Colorism and Health Disparities in Home Countries: The Case of Puerto Rico

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Abstract

This study reveals the association of skin color with health disparities in Puerto Rico, a US territory that is home to the second largest Latino population in the US. Aware of the inadequacy of standard OMB ethno-racial categories in capturing racial differences among Latinos, we incorporated skin color scales into the Puerto Rico BRFSS. We apply both logistic regressions and propensity score matching techniques. We found that colorism plays a significant role in health outcomes of dark-skinned Puerto Ricans in Puerto Rico and that skin color is a better health predictor than the OMB ethno-racial categories. Our results indicate that Puerto Ricans of the lightest skin tone have better general health than Puerto Ricans who self-described as being of the darkest skin tones. Findings underscore the importance of considering how racial discrimination manifested through colorism affects the health of Latino populations in the US and its territories.

Keywords Puerto Rico · Hispanic/Latino · Skin color/tone · Racial discrimination · Colorism · Health

Introduction

A small but growing number of researchers are taking note of the fact that "colorism," or discrimination based on skin color, plays a significant role in the life outcomes of dark-skinned Latinos who are most exposed to racial discrimination. This includes differential social treatment, exposure to social stressors, and poor health care access [1–9]. In examining the factors that influence the relationship between discrimination and health, some authors have argued that the capacity of Latinos to keep close ties to their traditional backgrounds, ethnic identity, or ethnic networks operates as a protective factor that can shield them from discrimination and other stressors that negatively impact Latino health in the US [7, 10–12]. Viruell-Fuentes has further argued that extended exposure to discrimination in the US is a potential pathway that can erode the health of Latino immigrants, affecting those generations that have spent greater time in the US more adversely than first-generation immigrants [13]. These and other studies on Latino immigrants' health appear

to assume that exposure to racial discrimination becomes a problem primarily in the context of the US [5, 14, 15].

However, there is evidence of health inequalities linked to colorism experienced by Latinos in their origin countries. For example, research has concluded that darker skin color increased exposure to class discrimination and low socioeconomic status leading to poorer health outcomes in various Latin American countries [16, 17].

In Puerto Rico, multiple lifestyle risk factors contribute to a high prevalence of chronic diseases [18]. Hypertension, high cholesterol, diabetes, coronary heart disease, cardiometabolic conditions, and behavioral risk factors are of higher prevalence there than among the general US population [19]. Puerto Ricans living in the continental US also have poorer health outcomes and higher prevalence of chronic health conditions than other Latino groups living in the US, as well as compared to the general population [19–22].

We contend that such negative outcomes are not homogeneously distributed among the population but are rather exacerbated among those most vulnerable to racial discrimination, even before they migrate to the continental US. Previous studies on the effects of racial discrimination on health in Puerto Rico are scarce and limited by small sample size or the use of standard statistical methods that might not capture the causality between variables [4, 5, 25]. Using data

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available for the first time from the Puerto Rican Behavioral Risk Factor Surveillance System (PR-BRFSS), the largest annual health survey conducted in Puerto Rico, we were able to assess the impact of colorism on self-rated health among Puerto Ricans with a representative sample of 5794 individuals using various statistical models [23]. Equipped with these enhancements, we thus ask: Does colorism play a significant role in health disparities in Puerto Rico? Because Puerto Rico is ambiguously positioned as a Latin American and Caribbean country that is a territory of the US, we also ask whether the standard categories of White, Black, and Other Race, among others, deployed by the US Office of Management and Budget (OMB) are the most adequate measurement for tracking racial discrimination there. To answer this question, we compare OMB categories with the use of a six-point self-reported skin color scale that ranges from very light (1) to very dark (6), which has been proven effective for predicting vulnerability to racial discrimination based on skin color in phone surveys among Latinos [24].

Methods

Data

Participants in the 2016 PR-BRFSS were randomly selected from eight regions defined by the Puerto Rico Health Department and interviewed by telephone (45% through landlines and 55% by cell phones). We used secondary data (the survey was done by the Department of Health) and the study was found to be exempt by the CDC Human Research Protection Office. The weighed cooperation rate (i.e., the ratio of complete and partial interviews divided by contacted and eligible participants) was 75.4% [26]. Our key variables, such as self-rated health and the skin color spectrum, had < 1% missing data.

Measures

Dependent Variable

Our dependent variable is based on responses to the self-rated health question that asked, "Would you say that in general your health is Excellent, Very good, Good, Fair, or Poor?" Those responses were dichotomized into two groups (1) fair (32%)/poor (5%) vs. (2) excellent (14%)/very good (13%)/good (35%), which is the convention in the related literature [27–29], assuring comparability of results.

Self-rated health has been found to be a good predictor of subsequent mortality [30] and current morbidity within different ethnic groups [31]. In fact, in our sample, 88% of the individuals who reported having poor general health also reported having at least one diagnosis of a chronic health condition.

Skin Color and Race

Federal surveys include the mandated OMB ethno-racial question, which in the case of the 2016 BRFSS was, "Which one or more of the following would you say is your race: White, Black or African American, Asian, Pacific Islander, or Other?" Seeking alternative measurements, we added the following question to the standard PR-BRFSS questionnaire: "Using a scale where 1 is the lightest color and 6 is the darkest color, how would you describe your skin color?" Interviewers described number 3 as "medium" to provide a reference point and no further meaning was specified. Distribution of these responses were: 18% as 1; 25% as 2; 34% as 3; 13% as 4; 4% as 5; 3% as 6; and 3% did not choose any of these classifications. Such preference for the medium categories of the skin-color spectrum is consistent with findings from other studies conducted in Latin America and among Latinos [24].

Regional studies conducted in Latin America have found that skin color is a more consistent and robust measurement to document racial inequality than census ethno-racial categories such as "Black," "White," or "Indio," which often provide inconsistent results, especially regarding the Afro-descendant populations of Colombia, Ecuador, and the Dominican Republic [32]. The use of standard OMB ethno-racial categories such as "White," "Black," and "Native American" has also been widely criticized for being at odds with dominant understandings of mixture among Latinos and Puerto Ricans [33–36].

Although there is no consensus as to whether self-perception by skin color equals ascription of skin color by others, previous research supports the use of a self-reported skin color scale to assess a person's vulnerability to racial discrimination and health-related effects among groups that place a high value on phenotypic distinctions as a basis for racial differentiation and stratification [37–40]. Monk, for example, found self-reported skin color to be a better predictor of perceived discrimination than interviewer-rated skin tone because it captures the relational sense of position that individuals have vis-à-vis their social circles and context [41].

To assess and contrast the association of skin color with health, we categorized individuals into three groups: very light (= 1), medium (= 2, 3, or 4), and very dark (= 5 or 6).

Because many people in Latin America and the Caribbean see themselves in the middle of the color spectrum, we defined a broad medium, paying close attention to those people located at the poles.[1] The rationale for this broad medium category is based on the response distribution we obtained for the skin color question, as most people chose skin color categories of 2 (25%), 3 (34%), and 4 (13%). A similar pattern of distribution was found by authors who compared results of five other studies that used skin color measurements among Latin Americans [24]. The poles were defined as 1 (18%) for the lighter end of the spectrum and 5 and 6 for the darker end of the spectrum, as 6 had too few responses to warrant creating a category of its own. For comparative purposes, we also utilized OMB categories of self-reported "White," "Black," and "Other Race." Only one person identified as "Native American" and two as "Asian," and these three were excluded from the analytic sample.

Control Variables

We followed the related literature [27, 28, 42] to approximate the functional form of our model. In particular, our covariates are sex, age, a 6-level categorical variable of educational attainment, an 8-level categorical variable of income, and dummies for marital status, Puerto Rican identity, employment status, and health plan availability. All these covariates have low correlation (< 13%) with the color and racial variables.

Analysis

Our logit model is specified as:

$$\log\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_1 X_i^1 + \cdots + \beta_n X_i^n + \Delta S_i + \delta A_i + \theta_1 E_i^1 + \cdots$$
$$+ \theta_5 E_i^5 + \gamma_1 I_i^1 + \cdots + \gamma_7 I_i^7 + \nabla M_i + \rho P_i + \tau L_i + \sigma H_i + \varepsilon_i \quad (1)$$

where the left-hand side indicates the log odds of the probability of π, which is having fair/poor self-rated health; β_0 is the constant; X is the main independent variable, with three skin color groups in one specification (with the lightest skin tone as the comparison point) and with the OMB racial categories (with "White" acting as the reference category) in the other estimation; S is the sex of individual i; E is educational attainment variable which has 5 levels (first level is used as the comparison point); I is the income variable that has 7 levels (first level is used as the comparison point); M is the dummy for marital status; P is the dummy for individuals who are Puerto Ricans; L is the dummy for employment status; H is the availability of a health plan, public or private; and ε is the error term.

Searching for robustness, we complemented the traditional logit analysis with a propensity score matching (PSM) [43]. PSM is a nonparametric method that can reveal, for instance, if there are health disparities between dark and light-skinned individuals conditioned on observable characteristics that are assumed to be orthogonal (exogenous) to the variable of interest (skin color in this case). In PSM, individuals with similar characteristics are matched so that they only differ in the variable of interests, often conceived as a form of "treatment" [43, 44]. Nevertheless, PSM is not limited to the health concept of "treatment" [45] and has been applied to studies that evaluate disparities associated with sex that consider sex as a "treatment" [45, 46]. In our case, the variable of interest is self-perceived "skin color," which we conceive as a social construction that impacts an individual's vulnerability to racial discrimination.

In PSM, the matching algorithm computes the missing potential outcomes for similar individuals who only differ in the application of the skin color variable. The matching algorithm computes the missing potential outcomes (i.e., self-rated health) for similar individuals in each skin color group. In our case, PSM is thus the conditional probability of a person's skin color affecting their health given a vector of covariates. In particular, the propensity score $p(x)$ can be defined as:

$$p(x) \equiv \Pr\{D = 1 | X = x\} \forall x \in \tilde{X}, \quad \text{where } Y_0 \perp D | p(X) \quad (2)$$

where D is the indicator of the skin color received by unit i; X is the set of observed characteristics (i.e., same control variables of Eq. (1); and $\tilde{X}$ is the untreated pool.

To test for sensitivity to model identification, we applied different PSM specifications. In the first two specifications, the mean treatment effect is the average of the difference between observed and potential outcomes of each person. In these specifications, each subject is matched with at least one other subject (nearest neighbor). In the third specification, "average treatment effects on the treated," we only measured the effect in the subsample that received the "treatment" in the statistical sense. The first PSM is specified with logit. To evaluate the consistency of our results, we estimated the second specification with probit. With this combination of results pointing in the same direction, we can expect relatively robust conclusions.

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[1] In Table 1 below we illustrate how most respondents located themselves in the middle of the skin color spectrum.

Table 1 Means (M) and proportions (%) of socioeconomic characteristics, by skin tone, 2016

	Full sample		Light-toned individuals		Medium-toned individuals		Dark-toned individuals	
	M/%	95% CI	M/%	95% CI	M/%	95% CI	M/%	95% CI
Outcomes of interest								
Fair-poor self-reported health	0.38	(0.37–0.39)	0.413	(0.38–0.44)	0.370	(0.35–0.38)	0.408	(0.36–0.46)
OMB racial categories								
White	0.59	(0.58–0.60)	0.260	(0.25–0.28)	0.679	(0.54–0.72)	0.015	(0.01–0.022)
Black	0.075	(0.07–0.08)	0.040	(0.02–0.06)	0.645	(0.55–0.76)	0.277	(0.22–0.35)
Other race	0.33	(0.32–0.34)	0.050	(0.04–0.06)	0.795	(0.74–0.85)	0.098	(0.08–0.12)
Independent variables								
No health plan	0.05	(0.05–0.06)	0.037	(0.03–0.05)	0.050	(0.04–0.056)	0.090	(0.06–0.12)
Female	0.63	(0.62–0.64)	0.680	(0.65–0.71)	0.620	(0.60–0.63)	0.560	(0.51–0.61)
Age	54.1	(53.6–54.6)	59.8	(58.8–60.9)	52.9	(52.3–53.5)	52.3	(50.3–54.2)
Not Puerto Rican	0.07	(0.08–0.08)	0.04	(0.03–0.05)	0.035	(0.03–0.04)	0.044	(0.02–0.07)
Not married	0.44	(0.42–0.45)	0.45	(0.42–0.48)	0.44	(0.43–0.46)	0.4	(0.35–0.45)
Education								
Never attended school	0.01	(0.006–0.01)	0.010	(0.007–0.02)	0.007	(0.005–0.01)	0.01	(− 0.001 to 0.02)
Grades 1 through 8	0.11	(0.10–0.12)	0.140	(0.12–0.16)	0.10	(0.09–0.11)	0.13	(0.10–0.17)
Grades 9 through 11	0.08	(0.07–0.09)	0.087	(0.07–0.10)	0.08	(0.07–0.09)	0.08	(0.05–0.11)
Grade 12 or GED	0.24	(0.23–0.25)	0.22	(0.20–0.25)	0.24	(0.23–0.26)	0.28	(0.23–0.32)
1–3 years of college	0.25	(0.24–0.27)	0.22	(0.20–0.25)	0.26	(0.25–0.28)	0.27	(0.22–0.32)
4+ years of college	0.3	(0.29–0.31)	0.31	(0.28–0.34)	0.310	(0.30–0.32)	0.23	(0.19–0.28)
Employed	0.34	(0.32–0.35)	0.26	(0.24–0.29)	0.360	(0.34–0.37)	0.34	(0.29–0.39)
Level of income								
< $10,000	0.27	(0.25–0.28)	0.32	(0.29–0.35)	0.240	(0.23–0.26)	0.320	(0.27–0.38)
10,000–14,999	0.17	(0.16–0.18)	0.19	(0.16–0.21)	0.17	(0.16–0.18)	0.156	(0.12–0.20)
15,000–19,999	0.17	(0.16–0.18)	0.14	(0.12–0.17)	0.18	(0.17–0.19)	0.16	(0.13–0.21)
20,000–24,999	0.14	(0.13–0.15)	0.12	(0.10–0.14)	0.15	(0.14–0.16)	0.14	(0.10–0.18)
25,000–34,999	0.1	(0.09–0.11)	0.09	(0.07–0.11)	0.11	(0.10–0.12)	0.080	(0.06–0.12)
35,000–49,999	0.07	(0.06–0.08)	0.07	(0.06–0.09)	0.07	(0.06–0.08)	0.090	(0.06–0.13)
50,000–74,999	0.044	(0.039–0.05)	0.04	(0.03–0.055)	0.05	(0.04–0.054)	0.030	(0.02–0.06)
75,000 or more	0.036	(0.03–0.04)	0.042	(0.03–0.06)	0.036	(0.03–0.043)	0.020	(0.01–0.046)
Sample size	5794		1013		4134		360	

Unweighted Ns. Individuals are defined as dark toned when self-reported skin color is reported as 5–6 on a scale from 1 to 6, and light toned when skin color is reported as 1

Source Authors' tabulations from the 2016 Puerto Rican BRFSS

Results

Descriptive Statistics

When applying the standard OMB ethno-racial categories, we found that such categories appear to amalgamate heterogenous color phenotypes under one category. For example, 59% of respondents classified themselves as "White," 8% as "Black," 33% as "Other Race," and 0% as "Asian," or "Pacific Islander." However, only 26% of those who self-identified as "White" chose the lightest skin color category (Table 1). Furthermore, 68% of respondents who classified themselves as "White" located themselves between 2 and 4 on the skin color scale. This high percentage of "Whites" gravitating among medium categories is consistent with the fact that in the Hispanic Caribbean, "white" is understood as a much more elastic term than in the continental US, where whiteness is restricted to people with no known black or brown ancestry [47]. The US principle of classification known as "the one drop rule," which establishes that any person with even one black ancestor ("one drop" of black blood) is considered black and non-white is not germane to Puerto Rico. Instead, "white" can encompass people with a wide mixture of racial heritages and phenotypic features, including people who would not be identified as "white" in the US [47].

Caribbean historian Hoetink [48] argued that even during the nineteenth century, the ideal of phenotypic whiteness was much darker in the Hispanic Caribbean than in the English or French Caribbean. People who belonged to the upper class and were identified as "colored" in the French or English Colonies, could be identified as white in the Spanish colonies (Puerto Rico, Cuba, or the Dominican Republic) [48].

Even with such considerations in mind, the fact that people in Puerto Rico define whiteness more broadly, does not mean that colorism is suspended. A darker shade of "white" combined with other phenotypic differences could differentiate a person from other less ambiguously looking whites. By comparing and contrasting the health status of people located at the poles of the skin color spectrum, we are better able to capture such possible mismatches, and the vulnerabilities afforded to people who are in the middle of the color spectrum who might not be treated with the same respect or have the same privileges as those who might look more evidently "white."

Individuals who answered "Black" in our survey also chose skin color classifications ranging from 2 to 4 (65%). Moreover, respondents who identified as "Other Race" chose skin color tones that ranged the whole skin color spectrum from 1 to 6. Ten percent of those who marked "Other Race" reported skin tones that ranged from 4, somewhat dark, to 6, very dark, which were skin tones also chosen by participants who identified as "Black." Hence, we find that OMB racial categories do not provide enough specificity in terms of a person's vulnerability to interpersonal discrimination or systemic racism; something a skin color scale can better establish. This challenge justifies comparing results in health disparities using both the skin color and the OMB ethno-racial measurements.

When applying the skin color measurement, we found that the darker the skin color, the lower the average age, education level, and percentage of females. In terms of income level, we found that lighter-skinned participants had higher representation in the highest income bracket. However, for most income groups there is no clear correlation between income and skin tone (see Table 1). The relationships between skin color with respect to employment and foreign status were also not linear. Differences in the foreign status between color group were not statistically significant, as the estimates overlapped in the confidence intervals.

Similarly, unconditional differences in terms of health status among color groups were not statistically significant (Table 1). However, as we show in the next section, once health insurance (public or private) is taken into consideration (conditional differences), the dark-skinned population reports feeling worse in general health than the light-skinned group and these differences were statistically significant. Health insurance, in fact, linearly decreases by skin color, with darker-skinned individuals having less access to a medical plan than medium or lighter-skinned individuals.

This disadvantage in insurance coverage does not appear to be linearly correlated with income in the two lowest income brackets. We found more people lacking health insurance (8.6%) among those with an annual income between $15,000 and $19,999 than among those in the lowest income level; 5.9% of individuals with an annual income lower than $10,000 had no health insurance. This difference in access to health insurance could be because individuals in the lowest income level are more likely to participate in Medicaid ("la Reforma," in the popular jargon), whereas members of the second lowest income category may not be eligible for this program and many low-income workplaces do not provide health insurance coverage. However, health insurance does not guarantee by itself a better health status; even with social health insurance, the lowest income individuals tend to have worse self-assessed health than in the second income group. For these reasons, in the next sections we analyze health disparities with a more systematic approach than the one provided by descriptive statistics, where several controls are considered simultaneously.

Logit Results

In Tables 2 and 3 we applied the standard logit model. The results show that once we control for access to health insurance and other factors, the dark-skinned population reported feeling worse in general health than the light-skinned group. Specifically, the average dark-skinned individual had a 4.4 percentage point higher likelihood of not feeling well in general health than the average light-skinned individual, after controlling for socio-demographic characteristics and access to health insurance. However, when using the OMB categories, the probability is lower; those who identified as "Black" according to the OMB racial labels had a three percentage point higher probability of feeling worse in general health than those who identified as "White."

Results comparing the medium-toned group with the light-skinned population reflected that being medium-toned increased the likelihood of not feeling well in general health by 4.3 percentage points, which is marginally worse than the results obtained for the darkest population segment. For now, these outcomes suggest that colorism operates almost linearly on health disparities: the darker the tone, the higher the probability of reporting fair/poor health status. However, in the results in the next section, when applying PSM analysis, we observe that it is only the darkest toned population (not the medium toned) that feels worse in health when compared to the lightest skin group.

When using OMB categories, we found less robust results in this standard regression analysis. In particular, participants who chose "Other Race" did not show to be

Table 2 Logit for self-rated health by skin tone, 2016

Dependent variable	Fair-poor self-reported health	
	Coefficient (s.e)	Marginal effect
Dark tone (light is reference)	0.239*** (0.007)	0.044*** (0.001)
Medium (light is reference)	0.235*** (0.004)	0.043*** (0.0008)
Covariates		
Constant	− 0.95*** (0.02)	
Female	0.33*** (0.003)	0.06*** (0.0007)
Age	0.03*** (0.0001)	0.006*** (0.00002)
Not Puerto Rican	0.24*** (0.009)	0.04*** (0.002)
Not married	0.04*** (0.004)	0.007*** (0.001)
Education level (less than 1st grade is the reference category)		
Grades 1 through 8	− 1.31*** (0.02)	− 0.28*** (0.004)
Grades 9 through 11	− 1.55*** (0.02)	− 0.32*** (0.004)
Grade 12 or GED	− 1.6*** (0.02)	− 0.34*** (0.004)
1–3 years of college	− 1.6*** (0.02)	− 0.33*** (0.004)
4+ years of college	− 2.1*** (0.02)	− 0.42*** (0.004)
Employed	− 0.41*** (0.004)	− 0.08*** (0.001)
Level of income (less than $10,000 is the reference category)		
10,000–14,999	0.05*** (0.005)	0.01*** (0.001)
15,000–19,999	− 0.08*** (0.005)	− 0.02*** (0.001)
20,000–24,999	− 0.33*** (0.006)	− 0.07*** (0.001)
25,000–34,999	− 0.64*** (0.007)	− 0.12*** (0.001)
35,000–49,999	− 0.75*** (0.01)	− 0.14*** (0.002)
50,000–74,999	− 0.99*** (0.013)	− 0.18*** (0.002)
75,000 or more	− 1.5*** (0.02)	− 0.24*** (0.002)
No health plan	− 0.14*** (0.006)	− 0.025*** (0.001)
Pseudo R-squared	0.13	
n	4491	

All estimates were weighed

Source Authors' results from the 2016 Puerto Rican BRFSS

***Statistically significant at the 1% level. Individuals are defined as dark toned when self-reported skin color is reported as 5–6 on a scale from 1 to 6, and light toned when skin color is reported as 1, medium toned when skin color is reported as 2, 3, 4

substantially worse than "Whites." These inconsistencies underline the improvement that skin color represents over OMB categories to identify physical health disparities among this Latino population.

In terms of the impact of other socio-economic variables over health disparities, we found that being female or old raised the probability of feeling worse in general health in both sets of regressions, as shown in Tables 2 and 3. In particular, being female raised the probability of feeling worse in general health by 0.06 and being older raised it by 0.006. On the other hand, those who identified as foreigners or unmarried had, on average, higher propensities of being worse in self-reported health than those who are native or married, respectively.

All of the logistic regression outcomes showed that the higher the socio-economic status, the better the health outcomes. For instance, being employed reduced the likelihood of feeling worse in general health by at least 8 percentage points. Those that had completed 4 years or more of college had at least a 0.36 higher likelihood of feeling better in general health than those who never attended school. In the case of income, earning $75,000 or more lowered the probability of feeling fair or poor in general health by at least 0.24 over those who earned less than $10,000.

Overall, having a darker skin tone exacerbated or modified the effect of these socio-economic conditions on a person's health status. Even after controlling for all of the above-mentioned socio-economic indicators, darker-skinned individuals had greater odds of reporting feeling worse in health than their lighter-skinned counterparts.

PSM: Self-reported Health

To corroborate the previous results obtained with standard logit regressions, we analyzed the results obtained with PSM analysis [49]. In Table 4, we matched individuals with similar sex, age, ethnic background, access to health, and socio-economic and marital status. In doing so, we found statistically significant results showing that, on average, being dark-skinned in Puerto Rico increases by 2–8% one's probability of reporting feeling worse than light-skinned people in terms of general health. These outcomes are robust to three changes in the PSM specifications.

We also found that the medium skin toned population indicated feeling somewhat better in general health than the light-skinned group, once the observable characteristics were taken into consideration. As noted in the previous section, these PSM results for the medium skin toned population contradict the results obtained with the traditional logit analysis, which were marginally worse for the medium skin toned group than for the light-skinned population. This discrepancy emerged because in PSM we matched individuals with the same observable characteristics, while in the standard logit regression analysis we only observed the relationships between variables. However, regardless of the statistical model, we can conclude that the population segment that is consistently disadvantaged in general good health is the dark-skinned population.

PSM: Ethno-racial OMB Categories vs. Skin Color

Regarding the adequacy of using OMB categories for tracking racial discrimination when applying the PSM methodology, Table 4 shows that the results are contradictory when using OMB categories. In particular, Models 1 and 3 show that individuals who identified as "Black" had a lower probability of not feeling well in general health,

Table 3 Logit for self-rated health by OMB racial categories, 2016

Dependent variable	Fair-poor self-reported health	
	Coefficient (s.e)	Marginal effect
Black (White is the reference)	0.16*** (0.006)	0.03*** (0.001)
Other race (White is the reference)	0.03*** (0.003)	0.006*** (0.006)
Covariates		
Constant	− 1.0*** (0.02)	
Female	0.34*** (0.003)	0.06*** (0.0006)
Age	0.03*** (0.0001)	0.006*** (0.00002)
Not Puerto Rican	0.17*** (0.006)	0.03 (0.001)
Not married	0.025*** (0.003)	0.005*** (0.0007)
Education level (less than 1st grade is the reference category)		
Grades 1 through 8	− 1.02*** (0.017)	− 0.22*** (0.004)
Grades 9 through 11	− 1.2*** (0.017)	− 0.26*** (0.003)
Grade 12 or GED	− 1.4*** (0.017)	− 0.28*** (0.003)
1–3 years of college	− 1.32*** (0.017)	− 0.28*** (0.003)
4+ years of college	− 1.8*** (0.02)	− 0.36*** (0.004)
Employed	− 0.46*** (0.004)	− 0.09*** (0.0007)
Level of income (less than $10,000 is the reference category)		
10,000–14,999	0.02*** (0.005)	0.004*** (0.0009)
15,000–19,999	− 0.06*** (0.005)	− 0.12*** (0.001)
20,000–24,999	− 0.36*** (0.006)	− 0.07*** (0.001)
25,000–34,999	− 0.69*** (0.007)	− 0.13*** (0.001)
35,000–49,999	− 0.75*** (0.009)	− 0.14*** (0.001)
50,000–74,999	− 0.98*** (0.01)	− 0.17*** (0.002)
75,000 or more	− 1.9*** (0.02)	− 0.28*** (0.002)
No health plan	− 0.22*** (0.006)	− 0.04*** (0.001)
Pseudo R-squared	0.13	
n	4631	

All estimates were weighed

Source Authors' results from the 2016 Puerto Rican BRFSS

***Statistically significant at the 1% level

while Model 2 contradicts those results. Such discrepancies are perhaps because the "White" OMB category collapses a myriad of color hues and therefore provides inconsistent outcomes. There are, thus, at least two reasons to avoid the OMB classifications with Latinos: the heterogeneous phenotypes of skin color observed within a single category such as "White" or "Other" and the empirical inferiority for providing robust results.

In the case of "Other Race," results are not robust either. For instance, Model 1 and Model 2 show that people who identified as "Other Race" reported feeling worse in general health than the White population. However, Model 3 reports individuals who identified as "Other Race" felt better than those who identified as "White." Regardless of the statistical model, we found that the use of OMB racial categories was suboptimal for assessing the impact of racial discrimination on health among Latinos.

Discussion and Conclusions

Latinos are not exempt from the health effects of being exposed to racial discrimination and skin color privilege in their home country. Our results for Puerto Rico show that approximately 202,817 dark-skinned individuals in Puerto Rico reported worse general health status than the 425,415 very light-skinned individuals who lived in the Puerto Rican Archipelago.

Outcomes for the medium skin toned group suggest that the association between skin color and socio-economic outcomes was not exactly linear when compared to the lighter-skinned group. Nevertheless, the darkest-skinned group was still at a greater disadvantage when compared to both the medium and light-skinned groups, suggesting that this group is the most vulnerable to social forces,

Table 4 PSM for fair-poor self-rated health, 2016

	Model 1: Logit Coefficient (s.e)	Model 2: Probit Coefficient (s.e)	Model 3: ATET Coefficient (s.e)
Panel A			
Dark vs. light tone	0.08***	0.08***	0.02***
	(0.001)	(0.001)	(0.002)
n	1371	1371	1371
Panel B			
Medium vs. light tone	− 0.004***	− 0.001***	− 0.017***
	(0.0005)	(0.0005)	(0.0005)
n	5138	5138	5138
Panel C			
Black vs. White	− 0.02***	0.018***	− 0.025***
	(0.001)	(0.0006)	(0.001)
n	3832	3832	3832
Panel D			
Other race vs. White	0.008***	0.0028***	− 0.006***
	(0.0004)	(0.0004)	(0.0006)
n	5292	5292	5292

Estimates are weighted and account for survey design. Model 1 is PSM for the average treatment effect using logit. Model 2 is PSM for the average treatment effect using probit. Model 3 is the average treatment effect on the treated using probit. All regressions include the following covariates: sex, age, educational attainment levels, income levels, dummies for employment, not Puerto Rican, marital status, and health plan availability

Source Authors' calculations from the 2016 Puerto Rican BRFSS

***p < 0.001

including racial discrimination, which affects their health negatively.

In interpreting these results, we follow previous studies that underscore the impact of discrimination on psychosocial stress and physical health [50], as well as those who highlight the role of structural racism, its impact on racial inequality, and health care access [51]. For example, a growing body of research has identified experiences of racial discrimination as an important type of psychosocial stressor that can lead to altered behavioral patterns that increase health risks [1, 15]. The impact of cultural racism, at the societal and individual level, also triggers negative stereotypes, discrimination, and promotes environments hostile to egalitarian policies, fostering health-damaging psychological responses, such as stereotype threat and internalized racism [52, p. 1152]. These authors also emphasize the impact of practices and policies driven by institutional racism that reduce access to housing, neighborhood and educational quality, healthy and accessible food options, health insurance and other desirable resources, which affect health negatively in racially stratified societies. We interpret self-perceived skin tone as an indicator of an individual's vulnerability to these social stressors and systemic effects.

For example, we found that the absence of health insurance coverage is an important factor that negatively impacts the health status of darker skin individuals, with skin color having a more consistent influence than income in this regard. There are structural factors such as the impact of institutional racism and the greater vulnerability of dark skin color individuals in late emancipation societies (slavery was abolished in 1876 in Puerto Rico) that can explain the enduring effects of colorism on health disparities, including health coverage disparities.

OMB ethno-racial categories are suboptimal for capturing such effects. Unlike skin color classifications, OMB categories provided inconsistent results, particularly when the model specification was changed to PSM. Because Puerto Ricans represent the second largest Latino group in the US and because other Afro-Latino and Caribbean migrants are also affected by similar racialized dynamics in the US and at home, a skin color question should be considered by policymakers interested in assessing the health effects of discrimination among this growing and heterogeneous group.

One potential limitation of this study is that phone surveys do not allow the interviewer to assess the skin color of participants. Hence, we do not know how self-reported color would differ from ascribed color. Even though we agree with Monk's positive assessment of self-reported color [41] an interesting future study could measure the difference (if any) between self-reported and ascribed color and how they are associated with health disparities. Another limitation is that this study does not include measures of self-perceived discrimination. However, previous research on personal/group discrimination discrepancy or PGDD has documented that even when people recognize that there is discriminatory treatment towards their ethnic or racial group, they tend to lessen the impact of this discrimination on a personal level to protect their self-esteem, to establish a sense that they control their environment, to avoid naming a powerful perpetrator, or because they give more importance to group identity than one's own, among other reasons [53–55].

We hope that more scholars will continue to study the impact of colorism on health among Puerto Rican and other Latino populations as increasing evidence indicates they are not immune to the pernicious effects of color stratification in their home societies. Also, we recommend that future research focus on evaluating why the lowest income group felt worse in general health than the second lowest income group, despite the fact that the former have greater access to health insurance than the latter. Such analysis exceeds the scope of this paper.

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