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The racial/ethnic and sociocultural aspects of the pandemic in rheumatology



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The disproportionate impact of coronavirus-2019 (COVID-19) on communities of color is gaining global attention. Current research demonstrates that historically marginalized populations are experiencing disproportionate levels of SARS-CoV-2 infection and adverse clinical outcomes. However, research examining whether COVID-19 outcomes vary by race and ethnicity within the rheumatic disease population is limited. This paper will review data showing how SARS-CoV-2 infection has differentially affected racial and ethnic minorities in the general population and those with rheumatic disease. We will also highlight disparities in rheumatic disease risk and severity that existed prior to the pandemic, and discuss recent work examining severe outcomes of COVID-19 in rheumatic disease patients by race and ethnicity. Finally, we propose several actionable steps for the rheumatology community to address COVID-19 health disparities, which may have long-term effects on patients with rheumatic disease.

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Introduction

The coronavirus 2019 (COVID-19) global pandemic, caused by the SARS-CoV-2 outbreak in December of 2019, has resulted in over 1 million deaths from nearly 40 million cases [1]. In the United States alone, there have been more than 200,000 deaths from over 8 million confirmed COVID-19 cases.

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The long-standing ramifications of the pandemic on global health are non-definitive, astronomical, and ongoing [1]. Global unemployment rates are at their highest in history, and in the United States, unemployment rates rival those experienced during the Great Depression. This has resulted in the loss of employer-sponsored insurance for tens of millions, while propelling and worsening global health disparities on a multitude of levels, namely along racial, ethnic, sociocultural, and socioeconomic levels [2]. In the United States, Americans have grappled with three major and concurrent phenomena, including the pandemic, unemployment figures exceeding 50 million people, and the increase in civil unrest coupled with urgent calls for the reforming of policies and institutions that have a history of oppressing communities of color [2].

As the prevalence of COVID-19 continues to increase, the disproportionate impact on communities of color is gaining global attention [3]. Throughout the world, and every major region of the United States, racial/ethnic minority groups have carried the brunt of the negative impacts from COVID-19, with much research focusing on Black, Native American, Latinx, and Asian communities [4–6]. The exact role of race and ethnicity on COVID-19 clinical outcomes is uncertain, but there is a consensus that traditionally marginalized populations are experiencing disproportionate levels of SARS-CoV-2 infections, diagnosis, and adverse clinical outcomes [7].

Given the greater burden of comorbidities for patients with chronic conditions, such as immune-mediated inflammatory diseases, more research examining the effects of COVID-19 on patients with rheumatic diseases is needed [8]. This is also important as many rheumatic patients may be at an increased risk of infection due to immunosuppressive medications. Currently we know that for patients with rheumatic diseases, the risk of more severe outcomes is tied closely to comorbidities and age [9], similar to the general population [10]. However, research examining whether COVID-19 outcomes vary by race and ethnicity within the rheumatic disease population is limited.

This paper will explore how the pandemic and SARS-CoV-2 infection have differentially impacted racial and ethnic minorities, including those with rheumatic disease. First, we will briefly review how COVID-19 disproportionately affects these communities. Next, we will highlight disparities in rheumatic disease risk and severity that existed prior to the pandemic. We will also discuss recent work examining severe outcomes of COVID-19 in rheumatic disease patients, as well as review evidence of disparities in outcomes by racial/ethnic categories in this population. Finally, we summarize our findings by proposing several actionable steps for the rheumatology community to address COVID-19 health care disparities, which may have long-term effects on patients with rheumatic disease.

COVID-19 disproportionately affects traditionally marginalized communities

The rapid spread of SARS-CoV-2 has highlighted widespread, long-standing inequalities regarding pervasive global health disparities. Research indicates that mortality rates among Black, Hispanic, and Native Americans individuals are disproportionately high. A study conducted with data from 12 states in the U.S. found that people of color were severely affected by COVID-19 with increased rates of hospitalization [11]. As of October 10, 2020, Hispanic persons are 4.5 times, American Indian or Alaska Native persons are 4.4 times, Black persons are 4.4 times, and Asian persons are 1.3 times more likely to be hospitalized compared to white, non-Hispanic patients [1].

While Black Americans only make up 13% of the U.S. population, they account for approximately 30% of COVID-19 cases and more than 20% of COVID-19 deaths, and these disparities are also similarly apparent in major cities throughout the country [12,13]. A national study found that among confirmed positive cases, Black individuals with COVID-19 had significantly higher risks of intensive care unit admission, hospitalization, ventilatory support, and death, even when adjusting for various other factors [14].

Outside of the United States, disparities in COVID-19 have also been demonstrated in countries such as England, various Nordic nations, India, and Brazil. In England, research shows that Black African, Black Caribbean, Pakistani, Bangladeshi, and Indian individuals have an increased risk of death related to SARS-CoV-2 infection, with the largest total numbers of deaths occurring in Indian and Black Caribbean groups [15]. Research also shows that Somali immigrants in Norway face higher SARS-CoV-2 infection rates at ten times the average national rates, and that similar disparities are evident in Sweden where Somali, Syrian, and Iraqi immigrants are disproportionately affected by the COVID-

19 pandemic [16]. In India, persons from lower socioeconomic statuses and those living in urban areas are particularly vulnerable to infection; for example, 50% of persons in Mumbai live in “slum conditions” and face additional challenges that include difficulty accessing clean water and latrine facilities, increased exposure to forms of discrimination, and adhering to social distancing mandates [17]. Additionally, a study found that among COVID-19 cases and mortality rates in Brazil, Black patients had a lower likelihood of survival compared to white patients [18]. Although some major cities and countries around the world are reporting cases, until more consistent and conclusive data becomes available that accurately reflects the true number of occurrences of COVID-19 by racial and ethnic categories, our ability to gain a more holistic understanding of the connections between race, ethnicity and COVID-19 remains limited.

Factors underlying disparities in COVID-19

Comorbidities

Several factors may contribute to the disparities in SARS-CoV-2 infection and severe COVID-19 outcomes by race and ethnicity (Fig. 1). Racial and ethnic minority communities may be more susceptible to both initial infection and severe outcomes because they have higher rates of comorbidities, namely diabetes and hypertension, that are associated with poor outcomes and mortality [19]. Hypertension disproportionately impacts Black individuals, with this group bearing the burden of heart failure and atherosclerotic disease [20]. Many studies have found that Black patients hospitalized and confirmed to have COVID-19 were more likely than whites to have comorbidities, notably asthma, cancer, chronic kidney disease, congestive heart failure, diabetes, hypertension, obesity, and solid organ transplantation [21].

Socioeconomic factors

Socioeconomic disparities also serve as underlying factors that disproportionately hinder nonwhite communities. Nonwhite individuals are more likely to live in poor, multigenerational, and overcrowded housing situations, making it more difficult to adhere to COVID-19 prevention guidelines [22]. Nonwhite individuals are also more likely to have inadequate access to health insurance and primary care providers and may experience various forms of discrimination when trying to access healthcare services [23]. Certain public-facing roles and other essential occupations can significantly increase the risk of exposure and infection, serving to drive disparities [24]. A study conducted in Utah found that one half of all outbreaks occurred in the following industries: manufacturing, construction, and wholesale trade [25]. Research has also shown that 73% of workplace infection outbreaks were among persons that identified as Hispanic or nonwhite, even though Hispanics or nonwhite individuals only made up 24% of the workforce for 15 identified affected sectors [26]. Additionally, communities of color are less likely to have full access and knowledge concerning appropriate methods to prevent infection, which has the potential to further increase existing disparities if individuals rely on incorrect prevention methods related to crowding and work conditions [19].

Testing and treatment

Variation in access to testing and treatment across racial and ethnic groups may also contribute to disparities in COVID-19. One study conducted in New York City found that racial minorities had decreased testing compared to white individuals [27], despite widespread availability of testing to residents with and without insurance. Looking ahead, we may find additional disparities in access to care once a vaccine becomes available, even if distributed regardless of insurance status. Historically, disparities in vaccination rates exist in the general US population, with Black, Hispanic, and Asian individuals much less likely to receive vaccinations compared with non-Hispanic white individuals [28,29]. Lower vaccination rates in communities of color, and the reasons for those lower rates, might have implications for immunization for COVID-19, if and when a vaccine is developed—despite the fact that these populations are more likely than white individuals to become infected, experience more severe disease, and die of COVID-19. One study found that non-Hispanic Black individuals were less likely to elect to receive the vaccine for COVID-19, if and when offered [30]. Further, to improve the health conditions of racial and ethnically diverse groups during this pandemic, diversity in clinical

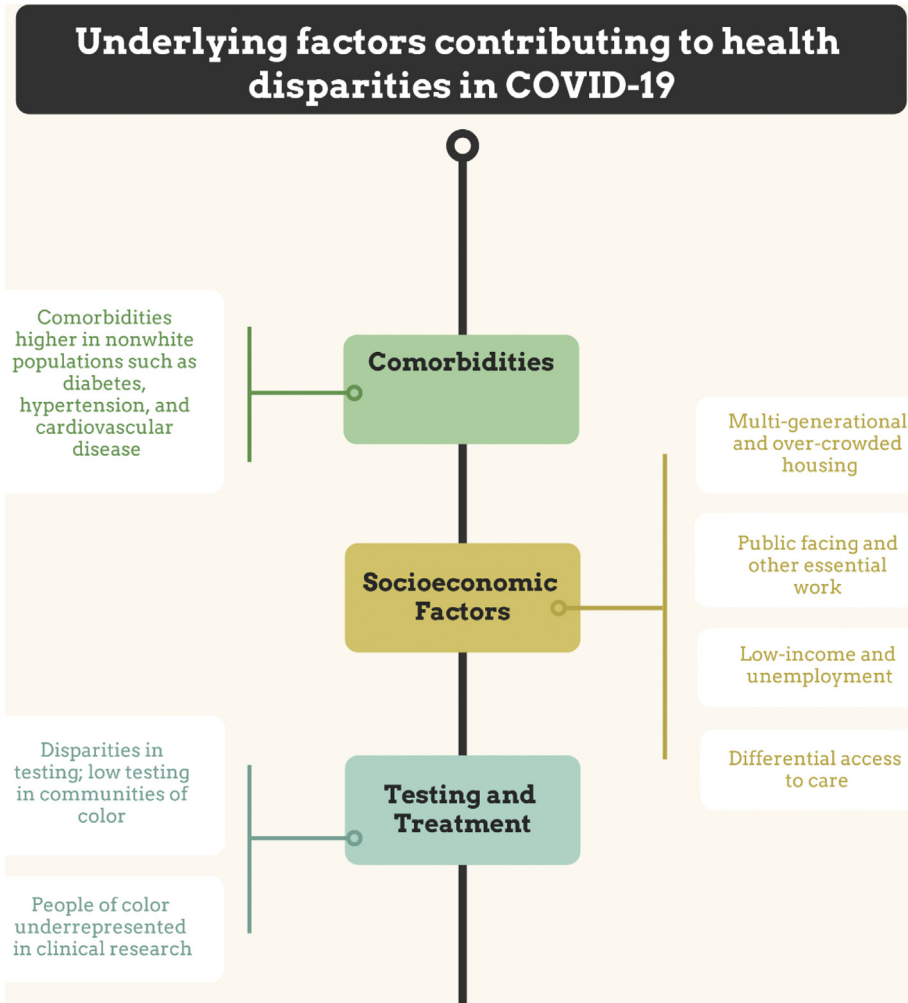


Fig. 1. Underlying factors contributing to health disparities in COVID-19.

trials for a vaccine are imperative. People of color continue to be underrepresented in clinical research and this should be reversed, whenever possible, in order to achieve health equity and lessen the gap in quality healthcare and services among groups [31].

Racial, ethnic and socioeconomic disparities in rheumatology

Global health research shows that health disparities within rheumatic diseases, particularly systemic lupus erythematosus (SLE), rheumatoid arthritis (RA), osteoarthritis, and systemic sclerosis, are widespread. Within the United States, American Indian, Alaska Native, Black, Hispanic (of all races) and Asians/Pacific Islander persons are disproportionately affected by SLE compared to white persons [32–35]. Disparities also exist in Latin America where the prevalence of musculoskeletal disorders was found to be highest in indigenous communities [36]. In addition to experiencing a higher risk of rheumatic disease diagnosis, nonwhite patients with rheumatologic conditions tend to experience a higher burden of disease activity and severity compared to white patients [37–40]. For example, one

study found that Black women experience the highest burden of SLE disease, followed by Hispanic, Asian, and white women [37]. SLE-related organ damage and disease activity have also been shown to be higher among Hispanic patients compared to non-Hispanic white patients in the United States [41–43]. Another study found that Black females with SLE are three times more likely to die than Black females in the general population [44].

Despite significant progress in the treatment of RA, large racial disparities still exist for this condition. Worse outcomes are observed in Black, Hispanic, and lower socioeconomic status groups when compared to white patients [38,39]. Latino and Black patients with RA are more likely to experience higher levels of disease activity, as well as the burden of disability, pain, worse function and adverse global health [38,39,45]. In one study, disparities remained after adjusting for demographic and socioeconomic factors, including health insurance status [45].

SARS-CoV-2 infection and rheumatic disease

Research in the rheumatic disease population has shown that risk factors for experiencing severe COVID-19 outcomes are similar to those found in the general population. For example, a large global study of rheumatic disease patients diagnosed with COVID-19 found that individuals over the age of 65 years and those with comorbid conditions such as hypertension/cardiovascular disease, lung disease, diabetes, and renal disease, were more likely to be hospitalized [9]. The study additionally found a strong association between glucocorticoids ≥ 10 mg/day and higher odds of hospitalization, but no association with biologic medications. These results indicate that rheumatic disease patients, many of whom have comorbid conditions, may be at higher risk of developing more severe infection, specifically those on glucocorticoids. Overall, rheumatic disease patients are considered at risk for infection and deserve special consideration pertaining to the potential impacts of COVID-19 on their health. Given that rheumatic diseases are often treated with medications that are immunomodulatory or immunosuppressive, additional work is ongoing to determine which specific drugs increase risk of infections. One case study hints at the possibility that SARS-CoV-2 infection may be associated with a new diagnosis of autoimmune conditions [46]. While some studies have shown no increased risk or only slightly increased risk of infection compared to the general population [47], additional research is needed to evaluate the risk and effect of COVID-19 across comorbidities, rheumatic disease types, and immunosuppressive drugs.

Race/ethnicity and COVID-19 outcomes in rheumatic disease

Given that racial/ethnic disparities in rheumatic disease diagnosis, severity, and progression exist, growing disparities in COVID-19 in the general population warrant immediate action to address potentially long-standing effects of the pandemic on vulnerable populations. To date, only two studies have examined COVID-19 outcomes among rheumatic disease patients in the context of race and ethnicity. A study conducted in New York found that nonwhite patients with SLE were hospitalized at higher rates than white patients [48]. Specifically, 83% of SLE patients hospitalized were nonwhite and 42% were Hispanic, compared to 59% nonwhite and 29% Hispanic in the ambulatory group. In an exploratory multivariable analysis, authors found that nonwhite race was associated with higher odds of hospitalization. Although this study focused on a small subset of SLE patients in one area, the findings mirror disparities found in the general population.

In a second study of over 1000 rheumatic disease patients with COVID-19 across the United States, differences in hospitalization by race/ethnicity were also demonstrated. White patients were less likely to be hospitalized (29%) compared to Black (51%), Latinx (37%), Asian (43%) and other/mixed race (35%) patients. Further, Black, Latinx, and Asian patients were found to have higher odds of hospitalization compared to white patients in analyses adjusting for age, sex, smoking, rheumatic disease diagnosis, comorbidities, medications taken prior to infection, and rheumatic disease activity [49]. Among those hospitalized, Latinx patients had three-fold increased odds of requiring ventilatory support. This study was not powered to examine mortality, but initial analyses found no differences in mortality by race/ethnicity. Results from these two studies suggest disparities in COVID-19 outcomes by race/ethnicity and highlight the need to proactively address the needs of rheumatic disease patients experiencing inequitable health outcomes during the pandemic. This may be even more of concern for vulnerable

groups, given recent evidence of a chronic post-viral syndrome associated with COVID-19 disease, in which patients continue to experience symptoms after SARS-CoV-2 infection has cleared (“long-haulers”) [50]. The possibility of patients living with an additional chronic disease has the potential to further impact their rheumatic disease activity and quality of life.

A call to the rheumatology community

Given the higher burden of both rheumatic disease and COVID-19 among racial/ethnic minorities, it is essential for the rheumatology community to appropriately plan and take actions to reduce COVID-19 disparities in this high-risk population [51,52]. We propose four actionable goals for the rheumatology community to focus on in the immediate future (Table 1).

Table 1
Actionable goals at the rheumatologist, community, and government/public policy levels to reduce racial/ethnic disparities in COVID-19.

Goal	Rheumatologist's Role	Community Action and Advocacy	Government and Public Policy
<p>Data Collection Accurately capturing and measuring racial and ethnic diversity in patients and communities</p>	<p>Capture accurate race and ethnicity data, and socioeconomic data, whenever possible, to contribute to ongoing studies in rheumatology and infectious diseases. Harness the power of social media and patient-reported outcomes for data collection purposes.</p>	<p>Advocate for more routine collection of race and ethnicity by institutions and community agencies so that necessary data to conduct research on the magnitude of racial/ethnic disparities are available</p>	<p>Implement policies to mandate collection of race and ethnicity in data sources and encourage more research on racial/ethnic disparities and COVID-19</p>
<p>Risk awareness and testing Ensuring high-risk patients are appropriately educated and tested, with an emphasis on racial/ethnic minorities</p>	<p>Create informational materials in multiple languages about risks and precautions, as well as testing availability to high-risk communities. Create and implement guidelines for recruiting study participants from diverse racial and ethnic backgrounds.</p>	<p>Encourage communities of color to participate in appropriate studies to further medical education and knowledge</p>	<p>Increase testing sites in areas of high incidence; make testing available regardless of insurance and/or symptoms Target efforts to high-risk racial/ethnic minority groups, including those who 1) are essential workers; 2) have comorbidities; 3) are over age 65; 4) are on medications that increase risk of infections; 5) live in a high-density household</p>
<p>Vaccination Ensuring that when a vaccine is available, all patients are provided an opportunity to receive one, with an emphasis on racial/ethnic minorities</p>	<p>Make vaccination sites available regardless of insurance; target at-risk populations; conduct effective campaigning (multiple languages, outreach from members of the community)</p>	<p>Multi-staged and specific efforts to increase the acceptability of a COVID-19 vaccine before its arrival, especially among historically marginalized communities</p>	<p>Prioritize effectively communicating to diverse groups, via multiple languages, the benefits of adhering to vaccine implementation plan for COVID-19</p>
<p>Research on racial/ethnic disparities More research examining racial/ethnic disparities in rheumatology</p>	<p>Design and conduct studies and clinical trials on racial/ethnic disparities in rheumatic disease patients</p>	<p>Call for more population-based studies examining differences in health outcomes based on racial/ethnic groups in order to highlight disparities in the population</p>	<p>Develop new and timely guidelines for managing and limiting the health disparities stemming from infectious disease outbreaks among historically marginalized communities and patients with rheumatic diseases</p>

Data collection

First, it is important to ensure that appropriate data sources are being used that capture the experience of nonwhite populations diagnosed with COVID-19. Race and ethnicity, along with socioeconomic status, and social determinants of health must be systematically and accurately captured in electronic health records and research studies, as it is crucial to understanding whether health disparities exist in relation to disease outcomes, including COVID-19 [53]. Rheumatologists within health systems may consider spearheading efforts to capture this information within their clinics and any studies being conducted at their sites. Research has also shown that diverse communities are likely to contribute COVID-19 related content on social media [54]; therefore, researchers may consider harnessing the power of digital health among these communities to capture information on patient-reported outcomes [55], while also implementing programs to address health literacy among rheumatic disease patients with COVID-19 [56].

Risk awareness and testing

Second, it is essential to ensure that high-risk patients are aware of COVID-19 risks and precautions, and tested appropriately, and testing efforts should be targeted to racial and ethnic minorities who may develop severe infection, including those who: 1) are essential workers, or share a household with someone who is an essential worker; 2) have comorbidities; 3) are over the age of 65; 4) are on medications that increase the risk of infections and/or severe COVID-19 outcomes (e.g. glucocorticoids); and/or 5) are living in a high-density household. This will involve targeted outreach in areas with a high incidence of disease [57]. In the case that hospitals and clinics do not already provide this type of information to their patients, rheumatologists should consider developing materials or counseling patients (in person or remotely) as best as possible. Materials should aid in improving patient education not only regarding SARS-CoV-2 infection, but also generate healthy behaviors that could potentially aid in reducing other types of infections. Effective control of COVID-19 and reduced burden of disease will also require increasing testing sites and availability in areas of high incidence and making testing available to patients regardless of insurance or symptoms. Rheumatologists should advocate for their patients to have access to testing and help them navigate testing procedures, especially those that are at highest risk.

Vaccination

Third, once a vaccine is available and thought to be safe in people with rheumatic diseases, targeted outreach will be needed in areas of high incidence of disease but also in populations that are less likely to receive a vaccination. Plans for outreach might incorporate digital health and social media with specialized outreach plans for communities of color [58]. The American College of Rheumatology (ACR) is in full support of the rigorous testing of a safe and effective vaccine before its widespread use and encourages researchers to create clinical trials that represent diverse populations [59]. Ensuring that the vaccine is available and that all patients are provided an opportunity to receive one will be essential, especially in patients who are high-risk. In addition to making the vaccine open to individuals regardless of insurance, effective outreach may prove helpful; for example, having members of the community advocate for vaccination, and providing materials in multiple languages. Rheumatologists and other clinicians play an important role in building trust with their patients in promoting vaccination once available.

Research on racial/ethnic disparities

Lastly, more population-based research is needed examining COVID-19 characteristics in the rheumatic disease population across various racial and ethnic groups, including clinical trials of vaccine development. Findings from these studies are urgently needed because the results may inform future guidelines for health management, identify high-risk individuals, and further our understanding of the underlying mechanisms driving racial/ethnic disparities in COVID-19.

Summary

The devastating effects of SARS-CoV-2 are unprecedented. Nonwhite communities are disproportionately affected by COVID-19, and this is also seen among patients with rheumatic disease. There are currently only two studies that address the racial and ethnic differences in rheumatic patients with COVID-19 [48,49]. Additional research is needed to understand the disproportionate adverse health outcomes among minority patients with rheumatic disease, and whether these disparities exist across cities, states, and countries around the world. Furthermore, research is needed to discover how communities are addressing the social, racial, and ethnic inequalities for COVID-19, and attention should be drawn to mitigating the underlying factors contributing to health disparities, including structural racism [60,61]. The pandemic has highlighted a multitude of health disparities across the world, proving to be devastating to all people, including those with rheumatic disease. Although the effects of COVID-19 have impacted millions, work remains in the fight against the pandemic, and rheumatologists can play an important role in improving the health of our most vulnerable patients.

Practice points

- Evidence shows that racial and ethnic minority patients with rheumatic disease experience worse COVID-19 outcomes compared to white patients.
- Disparities in outcomes are multifactorial, likely including comorbidities, socioeconomic factors, and access to testing and treatment.

Research agenda

- Actionable steps are needed to improve health outcomes of rheumatic disease patients at high-risk of developing severe infection at the rheumatologist, community, and government/public policy level.
- More work is needed in designing and conducting diverse studies on racial/ethnic disparities in rheumatic disease patients diagnosed with COVID-19, including those related to vaccine development.

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Declaration of Competing Interest

TT has nothing to disclose.

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References

- [1] Centers for Disease Control and Prevention. CDC COVID data tracker [cited 2020 September 23]. Available from: https://covid.cdc.gov/covid-data-tracker/#cases_casesinlast7days. [Accessed 1 October 2020].
- [2] Galea S, Abdalla SM. COVID-19 pandemic, unemployment, and civil unrest: underlying deep racial and socioeconomic divides. *J Am Med Assoc* 2020;324:227–8.
- [3] Laurencin CT, McClinton A. The COVID-19 pandemic: a call to action to identify and address racial and ethnic disparities. *J Racial Ethn Health Disparities* 2020;7:398–402.
- [4] Abedi V, Olulana O, Avula V, et al. Racial, economic, and health inequality and COVID-19 infection in the United States. *J Racial Ethn Health Disparities* 2020:1–11.
- [5] Gross CP, Essien UR, Pasha S, et al. Racial and ethnic disparities in population-level Covid-19 mortality. *J Gen Intern Med* 2020:1–3.
- [6] Meneses-Navarro S, Freyermuth-Enciso MG, Pelcastre-Villafuerte BE, et al. The challenges facing indigenous communities in Latin America as they confront the COVID-19 pandemic. *Int J Equity Health* 2020;19:63.
- [7] Pan D, Sze S, Minhas JS, et al. The impact of ethnicity on clinical outcomes in COVID-19: a systematic review. *EClinicalMedicine* 2020;23:100404.
- [8] Yazdany J. COVID-19 in rheumatic diseases: a research agenda. *Arthritis Rheum* 2020. <https://doi.org/10.1002/art.41447>.
- [9] Gianfrancesco M, Hyrich KL, Al-Adely S, et al. Characteristics associated with hospitalisation for COVID-19 in people with rheumatic disease: data from the COVID-19 Global Rheumatology Alliance physician-reported registry. *Ann Rheum Dis* 2020;79(7):859–66.
- [10] Webb Hooper M, Nápoles AM, Pérez-Stable EJ. COVID-19 and racial/ethnic disparities. *J Am Med Assoc* 2020;323:2466–7.
- [11] Karaca-Mandic P, Georgiou A, Sen S. Assessment of COVID-19 hospitalizations by race/ethnicity in 12 states. *JAMA Intern Med* 2020:e203857. <https://doi.org/10.1001/jamainternmed.2020.3857>.
- [12] Thakur N, Lovinsky-Desir S, Bime C, et al. Health equality and diversity committee of the American thoracic society. The structural and social determinants of the racial/ethnic disparities in the U.S. COVID-19 pandemic: what's our role? *Am J Respir Crit Care Med* 2020. <https://doi.org/10.1164/rccm.202005-1523PP>.
- [13] Price-Haywood EG, Burton J, Fort D, Seoane L. Hospitalization and mortality among Black patients and white patients with Covid-19. *N Engl J Med* 2020;382:2534–43.
- [14] Poulson M, Geary A, Annesi C, et al. National disparities in COVID-19 outcomes between Black and white Americans. *J Natl Med Assoc* 2020;S0027–9684(20):30149–58.
- [15] Aldridge RW, Lewer D, Katikireddi SV, et al. Black, Asian and Minority Ethnic groups in England are at increased risk of death from COVID-19: indirect standardisation of NHS mortality data. *Wellcome Open Res* 2020;5:88.
- [16] Yaya S, Yeboah H, Charles CH, et al. Ethnic and racial disparities in COVID-19-related deaths: counting the trees, hiding the forest. *BMJ Global Health* 2020;5:e002913.
- [17] Mishra S, Gayen A, Haque SM. COVID-19 and urban vulnerability in India. *Habitat Int* 2020;103:1–11.
- [18] Baqui P, Bica I, Marra V, et al. Ethnic and regional variations in hospital mortality from COVID-19 in Brazil: a cross-sectional observational study. *Lancet Glob Health* 2020;8:e1018–26.
- [19] Jones J, Sullivan PS, Sanchez TH, et al. Similarities and differences in COVID-19 awareness, concern, and symptoms by race and ethnicity in the United States: cross-sectional survey. *J Med Internet Res* 2020;22:e20001.
- [20] Ferdinand K, Batieste T, Fleurestil M. Contemporary and future concepts on hypertension in african Americans: COVID-19 and beyond. *J Natl Med Assoc* 2020;112:315–23.
- [21] Yehia BR, Winegar A, Fogel R, et al. Association of race with mortality among patients hospitalized with coronavirus disease 2019 (COVID-19) at 92 US hospitals. *JAMA Netw Open* 2020;3:e2018039.
- [22] Karaye IM, Horney JA. The impact of social vulnerability on COVID-19 in the U.S.: an analysis of spatially varying relationships. *Am J Prev Med* 2020;59:317–25.
- [23] Holmes Jr L, Enwere M, Williams J, et al. Black-white risk differentials in COVID-19 (SARS-CoV2) transmission, mortality and case fatality in the United States: translational epidemiologic perspective and challenges. *Int J Environ Res Publ Health* 2020;17:4322. <https://doi.org/10.3390/ijerph17124322>. Published 2020 Jun 17.
- [24] McClure ES, Vasudevan P, Bailey Z, et al. Racial capitalism within public health: how occupational settings drive COVID-19 disparities. *Am J Epidemiol* 2020. <https://doi.org/10.1093/aje/kwaa126>. kwaa126.
- [25] Bui DP, McCaffrey K, Friedrichs M, et al. Racial and ethnic disparities among COVID-19 cases in workplace outbreaks by industry sector - Utah, March 6-June 5, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:1133–8.
- [26] Vahidy FS, Nicolas JC, Meeks JR, et al. Racial and ethnic disparities in SARS-CoV-2 pandemic: analysis of a COVID-19 observational registry for a diverse US metropolitan population. *BMJ Open* 2020;10:e039849.
- [27] Lieberman-Cribbin W, Tuminello S, Flores RM, Taioli E. Disparities in COVID-19 testing and positivity in New York City. *Am J Prev Med* 2020;59:326–32.
- [28] Hirth J. Disparities in HPV vaccination rates and HPV prevalence in the United States: a review of the literature. *Hum Vaccines Immunother* 2019;15:146–55.
- [29] Lu PJ, O'Halloran A, Williams WW, et al. Racial and ethnic disparities in vaccination coverage among adult populations in the U.S. *Am J Prev Med* 2015;49:S412–25.
- [30] Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated? *Vaccine* 2020;38:6500–7.
- [31] Borno HT, Zhang S, Gomez S. COVID-19 disparities: an urgent call for race reporting and representation in clinical research. *Contemp Clin Trials Commun* 2020;19:100630.
- [32] Hirsch J, Mehta B, Finik J, et al. Racial disparities in pre-operative pain, function and disease activity for patients with rheumatoid arthritis undergoing Total knee or Total hip Arthroplasty: a New York based study. *BMC Rheumatol* 2020;4:17.
- [33] Chung MP, Dontsi M, Postlethwaite D, et al. Increased mortality in Asians with systemic sclerosis in northern California. *ACR Open Rheumatol* 2020;2:197–206.
- [34] Ferucci ED, Johnston JM, Gaddy JR, et al. Prevalence and incidence of systemic lupus erythematosus in a population-based registry of American Indian and Alaska Native people, 2007-2009. *Arthritis Rheum* 2014;66:2494–502.

- [35] Maningding E, Dall'Era M, Trupin L, et al. Racial and ethnic differences in the prevalence and time to onset of manifestations of systemic lupus erythematosus: the California lupus surveillance project. *Arthritis Care Res (Hoboken)*. 2020;72:622–9.
- [36] Julián-Santiago F, García-García C, García-Olivera I, et al. Epidemiology of rheumatic diseases in Mixtec and Chontal indigenous communities in Mexico: a cross-sectional community-based study. *Clin Rheumatol* 2016;35:35–42.
- [37] Dall'Era M, Cisternas MG, Snipes K, et al. The incidence and prevalence of systemic lupus erythematosus in san Francisco county, California: the California lupus surveillance project. *Arthritis Rheum* 2017;69:1996–2005.
- [38] Bruce B, Fries JF, Murtagh KN. Health status disparities in ethnic minority patients with rheumatoid arthritis: a cross-sectional study. *J Rheumatol* 2007;34:1475–9.
- [39] Barton JL, Trupin L, Schillinger D, et al. Racial and ethnic disparities in disease activity and function among persons with rheumatoid arthritis from university-affiliated clinics. *Arthritis Care Res (Hoboken)* 2011;63:1238–46.
- [40] Gómez-Puerta J, Gloria V. What impact do race and ethnicity have on lupus mortality? *Int J Clin Rheumatol* 2015;10:223–6.
- [41] Alarcón GS, McGwin Jr G, Bastian HM, et al. Systemic lupus erythematosus in three ethnic groups. VII [correction of VIII]. Predictors of early mortality in the LUMINA cohort. LUMINA Study group. *Arthritis Rheum* 2001;45:191–202.
- [42] Alarcón GS, Calvo-Alén J, McGwin Jr G, et al. Systemic lupus erythematosus in a multiethnic cohort: LUMINA XXXV. Predictive factors of high disease activity over time. *Ann Rheum Dis* 2006;65:1168–74.
- [43] Uribe AG, McGwin Jr G, Reveille JD, Alarcón GS. What have we learned from a 10-year experience with the LUMINA (Lupus in Minorities; Nature vs. nurture) cohort? Where are we heading? *Autoimmun Rev* 2004;3:321–9.
- [44] Lim SS, Helmick CG, Bao G, et al. Racial disparities in mortality associated with systemic lupus erythematosus - Fulton and DeKalb counties, Georgia, 2002–2016. *MMWR Morb Mortal Wkly Rep* 2019;68:419–22.
- [45] Greenberg JD, Spruill TM, Shan Y, et al. Racial and ethnic disparities in disease activity in patients with rheumatoid arthritis. *Am J Med* 2013;126:1089–98.
- [46] Ehrenfeld M, Tincani A, Andreoli L, et al. Covid-19 and autoimmunity. *Autoimmun Rev* 2020;19:102597.
- [47] Gianfrancesco M, Yazdany J, Robinson PC. Epidemiology and outcomes of novel coronavirus 2019 in patients with immune-mediated inflammatory diseases. *Curr Opin Rheumatol* 2020;32:434–40.
- [48] Fernandez-Ruiz R, Masson M, Kim MY, et al. Leveraging the United States epicenter to provide insights on COVID-19 in patients with systemic lupus erythematosus. *Arthritis Rheum* 2020. <https://doi.org/10.1002/art.41450>.
- [49] Gianfrancesco MA, Leykina L, Izadi Z, et al. Race/ethnicity association with COVID-19 outcomes in rheumatic disease: data from the COVID-19 global rheumatology alliance physician registry. *Arthritis Rheumatol* 2020 Nov 3. <https://doi.org/10.1002/art.41567>. Online ahead of print.
- [50] Rubin R. As their numbers grow, COVID-19 “long haulers” stump experts. *J Am Med Assoc* 2020;324:1381–3.
- [51] Siroitch E, Hausmann JS. Removing barriers and disparities in health: lessons from the COVID-19 pandemic. *Nat Rev Rheumatol* 2020. <https://doi.org/10.1038/s41584-020-00524-8>.
- [52] Feldman CH, Ramsey-Goldman R. Widening disparities among patients with rheumatic diseases in the COVID-19 era: an urgent call to action. *Arthritis Rheum* 2020. <https://doi.org/10.1002/art/41306>.
- [53] Kawachi I. COVID-19 and the “rediscovery” of health inequities. *Int J Epidemiol* 2020. <https://doi.org/10.1093/ije/dyaa159>.
- [54] Campos-Castillo C, Anthony D. Racial and ethnic differences in self-reported telehealth use during the COVID-19 pandemic: a secondary analysis of a U.S. Survey of internet users from late March [Preprint] *J Am Med Inf Assoc* 2020. Available from: <https://pubmed.ncbi.nlm.nih.gov/32909015/>. [Accessed 30 September 2020].
- [55] Gandrup J, Yazdany J. Using health information technology to support use of patient-reported outcomes in rheumatology. *Rheum Dis Clin N Am* 2019;45:257–73.
- [56] Katz P, Dall'Era M, Trupin L, et al. The impact of limited health literacy on patient-reported outcomes in systemic lupus erythematosus. *Arthritis Care Res (Hoboken)* 2020. <https://doi.org/10.1002/acr.24361>.
- [57] National Institutes of Health. NIH funds community engagement research efforts in areas hardest hit by COVID-19 [press release] (2020 Sep 16) [cited 2020 Sep 16]. Available from: <https://www.nih.gov/news-events/news-releases/nih-funds-community-engagement-research-efforts-areas-hardest-hit-covid-19>.
- [58] Hausmann JS, Sufka P, Bhana S, et al. Conducting research in a pandemic: the power of social media. *Eur J Rheumatol* 2020;7:S85–8.
- [59] American College of Rheumatology. Information from the American College of rheumatology regarding vaccination against SARS-CoV-2 [press release] (2020 Sep 23) [cited 2020 Sep 23]. Available from: <https://www.rheumatology.org/Portals/0/Files/ACR-Information-Vaccination-Against-SARS-CoV-2.pdf>.
- [60] Hsu HE, Ashe EM, Silverstein M, et al. Race/ethnicity, underlying medical conditions, homelessness, and hospitalization status of adult patients with COVID-19 at an urban safety-net medical center - Boston, Massachusetts, 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:864–9.
- [61] Ingraham NE, Purcell LN, Karam BS, et al. Racial/ethnic disparities in hospital admissions from COVID-19 and determining the impact of neighborhood deprivation and primary language [Preprint] medRxiv 2020. Available from: <https://pubmed.ncbi.nlm.nih.gov/32909015/>. [Accessed 30 September 2020].