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ABSTRACT

Objective: To understand the relationship between mortality and three types of perceived discrimination (lifetime, daily, chronic job) using a nationally representative sample of U.S. adults.

Methods: Data from 4562 adults in the Midlife in the United States (MIDUS) between 2004 and 2006 (MIDUS II and MIDUS African American sample) were analyzed. Unadjusted associations between primary independent discrimination variables (lifetime, chronic job, daily) and mortality were analyzed using univariate Cox's proportional hazards regression models. Covariates were added to the models by group: predisposing (sex, age, race/ethnicity, education, marital status); enabling (household income, employment status, insurance status); and need factors (body mass index, diabetes, hypertension, stroke, cancer) to estimate hazard ratios.

Results: After adjusting for all covariates, hazard ratios for lifetime discrimination (HR: 1.09, $p = 0.034$) and daily discrimination (HR: 1.03, $p = 0.030$) were statistically significant. There was no relationship between mortality and chronic job discrimination (HR: 1.03, $p = 0.15$).

Conclusions: Adults experiencing lifetime and daily discrimination had significantly increased risk of mortality after adjusting for predisposing, enabling, and need factors. The findings highlight the importance of screening patients during clinical encounters for experiences of discrimination and providing appropriate resources to mitigate the negative impact of discriminatory events on mortality. Future research should work to fully understand the mechanism by which discrimination increases risk of mortality. These future findings should be used to develop targets for interventions designed to decrease mortality among adults who have experienced discrimination.

Introduction

Thirty-one percent of U.S. adults have experienced at least one major discriminatory event such as being unfairly denied residence in a neighborhood or unfairly fired from a job, while 63% of adults experience discrimination daily (Healthy People, 2020). Discrimination, defined as the unfair or differential treatment of individuals or communities predicated on prejudice against a defining characteristic of that group, is known to negatively impact health outcomes (Abramson et al., 2015; Luo et al., 2012; ODPHP, 2020; Pascoe & Richman, 2009). Individuals may experience discrimination based on their gender, race/ethnicity, sexual orientation, or other characteristics (American Psychological Association, 2019). Studies have demonstrated a relationship between perceived discrimination and negative health outcomes including mortality, with adults reporting experiences with discrimination having a 3–12% increased risk of mortality (Barnes et al., 2008; Dawson et al., 2015, 2016; Farmer et al., 2019).

Three common forms of perceived discrimination described in health outcomes literature include lifetime, daily, and chronic job. Lifetime discrimination is defined as experiencing a major discriminatory event that may affect the socioeconomic status and life course (Ayalon & Gum 2011) of the individual such as being discouraged by someone from pursuing higher education, being prevented from renting or buying a home in a neighborhood of choice or being denied a bank loan. Daily discrimination describes unfair interpersonal treatment experienced on a more frequent basis (Ayalon & Gum 2011), while chronic job discrimination describes barriers faced by individuals in the workplace such as having been unfairly overlooked for workplace opportunities (Chou & Choi, 2011).

Prior literature has shown an overall increased risk of mortality is associated with perceived discrimination (Barnes et al., 2008; Farmer et al., 2019). However, there are inconsistencies in these results when specific types of discrimination are examined individually. For example, no association between mortality and lifetime discrimination was found in a study conducted by Dunlay et al. (2017) amongst African Americans enrolled in the Jackson Heart Study. Studies have also shown there is an increased risk of mortality associated with discrimination, with increases in risk of mortality ranging from as low as 18% to as high as 49% (Cobb et al., 2021; Farmer et al., 2019). Recent literature on job or workplace discrimination has focused on associations with mental health or overall self-rated health, with a significant gap in examining the relationship with mortality.

The 1995 Andersen Behavioral Model of Health Services Utilization provides a foundational framework by which to examine this relationship (Andersen, 1995). This model suggests there are multiple factors influencing health outcomes that can be categorized into predisposing, enabling, and need factors (Andersen, 1995). Predisposing factors (i.e. ethnicity/race, age, sex, education), enabling factors (i.e. income, employment,

insurance), and need factors (i.e. comorbidities, health status, chronic pain) are all known to be associated with mortality across a multitude of health conditions including both chronic and infectious diseases (Andersen, 1995; Babitsch et al., 2012; Bradley et al., 2002; Mikami et al., 2021). Perceived discrimination, specifically, is an enabling factor known to be associated with mortality (Barnes et al., 2008; Farmer et al., 2019). Structural racism, the way society and policies normalize systems resulting in the disenfranchisement of racial and ethnic minorities, has recently gained attention regarding its relationship with negative health outcomes (Gee & Ford, 2011; Riley, 2018; Williams et al., 2019). Structures and policies negatively impacting predisposing and enabling factors such as unequal housing, low quality education, poor job opportunities, result in the incessant perpetuation of discriminatory practices influencing health (Brown et al., 2019). Research shows the mere anticipation of being a victim of racism is associated with activation of biological stress response systems (Sawyer et al., 2012). While we know, overall perceived discrimination negatively impacts health, it remains unknown as to whether this association varies across three domains of discrimination (lifetime, daily, chronic job). Therefore, to fill this gap in the literature, the objective of this analysis was to assess the relationship between three types of perceived discrimination (lifetime, daily, chronic job) and mortality among a nationally representative sample of U.S. adults.

Methods

Dataset and study population

The Midlife in the United States (MIDUS) study is a national longitudinal study of health and well-being (Ryff et al., 2017). It is an interdisciplinary study of behavioral, psychological, and social factors involved in midlife health and well-being conducted between 1995 and 2016 (Ryff et al., 2017). All eligible participants were non-institutionalized, English-speaking adults in the United States, aged 25–74 years. This study used data from MIDUS II (2004–2006), a longitudinal follow-up study of the original MIDUS study, and included 4963 (75% retention rate, adjusted for mortality) of the 7108 participants in MIDUS 1 along with the addition of an African American subsample (*N* = 592) recruited from Milwaukee, Wisconsin to add refinements to MIDUS II (Ryff et al., 2017). Details about the sampling design, interview format, and methods are available elsewhere (Brim et al., 2004).

Measures

Dependent variable
Mortality. Mortality data were retrieved from three sources. First, the University of Wisconsin Survey Center conducted tracing prior to, during, and after data collection of the MIDUS II and MIDUS African American surveys. Second, searches were conducted using the National Death Index for deaths through 2006 and 2009 after the MIDUS II survey and all other data collection was completed. Third, notifications received from the family members of MIDUS study participants, information from obituary searches, grave listings, and funeral home websites were also used to update mortality status (Ryff et al., 2017).

Independent variables
Lifetime discrimination. Lifetime discrimination occurrences were assessed across 11 settings that included academics, employment, financial services, and experiences of social hostility. Eleven forms of lifetime discrimination were evaluated, including: 'discouraged by a teacher or advisor from seeking higher education,' 'denied a scholarship,' 'not hired for a job,' 'not given a job promotion,' 'fired,' 'prevented from renting or buying a home in the neighborhood you wanted,' 'prevented from remaining in a neighborhood because neighbors made life uncomfortable,' 'hassled by the police,' 'denied a bank loan,' 'denied or provided inferior medical care,' and 'denied or provided inferior service by a plumber, car mechanic, or another service provider.' (Kessler et al., 1999). Respondents were asked to indicate how many times they experienced each event. Each experience of discrimination was binary coded with an occurrence of the event being set equal to one, and no occurrence of the event set equal to zero. The responses were then summed across the 11 items to create a continuous summary variable with scores ranging from 0 to 11. There were 4472 participants with lifetime discrimination measures available for analysis.

Chronic job discrimination. Work discrimination and harassment experiences were measured by an aggregate score using a six-item scale developed for the Ypsilanti Everyday Stress (YES) and Health study, capturing six types of workplace discrimination (Chou & Choi, 2011; McNeilly et al., 1996). Participants were asked to 'indicate how often you have experienced the following', with the options of responding 'once a week or more', 'a few times a month', 'a few times a year', 'less than once a year', 'never'. This question follows a series of job-related questions following the prompt to 'consider all of the work that you do for pay. Answer these questions even if you are temporarily on leave or laid off from your main job and think about that job when answering the questions'. Items included being unfairly given jobs no one else wanted; watched more closely at job than others; use of ethnic/racial/sexual slurs or jokes by boss or coworkers; not taken seriously/ignored by boss; and co-worker with less experience and qualifications promoted before you. Participants indicated experiences using a five-point Likert-type scale (1 = never, 2 = less than once a year, 3 = a few times a year, 4 = a few times a month, and 5 = once a week or more). Chronic job discrimination scores ranged from 6 to 30 with higher scores representing higher discrimination. There were 2970 participants with chronic job discrimination measures available for analysis.

Daily discrimination. Everyday experiences of discrimination were reported as a frequency of various forms of interpersonal unfair treatment using the 9-item Detroit Area Study Everyday Discrimination Scale designed to capture perceptions of daily unfair treatment (Williams et al., 1997). Items included being treated with less courtesy or respect than others; receiving poorer service than others at restaurants or stores; having people act as if they are afraid of you; having people think you are dishonest, not smart or not good as they are; and being called names, insulted, threatened, or harassed. Participants reported how often they were the target of discriminatory acts using a 4-point scale (1 often; 2 sometimes; 3 rarely; 4 never). Responses were averaged to form a summary score of reverse coded values of the items (Cronbach's alpha for the 9-item index was .91). Daily discrimination scores ranged from 9 to 36,

with higher scores representing higher occurrences of discrimination. There were 4562 participants with daily discrimination measures available for analysis.

Covariates. The Andersen Model (Andersen 1995) was used to group covariates into predisposing, enabling, and need factors. Predisposing factors included sex (male, female), age (continuous), race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Other), education (less than or equal to high school diploma, higher education), and marital status (married, not married). Enabling factors included household income (less than $25,000, $25,000–$75,000, more than $75,000), employment status (employed, unemployed) and insurance status (insured, uninsured). Need factors included a continuous variable for body mass index (BMI) and other self-reported comorbidities including diabetes, hypertension, stroke and cancer.

Follow-up time and censoring

From January 2004 through the censored end date of October 2015, 617 participants were identified as deceased. Survival time for decedents was the interval from the date of MIDUS 2 completion (2004 to 2006) to the date of their death. Owing to reasons of confidentiality, only the month and year of death were included in the MIDUS 2 data set. Thus, every deceased participant was given the 15th day of the month as their day of death. Participants who were still alive (censored observations) had survival times that equaled the length of the follow-up (censored on May 15, 2015).

Statistical analysis

Three different analyses were performed. First, means, standard deviations, frequencies, and percentages were used to describe continuous and categorical variables, respectively. Second, unadjusted associations between primary independent variables (lifetime, chronic job, daily discrimination) and mortality were analyzed by using univariate Cox's proportional hazards regression models, with mortality considered to be time of death or censoring (end of follow-up). Third, covariates were added to the models in the following groups: predisposing factors (sex, age, race/ethnicity, education, marital status); enabling factors (household income, employment status, insurance status); and need factors (BMI, diabetes, hypertension, stroke cancer). These models were used to estimate adjusted hazard ratios (aHRs) and 95% confidence intervals (95% CIs). All analyses were completed in Stata/SE 15 (StataCorp LLC. Release 15. College Station, TX). The threshold for identifying statistically significant associations was set at $\alpha < 0.05$.

Results

Sample characteristics are shown in Table 1. The mean age was 55.0 years; 45.7% of the sample were men; and the racial/ethnic

Table 1. Sample characteristics by type of discrimination.

	All $n = 5555$	Lifetime discrimination $n = 4472$	Chronic job discrimination $n = 2970$	Daily discrimination $n = 4562$
		Predisposing factors		
Age (years)	55.0 ± 12.5	55.4 ± 12.3	52.0 ± 10.3	55.5 ± 12.4
Sex				
Male	45.7%	43.8%	47.3%	43.8%
Female	54.3%	56.2%	52.7%	56.2%
Race				
NHW	79.7%	78.8%	82.8%	79.0%
NHB	14.5%	15.9%	12.0%	15.7%
Hispanic	3.0%	2.8%	3.0%	2.7%
Other	2.8%	2.5%	2.3%	2.5%
Education level				
≤High school	35.4%	35.6%	29.8%	35.8%
>High school	64.6%	64.4%	70.2%	64.2%
Marital status				
Married	66.3%	65.5%	68.8%	65.9%
Not married	33.7%	34.5%	31.2%	34.1%
Enabling factors				
Income				
<$25,000	36.7%	22.9%	15.3%	23.5%
$25,000–$74,000	33.2%	40.3%	40.0%	40.1%
<$75,000	30.1%	36.8%	44.8%	36.5%
Employment status				
Employed	66.6%	66.6%	88.6%	65.1%
Unemployed	33.3%	34.5%	11.4%	34.9%
Insurance status				
Insured	92.1%	92.0%	92.5%	92.0%
Uninsured	7.9%	8.0%	7.5%	8.0%
Need factors				
BMI	28.5 1 ± 7.9	28.5 ± 7.9	28.3 ± 7.1	28.5 ± 7.9
High blood pressure				
No	61.1%	60.1%	66.4%	60.1%
Yes	38.9%	39.9%	33.6%	39.9%
Diabetes				
No	87.3%	87.2%	90.0%	87.2%
Yes	12.7%	12.8%	10.0%	12.8%
Stroke				
No	96.7%	96.5%	98.2%	96.5%
Yes	3.3%	3.5%	1.9%	3.5%
Cancer				
No	87.4%	87.2%	89.7%	87.0%
Yes	12.6%	12.8%	10.3%	13.0%

All numbers represent percentages or mean ± standard deviation.
BMI = Body Mass Index; NHB = Non-Hispanic Black; NHW = Non-Hispanic White.

distribution was composed of 3.0% Hispanics, 79.7% Non-Hispanic Whites, 14.5% Non-Hispanic Blacks, and 2.8% who identified as Non-Hispanic Other. About 37% had an income less than $25,000; 33% earned $25,000–$74,000; and 30% earned more than $75,000. The mean value for lifetime

discrimination was 1.1 ± 1.7. Chronic job discrimination had a mean of 10.6 ± 4.5, while daily discrimination had a mean of 12.9 ± 4.6.

Table 2 shows results for the unadjusted and fully adjusted cox proportional hazards models for mortality. The unadjusted

Table 2. Cox proportional hazards models for mortality by each primary independent variable adjusted for predisposing, enabling and need factors.

			Lifetime discrimination		Chronic job discrimination		Daily discrimination		All discrimination types	
	Unadjusted HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value	Adjusted HR (95% CI)	p-value
Primary independent variables										
Lifetime discrimination	0.94 (0.88–0.99)	**0.032**	1.09 (1.01–1.17)	**0.034**	–	–	–	–	1.07 (0.94–1.21)	0.299
Chronic job discrimination	0.99 (0.96–1.02)	0.480	–	–	1.03 (0.99–1.07)	0.147	–	–	1.02 (0.98–1.07)	0.317
Daily discrimination	0.99 (0.97–1.01)	0.185	–	–	–	–	1.03 (1.01–1.06)	**0.030**	1.01 (0.96–1.06)	0.699
Predisposing factors										
Age	1.10 (1.09–1.11)	**<0.001**	1.09 (1.08–1.11)	**<0.001**	1.09 (1.07–1.12)	**<0.001**	1.09 (1.08–1.11)	**<0.001**	1.10 (1.08–1.12)	**<0.001**
Sex										
Male	Ref		Ref		Ref		Ref		Ref	
Female	0.76 (0.65–0.89)	**0.001**	0.62 (0.50–0.78)	**<0.001**	0.64 (0.45–0.92)	**0.017**	0.60 (0.48–0.75)	**<0.001**	0.61 (0.42–0.88)	**0.009**
Race										
Non-Hispanic White	Ref		Ref		Ref		Ref		Ref	
Non-Hispanic Black	1.10 (0.88–1.37)	0.418	1.20 (0.73–1.97)	0.476	1.19 (0.54–2.59)	0.664	1.16 (0.71–1.88)	0.549	1.01 (0.42–2.43)	0.983
Hispanic	0.65 (0.37–1.15)	0.141	0.67 (0.30–1.51)	0.337	1.02 (0.41–2.54)	0.975	0.67 (0.29–1.50)	0.329	0.98 (0.39–2.46)	0.958
Other	1.36 (0.89–2.07)	0.145	1.74 (0.99–3.07)	0.054	1.35 (0.49–3.69)	0.555	1.55 (0.88–2.74)	0.129	1.49 (0.54–4.09)	0.443
Education level										
High school diploma or less	Ref		Ref		Ref		Ref		Ref	
Higher education	0.57 (0.48–0.66)	**<0.001**	0.76 (0.61–0.95)	**0.015**	0.82 (0.57–1.16)	0.258	0.79 (0.64–0.97)	**0.031**	0.80 (0.56–1.16)	0.24
Marital status										
Married	Ref		Ref		Ref		Ref		Ref	
Not married	1.63 (1.39–1.91)	**<0.001**	1.30 (1.03–1.65)	**0.030**	1.16 (0.79–1.70)	0.455	1.30 (1.02–1.65)	**0.031**	1.16 (0.78–1.71)	0.47
Enabling factors										
Income										
Less than $25,000	Ref		Ref		Ref		Ref		Ref	
$25,000–$74,000	0.78 (0.66–0.93)	**0.005**	1.04 (0.81–1.33)	0.784	1.54 (0.96–2.47)	0.075	1.03 (0.81–1.32)	0.794	1.48 (0.91–2.42)	0.117
More than $75,000	0.32 (0.25–0.41)	**<0.001**	0.82 (0.58–1.18)	0.286	1.04 (0.59–1.83)	0.889	0.82 (0.58–1.17)	0.276	1.02 (0.57–1.81)	0.953
Employment status										
Employed	Ref		Ref		Ref		Ref		Ref	
Unemployed	5.36 (4.45–6.47)	**<0.001**	1.32 (0.99–1.75)	0.054	1.32 (0.89–1.97)	0.169	1.34 (1.01–1.76)	**0.040**	0.79 (0.52–1.19)	0.255
Insurance status										
Insured	Ref		Ref		Ref		Ref		Ref	
Uninsured	0.89 (0.63–1.24)	0.487	1.11 (0.70–1.75)	0.667	1.11 (0.55–2.24)	0.778	1.06 (0.67–1.68)	0.812	1.15 (0.57–2.34)	0.692
Need Factors										
BMI	1.01 (0.99–1.01)	0.461	1.01 (0.99–1.03)	0.202	1.04 (1.01–1.07)	**0.016**	1.02 (0.99–1.04)	0.145	1.03 (1.00–1.07)	**0.04**
High Blood Pressure										
No	Ref		Ref		Ref		Ref		Ref	
Yes	2.42 (2.06–2.85)	**<0.001**	1.11 (0.89–1.39)	0.353	1.24 (0.87–1.75)	0.236	1.11 (0.89–1.38)	0.365	1.2 (0.84–1.71)	0.325
Diabetes										
No	Ref		Ref		Ref		Ref		Ref	
Yes	2.74 (2.25–3.32)	**<0.001**	1.39 (1.08–1.81)	**0.012**	1.61 (1.07–2.42)	**0.023**	1.42 (1.10–1.83)	**0.007**	1.53 (1.00–2.32)	**0.049**
Stroke										
No	Ref		Ref		Ref		Ref		Ref	
Yes	4.02 (3.11–5.21)	**<0.001**	1.91 (1.34–2.71)	**<0.001**	1.77 (0.87–3.61)	0.118	1.86 (1.31–2.64)	**0.001**	1.49 (0.69–3.25)	**0.31**
Cancer										
No	Ref		Ref		Ref		Ref		Ref	
Yes	2.54 (2.12–3.04)	**<0.001**	1.22 (0.95–1.55)	0.114	1.42 (0.95–2.13)	0.086	1.22 (0.96–1.55)	0.105	1.54 (1.03–2.31)	**0.036**

Model fully adjusted for predisposing (age, sex, ethnicity/race, education, marital status), enabling (income, employment, insurance), and need (BMI, high blood pressure, diabetes, stroke, cancer) factors.
Significance level: *$p<0.05$, **$p<0.01$, ***$p<0.001$.

hazard ratio for lifetime discrimination was statistically significant (HR: 0.94; $p = 0.032$), while results for chronic job (HR:0.99, $p = 0.48$) and daily discrimination (HR:0.99, $p = 0.19$) were not statistically significant. After fully adjusting for predisposing (age, sex, ethnicity/race, education, marital status), enabling (income, employment status, insurance), and need (BMI, high blood pressure, diabetes, stroke, cancer) factors, results showed every unit increase in lifetime discrimination was associated with a 9% increase in mortality (HR:1.09, $p = 0.034$). Similarly, in the fully adjusted model, daily discrimination was associated with a 3% increase in mortality (HR: 1.03, $p = 0.030$), while the relationship between chronic job discrimination was not statistically significant (HR:1.03, $p = 0.15$). When all three types of discrimination were added to the same model, none of the discrimination types were associated with mortality (Lifetime discrimination – HR: 1.07, 95% CI 0.94–1.21; Chronic Job Discrimination – HR: 1.02, 95% CI 0.98–1.07; Daily Discrimination – HR: 1.01, 95% CI 0.96–1.06).

Discussion

In this longitudinal analysis examining the impact of three forms of perceived discrimination on mortality in a nationally representative sample of adults, adults experiencing lifetime and daily discrimination had significantly increased risk of mortality after adjusting for predisposing, enabling, and need factors. Interestingly, unadjusted analyses showed lifetime discrimination was significantly associated with a decreased risk of mortality. However, after adjusting for predisposing, enabling, and need factors, lifetime discrimination and daily discrimination were significantly associated with an increased risk of mortality. Consistent with the literature on discrimination, the findings of this study show that lifetime discrimination and daily discrimination are associated with increased mortality.

Unexpectedly, the direction of the relationship in the unadjusted model for lifetime discrimination appeared to have a protective effect, however after adjusting for predisposing, enabling, and need factors lifetime discrimination was associated with increased risk of mortality as one would expect. As the sample of individuals included in the analysis were predominantly non-Hispanic White (78.8%), had greater than a high school level of education (64.4%), were employed (66.6%), and insured (92%). One might presume this population had reduced exposures to lifetime discrimination, and those who did experience discrimination may have used positive coping strategies to mitigate the negative impact of discrimination (Bogart et al., 2018). However, factors including age, sex, education, marital status, diabetes, and stroke were all identified as independent correlates of the relationship between lifetime discrimination and mortality; with stroke, diabetes, being unmarried, and older age being associated with increased mortality. The same factors were identified as independent correlates of daily discrimination with the addition of employment status. By adjusting for these factors, we removed the contribution to the initial relationship that was identified in the unadjusted model that we believe was due to the sample and was not capturing the true impact. This idea is supported with results from the adjusted model that were ultimately consistent with what is shown in the literature.

Lifetime and daily discrimination encompass discrimination around education, employment, financial services, and experiencing hostility in social encounters such as being harassed by the police, being treated with less respect than others, and having people act as if they are afraid of you (Chou & Choi, 2011; Kessler et al., 1999; McNeilly et al., 1996). Experiencing discrimination has been shown to result in increased perceived and biological stress levels (O'Brien et al., 2016; Sawyer et al., 2012; Spence et al., 2016), and increased stress is known to be associated with mortality. Studies have shown an association between perceived discrimination and increased rates of mortality by up to 18% (Barnes et al., 2008; Farmer et al., 2019). These findings are consistent with the results of this study; however, the relationships examined by earlier studies primarily considered the frequency of exposure to discrimination in the context of race/ethnicity (Cobb et al., 2021; Dunlay et al., 2019). In contrast, this study considers a broader context in which discriminatory experiences may occur including on a daily basis, over the course of one's life, and while on the job.

The relationship between perceived discrimination and mortality is important to understand not only in the context of increased risk, but also with consideration for factors that might affect this relationship. In this study, the association between two types of discrimination and mortality remained significant irrespective of predisposing, enabling, and need factors. Research implications of this study illustrate the need for additional research that includes factors that may explain the relationship such as cultural beliefs, coping styles, self-concept, and other psychosocial constructs that may have a mediating effect on the relationship (Andersen, 1995; Pascoe & Richman, 2009). Clinical implications of the study findings highlight the need for assessment of perceived discrimination, perceived and biological measures of stress during patient encounters. Identification of patients' exposure and experiences with discrimination will be useful when referring patients to counseling or other services which may be able to mitigate the negative impact of stress resultant of discrimination on the physiological and biological mechanisms leading to increased risk of mortality. Future research studies should include coping, resilience, and other psychosocial factors that may explain the relationship between lifetime and daily discrimination.

Strengths of this study include utilization of a nationally representative dataset and assessing the relationship between three distinct forms of perceived discrimination. There are also four noteworthy limitations for the study. First, there was a small sample of racial/ethnic minorities included in the study, which may have resulted in a smaller number of reported perceived discriminatory experiences. Second, data used for the analysis were based on self-report and is subject to recall bias. Individuals may have underreported previously experiencing discrimination or chronic conditions that were included in the analysis as covariates. Third, questions regarding chronic job discrimination were asked in relation to the individual's current job, and not in terms of their "lifetime work experience" which may be why we did not see a significant effect for chronic job discrimination. In addition, because questions are regarding one's current job, chronic job discrimination may be a misnomer for this measure. Fourth, no measures of stress were included in the analysis. Future studies should incorporate perceived and biological measures of stress to assess the potential mediating or moderating effect on mortality.

Conclusions

Overall, this study showed that individuals experiencing lifetime and daily discrimination had significantly increased risk of

mortality even after adjusting for predisposing, enabling, and need factors. These study results are consistent with previous findings regarding the relationship between perceived discrimination and mortality. However, this study adds to the literature by examining the relationship between mortality and three distinct types of discrimination (daily, lifetime, chronic job); and provides understanding on how this relationship differs across discrimination type. These study results emphasize the importance of assessing whether patients believe they have been discriminated against during the clinic encounter and referral to appropriate counseling or other services which may help to reduce the impact on the biological and physiological systems, reducing risk of mortality. Additionally, future studies should work to fully understand the mechanism by which discrimination increases risk of mortality.

Authorship

LEE obtained funding for the study. MT, AZD and LEE acquired, analyzed and interpreted the data. JO, AZD, MT, JSW and LEE designed the study, drafted the article, and critically revised the manuscript for intellectual content. All authors approved the final manuscript.

Disclosure statement

No potential conflict of interest was reported by the authors.

Ethical standards disclosure

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the Institutional Review Board of the Medical College of Wisconsin, Milwaukee, WI, USA.

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