Ethnoracial Disparities in Self-Rated Health: Exploring the Impact of Skin Color and Other Ethnoracial Characteristics in Mexico

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Abstract

Objectives This manuscript aims to understand the association between self-rated health and ethnic-racial characteristics (i.e., skin color, self-ascription, and Indigenous language) in the context of the Mexican population.

Design Logistic regression analyses, using the 2019 PRODER ($N = 7187$)—a representative survey at the national level. We centered the analysis on two measures of skin color: the interviewer assessment of color skin (that has been used in previous studies), and the ITA scale, a measure constructed from optical digital colorimeter readings (a novel method in ethnoraciality studies in Mexico, included in the PRODER survey).

Results In comparison to the interviewer's assessment of skin color, the ITA score shows a significant association with self-rated health, even in the presence of individual conditions, sociodemographic traits, and life-course events. In contrast, ethnic-racial self-ascriptions and speaking of an Indigenous language do not show any statistical associations.

Conclusion Contrary to previous research, our results suggest a positive association between skin color and self-rated health, when the former is assessed with the colorimeter readings; it means that those with lighter color skin are more prone to report a better health perception. It has methodological implications in the way skin color is observed.

Keywords Self-rated health · Ethnic-racial ascription · Skin color · Indigenous language · Socioeconomic disparities

Introduction

Self-rated health refers to the perceptions, experiences, and values that individuals have concerning their health situation [1]. Perception of health is a subjective experience that incorporates the interaction between individuals and their sociocultural world [2]; thus, it relates to physical, emotional, and subjective well-being dimensions [3]. It mirrors objective conditions of health, although the perception of own health does not have to be confirmed by medical staff or biomedical indicators [1, 4, 5]. Besides, it mostly represents physical health problems and, less frequently, mental conditions [6]. Self-rated health has also been extensively associated with several health indicators and outcomes [4]. More specifically, it has been related to morbidities and the demand for public health services [1] and mortality and the increased risk of premature death [3]. Moreover, poor perceptions of health have been linked to social isolation, negative life events, depression, and stress [7].

Despite these associations, self-rated health is a relevant indicator by itself, considering subjective perspectives of life can predict the health behaviors and lifestyles of individuals and communities [3, 6]. In addition, since it is a measure included in many studies, it has demonstrated its comparability, validity, and conceptual robustness in different contexts [3, 8]. In turn, it has been used to describe and compare the health conditions of several populations and groups [3]. This last attribute is particularly useful in the analysis of the distribution of health disparities between advantaged and disadvantaged individuals. For instance, several studies indicate that the incidence and prevalence of diseases and

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health patterns are unequally distributed according to social stratification categories, such as gender, race, ethnicity, age, education attainment, or socioeconomic conditions [7–9]. However, in the case of race and ethnicity, understanding of the relationship between them and health and health perception remains incomplete [9].

In Mexico, ethnoracial differences are an important dimension in the configuration of social structure and stratification [10], although, in the field of health perception, a little-studied one. Regarding social structures, ethnicity and race have proven to impact the distribution of economic, social, and cultural resources, and the access to social and market services and goods (such as access to healthcare), contributing to the making of hierarchies where some groups are excluded from opportunities (see, e.g., [11–15]. Furthermore, the "ethnoracial" adjective defines the lack of boundaries between ethnic and racial attributes [16]. In the case of Mexico, notions of ethnicity and race are blurred as a result of the narrative of Mestizaje [17], a state project that originated at the beginning of the last century, which pursued the homogeneity of the Mexican population, and therefore, the assimilation of Indigenous and African Mexican populations into the (more dominant) Mestizo society. As a result, during the rest of the twentieth century, ethnic and racial differences were sidestepped, turning the Indigenous and Afro-Mexican identities into residual categories [18] and marginalized groups, despite in 2020 they represent 9.4% and 2.0% of the Mexican population, respectively [19]. In the last decades, various social and political movements have advocated for the recognition of Indigenous and Afro-Mexican peoples, as well as for the fulfilment of their rights, leading to a constitutional and public acknowledgment of these populations.

Despite these advancements, the Mestizaje discourse has obscured the general categories of "ethnic group" and "race," and thus, Mexicans are little familiar with the terms and avoid their use as forms of classification and social self-identification [18]. Still, people do identify some common traits in more specific categories (e.g., Indigenous or Afro-Mexicans). For instance, those who identify themselves as "Black" or "White" expose as their main argument for self-ascription racialized physical traits, such as physical attributes or skin color, whereas those who identify themselves as "Indigenous" and "Mestizos" focus on the family origin and language, culture, traditions, and customs [18]. It implies that considerations on race and ethnicity are being determined, in part, by physical characteristics, and in other, by cultural aspects. In any case, "ethnoracial" categories can be simultaneously determined by (1) other's perceptions; (2) self-perceptions, and (3) random genetic composition. This suggests that no category is exclusively composed of one criterion, and thus, the ethnicity and race concepts are multidimensional—i.e., comprised of multiple indicators or dimensions.

In this vein, several scholars have pointed out the necessity to observe and measure dimensions such as skin color, self-ascription, color of physical features (e.g., eye color, hair color), characteristics of physical features (hair texture, nose shape, eye shape, body density, height, weight), language, or regional origin, among others, as multi-composing dimensions of ethnoracial ascriptions. If we consider the fragility or ambiguity of the concepts of race and ethnicity for Mexicans, the inclusion of these different dimensions and indicators could be central in the evaluation of socioeconomic inequalities in relation to ethnoraciality. In fact, most prior studies related to ethnoracial traits have relied on one-dimension indicators (e.g., phenotypical markers) or external criteria (i.e., assessment of interviewers) and not on multifaceted indicators or self-ascribed identities [20]. It follows that it is not only pertinent to include different dimensions of ethnoraciality but also to measure them in alternative ways. For example, skin color usually has been observed through the interviewer's or the interviewee's assessment, but not with measurements non-based on appreciations (e.g., optical devices), which can be less subject to social bias. This is important in the observation of race and ethnicity, considering the lack of logical consistency of ethnoracial categories that may be partially explained by other's perceptions of appearance or identification.

In the Mexican case, research that examines multiple ethnoracial dimensions is scarcer [20], despite in recent studies, it has been highlighting the need to study social inequalities and ethnoracial characteristics from intersectional and multidimensional approaches [10, 21, 22]. This perspective is necessary due to the composite nature of discrimination, life experiences, and perceptions of social well-being that cannot be explained solely by one attribute, such as belonging to one population or displaying specific racialized physical traits, which remarks the importance of measuring social and economic disparities through multidimensional views of ethnic and race. Evidence demonstrates socioeconomic inequalities between distinctive ethnic and racial populations, among them, Indigenous and African Mexicans, and those with specific phenotypes (e.g., darker skin tones). These disparities reproduce and legitimize economic, social, cultural, and political inequalities [10] and reflect on issues such as the lack of access to wealth and education [23, 24]; barriers to the labor market [24, 25]; narrow social mobility [26, 27]; everyday and major discrimination experiences [22]; interaction with government institutions [28]; and a diminished perception of subjective well-being [12].

In this way, the 2019 Project on Ethnic-Racial Discrimination in Mexico (*Proyecto Sobre Discriminación Étnico-Racial en México 2019*, in Spanish [PRODER 2019]) aimed to collect information on the multiple dimensions of ethnoraciality of Mexicans and their relationship to inequalities. Some important advances in this study were the utilization

of several evaluations of ethnoracial traits, including external observations, as well as self-perception of interviewees and the novelty use of digital optical colorimeters in inequality studies to observe the color of skin. The employment of these electronic devices represented an addition to the study of ethnoracial traits, mostly because it helped to suppress the bias based on external assessments, such as those produced by the interviewer's perceptions or those originating from contextual factors or social markers. Consequently, the use of multiple and distinctive assessments led to more precise analyses of the role of skin color and other ethnoracial traits on economic and social inequalities, such as has been evidenced in previous studies using the 2019 PRODER (see, e.g., [12, 17, 22, 29]).

Concerning health perception, a few studies have explored its association with ethnoracial dimensions in the context of Latin America, indicating bad and poor self-rated health in those self-ascribed as Indigenous or in any ethnic minority, or whose interviewers have reported them as having dark-skin color [1, 20, 30]. Contrary, those who self-ascribe as Whites are less prone to report bad health, in comparison to non-Whites [3]. However, in Mexico, little is known about the role of ethnic-racial traits on self-rated health. Only a few scholars have exposed that Afro-descendants, light brown, and dark brown individuals report lower health status compared to Whites [31, p. 9], but in general, the relationship with ethnic-racial attributes has been overlooked [20]. In consequence, self-rated health measurements have been not considered in the decisions of health care policies despite their theoretical and empirical importance and associations with social structures [1].

A better understanding of self-rated health, particularly among Indigenous and Afro-descendant groups or those with darker skin tones, will redress health disparities and allow the construction of relevant health policies and interventions [32]. In countries with similar economic contexts—i.e., mid and low-income ones—and with comparable historic and cultural trajectories and ethnic-racial compositions—i.e., Latin American nations—knowledge about self-rated health and distinctions of ethnoracial measurements will help to promote equity, improve access to health care, personalize healthcare for different patient groups, and advance health research and policy.

Therefore, in the current manuscript, we aim to explore the associations between self-rated health and several ethnic-racial characteristics, such as skin color, ethnic-racial self-ascription, and the speaking or understanding of an Indigenous language, in Mexico, using data from the 2019 PRODER. As noted, in comparison to previous research, we will employ a multidimensional and multi-measurement approach to the ethnic-racial traits, particularly with skin color, as well as several socioeconomic indicators related to inequalities that may account for the perception of health.

Bearing all previous exposition in mind, the research question that emerges is, how is the association between self-rated health and ethnic-racial characteristics (i.e., skin color, self-ascription, and language) in the Mexican context? The answer to this question will be helpful in the explanation of the underlying factors that compose perceptions of health, in such a context as those like Mexico. In turn, hopefully, findings from this research will be useful in the design of health policies and healthcare systems that minimize ethnoracial disparities and abolish social conditions that have been, historically, uneven.

Hypotheses

As noted, extant literature suggests the existence of a negative association between self-ascription of disadvantaged racial-ethnic categories, individuals with darker skin tones, and self-rated health. However, these relationships have been not fully explored in the context of the multiracial and multiethnic population in Mexico, and less from the perspective of multiple and overlapping dimensions of race and ethnicity. Thus, trying to fulfil this gap, we propose the following exploratory hypotheses:

H1. Darker tones of skin color (measured by the interviewer's assessment) will decrease the likelihood that interviewees classify themselves in the higher category of self-rated health; whereas, lighter tones of skin color will increase it.

H2. Darker tones of skin color (measured by optical colorimeter readings) will decrease the likelihood that interviewees classify themselves in the higher category of self-rated health; whereas, lighter tones of skin color will increase it.

H3. Indigenous and Black self-ascriptions will decrease the likelihood that interviewees classify themselves in the higher category of self-rated health; meanwhile, White self-ascription will increase the likelihood that interviewees classify themselves in the higher category of self-rated health.

H4. Speaking and understanding an Indigenous language will decrease the likelihood that interviewees identified as Indigenous classify themselves in the higher category of self-rated health.

Materials and Methods

Study Design, Dataset, and Sample

This study is a secondary data and quantitative analysis with an exploratory and relational approach. The analysis uses

data from the 2019 PRODER that aims to obtain information on the ethnic-racial characteristics of Mexicans and learn about ethnic-racial discrimination in Mexico, social inequities, and the perceptions of these issues [33].

The 2019 PRODER was a representative survey at the national level. The sampling design was probabilistic, multistage, and by conglomerates. Weights were calculated using sociodemographic information from the 2015 Intercensal Survey (*Encuesta Intercensal 2015*, in Spanish) [33]. Data were collected from 7187 face-to-face interviews with people from 25 to 64 years old, from July to October 2019, in Spanish. In addition, electronic devices, such as smartphones and digital colorimeters, were used [22, 29].

In order to test and validate the instrument of the survey and the data collection system, a pilot test was carried out, using the field procedures that would be used to collect the definitive information and capture skin images through the colorimeter.

Measurements

In this study, the outcome (i.e., dependent variable) is the self-rated health indicator. Independent variables are organized into three sets of indicators: ethnoracial characteristics (i.e., skin color assessment by the interviewer, skin color assessment by the optical colorimeter, self-ascription, and Indigenous language [only for those who self-identify as Indigenous]), individual and sociodemographic traits (i.e., age, sex, marital status, type of region, years of education, and the assets index), and life-course events (i.e., discrimination experiences and recent health events). All of them have been selected according to findings in the literature. In the next paragraphs, we describe everyone (a summary of measurements is available in Supplementary Information 1, Table S1).

Self-Rated Health

In the 2019 PRODER survey, the self-rated health perception was evaluated through the question, "How do you consider your current state of health?" The item included five categories of response: (1) very good, (2) good, (3) fair, (4) bad, and (5) very bad. Then, following literature in the field, the variable was dichotomized between (1) those who perceived good health (responses "very good" and "good") and (0) those who perceived bad or regular health ("fair," "bad," and "very bad") [20].

Skin Color Assessment by the Interviewer

In this paper, we employ the PRODER color palette, an alternative color scale designed to "capture the subtler variations in skin color, and more specifically lightness of skin, in

the Mexican population" [17, p. 13]. The PRODER palette is originally based on the Pantone skin tone guide, which establishes a standard for skin color variations while guaranteeing more precise color representation in the PRODER palette. In the final part of the design, only eleven skin tones were selected, to allow comparability with previous palettes, such as the PERLA scale[1] [34].

Bearing that in mind, in the PRODER survey, skin color was assessed by the interviewer in one item. It used the question "Based on the PRODER color scale, in what skin tone would you place the person interviewed?" Following previous research,[2] we recodified the variable into five groups, from darker to lighter tones: group 1 (from A to C color), group 2 (D and E color), group 3 (F color), group 4 (from G to H color), and group 5 (from I to K color).

Skin Color Assessment by the Optical Colorimeter

Despite the importance of the PRODER palette regarding a more accurate evaluation of the Mexican population, it does not eliminate the problems of measurement error and bias [17]. Measurements based on external appreciations, such as those using color palettes or interviewers' assessments, are more prone to be affected by circumstantial situations or influenced by several factors, for example, clothing or socioeconomic status markers. Considering this, in the 2019 PRODER, the skin color of respondents was alternatively captured via portable digital optical colorimeters, color scanners that have their light source to measure color, and thus, are not affected by interviewers' biases or are less influenced by measurement error.

Measures of the inside of the wrist and the back of the hand were collected, using the colorimeter, and then averaged. Data was recodified using the CIELAB color space, based on the values L*, for luminosity from 0 (black) to 100 (white), and b*, for the variations in color from blue to yellow. In turn, based on the values of L* and b*, we built a measure of skin tone termed the individual typological angle (ITA) [17]. The result, the ITA scale, is a continuous variable that ranges from darker skin tones to lighter ones.

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[1] The PERLA palette was developed by Telles and Martínez Casas [34] in the context of the PERLA study. One of its purposes was the measurement of skin tone in the Latin American countries. However, considering the ample ethnic and skin tone diversity in the region, it included a wide spectrum of colors that do not completely match those found in the Mexican population. In sum, the PRODER palette is a more accurate representation of the skin-tone variability in Mexico than the PERLA color palette [17].

[2] In previous research (see, e.g., [14]), color clustering has been used to avoid nonlinearities in the association of skin color with health. For this reason and to allow comparability, we grouped the interviewer's color assessment variable into (approximately) quintiles.

Ethnoracial Self-Ascription and Speaking of an Indigenous Language

The 2019 PRODER survey includes four dichotomous items that asked interviewees whether they considered themselves Indigenous, Afro-Mexican (or Black), White, and Mestizo, or not (yes = 1, no = 0). In the case of the Indigenous self-ascription and speaking of an Indigenous language items, they were integrated into one variable, so, data was recoded into (a) those who do not identify themselves as Indigenous, (b) those who identify as Indigenous but do not speak an Indigenous language or their parents do not speak one, and (c) those who identify as Indigenous and speak an Indigenous language or their parents speak one. The other ascriptions were recoded into those who do not identify with the self-ascription and those who do (no = 0, yes = 1).

Individual and Sociodemographic Traits

The second group of variables covers individual and sociodemographic indicators that have been evidenced to be related to perceptions of health; thus, we employ them as control variables.

Age has been linked to the perception of health [3, 8], although the relationship remains controversial, that is, some authors suggest a better perception of health in younger individuals, while others point to older people. In any case, we measure age with a continuous variable that specifies years old turned. Sex and gender have been also evidenced to have an association with self-rated health, usually, interacting with other factors such as socioeconomic status, age, and education [1, 3, 8]. In the analysis, we employ sex as a dichotomous variable that categorizes respondents into man or woman (man = 1, woman = 2). Social capital and social support have been also related to perceptions of health because; in some way, they reflect the availability of resources for coping with future health events [7]. Thus, we include marital status as a proxy for both conditions with a variable that indicates whether the individuals are in a relationship or not (no = 0, yes = 1). The geographic area or type of region (urban or rural) influences access to health services; therefore, it has been suggested to have an influence on self-rated health [1]. Considering this, in the analysis, we include the type of region where the interviewee lives at the moment of the interview, which could be urban or rural regions (urban = 0, rural = 1). Education is another central trait in the perception of health. To some scholars, more educated individuals are more prone to report better health outcomes, probably, because of a major awareness of individual health conditions [1, 3, 8]. In the analysis, we incorporated educational attainment expressed as the standardized variable of years of education, which is an interval measure. Finally, socioeconomic status has also been evidenced to predict self-rated health [8, 35]. In this vein, we employ the assets index—a standardized and interval variable of the total number of assets, goods, and services in the household—as a proxy of socioeconomic status. The index comprises the ownership of the following items: refrigerator, iron, blender, gas or electric stove, washing machine, cable television, telephone, DVD/Blu-ray player, microwave, fan, videogame console, toaster, internet access, number of light bulbs, printer, car, property or real estate, and the number of household members divided by the number of bedrooms.

Life-Course Events

The third set of independent variables includes occurrences that have been referred to in the literature as relevant determinants of perceptions of health, such as discrimination experiences and recent health events. This is particularly more noticeable in the case of discrimination, which has been related to health and perceptions of health in contexts of ethnic-racial diversity [36].

The discrimination indicator specifies whether the respondent has lived discrimination ever in his/her life or not. This is a dichotomous variable that has been built from two scales incorporated in the 2019 PRODER survey: the Everyday Discrimination Scale (EDS) and the Major Discrimination Scale (MDS).[3] Both scales have been overly validated and widely used in studies related to discrimination experiences; thus, we integrated them into the analysis, in the form of one single item.

The last variable is the discomfort-illness item that asked, "How long ago was the last time you suffered any pain, discomfort, illness, or accident that prevented you from performing your daily activities?" Responses were recoded into three categories, (1) never or did not have, (2) more than 1 year ago, and (3) less than 1 year ago.

Data Analysis Procedures

Several tests were performed to analyze the relationship between self-rated health and ethnic-racial characteristics. First, univariate analyses were run. For categorical variables, absolute and relative frequencies were calculated; while for interval variables, the mean, standard deviation, variance, skewness, and kurtosis were estimated. After, logistic regression models were performed. This technique allows for exploring the effect of each independent variable on the probability of the event occurring [37, p. 180]. Besides, to further interpretation, we calculated odds ratios. These can

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[3] The 2019 PRODER survey uses EDS and MDS scales in their dichotomized form, where respondents indicate whether they have lived the mentioned experienced or not [38].

be used to estimate how an independent variable influences the dependent variable (refer to Supplementary Information 2 for logistic regression and odds ratios equations).

To test hypotheses, we build two groups of models. Each group is differentiated in the measurement of skin color. In the first one, we employed the assessment by the interviewer using the PRODER palette; whereas, in the second group, models included the measurement of skin color based on the colorimeter readings (i.e., the ITA scale).

Accordingly, in the first group, we developed three models. In model 1, we tested the association between self-rated health and ethnic-racial characteristics (skin color assessment by the interviewer, self-ascription, and speaking of an Indigenous language). In model 2, along with previous variables, we included age, sex, marital status, area of residence, education, and the assets index (i.e., the individual and sociodemographic traits). In model 3, we added to model 2 those variables related to life-course events (i.e., discrimination experiences and illness or discomfort).

In the second group, we also proposed three models. In model 4, we estimated the association between self-rated health and ethnic-racial characteristics (the ITA scale, self-ascription, and speaking of an Indigenous language). In model 5, besides variables in model 4, age, sex, marital status, area of residence, education, and the assets index were incorporated. In model 6, along with those variables in model 5, we integrated discrimination experiences and illness or discomfort indicators. Besides, odds ratios and measures of goodness-of-fit (Pearson goodness-of-fit and the Hosmer–Lemeshow tests) were calculated for the six models. Expansion factors were used for all estimations.

Results

Descriptive Statistics

According to the analysis, most respondents reported good health (74.8%), while fewer of them indicated bad health (25.3%). Concerning the assessment of skin color using the PRODER palette, respondents are distributed as follows: from tones A to C, 13.5%; tones D and E, 33.6%; tones F, 16.7%; tones G and H, 25.8%; and tones I to K, 10.4%. As noted, most interviewees are categorized into the middle tones of the scale, from D to H colors (76.1%). In the case of the ITA scale, the mean is -0.11, the standard deviation is 0.96, the minimum value is -4.61, and the maximum is 3.54.

In regard to ethnic-racial self-ascription, 38.2% identify as Indigenous, of which 17.1% do not speak an Indigenous language and 21.1% speak one or his/her parents are speakers of one. Regarding Black self-ascription, only 2.9%

identify with this category, 60.8% with the Mestizo self-ascription, whereas 8.0% with the White group.

Concerning sociodemographic traits, most respondents are women (52.4%). The mean age is 41.3 years (standard deviation = 11.54, minimum age = 25 years old, maximum = 64 years old) and the mean of years of education is 9.6 years (standard deviation = 4.3, minimum = 0 years of education, maximum = 22 years), which is equivalent to secondary education. Other variables are summarized in Table 1.

Logit Results

Table 2 shows the logit results of the first group of models—i.e., those with the skin color variable assessed by the interviewer using the PRODER scale. The three models are statistically significant ($p < 0.001$) and show pseudo r2 from 0.02 (model 1) to 0.13 (model 3).

As observed in Table 2, in model 3, after adjusting for individual and sociodemographic characteristics—i.e., age, sex, marital status, area of residence, education, and the assets index—and life-course events—discrimination experiences and recent health events (illness or discomfort)—we found that none of the skin color measurement groups and the self-ascription categories show significant relationships. Considering age ($p < 0.001$), education ($p < 0.001$), assets ($p < 0.001$), and the occurrences of life-course events have statistically significant associations ($p < 0.01$ and $p < 0.001$) for discrimination categories, and ($p < 0.001$ and $p < 0.001$) for the illness' ones, it suggests that the hypothesized association between skin color (assessed by the interviewer), self-ascriptions, language, and self-perception of health could be fully explained by individual and sociodemographic traits and individual negative life experiences.

In Table 3, we present the logit results of the second group of models, i.e., those including the ITA scale. The three models are statistically significant ($p < 0.001$) and show pseudo r2 from 0.02 (model 4) to 0.14 (model 6).

In model 6, after adjusting for individual and sociodemographic characteristics and the life-course event variables, the association with the ITA scale remains statistically significant, even though this coefficient is lower than in models 4 and 5 (0.16, $p < 0.001$). Meanwhile, no self-identification variable remains significant in model 6, in contrast to models 4 and 5. The decrease in the ITA scale coefficient and the loss of significance of self-ascription variables in the presence of control variables suggest that sociodemographic traits and life-course events could participate as mediators or moderators of the relationship with self-perceived health.

Along with coefficients, odds are also presented in Tables 2 and 3, suggesting how a change in an independent variable is associated with a change in the dependent variable. In model 6, for instance, holding all other

Table 1 Descriptive statistics variables

Categorical variables	Frequency	Percent
Self-rated health		
Regular/bad	1815	25.25%
Good	5372	74.75%
Skin color, interviewer assessment, PRODER scale		
A–C	973	13.50%
D–E	2414	33.60%
F	1201	16.70%
G–H	1852	25.80%
I–K	747	10.40%
Self-ascription, Indigenous		
No	4441	61.80%
Indigenous[a]	1231	17.10%
Indigenous[b]	1515	21.10%
Self-ascription, Black		
No	6975	97.10%
Yes	212	2.90%
Self-ascription, Mestizo		
No	2814	39.20%
Yes	4373	60.80%
Self-ascription, White		
No	6614	92.00%
Yes	573	8.00%
Sex		
Men	3422	47.60%
Women	3765	52.40%
Marital status		
Not in a partnership	2651	36.90%
In a partnership	4536	63.10%
Type of area of residence		
Urban	5944	82.70%
Rural	1243	17.30%
Discrimination experiences		
None	3827	53.20%
1 or 2 experiences	1446	20.10%
3 or more experiences	1914	26.60%
Illness or discomfort		
Never or did not have	2955	41.10%
More than 1 year ago	1654	23.00%
Less than 1 year ago	2578	35.90%

Interval variables	N	Mean	S.D	Var	Skew	Kurt	Min	Max
Skin color, ITA std	7187	−0.11	0.96	0.92	0.04	3.64	−4.61	3.54
Age	7187	41.31	11.54	133.35	0.33	1.99	25.00	64.00
Education (years)	7187	9.63	4.37	19.11	−0.29	2.78	0.00	22.00
Assets index (std)	7187	−0.05	0.95	0.92	0.24	2.76	−2.30	2.87

Note. [a]Indigenous no speaker of an Indigenous language. [b]Indigenous speaker of an Indigenous language or with parents speakers of an Indigenous language. *N* number of observations, *S.D.* standard deviation, *Var* variance, *Skew* skewness, *Kurt* kurtosis, *std* standardized measures

variables constant, a lighter skin color (i.e., an increase of one standard deviation in the ITA score) implies 1.17 times higher odds of reporting good health, in comparison to bad health. Also, those individuals with higher levels of education and assets are more prone to report good health (1.05 and 1.23 times more odds per standard deviation, respectively). In contrast, a participant who experienced discomfort or illness in the previous year was 65%

Table 2 Logit results, coefficients (coef.) and odds ratios (OR), interviewer assessment with PRODER palette

Variables	Model 1		Model 2		Model 3	
	Coef	OR	Coef	OR	Coef	OR
Skin color, int. assessment, D–E[a]	−0.12	0.89	−0.28*	0.75*	−0.24	0.79
	(0.13)	(0.11)	(0.14)	(0.10)	(0.14)	(0.11)
Skin color, int. assessment, F[a]	0.10	1.11	−0.07	0.94	−0.15	0.86
	(0.15)	(0.16)	(0.16)	(0.15)	(0.16)	(0.14)
Skin color, int. assessment, G–H[a]	0.32*	1.37*	0.13	1.14	0.03	1.03
	(0.13)	(0.18)	(0.14)	(0.16)	(0.15)	(0.15)
Skin color, int. assessment, I–K[a]	0.49**	1.63**	0.04	1.04	−0.09	0.92
	(0.17)	(0.28)	(0.18)	(0.19)	(0.18)	(0.17)
Self-ascription, Indigenous, yes[+,b]	−0.22*	0.81*	−0.17	0.85	−0.21	0.81
	(0.10)	(0.08)	(0.11)	(0.09)	(0.11)	(0.09)
Self-ascription, Indigenous, yes[++,b]	−0.51***	0.60***	−0.21	0.81	0.00	1.00
	(0.13)	(0.08)	(0.14)	(0.12)	(0.15)	(0.15)
Self-ascription, Black, yes[b]	−0.55*	0.58*	−0.51*	0.60*	−0.34	0.71
	(0.22)	(0.13)	(0.23)	(0.14)	(0.26)	(0.18)
Self-ascription, Mestizo, yes[b]	−0.09	0.91	−0.21*	0.81*	−0.13	0.88
	(0.08)	(0.08)	(0.09)	(0.07)	(0.09)	(0.08)
Self-ascription, White, yes[b]	−0.08	0.92	−0.08	0.92	−0.04	0.96
	(0.16)	(0.14)	(0.16)	(0.15)	(0.16)	(0.16)
Age	-	-	−0.05***	0.95***	−0.05***	0.95***
	-	-	(0.00)	(0.00)	(0.00)	(0.00)
Sex, women[c]	-	-	−0.07	0.93	−0.10	0.91
	-	-	(0.08)	(0.08)	(0.09)	(0.08)
Marital status, in a partnership[d]	-	-	0.08	1.08	0.06	1.06
	-	-	(0.09)	(0.09)	(0.09)	(0.10)
Area of residence, rural[e]	-	-	−0.09	0.91	−0.11	0.89
	-	-	(0.11)	(0.10)	(0.11)	(0.10)
Education (years)	-	-	0.03**	1.03**	0.05***	1.05***
	-	-	(0.01)	(0.01)	(0.01)	(0.01)
Assets index (std)	-	-	0.29***	1.34***	0.23***	1.26***
	-	-	(0.05)	(0.07)	(0.06)	(0.07)
Discrimination exp., 1–2 exp. [f]	-	-	-	-	−0.31**	0.73**
	-	-	-	-	(0.11)	(0.08)
Discrimination exp., 3 ≥ exp.[f]	-	-	-	-	−0.72***	0.48***
	-	-	-	-	(0.10)	(0.05)
Illness, more than 1 year ago[g]	-	-	-	-	−0.62***	0.54***
	-	-	-	-	(0.11)	(0.06)
Illness, less than 1 year ago[g]	-	-	-	-	−1.03***	0.36***
	-	-	-	-	(0.10)	(0.04)
_cons	1.16***	3.19***	3.35***	28.50***	3.74***	42.26***
	(0.12)	(0.39)	(0.25)	(7.22)	(0.27)	(11.34)
N	7187		7187		7187	
p	0.0000		0.0000		0.0000	
pr2	0.0163		0.0911		0.1339	
ll	−3.15e+07		−2.91e+07		−2.77e+07	
chi2	62.35		356.13		459.65	
aic	6.29e+07		5.81e+07		5.54e+07	
bic	6.29e+07		5.81e+07		5.54e+07	

Note. Standard errors in parentheses, [+] Indigenous no speaker of an Indigenous language, [++] Indigenous speaker of an Indigenous language or with parents speakers of an Indigenous language. In comparison to [a]A–C colors, [b]no, [c]men, [d]not in a partnership, [e]urban, [f]none, [g]never or did not have

*p < 0.05, **p < 0.01, ***p < 0.001

Table 3 Logit results, coefficients (Coef.), and odds ratios (OR), with colorimeter readings (ITA Scale)

Variables	Model 4		Model 5		Model 6	
	Coef	OR	Coef	OR	Coef	OR
Skin color, ITA std	0.29***	1.33***	0.21***	1.23***	0.16***	1.17***
	(0.04)	(0.06)	(0.05)	(0.06)	(0.05)	(0.06)
Self-ascription, Indigenous, yes [+,a]	−0.14	0.87	−0.11	0.90	−0.17	0.84
	(0.10)	(0.09)	(0.11)	(0.10)	(0.11)	(0.09)
Self-ascription, Indigenous, yes [++,a]	−0.46***	0.63***	−0.18	0.84	0.03	1.03
	(0.13)	(0.08)	(0.15)	(0.12)	(0.15)	(0.15)
Self-ascription, Black, yes[a]	−0.44*	0.65*	−0.37	0.69	−0.21	0.81
	(0.22)	(0.14)	(0.22)	(0.16)	(0.25)	(0.20)
Self-ascription, Mestizo, yes[a]	−0.05	0.95	−0.19*	0.82*	−0.12	0.89
	(0.08)	(0.08)	(0.09)	(0.07)	(0.09)	(0.08)
Self-ascription, White, yes[a]	−0.05	0.95	−0.13	0.88	−0.11	0.89
	(0.15)	(0.14)	(0.15)	(0.13)	(0.15)	(0.13)
Age	-	-	−0.05***	0.95***	−0.05***	0.96***
	-	-	(0.00)	(0.00)	(0.00)	(0.00)
Sex, women[b]	-	-	−0.11	0.90	−0.13	0.88
	-	-	(0.08)	(0.08)	(0.09)	(0.08)
Marital status, in a partnership[c]	-	-	0.09	1.09	0.06	1.06
	-	-	(0.09)	(0.10)	(0.09)	(0.10)
Area of residence, rural[d]	-	-	−0.09	0.92	−0.11	0.90
	-	-	(0.11)	(0.10)	(0.11)	(0.10)
Education (years)	-	-	0.03**	1.03**	0.05***	1.05***
	-	-	(0.01)	(0.01)	(0.01)	(0.01)
Assets index (std)	-	-	0.27***	1.31***	0.21***	1.23***
	-	-	(0.05)	(0.07)	(0.05)	(0.07)
Discrimination exp., 1–2 exp.[e]	-	-	-	-	−0.31**	0.73**
	-	-	-	-	(0.11)	(0.08)
Discrimination exp., 3 ≥ exp. [e]	-	-	-	-	−0.69***	0.50***
	-	-	-	-	(0.10)	(0.05)
Illness, more than 1 year ago[f]	-	-	-	-	−0.62***	0.54***
	-	-	-	-	(0.11)	(0.06)
Illness, less than 1 year ago[f]	-	-	-	-	−1.04***	0.35***
	-	-	-	-	(0.10)	(0.04)
_cons	1.25***	3.50***	3.23***	25.30***	3.61***	37.05***
	(0.08)	(0.26)	(0.24)	(5.95)	(0.25)	(9.20)
N	7186		7186		7186	
p	0.0000		0.0000		0.0000	
pr2	0.0215		0.0925		0.1350	
ll	−3.13e+07		−2.90e+07		−2.77e+07	
chi2	83.45		369.83		472.82	
aic	6.26e+07		5.80e+07		5.53e+07	
bic	6.26e+07		5.80e+07		5.53e+07	

Note. Standard errors in parentheses. + Indigenous no speaker of an Indigenous language. + + Indigenous speaker of an Indigenous language or with parents speakers of an Indigenous language. In comparison to [a]no, [b]men, [c]not in a partnership, [d]urban, [e]none, [f]never or did not have

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

less likely (odds ratio = 0.35) to report good versus bad health compared to someone reporting never having a health event; while those who experienced three or more discrimination events were 50% less likely (odds = 0.50) of mentioning good health, in comparison to bad health, holding all other variables constant.

In addition, according to AIC and BIC indicators, the model with a better fit is model 6 (with the lowest values of both criteria). Finally, also measures of goodness-of-fit (Pearson goodness-of-fit and the Hosmer–Lemeshow tests) were calculated. In every model, these tests show *p* values above 0.05 (i.e., they are not significant), which suggests that observed data correspond to the fitted (assumed) model.

Discussion

Results show that, in the Mexican context, self-rated health is not equally associated with all ethnic-racial characteristics. After controlling for several factors related to the perception of health, the self-ascriptions of Indigenous, Black, Mestizo, and White show a null statistical association with self-rated health. Similarly, speaking or understanding an Indigenous language (both Indigenous respondents who have speaking parents and those who speak or understand an Indigenous language) does not manifest a significant association with the self-rated health indicator. Contrary, skin color, when measured by the ITA scale (in comparison to the assessment made by the interviewer), remains statistically related to perceptions of health.

In the extant literature, although the relationship between ethnic-racial ascriptions and self-rated health has been evidenced, in the case of Mexico, the association is still ambiguous or unknown. In research where self-ascriptions have been incorporated, they are superseded by skin color (or in reverse) [3, 31]. In other studies, racialized characteristics have not been included in the analysis [30], which ignores the complex nature of ethnic-racial identities. Despite this, in the study by Perreira and Telles [20], some results partially support our findings here: ethnic-racial self-ascription is not linked to self-rated health in the presence of skin color measurements, sociodemographic traits, and life-course events. However, according to Perreira and Telles [20], skin color assessed by the interviewer loses significance when adjusted with sociodemographic characteristics and life-course experiences. In other words, ethnic-racial ascription and skin color observed by the interviewer are not relevant to self-rated health when they are controlled by several individual and contextual conditions.

Contrary to these scholars, our findings indicate that there is an association between self-rated health and skin color when we measure the last with optical colorimeter readings, instead of assessments based on personal perceptions (such as those by the interviewer or the interviewee). It reminds a similar discussion in the field regarding the breach between ethnic-racial self-ascriptions and ascriptions assigned by external observers [34], which may lead to biases and inconsistencies in the evaluation of several inequalities. Regarding skin color, it has been evidenced how its measurement can

be modified by economic, social, and cultural markers, such as socioeconomic status [29]. Therefore, measures based on colorimeter readings, that use digital scans and controlled lighting, are free of social biases and measurement error [17, 29], which is not the same for external and subjective assessments. In this analysis, we avoid these predispositions by employing the ITA score, which is constructed with the data from digital colorimeters (see the "Materials and Methods" section). Using these devices has proven to be a reliable method in the evaluation of skin color [39, 40]. Thereby, results show that ethnic-racial self-ascriptions and skin color assessed by the interviewer lost relevance in the presence of control variables; whereas the ITA score shows consistent associations with self-rated health in the last three models presented, even in the presence of determinant conditions.

In other words, these findings bring more evidence to the discussion of the measurement of ethnic-racial characteristics and how some conceptual and technical decisions may affect associations with social and economic disparities. This is particularly relevant, first, because in Mexico, it has been evidenced the key role of skin color in socioeconomic inequalities, in contrast to other Latin American countries [20, 34]; and second, considering the ambiguous understanding of ethnic and racial categories for the Mexicans [18], the consistency of skin color measurements allows us to suppose that we are proposing a solid measure in the explanation and evaluation of social, economic, and political inequalities.

With the ITA scale, results suggest that lighter skin colors have an increment in the likelihood that interviewees report a higher category of self-rated health, while, in those with darker skin colors, the relationship is inverse. These findings are also consistent with the literature on self-rated health [3, 31], as well as with other inequalities related to health and access to socioeconomic resources by skin color [24, 34]. Furthermore, despite it was not significant, Perreira and Telles [20] found in Mexico a negative association between darker skin color and good self-rated health, in comparison to other Latin American countries. Thus, the sum of evidence suggests that in Mexico, skin color may be a more relevant feature than ethnic-racial identity in the distribution of economic and social benefits, and thus, in the better (or worse) well-being of specific groups and individuals [41].

Concerning the speaking or understanding of an Indigenous language, findings here do not support an association with self-rated health, due to the null results in the presence of control variables. Despite in previous studies it has been demonstrated a relationship between the use of Indigenous language, well-being [42, 43], and health [44, 45], the specific link with health perceptions has not been fully explored in the case of Latin American countries or in Mexico, suggesting an additional research line in future investigations.

The varying self-rated health outcomes across ethnoracial measures carry significant implications, particularly

concerning the study of inequalities. One implication is the ongoing debate about the components defining racial or ethnic factors (see, e.g., [46]). These findings, in contrast to previous research, indicate the need for further exploration in this topic. Presently, it is uncertain whether findings within specific dimensions are exclusive and applicable across others. Therefore, to assess social outcomes—such as self-rated health—it is imperative to conduct studies incorporating more comprehensive measures, beyond traditional ones, especially those derived from external assessments or observers.

Secondly, it is evident that factors constituting ethnoracial identity are not homogenous or one-dimensional. Continual refinement of conceptualization and measurement is necessary to better grasp this concept. As noted by Roth [21], different approaches to evaluating characteristics yield varied results in social and economic disparities. Regarding skin color, it remains a controversial measure necessitating diverse approaches to provide comprehensive perspectives. While these approaches may be complementary, some might offer better insights into specific inequalities than others.

There are various potential mechanisms explaining these outcomes. According to Diderichsen et al. [47], distinctive social conditions—or social determinants of health (SDH)—rely on unbalanced social relations and power. Consequently, they promote exclusion and the lack of access to certain resources according to the structuring dimensions of identities (e.g., class, race, ethnicity, skin color, gender). It means the SDH model is based on the effects of stratified social factors, through inequalities, on health that are systematically manifested in social groups [48], particularly, in those more vulnerable. Thus, it can be pointed out that ethnicity and racialized attributes are elements of social stratification, especially in societies in which these attributes are differentiating characteristics in the access to health services, exposure to risk, and other factors that worsen the quality of life and wellness, as in the case of Mexico (see, e.g., [10, 23]).

In addition, several conditions may participate as mediators in the relationship between skin color and self-rated health. In the literature, it has been evidenced the role of socioeconomic and demographic traits as determinants of health and self-rated health. In the case of negative life experiences, our findings suggest that at least one proportion of the association between skin color and self-rated health can be explained by the effect of discrimination and life-course events, which is also coherent with previous literature [36]. Similarly, results on age, assets, and education support the idea that social and economic inequalities may be relevant predictors of perceptions of health [24, 49], confirming the notions of the SDH framework. In other words, in the analysis of outcomes related to ethnic-racial traits, it is not pertinent to overlook the influence as mediators (or moderators) of several individual and social situations.

Bearing the previous exposition in mind, we can state that hypotheses 1, 3, and 4 are not supported by our findings here, due to the null results in the associations between color skin measured by the interviewer, ethnic-racial self-ascriptions, speaking of an Indigenous language, and self-rated health. In contrast, hypothesis 2 is supported by our results, because, when skin color is measured by optical instruments, individuals with darker skin colors have less probability to report better perceptions of health; meanwhile, those with lighter tones have higher probabilities to show better self-rated health.

Conclusions

In the current manuscript, findings indicate that skin color may be associated with self-rated health depending on the method to measure color: null results when measured by external interviewers, and significant associations when evaluated by digital colorimeters. It means that skin color may change the likelihood of being in a higher category of self-rated health. In the case of darker tones, this likelihood is negative, whereas, in lighter skin tones, the probability is higher. Speaking an Indigenous language does not show the same association, despite in literature, they are somewhat related. In the case of ethnic-racial self-ascription, no identity is related to perceptions of health. Considering all these variables are included in the same models, it may imply a major role of skin color in health perception, in comparison to self-ascription or language.

Our results have some implications in public policies. First, considering self-rated health mirrors current health status, the role of skin color in health needs to be taken into account in the formulation, allocation, and delivery of culturally tailored health policies, programs, and interventions. Particularly, for those individuals and communities that have been excluded by the current economic model, among them, Indigenous, Afro-Mexicans, and individuals with certain racialized features (e.g., darker skin tones), but also, by those who do not have access to social and economic resources, such as education and assets.

Second, disparities in self-rated health expose the need for public health campaigns and educational interventions aimed at sensibilizing the role of skin color, ethnicity, race, and language on social outcomes. This also applies to the clinical context, where it is mandatory the training on cultural diversity to understand and address the needs of unique patient populations.

Third, future research must account for the measurement and multidimensionality of ethnic-racial attributes, and how these dimensions may have distinctive results in social and economic inequalities, as well as in perceptions

and experiences, such as the self-rated health construct. This could involve developing more nuanced measurement instruments, methodologies, and studies and surveys to capture the complexity of racial and ethnic identities and its impact on health disparities.

Finally, although the cross-sectional design of the survey does not allow causality and the sample is mostly urban and non-indigenous, the present research provides empirical and nationally representative evidence for the study of ethnic-racial disparities in health perception, in contexts like the Mexican one.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s40615-024-02002-3.

Declarations

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