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BEYOND RACE/ETHNICITY: SKIN COLOR, GENDER, AND THE HEALTH OF YOUNG ADULTS IN THE UNITED STATES

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Abstract

Researchers typically identify health disparities using self-reported race/ethnicity, a measure identifying individuals' social and cultural affiliations. In this study, we use data from Waves 1, 3, and 4 of Add Health to examine health disparities by interviewer-ascribed skin color, a measure capturing the perceptions of race/ethnicity ascribed to individuals by others. Individuals with darker skin tones may face greater exposure to serious stressors such as perceived discrimination, poverty, and economic hardship which can accumulate over the lifecourse and increase the likelihood of poor health. We found significant gradients in Body Mass Index (BMI), obesity, self-reported health, and depressive symptoms by interviewer-ascribed skin color but results differed by gender. Associations of BMI, obesity, and fair/poor health among women were only partially mediated by discrimination, self-reported stress, or low socio-economic status and persisted after controlling for race/ethnicity. Among men, initial associations between skin color and both fair/poor health and depressive symptoms did not persist after controlling for race/ethnicity. This study demonstrates the value of considering stratification by skin color and gender in conjunction with race/ethnicity.

Keywords

Skin color/tone; race/ethnicity; Hispanic; Black; health disparities/equity; discrimination

INTRODUCTION

Racial/ethnic disparities in health have been well documented. These disparities appear in early childhood and persist through adulthood (Braveman 2009). In comparison to Non-Hispanic (NH) White adults, NH Blacks and Hispanics have a greater prevalence of obesity,

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[7]Regression analyses (available upon request) showed that skin color gradients in discrimination and stress did not differ by gender. Skin color gradients in income (Male β_{color}= −.30 vs. Female β_{color}= −.65. Wald test = 16.18, p<.001) and economic hardship (Male OR_{color}= .05 vs. Female OR_{color}= .13 Wald test = 9.98, p<05) were significantly greater among women than among men.

lower self-reported health, and higher rates of serious psychological distress (NCHS 2016). Asians have a lower prevalence of obesity, higher self-reported health, and lower rates of serious psychological distress (NCHS 2016).

Researchers typically examine these health disparities using self-reported racial/ethnic identifications that presumably capture individuals' social and cultural affiliations with specific races/ethnicities (Nagel 1994). However, the standard four-category racial/ethnic identification regime commonly utilized in U.S.-based research on health disparities (i.e. NH White, NH Black, Hispanic, and NH Asian) combines individuals from highly disparate social and cultural backgrounds. Moreover, previous research has shown that racial/ethnic self-identifications can depend on the structure of survey questions and can change over the lifecourse or across social contexts (Harris and Sim 2002; Brown, Hitlin and Elder 2006; Hitlin, Brown, and Elder 2006). In the United States, where mixed racial/ethnic self-identifications have become more common, the boundaries between races/ethnicities may shift and lead to erroneous conclusions about changes in health disparities that result from changing racial/ethnic identifications rather than changes in health (Bratter and Gorman 2011; Frank, Akresh, and Lu 2010; Mays et al. 2003).

As an addition to self-identified race/ethnicity, researchers interested in racial/ethnic disparities have sometimes utilized measures of interviewer-ascribed skin color (Hill 2002; Frank, Akresh, and Lu 2010; Perreira and Telles 2014). The addition of interviewer-ascribed skin color may help to identify differences in daily experiences and access to socio-economic resources due to racism or discrimination beyond those attributable to race/ethnic self-identification (Bonilla-Silva 1997, Dressler, Oths, and Gravlee 2005; Jones et al. 2008).

Unlike self-reported race/ethnicity, disparities based on skin color reflect "colorism" or "pigmatocracies" (Bonilla-Silva 2004; Hunter 2013; Dixon and Telles 2017). Historically, whiteness has conferred social advantages on individuals both across and within races/ethnicities (Drake and Clayton 1945; Keith and Herring 1991). In the United States, racial/ethnic hierarchies, which assign Asians, Blacks, and Hispanics to a lower status than Whites, reflect this color hierarchy (Dixon and Telles 2017; Tichenor 2002). This color hierarchy is also reflected in caste systems and ethnographic narratives associating whiteness with beauty, desirability, health, and class *within* various racial/ethnic communities in the United States and abroad (Harris 2009; Hunter 2013). The color hierarchy intersects with gender often placing females with darker-skin tones at the bottom of the social hierarchy (Browne and Misre 2003; Hunter 2002).

In this study, we identify associations between skin color and four health outcomes, examine associations of skin color with health outcomes when race/ethnicity is considered, and evaluate how gender modifies associations between skin color and health. The four health outcome considered – body mass index, obesity, self-reported health, and depressive symptoms -- capture three widely studied aspects of health associated with psychosocial stress and socioeconomic status (SES) – overall health, mental health, and physical/cardiovascular health. We include both BMI and obesity for ease of comparison with previous literature using both measures.

This article makes five major contributions to the literature. First, we extend the literature on health disparities by assessing associations between skin color and health both across and within races/ethnicities. We argue that skin color contributes to racial/ethnic stratification in the U.S (Bonilla-Silva 2004). As new immigrants from Latin America and Asia inter-marry with other races/ethnicities in the United States, their children challenge historical racial/ethnic boundaries by adopting multi-racial/ethnic identities, redefining Whiteness, or refusing to identify any racial/ethnic identity (Frank, Akresh, Lu 2010; Vaquero and Kao 2006). Nevertheless, they continue to be categorized by others largely on the basis of their skin colors and these ascribed racial/ethnic identities can affect their access to resources and their well-being (Painter, Holmes and Bateman 2015; Perreira and Telles 2014).

Second, we extend the research on skin color and health to be inclusive of Hispanics and Asians. Previous studies of skin color and health have focused primarily on Blacks (Armstead et al. 2014; Borrell et al. 2006; Monk 2015). Yet colorism exists in both Hispanic and Asian populations as well and can impact health (Montalvo and Codina 2001; Hunter 2013; Kiang and Takeuchi 2009). Colorism also has a long history among self-identified Whites, where Whites with darker skin tones, different religious backgrounds (e.g., Catholics, Jews or Muslims), or from different world regions (e.g., Southern Europe, Northern Africa, and the Middle East) have been treated as inferior (Dixon and Telles 2017; Tichenor 2002). Additionally, multiracial/ethnic individuals self-identifying as White may experience colorism and racial/ethnic misclassification of lighter-toned individuals who self-identify as racial/ethnic minorities can be a source of stress contributing to poor health (Campbell and Troyer 2007; Hunter 2002).

Third, we extend the literature on health disparities to show associations between skin color and multiple measures of health. With some exceptions (Borrell et al. 2006; Monk 2015), previous literature has focused on the relationship between skin color and hypertension (Armstead et al. 2014; Gravalee et al. 2005). Research on racial/ethnic health disparities has shown that these disparities can differ across dimensions of health. Multiple dimensions of health are equally important to consider with respect to skin color. Fourth, we extend the health disparities literature by investigating the relationship between skin color and health in early adulthood, a time period in which the psychosocial stress associated with race/ethnicity have just begun to accumulate (Klonoff and Landrine 2000; Hertzman and Boyce 2010). Previous literature has focused on older adults (e.g., Borrell et al. 2006; Monk 2015). Finally, we consider the modifying effects of gender on the association between skin color and health. As argued by intersectionality theory, gender shapes racial/ethnic experiences (Cummings and Jackson 2008; Harris 2009). Health researchers have begun to evaluate the interaction between race/ethnicity and gender (Schulz and Mullings 2006; Cummings and Jackson 2008). Yet previous research on colorism and health disparities rarely considers this intersection (see Borrell et al. 2006 and Kiang and Takeuchi 2009 for exceptions).

THEORETICAL BACKGROUND

This study draws on structural interpretations of race/ethnicity and research highlighting the increasing importance of skin color in the U.S. stratification system (Bonilla-Silva 1997; Bonilla-Silva 2004). According to the structural perspective, racial/ethnic categories are

deeply embedded in the history of inter-group relations within and between countries, socially constructed, and malleable (Bonilla-Silva 1997; Drake and Clayton 1945). They develop from group relations within racialized social systems which allocate economic, political, and social resources to benefit the dominant social group. Though skin color, especially the color perceived by others, is not the only factor contributing to the placement of individuals in particular racial/ethnic categories, it is a dominant phenotypical characteristic associated with both individuals' own racial/ethnic identifications and with the racial/ethnic ascriptions made by observers (Frank, Akresh and Lu 2010; Golah-Boza and Darity 2008; Rockquemore and Brunsma 2002). Other phenotypical characteristics associated with race/ethnic classifications include hair color, eye color, skeletal structures, and other facial features (Dixon and Telles 2017). Skin tone and facial features have been found to have independent effects on Whites' affective reactions to Blacks (Hagiwara, Kashy and Cesario 2012). Independent of skin tone, Afrocentric facial features have also been associated with harsher punishment for crimes and more Eurocentric features have been associated with higher incomes and better health (King and Johnson 2016; Kiang and Takeuchi 2009).

This study further draws on the psychosocial stress models of health disparities (Dressler, Orths, and Gravlee 2005; Pearlin et al. 2005). According to this model, racial/ethnic minorities in the United States experience greater exposure to serious stressors such as perceived discrimination, poverty, and economic hardship. These stressors accumulate over the lifecourse, "getting under the skin" to cause biological harm to the mind and body, and increasing the likelihood of poor physical and mental health outcomes (Hertzman and Boyce 2010). Consequently, racial/ethnic health disparities may be mediated by these stressors and reflect phenotypical attributes, such as skin color, associated with the accumulation of exposures to these stressors over the lifecourse (Klonoff and Landrine 2000). As has been found elsewhere (see Wassink, Perreira, and Harris 2017)), these disparities may be largest among U.S.-born racial/ethnic minorities that have been exposed to these stressors over more of their lifecourse than first-generation immigrants.

Finally, this study draws on theories of intersectionality. Skin color and gender create layers of social stratification that both confound and sometimes restructure racial/ethnic hierarchies (Harris 2009; Schulz and Mullings 2006). Consequently, these social identities cannot be disaggregated into their constituent parts. They must be examined in concert. In comparison to men, women are often judged more on the basis of attractiveness (Harter 1999; Hunter 2002). As a result, lighter-toned Asian, Black, and Hispanic women who conform to Eurocentric images of beauty have potentially greater power, prestige, and social capital leading to improved labor market trajectories, marriage to higher-status men, and greater self-esteem (Browne and Misre 2003; Hill 2009). In some circumstances, these lighter-toned Asian, Black and Hispanic women may have a social advantage, over racially/ethnically White women. On the other hand, lighter skin tone may confer less of an advantage on Asian, Black, or Hispanic men. Even with lighter skin color, men in these ethnic groups may be perceived as threats and subjected to more stereotypes and biases that constrain their access to the economic and social resources needed to promote health (Browne and Misre 2003; Hill 2009).

Skin Color, Gender and Health Disparities

This study considers three aspects of health commonly associated with psychosocial stress and with a high degree of variation by race/ethnicity in the United States – overall general health measured by self-reported health, mental health measured by depressive symptoms, and cardiovascular health measured by BMI and obesity. On self-reported health, which strongly correlates with morbidity and mortality, reports of being in fair/poor health are higher among Blacks and Hispanics (14% and 12% respectively), and lower among Asians and Whites (7% and 8% respectively) (Idler and Benyamini 1997; NCHS 2015). On mental health, rates of moderate-severe depressive symptoms are higher among Blacks and Hispanics (9.7% and 9.4% respectively) than among Whites (6.9%) (Pratt 2014). A strong predictors of coronary heart disease (CHD) and other CHD risk factors (e.g., cholesterol, blood pressure, and diabetes), obesity (defined as BMI>30kg/m^2) is more common among Blacks (48%) and Hispanics (42%) than among Whites (35%) and Asians (12%) (NCHS 2016).

Studies, primarily among blacks, have looked beyond race/ethnicity to evaluate how health disparities vary by skin color in the United States. They typically find associations between interviewer-ascribed or self-reported skin color and health conditions associated with stress (e.g., hypertension and depression) or general self-reported health (e.g., Armstead 2014; Borrell et al. 2006; Gravalee et al. 2005; Monk 2015; Montalvo and Codina 2001). These associations potentially reflect the association of skin color with socially-ascribed race/ethnicity (Borrell et al. 2006; Dresslee, Orths, and Gravelee 2005). As a phenotypical marker of socially-ascribed race/ethnicity, skin color can provide a possible indicator of life-time exposure to discrimination and the structural racism that permeates racialized social systems in the United States. (Bonilla-Silva 1997; Klonoff and Landrine 2000; Krieger, Sidney and Coakley 1998). To the extent that skin color captures a life-time of racialized treatment and the psychosocial stress associated with this treatment, it may have associations with health above and beyond cross-sectional associations of discrimination or SES with health. Yet, skin color is “not simply another measure of discrimination” stemming from interracial contact over one’s lifecourse (Monk 2015:411). It also captures differential treatment that may stem from an individual’s position in the social hierarchy *within* a race/ethnicity. Previous research has identified preferences for whiteness and Eurocentric features among every race/ethnic group and suggests these preferences may be particularly strong for females in every racial/ethnic group (Dixon and Telles 2017; Harter 1999).

Despite studies that show variation in racial/ethnic disparities by gender, research on skin color and health has rarely evaluated differences between females and males. Scholarship suggests that darker color may be more socially disadvantageous for minority females than minority males in large part because females are judged more on the basis of their physical attributes while men are judged based on a wider spectrum of characteristics such as wealth, power and occupational status (Browne and Misre 2003; Keith and Herring 1991; Harter 1999). Racial/ethnic disparities across multiple measures of health (e.g., obesity, self-reported health, and depression) are similarly gendered, with greater disparities among females than males (Cummings and Jackson 2008; Flegal et al. 2012; Schulz and Mullings

2006). Thus, we expect that gender might similarly interact with skin color to place darker-toned females at a double disadvantage.

Skin Color and Race/Ethnicity in the United States

Previous research on racial/ethnic health disparities suggests that different indicators of race/ethnicity (e.g., self-reported race/ethnicity, interviewer-ascribed race/ethnicity, or interviewer-ascribed skin color) will be differently associated with health as well as other outcomes such as income (Jones et al. 2008; Monk 2014, 2015; Perreira and Telles 2014). They measure distinct aspects of racialization and provide different insights into the mechanisms underlying racial/ethnic health disparities (Dressler, Orths, and Gravlee 2005; Monk 2014).

Since the 1960s, when race/ethnicity was increasingly recognized as a social construction rather than a biological or genetic attribute, most studies of health inequalities have utilized self-reported measures of race/ethnicity (Smedley, Stith, and Nelson 2003). Racial/ethnic self-identifications reflect both individuals' internal racial/ethnic identities and their expressed racial/ethnic identities (Harris and Sim 2002). During adolescence and young adulthood (Phinney 1996), individuals construct these internal identities based on their family ancestry and the racial/ethnic identities of their parents; their social affiliations outside of their home environments; and phenotypical characteristics including skin tone, hair texture, eye and hair color (Harris and Sim 2002; Herman 2004; Hitlin, Brown, and Elder 2006). As their social affiliations change, the racial/ethnic self-identifications that individuals express can change (Harris and Sim 2002; Hitlin, Brown, and Elder 2006; Brown, Hitlin, and Elder 2006). Consequently, self-reported racial/ethnic identities have been recognized, by some, as fluid rather than stable social categories (Doyle and Kao 2007; Saperstein and Penner 2012, 2014). Others dispute the fluidity of racial/ethnic identity (Kramer 2016; Alba 2016).

In contrast, interviewer-ascribed skin color is an indicator of externally-imposed racial/ethnic identity. Analytically distinct from self-identified race/ethnicity, perceived skin color can independently structure an individual's access to economic, political, and social resources and shape life experiences in a racialized social system (Bonilla-Silva 1997; Monk 2014). Additionally, skin color as perceived by others can potentially vary over time and across social context in response to cues. In short, interviewer-ascribed skin color captures the potential for colorism (i.e. discrimination based on skin color or a preference for whiteness) in the United States, which occurs not only in social interactions between races/ethnicities but also in social interactions within races/ethnicities.

At the same time, there is a complex interplay between perceived skin color and race/ethnic self-identification. Though skin color strongly correlates with racial/ethnic self-identifications, wide skin-color variations exist within self-identified racial/ethnic groups (Golash-Boza and Darity 2008). Individuals do not necessarily choose the racial/ethnic identity most commonly associated with their skin colors. Social affiliations, language spoken, and cultural heritage also play a role in racial/ethnic identification, especially among recent Asian, Latin American, and African immigrant populations (Frank, Akresh, and Lu 2010; Fuligni et al. 2008; Rockquemore and Brunsma 2002).

Skin Color, Perceived Discrimination, Perceived Stress, and SES

According to psychosocial stress models of health disparities, the skin color of an individual affects the behavior of others towards that individual, which leads to perceived discrimination and stress and potentially poor health outcomes (Dressler, Orths, Gravlee 2005). Psychosocial stress models of health define stress as the tension felt by individuals when they perceive a threat and/or discern that they do not have the resources to cope with the threat (Aneshensel 1996). Stress can stem from both psychological and physical threats to well-being in home, work, and neighborhood environments (Pearlin et al. 2005; Thoits 2010). Stress can occur from a single momentous event, result from repeated exposures on a daily basis, and accumulate over time (Pearlin et al. 2005; Thoits 2010). Moreover, stress can result in not only a cognitive appraisal that a threat exists but also in a physiological response, referred to as allostasis, affecting endocrine, cardiovascular, metabolic, and immune systems (Hertzman and Boyce 2010). Prolonged allostasis can result in chronic illness (Geronimus 2006).

Perceived discrimination, one source of stress, reflects individuals' experiences with unfair or prejudicial treatment based on a variety of personal characteristics (e.g., age, color, gender, religion, race/ethnicity, sexuality, and social class) (Krieger 1999). It can take many forms stemming from both overt, interpersonal behaviors as well as more subtle institutional designs that systematically bestow privileges on a dominant social group while circumscribing opportunities available to a subordinate group (Krieger 1999).

Numerous studies have documented an association between perceived racial/ethnic discrimination and a variety of both physical and mental health outcomes (Paradies 2006; Pascoe & Richman 2009; Williams and Mohammed 2009). Individuals reporting more discrimination tend to have higher rates of fair/poor self-reported health, higher rates of depression, and higher rates of obesity (Paradies 2006). Studies have also documented associations between perceived stress and both physical and mental health (Geronimus 2006; Thoits 2010). Though few studies have directly evaluated associations between skin color and either perceived discrimination or perceived stress, evidence suggests a high correlation between darker skin color and greater lifetime exposure to discrimination (Klonoff and Landrine 2000) and between skin color and stress (Armstead et al. 2014). In early adulthood, this accumulation of lifetime exposure to discrimination and stress has only just begun. Thus, this study provides an opportunity to identify these associations early in the lifecourse.

Skin Color and SES

According to psychosocial stress models of health disparities, skin color may also affect health through its associations with SES as measured by income, education, and economic hardship (Dressler, Orths, Gravlee 2005; Pearlin et al. 2005). Previous studies have shown associations between darker skin color and lower educational attainment, employment, and incomes in both the United States (Ryabov 2013; Frank et al. 2010; Hersch 2011) and other countries (Perreira and Telles 2014).

Previous studies have also shown that low SES is a leading predictor of poor physical and mental health (e.g., Hayward et al. 2000). Individuals with low SES backgrounds have

greater exposure to stress and violence in their communities; more limited access to health-related resources such as medical care, exercise equipment, and nutritious food; fewer beneficial social connections; and possibly poorer health behaviors (Adler and Newman 2002). Thus, some scholars have argued that low SES is the fundamental social cause of disease (Link and Phelan 1995; Phelan, Link, and Tehranifar 2010). However, in early adulthood, the relationship between SES and health may not be as strong as it is in later adulthood since these effects compound over time (Hayward et al. 2000). Though these relationships have been well-established by previous research with adults, this study provides a unique opportunity to examine these associations early in the lifecourse and confirm their presence in the Add Health cohort.

HYPOTHESES

Along with our hypotheses, an overview of our conceptual framework is provided in Figure 1. Our primary hypothesis is that darker skin color ascribed by interviewers during adolescence will be associated with poorer health during young adulthood (H1a) and that this association will be stronger among females (H1b). We also expect to find variation in interviewer-ascribed skin color within self-identified race/ethnicities and vice versa (H2a). Thus, skin color may be associated with health over and above the association of self-reported race/ethnicity with health (H2b). Additionally, we expect darker interviewer-ascribed skin color to be associated with several mediating factors, including higher rates of perceived discrimination and perceived stress, lower education and income, and greater economic hardship (H3a). These mediating factors may explain some of the associations between skin color and health (H3b). Finally, we expect that darker interviewer-ascribed skin color will be associated with poorer health within each race/ethnicity (H4a) and that gender will continue to modify associations of skin color with health within each race/ethnicity (H4b).

METHODS

Data

To investigate the association between skin color and health among young adults, we used data from The National Longitudinal Study of Adolescent to Adult Health (Add Health) (Harris 2013), a nationally representative study of adolescents in grades 7-12 in the United States in 1994-1995. Add Health used a multistage, stratified, school-based, cluster sampling design and drew from 80 high schools and their corresponding feeder schools. Add Health also oversampled several ethnic groups (i.e. Chinese, Cuban, Puerto Rican) and African American youth from families with a high socioeconomic status. These oversamples ensure relatively large sample sizes of Hispanics, Asians, and African Americans.

At Wave 1, 20,745 adolescents completed in-home interviews. Three follow-up interviews have been administered to the in-home sample, most recently in 2008-09 (Wave 4) when the adolescents had entered adulthood (ages 24-32).[1] From the original sample, 15,701 were re-interviewed at Wave 4 (79.4% of eligible respondents). Of these, 12,228 also responded at

[1]Add Health Wave 5 is currently in the field and may be released in 2019-2020.

Wave 3 (2001-2002) and had non-missing values on the longitudinal sample weight. Wave 2 (1995-96) data were not utilized in this analysis because interviews were conducted in schools and did not include seniors who graduated following Wave 1.

This study relied on Add Health data from White, Asian, Black, and Hispanic respondents interviewed at Waves 1, 3, and Wave 4. Because of their small sample sizes, we excluded respondents whose identified as Native American (N=98) or other race (N=111), but did not identify as Hispanic. We also omitted 463 observations (3.8%) due to missing data on independent variables, creating a final analytic sample of 11,616. Due to missing data on health outcomes, the analytic sample varies slightly across dependent variables (N=11,616 for self-reported health, N=11,604 for CESD, N=11,470 for BMI and obesity).

Measures

All health outcomes are based on measures from Wave 4. Two of our primary independent variables (race/ethnicity and gender) are measured at Wave 1; Interviewer-ascribed skin color was assessed at Wave 3. Interviewer-ascribed skin color was not available at Waves 1 or 4. Potential mediating variables (e.g., perceived stress, discrimination, and economic hardship) were measured at Wave 4. Perceived discrimination and stress measures were not available prior to Wave 4. While we recognize that discrimination, stress and SES can lead to changes in self-identified racial/ethnic affiliations over time, we measured self-reported race/ethnicity and skin color in early and late adolescence prior to our measurements of perceived discrimination, perceived stress, SES, and health in early adulthood. Means and standard errors for all variables used in this analysis are reported in Table 1.

BMI and Obesity.—Immediately following interviews, interviewers took physical measurements of height and weight in Wave 4. Using these anthropometric data, we derived a continuous measure of BMI (kg/m^2) and classified those respondents with a BMI of 30 or higher as obese (NCHS 2016). Pregnant women were excluded from the analysis of BMI and obesity.

Self-Reported Health.—Self-rated health was assessed in Wave 4 using a single question, “In general, how is your health: excellent, very good, good, fair, or poor?” Correlating strongly with morbidity and mortality, this question has been well validated and utilized throughout the United States (Idler and Benyamini 1997). We combined the top three categories (good-excellent) and the bottom two categories (fair/poor). Results from logistic regression are consistent with those generated by alternative statistical methods incorporating the ordinality of self-rated health (Manor, Matthews, and Power 2000).

Depressive Symptoms.—The Add Health questionnaire included an abbreviated, 10-item, version of the Center for Epidemiologic Studies Depression Scale (CES-D) in Wave 4 (Radloff 1977). The 10-item CES-D scale measures positive and negative affect, somatic complaints, and interpersonal relations, providing a multidimensional indication of respondents’ underlying mental health and well-being. Because structural equation models of the CES-D reveal that the full linear scale does not have a consistent measurement structure across races/ethnicities (Perreira et al. 2005), we replicated all analyses of

depressive affect using a shortened, four-item, negative affect scale (available upon request). These analyses were substantively identical to those using the full scale. To maintain comparability with studies that employ the full CES-D, we present results based on the full 10-item scale.

Self-reported race/ethnicity and Gender.—At Wave 1, respondents reported their race as: White, Black or African American, American Indian or Native American, Asian Pacific Islander, and/or other. They were allowed to select multiple racial identities. In addition, respondents reported whether they were of Hispanic/Latino origin. From these responses, we constructed a four-category measure of race/ethnicity that classifies respondents as White, Asian or Pacific Islander, Hispanic, or Black/African American. All those who reported Hispanic or Latino ancestry were coded as Hispanic regardless of their racial classification. Those reporting multiple races/ethnicities were assigned to a single race/ethnicity based on a second question asking which racial background best described their race/ethnicity.[2] Respondents reported their self-identified gender as female (=1) or male (=0) at Wave 1.

Skin color.—At Wave 3 only, interviewers completed a supplement questionnaire which asked: "What is the respondent's skin color: black, dark brown, medium brown, light brown, or white?" Interviewers were trained to consider the facial and hand skin color in making their assessments but were not provided with color palettes as have been utilized in other studies of skin color (e.g. Perreira and Telles 2014). The majority of Add Health interviewers were White (74%) or Black (21%) at Wave 3. Approximately, 61% of interviews were conducted by interviewers who reported the same race/ethnicity as respondents; 86% of self-identified White respondents were interviewed by White interviewers; 42% of Black respondents were interviewed by Black interviewers; 18% of Hispanic respondents were interviewed by Hispanic interviewers; and 1.5% of Asian respondents were interviewed by Asian interviewers.[3]

We evaluated the linearity of associations between skin color and each of our outcomes. There is a linear trend in the associations. Additionally, the inclusion of a squared term (i.e. color squared) did not improve model fit. Thus, following Frank, Akresh and Lu (2010), we treat color as a continuous variable in our multivariable analyses. Models treating skin color as a categorical variable are available upon request. These results yield similar conclusions. We prefer the parsimony of results treating skin color as continuous.

[2]Among non-Hispanics in this sample, 151 adolescents reported White/Native American identities, 78 reported White/Asian identities, 86 reported White/Black race/ethnic identities, 20 reported Black/Asian identities, and 67 reported Black/Native American identities. In sensitivity analyses, we found that the associations between race/ethnicity and health did not depend on the racial/ethnic category to which multi-race individuals were assigned.

[3]Previous studies have indicated that, interviewers perceive greater variation in skin tones within their own race/ethnicity than within another race/ethnicity (Hill 2002). To evaluate the association of race/ethnic matching of interviewers with respondents on interviewer-ascribed skin color, we estimated four separate ordered logistic regressions of skin color on interviewer's race/ethnicity (White vs. non-White) among self-identified (1) White, (2) Asian, (3) Hispanic, and (4) Black respondents. Among White and Hispanic respondents, we found no evidence that the skin colors perceived by White interviewers differed from the skin colors perceived by non-white interviewers. However, among Black and Asian respondents, we found that White interviewers had higher odds of perceiving a darker skin color than non-White interviewers. We do not consider this result to be evidence of "bias" in interviewer-ascribed skin color since the aim of the Add Health questions was not to get an unbiased or objective measure of the respondent's skin color. Instead, the aim was to identify how respondents would be perceived by others. Though interviewer race/ethnicity is correlated with interviewer-ascribed skin color, we have no reason to believe that interviewer race/ethnicity is correlated with a respondent's health. A variable indicating that the interviewer was the same race as the respondents (1=yes, 0 = no) in our models of health outcomes was never significant.

Perceived Discrimination.—Using a single-item from the everyday discrimination scale (Williams 1997), respondents were asked “In your day-to-day life, how often do you feel you have been treated with less respect or courtesy than other people: never, rarely, sometimes, or often?” Those who responded sometimes-often were coded as having experienced discrimination (=1). Those who reported being treated with less respect or courtesy sometimes-often were asked for the “main reason for these experiences.” Because the majority (60%) of respondents attributed their poor treatment to “other” reasons, we do not include measures of specific types of discrimination in regression models. Consequently, our measure of perceived discrimination captures the general experience of differential treatment but not the specific cause.

Perceived Stress.—To capture differences in perceived stress, we included a 4-item version of the Cohen perceived stress scale (CPSS) (Cohen et al., 1983). It measures both positive and negative aspects of stress perceived by respondents over the past 30 days. Each item was measured on a 5-point scale ranging from never (0) to very often (4). Positive responses were reverse coded and the four items were summed creating a scale that ranged from 0-16.

Socioeconomic Status and Economic Hardship.—We used two measures of socioeconomic status (SES) based on Wave 4 responses—education and household income.[4] To capture education, we created a dichotomous variable that indicates whether a respondent received more than a high school education (some college, vocational training, college, graduate/professional school =1, high school or less=0). Respondents also estimated their annual household incomes on a 12-point scale ranging from less than $5,000 to $150,000 or more in increasing increments of five to fifty thousand dollars. We coded values at the midpoint of each range with the top value set at $150,000. Multiple imputation with chained equations was used to impute missing household income values for 6% of respondents and a variable indicating imputed income was included in models using income.

Economic hardship was measured based on six yes-no questions regarding whether respondents had experienced any of the following hardships in the past 12 months: lack of phone service, inability to make rent payments, evictions, inability to make utilities payments, lack of utility services, and/or food insecurity. We summed the responses to create a continuous scale of economic hardship ranging from 0-6. Since the majority of respondents, did not experience any hardships, the mean of this variable was less than one.

Control Variables.—In all multivariable analyses, we controlled for age, foreign-born (1=yes, 0=no), married or cohabitating (1=yes, 0=no), health insurance status (insured=1, uninsured=0), urban location (1=yes, 0=no), and U.S. region. Following guidelines established by the U.S. Census Bureau, we identified urban residents (1=yes, 0=no) as those who resided in census blocks with at least 386 inhabitants per square mile. We also controlled for U.S. Region of residence -- Northeast (1=yes,0=no), Southeast (1=yes,0=no),

[4]When parental income was added to the model, associations of young adult income and education with health remained unchanged.

Midwest (1=yes, 0=no), West (1=yes, 0=no). All demographic control variables were measured at Wave 1 with the exception of age, urban residence, and U.S. region.

Analytic Approach

Our primary goal was to identify the association between health in young adulthood and skin color and to evaluate whether this association varied by gender. Our analysis begins with an examination of bivariate associations to evaluate hypotheses H1a-H3a. We first examined bivariate associations between skin color and each of our four health outcomes – BMI, obesity, poor self-reported health, and depressive symptoms – to determine whether a gradient indeed existed (H1a). For comparative purposes, we also examined bivariate associations between race/ethnicity and each of our health outcomes. Second, we evaluated bivariate associations between interviewer-ascribed skin color and self-reported race/ethnicity (H2a). Third, we evaluated bivariate associations between skin color and potential mediating variables – perceived discrimination, perceived stress, educational attainment, income, and economic hardship (H3a). For comparative purposes, we also evaluated bivariate associations between race/ethnicity and each of these potential mediating variables.

Moving to a regression framework, we evaluated hypotheses H1b, H2b, H3b, and H4a-b using a step-wise approach. We first estimated the association between skin color and each health measure including only our demographic controls variables. We next tested whether gender modified this association by adding an interaction between gender and color to each regression (H1b). We then identified whether the associations persisted after including potential mediating variables (i.e. perceived discrimination, perceived stress, educational attainment, income, and economic hardship) in each regression (H3b). To formally test the significance of potential mediating variables, we used the delta method proposed by Sobel (1982). Lastly, we added self-reported race/ethnicity to the models to determine whether differences in health observed by interviewer-ascribed skin color persisted after controlling for self-reported race/ethnicity (H2b). The order in which we add variables to each regression is driven by our focus on how discrimination, stress, and low SES potentially mediate associations between skin color (rather than self-identified race/ethnicity) and health. Finally, we evaluated the effects of skin color on each health outcome by race/ethnicity (H4). For each race/ethnicity, we regressed health outcomes on skin color (H4a) while adjusting for all potential mediators (i.e. discrimination, stress, education, income, and economic hardship). To account for potential gender modification within race/ethnicity, we then estimated the same models with a skin color by gender interaction (H4b).

We used STATA v14 to conduct all analyses. To estimate models with continuous outcome variables (i.e. BMI and CESD) we used ordinary least squares (OLS) regression. Models with dichotomous dependent variables (i.e. obesity and fair/poor health), were estimated using logistic regression.[5] Because of Add Health's complex design we weight all analyses and adjust standard errors for school-level clustering (Chantala and Tabor 1999). The Add

[5]Because of the high prevalence of obesity, odds ratios calculated from logistic models potentially overestimate the strength of associations and risk ratios calculated from binomial regressions are sometimes preferred. However, scholarship on the use of odds ratios versus risk ratios generally suggests that odds ratios become problematic when they fall outside the range of 0.5-2.5 (Hilbe 2011). Odd ratios for associations with obesity in this study fall below this range.

Health weights are designed to adjust for Add Health's unique design, including the oversamples. Thorough analysis of weighting and non-response at Wave 4 reveals very limited bias, especially on health measures, after sample weights were applied (Brownstein et al. 2010). All regressions also controlled for age, foreign-born, married or cohabiting, urban location, health insurance coverage, and U.S. region.

RESULTS

Health Outcomes by Interviewer-Ascribed Skin Color and by Self-Reported Race/Ethnicity

We found significant gradients in health by interviewer-ascribed skin color (Table 2, **Panel A**). Individuals with darker skin colors had higher mean BMIs and a greater prevalence of obesity. Also, darker-toned individuals more often reported fair/poor health and symptoms of depression. Differences by self-reported race/ethnicity reflected the color hierarchy (Table 2, **Panel B**). Self-reported Blacks and Hispanics reported significantly worse health outcomes than Whites. There were no significant differences in mean BMI, obesity prevalence, and fair/poor health between Asian and White race/ethnicities. Asians did report significantly greater depression symptoms than racial/ethnic Whites.

Interviewer-Ascribed Skin Color and Self-Reported Race/Ethnicity

Although interviewer-ascribed skin color and self-reported race/ethnicity were strongly correlated (r=.82), there was variation in ascribed skin colors among those with the same racial/ethnic self-identifications (Table 3, **Panel A**) and variation in racial/ethnic identity among those with similar ascribed skin colors (Table 3, **Panel B**).[6] While 96% of self-identified Whites were perceived as white by interviewers, 9% of individuals perceived as white by interviewers identified as non-White. Among self-identified Asians and Hispanics, interviewer-ascribed skin color was most often white (30 and 43%, respectively), light brown (48% and 41%, respectively), and medium brown (18% and 13%, respectively). Among self-identified Blacks, interviewer-ascribed skin color was most often medium brown (30%), dark brown (30%), and black (28%). Conversely, individuals with interviewer-ascribed light brown skin tones most commonly self-identified as Hispanic (47%) but also identified as White (20%), Asian (16%), or Black (16%). Those with interviewer-ascribed medium brown skin tones self-identified their race/ethnicity as Black (66%), Hispanic (21%), Asian (9%) or White (4%).

Discrimination, Stress, and SES by Interviewer-Ascribed Skin Color and by Self-Reported Race/Ethnicity

We found strong skin color gradients in reports of perceived discrimination and stress (Table 4, **Panel A**). Compared to those with white skin color, those with black skin color perceived higher rates of discrimination (31% vs. 23%) and higher levels of stress (5.4 vs. 4.7). Rates of perceived discrimination and stress fell in between these two extremes for individuals with light, medium, and dark brown skin colors.

[6]In additional analyses, we estimated multinomial logistic regressions of selecting a Black, Hispanic, or Asian vs. a White racial/ethnic identity on skin color. We found strong positive associations between darker interviewer-assigned skin color and a non-White self-reported identity.

Regardless of the indicator used, we also found strong skin color gradients in indicators of SES (Table 4, **Panel A**). Compared to those with white skin colors, those with black skin colors graduated from high school at lower rates (84% vs. 93%); earned less income ($41,000 vs. $65,000); and reported more economic hardship (.82 vs. .44). High school graduation rates, income, and economic hardships fell in between these two extremes for individuals with light, medium, and dark brown skin colors. [7]

Racial/ethnic disparities reflected these skin color gradients in discrimination, stress, and SES (Table 4, **Panel B**). In comparison to both Whites and Asians, those who self-identified as Black or Hispanic perceived more discrimination but only Blacks reported greater stress. In comparison to both Whites and Asians, those who self-identified as Black or Hispanic also reported lower high school graduation rates and lower incomes but only Blacks reported higher economic hardship. Asians reported higher incomes and lower economic hardship than Whites.

Multivariable Analyses of Skin Color and Health

For each indicator of health (BMI, Obesity, Fair/poor health, and Depressive Symptoms), we consistently found gradients in health by skin color (Table 5, **Panel A)** but results differed by gender (Table 5, **Panel B**). Skin color associations with BMI and obesity were significantly stronger among females than males ($F=39.95$, $p<.001$ and $F=23.80$, $p<.001$, respectively). Skin color associations with fair-poor health and the CESD-10 did not differ significantly by gender. For females, darker skin color was associated with higher BMI, greater obesity, fair/poor health, and depressive symptoms. For males, darker skin color was associated with lower self-reported health and more depressive symptoms only.

These associations were attenuated but remained significant after adjusting for potential mediators – discrimination, stress, and SES measures (Table 5, **Panel C**). Moreover, Sobel tests revealed statistically significant indirect effects of color via our mediators, suggesting partial mediation. BMI and obesity associations were partially mediated by income ($t_{BMI}=3.07$, $p<0.002$; $t_{obesity}=-2.34$, $p<0.02$) and economic hardship ($t_{BMI}=2.85$, $p<0.004$; $t_{obesity}=2.32$, $p<0.02$). Stress ($t=2.29$, $p<0.02$), high school graduation ($t=2.62$, $p<0.009$), and economic hardship ($t=2.91$, $p<0.004$) mediated the skin color-fair/poor health association. Discrimination ($t=4.17$, $p<0.001$), stress ($t=3.24$, $p<001$), and education ($t=2.66$, $p<.008$) mediated the skin color-depression association. Our final model for the full sample (Table 5, **Panel D)** shows the association of each of these mediators with each health outcome.

Furthermore, after including self-reported race/ethnicity in each model (Table 5, **Panel D**), associations between skin color and BMI, obesity, and fair/poor health persisted for females. However, the associations between skin color and fair/poor health for males and depressive symptoms for both males and females became insignificant. Thus, skin color contributes or adds to racial/ethnic disparities above and beyond self-identified race/ethnicity but these associations are gendered. At the same time, the persistence of these racial/ethnic disparities in these models, especially among Hispanics, merits further investigation of the association between skin color and health within race/ethnicity.

Skin Color and Health, by Race/Ethnicity

In models fully adjusting for all potential mediators and control variables, we found persistent significant effects of skin color *within* all self-reported races/ethnicities, except Asians (Table 6, **Panel A**). Among Hispanics, darker-toned Hispanics had greater BMIs, higher odds of obesity, and poorer self-reported health than lighter-toned Hispanics. Among Blacks, darker skin color was associated with higher BMI and greater odds of obesity. Among Whites, darker skin color was associated with higher odds of fair/poor health. This association among Whites stemmed from multi-racial/ethnic Asians, Blacks, and Native Americans who self-identified primarily as White. In analyses by race/ethnicity, we detected few significant differences in the effects of skin color by gender due to the smaller sample sizes and lower power of these analyses (Table 6, **Panel B**).

DISCUSSION AND CONCLUSION

This study investigated the relationship between skin color and four measures of health – BMI, obesity, self-reported fair/poor health, and depressive symptoms. After controlling for race/ethnic self-identifications, we found strong evidence of an association between skin color and health in three out of four of these health measures but only for females. In comparison with lighter-toned females, females with darker skin colors had higher BMIs, greater odds of obesity, and greater odds of fair/poor health. Among males, the initially positive associations between darker skin color and both fair/poor health and depressive symptoms became insignificant after adjusting for potential mediators and racial/ethnic self-identification.

These results are consistent with structural perspectives on racial/ethnic stratification that emphasize the importance of skin color in the U.S. stratification system, perhaps especially salient among young adults who are just finding their place in the social hierarchy (Bonilla-Silva 1997; Monk 2014). These results are also consistent with research on intersectionality showing the combined effects of gender and race/ethnicity on a variety of outcomes (Hunter 2002; Geronimous et al. 2006). Previous literature on the relationship between skin color and health failed to adequately account for variation across gender. Yet gender shapes racial/ethnic experiences and this intersection is essential to understanding racial/ethnic disparities in health.

We found limited support for the hypothesis that the association between skin color and health is mediated through perceived discrimination, perceived stress, or SES (i.e. education, income, and economic hardship). Skin color was associated with perceived discrimination, stress, and SES. Additionally, perceived discrimination, stress, and SES were associated with at least one or more of the health outcomes that we evaluated. Though formal tests for mediation identified significant partial mediation for all health outcomes, skin color remained directly associated with BMI, obesity, and self-reported health among women beyond its association with perceived discrimination, stress, and SES.

These results support the psychosocial stress model of health disparities (Dressler, Orths, and Gravlee 2004; Pearlin et al. 2005; Thoits 2010) as well as the argument that skin color can provide a possible indicator of life-time exposure to discrimination, racialized treatment,

and colorism (Klonoff and Landrine 2000; Monk 2015). While our work demonstrates its importance, future research of color, gender, and health must seek to better understand the mechanisms leading to this association. Our work suggests that higher rates of perceived discrimination and stress, and lower SES may underlay gendered associations between skin color and health. This lends credence to theory and research suggesting that Eurocentric images of beauty are more socially disadvantageous for minority females (including those that may be self-identified as racially/ethnically White) than minority males. (Browne and Mire 2003; Keith and Herring 1992; Harter 1999).

The persistence of the skin color-health association among self-identified Hispanics, Blacks and Whites underscores how colorism can influence well-being not only between races/ethnicities but also within races/ethnicities. However, we had limited power to detect significant interactions between gender and skin color within race/ethnicities. Although skin color strongly shapes racial/ethnic self-identifications, race/ethnicity and skin color measure different aspects of racialization in the United States. Racial/ethnic self-identifications are a choice that reflect social/cultural affiliations which observers cannot identify based on skin color or other phenotypical characteristics (Nagel 1994). On the other hand, interviewer-ascribed skin color better captures the ways (observed and unobserved) in which externally-imposed social ascriptions structure access to resources which can influence health (Perreira and Telles 2014).

Our results stratified by race/ethnicity, suggested that interviewer-ascribed skin color may be particularly useful in capturing externally-imposed social ascriptions among self-identified Hispanics. Among Asians and Blacks, we found no or weaker associations between interviewer-ascribed skin color and health. However, studies considering more specific Asian populations (e.g., Filipinos) and using self-reported skin color among Blacks have found associations with health (Monk 2015; Kiang and Takeuchi 2009). This suggests that interviewer-ascribed skin color as measured in Add Health may not fully capture subjective social status within these race/ethnicities. Alternative measures of skin color and other phenotypic features (e.g., facial structure) associated with Eurocentric notions of beauty may need further consideration.

Overall, our research contributes substantially to understanding how skin color shapes racial/ethnic disparities in health. At the same time, we recognize the limitations of our analysis and the potential for future research. First, this analysis is focused on how skin color influences health in early adulthood (ages 24-32). Additional effects may continue to accrue as Add Health respondents age into later adulthood. Second, Add Health relied on interviewers' personal assessments of skin color within only 5 categories. Unlike the Project on Ethnicity and Race in Latin America (Perreira and Telles 2014) or the longitudinal Coronary Artery Risk Development in Young Adults study (Borell et al. 2006), Add Health interviewers were not trained in the use of a skin color palette or a skin colorimeter/reflectometer allowing more continuous variation in skin color. Additionally, Add Health does not have self-reported skin color, a measure thought to identify subjective social status within races/ethnicities (Monk 2015) or measures of other phenotypic features. Third, this analysis relied on a single-item to measure perceived discrimination. A single-item measure may lead to under-reporting of discrimination and less reliable results, as opposed to multi-

item measures which have been recommended by Krieger (1999) and others. Finally, the Add Health sample is not sufficiently large to allow for more detailed disaggregation of panethnic racial/ethnic groups to evaluate skin color associations and skin color by gender interactions within smaller racial/ethnic subgroups. Future studies should be powered to allow for further disaggregation which could reveal either stronger or weaker associations within subgroups. Future studies should also go beyond a focus on skin color and consider additional sources of phenotypic bias.

This study provides further evidence that colorism exists in the United States, that skin color contributes to the racial/ethnic disparities in health, and that these effects vary by gender. While we must continue to collect racial/ethnic self-identification data and analyze disparities, we must also recognize that differences by racial/ethnic self-identifications do not simply reflect social/cultural affiliations in the United States. They also reflect the influence of skin color in shaping both how others perceive us and how we perceive ourselves. How others perceive us may be especially salient during young adulthood as young people begin to make their way into the stratification system in the United States, and learn about the powerful influence of others in facilitating or impeding mobility within this system. Moreover, racial/ethnic differences can belie substantial social/cultural heterogeneity within racial/ethnic groups and may become less meaningful as individuals in the United States increasingly adopt mixed-racial/ethnic identities. Thus, future research on health disparities should continue to consider the influence of skin color in addition to race/ethnicity.

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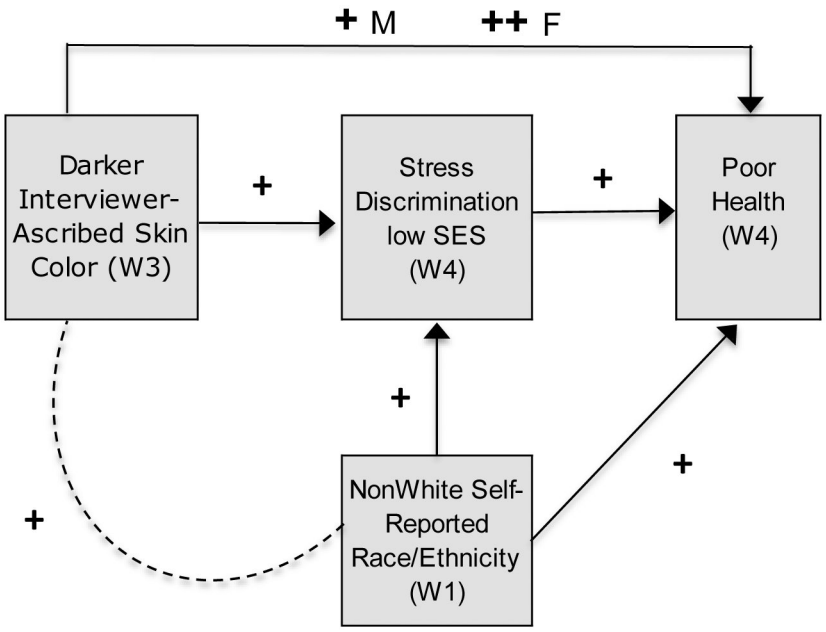

Figure 1. Conceptual Framework for Associations of Skin Color with Health

Note: We used a dashed curve to connote the positive correlation between darker ascribed skin color and nonwhite self-reporte race/ethnicity. We used the abbreviation M for male and F for female and the two plus signs to connote the expected stronger association between skin color and health for females vs. males. W1, W3, and W4 indicate that variables in these constructs are measured at Wave 1, Wave 3, and Wave 4 respectively.

Table 1.

Means of Variables in Add Health longitudinal sample at Wave 4 (N=11616)

	Mean/%	(s.e.)
Dependent Variables		
BMI (Mean)	29.02	(0.13)
Obese (%)	36.47%	(0.83)
Fair to Poor Health (%)	9.48%	(0.48)
CES-D Score (10-items)	6.05	(0.08)
Independent Variables		
Self-Reported Race-Ethnicity		
White	68.64%	(0.03)
Asian	3.43%	(0.01)
Hispanic	12.03%	(0.02)
Black	15.91%	(0.02)
Self-Reported Female	49.75%	(0.01)
Interviewer-ascribed Skin Color		
White	72.35%	(0.02)
Light Brown	10.36%	(0.01)
Medium Brown	7.23%	(0.01)
Dark Brown	5.32%	(0.01)
Black	4.74%	(0.01)
Perceived Discrimination		
Never	31.17%	(0.01)
Rarely	44.40%	(0.01)
Sometime	20.62%	(0.01)
Often	3.80%	(0.00)
Perceived Stress (0-16)	4.77	(0.05)
Socio-Economic Status		
High School Graduate	91.53%	(0.01)
Household Income (10,000s)	62.01	(1.02)
Economic Hardship (0-6)	0.49	(0.02)
Demographic Control Variables		
Age (at Wave 4)	28.94	(0.11)
Foreign-Born	4.44%	(0.01)
Married or Cohabitating	64.14%	(0.01)
Insured	78.16%	(0.01)
Urban	62.98%	(0.02)
US West	12.77%	(0.02)
US Midwest	27.86%	(0.04)
US South	42.16%	(0.03)
US Northeast	17.21%	(0.02)

Note: Ns are unweighted. Means and percentages are weighted. Data were imputed on income for 663 participants.

Table 2.

Means and Prevalence of Health Outcomes by Interviewer-Ascribed Skin Color and Self-Reported Race/Ethnicity in Add Health longitudinal sample at Wave 4

	BMI (Mean)	Obese (%)	Fair-Poor Health (%)	CESD-10 Score (Mean)
Panel A. Interviewer-Ascribed Color				
White (ref)	28.60	34.12%	7.79%	5.80
Light Brown	29.21 **	39.04% ***	14.36% ***	6.45 **
Medium Brown	30.44 ***	41.94% ***	13.74% ***	6.70 ***
Dark Brown	30.93 ***	47.32% ***	13.25% ***	6.97 ***
Black	30.75 ***	46.37% ***	13.87% **	7.07 ***
P-trend	p<.001	p<.001	p<.001	p<.001
Panel B. Self-Reported Race-Ethnicity				
White (ref)	28.57	34.07%	7.69%	5.74
Asian	26.68	24.56%	9.26%	6.40 **
Hispanic	29.91 ***	41.43% ***	14.97% ***	6.45 ***
Black	30.83 ***	45.72% ***	13.07% ***	7.03 ***
N	11470	11470	11616	11604

* p<.05,

** p<.01,

*** p<.001

Note: Ns are unweighted. Means and percentages are weighted. Statistical tests for trends and differences by interviewer-ascribed skin color and by self-reported race/ethnicity are evaluated using logistic regressions for categorical outcomes and OLS regressions for continuous outcomes. All regressions adjust for controls (i.e. age, gender, foreign-born, married or cohabitating, urban location, health insurance coverage, and U.S. region).

Table 3.

Distributions of Interviewer-Ascribed Skin Color by Self-Reported Race/Ethnicity (Panel A) and Self-Reported Race-Ethnicity by Interviewer-Ascribed Skin Color (Panel B) in Add Health longitudinal sample at Wave 4 (N=11616)

	Self-Reported Race/Ethnicity				
	White	**Asian**	**Hispanic**	**Black**	**N/%**
Panel A. Interviewer-Ascribed Color					
White	96%	30%	43%	1%	72%
Light Brown	3%	48%	41%	11%	10%
Medium Brown	.4%	18%	13%	30%	7%
Dark Brown	.1%	3%	3%	30%	5%
Black	.2%	1%	1%	28%	5%
Total N	**6570**	**756**	**1839**	**2451**	**100%**
Panel B. Interviewer-Ascribed Color					
White	91%	1%	7%	.1%	**7451**
Light Brown	20%	16%	47%	16%	**1567**
Medium Brown	4%	9%	21%	66%	**1138**
Dark Brown	1%	2%	6%	91%	**752**
Black	2%	.5%	2%	95%	**708**
Total %	69%	3%	12%	16%	**100%**

Note: Ns are unweighted. Means and percentages are weighted. The correlation between skin color and self-reported race/ethnicity (1=White, 2-Asian, 3- Hispanic, 4-Black) is r=.82.

Table 4.

Associations of Interviewer-Ascribed Skin Color and Race-Ethnicity with Perceived Discrimination, Perceived Stress, and SES measures in Add Health longitudinal sample at Wave 4 (N=11616)

	Perceived Discrimination (%)	Perceived Stress (Mean)	High School Graduate (%)	Income (10,000s; Mean)	Economic Hardship (Mean)
Panel A. Interviewer-Ascribed Skin Color					
White (ref)	23%	4.7	93%	6.5	0.44
Light Brown	25% ***	4.9 *	88% **	6.2 *	0.51 ***
Medium Brown	28% *	5.0	90% *	5.3 ***	0.67 ***
Dark Brown	29% *	5.0	90% *	4.9 ***	0.65 ***
Black	31% ***	5.4 ***	84% ***	4.1 ***	0.82 ***
P-trend	p<.001	p<.001	p<.001	p<.001	p<.001
Panel B. Self-Reported Race/Ethnicity					
White (ref)	23%	4.6	93%	6.5	0.45
Asian	18%	4.9	98%	8.2 ***	0.24 *
Hispanic	26% *	4.9	88% ***	6.3 **	0.45
Black	30% ***	5.2 ***	88% ***	4.6 ***	0.75 ***

* p<.05,

** p<.01,

*** p<.001

Note: Ns are unweighted. Means and percentages are weighted. Statistical tests for trends and differences by interviewer-ascribed skin color and by self-reported race/ethnicity are evaluated using logistic regressions for categorical outcomes and OLS regressions for continuous outcomes. All regressions adjust for controls (i.e. age, gender, foreign-born, married or cohabitating, urban location, health insurance coverage, and U.S. region).

Table 5.

Regressions of BMI, Obesity, Fair-Poor Health, and CESD-10 as a function of Interviwer-Ascribed Skin Color in Add Health longitudinal sample at Wave 4

	BMI β (95% CI)	Obesity OR (95% CI)	Fair-Poor Health OR (95% CI)	CESD-10 β (95% CI)
Panel A. Skin Color				
Color-5pt	0.70 (0.49 0.90) ***	1.18 (1.13 1.23) ***	1.20 (1.12 1.28) ***	0.32 (0.20 0.44) ***
Panel B. Skin Color with Gender Interaction				
Male: Color-5pt	0.18 (−0.06 0.42)	1.06 (0.99 1.14)	1.15 (1.04 1.28) **	0.37 (0.19 0.54) ***
Female: Color-5pt	1.32 (1.02 1.61) ***	1.34 (1.26 1.42) ***	1.24 (1.14 1.57) ***	0.27 (0.12 0.42) ***
Wald Test (F-Statistic)	39.95 ***	23.80 ***	1.29	0.65
Panel C. Skin Color with Gender Interaction (Panel B Adjusted for Discrimination, Stress, and SES Measures)				
Male: Color-5pt	0.13 (−0.10 0.37)	1.05 (0.98 1.12)	1.09 (0.99 1.21) †	0.19 (0.05 0.34) **
Female: Color-5pt	1.20 (0.90 1.51) ***	1.29 (1.22 1.37) ***	1.16 (1.07 1.27) ***	0.07 (−0.02 0.17)
Wald Test (F-Statistic)	30.29 ***	19.81 ***	0.88	1.98
Panel D. Full Model, Skin Color with Gender Interaction (Panel C Adjusted for Race/Ethnicity)				
Skin Color				
Male: Color-5pt	−0.19 (−0.55 0.16)	1.00 (0.89 1.12)	1.12 (0.94 1.33)	0.08 (−0.07 0.24)
Female: Color-5pt	0.88 (0.47 1.28) ***	1.24 (1.12 1.37) ***	1.21 (1.03 1.43) *	−0.05 (−0.20 0.11)
Wald Test (F-Statistic)	34.98 ***	21.17 ***	1.4	2.15
Discrimination and Stress				
Some Discrimination	0.32 (−0.19 0.84)	0.99 (0.97 1.01)	1.29 (1.03 1.61) *	1.42 (1.17 1.67) ***
Stess Index	−0.04 (−0.12 0.04)	0.98 (0.81 1.19)	1.16 (1.12 1.20) ***	0.97 (0.93 1.01) ***
SES				
High School Grad.	0.14 (−0.58 0.86)	0.98 (0.81 1.19)	0.66 (0.49 0.89) **	−0.57 (−0.95 −0.20) **
Income (10,000s)	−0.10 (−0.17 −0.04) ***	0.97 (0.95 0.98) ***	0.97 (0.94 1.00) *	0.00 (−0.03 0.03)
Economic Hardship	0.20 (−0.00 0.41)	1.06 (1.00 1.12) *	1.19 (1.09 1.29) ***	0.17 (0.06 0.29) **
Self-Reported Race-Ethnicity				
White (ref)	-- -- --	-- -- --	-- -- --	-- -- --
Asian	−0.79 (−1.99 0.41)	0.84 (0.55 1.28)	1.51 (0.82 2.76)	0.56 (0.07 1.05) *
Hispanic	1.88 (1.22 2.53) ***	1.55 (1.25 1.91) ***	1.99 (1.48 2.68) ***	0.41 (0.13 0.68) **
Black	1.26 (0.32 2.19) **	1.19 (0.88 1.60)	0.90 (0.54 1.53)	0.40 (−0.05 0.85)
Female	−1.62 (−2.27 −0.97) ***	0.77 (0.64 0.93) **	0.85 (0.63 1.16)	0.66 (0.36 0.96) ***
Sample Size	11470	11470	11616	11604

† p<.10,

* p<.05,

** p<.01,

*** p<.001

Note: Models estimated for BMI and CESD-10 are OLS regressions. Models estimated for obesity and fair-poor health are Logistic regressions and odds ratios (ORs) are reported. All models are weighted and standard errors are adjusted for sampling design. All models include demographic controls for age, gender, foreign-born, married or cohabitating, health insurance coverage, urban location, and U.S. region. Models in Panels B-D include an interaction between gender and skin color. For ease of interpretation, we report the total color effect for males (B_{color}) and females ($B_{color} + B_{color*female}$).

Table 6.

Regressions of Health Outcomes by Race/Ethnicity as a function of Interviewer-Ascribed Skin Color in Add Health longitudinal sample at Wave 4, without (Panel A) and with (Panel B) gender interaction

	BMI beta (95% CI)	Obese OR (95% CI)	Fair-Poor Health OR (95% CI)	CESD-10 Beta (95% CI)
Panel A. By Race without Gender Interaction				
Model 1, White: Color-5pt	0.03 (−0.67 0.73)	1.13 (0.89 1.44)	1.35 (1.05 1.74) *	0.00 (−0.35 0.34)
Model 2, Asian: Color-5pt	0.05 (−0.95 1.04)	1.07 (0.72 1.59)	1.26 (0.89 1.78)	0.07 (−0.35 0.49)
Model 3, Hispanic: Color-5pt	0.57 (0.01 1.12) *	1.17 (0.99 1.38) *	1.43 (1.10 1.86) **	0.13 (−0.11 0.37)
Model 4, Black: Color-5pt	0.42 (−0.03 0.87) †	1.11 (0.98 1.26) †	0.93 (0.76 1.13)	−0.09 (−0.30 0.13)
Panel B. By Race with Gender Interaction				
Model 1, White				
Male: Color-5pt	0.09 −(1.06 1.24)	1.16 (0.74 1.84)	1.42 (0.84 2.38)	−0.44 (−0.89 0.01) †
Female: Color-5pt	−0.02 −(0.94 0.89)	1.11 (0.87 1.42)	1.29 (1.00 1.67) *	0.33 (−0.13 0.78)
Wald Test	0.02	0.03	0.08	5.46 *
Model 2, Asian				
Male: Color-5pt	0.22 −(0.94 1.39)	1.18 (0.76 1.84)	1.38 (0.92 2.06)	0.18 (−0.36 0.71)
Female: Color-5pt	−0.32 −(1.74 1.10)	0.82 (0.43 1.56)	1.04 (0.62 1.73)	−0.15 (−0.98 0.68)
Wald Test	0.44	1.07	0.98	0.36
Model 3, Hispanic				
Male: Color-5pt	0.46 (−0.36 1.28)	1.27 (1.00 1.62) †	1.34 (0.87 2.06)	0.04 (−0.26 0.34)
Female: Color-5pt	0.73 (−0.25 1.71)	1.03 (0.78 1.36)	1.56 (1.14 2.13) **	0.26 (−0.16 0.67)
Wald Test	0.14	1.01	0.30	0.66
Model 4, Black				
Male: Color-5pt	0.08 (−0.49 0.65)	1.03 (0.86 1.25)	0.89 (0.64 1.25)	−0.03 (−0.31 0.25)
Female: Color-5pt	0.74 (0.11 1.38) *	1.19 (1.01 1.39) *	0.96 (0.74 1.24)	−0.14 (−0.47 0.19)
Wald Test	2.61	1.17	0.12	0.23

† p<.10,

* p<.05,

** p<.01,

*** p<.001

Note: Models estimated for BMI and CESD-10 are OLS regressions. Models estimated for obesity and fair-poor health are Logistic regressions and odds ratios (ORs) are reported. All models are weighted and standard errors are adjusted for sampling design. All models include demographic controls for age, gender, foreign-born, married or cohabitating, urban location, health insurance coverage, and US region. All models also include measures of discrimination, stress, education, income (imputed), and economic hardship. Models in Panels B include an interaction between gender and skin color. In models in Panel B, we report the color effect for males (B_{color}) and females ($B_{color} + B_{color*female}$) to allow for easy interpretation. Ns vary slightly by model and are not reported due to space limitations. The numbers of respondents by race are as follows: 6570 Whites, 756 Asians, 1839 Hispanics, 2451 Blacks.