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## The Impact of Everyday Discrimination on Systemic Lupus Erythematosus Disease Activity and Mental Health Outcomes

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### Abstract

**Objective:** Systemic Lupus Erythematosus (SLE) disproportionately affects racial and ethnic minority populations in the US. Though discrimination is linked to worse SLE outcomes, the mechanisms of this association remain underexplored. Among a multiracial, multiethnic cohort with SLE, we explored relationships between discrimination and patient-reported outcomes (PROs) and if mental health affects these relationships.

**Methods:** We analyzed data from the California Lupus Epidemiology Study, comprised of Asian (31%), Black (10%), Hispanic (24%), and White (34%) participants (N=245). Participants completed the Everyday Discrimination Scale and the following PROs: Systemic Lupus Activity Questionnaire (SLAQ), PROMIS Pain Interference and Fatigue, PHQ8 (depression), and GAD7 (anxiety). Multivariable linear regressions modeled associations between discrimination and PROs. Mediation analyses evaluated if depression or anxiety mediated associations between discrimination and SLAQ, pain, or fatigue.

**Results:** Everyday discrimination scores were highest among Black and Asian participants. Among multivariable models, higher discrimination was associated with worse SLAQ ( $\beta=0.25$ ,  $P<0.001$ ), PHQ8 ( $\beta=0.21$ ,  $P<0.001$ ), GAD7 ( $\beta=0.27$ ,  $P<0.001$ ), pain ( $\beta=0.24$ ,  $P=0.01$ ), and fatigue ( $\beta=0.3$ ,  $P=0.007$ ). By racial/ethnic subgroups, discrimination was significantly associated with higher SLAQ among Black and Asian participants. Discrimination was no longer significantly associated with SLAQ, pain, or fatigue after adjusting for PHQ8 or GAD7.

**Conclusion:** In this diverse SLE cohort, discrimination was associated with greater patient-reported disease activity, pain, fatigue, depression, and anxiety. Mediation analyses suggest that

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mental health mediates the relationship between discrimination and PROs. These results highlight the impact of discrimination as a psychosocial stressor on disease outcome variables.

### Key Indexing Terms

Discrimination; Anxiety; Depression; Mental Health; Minority Groups; Systemic Lupus Erythematosus

## Introduction

Systemic lupus erythematosus (SLE) is a chronic autoimmune disease characterized by heterogeneous manifestations and unpredictable flares, leading to cumulative organ damage and reduced quality of life. Despite advances in treatment, striking disparities in SLE outcomes persist across racial and ethnic groups in the United States. Individuals from historically marginalized populations, particularly Black, Hispanic, and Asian individuals, experience greater disease severity and greater mortality compared to White individuals with SLE.<sup>1-3</sup>

The underlying cause of disparities in SLE disease burden is multifactorial; prior work has demonstrated that differences are partially explained by factors including poverty, neighborhood context, health literacy, education, environmental exposures, and access to healthcare.<sup>4-7</sup> Growing evidence suggests that racism independently contributes to disparities in SLE outcomes, both through structural racism and individual-level discrimination.<sup>4,5,7,8</sup>

Discrimination is increasingly recognized as a chronic psychosocial stressor that adversely affects both mental and physical health.<sup>9,10</sup> Prior research has linked experiences of discrimination with increased disease activity and poorer quality of life in patients with SLE.<sup>8,11-13</sup> Discrimination may also contribute to psychological distress, including anxiety and depression, which themselves are associated with greater self-reported disease activity, pain, and fatigue in SLE.<sup>14,15</sup> Existing literature examining the effect of discrimination on SLE outcomes primarily focuses on Black participants and multiracial, multiethnic cohorts remain underexplored. Additionally, few studies have simultaneously examined the relationships between discrimination, mental health, and patient-reported disease activity across diverse racial and ethnic groups.

Thus, we conducted a comprehensive study of patient-reported SLE disease outcomes across a racially and ethnically diverse regional cohort of adults in the San Francisco Bay Area. Specifically, our objectives were to: (1) characterize experiences of discrimination in a diverse SLE cohort; (2) evaluate the association between discrimination and five patient-reported outcomes: SLE disease activity, pain interference, fatigue, depression, and anxiety; and (3) explore the potential mediating role of mental health symptoms (depression and anxiety) on relationships between discrimination and SLE disease burden. Understanding these relationships is critical for identifying modifiable drivers of disease burden and developing interventions to improve health equity in lupus care.

## Methods

### Study Population

The study population was comprised of participants in the California Lupus Epidemiology Study (CLUES), a multiracial, multiethnic cohort of individuals with SLE. Participants were recruited to the CLUES study from 1) the California Lupus Surveillance Project (CLSP), a San Francisco County population-based cohort of individuals with SLE from 2007-2009,<sup>16</sup> or 2) rheumatology clinics (academic and community clinics) and existing research cohorts within the nine surrounding counties in the San Francisco Bay Area geographic region between 2015-2018 (N=260). The two groups had similar sociodemographic and clinical characteristics. Inclusion criteria included residence in the San Francisco Bay Area, physician-confirmed SLE diagnosis, oral fluency in English, Spanish, Cantonese, or Mandarin (for ease of interviews), age  $\geq 18$ , and the ability to provide informed consent. Study procedures were reviewed and approved by University of California, San Francisco Institutional Review Board (approval 14-14429).

Data were gathered through an initial in-person research clinic visit, which involved obtaining a history with review of prior medical records, conducting a physical exam (by a physician specializing in SLE), collecting biospecimens, and completing a structured interview (by a trained research assistant).

Study physicians confirmed SLE diagnoses if the individual had 1)  $\geq 4$  out of the 11 American College of Rheumatology (ACR) revised SLE classification criteria (defined in 1982 and updated in 1997),<sup>17,18</sup> 2)  $\geq 3$  out of the 11 ACR criteria and documentation of a SLE diagnosis by a rheumatologist, or 3) a confirmed lupus nephritis diagnosis. A subgroup was unable to attend the in-person clinic visit and underwent data collection by telephone (n=37 [22%] from the CLSP and n=62 [24%] from broader geographic region participants) and diagnoses were confirmed through review of the medical records. Follow-up interviews were conducted annually; all data in this analysis are from year 5 of interviews (2020-2021).

### Discrimination

This study examines discrimination as captured by The Everyday Discrimination Scale (EDS), first developed in 1997 by Williams et al., which queries experiences of discrimination with Likert scale responses about the frequency of these experiences.<sup>19</sup> The initial survey involved 9 questions related to experiences of being treated as dishonest or dangerous, less smart or otherwise less than others, with less courtesy or respect, and/or experiencing worse service, being called names or insults, or being threatened or harassed.<sup>19</sup> The EDS was expanded to include a tenth item inquiring about being followed around in stores,<sup>20</sup> which was included in this study. Likert scale responses were coded (never = 0, less than once a year =1, a few times a year =2, a few times a month =3, at least once a week =4, and almost every day =5) and summed to create a score for each of the types of discrimination experiences. Overall discrimination scores were calculated as the sum of the scores for each discrimination experience type. The EDS has been used extensively in literature exploring the impact of discrimination on health, including among studies

exploring specifically the impact of discrimination on patients with SLE.<sup>21,22</sup> Individual EDS items can be seen in Supplemental Table 1.

### SLE and Mental Health Outcomes

Five patient-reported outcomes (PROs) were explored as the outcomes of interest: self-reported disease activity, pain interference, fatigue, depression, and anxiety. The Systemic Lupus Activity Questionnaire (SLAQ) measures patient-reported SLE disease activity through assessment of recent lupus flares, overall disease activity rating, and severity of 24 different lupus symptoms.<sup>23</sup> The National Institute of Health's Patient-Reported Outcome Measurement Information System (PROMIS) scales for pain interference and fatigue were scored and subsequently converted to T scores, with a population mean of 50 and SD of 10 per PROMIS scoring documentation.<sup>24</sup> These scales were chosen as they have been previously validated in this multiracial, multiethnic cohort with SLE as reliable and valid.<sup>25</sup> The Patient Health Questionnaire (PHQ8) and Generalized Anxiety Disorder (GAD7) were utilized as validated screening measures for depression and anxiety, respectively.<sup>26,27</sup>

### Covariates

Covariates contained in this analysis included age, biological sex, race, ethnicity, lower educational attainment (as defined as high school education or less), lupus disease duration, high dose glucocorticoid use (defined as the use of prednisone 7.5mg or more daily for at least 3 months within the past 12 months), current immunosuppressive use (defined as use of any immunosuppressive medication within the past month, as detailed in Supplemental Table 2), current hydroxychloroquine use, and the Brief Index of Lupus Damage (BILD) score. Race and ethnicity were self-reported. The BILD was utilized as a covariate to capture severity of disease through survey questions about organ damage associated with SLE, which was chosen given its prior validity as a proxy measure of physician-reported disease damage.<sup>28</sup>

### Statistical Analysis

We reported PROs by racial and ethnic groups and conducted an analysis of variance to assess for significant differences between the groups. We then conducted three sets of linear regression analyses to assess the association of continuous discrimination scores with each of the five PROs among the overall group. Model 1 was the unadjusted linear regression; Model 2 adjusted for age, biological sex, lower education, and disease duration; Model 3 controlled for the covariates included in Model 2 in addition to high dose glucocorticoid use, current immunosuppressive use, current hydroxychloroquine use, and BILD.

We then conducted these three sets of analyses within each racial and ethnic group. All models adjusted for the same covariates except for analyses of the Black participants, which had too few observations to support all covariates. Adjusted analyses of data from the Black participants included only education and disease duration.

Finally, we conducted mediation analyses to assess the relationship of PHQ8 and GAD7 on the association between discrimination and SLAQ, pain interference, and fatigue scores within the overall group and then separately by each racial and ethnic group. We chose

to examine depression and anxiety as mediators because of our hypothesis that the effect of discrimination on SLE activity is exerted at least in part through its impact on mental health, though we were unable to assess causality given the cross-sectional data. Because of the small sample sizes for some of the groups, we used robust standard errors for the mediation analysis. We conducted separate mediation analyses for PHQ8 and GAD7 as well as mediation analyses with both variables in the same model. We did not explore pain and fatigue as mediators of the association between discrimination and SLAQ because measures of both are contained within the SLAQ.

## Results

Descriptive characteristics of the participants are detailed in Table 1 for the overall group, and stratified by race and ethnicity. The total analytic sample included 245 participants. The vast majority of participants were female (90%) with mean age of 50 years, mean SLE disease duration of 22 years, and mean BILD score of 2.5. Among the overall sample, 31% of the participants identified as Asian, 10% Black, 24% Hispanic, and 34% White. The Asian and Hispanic participants were younger and with fewer comorbidities as compared to the other racial and ethnic groups. The Black and Hispanic participants had greater representation of individuals with income below the poverty level and lower educational attainment. There were no significant differences in BILD scores or high-dose steroid use, but there was less immunosuppressive use among the White participants as compared to the other racial and ethnic groups.

Discrimination scores with scores stratified by race and ethnicity are detailed in Table 2, along with participants' reported reasons for discrimination. The one individual with missing EDS item data was omitted from the analyses. The majority of participants (60%) reported some experience of discrimination. The discrimination scores, a compilation of the experiences and frequency of discrimination, were significantly different by race and ethnicity. Black participants reported the highest degree of discrimination (mean score 11.8), followed by Asian participants (mean score 7.7), and then Hispanic participants (mean score 5.9). The most commonly reported reason for discrimination was race, which was reported by 32% of Black participants, 25% of Asian participants, and 17% of Hispanic participants. Gender was also a highly reported reason for discrimination, particularly among Asian participants (17%). Report of "other" reasons for discrimination was also common (23%); some participants provided free text to elaborate. Recurring "other" reasons for discrimination included personality characteristics, experiences or positions at work, perpetrator related factors, and unknown.

The primary dependent outcomes of interest, including patient reported lupus disease activity, anxiety, depression, pain, and fatigue, are detailed in Table 3 along with the differences in these outcomes by race and ethnicity. There was a statistically significant difference in SLAQ scores and pain scores by race and ethnicity; Black participants reported the highest mean scores for SLAQ and pain, followed by White, Hispanic, and then Asian participants. The other outcomes of interest did not have statistically significant differences by race and ethnicity. Black participants followed by Asian participants had the highest mean PHQ8 scores, and Asian participants followed by Black participants had the highest

mean GAD7 scores. The highest mean fatigue scores were reported among the Black and White participants.

Multivariable models examining the impact of discrimination on patient-reported disease activity, depression, anxiety, pain, and fatigue are summarized in Table 4. For the overall group, greater discrimination scores were associated with higher SLAQ, PHQ8, GAD7, pain, and fatigue scores in all three multivariable adjusted models except the unadjusted model for pain. Among the fully adjusted multivariable models, higher discrimination was associated with worse SLAQ ( $\beta=0.25$ ,  $P<0.001$ ), PHQ8 ( $\beta=0.21$ ,  $P<0.001$ ), GAD7 ( $\beta=0.27$ ,  $P<0.001$ ), pain ( $\beta=0.24$ ,  $P=0.01$ ), and fatigue ( $\beta=0.30$ ,  $P=0.007$ ). Higher discrimination scores were significantly associated with higher SLAQ scores among the Black and Asian groups only (among all multivariable models). Higher discrimination scores were significantly associated with higher PHQ8 scores, among the Asian and White groups, and higher GAD7 scores, among all racial and ethnic groups except the Black group. Higher discrimination scores were also associated with higher pain and fatigue scores among Asian participants in all multivariable models and Black participants in the adjusted model.

The mediation analyses of depression and anxiety on the relationship between discrimination scores and reported disease activity, pain, and fatigue are detailed in Table 5. Discrimination scores were no longer significantly associated with SLAQ, pain, or fatigue when controlling for PHQ8 and/or GAD7. Mediation analyses were also completed by racial and ethnic group with the same findings; these results are omitted from this manuscript given similar findings but are available on request.

## Discussion

In this cross-sectional study of a regional, population-based cohort, we found that greater experiences of discrimination were associated with higher self-reported SLE disease activity, pain, fatigue, depression, and anxiety. These associations persisted even after adjusting for other factors associated with lupus disease activity. Mediation analyses further demonstrated that depression and anxiety symptoms partially explained the association between discrimination and disease activity, pain, and fatigue. While causality cannot be established with cross-sectional data, and thus directionality of the associations cannot be assessed, we hypothesize that discrimination influences mental health symptoms that subsequently affect patient-reported physical health outcomes. This study, conducted with racially and ethnically diverse participants, adds to the growing body of research demonstrating how discrimination contributes to SLE disease and symptom burden.

Extensive prior literature has found increased experiences of discrimination to be associated with increased patient-reported lupus disease activity (SLAQ) and patient-reported severity of disease and organ damage (BILD) among Black individuals, particularly out of the Atlanta, Georgia, Black Women's Experiences Living with Lupus (BeWELL) cohort.<sup>8,11–13,22</sup> However, to our knowledge, only Hunter et al. has also examined the role of mental health in mediating the impact of discrimination on lupus disease activity.<sup>13</sup> Hunter et al. found similar results to our study; higher discrimination was associated with higher patient-

reported lupus disease activity and psychological distress (as measured by depression, anxiety, and anger) mediated this relationship among their cohort of Black women with SLE.<sup>13</sup> Our study demonstrates that this finding is consistent across a multiracial, multiethnic non-sex restricted cohort with SLE. Furthermore, our subgroup analysis showed discrimination was significantly associated with SLAQ only among Black and Asian participants. This result may reflect different effects of the chronic stress of discrimination on different racial and ethnic groups, or the disproportionately high discrimination scores among these two racial/ethnic groups.

Drawing on literature from SLE and other chronic conditions, there are multiple theories for how discrimination influences SLE disease activity. One primary theory involves understanding discrimination as a chronic, pro-inflammatory stressor that over time exerts an allostatic load on individuals, which ultimately increases chronic disease activity through dysregulation of the hypothalamic-pituitary-adrenal axis and inflammatory responses.<sup>29–32</sup> Similar theories have been postulated in the SLE literature supported by biomarker studies, including establishing a connection between salivary alpha-amylase and patients with SLE compared to age-matched controls<sup>33</sup> and a connection between discrimination and higher C-reactive protein levels among patients with SLE.<sup>34</sup> Another proposed mechanism undergoing investigation by Vara et al. is that environmental exposures including racism exert an epigenetic force on gene expression that ultimately drives disparities in SLE outcomes.<sup>35</sup> Other literature suggests that experiences of discrimination from providers drives disparate adherence to SLE medication regimens, leading to disparities in disease outcomes.<sup>36</sup> Experiences of discrimination in the healthcare setting may also be impacted by patients' healthcare access and utilization, which is known to be impacted by structural inequities.<sup>37</sup> Together this prior robust scholarship highlights the multifactorial mechanisms by which discrimination impacts SLE disease burden.

Our study is consistent with previous research that found an association between discrimination and higher rates of depression and anxiety. For example, prior literature found that among Black participants with SLE, higher perceived racism was associated with having moderate to severe depression, even after adjusting for sociodemographic and clinical variables.<sup>38</sup> Beyond patients with SLE, several meta-analyses have identified strong associations between experiences of discrimination and the burden of anxiety and depression in adults,<sup>9,10,39</sup> and this relationship has been shown to be partially mediated by the chronic stress response.<sup>40,41</sup> Among patients with SLE, the impact of discrimination on mental health is also closely linked to experiencing pain and fatigue. Prior studies have demonstrated that depression is independently associated with fatigue severity.<sup>42</sup> In addition, depression has been linked to greater pain interference, particularly among populations with high psychosocial vulnerability.<sup>43</sup> These associations may be driven by both behavioral factors, such as reduced engagement in physical activity and self-management, and physiologic mechanisms involving neuroendocrine and immune dysregulation. Collectively, these findings underscore the importance of routine screening for depression and anxiety in patients with SLE and support the integration of mental health interventions as part of comprehensive symptom management strategies.

Our findings contribute important evidence on the health impacts of discrimination among Asian patients with SLE specifically, a relationship that has received limited attention in prior lupus research. In our study, Asian participants reported the second-highest discrimination scores, and higher discrimination was significantly associated with greater disease burden (including worse patient-reported disease activity, pain, fatigue, and mental health symptoms). Importantly, these data were collected during the COVID-19 pandemic, a time when racism and xenophobia directed at Asian communities sharply increased.<sup>44,45</sup> Other studies have shown that this surge in discrimination was associated with higher levels of anxiety and depression among Asian Americans.<sup>46</sup> Our study builds on this work showing how these mental health effects may help explain the link between discrimination and greater SLE disease burden among Asian Americans. Recognizing anti-Asian discrimination as a structural contributor to disease burden underscores the need for integrated mental health care and targeted support for Asian patients with SLE, particularly during periods of intensified racialized stress.

This study has some limitations. First, our cross-sectional study cannot establish causality. Even so, our results align with life course theories of health inequity, including cumulative inequality theory and the life course vulnerability perspective.<sup>47,48</sup> These frameworks posit that early and sustained exposures to social disadvantage, such as discrimination, can shape disease trajectories over time through compounded physiological and psychosocial burdens. In the context of lupus, a disease with known environmental and immunologic triggers, chronic social stressors may contribute to both flare frequency and perception of disease activity. Therefore, although assigning causality is beyond the scope of this study, the associations we found among discrimination, mental health, and disease activity support and extend existing frameworks of health inequity. Future longitudinal studies are needed to explore the time-ordering and potential causality of these associations. Second, the nature of self-reported outcomes introduces the possibility of a number of biases (e.g. recall bias, social desirability bias). Specific criticisms have been raised about the SLAQ with prior literature demonstrating weak correlation with physician-reported SLE disease activity.<sup>49</sup> Future studies should examine the association of discrimination with physician-reported disease activity. There are also critiques of the EDS including that it does not isolate discrimination that is perceived to be racially or ethnically motivated, leading to variable interpretations of the survey.<sup>50</sup> While the data for reason for discrimination was collected, participants could report multiple reasons for discrimination and there was insufficient power to analyze the models in this study among only those reporting racially or ethnically motivated discrimination. However, the EDS has been used extensively in prior studies and thus acted as an important tool for comparison to prior works and was the only discrimination metric available from the 2020-2021 CLUES interviews analyzed here. In the future, researchers should examine discrimination specifically attributed to race or ethnicity using alternative tools such as those assessing vicarious racism, experiences of racial and ethnic discrimination, anticipatory racism stress, and negative racialized event experiences as done in other studies.<sup>8,11–13</sup> Limitations in interpretation of our analysis also exist among the Black subgroup given the small sample size, which precluded the ability for full multivariable analysis of this group and provided less power to detect differences in

outcomes. Future analyses should investigate larger multiracial, multiethnic cohorts, perhaps through pooling cohorts from multiple geographic regions.

In conclusion, among a racially and ethnically diverse cohort of patients with SLE, we found that greater experiences of discrimination were associated with higher levels of self-reported disease activity, pain, fatigue, and symptoms of depression and anxiety. The relationships between discrimination and disease activity, pain, and fatigue were mediated by depression and anxiety. Our findings make clear that the effects of discrimination go beyond emotional distress; they can contribute to disease activity in autoimmune disease populations. This study adds to growing evidence that social disadvantage and discrimination can meaningfully influence health outcomes in SLE. Given the substantial impact of these symptoms on quality of life, our findings underscore the importance of combating discrimination and developing interventions to help mitigate the impact of discrimination on mental health among people living with lupus.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## Disclaimer:

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

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**Table 1.**  
Patient Demographics and SLE Disease Characteristics

|                                        | Overall (N=245) | White (n=84) | Black (n=25) | Hispanic (n=59) | Asian (n=77) | P       |
|----------------------------------------|-----------------|--------------|--------------|-----------------|--------------|---------|
| Sociodemographic                       |                 |              |              |                 |              |         |
| Age                                    | 49.5 [13.4]     | 54.8 [12.1]  | 52.8 [14.2]  | 46.9 [12.7]     | 44.8 [12.8]  | < 0.001 |
| Female                                 | 221 (90.2%)     | 77 (91.7%)   | 25 (100%)    | 50 (84.8%)      | 69 (89.6%)   | 0.18    |
| Income below poverty level (N=228)     | 27 (11.8%)      | 3 (3.7%)     | 5 (20.7%)    | 12 (22.2%)      | 7 (10%)      | 0.0044  |
| Lower education <sup>a</sup> (N=244)   | 39 (16%)        | 9 (10.7%)    | 7 (28%)      | 17 (28.8%)      | 6 (7.8%)     | 0.0015  |
| Health                                 |                 |              |              |                 |              |         |
| Number of comorbid conditions          | 2 [1.6]         | 2 [1.6]      | 3 [2.1]      | 1.9 [1.5]       | 1.6 [1.4]    | 0.0044  |
| SLE duration, years                    | 22.3 [10.6]     | 26.1 [10.7]  | 23 [11.4]    | 19.8 [10.5]     | 19.9 [9.4]   | < 0.001 |
| Brief Index of Lupus Damage            | 2.4 [2.4]       | 2.3 [2.2]    | 2.8 [2.7]    | 2.8 [2.8]       | 2.2 [2.1]    | 0.44    |
| Medications                            |                 |              |              |                 |              |         |
| Immunosuppressives <sup>b</sup>        | 127 (51.8%)     | 28 (33.3%)   | 17 (68%)     | 32 (54.2%)      | 50 (64.9%)   | < 0.001 |
| High-dose glucocorticoids <sup>c</sup> | 33 (13.5%)      | 14 (16.7%)   | 4 (16%)      | 7 (11.9%)       | 8 (10.4%)    | 0.65    |
| Hydroxychloroquine <sup>d</sup>        | 160 (65.3%)     | 49 (58.3%)   | 17 (68%)     | 38 (64.4%)      | 56 (72.7%)   | 0.29    |

Tabled values are n (%) or mean [standard deviation]

<sup>a</sup> Lower education was defined as high school or less educational attainment

<sup>b</sup> Immunosuppressive use was defined as use of any immunosuppressive medication within the past month, as detailed in Supplemental Table 2

<sup>c</sup> High-dose glucocorticoids was defined as use of 7.5mg or more of prednisone daily for at least 3 months of the past 12 months

<sup>d</sup> Hydroxychloroquine was defined as current use of hydroxychloroquine

**Table 2.**  
Discrimination Scores and Reported Reason for Discrimination by Race/Ethnicity

|                                            | Overall (N= 245) | White (n=84) | Black (n=25) | Hispanic (n=59) | Asian (n=77) | P       |
|--------------------------------------------|------------------|--------------|--------------|-----------------|--------------|---------|
| Report experiencing any discrimination     | 148 (60.4%)      | 43 (51.2%)   | 19 (76%)     | 36 (61%)        | 50 (64.9%)   | 0.1     |
| Number of types of discrimination reported | 2.1 [2.3]        | 1.4 [1.8]    | 3.4 [2.6]    | 1.8 [2.3]       | 2.5 [2.4]    | < 0.001 |
| Discrimination Score                       | 6.4 [6.5]        | 4.2 [4.8]    | 11.8 [9]     | 5.9 [6.4]       | 7.7 [6]      | < 0.001 |
| Reason For Discrimination <sup>a</sup>     |                  |              |              |                 |              |         |
| Race                                       | 38 (15.5%)       | 1 (1.2%)     | 8 (32%)      | 10 (16.9%)      | 19 (24.7%)   |         |
| Skin Color                                 | 14 (5.7%)        | 1 (1.2%)     | 6 (24%)      | 3 (5.1%)        | 4 (5.2%)     |         |
| Ancestry                                   | 5 (2%)           | 0 (0%)       | 0 (0%)       | 1 (1.7%)        | 4 (5.2%)     |         |
| Language                                   | 6 (2.4%)         | 2 (2.4%)     | 0 (0%)       | 2 (3.4%)        | 2 (2.6%)     |         |
| Religion                                   | 2 (0.8%)         | 0 (0%)       | 0 (0%)       | 1 (1.7%)        | 1 (1.3%)     |         |
| Gender                                     | 26 (10.6%)       | 7 (8.3%)     | 1 (4%)       | 5 (8.5%)        | 13 (16.9%)   |         |
| Sexual Orientation                         | 5 (2%)           | 1 (1.2%)     | 1 (4%)       | 0 (0%)          | 3 (3.9%)     |         |
| Age                                        | 12 (4.9%)        | 4 (4.8%)     | 0 (0%)       | 2 (3.4%)        | 6 (7.8%)     |         |
| Height                                     | 3 (1.2%)         | 0 (0%)       | 1 (4%)       | 0 (0%)          | 2 (2.6%)     |         |
| Weight                                     | 6 (2.4%)         | 2 (2.4%)     | 2 (8%)       | 0 (0%)          | 2 (2.6%)     |         |
| Physical Disability                        | 12 (4.9%)        | 4 (4.8%)     | 2 (8%)       | 2 (3.4%)        | 4 (5.2%)     |         |
| Other Appearance                           | 8 (3.3%)         | 1 (1.2%)     | 0 (0%)       | 4 (6.8%)        | 3 (3.9%)     |         |
| Income                                     | 14 (5.7%)        | 5 (6%)       | 2 (8%)       | 4 (6.8%)        | 3 (3.9%)     |         |
| Other                                      | 57 (23.3%)       | 18 (21.4%)   | 7 (28%)      | 16 (27.1%)      | 16 (20.8%)   |         |

Tabled values are n (%) or mean [standard deviation]

<sup>a</sup>Participants could report multiple reasons for discrimination

**Table 3.**  
Patient Reported Outcomes of SLE Disease Activity, Depression, Anxiety, Pain, and Fatigue by Race/  
Ethnicity

|                                              | Overall (N=245) | White (n=84) | Black (n=25) | Hispanic (n=59) | Asian (n=77) | P     |
|----------------------------------------------|-----------------|--------------|--------------|-----------------|--------------|-------|
| Systemic Lupus Activity Questionnaire (SLAQ) | 9.1 [6.8]       | 9.7 [7.4]    | 12.3 [7]     | 8.2 [6.7]       | 8 [5.8]      | 0.025 |
| Patient Health Questionnaire-8 (PHQ8)        | 5.3 [4.5]       | 5.3 [4.5]    | 5.7 [3.7]    | 4.9 [4.8]       | 5.4 [4.7]    | 0.89  |
| General Anxiety Disorder-7 (GAD7)            | 4.3 [4.4]       | 3.6 [3.9]    | 5 [4.3]      | 4 [4.3]         | 5.1 [4.9]    | 0.14  |
| Pain <sup>a</sup>                            | 53.1 [9.7]      | 54.8 [9.4]   | 56.0 [9.2]   | 52.3 [10.1]     | 52.0 [10.5]  | 0.03  |
| Fatigue <sup>b</sup>                         | 52.9 [10.6]     | 54.1 [11.3]  | 54.5 [9.7]   | 51.5 [10.1]     | 51.0 [9.4]   | 0.37  |

Tabled values are n (%) or mean [standard deviation]

<sup>a</sup>Pain was defined using the PROMIS Pain Interference scale

<sup>b</sup>Fatigue was defined using the PROMIS Fatigue scale

**Table 4.**

Multivariable Linear Regression of the Relationship between Discrimination and Patient-Reported Lupus Disease Activity, Depression, Anxiety, Pain, and Fatigue

|                      | Overall (N=244 for Model 1, and N=243 for Model 2 and 3) |         | White (n=84) |         | Black (n=24) |       | Hispanic (n=59) |      | Asian (n=77 for Model 1 and n=76 for Model 2 and 3) |         |
|----------------------|----------------------------------------------------------|---------|--------------|---------|--------------|-------|-----------------|------|-----------------------------------------------------|---------|
|                      | $\beta$                                                  | P       | $\beta$      | P       | $\beta$      | P     | $\beta$         | P    | $\beta$                                             | P       |
| SLAQ                 |                                                          |         |              |         |              |       |                 |      |                                                     |         |
| Model 1 <sup>a</sup> | 0.26                                                     | < 0.001 | 0.28         | 0.10    | 0.30         | 0.07  | 0.20            | 0.15 | 0.33                                                | 0.004   |
| Model 2 <sup>b</sup> | 0.28                                                     | < 0.001 | 0.28         | 0.11    | 0.46         | 0.005 | 0.16            | 0.26 | 0.35                                                | 0.003   |
| Model 3 <sup>c</sup> | 0.25                                                     | <0.001  | 0.11         | 0.47    | --           | --    | 0.15            | 0.22 | 0.33                                                | 0.004   |
| PHQ8                 |                                                          |         |              |         |              |       |                 |      |                                                     |         |
| Model 1 <sup>a</sup> | 0.20                                                     | < 0.001 | 0.26         | 0.001   | 0.09         | 0.31  | 0.18            | 0.06 | 0.33                                                | < 0.001 |
| Model 2 <sup>b</sup> | 0.23                                                     | < 0.001 | 0.27         | 0.008   | 0.16         | 0.11  | 0.17            | 0.10 | 0.37                                                | <0.001  |
| Model 3 <sup>c</sup> | 0.21                                                     | < 0.001 | 0.15         | 0.09    | --           | --    | 0.14            | 0.16 | 0.38                                                | < 0.001 |
| GAD7                 |                                                          |         |              |         |              |       |                 |      |                                                     |         |
| Model 1 <sup>a</sup> | 0.27                                                     | < 0.001 | 0.39         | < 0.001 | 0.05         | 0.64  | 0.22            | 0.01 | 0.38                                                | < 0.001 |
| Model 2 <sup>b</sup> | 0.28                                                     | < 0.001 | 0.39         | < 0.001 | 0.01         | 0.92  | 0.25            | 0.07 | 0.44                                                | < 0.001 |
| Model 3 <sup>c</sup> | 0.27                                                     | < 0.001 | 0.32         | < 0.001 | --           | --    | 0.24            | 0.01 | 0.44                                                | < 0.001 |
| Pain                 |                                                          |         |              |         |              |       |                 |      |                                                     |         |
| Model 1 <sup>a</sup> | 0.22                                                     | 0.03    | 0.00         | 0.99    | 0.32         | 0.14  | 0.26            | 0.22 | 0.44                                                | 0.02    |
| Model 2 <sup>b</sup> | 0.29                                                     | 0.005   | 0.01         | 0.96    | 0.59         | 0.008 | 0.27            | 0.22 | 0.50                                                | 0.008   |
| Model 3 <sup>c</sup> | 0.24                                                     | 0.01    | -0.19        | 0.35    | --           | --    | 0.22            | 0.26 | 0.45                                                | 0.01    |
| Fatigue              |                                                          |         |              |         |              |       |                 |      |                                                     |         |
| Model 1 <sup>a</sup> | 0.27                                                     | 0.01    | 0.18         | 0.49    | 0.17         | 0.48  | 0.43            | 0.04 | 0.45                                                | 0.04    |
| Model 2 <sup>b</sup> | 0.34                                                     | 0.003   | 0.20         | 0.44    | 0.29         | 0.28  | 0.42            | 0.05 | 0.55                                                | 0.012   |
| Model 3 <sup>c</sup> | 0.30                                                     | 0.007   | -0.03        | 0.91    | --           | --    | 0.37            | 0.07 | 0.53                                                | 0.012   |

Tabled values are b coefficient for discrimination score and p-value from regression models

<sup>a</sup> Model 1 is unadjusted

<sup>b</sup> Model 2 is adjusted for age, gender, lower education, disease duration. Also adjusted for race/ethnicity only in the overall cohort. Model 2 for the Black cohort is only adjusted for lower education and disease duration.

<sup>c</sup> Model 3 is adjusted for variables in model 2, high dose glucocorticoid use (use of prednisone 7.5mg or more daily for at least 3 months within the past 12 months), immunosuppressive use within the past month, current hydroxychloroquine use, and the Brief Index of Lupus Damage score.

**Table 5.**

Mediation of the Relationship Between Discrimination and Patient Reported Outcomes by Anxiety and Depression

|                            |                      | Model 1 <sup>a</sup> (N=244) |         | Model 2 <sup>b</sup> (N=243) |         | Model 3 <sup>c</sup> (N=243) |         |
|----------------------------|----------------------|------------------------------|---------|------------------------------|---------|------------------------------|---------|
|                            |                      | $\beta$                      | P       | $\beta$                      | P       | $\beta$                      | P       |
| SLAQ                       |                      |                              |         |                              |         |                              |         |
| Mediation by PHQ8          | Discrimination score | 0.07                         | 0.16    | 0.06                         | 0.25    | 0.07                         | 0.19    |
|                            | PHQ8                 | 0.92                         | < 0.001 | 0.93                         | < 0.001 | 0.83                         | < 0.001 |
| Mediation by GAD7          | Discrimination score | 0.08                         | 0.21    | 0.08                         | 0.16    | 0.08                         | 0.17    |
|                            | GAD7                 | 0.67                         | < 0.001 | 0.70                         | < 0.001 | 0.63                         | < 0.001 |
| Mediation by PHQ8 and GAD7 | Discrimination score | 0.08                         | 0.18    | 0.06                         | 0.29    | 0.06                         | 0.25    |
|                            | PHQ8                 | 0.94                         | <0.001  | 0.92                         | < 0.001 | 0.79                         | < 0.001 |
|                            | GAD7                 | -0.03                        | 0.83    | 0.02                         | 0.87    | 0.06                         | 0.55    |
| Pain                       |                      |                              |         |                              |         |                              |         |
| Mediation by PHQ8          | Discrimination score | -0.01                        | 0.94    | 0.04                         | 0.64    | 0.05                         | 0.53    |
|                            | PHQ8                 | 1.10                         | < 0.001 | 1.07                         | < 0.001 | 0.91                         | < 0.001 |
| Mediation by GAD7          | Discrimination score | 0.02                         | 0.82    | 0.08                         | 0.36    | 0.08                         | 0.34    |
|                            | GAD7                 | 0.73                         | < 0.001 | 0.74                         | < 0.001 | 0.62                         | < 0.001 |
| Mediation by PHQ8 and GAD7 | Discrimination score | 0.01                         | 0.87    | 0.05                         | 0.54    | 0.06                         | 0.48    |
|                            | PHQ8                 | 1.20                         | < 0.001 | 1.13                         | <0.001  | 0.94                         | < 0.001 |
|                            | GAD7                 | -0.15                        | 0.42    | -0.10                        | 0.57    | -0.05                        | 0.75    |
| Fatigue                    |                      |                              |         |                              |         |                              |         |
| Mediation by PHQ8          | Discrimination score | -0.05                        | 0.56    | -0.02                        | 0.80    | -0.01                        | 0.88    |
|                            | PHQ8                 | 1.58                         | < 0.001 | 1.57                         | < 0.001 | 1.44                         | < 0.001 |
| Mediation by GAD7          | Discrimination score | -0.07                        | 0.46    | -0.02                        | 0.85    | -0.02                        | 0.80    |
|                            | GAD7                 | 1.28                         | < 0.001 | 1.31                         | < 0.001 | 1.19                         | < 0.001 |
| Mediation by PHQ8 and GAD7 | Discrimination score | -0.08                        | 0.39    | -0.06                        | 0.56    | -0.05                        | 0.58    |
|                            | PHQ8                 | 1.45                         | < 0.001 | 1.40                         | < 0.001 | 1.23                         | < 0.001 |
|                            | GAD7                 | 0.21                         | 0.29    | 0.26                         | 0.18    | 0.31                         | 0.10    |

Tabled values are  $\beta$  coefficient for discrimination score and p-value from regression models

<sup>a</sup> Model 1 is unadjusted

<sup>b</sup> Model 2 is adjusted for age, gender, lower education, disease duration, and race/ethnicity

<sup>c</sup> Model 3 is adjusted for variables in model 2, high dose glucocorticoid use (use of prednisone 7.5mg or more daily for at least 3 months within the past 12 months), immunosuppressive use within the past month, current hydroxychloroquine use, and the Brief Index of Lupus Damage score