the same respondent (Hannon and DeFina 2016), arguably reflecting the contingency of skin color perception on both the specifics of the social interaction in which the respondent's body is perceived, as well as on specifics of the physical conditions of the interview setting, such as ambient light. Prior research has found perception of skin color to differ by factors including the duration of an observer's exposure to the respondent (Ostrom and Sedikides 1992), how much information an observer has about the respondent (Ostrom and Sedikides 1992; Quattrone and Jones 1980), and whether an observer is of the same race as the respondent (Hill 2002a). As long as perceived skin color remains an ill-defined and highly contextually variable construct, the utility of interviewer-coded skin color measures seems inexorably dependent on the extent to which they functionally approximate a more stable measure of objective skin color. To date, whether interviewer-coded measures of skin color are reasonably comparable with mechanical measures of skin color remains unknown.

Even were interviewers to code skin color with perfect accuracy, the use of a single linear scale to code individuals of varying races has had the unintended consequence of structurally precluding within-race analyses of white respondents. In terms of percent reflectance, white Americans have only about half the variance in skin color as do black Americans (Branigan et al. 2013), and combined with the limited number of categories on the interviewer-coded skin color measures most commonly used in large social surveys (e.g., Massey and Martin 2003), this has consistently resulted in the vast majority of white respondents clustering into the lightest one or two available color bins.[3] For example, 96 percent of white respondents in the National Longitudinal Study of Adolescent to Adult Health fall into the lightest of the 5 available skin color categories, aptly labeled "white." In the NLSY97, 82 percent of white respondents fall into 2 of the 11 available categories on a modified version of the Massey-Martin scale. Analyses in the present study are thus constrained to black Americans only, strictly as a reflection of available data.

Studies of the association between skin color and social outcomes are generally seeking to estimate an effect of colorism, wherein people with darker skin are treated differently than people with lighter skin within race (Pearce-Doughlin, Goldsmith, and Hamilton 2013). Because objectively measuring discrimination is notoriously difficult (Anderson, Fryer, and Holt 2006), colorism is most frequently assumed as the causal mechanism underlying any residual association between skin color and social outcomes after controlling for background factors (Hill 2002b; Hughes and Hertel 1990; Keith and Herring 1991). However, skin color may also be associated with social outcomes due to a legacy of colorism, even in the absence of contemporary discrimination. For example, as discrimination by skin color is known to have influenced educational attainment in the past (Franklin 2000; Myrdal 1944), and skin color and education are both correlated between parents and children (Black, Devereux, and Salvanes 2005), one might

[2]As noted, examples include the NLSY97, the GSS 2012 and 2014, and the Fragile Families and Child Wellbeing Study.

[3]The list of social surveys in which interviewer-coded skin color data have been used to investigate socioeconomic disparities by color is growing. Examples include the NSBA (Gullickson 2005; Hersch 2006; Hill 2002b; Hughes and Hertel 1990; Keith and Herring 1991; Thompson and Keith 2001), the Multi-City Study of Urban Inequality (Hersch 2006; Hill 2002a), multiple waves of the GSS (Gullickson 2005), the Detroit Area Study (Hersch 2006), and the New Immigrant Survey (Hersch 2008). The color scales in the surveys named contain between 3 and 11 categories.

still observe an association between skin color and education even if skin color is no longer a basis for direct discrimination in the educational sphere today.

Where colorism is difficult to definitively confirm, a finding that the association between skin color and a given social outcome can be fully explained by variation in the socioeconomic status (SES) of one's parents may be reasonably interpreted as reflecting a legacy of color-based disadvantage rather than contemporary discrimination. As such, here we ask first whether the association between skin color and educational attainment differs between black American baby boomers (CARDIA) and millennials (NLSY97), separately by sex. We then ask whether any such association in either cohort is attenuated by controls for parental educational attainment, and thus plausibly functions through a legacy of colorism in the previous generation.

Methods and Analysis

To address the question of whether the social salience of skin color has declined, one would ideally use a longitudinal study in which comparable skin color data were collected from similarly sampled successive cohorts. However, even interviewer-coded skin color data have only recently become more common in social science surveys, and to our knowledge, no existing survey has collected color data for more than one cohort. As an alternative, here we take a similar approach to Hughes and Hertel (1990), comparing across samples born two decades apart, with the exception that one of our samples involves an objective, mechanical measurement of skin color.

Our baby boomer respondents are drawn from the CARDIA study, a health-related cohort study sponsored by the National Heart, Lung, and Blood Institute. Data collection has been carried out in eight waves two to five years apart, beginning in 1985 with 5,115 non-Hispanic blacks and whites between the ages of 18 and 30 years. Respondents were randomly selected after stratification by race, sex, age, and education in four U.S. cities: Birmingham, Alabama; Chicago; Minneapolis; and Oakland, California.[4] A basic sociodemographic questionnaire has been administered in each wave of data collection.

Our millennial respondents are drawn from the NLSY97, a nationally representative sample of approximately 9,000 respondents between the ages of 12 and 16 years on December 31, 1996, conducted by the U.S. Bureau of Labor Statistics (Horrigan and Walker 2001). The mean birth year is 1982, compared with a mean birth year of 1960 in the CARDIA cohort. Respondents were surveyed annually beginning in 1997, with additional information collected from respondents' family members. Although the primary focus of the study is labor market behavior, a rich battery of socioeconomic and demographic information has also been collected, as well as some basic health information.

The skin color measure in CARDIA was taken in the fourth wave of data collection (1992–1993) as the percentage of light reflected off the skin, assessed using a Photovolt 577 spectrophotometer at the upper volar arm (the underside of the upper arm).[5] Of all black respondents in wave 4, 96 percent had measurements of skin color recorded. Spectrophotometer readings were taken using three filters (amber, green, and blue); because correlations among the three sets of readings ranged from .96 to .98, we follow previous literature (e.g., Sweet et al. 2007) in using only the reading taken with the amber filter. Higher reflectance scores denote lighter skin because lighter colors reflect more light. Skin color in the NLSY97 was assessed between 2008 and 2010 via interviewer coding (Massey and Martin 2003), with values on the skin color scale ranging from 0 to 10. The direction of the color scale was reversed to match the direction of the CARDIA reflectance measure, such that higher numbers denote lighter skin. Of black NLSY97 respondents surveyed from 2008 through 2010, 85 percent were coded for skin color.[6]

As can be seen in Figure 1, the distributions of skin color in CARDIA and the NLSY97 are visually similar, and two additional shared characteristics lend support to the argument that these scales may be reasonably comparable. First, across all populations in which skin color has been measured mechanically, women are known to be very slightly lighter than men on average (Jablonski and Chaplin 2000); this expected sex difference is indeed apparent across both races in the CARDIA sample, with white women averaging 1.4 percentage points lighter than white men and black women averaging 2.5 percentage points lighter than black men (Figure 2). This difference is also present in the NLSY97 distribution, with white women coded on average one tenth of a color category lighter than white men, and black women coded two fifths of a category lighter than black men (Figure 2). These differences are all significant at $p < .01$.

Second, in the CARDIA distribution, the variance for respondents who self-identify as white is just over half the variance for those who self-identify as black, and this ratio

[4]For a detailed description of selection procedures at each site, see Hughes et al. (1987). Sex was stratified to balance men and women, race was stratified to balance non-Hispanic blacks and whites, age was stratified to balance respondents ages 18 to 24 years with respondents ages 25 to 30 years, and education was stratified to balance those with a high school degree or less and those with more than a high school degree.

[5]See Sweet et al. (2007) on skin color and blood pressure, and Borrell et al. (2006) and Krieger, Sidney, and Coakley (1998) on skin color and self-reports of discrimination.

[6]Although we cannot directly test the possibility of differential rates of attrition in wave 4 by skin color within race, models estimating the relationship between skin reflectance at wave 4 and likelihood of attrition in later waves yielded no significant or substantively meaningful association.

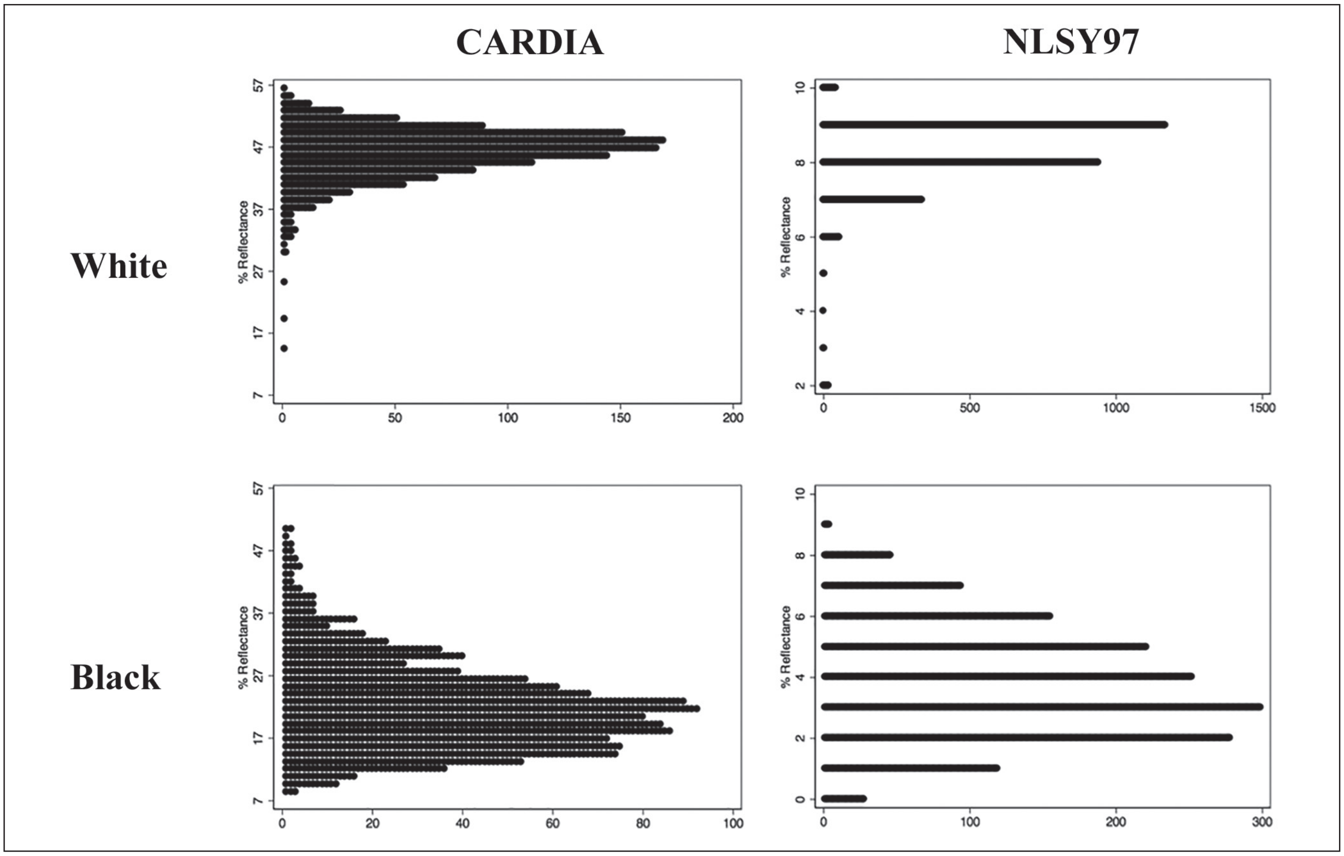

Figure 1. Distributions of Skin Color in CARDIA and NLSY97 by Self-Reported Race.
Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black and white respondents for whom data on skin color were recorded.

holds in the NLSY97 distribution as well. Although it remains plausible that socioeconomic factors associated with skin color, such as education or income, could be captured in an interviewer-coded skin color reading, it is less plausible that the relative variance of white to black respondents is sufficiently common knowledge as to be generated in the data by interviewer predisposition alone. The same arguably holds for the slightly lighter skin color in women relative to men, although the possibility that women are perceived as lighter even net of actual skin color remains untested. In any case, because of the categorical measure of color in NLSY97, further analysis is constrained to black respondents only, as the smaller variance among white respondents leads to little within-race color variation in an 11-category scale (Figure 1).[7]

Generating Comparable Color Metrics

To make the CARDIA and NLSY97 color metrics comparable, we use a transformation of the NLSY97 scale based on the empirical percentile function from CARDIA, in which each NLSY97 skin color bin is coded to the equivalent percentage reflectance from the CARDIA distribution. For example, as per Table 1, black women in the NLSY97 sample who have a color rating of 5 are between the 44th and 61st percentiles of skin color, or a mean percentile of 52.6 for that color category. In CARDIA, a black woman at the 52.6th percentile of skin color has a reflectance reading of 22.7 percent. We thus code black women in the NLSY97 who have a color rating of 5 to a reflectance reading of 22.7 percent. This is done for black men and women separately to account for sex differences in average skin color.

This method of generating a comparable measure across samples is based on four assumptions. First, we assume that the distribution of skin color in a sample drawn from four geographically distant U.S. cities is comparable with the national U.S. skin color distribution. Unfortunately, this assumption cannot be directly tested in the public-use NLSY97, as geographic location is available only as four census regions; with more micro-level geographic identifiers, the distribution of skin color among NLSY97 respondents living in proximity to the four CARDIA cities might be compared with the distribution of skin color for the full

[7]Although the effects of tanning would be expected to bias results downward, the exclusion of white respondents also helps minimize concerns about a tanning effect given that NLSY97 measurements are based on the face.

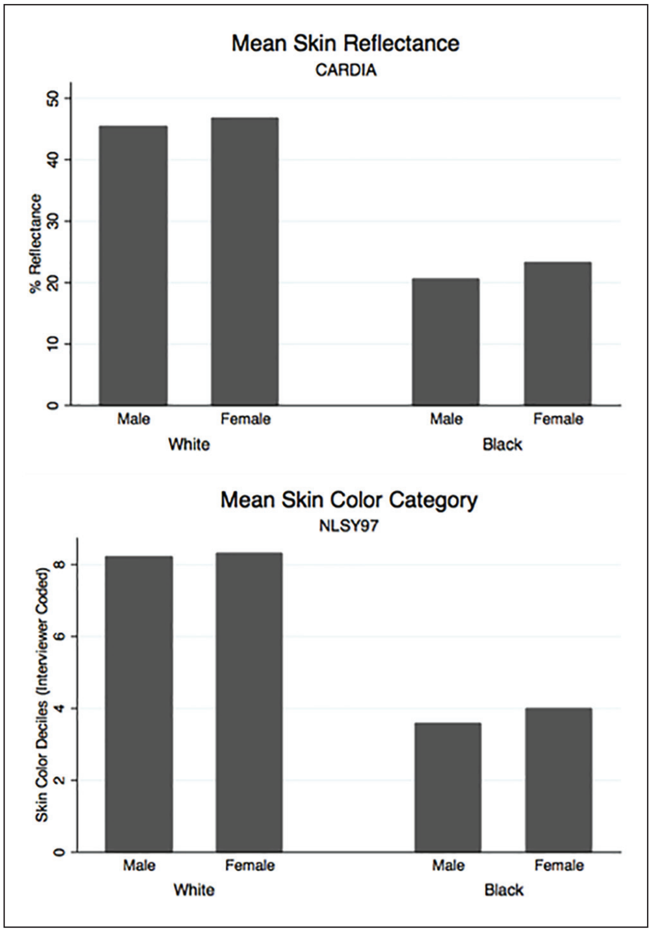

Figure 2. Means of Skin Color in CARDIA and NLSY97, by Sex and Self-Reported Race.
Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black and white respondents for whom data on skin color were recorded.

NLSY97 population (depending on available sample sizes of NLSY97 respondents in the cities in question).

Second, we assume that the distribution of skin color in the United States remained relatively stable between the birth years of the CARDIA and NLSY97 cohorts. To test this assumption, we use data from the GSS, a biennial probability sample of adults living in households in the United States (Smith, Hout, and Marsden 2014) in which skin color data were recorded in 2012 and 2014 for respondents between the ages of 18 and 89 or older using the same interviewer-coded scale as in the NLSY97. We find no differences in mean skin color by birth year among the 687 self-reported black respondents, either when run as a continuous time trend or when comparing across 10-year birth cohorts. (As in CARDIA and the NLSY97, white respondents in the GSS have approximately half the variance in skin color as do black respondents, and black women in the GSS were slightly lighter than men on average.)

Third, we assume that the accuracy of the coding methods varies only in that the NLSY97 data were coded categorically. The third assumption is almost certainly violated to some extent, as interviewer-coded skin color is at far higher risk for bias than is mechanical measurement. However, the comparable distributions of the skin color measure across the two data sets as discussed previously lends more confidence to the NLSY97 color rating, which was assessed using a graphic coding reference to help standardize across interviewers. The error introduced by simply using a categorical versus a continuous scale should itself be minimal: in CARDIA, coding the continuous skin reflectance data into categories matching the NLSY97 color distribution results in about a 1 percent reflectance mean error for both black men and women, equal to about one seventh of a standard deviation.

Finally, whereas the CARDIA reflectance measure assesses "constitutive" skin color (baseline skin color at regions not exposed to light), the NLSY97 interviewer-coded measurement assesses "facultative" color (skin color at light-exposed sites such as the forehead, arms, and other parts of the body that one would be expected to observe in a survey interview). Whereas constitutive skin color stays relatively constant in the same person over time compared with other locations on the body (Pershing et al. 2008), facultative skin color is expected to be more sensitive to variables such as season of measurement. That said, the transformation of the NLSY97 skin color metric presumes only that respondents are correctly ordered by color in the coding bins relative to other respondents; it does not presume to match exact skin color between the two samples. As long as constitutive and facultative skin color are correlated within an individual body (Pershing et al. 2008), the difference in skin color assessment location between the two samples should not itself be of concern. Although no significant differences in skin reflectance scores by season of measurement are present for black respondents in CARDIA (Branigan et al. 2013), we include in our models a control for season of interview to capture any variation in the NLSY97 skin color measure by seasonal light exposure.

We emphasize that the transformation of the NLSY97 scale into a metric of percent reflectance is necessary only for cross-cohort comparison of coefficient magnitudes relative to the CARDIA cohort. Using the original NLSY97 coding metric without the transformation applied, we observe no differences in the patterns of significance across the coefficients on skin color from the results presented. Results of models run in the original coding metric from the NLSY97 are available on request from the authors.

Outcome and Control Variables

Although ultimate educational attainment in earlier cohorts is often assessed at age 25 (National Center for Education

Table 1. Estimated Percent Reflectance at Color Bin Midpoint among Black Respondents in the NLSY97, Based on the Distribution of Skin Reflectance in the CARDIA Study.

	NLSY97 Color Rating									
	1 Darkest	2	3	4	5	6	7	8	9	10 Lightest
Black women										
NLSY97 percentile at color category midpoint	.7	4.4	15.9	34.3	52.6	69.2	82.9	92.6	98.1	99.8
Percentage reflectance at same percentile in CARDIA	9.9	12.7	16.3	19.7	22.7	26.1	29.8	34.2	41.2	50.7
Black men										
NLSY97 percentile at color category midpoint	1.5	8.8	24.2	43.8	61.9	76.6	87.4	94.4	98.4	99.9
Percentage reflectance at same percentile in CARDIA	9.6	12.6	15.5	18.4	21.5	24.3	28.8	33.1	39.2	45.6

Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black respondents for whom data on skin color were recorded.

Statistics 1993), given higher average educational attainment among millennials (Bialik and Fry 2019), we use as our outcome variable in both samples a measure of years of education attained by age 29.[8] In the NLSY97, education is assessed annually, so we code ultimate educational attainment when the respondent is age 29. Data collection in the CARDIA study is at wider intervals, so we code education at the next survey wave after a respondent turned 29. We define our analytical samples as the native-born non-Hispanic black men (n = 665) and women (n = 891) in CARDIA and the native-born non-Hispanic black men (n = 746) and women (n = 884) in the NLSY97 for whom data on both skin color and education by age 29 are available.

Models include an indicator for being multiracial, defined as having a parent identified as belonging to a racial group other than the respondent's own. We include a full set of indicators for birth year, as well as for geographic location: in CARDIA, location is defined by survey center, whereas in the NLSY97, location is defined by census region (northeast, north central, south, or west).[9] Because sibship size is known to correlate with educational attainment (Jaeger 2008), number of biological siblings is also included. Although the race of the interviewer is known to affect skin color ratings (Hill 2002a), an indicator for having a same-race interviewer among NLSY97 respondents had no meaningful effect on the relationship between skin color and educational attainment and was thus dropped from the final specification of our model. For respondents with both skin color and education data recorded, more than 95 percent of cases have no other missing data on the variables listed.

Mother's and father's education in years is included as a control in both samples. In the CARDIA sample, all respondents answered the questions on parental education, but categories were provided for respondents who reported that they "did not know" their parents' education or that the question on their parents' education was "not applicable." The vast majority of unknown parental education in the NLSY97 similarly reflected a valid skip rather than nonresponse; only 2 percent of respondents had missing data for either parent's education. Because all unknown parental education data in the CARDIA sample and the vast majority of unknown parental education data in the NLSY97 sample reflected valid nonresponse, we coded unknown parental education to the mean value of known parental education and included a dummy variable indicating replacement (imputed values were excluded for calculation of summary statistics).

Summary statistics for select variables in the CARDIA and NLSY97 data are presented in Table 2.

Analytic Strategy

To determine whether the association between skin color and educational attainment among black Americans has declined between the CARDIA and NLSY97 cohorts, we estimate the ordinary least squares regression model used in past research on skin color and educational attainment,

$$y_{id} = \alpha_{id} + \beta_{\mathrm{rd}} r_{id} + \beta_{Pd}\mathbf{P}_{id} + \beta_{Ld}\mathbf{L}_{id} + \beta_{Bd}\mathbf{B}_{id} + \varepsilon_{id},$$

in which i denotes an individual respondent, and d denotes an indicator of the data set (CARDIA or NLSY97) in which respondent i was sampled. The outcome of interest, y, is years of education attained by respondent i in data set d by age 29; r is the skin reflectance score; **P** is a vector of family background measures (parental education, number of siblings, and whether either parent was of a different race than

[8]We additionally ran our models as a set of ordered logistic regressions in which the outcome is an ordinal measure of degree category (less than high school, high school graduation, associate degree, bachelor's degree, postgraduate degree). Our substantive findings were consistent with those presented.

[9]All models were also estimated with a continuous measure of birth year. Results were substantively similar, and the statistical significance of coefficients was the same.

Table 2. Means and Proportions for Selected Variables: Black Respondents in the CARDIA Study and the NLSY1997.

	CARDIA			NLSY		
Variable	Full	Male	Female	Full	Male	Female
Years of education (age 29)	13.675 (2.060)	13.533 (2.129)	13.781 (2.002)	13.027 (2.785)	12.452 (2.635)	13.507 (2.817)
Skin color	22.092 (7.161)	20.827 (6.996)	23.033 (7.142)	22.112 (7.021)	20.781 (6.802)	23.223 (7.012)
Mother's education	11.082 (4.479)	11.364 (4.223)	10.873 (4.651)	11.644 (3.633)	11.755 (3.550)	11.551 (3.701)
Father's education	8.592 (5.788)	8.909 (5.620)	8.356 (5.902)	8.858 (5.856)	8.786 (5.834)	8.918 (5.878)
Mother's education unknown	.103 (.304)	.088 (.283)	.115 (.319)	.063 (.244)	.058 (.234)	.068 (.252)
Father's education unknown	.258 (.438)	.230 (.421)	.280 (.449)	.283 (.451)	.283 (.451)	.284 (.451)
Non-same-race parent	.051 (.219)	.055 (.229)	.047 (.212)	.211 (.408)	.230 (.421)	.195 (.397)
Number of siblings	3.600 (2.823)	3.582 (2.807)	3.614 (2.837)	1.646 (1.524)	1.601 (1.476)	1.684 (1.564)
Urban	1 (0)	1 (0)	1	.822 (.383)	.797 (.402)	.843 (.364)
Birth year	1960.794 (3.485)	1960.746 (3.448)	1960.829 (3.515)	1981.978 (1.395)	1981.991 (1.355)	1981.968 (1.429)
Female	.573 (.495)	0 (0)	1 (0)	.545 (.498)	0 (0)	1 (0)
n	1,411	665	746	1,775	891	884

Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black respondents for whom data on skin color were recorded. Urbanicity is included as a control only in NLSY97 models, as all CARDIA respondents were impaneled in urban areas. Skin color for CARDIA respondents in Table 1 is measured as percent reflectance; skin color for NLSY97 respondents is measured as a categorical interviewer-coded scale ranging from 0 to 10. In both cases, higher numbers denote lighter skin. Values in parentheses are standard deviations.

Table 3. Ordinary Least Squares Regression: Years of Education at Age 29 on Black Men's Percent Skin Reflectance.

	CARDIA (Born 1959–1968)			NLSY (Born 1980–1985)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	Bivariate	+ Center and Birth Year FE	+ Family Background	Bivariate	+ Region and Birth Year FE	+ Family Background
Percent reflectance	.043*** (.012)	.048*** (.012)	.036** (.011)	.031* (.014)	.027+ (.014)	.020 (.013)
Urban					.292 (.253)	.170 (.236)
Mother's education			.133*** (.036)			.325*** (.048)
Father's education			.114*** (.030)			.201*** (.051)
Multiracial			−.902** (.332)			.035 (.232)
Number of siblings			−.050+ (.028)			−.120* (.060)
Missingness indicators						
Mother's education			1.039* (.520)			3.466*** (.699)
Father's education			.655+ (.390)			1.546* (.651)
Constant	12.593*** (.255)	10.555*** (1.235)	7.916*** (1.252)	11.723*** (.304)	11.120*** (2.636)	4.143 (2.541)
R^2	.020	.109	.216	.007	.034	.195
n		665			746	

Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black men for whom data on skin color were recorded. Urbanicity is included as a control only in NLSY97 models, as all CARDIA respondents were impaneled in urban areas. Model 1 is the bivariate relationship between skin color and years of education, model 2 introduces fixed effects (FE) for birth year and geographic region, and model 3 introduces controls for family background. Values in parentheses are standard errors.
$^+p < .10$. $^*p < .05$. $^{**}p < 0.01$. $^{***}p < .001$.

the respondent); **L** is a full set of indicator variables for location (in CARDIA, this is survey centers, and in NLSY97, this is census regions of residence at wave 1); and **B** is a full set of indicator variables for each birth year of respondents in the sample.

We estimate the model separately for the two birth cohorts by sex. In Tables 3 and 4, model 1 is the bivariate relationship between skin color and education at age 29, model 2 introduces fixed effects for location and birth year, and model 3 introduces the full set of family background controls. The significance of the differences between the coefficients on skin color in the CARDIA and NLSY97 models is assessed using a series of Wald tests, reported in Table 5.

Results

Results from models predicting educational attainment for black men in the CARDIA and NLSY97 samples are

Table 4. Ordinary Least Squares Regression: Years of Education at Age 29 on Black Women's Percent Skin Reflectance.

	CARDIA (Born 1955–1968)			NLSY (Born 1980–1985)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	Bivariate	+ Center and Birth Year FE	+ Family Background	Bivariate	+ Region and Birth Year FE	+ Family Background
Percent reflectance	.035*** (.009)	.040*** (.009)	.035*** (.009)	.012 (.013)	.014 (.014)	.004 (.012)
Urban					.037 (.271)	−.290 (.238)
Mother's education			.142*** (.027)			.470*** (.046)
Father's education			.045+ (.024)			.160** (.052)
Multiracial			−.804** (.292)			−.178 (.227)
Number of siblings			−.083*** (.022)			−.178*** (.053)
Missingness indicators						
Mother's education			1.152** (.376)			5.006*** (.648)
Father's education			−.223 (.309)			1.048 (.660)
Constant	12.861*** (.220)	13.036*** (.978)	11.607*** (.970)	13.045*** (.322)	12.180*** (2.103)	6.225** (1.910)
R^2	.017	.093	.218	.001	.011	.250
n		891			884	

Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black women for whom data on skin color were recorded. Urbanicity is included as a control only in NLSY97 models, as all CARDIA respondents were impaneled in urban areas. Model 1 is the bivariate relationship between skin color and years of education, model 2 introduces fixed effects (FE) for birth year and geographic region, and model 3 introduces controls for family background. Values in parentheses are standard errors.

$^{+}p < .10$. $^{**}p < 0.01$. $^{***}p < .001$.

Table 5. Increase in Years of Education at Age 29 as Skin Reflectance Increases.

	Change from 10th to 90th Percentile		1-*SD* Change		
	Difference in Reflectance	Difference in Years	Difference in Reflectance	Difference in Years	Wald Test of Cohort Difference
CARDIA men	17.4	.624	6.8	.245	p = .369
NLSY97 men	16.2	.324	6.7	.134	
CARDIA women	18.0	.630	7.2	.252	p = .027
NLSY97 women	17.9	.072	6.9	.028	

Note: Data were drawn from the Coronary Artery Risk Development in Young Adults (CARDIA) study and the National Longitudinal Survey of Youth 1997 (NLSY97). The sample includes non-Hispanic black respondents for whom data on skin color were recorded. Wald tests indicate the significance of the differences in the coefficients on skin color between cohorts in model 3 from Tables 3 and 4.

presented in Table 3. Among CARDIA men, skin color is significantly associated with attainment in the bivariate model, and this association persists through the addition of center and birth year fixed effects in model 2. Parental education, sibship size, and being multiracial explain relatively little of the association between skin color and attainment in this cohort, as the magnitude of the coefficient on skin color declines by only one sixth after the inclusion of all controls. As per Table 5, on the basis of estimates from the full model (model 3), a 1-*SD* increase in skin color among CARDIA men is associated with one quarter of a year of additional education. This finding is consistent in direction with analyses of the relationship between interviewer-coded skin color and ultimate educational attainment in nationally representative data on respondents of similar birth years (e.g., Keith and Herring 1991; Monk 2014), allaying any concern that our results reflect some exclusive property of a mechanical skin color measure.

Among black men in the NLSY97, skin color is again significantly associated with educational attainment in the bivariate model. This association remains relatively stable in magnitude through the inclusion of center and birth cohort fixed effects, although it is rendered only marginally significant. Unlike among the CARDIA baby boomers, however, controls for parental education account for about one quarter of the remaining association between skin color and educational attainment among the NLSY97 millennials, leaving a nonsignificant coefficient on skin color in model 3 that is 44 percent smaller than the equivalent association in the CARDIA cohort. As per Table 5, net of all controls, a 1-*SD* increase in skin color among NLSY97 men is associated with 13.4 percent of a year of additional education, compared with 24.5 percent of a year among CARDIA men, but this 11 percentage point decline between the two birth cohorts is not itself statistically significant ($p = .369$), leaving us unable to affirm that there has been any shift in this association between cohorts in the population.

Results from models predicting educational attainment for black women in the CARDIA and NLSY97 samples are presented in Table 4. As for CARDIA men, skin color is significantly associated with educational attainment in the bivariate model for CARDIA women, and this association again persists through the addition of center and birth year fixed effects in model 2. Background controls account for notably little of the association between skin color and educational attainment in this cohort, with the coefficient on skin color identical in the bivariate (model 1) and full models (model 3). As for CARDIA men, a 1-*SD* increase in skin color among CARDIA women is associated with one quarter of a year of additional education completed (Table 5).

Black NLSY97 women are the sole subgroup in which skin color is not significantly associated with educational attainment even in the bivariate model, and the magnitude of the nonsignificant coefficient is a mere third of the equivalent association among CARDIA women. The magnitude of this coefficient remains relatively stable through the inclusion of center and birth cohort fixed effects but is further reduced to near zero after controlling for parental education (model 3). Net of all controls, a 1-*SD* increase in skin color among NLSY97 women is associated with a nonsignificant 3 percent of a year of additional education (Table 5); even were this coefficient to reach statistical significance in a larger sample, it would still constitute a near complete reduction in the association between skin color and educational attainment relative to black women born two decades earlier. Unlike in the models for men, the 22.4 percentage point cohort difference among black women (25.2 percent of a year in CARDIA vs. 2.8 percent of a year in the NLSY97) is indeed statistically significant ($p = .027$).

Discussion

Whereas findings of an association between skin color and educational attainment have been fairly consistent among black Americans born in the 1960s and earlier (e.g., Hughes and Hertel 1990; Keith and Herring 1991; Monk 2014), little is known regarding the relationship between skin color and educational attainment among later born cohorts. Mirroring the liberalization of racial attitudes over the latter half of the twentieth century (Firebaugh and Davis 1988), the results presented here suggest that the association between skin color and educational attainment may indeed have undergone a shift among black millennials relative to black Americans born two decades earlier, with color-based disparities today being meaningfully smaller (among women, at least) and largely reflective of colorism in previous generations. Although we considered only educational attainment as our outcome, this finding could also indicate a shift in how skin color relates to other indicators of SES among young adults today relative to their parents, because differences by skin color in certain later life measures of SES such as occupational prestige have been found in earlier cohorts to derive largely from differences by skin color in educational attainment (Branigan et al. 2013).

On the other hand, although skin color may no longer be significantly associated with educational attainment among black millennials net of controls for parental education, we find that the magnitude and significance of the cross-cohort change in this association varies by sex. Among black baby boomer women, a 1-*SD* increase in skin lightness is associated with an additional one quarter year of schooling, whereas among black millennial women, the association between skin color and educational attainment has fallen to near zero. In contrast, the association between skin color and years of education attained among black men has declined by less than half between the two cohorts, and this difference is not itself statistically significant. Nonsignificance of the cohort difference among men does not imply that the true difference in the population is indeed zero, and the magnitude of the cohort difference among men is large enough to merit caution in suggesting that there has been *no* change over time. The decline in the association between skin color and educational attainment for black women is simply quite clear in our models, whereas it is not at all clear for black men. The observed null effect of skin color on educational attainment among black Millennial women is encouraging, but the smaller and nonsignificant cross-cohort difference among men emphasizes the need for research on the relationship between phenotypic characteristics and social outcomes to take an intersectional approach, asking how the social interpretation of the physical body may differ by both race and also sex.

Although our analysis is correlational and does not test any specific mechanisms potentially driving sex differences in our findings, we note the concurrent divergence by sex in educational outcomes among black Americans, wherein black men now underperform relative to black women across a wide array of measures of both educational achievement and attainment (Snyder and Dillow 2012). Black men have also been more likely to encounter the criminal justice system over this period relative to black women or nonblack men (Drake 2013), and even within the school context itself, black boys are more likely than any other race-by-sex subgroup to be suspended from school (College Board Advocacy and Policy Center 2010). Future research might consider how social understandings of variation in black male physical bodies in particular may operate interactively with broader patterns of group-specific socioeconomic disadvantage and discrimination. As black boys are disproportionately disciplined in schools and black men disproportionately incarcerated, skin color may be entering into stereotypes of deviance in more salient ways for black boys and men than for other groups, potentially including black women.

The significant association between skin color and educational attainment in the bivariate models for black millennial men means that lighter skinned men in this cohort are still on average more educated than their darker skinned peers. However, that controls for parental SES substantially attenuate the magnitude of this association and render it nonsignificant suggests that the relationship between skin color and educational attainment today may be largely channeling color-based disparities in previous generations. The same may be true for black millennial women, among whom controls for parental background reduce an already small and nonsignificant association between skin color and educational attainment to near zero. For a large percentage of any residual association between skin color and educational attainment among black millennials to be explained by their parents' educational attainment may be interpreted as an optimistic finding, as although SES is itself transmitted intergenerationally (Black et al. 2005), a decline in contemporaneous ongoing color-based discrimination would suggest the potential for a continued decline in the relationship between skin color and educational attainment in successive cohorts. However, although contemporary skin color disparities in educational attainment appear to potentially reflect less direct discrimination and more intergenerational transmission of disadvantage for black millennials than for earlier cohorts, the lack of clarity as to whether there has been any meaningful cross-cohort decline whatsoever in the association between skin color and educational attainment for black men cautions against a suggestion that colorism is no longer a contemporary issue with respect to years of education attained.

The findings presented here emphasize the possibility that social understandings of visible physical characteristics such as skin color may vary meaningfully over relatively short periods of time, particularly periods of political and social shift with respect to race and skin color such as the decades following the civil rights movement. The generalizability of research on the relationship between skin color and social outcomes across birth cohorts should therefore be taken as a question to be tested empirically rather than simply assumed. For example, although an association between skin color and spouse selection has been demonstrated in the NSBA sample (Hughes and Hertel 1990), the relevance of skin color in the marriage market merits follow-up among millennials. Similarly, although the association between skin color and occupational prestige is largely attenuated by controls for educational attainment among baby boomers (Branigan et al. 2013), the association between skin color and income among slightly older black Americans has been found to persist even net of education (Keith and Herring 1991), yet another relationship worthy of investigation among millennials.

We present this analysis as a starting point for future research as new data become available, while recognizing that our method of generating comparable metrics across our baby boomer and millennial samples rests on the list of assumptions delineated in our methods section. These assumptions merit caution and consideration when interpreting our results. In addition, omitted variable bias remains perhaps the most consistent validity threat in any of the many studies quantifying colorism via the association between skin color and social outcomes (e.g., Goldsmith et al. 2006; Hughes and Hertel 1990; Keith and Herring 1991), including the present study. Of additional concern is the potential for interviewer bias in the measure of skin color in the NLSY97 data, although our comparison of the color distributions between the NLSY97 and CARDIA samples lends some reassurance here. In any case, interviewer bias would seem an unlikely explanation for the cross-cohort shift observed among women, because if interviewer bias results in lower SES respondents being perceived as darker than higher SES respondents with identical skin color (as is the commonly hypothesized concern), associations between skin color and educational attainment may well be inflated. A cautious interpretation might therefore read our NLSY97 estimates as upper bounds on the true parameters, and thus an underestimate of the cohort differences reported. Differing interviewer bias by sex could thus stand as one purely error-based explanation for the lack of a significant cohort difference among black men, if interviewers are more likely to conflate SES with skin color among black men than among black women. Such a difference by sex in the bias in interviewer perceptions of skin color would be an interesting finding in and of itself.

That the skin color distribution in the NLSY97 does indeed approximate particular characteristics of the distribution of reflectance data in CARDIA is a useful validation of existing interviewer-coded color measures. Nonetheless, our findings underscore the need to collect more precise and consistent data on skin color in social surveys, such that the assumptions made to render our two cohorts comparable are no longer necessary. As noted, supplemental models using the original NLSY97 skin color metric are largely redundant to the results presented; the transformation of the NLSY97 color measure into percent reflectance is necessary only to enable direct cross-cohort comparison in the absence of samples with consistent skin color measurements. Should skin reflectance measures become available in a survey sample of millennials that also contains sociodemographic data on respondents and their parents, this study could ideally be repeated without the need for the transformation of the metrics of skin color measurement.

Whereas more traditional quantities of interest in population research (e.g., income, employment, education) are by definition social indicators of status, the same is not true of elements of the visible body. To the contrary, characteristics such as skin, eye, and hair color, weight, and height may be meaningful in some cohorts and not in others, depending on the extent to which a particular trait is considered socially preferable at a given point in time. Such potential for volatility in the social meaning of visible phenotype makes comparison over time an issue of critical importance in the ongoing social science research on colorism, as well as for any line of research relating aspects of physical appearance to measures of social inequality.

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Catarina I. Kiefe is, by training, an internist (MD) and a mathematician (PhD). She founded the Department of Population and Quantitative Health Sciences at the University of Massachusetts Medical School (UMMS) and holds the inaugural Cutler Chair for Biomedical Research. She has founded and lead multiple research centers at UMMS and the University of Alabama at Birmingham. Dr. Kiefe's major research interests are in the development and application of innovative methods to measuring quality in health care and in cardiovascular epidemiology and outcomes and effectiveness research. She has been the principal investigator on federally funded research grants continuously for more than two decades, has more than 290 peer-reviewed publications, has served on or led multiple national and international scientific advisory boards, and is co-editor-in-chief of *Medical Care*, a premier journal in health services research.