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The relationship between racial discrimination in healthcare, loneliness, and mental health among Black Philadelphia residents

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Abstract

Background Black individuals in the U.S. report experiencing the highest levels of racial discrimination in healthcare. Racial discrimination in healthcare contributes to mental health issues and has been shown to be associated with loneliness. Despite this, there is limited research on the role loneliness plays in the relationship between racial discrimination in healthcare settings and mental health outcomes. This study explored the relationship between racial discrimination in healthcare, loneliness, and mental health outcomes (depression and anxiety) among Black individuals.

Methods This study was part of the PhillyCEAL (Community Engagement Alliance) initiative. Between February 2024 and April 2024, 327 Black Philadelphia residents completed online surveys. Multiple linear regression analyses examined the associations between racial discrimination in healthcare, loneliness, depression, and anxiety. Covariates included Hispanic ethnicity, age, insurance, lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse (LGBTQ+) status, sex assigned at birth, relationship status, employment, medical conditions, income, and education.

Results Racial discrimination in healthcare was positively associated with loneliness (b = 0.66, 95% CI: 0.29 to 1.04), depression (b = 0.52, 95% CI: 0.19 to 0.86), and anxiety (b = 0.85, 95% CI: 0.50 to 1.19). When controlling for loneliness, the association between racial discrimination in healthcare and depression became non-significant (b = 0.29, 95% CI: -0.03 to 0.61), while the association between racial discrimination in healthcare and anxiety remained significant (b = 0.62, 95% CI: 0.29 to 0.94).

Conclusion Addressing racial discrimination within healthcare settings is crucial for improving mental health outcomes among Black populations. Given the significant role of loneliness in this relationship, interventions aimed at reducing loneliness may help mitigate the adverse mental health effects of racial discrimination in healthcare for Black populations.

Keywords Racial discrimination, Healthcare, Mental health, Depression, Anxiety, Loneliness

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Background

Racial and ethnic minorities in the U.S. frequently report experiencing discrimination in healthcare settings [1, 2]. Approximately half of U.S. healthcare workers have witnessed racial discrimination against patients of color and view it as a crisis or major problem [3]. Among them, Black individuals report the highest discrimination in healthcare [4, 5]. A national survey revealed that over one-third of Black adults (36%) reported that either they or their household members experienced one or more forms of discrimination when seeing a healthcare professional or being hospitalized overnight [6, 7]. This long-standing issue persists, leading to healthcare distrust [8, 9], delayed or forgone care, and healthcare avoidance [10, 11], which may further exacerbate health disparities among Black individuals in the U.S. [4].

Racial discrimination has far-reaching effects on the mental health of individuals who experience it [2, 12, 13]. Extensive research has established a strong association between racial discrimination and both depression and anxiety disorders [14–17]. Many studies have investigated Black populations and found a positive association between racial discrimination and symptoms of depression and anxiety [18–20]. Meta-analyses have also consistently reported a significant relationship between racial discrimination and depression and anxiety among Black Americans [21, 22]. While the associations between racial discrimination and mental health have been extensively studied, the mechanisms involved in these relationships are less well understood.

One potential mechanism through which racial discrimination in healthcare settings impacts mental health among Black individuals is loneliness. Loneliness refers to the subjective experience of feeling isolated or disconnected, regardless of the actual level of social contact [23, 24]. While loneliness can be a normal and non-pathological response to changing circumstances, it can also become chronic and persistent, leading to significant mental health challenges [25]. It arises when there is a discrepancy between the social connections one desires and those that are actually experienced [23].

Fundamental Cause Theory [26–28] provides a framework for understanding how racial discrimination in healthcare contributes to mental health issues, such as depression and anxiety, among Black populations. This theory posits that social conditions such as stigma [28], defined by labeling, stereotyping, separation, and discrimination within power dynamics, serve as fundamental causes of health inequities. Applied to Black populations in healthcare, this stigma manifests as systemic racial discrimination, which restricts access to essential resources for well-being, such as quality medical care, emotional support, and fair treatment. According to this theory, these discriminatory practices have a profound impact on mental health by perpetuating stress, reducing access to protective resources, and increasing exposure to mental health risks [28].

The Psychological Mediation Framework further clarifies how loneliness may influence the relationship between racial discrimination in healthcare and mental health [29]. When Black individuals encounter stigma and discrimination within healthcare settings, they may internalize feelings of rejection and marginalization [30], which may contribute to an intensified sense of loneliness. Research shows that social exclusion often leads to selective recall of negative social experiences [30], reinforcing loneliness and fostering a tendency to avoid social interactions to prevent further rejection [31]. Additionally, discrimination can erode trust [32] and foster feelings of lack of support, which may further contribute to loneliness [33]. Loneliness, as a psychological state, may contribute to mental health issues by increasing vulnerability to depression and anxiety [34].

Table 1 summarizes U.S.-based studies that examined the relationship between discrimination, loneliness, and mental health. The study focusing on Black older adult populations showed a positive association between perceived discrimination and depressive symptoms, with no influence from loneliness [35]. Another study focused on Black women found that loneliness influenced the relationship between gendered racism, gendered racial stress, and both anxiety and depression [36]. Most of these studies assessed everyday discrimination rather than racial discrimination specific to healthcare settings.

The Fundamental Cause Theory [26–28] and Psychological Mediation Framework [29] directly informed our hypotheses and study design. Guided by Fundamental Cause Theory, we conceptualized racial discrimination in healthcare as a structural barrier that limits access to health-promoting resources, contributing to poor mental health. This informed our use of a healthcare-specific measure of racial discrimination. The Psychological Mediation Framework guided our inclusion of loneliness as a potential mechanism linking discrimination to depression and anxiety. We also accounted for social factors associated with both discrimination and mental health, such as income, insurance, employment, and relationship status, to more accurately estimate these relationships. Together, these frameworks shaped our aim to examine whether loneliness helps explain the association between racial discrimination in healthcare and mental health outcomes among Black individuals.

Hypotheses

1. Racial discrimination in healthcare among Black individuals will be significantly associated with depression and anxiety.

Table 1 U.S. studies examining racial discrimination, loneliness and mental health

Authors (Years)	Region	Sample	*N*	Discrimination Scale	Mental Health Variables	Key Findings
Dong, Hwang and Hodgson (2024) [62]	Various	Asian international graduate students (mean age: 29.4 ± 5.1)	177	Everyday discrimination scale [71	Depression, loneliness, anxiety	Racial discrimination was associated with depression. Greater loneliness symptoms were linked to more severe depression and increased anxiety symptoms.
Jochman et al. (2019) [61]	Midwestern	Racially diverse college students (mean age: 20.3 ± 1.9)	149	Racism and life experiences scale [72]	Depression, anxiety, loneliness, anger, positive affect	Interpersonal discrimination predicted increased anxiety, depressive symptoms, and loneliness, both on a daily basis and on average over time.
Lee and Bierman (2019) [63]	Various	Racially diverse older adults (mean age: 66.0 ± 10.4)	7,130	Short-form everyday discrimination scale [73]	Depression	Everyday discrimination was associated with loneliness and depressive symptoms. The link between discrimination and loneliness was stronger among older adults with low educational attainment, making discrimination indirectly associated with depressive symptoms through loneliness only in this group.
Lee and Turney (2012) [13]	Chicago	Racially diverse adults (mean age not reported)	3,102	Everyday discrimination scale [71] & major lifetime discrimination scale [74]	Depression, loneliness, hostility	Everyday discrimination scores, but not major lifetime discrimination scores, were associated with depressive symptoms and loneliness.
Maleku et al. (2022) [64]	Various	Racially diverse international students (mean age: 27.8 ± 5.5)	103	Everyday discrimination scale [71]	Depression, loneliness, anxiety	Loneliness partially mediated the relationship between discrimination and both depression and anxiety. Both loneliness and anxiety partially mediated the relationship between discrimination and depression.
Nadimpalli et al. (2015) [35]	Urban city	Black older adults (mean age: 73.6 ± 6.3)	487	Everyday discrimination scale [71]	Depression, loneliness	Discrimination was positively associated with depressive symptoms. Loneliness did not moderate this relationship.
Nelson et al. (2021) [36]	Various	Black women (mean age: 34.2 ± 11.4)	263	Revised schedule of sexist events [75]	Depression, loneliness, anxiety	Loneliness mediated the relationships between gendered racism, gendered racial stress, and both anxiety and depression.
Ormiston et al. (2024) [60]	Various	Asian and Pacific Islander adults (mean age not reported)	5,413	Short-form everyday discrimination scale [73]	Depression, loneliness, anxiety	Experiencing discrimination once a month was associated with increased odds of anxiety, depression, and loneliness. Experiencing discrimination once a week or more was linked to even higher odds of these outcomes.

2. Racial discrimination in healthcare among Black individuals will be significantly associated with loneliness.
3. The association between racial discrimination in healthcare and depression and anxiety will be attenuated when controlling for loneliness.

Methods

Procedure

This study was conducted as part of the PhillyCEAL (Community Engagement Alliance) project, which is integrated into the National Institutes of Health (NIH) CEAL research network. This network aims to identify effective engagement and outreach practices that provide trustworthy, science-based information to communities facing COVID-19 related health disparities. As part of this initiative, a series of online surveys were conducted over the course of one year (referred to as year 1), followed by a subsequent survey in year 3. These surveys were tailored specifically for CEAL initiatives and included questions derived from a standardized metric set developed collaboratively by CEAL teams nationwide and NIH partners [37].

The eligibility criteria for year 1 targeted individuals aged 13 and above residing in Philadelphia County in 2021. Recruitment occurred online through various social media platforms, with a real-time fraud detection protocol in place to safeguard data integrity, as elaborated in a separate publication [38]. Participants failing to complete the entire survey or provide a residential zip code matching one of the 48 zip codes of Philadelphia County were excluded. The year 1 online confidential cohort survey yielded responses from 2,870 participants who provided their demographic information, as well as their email addresses, between September 2021 and February 2022.

From this initial pool, we selected all individuals from racial and ethnic minority backgrounds and invited

1,188 participants via email to participate in the year 3 survey. The year 3 surveys were conducted from February 2024 to April 2024, resulting in responses from 550 participants, equating to a 46.3% response rate. Of these, we included 329 participants who identified as Hispanic Black or non-Hispanic Black. Since study variables were only available from the year 3 survey, we conducted a cross-sectional analysis using the data from that survey. The study protocols were approved by the University of Pennsylvania Institutional Review Board, and all participants provided informed consent before their involvement. As an incentive for their participation, respondents received a $50 incentive upon completing the survey.

Measures

Independent variable

Racial discrimination in healthcare was assessed using a single item from the Commonwealth Fund 2001 Health Care Quality Survey [39]: "Was there ever a time when you felt you would have gotten better medical care if you had belonged to a different race or ethnic group?" The response is binary, with "no" coded as 0 and "yes" coded as 1.

Dependent variable

Depression was assessed using the Patient Health Questionnaire-2 (PHQ-2) [40]. Participants provided their responses on a four-point Likert scale, ranging from '1 = Not at all' to '4 = Nearly every day.' The Cronbach's alpha for the two-item scale was 0.74. Scores were calculated by summing the responses for each question, with higher scores suggesting a higher likelihood of major depressive disorder.

Anxiety was assessed using the Generalized Anxiety Disorder 2 (GAD-2) [41], with participants using the same four-point Likert scale for their responses. The Cronbach's alpha for the two-item scale was 0.75. Scores were calculated by summing the responses for each question, with higher scores suggesting a higher likelihood of generalized anxiety disorder.

Mediating variable

Loneliness was assessed using the UCLA 3-Item Loneliness Scale [42], which includes the following questions: "How often do you feel that you lack companionship?", "How often do you feel left out?", and "How often do you feel isolated from others?" Participants provided their responses on a three-point Likert scale, ranging from '1 = Hardly ever' to '3 = Often.' The Cronbach's alpha for the scale was 0.66. Scores were calculated by summing the responses for each question, with higher scores suggesting a higher loneliness.

Covariates

In our analysis, we incorporated a range of sociodemographic factors that have been consistently associated with experiences of discrimination and mental health outcomes, such as depression and anxiety. These covariates were selected based on prior literature demonstrating their potential confounding role in studies examining psychological outcomes related to structural and interpersonal discrimination. Specifically, we included Hispanic ethnicity [9, 43], age [44, 45], insurance status [46, 47], lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse (LGBTQ+) status [48, 49], sex assigned at birth [50], relationship status [51, 52], employment [53, 54], income, education [53, 55], and the presence of medical conditions [56]. These variables were included to adjust for underlying differences in exposure to discrimination, health risk, or access to protective social and economic resources, which may influence both loneliness and mental health outcomes.

Statistical analysis

All data analyses were performed using Stata version 17. We presented descriptive statistics, including frequencies for categorical variables and means and standard deviations for continuous variables. To explore the relationships among racial discrimination in healthcare, loneliness, and mental health outcomes (depression and anxiety), we used multiple linear regression analyses with robust standard errors [57]. While our study was guided by the Psychological Mediation Framework [29], which proposes that psychological processes such as loneliness may mediate the effects of stigma and discrimination on mental health, we did not conduct formal mediation analysis due to the cross-sectional nature of the data. Mediation analysis requires assumptions about temporal ordering that cannot be met with cross-sectional data. Instead, we used a series of regression models to test associations that are consistent with a hypothesized mediational pathway. Specifically, we assessed whether the association between racial discrimination in healthcare and mental health outcomes (depression and anxiety) was reduced when loneliness was added to the model.

The analytic strategy proceeded in three steps. First, we examined the association between racial discrimination in healthcare and mental health outcomes (depression and anxiety) without considering loneliness. Second, we assessed the relationship between racial discrimination in healthcare and loneliness. Finally, we included loneliness in the model predicting depression and anxiety to determine whether the relationship between racial discrimination and mental health outcomes was attenuated. Each model accounted for covariates, including age, ethnicity, sex assigned at birth, LGBTQ + status, relationship

Table 2 Characteristics of participated Black Philadelphia residents (*N* = 327)

	Mean (SD) / *N* (%)
Depression (mean (SD))	1.7 (1.3)
Anxiety (mean (SD))	1.8 (1.4)
Loneliness (mean (SD))	5.2 (1.5)
Racial discrimination in healthcare (n (%))	
Yes	211 (64.5)
No	116 (35.5)
Age (mean (SD))	41.2 (10.5)
Insurance (n (%))	
Insured	255 (78.0)
Uninsured	72 (22.0)
Ethnicity (n (%))	
Non-Hispanic	303 (92.7)
Hispanic	24 (7.3)
Sex assigned at birth (n (%))	
Female	245 (74.9)
Male	82 (25.1)
LGBTQ + status (n (%))[a]	
Yes	39 (11.9)
No	288 (88.1)
Education (n (%))	
College degree	249 (76.2)
No college degree	78 (23.8)
Relationship status (n (%))	
Partnered	208 (63.6)
Not partnered	119 (36.4)
Income (n (%))[b]	
Above the median income of Philadelphia in 2022	272 (83.2)
Below the median income of Philadelphia in 2022	55 (16.8)
Employment (n (%))	
Working for pay-full time (40 h a week or more)	272 (83.2)
Working for pay-part time (less than 40 h a week)	24 (7.3)
Not currently working	31 (9.5)
Medical conditions (n (%))[c]	
Yes	186 (56.9)
No	141 (43.1)

Abbreviation: SD (standard deviation), LGBTQ+ (lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse individuals)

a: A binary LGBTQ+ status variable was created by comparing those who identified as heterosexual and cisgender with anyone within the LGBTQ+ community.

b: The income variable was created based on the 2022 Philadelphia median income, with categories 'above median' (≥ $35,000) and 'below median' (< $35,000).

c: A medical condition variable was created based on responses to the question, "Please check all of the medical conditions that a doctor, nurse, or other healthcare professional has told you that you have," which included 31 listed conditions and an option to specify others. This variable was coded as 'yes' if a participant selected any of the 31 conditions or provided a written response, and 'no' if they did not select any of these options.

status, education, income, employment, insurance, and medical conditions. By including these covariates in our analysis, we aimed to account for potential confounding variables and better understand the relationship between racial discrimination in healthcare and mental health outcomes among Black Philadelphia residents. We calculated generalized variance inflation factors (GVIFs) for each independent variable to assess multicollinearity. All GVIF values were low, ranging from 1.06 to 1.60. Additionally, we examined a correlation matrix of all independent variables, and all pairwise correlations were below 0.5, further indicating low risk of multicollinearity. In our dataset, two participants had missing values: one in the income variable and one in a loneliness item. These participants were excluded from further analyses.

Results

Participant characteristics are presented in Table 2. The mean age of participants was 41.2 years, with a standard deviation (SD) of 10.5. Among the participants, 92.7% identified as non-Hispanic, 74.9% were assigned female at birth, and 11.9% identified as LGBTQ+. The mean depression score was 1.7 (SD = 1.3), the mean anxiety score was 1.8 (SD = 1.4), and the mean loneliness score was 5.2 (SD = 1.5). Nearly two-thirds of participants (64.5%) reported experiencing racial discrimination in healthcare settings.

The results of the relationship between racial discrimination in healthcare and loneliness are presented in Table 3. Racial discrimination in healthcare was positively associated with loneliness (b = 0.66, 95% CI: 0.29; 1.04). Age and the presence of medical conditions were significant predictors of loneliness. Each additional year of age was negatively associated with loneliness (b = -0.03, 95% CI: -0.05; -0.02). Participants with medical conditions reported higher levels of loneliness compared to those without (b = 0.42, 95% CI: 0.01; 0.84).

The results for depression as an outcome are presented in Table 4. Racial discrimination in healthcare was positively associated with depression (b = 0.52, 95% CI: 0.19; 0.86). When loneliness was included in the model, the relationship between racial discrimination in healthcare and depression remained positive but was not statistically significant (b = 0.29, 95% CI: -0.03; 0.61), while the relationship between loneliness and depression was significant (b = 0.35, 95% CI: 0.24; 0.46). In the final model, age, relationship status, and insurance status were significant predictors. Each additional year of age was negatively associated with depressive symptoms (b = -0.02, 95% CI: -0.03; -0.01). Non-partnered participants had lower depressive symptoms compared to partnered participants (b = -0.44, 95% CI: -0.79; -0.08). Uninsured participants had greater depressive symptoms compared to those with insurance (b = 0.37, 95% CI: 0.01; 0.74).

Table 3 Results of loneliness regressed on racial discrimination in healthcare

	Coefficients [95% confidence interval]
Racial discrimination in healthcare	
Yes	0.66 [0.29; 1.04] **
No (reference)	
Age	-0.03 [-0.05; -0.02] ***
Insurance	
Insured (reference)	
Uninsured	-0.44 [-0.92; 0.05]
Ethnicity	
Non-Hispanic (reference)	
Hispanic	0.30 [-0.36; 0.96]
Sex assigned at birth	
Female (reference)	
Male	-0.09 [-0.49; 0.30]
LGBTQ + status	
Yes	0.20 [-0.41; 0.82]
No (reference)	
Education	
College degree (reference)	
No college degree	0.13 [-0.30; 0.57]
Relationship status	
Partnered (reference)	
Not partnered	0.22 [-0.23; 0.68]
Income	
Above the median income of Philadelphia in 2022 (reference)	
Below the median income of Philadelphia in 2022	-0.06 [-0.63; 0.50]
Employment	
Working for pay-full time (40 h a week or more) (reference)	
Working for pay-part time (less than 40 h a week)	0.54 [-0.28; 1.35]
Not currently working	-0.16 [-0.94; 0.62]
Medical conditions	
Yes	0.42 [0.01; 0.84] *
No (reference)	

Abbreviation: LGBTQ+ (lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse individuals)

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

The results for anxiety as an outcome are presented in Table 5. Racial discrimination in healthcare was positively associated with anxiety (b = 0.85, 95% CI: 0.50; 1.19). When loneliness was included in the model, the relationship between racial discrimination in healthcare and anxiety remained statistically significant (b = 0.62, 95% CI: 0.29; 0.94), while the relationship between loneliness and anxiety was also significant (b = 0.34, 95% CI: 0.23; 0.45). In the final model, age and relationship status were significant predictors. Each additional year of age was negatively associated with anxiety symptoms (b = -0.03, 95% CI: -0.04; -0.01). Non-partnered participants had lower anxiety symptoms compared to partnered participants (b = -0.53, 95% CI: -0.87; -0.20).

Discussion

This study demonstrates a significant association between racial discrimination in healthcare, loneliness, and mental health outcomes among Black individuals. The findings highlight the importance of not only addressing race-based discriminatory practices within healthcare systems but also developing interventions aimed at reducing loneliness as a means of mitigating the adverse mental health effects associated with racial discrimination in healthcare among Black populations.

Consistent with recent national survey findings [3, 5], we found high levels of racial discrimination in healthcare among Black individuals. Moreover, this discrimination was positively associated with both depression and anxiety. The persistence of these associations, even after controlling for various sociodemographic factors, underscores the inherent link between racial discrimination and psychological distress among Black populations. This aligns with the findings of a Canadian study on Black adults, which showed that racial discrimination in healthcare services was associated with symptoms of depression and anxiety [58]. Similarly, another U.S.-based study focusing primarily on Black women with sickle cell disease found that racism-based discrimination in healthcare settings was associated with depressive symptoms [59]. These studies collectively underscore the critical need to address racial discrimination in healthcare settings as a key factor contributing to mental health disparities. The generalizability of our findings is strengthened by including a diverse sample of Black individuals, suggesting that the mental health impacts of racial discrimination may be relevant across various contexts and healthcare settings. Urgent efforts to dismantle discriminatory practices against Black patients are essential to creating a more equitable healthcare system and reducing the significant mental health burden linked to these experiences.

As hypothesized, loneliness was directly associated with racial discrimination in healthcare. These findings are consistent with prior research. Although the discrimination measures used in earlier studies were not specific to healthcare settings, U.S.-based studies on Black older adults [35], Asian and Pacific Islander adults [60], and racially diverse college students [61] have all found that experiencing discrimination is linked to increased loneliness. Loneliness can arise even in the presence of social contact, particularly when the quality or meaningfulness of that contact is low [23]. Feeling discriminated against during social interactions in healthcare settings can lead to such loneliness [30]. Additionally, our findings indicate

Table 4 Regression results for depression as outcome

	Coefficients [95% confidence interval]	
	Depression regressed on Racial Discrimination in Healthcare	**Depression regressed on Racial Discrimination in Healthcare controlling for Loneliness**
Loneliness		0.35 [0.24; 0.46] ***
Racial discrimination in healthcare		
Yes	0.52 [0.19; 0.86] **	0.29 [-0.03; 0.61]
No (reference)		
Age	-0.03 [-0.04; -0.01] **	-0.02 [-0.03; -0.01] *
Insurance		
Insured (reference)		
Uninsured	0.22 [-0.20; 0.63]	0.37 [0.01; 0.74] *
Ethnicity		
Non-Hispanic (reference)		
Hispanic	-0.13 [-0.66; 0.40]	-0.23 [-0.74; 0.27]
Sex assigned at birth		
Female (reference)		
Male	0.13 [-0.18; 0.44]	0.16 [-0.10; 0.43]
LGBTQ + status		
Yes	0.51 [-0.04; 1.06]	0.44 [-0.01; 0.97]
No (reference)		
Education		
College degree (reference)		
No college degree	0.25 [-0.15; 0.64]	0.20 [-0.16; 0.56]
Relationship status		
Partnered (reference)		
Not partnered	-0.36 [-0.78; 0.06]	-0.44 [-0.79; -0.08] *
Income		
Above the median income of Philadelphia in 2022 (reference)		
Below the median income of Philadelphia in 2022	0.01 [-0.46; 0.48]	0.03 [-0.39; 0.45]
Employment		
Working for pay-full time (40 h a week or more) (reference)		
Working for pay-part time (less than 40 h a week)	-0.03 [-0.62; 0.68]	-0.16 [-0.71; 0.40]
Not currently working	-0.04 [-0.74; 0.66]	0.02 [-0.62; 0.65]
Medical conditions		
Yes	0.24 [-0.14;0.61]	0.09 [-0.25; 0.43]
No (reference)		

Abbreviation: LGBTQ+ (lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse individuals)

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

that loneliness was directly associated with mental health outcomes, consistent with prior studies on Black women [36] and Asian international graduate students [62]. Loneliness contributes to mental health issues by creating emotional isolation and activating stress response systems, which can contribute to symptoms of depression and anxiety [23].

Our study significantly enhances our understanding of loneliness in the complex relationship between racial discrimination in healthcare and mental health among Black individuals. Loneliness completely accounted for the relationship between racial discrimination in healthcare and depression in our study, which aligns with findings from a U.S.-based study on racially diverse older adults [63]. This suggests that depressive symptoms resulting from racial discrimination in healthcare may be largely driven by feelings of social isolation and disconnection. While loneliness contributes to anxiety, a direct effect of discrimination remains, indicating that anxiety symptoms associated with racial discrimination in healthcare may be driven not only by feelings of isolation but also by other emotional and structural consequences of discriminatory experiences. Developing interventions aimed at reducing loneliness could be an effective strategy to mitigate some of the adverse mental health effects linked to racial discrimination in healthcare, particularly

Table 5 Regression results for anxiety as outcome

	Coefficients [95% confidence interval]	
	Anxiety regressed on Racial Discrimination in Healthcare	**Anxiety regressed on Racial Discrimination in Healthcare controlling for Loneliness**
Loneliness		0.34 [0.23; 0.45] ***
Racial discrimination in healthcare		
Yes	0.85 [0.50; 1.19] ***	0.62 [0.29; 0.94] ***
No (reference)		
Age	-0.04 [-0.05; -0.02] ***	-0.03 [-0.04; -0.01] ***
Insurance		
Insured (reference)		
Uninsured	-0.05 [-0.42; 0.32]	0.10 [-0.26; 0.46]
Ethnicity		
Non-Hispanic (reference)		
Hispanic	0.04 [-0.49; 0.57]	-0.07 [-0.50; 0.37]
Sex assigned at birth		
Female (reference)		
Male	-0.18 [-0.46; 0.11]	-0.14 [-0.41; 0.12]
LGBTQ + status		
Yes	0.51 [0.03; 1.00] *	0.44 [-0.02; 0.91]
No (reference)		
Education		
College degree (reference)		
No college degree	0.17 [-0.19; 0.52]	0.12 [-0.20; 0.44]
Relationship status		
Partnered (reference)		
Not partnered	-0.36 [-0.78; 0.06]	-0.53 [-0.87; -0.20] *
Income		
Above the median income of Philadelphia in 2022 (reference)		
Below the median income of Philadelphia in 2022	-0.01 [-0.44; 0.41]	0.01 [-0.40; 0.42]
Employment		
Working for pay-full time (40 h a week or more) (reference)		
Working for pay-part time (less than 40 h a week)	0.43 [-0.16; 1.02]	0.24 [-0.33; 0.81]
Not currently working	0.33 [-0.35; 1.02]	0.39 [-0.22; 0.99]
Medical conditions		
Yes	0.29 [-0.07;0.65]	0.14 [-0.19; 0.48]
No (reference)		

Abbreviation: LGBTQ+ (lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse individuals)

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

for depression. Such interventions may offer a valuable approach to support mental health and resilience among Black individuals facing healthcare-based discrimination.

However, these results differ from another U.S.-based study on racially diverse college students who came to the U.S. for their studies [64]. In that study, the association between discrimination and depression remained significant even when loneliness was included in the model. The varying effects of loneliness may be influenced by several factors. In the study on international students [64], unique challenges associated with being an international student, such as acculturation stress, may contribute more significantly to depression in that population than loneliness alone. Additionally, our study, focused on middle-aged adults, found that older age was associated with lower levels of loneliness and fewer mental health issues, suggesting that the negative impacts of racial discrimination in healthcare on mental health may change as individuals age during the middle-aged stage. This highlights the importance of considering age as a factor in understanding how discrimination impacts mental health over the life course. Additionally, experiences of discrimination and loneliness may vary significantly across different racial and ethnic groups. For example, Asian and Black individuals may experience and cope with discrimination differently due to distinct cultural, social, and historical contexts [65, 66]. These variations can influence the role of loneliness in the relationship between racial discrimination in healthcare and mental health outcomes.

The significant role of loneliness among Black individuals is concerning, especially in light of the U.S. Surgeon General's Advisory highlighting the epidemic of loneliness and its detrimental effects on mental health [67]. General rises in loneliness suggest that feelings of isolation are becoming increasingly prevalent across various populations. This rise in loneliness could further contribute to the mental health challenges faced by Black individuals already experiencing the additional burden of discrimination. Black individuals experience highest racial discrimination in healthcare [4, 5], making them particularly vulnerable to loneliness and its adverse effects. Discrimination-induced loneliness, therefore, may compound existing mental health disparities and further isolate individuals from vital support networks, making it crucial to address loneliness as a distinct, but interconnected, factor in efforts to mitigate the mental health impact of racial discrimination.

Our research underscores the need for interventions that foster social connections to mitigate the adverse impacts of racial discrimination in healthcare on mental health. Aligning with the Surgeon General's call for a more connected society, we emphasize two key strategies. First, accurately assessing loneliness using validated tools is essential for effective intervention. Given the high

prevalence of discrimination in healthcare experienced by Black individuals and the associated risk of loneliness and its negative consequences, it is vital to screen for loneliness, particularly within populations more likely to encounter racial discrimination. Second, implementing strategies to reduce loneliness and enhance social support is critical [68, 69]. This includes creating tailored support groups, developing community networks for Black individuals or those who have experienced healthcare discrimination, and providing opportunities for social interaction within healthcare settings, such as group therapy or peer support programs. Enhancing social support networks involves connecting individuals with family, friends, or community organizations for emotional and practical support. Healthcare providers should play an active role in linking patients to support resources, fostering a sense of belonging, and promoting patient education and involvement in decision-making to empower patients in navigating the healthcare system.

Given the limited research on racial discrimination specific to healthcare settings among Black individuals and its impact on mental health and loneliness, this study's strength lies in its theory-based exploration of these relationships. However, the study has several limitations. First, focusing on Black individuals in a single metropolitan area in the U.S. who are highly educated and have an income above the median restricts the generalizability of the results. Online recruitment via social media may have excluded individuals without reliable internet access or digital literacy, further narrowing the sample to more digitally connected participants. Additionally, the $50 incentive, while intended to compensate participants, may have disproportionately attracted those with greater financial need. These sampling factors may introduce bias and limit the generalizability of the findings beyond the study population. Second, despite our theoretical justification, the cross-sectional design limits our ability to infer causal relationships. Third, the loneliness scale used in this study showed suboptimal internal consistency, which may limit measurement precision and attenuate associations. Future studies may improve robustness by using longer or more comprehensive loneliness scales. Next, reliance on self-reported measures and a single-item assessment of racial discrimination in healthcare may oversimplify the complex and multifaceted nature of discriminatory experiences. While the item is drawn from the well-regarded Commonwealth Fund Health Care Quality Survey, single-item measures may lack the depth and reliability needed to fully capture the range and subtlety of discrimination in healthcare settings [70]. Future research should use longitudinal designs with comprehensive measures to better understand the temporal dynamics between racial discrimination, loneliness, and mental health. We were unable to include contextual factors such as neighborhood characteristics or environmental stressors in the model, which may influence both discrimination and mental health. Their omission may result in residual confounding, underscoring the need for future studies that incorporate neighborhood-level data. Additionally, examining other moderating factors quantitatively (e.g., age) that may influence the role of loneliness differently, or exploring these dynamics qualitatively, would be valuable directions for future studies.

Conclusions

This study underscores that racial discrimination in healthcare is associated with both loneliness and mental health issues among Black individuals. There is an urgent need to address and combat racial discrimination in healthcare settings. In alignment with the U.S. Surgeon General's Advisory on the Healing Effects of Social Connection, interventions to reduce loneliness, such as peer support programs, culturally grounded community-based mental health initiatives, and social prescribing models, may help mitigate the adverse mental health effects associated with racial discrimination. Social prescribing models, which involve connecting individuals to non-clinical community resources like arts activities or volunteer opportunities, can foster social connection and emotional well-being. Healthcare systems should prioritize efforts that promote trust, belonging, and culturally responsive care to improve outcomes for Black populations.

Abbreviations

CEAL	Community Engagement Alliance
CI	Confidence interval
COVID-19	Coronavirus disease 2019
GAD-2	Generalized Anxiety Disorder-2
LGBTQ+	Lesbian, gay, bisexual, transgender, queer or questioning, and other sexual and gender diverse individuals
NIH	National Institutes of Health
PHQ-2	Patient Health Questionnaire-2
SD	Standard deviation
UCLA	University of California, Los Angeles
U.S.	United States

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Author contributions

HY, JB, UO, AV and SB made contributions to the conception and design of this article. HY, JB, UO, AV and SB contributed to the acquisition, analysis and interpretation of data. HY drafted the manuscript. HY, JB, UO, AV and SB revised the manuscript. All authors approved the final manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethics approval and consent to participate: All study procedures received approval from the University of Pennsylvania Institutional Review Board (IRB protocol number: 848650). The research was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants after fully explaining the nature and potential consequences of the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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