

Associations between perceived discrimination over the life course, subjective social status, and health literacy: A racial/ethnic stratification analysis

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ABSTRACT

Objective: To analyze the relationship between perceived discrimination over the life course, social status, and limited health literacy (HL).

Methods: 5040 adults who participated in the 2023 Survey of Racism and Public Health. We applied stratified multilevel models adjusted for sociodemographic characteristics.

Results: The average age was 47 years, 48% identified as White, 20% as Latinx, and 17% as Black. In the overall sample, we observed associations of perceived discrimination ($b = 0.05$, 95% CI: 0.01, 0.09), subjective social status ($b = -0.16$, 95% CI: -0.23 , -0.10), and their interaction ($b = 0.02$, 95% CI: 0.01, 0.03). More perceived discrimination was associated with lower HL in the White and Multiracial participants. Higher subjective social status was associated with higher HL in the White and Latinx participants. There was a statistically significant interaction between perceived discrimination and subjective social status on HL among the White, Latinx, and Multiracial participants.

Conclusion: This analysis has implications for public health practice, indicating that multi-level interventions are needed to address limited HL.

Innovation: Our findings provide novel insights for identifying key SDOH indicators to assess in clinical settings to provide health literate care.

1. Introduction

Improving health literacy is essential across all medical specialties [1]. Patients with limited health literacy often struggle with effective health self-management, such as medication non-adherence and drug label misinterpretation [2-4]. Limited health literacy is associated with worse glycemic control, cardiovascular and chronic diseases, and higher all-cause mortality rates [5-7]. These challenges have significant implications for healthcare costs, as patients with low health literacy are more likely to visit the emergency department and require

hospitalization [2,4,8]. As a result, there has been growing interest in understanding the root causes of health literacy, such as social determinants of health, which may inform health literacy skills [9-11].

Perceived racial discrimination and social status have long been implicated as SDOH [12-17]. Perceived discrimination is a subjective measure of how often an individual experiences unfair treatment due to race, ethnicity, or color [18]. Studies have linked perceived discrimination to elevated blood pressure, low infant birthweight, and autoimmune disease severity [12-14]. Social status, another subjective measure, assesses an individual's perceived social standing relative to

Abbreviations: SDOH, Social Determinants of Health; BHLS, Brief Health Literacy Screen; MacArthur SSS Scale, MacArthur Scale of Subjective Social Status – Adult Version; AA/PI, Asian American or Pacific Islander; AI/AN/A/ME/NA, American Indian, Native American, Arab, Middle Eastern, or North African.

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others [19]. Higher perceived social status is associated with better mental and physical health and predicts health outcomes more accurately than traditional socioeconomic indicators such as income and educational attainment [15-17]. Despite their potential significance, perceived discrimination and social status remain relatively unexplored in the health literacy literature.

There are several mechanisms by which perceived discrimination and subjective social status may impact health literacy. Individuals who perceive discrimination or occupy a lower subjective social status may face barriers to accessing healthcare services, obtaining accurate health information, and making informed decisions about their health. People who experience discrimination or perceive themselves to have a lower social status may be more likely to engage in unhealthy behaviors, such as smoking, excessive alcohol consumption, and lack of physical activity [20,21]. Additionally, they may have limited access to health information and resources, leading to lower health literacy levels. Experiences of discrimination and lower social status can impair cognitive processes, attention, and memory, and in turn, negatively affect comprehension of health information. Lastly, perceived discrimination and lower subjective social status can create power imbalances and communication barriers in healthcare settings. Patients who feel discriminated against or perceive a lower social status may be less likely to seek care, and, in turn, less likely to obtain health-promoting information.

Therefore, we analyzed the relationship between perceived discrimination over the life course, subjective social status, and limited health literacy among adults in the 2023 Survey of Racism and Public Health. Specifically, we used survey data from over 5000 study participants to investigate the following research questions:

- (1) Is perceived discrimination associated with health literacy?
- (2) Is subjective social status associated with health literacy?
- (3) Does the perceived discrimination association with health literacy vary across levels of subjective social status?
- (4) Do these relationships vary across racial/ethnic groups?

We hypothesize that more experiences of discrimination across the life course is associated with limited health literacy. We hypothesize that this association will be more pronounced among those who perceive themselves as having low social status and those belonging to racial/ethnic minoritized groups.

2. Methods

2.1. Participant recruitment and data collection

We used data from the Survey of Racism and Public Health. This web-based cross-sectional survey included sociodemographic questions and asked participants about their experiences with discrimination, social status, financial and food insecurity, voting, policing, and health. Study participants were sourced through Qualtrics Research Services, which collected survey data based on inclusion/exclusion criteria, sample size, and target demographics. To be eligible, participants had to be at least 18 years old, speak and read English, and reside in the following states/territories: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Puerto Rico, Rhode Island, Vermont, and Virginia. The target age groups were 30% aged 18–34, 32% aged 35–54, and 38% aged 55 or older. The target racial/ethnic categories included an oversampling of minorities relative to their percentage in the US population: 50% White, 20% Black, 20% Hispanic, and 10% Other. Participants received compensation (e.g., gift cards) through Qualtrics’s third-party vendors. Additional details about the study protocol can be found elsewhere [22,23]. Informed consent was obtained prior to survey participation, and the study protocol was approved by the New York University Institutional Review Board (IRB-FY2023-7408).

2.2. Analytic sample

Participants were recruited from March 10 to April 12, 2023 (Fig. 1). Out of 9096 potential participants, 44.4% ($n = 4037$) did not consent ($n = 1106$), were removed through Qualtrics data cleaning services ($n = 2389$) or did not complete the survey ($n = 542$). Qualtrics removed responses for the following reasons: non-sensical answers, duplicates, responses to questions not making sense (e.g., height being too short or too tall), bots, contradictory responses, suspicious weight, suspicious race and origin, invalid IP, and gibberish. The remaining participants totaled over 5000 ($n = 5059$) who were eligible, agreed to participate, and completed the survey. Of these, 12 (0.2%) participants did not provide information on their race/ethnicity, and 7 (0.1%) participants did not complete the BHLS, resulting in a final analytic sample of 5040 study participants.

2.3. Dependent variable

2.3.1. Health literacy

We evaluated health literacy using the Brief Health Literacy Screen (BHLS), a validated subjective measure comprised of three self-reported Single Item Literacy Screeners [24-26]. These items gauge an individual’s difficulty reading hospital materials, difficulty learning about their medical condition, and confidence in filling out medical forms. Each item was rated on a 5-point Likert scale and then summed to create a BHLS index (Cronbach’s $\alpha = 0.69$). Lower scores indicate higher health

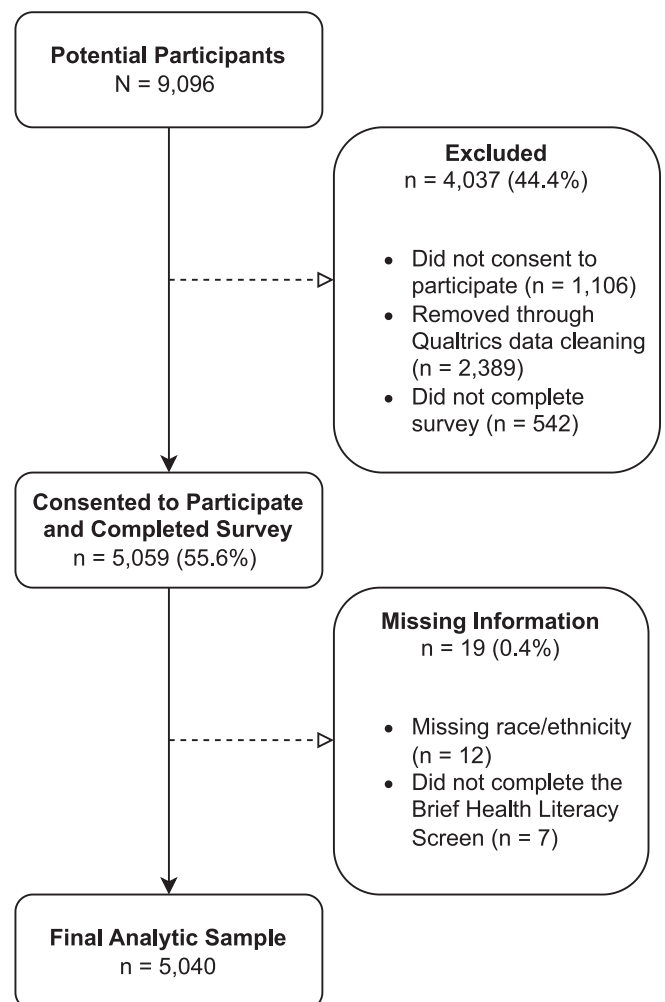


Fig. 1. Recruitment of Survey of Racism and Public Health study participants, March 10 to April 12, 2023.

literacy (range = 3–15).

2.4. Independent variables

2.4.1. Discrimination across the life course

We assessed perceived discrimination with an adapted version of the Major Experiences of Discrimination Scale [18]. Four items measured participants' experiences with discrimination throughout their lives. Participants indicated how often they were mistreated because of their race, color, or ethnicity during different life stages: childhood, teenage years, adulthood, and the past year. Response options ranged from *never* (1) to *always* (5) on a 5-point scale and were summed to create a composite perceived life course discrimination index (Cronbach's $\alpha = 0.92$). Higher values reflected more frequent experiences with discrimination across the life course (range = 4–20).

2.4.2. Social status

We used the MacArthur Scale of Subjective Social Status – Adult Version (MacArthur SSS Scale) to measure subjective social status [19]. Other researchers have employed this scale across diverse racial and ethnic groups [27–30]. The MacArthur SSS Scale asks participants to rank themselves on a ladder compared to others in their community. Specifically, participants in the survey were asked: “Think of this ladder as representing where people stand in our society. At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, and the worst jobs or no job. Where would you place yourself on this ladder? Please select the number that best represents where you would be on this ladder.” Response options range from 1 (*lowest*) to 10 (*highest*). We treated this variable as continuous in the analysis.

2.4.3. Sociodemographic factors

The survey also collected information on the participants' demographics. We recoded the categorical variables for this analysis. Demographic covariates include age (measured continuously in years), race/ethnicity, gender identity (woman, man), educational attainment (\leq high school, some college, \geq college degree), marital status (married/living with partner vs. other), employment status (full/part-time vs. other), number of dependents (0, 1, 2+), and zip code. Race/ethnicity was recategorized as White, Hispanic/Latinx (Latinx), Black/African American (Black), Asian American/Pacific Islander (AA/PI), Multiracial, and American Indian/Native American/Arab/Middle Eastern/North African (AI/AN/A/ME/NA). Latinx was inclusive of race as all other groups are non-Hispanic (e.g., non-Hispanic White, non-Hispanic Black). We classified “other” gender identity ($n = 29$) as missing due to the small sample size. The “other” marital status category includes those who were divorced, separated, widowed, or never married. The “other” employment status category consists of those on temporary leave, unemployed, not working by choice (e.g., disability, student), independent contractors, or business owners. We used rural-urban commuting area codes from the US Department of Agriculture to classify zip codes as rural or urban [31].

2.5. Analytic strategy

We calculated frequencies or means to describe the characteristics of the study sample. Next, we performed bivariate analyses using the Kruskal-Wallis rank sum test and Pearson's Chi-squared test to examine descriptive factors by race/ethnicity. We applied multilevel linear regression models to explore the relationship between perceived discrimination across the life course, social status, and limited health literacy. We nested participants by zip code to account for the correlation of health literacy outcomes among respondents residing in the same area. Covariates were determined a priori based on previous health literacy studies [32–35]. We fit adjusted models for the overall sample and

each racial/ethnic group and tabulate the estimates (β) with their corresponding 95% confidence intervals. In the supplementary materials, we provided additional bivariate analyses using a dichotomous health literacy measure. Consistent with other studies [3,26], we classified individuals with total BHLS scores of 6 or greater as having limited health literacy and those with scores <6 as having adequate health literacy. All statistical analyses were conducted using R [36].

3. Results

3.1. Study population characteristics

Table 1 presents the characteristics of the overall study population and stratified by racial/ethnic group. The average age was 47.0 years (SD: 17.5), with an equal gender identity distribution (man: 50.3%; woman: 49.7%). Most of the respondents identified as White (48.0%) or Latinx (20.4%), had obtained at least some college education (74.5%), were married or living with a partner (53.0%), were engaged in full- or part-time employment (57.0%), had no dependents (55.8%), and resided in an urban area (91.8%). The average health literacy score was 5.1 (SD = 2.4), and 35.4% were classified as having limited health literacy according to the BHLS (Supplemental Table 1). The mean perceived discrimination score was 8.0 (SD = 3.8), implying that, on average, individuals in this sample reported low levels of discrimination over the life course. The average subjective social status score was 5.9 (SD = 2.0), demonstrating that, on average, study participants perceived themselves a little above average within society.

We found statistically significant differences in sociodemographic characteristics across racial/ethnic groups (all $p < 0.001$). White respondents were the oldest (mean age = 56.2, SD: 15.9) and had the lowest proportion of woman participants (36.5%) and participants who worked full- or part-time (50.7%). Additionally, White respondents had the highest proportion of participants who were married or living with a partner (62.4%) and had no dependents (58.3%). In contrast, Black participants had the lowest proportion of participants who were married or living with a partner (32.9%). Latinx participants were the youngest (mean age = 34.8, SD: 12.7) and had the highest proportions of woman participants (64.7%). AA/PI had the highest proportions of those living in an urban area (98.3%), those with at least some college education (87.6%), and those who worked full- or part-time (67.2%).

We observed statistically significant differences in measures of health literacy, perceived discrimination, and social status across racial/ethnic groups (all $p < 0.001$, Table 1). When comparing racial/ethnic groups, the mean health literacy scores ranged from 4.8 (White, SD: 2.3) to 5.9 (AI/AN/A/ME/NA, SD: 2.5). White participants had the lowest mean discrimination score (mean = 6.3, SD: 3.2), while Multiracial participants had the highest (mean = 10.4, SD: 3.8). Black (mean = 5.4, SD: 2.1) and Multiracial (mean = 5.4, SD: 2.0) participants had the lowest subjective social status score, whereas AA/PI participants had the highest (mean = 6.2, SD: 1.8).

3.2. Associations with health literacy among the study sample

Table 2 displays the adjusted associations between health literacy, perceived discrimination, and social status in the overall sample. The statistically significant association of perceived discrimination ($b = 0.049$, 95% CI: 0.005, 0.094) suggests that more frequent perceived discrimination experiences over the life course are associated with lower health literacy. However, this association depends on the level of subjective social status. The interaction term between perceived discrimination and subjective social status ($b = 0.021$, 95% CI: 0.014, 0.089) was found to be statistically significant, in addition to the independent association of subjective social status ($b = -0.163$, 95% CI: -0.230 , -0.096).

To illustrate this combined association, we plotted the predicted marginal means for subjective social status ratings of low (1), middle

Table 1
Study participant characteristics, Survey of Racism and Public Health, 2023.

Characteristic	N	Overall N = 5040	White N = 2420	Latinx N = 1027	Black N = 879	AA/PI N = 419	Multiracial N = 158	AI/AN/A/ME/ NA N = 137	p-value ¹
Age	5038								<0.001
Mean (SD)		47.0 (17.5)	56.2 (15.9)	34.8 (12.7)	40.8 (15.3)	41.9 (14.3)	38.2 (14.6)	41.9 (14.6)	
Range		18.0, 90.0	18.0, 90.0	18.0, 88.0	18.0, 83.0	18.0, 86.0	18.0, 79.0	18.0, 75.0	
Gender identity, No. (%)	5010								<0.001
Man		2519 (50.3%)	1533 (63.5%)	358 (35.3%)	346 (39.5%)	165 (39.7%)	56 (35.9%)	61 (44.9%)	
Woman		2491 (49.7%)	881 (36.5%)	655 (64.7%)	529 (60.5%)	251 (60.3%)	100 (64.1%)	75 (55.1%)	
Educational attainment, No. (%)	5016								<0.001
≤High School		1280 (25.5%)	497 (20.6%)	329 (32.2%)	320 (36.5%)	52 (12.4%)	39 (24.7%)	43 (31.9%)	
Some College		1639 (32.7%)	750 (31.1%)	353 (34.6%)	329 (37.6%)	81 (19.4%)	69 (43.7%)	57 (42.2%)	
≥College Degree		2097 (41.8%)	1161 (48.2%)	339 (33.2%)	227 (25.9%)	285 (68.2%)	50 (31.6%)	35 (25.9%)	
Marital status, No. (%)	5038								<0.001
Other		2368 (47.0%)	909 (37.6%)	534 (52.0%)	589 (67.1%)	186 (44.4%)	80 (50.6%)	70 (51.1%)	
Married/Living with partner		2670 (53.0%)	1510 (62.4%)	493 (48.0%)	289 (32.9%)	233 (55.6%)	78 (49.4%)	67 (48.9%)	
Employment status, No. (%)	5005								<0.001
Other		2154 (43.0%)	1179 (49.3%)	357 (34.8%)	350 (39.9%)	137 (32.8%)	75 (47.5%)	56 (41.2%)	
Full/part-time		2851 (57.0%)	1211 (50.7%)	669 (65.2%)	527 (60.1%)	281 (67.2%)	83 (52.5%)	80 (58.8%)	
# Children, No. (%)	5039								<0.001
0		2812 (55.8%)	1410 (58.3%)	515 (50.1%)	491 (55.9%)	240 (57.3%)	91 (57.6%)	65 (47.4%)	
1		998 (19.8%)	473 (19.5%)	190 (18.5%)	198 (22.6%)	81 (19.3%)	28 (17.7%)	28 (20.4%)	
2+		1229 (24.4%)	537 (22.2%)	322 (31.4%)	189 (21.5%)	98 (23.4%)	39 (24.7%)	44 (32.1%)	
Residence, No. (%)	5040								<0.001
Rural		414 (8.2%)	315 (13.0%)	33 (3.2%)	26 (3.0%)	7 (1.7%)	17 (10.8%)	16 (11.7%)	
Urban		4626 (91.8%)	2105 (87.0%)	994 (96.8%)	853 (97.0%)	412 (98.3%)	141 (89.2%)	121 (88.3%)	
Health literacy	5040								<0.001
Mean (SD)		5.1 (2.4)	4.8 (2.3)	5.7 (2.6)	5.3 (2.6)	5.2 (2.3)	5.1 (2.3)	5.9 (2.5)	
Range		3.0, 15.0	3.0, 15.0	3.0, 14.0	3.0, 14.0	3.0, 13.0	3.0, 11.0	3.0, 15.0	
Perceived discrimination	5038								<0.001
Mean (SD)		8.0 (3.8)	6.3 (3.2)	9.0 (3.8)	9.8 (3.8)	9.4 (3.3)	10.4 (3.8)	9.5 (3.9)	
Range		4.0, 20.0	4.0, 20.0	4.0, 20.0	4.0, 20.0	4.0, 20.0	4.0, 20.0	4.0, 20.0	
Subjective social status	5040								<0.001
Mean (SD)		5.9 (2.0)	6.1 (1.9)	5.7 (2.1)	5.4 (2.1)	6.2 (1.8)	5.4 (2.0)	5.5 (2.2)	
Range		1.0, 10.0	1.0, 10.0	1.0, 10.0	1.0, 10.0	1.0, 10.0	1.0, 10.0	1.0, 10.0	

Latinx = Hispanic/Latinx, Black = Black/African American, AA/PI = Asian American/Pacific Islander, AI/AN/A/ME/NA = American Indian/Native American/Arab/Middle Eastern/North African, SD = Standard Deviation.

¹ Kruskal-Wallis rank sum test; Pearson’s Chi-squared test.

Table 2
Adjusted associations between health literacy, perceived discrimination, and social status among the overall sample, Survey of Racism and Public Health, 2023.

	Overall (n = 4944)	
	b	95% CI
Perceived discrimination	0.049	0.005, 0.094
Subjective social status	-0.163	-0.230, -0.096
Perceived discrimination*Subjective social status	0.021	0.014, 0.028

CI = Confidence interval. Model adjusted for age, race/ethnicity, gender identity, educational attainment, marital status, employment status, number of children, and residence.

(5), and high (10), controlling for race/ethnicity, gender identity, education, marital and employment status, dependents, and location (Fig. 2). Among individuals who reported never experiencing discrimination throughout their lives (perceived discrimination score = 4), those who perceived themselves as high (social status = 10; predicted mean health literacy score = 4.09) on the social status ladder had better health literacy than those who perceived themselves as low (social status = 1; predicted mean health literacy score = 4.78) or middle (social status = 5; predicted mean health literacy score = 4.47) on the ladder. However, this relationship reversed among individuals who reported frequent discrimination (perceived discrimination score = 20). For instance, those who perceived themselves as low (social status = 1; predicted mean health literacy score = 5.92) on the social status ladder had better health literacy than those who perceived themselves as high (social status = 10; predicted mean health literacy score = 8.30) or middle (social status = 5; predicted mean health literacy score = 6.97) on the

ladder.

3.3. Associations with health literacy by race/ethnicity

Table 3 compares the associations between health literacy, perceived discrimination, and social status stratified by racial/ethnic groups. The table reveals that many statistically significant associations observed in the overall sample persisted among White participants, with some strengthened associations. These associations include perceived discrimination ($b_{White} = 0.082$, 95% CI: 0.010, 0.155; $b_{Overall} = 0.049$, 95% CI: 0.005, 0.094), social status ($b_{White} = -0.188$, 95% CI: -0.275, -0.102; $b_{Overall} = -0.163$, 95% CI: -0.230, -0.096), and the interaction between perceived discrimination and subjective social status ($b_{White} = 0.026$, 95% CI: 0.016, 0.037; $b_{Overall} = 0.021$, 95% CI: 0.014, 0.028).

Similar to the overall sample results, the combined association of perceived discrimination and subjective social status on health literacy among the White sample population can be interpreted by examining the predicted marginal means (not shown). Among White individuals who reported never experiencing discrimination across their life course (perceived discrimination score = 4), those who perceived themselves as high (social status score = 10; predicted mean health literacy score = 3.92) on the social status ladder had better health literacy compared to those who perceived themselves as low (social status score = 1; predicted mean health literacy score = 4.66) or middle (social status score = 5; predicted mean health literacy score = 4.33) on the ladder. However, this relationship reversed among individuals who reported frequent discrimination (perceived discrimination score = 20). Particularly, those who perceived themselves as low (social status score = 1; predicted mean health literacy score = 6.41) on the social status ladder had better health literacy than those who perceived themselves as high

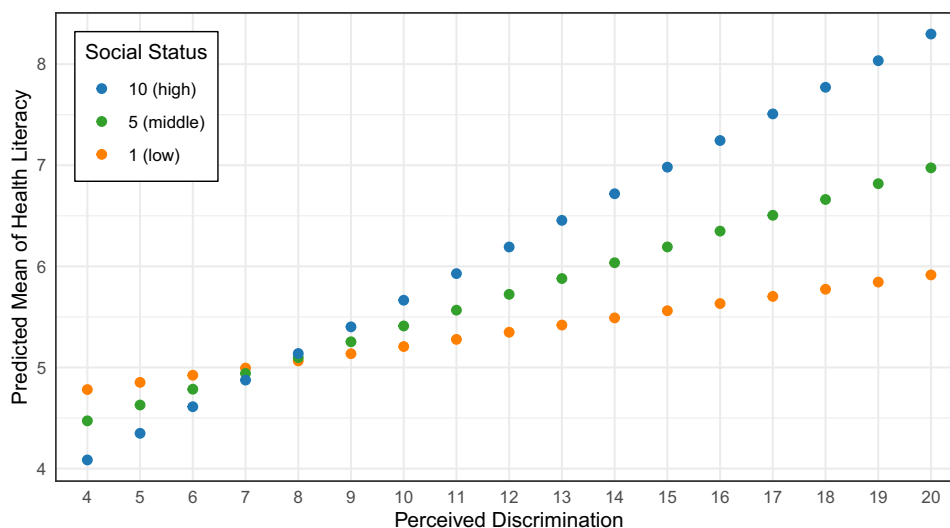


Fig. 2. Predicted marginal means from the multilevel model of the overall sample, adjusted for race/ethnicity, gender identity, education, marital and employment status, dependents, and location, Survey of Racism and Public Health, 2023.

Table 3

Adjusted associations between health literacy, perceived discrimination, and social status across racial/ethnic groups, Survey of Racism and Public Health, 2023.

	White n = 2371		Latinx n = 1006		Black n = 867		AA/PI n = 413		Multiracial n = 155		AI/AN/A/ME/NA n = 132	
	b	95% CI	b	95% CI	b	95% CI	b	95% CI	b	95% CI	b	95% CI
Perceived discrimination	0.082	0.010, 0.155	0.008	-0.096, 0.111	0.083	-0.020, 0.186	0.081	-0.133, 0.295	0.249	0.026, 0.471	0.030	-0.248, 0.308
Subjective social status	-0.188	-0.275, -0.102	-0.181	-0.348, -0.014	-0.024	-0.214, 0.165	-0.107	-0.434, 0.220	0.409	-0.067, 0.885	-0.305	-0.804, 0.194
Perceived discrimination*Subjective social status	0.026	0.016, 0.037	0.026	0.010, 0.042	0.008	-0.010, 0.025	0.003	-0.029, 0.035	-0.042	-0.082, -0.002	0.021	-0.023, 0.065

Latinx = Hispanic/Latinx, Black = Black/African American, AA/PI = Asian American/Pacific Islander, AI/AN/A/ME/NA = American Indian/Native American/Arab/Middle Eastern/North African, CI = Confidence Interval.

Model adjusted for age, gender identity, educational attainment, marital status, employment status, number of children, and residence.

Bold font indicates 95% confidence interval does not include 0.

(social status score = 10; predicted mean health literacy score = 9.48) or middle (social status score = 5; predicted mean health literacy score = 7.77).

Among Latinx participants, we observed statistically significant associations of subjective social status ($b = -0.181$, 95% CI: $-0.348, -0.014$) and the interaction between perceived discrimination and subjective social status ($b = 0.026$, 95% CI: $0.010, 0.042$). Among Multiracial participants, we found statistically significant associations of perceived discrimination ($b = 0.249$, 95% CI: $0.026, 0.471$) and the interaction between perceived discrimination and subjective social status ($b = -0.042$, 95% CI: $-0.082, -0.002$). We did not find statistically significant associations of perceived discrimination, subjective social status, and their interaction among participants identified as Black, Asian American/Pacific Islander, or American Indian/Native American/Arab/Middle Eastern/North African.

4. Discussion and conclusion

4.1. Discussion

We investigated the relationship between perceived discrimination across the life course, subjective social status, and health literacy. We observed that among the overall, White, and Multiracial participants, more perceived discrimination was associated with lower health literacy. Among the overall, White, and Latinx participants, we found that

higher subjective social status was associated with higher health literacy. There was a statistically significant interaction between perceived discrimination and subjective social status on health literacy among the overall, White, Latinx, and Multiracial participants. These findings underpin the importance of examining social determinants of health literacy.

The negative relationship between perceived discrimination over the life course in the overall sample may be due to the weathering hypothesis [37,38]. This theory suggests that cumulative exposure to socioeconomic disadvantage adversely affects health outcomes [37,38]. Given the link between health literacy and health [39-46], it is plausible that cumulative exposure to discrimination also negatively impacts health literacy. Life course discrimination may be an additional barrier to obtaining higher health literacy among populations with low income and education levels [47-51]. Our findings further suggest that subjective social status may modify the relationship between perceived discrimination and health literacy. Study participants with the most experiences of perceived discrimination and the highest self-ranking of social status tended to have limited health literacy. This may indicate that even when individuals believe they have reached the highest social level in society, their health literacy may still be plagued by internalized racism.

We observed statistically significant associations of perceived discrimination, subjective social status, and their interaction with health literacy among those racialized as White. We did not find statistically

significant associations among populations racialized as Black, Asian American/Pacific Islander, and American Indian/Native American/Arab/Middle Eastern/North African. These null findings could be attributed to little variation in the frequency of interpersonal racism experienced among racially minoritized populations [52]. Despite differences in income and education levels, it is likely that no within-group variation exists because we assessed race/ethnicity using a social construct [53-61]. Future investigations should explore within-group differences based on an objective skin color measurement [62-69].

Limited data exist on the intersection between perceived discrimination, social status, and health literacy. A study by Goodman et al. explored the association between self-reported segregation across the life course and health literacy among Suffolk County, NY health center patients [32]. The authors found that patients who reported attending predominantly White junior high schools were more likely to have adequate health literacy than those who reported attending non-predominantly White junior high schools. Additionally, this study revealed a similar association between self-reports of living in predominantly White neighborhoods and adequate health literacy. Zou et al. conducted a mediation analysis on health literacy, subjective social status, and depressive symptoms in heart failure patients [70]. In their subjective social status and health literacy model, Zou et al. found that higher perceived social status correlated with better health literacy.

Improving organizational health literacy is a viable solution for mitigating the impacts of cumulative discrimination exposure [71-73]. Organizational health literacy is “the degree to which organizations equitably enable individuals to find, understand, and use information and services to inform health-related decisions and actions for themselves and others [73].” Researchers have argued that physicians and trainees should be held more accountable for progress in increasing health literacy among minoritized patients [71-73]. Even though physicians and trainees take required patient communication courses, Coleman et al. contend that physicians and trainees continue to overcomplicate patient-provider communication [71]. The findings from the present study underscore the need for physicians and trainees to consider patient’s past discrimination experiences. Understanding these experiences can potentially improve how providers interact with their patients, especially when socially disadvantaged patients interact with providers from historically advantaged racial backgrounds [74-78].

Several limitations should be considered when interpreting our study’s findings. First, the sample was limited to online computer and mobile device users, excluding individuals without computer or mobile access. Social factors may disproportionately impact the health literacy of populations without computer or mobile access. Second, this study’s findings may not be generalizable because the study recruitment strategy required participants to reside in a geographic region comprised mainly of Northeastern states/territories and be English-speaking. Participants who speak English as a second language may not fully understand English [79], which, in turn, may result in low health literacy scores. Our inferences may have been susceptible to selection bias because we oversampled Latinx participants and recruited participants from Puerto Rico but required the survey to be completed in English [80]. Future studies are needed to investigate the reliability of the BHLS in populations of varying English proficiency. Future iterations of the Survey of Racism and Public Health should be administered in multiple languages. Our results may also not be generalizable since 42% of the study sample were college graduates, a higher proportion than the US population (34%) [81]. Additionally, sample participants generally reported low levels of discrimination over the life course. As with all self-reported survey measures, there is the potential for recall and social desirability bias in participant responses [82]. We were able to discern a statistically significant association between life course discrimination and health literacy, but it will be important to examine this relationship further in a sample with greater variability in perceived discrimination.

Third, we stratified the analyses based on a social construct of race [53-61]. Fourth, we excluded participants who did not report

demographic characteristics, such as race, that might marginalize them. We also classified 29 individuals in the other gender identity category as missing. Future generalizable analyses should explore associations of perceived discrimination, social status, and health literacy among gender-minoritized individuals. This would require the oversampling of gender-minoritized individuals. Fifth, assessing discrimination across the life course introduces potential recall bias and measurement error. Sixth, the BHLS does not assess other aspects of health literacy, such as visual literacy, numeracy, and oral communication [25].

Additionally, the alpha reliability coefficient for the BHLS was 0.69, slightly below the adequate level, possibly due to the difference between our sample and the BHLS validation sample [24]. Future research is needed to confirm whether our findings hold when using functional health literacy measures, such as the Test of Functional Health Literacy in Adults [83] or the Newest Vital Sign [84]. Seventh, our cross-sectional analysis prevented us from inferring causal relationships between perceived discrimination, social status, and health literacy. Lastly, we did not have access to medical records, which would have allowed us to control for factors related to health literacy, such as emergency department visits, hospitalizations, and health insurance status.

Despite its limitations, our study exhibited notable strengths and innovations. We analyzed a large sample size of over 5000 participants, which may have increased the statistical power to detect interaction effects within the overall sample and across different racial/ethnic groups. Additionally, the relatively large sample sizes within each racial/ethnic group enabled us to perform stratified analyses in a diverse study population. Our study also used validated measures of health literacy, subjective social status, and perceived discrimination. Notably, the life course measure of perceived discrimination demonstrated high reliability [85].

4.2. Innovation

This study is innovative in its focus on associations between health literacy and two SDOH (i.e., perceived discrimination over the life course and subjective social status). While conceptual frameworks have highlighted the importance of examining relationships between SDOH and health literacy [10], little empirical research has investigated this issue. The inclusion of a life-course measure of discrimination also adds to the innovation [47-51,86]. The present study is also innovative in the health literacy literature with its grounding in psychosocial epidemiological theory [87,88], which informed the investigation of the interplay between two psychosocial mechanisms concerning health literacy. While much is known about how individual-level demographic factors are associated with health literacy [89,90], demographic data available in the electronic health record is often missing or unreliable [91]. There is a need to develop screening instruments for SDOH that are reliable predictors of health literacy and can be quickly collected in clinical settings. This work provides a key first step in determining how to measure SDOH.

Additionally, the present study’s findings have potential implications for healthcare education and patient-provider communication. By demonstrating an association between lower health literacy and perceived discrimination in our sample, we highlight a critical area for improvement in healthcare delivery. These results suggest that healthcare providers may need enhanced education and re-education on implicit bias and its potential impact on patient understanding. If patients with lower health literacy are experiencing higher levels of perceived discrimination, it raises questions about how effectively healthcare professionals are conveying information to these patients. This insight could lead to innovations in medical education curricula and the development of more effective, culturally sensitive communication strategies in clinical settings. By addressing these issues, we may improve patient understanding, reduce perceived discrimination, and ultimately enhance health outcomes for minoritized populations.

4.3. Conclusion

After adjusting for potential confounders, we found that the impact of perceived discrimination on health literacy depends on subjective social status. Further research is necessary to confirm these associations, particularly studies that assess various household factors. In addition, further analyses of the relationships between perceived discrimination over the life course, subjective social status, and health literacy are needed among generalizable populations. Establishing evidence highlighting the social influences on health literacy can provide meaningful insights for interventions focused on patient engagement and communication.

CRedit authorship contribution statement

Jemar R. Bather: Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis. **Adolfo G. Cuevas:** Writing – review & editing, Resources, Conceptualization. **Adrian Harris:** Writing – review & editing, Software, Investigation, Data curation. **Kimberly A. Kaphingst:** Writing – review & editing, Resources, Conceptualization. **Melody S. Goodman:** Writing – review & editing, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data availability

The data that support the findings of this study are available from the Center for Anti-racism, Social Justice & Public Health (gph.casjph@nyu.edu), upon reasonable request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pecinn.2024.100334>.

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