

# Time to Reflect and Take Action on Health Disparities and Health Inequities

Susan Salmond ▼ Caroline Dorsen

The United States healthcare system underperforms in healthcare access, quality, and cost resulting in some of the poorest health outcomes among comparable countries, despite spending more of its gross national product on healthcare than any other country in the world. Within the United States, there are significant healthcare disparities based on race, ethnicity, socioeconomic status, education level, sexual orientation, gender identity, and geographic location. COVID-19 has illuminated the racial disparities in health outcomes.

This article provides an overview of some of the main concepts related to health disparities generally, and in orthopaedics specifically. It provides an introduction to health equity terminology, issues of bias and equity, and potential interventions to achieve equity and social justice by addressing commonly asked questions and then introduces the reader to persistent orthopaedic health disparities specific to total hip and total knee arthroplasty.

The U.S. healthcare system underperforms in healthcare access, quality, and cost resulting in some of the poorest health outcomes among comparable countries, despite spending more of its gross national product on healthcare than any other country in the world (Commonwealth Fund, 2021; Salmond & Echevarria, 2017). Within the United States, there are significant healthcare disparities based on race, ethnicity, socioeconomic status, education level, sexual orientation, gender identity, and geographic location (Healthy People 2020, n.d.a). Although the issue of health disparities is not new, the coronavirus disease-2019 (COVID-19) pandemic has illuminated these inequities.

Over 35 years ago, the U.S. government convened a group of experts to study the health status of “minorities” (more modern nomenclature, which will be used whenever possible in this article, is Black, indigenous and other people of color, or BIPOC) (see Box 1). The results, released in the *Report of the Secretary’s Task Force on Black and Minority Health (Heckler Report)*, documented the existence of shocking racial disparities in health outcomes in the United States. Margaret Heckler, the U.S. Department of Health and Human Services (HHS; 1985) secretary at the time, responded to the report stating that the plague of health inequities

is “an affront both to our ideals and to the ongoing genius of American medicine” (Gracia, 2015). The report put reduction of health inequities, especially among BIPOC, on the national agenda. Key policy and research centers such as the HHS Office of Minority Health and the National Center on Minority Health and Health Disparities, which ultimately became the National Institute on Minority Health and Health Disparities, were established. During the nearly four decades since the publication of the Heckler Report, *Healthy People*, which guides national health promotion and disease prevention efforts to improve the health of the nation, has set national strategy to address disparities. *Healthy People’s* progressive goals include (1) reduce health disparities (Healthy People 2000, n.d.a), (2) eliminate health disparities (Healthy People 2010), (3) achieve health equity and eliminate disparities (Healthy People 2020, n.d.a) and, in the latest version, *Healthy People 2030*, to (4) expand health equity focus to consider social determinants of health (the conditions in which people are born, grow, live, work, and age that shape health), health literacy, and well-being. Other key policy initiatives have been the promulgation of the National Culturally and Linguistically Appropriate Services Standards, HHS Action Plan to Reduce Racial and Ethnic Health Disparities, The National Partnership for Action to End Health Disparities, and the Affordable Care Act.

Prioritization and interest in the reduction of health disparities extend well beyond the federal level. In 2003, the Institute of Medicine (now the National Academy of Medicine, NAM) published the landmark report, *Unequal Treatment: Confronting Racial and Ethnic*

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## Box 1. LANGUAGE USED IN THE ARTICLE

In this article we used the term “BIPOC” (black, indigenous, and people of color) but this is a relatively new term and is currently not without its critics. “People of color” or “patient of color” refers to individuals who do not identify as White. “White” as a race, is defined using the U.S. Census Bureau definition “A person having origins in any of the original people of Europe, The Middle East, or North Africa.” Note that an individual’s response to a question about race is based on self-identification.

We do recognize that “people of color” includes people of many ethnicities and races including African Americans, Asian Americans, Native Americans, Pacific Islander American, multiracial Americans, and some Latino Americans, and that members of these communities are more likely to identify through these communities than as “people of color.” “People of color,” however, does emphasize the common experiences of systemic racism faced by most, if not all, non-White communities.

Throughout the narrative and in the evidence tables, we used the term “Black” to refer to populations or individuals referred in the corresponding studies as “African American” and/or “Black.” As the published studies rarely record or report the richness of ethnic and racial information beyond labels, we too were limited by the racial categories used in the primary articles.

*Disparities in Health Care* (Institute of Medicine, 2003). This report charted the history of unequal healthcare for BIPOC in the United States, and highlighted the existence and persistence of racial and ethnic health disparities even after controlling for disease severity, socioeconomic status, education, and access. Significant findings included BIPOC were less likely to receive preventive health services, often received lower-quality care across the care continuum, and had poorer health outcomes including lower quality of life and a higher incidence of functional impairment and mortality than their White counterparts. Nearly 10 years later, the follow-up report, “How Far Have We Come in Reducing Health Disparities? Progress Since 2000” (Institute of Medicine, 2012) documented the persistence of stark health disparities over time and across the life course, despite the dramatic increase in public and governmental awareness of health. Recognizing these disparities, numerous organizations have prioritized working toward health equity through community action and research, including Robert Wood Johnson Foundation, the Kellogg Foundation, and the Kaiser Family Foundation.

## Health Disparities in Orthopaedics

The field of orthopaedics is not immune to health inequities. There is clear documentation of disparities in the treatment of musculoskeletal disorders, which collectively are a leading cause of disability accounting for nearly 70 million physician office visits per year and an estimated 130 million total health care encounters including outpatient, hospital and emergency room visits (Centers for Disease Control and Prevention [CDC], n.d.a). For example, significant disparities are seen in access to care for, and outcomes associated with, hip and knee arthroplasty, fracture treatment, and pain management (Amen et al., 2020; Dykes & White, 2009).

Responding to data on inequities in orthopaedic care and outcomes, the American Academy of Orthopaedic Surgeons, the Orthopaedic Research Society, and the Association of Bone and Joint Surgeons sponsored a research symposium in May 2010 to better understand musculoskeletal healthcare disparities and initiated a “call to arms” to eliminate these disparities. The subsequent 2011 report, *Movement Is Life: A Catalyst for Change* prioritized an action plan for eliminating racial disparities in musculoskeletal care (Movement Is Life Caucus, 2011). That action plan includes three recommendations: the first, “Sound the Alarm” recommends researching and disseminating information to energize people to address musculoskeletal health disparities; the second recommendation, “Mirror Success,” encourages the acceleration of development and adoption of solutions that address disparities; and the third, “Open Communication Lines” recommends the facilitation of better patient and provider understanding of the unique needs of women and BIPOC.

As well, the orthopaedic community has begun to acknowledge and address the lack of diversity of the orthopaedic workforce as a potential contributor to inequities. Orthopaedics has the lowest percentage of both BIPOC and female providers of all medical and surgical subspecialties (Day et al., 2019). Increased diversity of healthcare providers leads to improved access to and utilization of care by underrepresented groups, such as racial/ethnic minorities, as well as improved patient satisfaction (Smedley et al., 2004). Improving the diversity of the orthopaedic workforce may have a significant impact on patient outcomes, especially among historically underrepresented groups.

## The Role of Nurses in Addressing Health Inequities

Working to lessen disparities is an essential part of the nursing role and reflects the values, vision and mission of the profession. In the past year, multiple major nursing organizations have acknowledged that racism is a public health threat, and made statements about the overdue need to address bias, stigma, and discrimination in our profession, organizations, and institutions. Despite inclusion in major nursing documents, such as the American Nurses Association and International Council of Nurses Codes of Ethics, health disparities and inequities, and the underlying roots of these differences including racism, have been underaddressed in nursing. The publishing of the National Academy of Medicine Report, *The Future of Nursing 2020–2030: Charting a Path to Achieve Health Equity* (National Academies of Sciences, Engineering, and Medicine, 2021) addresses building the capacity of the nursing workforce to engage in advancing health equity, addressing social determinants of health, and meeting social needs of individuals and families (National Academies of Sciences, Engineering, and Medicine, 2021). It provides eight recommendations and 37 sub-recommendations that are needed to strengthen the nursing workforce to significantly contribute to advancing health equity. These recommendations are outlined in the article, *The Future of Nursing: Application of*

*Health Equity in Orthopaedics*, in this issue. The *Future of Nursing* report calls on all nurses to stop and reflect on the state of health disparities in the United States, understand the contributing factors, and how we as nurses can take action to promote health equity for all.

This article provides an overview of some of the main concepts related to health disparities generally, and in orthopaedics specifically. It provides an introduction to health equity terminology, issues of bias and equity, and potential interventions to achieve equity and social justice by addressing commonly asked questions and then introduces the reader to persistent orthopaedic health disparities specific to arthritis and knee and hip surgical intervention (total hip and total knee arthroplasty). As one article cannot address all of orthopaedics, this article focuses on the management of osteoarthritis and the use of total hip arthroplasty (THA) and total knee arthroplasty (TKA) as exemplars for addressing orthopaedic inequities. Differential outcomes according to race/ethnicity and gender are examined and issues related to implicit biases that may impact payment, patient preference, and body type are explored. The hope is that this article will serve as a starting point for deeper reflection, conversation, and action around health disparities.

## What Are Health Differences, Disparities, and Inequities?

### HEALTH DIFFERENCES

- *Football players have a higher incidence of knee injuries than those who do not play football.*
- *Due to static postures, dentists are more apt to develop cervical herniated intervertebral disc compared with the general population.*
- *Adults between 50 and 70 years have higher incidence rates of symptomatic osteoarthritis of either the hand, knee, or hip as compared with younger cohorts.*

These are differences, but not disparities. Differences can be identified through epidemiologic studies that examine prevalence and incidence. However, they are not related to systematic social, economic, or environmental disadvantage (see later).

### HEALTH DISPARITIES AND INEQUITIES

The following are examples of *health disparities*:

- *Black, American Indian, and Alaska Native people are two to three times more likely to die from pregnancy-related causes than White people (CDC, 2019).*
- *The mortality rate for Black infants is twice that of infants born to non-Hispanic White mothers (Office of Minority Health, n.d.a, n.d.b).*
- *Sexual minority adolescents (lesbian, gay, and bisexual) report a greater incidence of depression, anxiety, and suicidal behaviors than heterosexual adolescents (Healthy People 2020, n.d.b).*
- *The rural south leads in mortality rates for nearly all top 10 causes of death (Rural Health Information Hub, n.d.).*

- *Women are diagnosed later than men for more than 700 diseases (Westergaard et al., 2019).*
- *There is strong evidence of racial/ethnic disparities in pain burden and pain management in both cancer pain and noncancer pain (Samuel et al., 2019).*

Whereas health differences are just that—differences—disparities are measures of *inequities*, or differences in health access and/or outcomes between socially advantaged and socially disadvantaged or marginalized population groups (Agency for Health Care Research and Quality, n.d.; Braveman, 2006). Disadvantage is a systematic experience of unfavorable social, economic, environmental, or political conditions based on relative position in a hierarchy (Braveman, 2014b). Groups higher in position (considered dominant groups) have more assets and resources, and this translates to improved opportunity, access, and health outcomes. Nondominant groups are devalued and disempowered and have less allocation of societal opportunities and may be regarded as inferior (Bonilla-Silva, 2006; Williams et al., 2019). This applies to many groups of people, based on demographic or identity characteristics such as age, race/ethnicity, sex, sexual orientation and gender identity, socioeconomic class (educational level, income, and occupation), country of birth, disability status, and geographic location as well as other characteristics associated with discrimination or marginalization (Agency for Health Care Research and Quality, n.d.; Braveman, 2014a; Braveman et al., 2011).

Health disparities are measured by comparing health indicators between the “dominant” or more advantaged group and the less dominant or more disadvantaged group (Braveman, 2006; Dean et al., 2016). Table 1 illustrates this concept for common identities based on the dominant discourse and the ultimate consequences of this social status in creating “isms” (Robinson, 1999) that perpetuate the status quo and contribute to inequities and disparities. It is essential to note that individuals often belong to more than one group, and therefore, may have overlapping health and social inequities, as well as overlapping strengths and assets. The concept of intersectionality helps us understand the exponential impact of multiple, intersecting marginalized identities on health and health outcomes (Kapilashrami & Hankivsky, 2018).

## Social Justice

The World Health Organization (WHO) further expands the definition of disparities to identify disparities as an issue of social justice. The WHO puts forth that health inequities (the underlying contributing factor(s) or structural or institutional patterns that result in disparities) are “differences in health status or in the distribution of health resources between different population groups, arising from the social determinants of health or the conditions in which people are born, grow, live, work and age.” The WHO goes on to point out that “health inequities are unfair and could be reduced by the right mix of government policies” (WHO, 2018).

**TABLE 1. VISIBLE AND INVISIBLE IDENTITIES**

Race	Gender Identity	Sexual Orientation	Physical Ability	Class
<i>Dominant United States discourses: Advantage</i>				
Whites	Cisgender men (i.e., people who were both born male and currently identify as men)	Heterosexuals	Able-bodied	Middle class or higher
<i>Dominant United States discourses: Disadvantage</i>				
Black, indigenous, people of color (BIPOC)	Cisgender women and gender minorities, including transgender and nonbinary and gender nonconforming persons	Sexual minorities, including lesbian, gay, bisexual, and others	Persons with disabilities	People with lower incomes, people experiencing poverty, people who are unhoused
<i>Consequences of dominant discourses</i>				
Racism	Sexism, transphobia	heterosexism, homo- and bi-phobia	Ableism	Classism

Overcoming inequities or systemic, preventable, and unjust differences in health outcomes require tackling the root causes for these differences (American Medical Association, 2021). Getting at the roots means understanding the social, economic, environmental, and structural disparities that make people sick (Castrucci & Auerbach, 2019). It requires both an acknowledgment of the harmful effects of the past and a sincere and in-depth examination of contemporary inequities in the healthcare system and other social institutions. Only by changing community conditions will we truly create health equity.

### WHAT ARE HEALTH EQUITY AND SOCIAL JUSTICE? WHY EQUITY AND NOT EQUALITY?

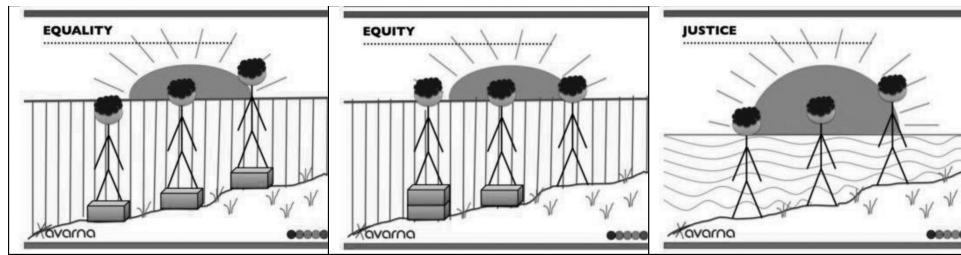
Health equity means that every individual has a fair and just opportunity to be as healthy as possible and no one is disadvantaged from achieving this potential because of their social position or other socially determined circumstances (Brennan Ramirez et al., 2008). Underlying health equity is the basic tenet that health is a human right and calls for action to equalize opportunities to be healthy (Braveman et al., 2011). Equality, a core value of the United States, suggests that resources or opportunities should be distributed equally across individuals and groups. This type of equality can result in further continuation of differential outcomes—outcomes that do not address the underlying inequity. This concept (equality) is illustrated in the first image in Figure 1—all of the stick figures are the same height, symbolizing that all people are equally valuable human beings, despite being different from each other. However, the foundation on which these three stick figures stand, is unequal. In the first image in Figure 1, the first stick figure still cannot see over the fence that obscures the sunrise over the ocean, whereas the second and third figures can see over the fence. In the middle image in Figure 1, the wooden boxes on which the stick figures stand take into consideration that persons and groups have different circumstances (as symbolized by the hill on which the stick figures stand). To this end, different resources and opportunities (as symbolized by the two boxes under one stick figure and the single box under the other) are provided to reach an equal outcome (i.e., each of the

individuals can now see over the fence and view the sunrise on the other side). In the third image in Figure 1, efforts to remove barriers (in this case the fence that obscured the sunset has been removed) bring justice to all. The removal of the fence is symbolic of efforts that might include, for example, rebuilding a criminal justice system that is restorative rather than punitive, establishing educational systems that are excellent regardless of neighborhood, and removing discrimination that acts as a barrier to education or jobs.

Health disparities are the metrics we use to assess our progress toward achieving health equity. Examining how disparities change over time—whether they are consistent, narrowing, or widening—is critical to planning priorities around health equity. Social justice goes beyond allocating resources differentially and focuses on removing the sources of the inequities or “fixing systems in a way that leads to long-term, sustainable, equitable access for generations to come” (Milken Institute School of Public Health, 2020).

### How Did the COVID-19 Crisis Draw Attention to Health Disparities and Inequities?

Despite the recognition and documentation of U.S. health disparities for decades, many disparities have persisted, and in some cases, widened over the past 20 years. The COVID-19 global pandemic brought the issue of disparities to the forefront of the national scene. Although it was originally thought that COVID might be a “great equalizer”—meaning that everyone was more or less at the same risk of COVID morbidity and mortality—data show that people at greater social disadvantage have experienced a far greater burden of disease than their more advantaged counterparts. For example, people of color fared worse compared with their White counterparts, with greater mortality, intensive care needs, suffering, and sacrifice (Kapilashrami & Bhui, 2020). This is due to the complex relationship between physical health, mental health, and social health/opportunity. Understanding COVID-19 as both a pandemic and a syndemic helps to explain these disparate outcomes as a consequence of economic and social marginalization.



**FIGURE 1.** Equality versus equity and social justice. Image credit: Xavarna. “And ... Here’s yet another equity v., equality (v. justice) image series.” <https://theavarnagroup.com/and-heres-yet-another-equity-v-equality-v-justice-image-series/>

The science of syndemics examines the biosocial complexities of disease. It suggests that comorbidities are not simply coexisting illnesses. Rather, the science of syndemics examines the linkages and adverse interactions among comorbidities, and between comorbidities and social determinants of health. In the case of COVID, we saw that underlying comorbidities, such as hypertension, diabetes, and asthma, put people at higher risk for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Horton, 2020). BIPOC not only tend to have a higher prevalence of these underlying comorbidities, but are also often employed in essential worker settings such as healthcare facilities, farms, factories, grocery stores, and public transportation, placing them in higher risk settings and in positions where working from home was not an option. The aggregation of underlying comorbidities on a background of social and economic disparity, combined with barriers to accessing healthcare, exacerbates the adverse effects of each separate disease or social condition and places the individual and population at greater susceptibility to harm and more negative health outcomes (Gravlee, 2020; Horton, 2020; Nikiphorou et al., 2019).

It is imperative to understand that these diseases are not independent of the social contexts in which they are found. In fact, these linkages, and the subsequent health inequities, are a direct result of “poverty, stigmatization, discrimination, marginalization, stress, structural racism, or structural violence” (Mendenhall & Like, 2020; Singer et al., 2017, p. 941). For example, in the case of COVID-19, morbidity and mortality increased among essential workers, many of whom were people with less social capital than those who were able to quarantine safely at home (Khazanchi et al., 2020). To effectively respond to this complexity requires not only attention to the biologic interaction of multiple comorbidities, but also to the social determinant context of people’s lives that may contribute to adversity, healthcare access, and outcomes. This necessitates a truly holistic and personalized approach to thinking about how we promote health, and prevent and treat illness.

## Racial Reckoning and Health Equity

At the same time as the COVID pandemic was illuminating the role of economic, environmental, and social inequities on health and health disparities, the murder of George Floyd, a Black man, accused of using a counterfeit \$20 bill brought the reality of racial injustice in the

United States into the living rooms of everyone in the country. The tragedy of his senseless arrest and murder brought renewed and long overdue attention to the societal and public health crisis of racism.

Racism, not race, is a root cause or critical driver of health disparities (Boyd et al., 2020). Race is a social categorization, *not* a biological category. We now know that genes have little to do with the racial patterns of health and disease. Instead, disparities reflect ongoing social and economic inequity patterns stemming from long-standing social policy—laws, rules, and practices, sanctioned and embedded in our economic, cultural and social system and norms (Bailey et al., 2021). These policies and practices constitute structural racism and maintain a racial hierarchy with BIPOC more frequently residing in neighborhoods with significant socioeconomic challenges, greater exposures to environmental toxins, lower tax bases, fewer jobs, and fewer services (Gee, 2016). Ongoing exposure to overt racism, subtler forms of racism such as implicit bias and microaggressions (everyday verbal, nonverbal, and environmental slights, snubs, or insults, whether intentional or unintentional, which communicate hostile, derogatory, or negative messages to target persons based solely upon their marginalized group membership), and discrimination, has a detrimental impact on health and overall well-being (Williams & Mohammed, 2013). This limited access to opportunity, greater exposure to risk and stress, and less opportunity for preventive activities place these individuals and communities at greater risk (Boyd et al., 2020). Understanding this requires a shift in thinking from a framework where the focus is on proximal causes for disease (diet, cholesterol levels, exercise, substance use, etc.) to a framework where one considers what puts people at risk. These social conditions—the conditions in the places where people live, learn, work, and play—are also referred to as “upstream” factors or conditions. By examining upstream conditions for social determinants of health and investing resources and support targeting these upstream issues, it is more likely to result in real health outcome change (Link & Phelan, 1995).

By acknowledging racism as a public health crisis that contributes to disparities and health inequities, it focuses attention on the underlying structures and systems contributing to disparities rather than blaming health differences on individual behaviors. Confronting racism as a public health crisis will require individuals, organizations, and municipalities to critically reflect on race, power, and privilege and its contribution to inequity. Such a reflection needs to then be followed by

allocation of resources and strategic action. The American Nurses Association, the American Academy of Nursing, the American Association of Colleges of Nursing, and the American Medical Association among many other organizational groups have published position papers highlighting racism as a public health crisis that impacts the mental, spiritual, and physical health of all people (American Nurses Association, 2020). All have called for active antiracist strategies addressing the continuum of interpersonal racism and unconscious bias to systemic and institutional racism, known to perpetuate ongoing disparities.

## Orthopaedic Health Disparities

Arthritis is a leading cause of disability in the United States and osteoarthritis is a leading cause of arthritis-related disability (CDC, n.d.a). An estimated 45% of adults in the United States are at risk for developing symptomatic knee osteoarthritis. Impacting about 32.5 million U.S. adults, the incidence of osteoarthritis is similar or greater among Black and Hispanic populations as compared with Whites (Dunlop et al., 2001; Helmick et al., 2009) although the disabling effects of arthritis in terms of activity and work limitations and presence of severe pain are disproportionately prevalent in racial/ethnic minorities (CDC, n.d.b; Arthritis Health Disparity Statistics). Total hip arthroplasty and TKA are cost-effective, efficacious treatments for more severe arthritis with outcomes of decreased pain, improved physical function, and quality of life (Zhang et al., 2008). Despite the consensus of the value of arthroplasty, racial and ethnic minority groups in the United States have lower utilization of this procedure (Dunlop et al., 2008; Emejuaiwe et al., 2007; Skinner et al., 2003). One of the objectives of *Healthy People 2010* calls for eliminating racial disparities in the rate of TKA among persons older than 65 years.

As arthroplasty can potentially improve the health of many Americans, it is important that we understand, track, and resolve racial and/or ethnic disparities (Zhang et al., 2016). Racial disparities associated with arthroplasty have been identified in: (1) rates in use of arthroplasty; (2) hospital metric outcomes; and (3) postoperative outcomes (Amen et al., 2020). The majority of studies examining these disparities have focused on a comparison of Black and White populations, with little data on other minority groups (Mehta et al., 2018; Wu et al., 2021). Unfortunately, much of the literature examining outcomes THA and TKA does not examine race.

### PREVALENCE DISPARITIES IN USE OF TKA AND THA

Black, Hispanic, Asian, Native American, and mixed-race patients are less likely than their White counterparts to receive joint arthroplasty treatment for advanced hip and knee osteoarthritis (Dunlop et al., 2008). These disparities are not recent but have been noted since the 1980s and 1990s (Baron et al., 1996; Katz et al., 1996; McBean & Gornick, 1994). Dunlop et al. (2003) reported that Whites were 1.5 times more likely than Black or Hispanic individuals to be treated with TKA even after controlling for economic

access (income, assets, education, and health insurance) and functional levels. Similarly, Skinner et al. (2003) examined rates of TKA by race using Medicare fee-for-service claims from 1998 through 2000 and found the same trends—the annual rate of TKA was higher for non-Hispanic White women compared with Hispanic and Black women. The rate for White men was higher than that of Hispanic men and more than double that for Black men. In an early study by Jones et al. (2005), these similar disparities were found in a universally insured population of patients from the Veterans Affairs system. African American patients were significantly less likely than White patients to undergo TKA. Tables 2–4 provide evidence from the last 20 years examining disparities in rates, hospital metrics, and patient outcomes for THA and TKA by race.

Table 2 presents data examining prevalence rates of arthroplasty, particularly THA and TKA, by race. This evidence shows that despite many national initiatives to reduce this gap, racial disparities persist and are more pronounced among men than women (Hanchate et al., 2008). Even with similar incidences in osteoarthritis among White, Black, and Hispanic patients, and in some cases greater symptomatic incidence among those who were Black (Dunlop et al., 2008), the access to hip and knee arthroplasty continues when comparing White with Black patients (12%–50% difference) or White with Hispanic patients (5%–40% difference) (CDC, 2009; Helmick et al., 2009; Jha et al., 2005; Lan & Kamath, 2017; Skinner et al., 2006; Singh et al., 2014). Regrettably, evidence shows the gap in usage is not only continuing, but worsening (Amen et al., 2020; Best et al., 2021; Helmick et al., 2009; Singh et al., 2014; Zhang et al., 2016). Klemm et al. (2021) report similar disparities in THA/TKA revision with underutilization by ethnic minority groups despite higher failure rates as compared with White patients.

Of particular note is the study by Kim et al. (2021) who examined differences in prevalence rates before and after the enactment of the Comprehensive Care for Joint Replacement (CJR) model through Medicare. Comprehensive Care for Joint Replacement provides bundled payment and quality measurement for TKA and THA with the expectation that the bundled and quality approach will enhance coordination of care. They found continuation of racial disparities in receipt of elective hip or knee replacement among Black beneficiaries, not Hispanic beneficiaries. Similar findings were reported by Thirukumaran et al. (2021) who found that CJR did not impact THA rates but was associated with modest reductions in TKA use for Black in comparison to White beneficiaries, and no difference in rates among those who were Hispanic.

### HOSPITAL METRIC OUTCOME DISPARITIES

The literature examining racial variations in hospital metrics is reported in Table 3. Black patients have more negative hospital metrics as compared with White patients with longer length of stay (LOS) (Amen et al., 2020; Lan & Kamath, 2017; Larrieux, 2017; Singh et al., 2014). There is a greater likelihood that Black patients will be discharged to a skilled nursing facility as

**TABLE 2. PREVALENCE OF ARTHROPLASTY BY RACE/ETHNICITY**

	Sample	Aims	Significant Findings <sup>a</sup>																												
Skinner et al., 2003	All Medicare fee-for-service claims data for 1998 through 2000. 430,726 knee arthroplasties were performed during the 3-year study period.	To determine the incidence of TKA according to hospital referral region, sex, race, or ethnic group.	<ul style="list-style-type: none"> <li>The annual rate of knee arthroplasty was higher for non-Hispanic White women (5.97 procedures per 1,000) than for Hispanic women (5.37 per 1,000) and Black women (4.84 per 1,000).</li> <li>The rate for non-Hispanic White men (4.82 procedures per 1,000) was higher than that for Hispanic men (3.46 per 1,000) and more than double that for Black men (1.84 per 1,000)<sup>b</sup>.</li> <li>For the Hispanic population and for Black women, racial or ethnic disparities at the national level were due in part to geographic differences rather than to differences in the rates for different racial and ethnic groups within geographic areas.</li> <li>Residential segregation and low-income levels contributed to racial and ethnic disparities in arthroplasty rates.</li> <li>Rates of procedures greater for Whites than Blacks.</li> <li>Differences in these rates did not narrow meaningfully during the 10-year examination.</li> </ul>																												
Jha et al., 2005	Data from Medicare beneficiaries enrolled for fee-for-service programs from 1992 to 2001.	To examine trends in the rate of use of nine major procedures among Black persons and White persons enrolled in Medicare between 1992 and 2001 (including back surgery, THA, and TKA).	<table border="1"> <thead> <tr> <th></th> <th>Whites</th> <th>Blacks</th> <th>Difference</th> </tr> </thead> <tbody> <tr> <td>1992 THA</td> <td>1.96</td> <td>0.86</td> <td>1.10<sup>b</sup></td> </tr> <tr> <td>2001 THA</td> <td>2.60</td> <td>1.08</td> <td>1.52<sup>a</sup></td> </tr> <tr> <td>1992 TKA</td> <td>3.47</td> <td>1.19</td> <td>2.28<sup>b</sup></td> </tr> <tr> <td>2001 TKA</td> <td>5.05</td> <td>1.85</td> <td>3.25<sup>a</sup></td> </tr> <tr> <td>1992 back</td> <td>3.05</td> <td>1.59</td> <td>1.46<sup>b</sup></td> </tr> <tr> <td>2001 back</td> <td>4.70</td> <td>2.51</td> <td>2.19<sup>a</sup></td> </tr> </tbody> </table>		Whites	Blacks	Difference	1992 THA	1.96	0.86	1.10 <sup>b</sup>	2001 THA	2.60	1.08	1.52 <sup>a</sup>	1992 TKA	3.47	1.19	2.28 <sup>b</sup>	2001 TKA	5.05	1.85	3.25 <sup>a</sup>	1992 back	3.05	1.59	1.46 <sup>b</sup>	2001 back	4.70	2.51	2.19 <sup>a</sup>
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1992 THA	1.96	0.86	1.10 <sup>b</sup>																												
2001 THA	2.60	1.08	1.52 <sup>a</sup>																												
1992 TKA	3.47	1.19	2.28 <sup>b</sup>																												
2001 TKA	5.05	1.85	3.25 <sup>a</sup>																												
1992 back	3.05	1.59	1.46 <sup>b</sup>																												
2001 back	4.70	2.51	2.19 <sup>a</sup>																												
Dunlop et al., 2008	6 years of prospective data from the Health and Retirement Study (HRS), which collected data on adults ≥51 years. Total n = 16,713	To examine racial/ethnic differences in the use of THA and TKA in pre-retirement adults (51–64) and older adults ≥65 years.	<ul style="list-style-type: none"> <li>During the study period, the gap between Whites and Blacks for total hip replacement widened in 17 of these 20 hospital-referral regions.</li> <li>For both age groups, symptomatic arthritis greatest in Blacks.</li> </ul> <table border="1"> <thead> <tr> <th rowspan="2">Age</th> <th colspan="2">Symptomatic Arthritis</th> </tr> <tr> <th>Black</th> <th>White</th> </tr> </thead> <tbody> <tr> <td>51–64</td> <td>43%</td> <td>33%</td> </tr> <tr> <td>≥65</td> <td>58%</td> <td>48.6%</td> </tr> <tr> <td colspan="3">Arthroplasty (hip and knee) rates per 1,000</td> </tr> <tr> <td>51–64</td> <td>5.2</td> <td>7.5</td> </tr> <tr> <td>≥65</td> <td>3.8</td> <td>6.0</td> </tr> <tr> <td></td> <td></td> <td>9.7<sup>a</sup></td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>For persons ≥65 years, after adjusting for demographics, health needs, and medical access, older Black adults and Hispanic adults are significantly less likely to use arthritis-related hip/knee surgeries compared with White adults.</li> <li>There is no significant difference in utilization rates between Blacks and Whites in the 51- to 64-year age group; however, the numbers having surgery were low.</li> </ul>	Age	Symptomatic Arthritis		Black	White	51–64	43%	33%	≥65	58%	48.6%	Arthroplasty (hip and knee) rates per 1,000			51–64	5.2	7.5	≥65	3.8	6.0			9.7 <sup>a</sup>					
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(continues)

**TABLE 2. PREVALENCE OF ARTHROPLASTY BY RACE/ETHNICITY (Continued)**

	Sample	Aims	Significant Findings <sup>a</sup>
Helmick et al., 2009	National and state TKA rates for Medicare enrollees for the period of 2000–2006.	To examine TKA rates among Whites and Blacks for the period of 2000–2006.	<ul style="list-style-type: none"> <li>TKA rates for Blacks was 37% lower than for Whites in 2000 and 39% lower in 2006.</li> <li>The disparity was slightly lower among women (23% in 2000 and 28% in 2006) but the Black/White disparity increased across all age groups among women.</li> </ul>
Singh et al., 2014	Data from the U.S. Medicare Program (MedPAR data) for years 1991–2008 to identify four separate cohorts of patients (primary TKA, revision TKA, primary THA, revision THA).	To examine usage rates of TKA and THA among Black and White Medicare beneficiaries at different time points.	<ul style="list-style-type: none"> <li>1991: primary TKA was 36% lower for Blacks compared with Whites.</li> <li>2008: primary TKA was 40% lower for Blacks compared with Whites.</li> <li>At both points, use of THA was lower among Blacks than Whites and the level of disparity was consistent over time.</li> </ul>
Zhang et al., 2016	Using all-payer State Inpatient databases: Data from 8 years (2001–2008) in eight racially diverse states (Arizona, Colorado, Iowa, North Carolina, New Jersey, Rhode Island, Wisconsin and Florida). Included 547,380 admissions for TKA.	To examine racial disparities in the use of TKA in high-volume hospitals.	<ul style="list-style-type: none"> <li>Overall, minorities were found to have significantly lower rates of TKA utilization and were less likely to go to high-volume hospitals as compared with Whites.</li> <li>Looking at the data from 2002 to 2008, the disparity gap increased                             <ul style="list-style-type: none"> <li>The difference between Blacks and Whites with respect to TKA utilization increased from 0.53 per 1,000 in 2002 to 0.70 per 1,000 in 2008 (a 32% increase).</li> <li>During the same period, the disparities also become worse for Hispanics (a 38% increase) and mixed-race individuals (a 22% increase).</li> </ul> </li> </ul>
Jan & Kamath, 2017	Single institutional database of 2,869 hip or knee arthroplasty patients.	To determine whether socioeconomic, gender, or race factors impacted LOS and postacute rehabilitation status after TKA or THA.	<ul style="list-style-type: none"> <li>Minority status and nonprivate insurance status are strong predictors for longer LOS.</li> <li>Gender was not a statistically significant predictor of longer LOS.</li> <li>Black and Asian patients were discharged more frequently to SNFs, when compared with White patients who were discharged more frequently to home with home health services.</li> <li>Females were discharged more frequently to SNFs than males who were discharged to home with home health services.</li> <li>Managed care patients have shorter LOS than nonmanaged care patients.</li> </ul>
Wang et al., 2018	Pooled data from 21,294 adults ≥50 years from the 1999–2014 National Health and Nutrition Examination Survey.	To examine whether the use of inflexible eligibility criteria related to (1) BMI, (2) HbA1c level, and (3) smoking status potentially decrease the odds of lower extremity joint arthroplasty eligibility for members of racial-ethnic minority groups, women, and those of lower socioeconomic status more than it does for non-Hispanic Whites, men, and those of higher socioeconomic status.	<ul style="list-style-type: none"> <li>The BMI &lt;35-kg/m<sup>2</sup> criterion resulted in lower arthroplasty eligibility for non-Hispanic Blacks compared with non-Hispanic Whites, women vs. men, individuals of lower socioeconomic status vs. those of higher socioeconomic status, and those with a high school degree or less vs. those with a degree beyond high school.</li> <li>The HbA1c &lt;8% criterion resulted in lower arthroplasty eligibility for non-Hispanic Blacks and Hispanics vs. non-Hispanic Whites, for individuals of lower socioeconomic status vs. those of higher socioeconomic status, and for those with a high school degree or less vs. those with a degree beyond a high school degree.</li> <li>Excluding smokers resulted in lower arthroplasty eligibility for non-Hispanic Blacks vs. non-Hispanic Whites, for individuals of lower socioeconomic status vs. those of higher socioeconomic status, and for those with a high school degree or less vs. those with a degree beyond a high school degree.</li> </ul>
Amen et al., 2020	Medicare and Medicaid services 2006–2015. 5,442,646 TKA procedures 2,644,193 THA procedures.	To examine TKA and THA rates.	<ul style="list-style-type: none"> <li>Black patients had lower median income, more likely to be insured by Medicaid and more likely to be treated in an urban teaching hospital.</li> <li>Rates per 10,000 below</li> </ul>

	Whites	Blacks	Difference
2006 TKA	20.8	8.0	12.8
2015 TKA	28.7	13.4	15.3
2006 THA	9.6	3.5	6.1
2015 THA	16.2	7.2	9

(continues)



**TABLE 2. PREVALENCE OF ARTHROPLASTY BY RACE/ETHNICITY (Continued)**

	Sample	Aims	Significant Findings <sup>a</sup>
Wu et al., 2021	54,582 patients drawn from 2018 data in the American College of Surgeons National Surgical Quality Improvement Program (ACSNSQIP) database.	To examine whether racial disparities exist in outpatient compared with inpatient TKA.	<ul style="list-style-type: none"> <li>Blacks had the lowest rate of outpatient TKA (18.3%).</li> <li>Caucasian, Asian, and Hispanic patients were more likely to undergo outpatient TKA.</li> <li>Black patients had a higher BMI and ASA score and overall comorbidity burden preoperatively.</li> <li>When controlling for comorbidities, race was not an independent risk factor inpatient vs. outpatient surgery. The differences in indication for outpatient TKA between races/ethnicities was associated with comorbidity burden and preoperative baseline differences, not race alone.</li> </ul>
MacFarlane et al., 2018	Subgroup drawn from a nationwide, RCT named VITAL (Vitamin D and Omega-3 Trial) who presented with likely knee osteoarthritis based on severity of knee pain, physician-diagnosed knee osteoarthritis, and an inability to walk two to three blocks without pain. Subgroup $n = 1,070$ .	To investigate racial variation in TKA procedures in a diverse cohort with severe knee pain followed in an ongoing clinical trial. This study varies from many in that the denominator used to identify disparities is an at-risk denominator, consisting of individuals with severe knee pain and likely knee OA, rather than otherwise healthy individuals.	<ul style="list-style-type: none"> <li>Black participants reported significantly worse baseline WOMAC pain and function.</li> <li>Black participants were less likely to undergo TKA (11% vs. 19%).</li> <li>After adjustment, the hazard ratio for TKA for Black vs. White participants showed ~50% lower hazards of having a TKA compared with White participants despite Black participants reporting more knee pain and worse function at baseline.</li> <li>The wide racial disparity in TKA rates was not significantly modified by socioeconomic factors, but the interaction of race and socioeconomic factors approached significance suggesting that although socioeconomic factors should not be overlooked in the discussion of racial disparity in TKA, these factors do not completely explain the observed disparity.</li> </ul>
Best et al., 2021	National inpatient data from 2012 to 2017 from the National Inpatient Sample database.	To analyze whether national initiatives are associated with improvement in racial disparities between White and Black patients in the use of nine surgical procedures in the United States (reporting THA and TKA).	<ul style="list-style-type: none"> <li>The race-adjusted procedural incidence was higher for White than Black patients for every procedure analyzed at every time point in the study, for both men and women.</li> <li>Findings show widening racial disparities for THA and TKA usage.</li> </ul>
Thirukumar et al., 2021	2013–2017 Medicare Provider Analysis and Review inpatient claim files (data pulled from the 67 mandatory CJR model geographic areas and those from the 104 areas not in CJR areas so not required to participate in the CJR program).	To examine the association of the CJR model with racial/ethnic and socioeconomic disparities in the use of elective THA and TKA among older Medicare beneficiaries after accounting for the population of patients who were at risk or eligible for these surgical procedures.	<ul style="list-style-type: none"> <li>CJR model was associated with modest reductions in TKA use for non-Hispanic Black Medicare beneficiaries with both dual and non-dual eligibility, in comparison to non-Hispanic White non-dual-eligible beneficiaries.</li> <li>This worsening of the disparities is important because it is superimposed on substantial and persistent preexisting inequality in TKA use (non-Hispanic White non-dual-eligible beneficiaries were twice as likely to undergo TKA as non-Hispanic Black dual-eligible beneficiaries before the CJR model implementation).</li> <li>The CJR model was not associated with an increase in THA disparities.</li> <li>No evidence of changes in THA or TKA use that were associated with the CJR model for Hispanic beneficiaries vs. for non-Hispanic White non-dual-eligible beneficiaries.</li> </ul>

Note. ASA = American Society of Anesthesiologists; BMI = body mass index; CJR = Comprehensive Care for Joint Replacement; HbA1c = hemoglobin A1c; LOS = length of stay; OA = osteoarthritis; RCT = randomized controlled trial; SNF = skilled nursing facility; THA = total hip arthroplasty; TKA = total knee arthroplasty; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

<sup>a</sup>All reported results are statistically significant unless specifically reported as nonsignificant.

<sup>b</sup>Nonsignificant.

**TABLE 3. HOSPITAL METRICS BY RACE/ETHNICITY (LOS, DISCHARGE STATUS, AND READMISSIONS)**

Citation	Sample	Aims	Significant Findings <sup>a</sup>
Singh et al., 2014	Data from the U.S. Medicare Program (MedPAR data) for 1991–2008 to identify four separate cohorts of patients (primary TKA, revision TKA, primary THA, revision THA).	To examine 30-day readmission rates, LOS and discharge status of TKA and THA among Black and White Medicare beneficiaries at different time points.	<ul style="list-style-type: none"> <li>• 30-day readmission rates for Blacks receiving TKA were 6% higher than for Whites in 1991, and in 2008 the readmission rates for Blacks were 24% higher.</li> <li>• At all points, Blacks had longer LOS.</li> <li>• At all points, Blacks were less likely to be discharged to home.</li> </ul>
Oronce et al., 2015	A retrospective cohort study of patients discharged for an elective THA drawn from the Healthcare Cost & Utilization Project's State Inpatient Database from California, 2009–2011.	To identify disparities in 30-day readmissions after elective primary THA based on race, socioeconomic status, and type of insurance.	<ul style="list-style-type: none"> <li>• Overall rate of unplanned 30-day all-cause readmissions was 4.6%.</li> <li>• Blacks had higher risk of readmission than White patients after THA, when accounting for comorbidities and hospital factors.</li> <li>• Observed difference for Hispanic patients; however, was null after adjusting for socioeconomic status and payer.</li> <li>• Lower socioeconomic status was associated with higher odds of readmission.</li> <li>• Compared with private insurance, Medicare, Medicaid, and uninsured status were also associated with increased readmission risk.</li> </ul>
Lasater & Mchugh, 2016	Multiple linked data sources from 2006, including the Multi-State Nursing Care and Patient Safety Survey of registered nurses in four states (California, Florida, New Jersey, and Pennsylvania), the American Hospital Association (AHA) Annual Survey of hospital organizational characteristics, and the Medicare Provider Analysis and Review (MedPAR) dataset of hospitalizations. U.S. Census data from 2000 were used to derive a proxy measure of socioeconomic status. <i>n</i> = 106,848	To examine racial differences in readmissions of older adults undergoing elective total hip and knee replacement, to determine the relationship between nurse staffing and 30-day readmission, and to study whether the relationship between staffing and readmission differs for older Black and White adults.	<ul style="list-style-type: none"> <li>• Black participants were significantly younger, more likely to be female, and more likely to live in lower socioeconomic status areas.</li> <li>• Significant racial disparities in postoperative readmissions of older Black participants who underwent elective joint replacement, even after adjusting for participant and hospital characteristics, at a rate of 7.5 per 100 Black participants, vs. 5.6 per 100 White participants.</li> <li>• Black participants were more likely to be readmitted when cared for in hospitals with higher nursing workloads.</li> <li>• Nurse staffing was significantly associated with readmissions in all participants after adjusting for participant and hospital characteristics.</li> <li>• Race moderated the effect of staffing such that older Black participants had 15% higher odds of readmission with each additional patient per nurse, whereas their older White counterparts had 8% higher odds of readmission with each additional patient per nurse.</li> <li>• Black patients experienced significantly longer LOS than White patients (3.7 vs. 3.5 days).</li> <li>• Females discharged significantly more frequently to SNFs than males (56.3% vs. 43%).</li> <li>• Black and Asian patients discharged significantly more frequently to SNFs when compared to White patients (60.0%, 59.2% vs. 43.0%).</li> <li>• White patients were discharged significantly more frequently to home health than either Black or Asian patients (36.4%, 21.9%, 20.4%).</li> </ul>
Larrieux, 2017	A consecutive series of 2,869 patients who underwent a hip or knee arthroplasty procedure from 2007 to 2015 from a single institution.	To determine: (1) whether socioeconomic, gender, or race factors impacted post-acute rehabilitation care (PARC). (2) the influence of socioeconomic, gender, and race factors on LOS. (3) whether socioeconomic, gender, or race factors influenced costs after total joint arthroplasty (TKA or TIA).	<ul style="list-style-type: none"> <li>• LOS White 2.89; Black 3.05, and Hispanic 3.19.</li> <li>• The median length of postacute home healthcare was 20 days for the total study sample, whereas the median for Blacks and Hispanics was 23 and 24 days, respectively.</li> <li>• The median charge amount for physical therapy services in the acute care hospital was between \$1,110 and \$1,190 for White, Black, and others of the study population, but was \$1,413 for Hispanics.</li> <li>• More comorbidities (the sicker) and older beneficiaries were associated with longer acute hospital stays, greater amounts charged for physical therapy, and more days of home healthcare services.</li> </ul>
Larrieux, 2017	CMS assessment and claims file from CMS Chronic Conditions Data Warehouse. <i>n</i> = 249,060 beneficiaries undergoing THA in 2012.	To examine whether there are racial/ethnic differences in acute hospital length of stay, physical therapy costs, and home care days.	

(continues)

**TABLE 3. HOSPITAL METRICS BY RACE/ETHNICITY (LOS, DISCHARGE STATUS, AND READMISSIONS) (Continued)**

Citation	Sample	Aims	Significant Findings <sup>a</sup>																		
Arroyo et al., 2019	This analysis extends beyond the Medicare population, and uses administrative hospitalization and discharge data from Healthcare Cost and Utilization Project's State Inpatient Databases (SID) for California (2007–2011), Florida (2007–2014), New York (2007–2014), and Maryland (2012–2014).	To examine the impact that race/ethnicity, primary payer status, median income, and hospital volume have on readmissions after TKA.	<ul style="list-style-type: none"> <li>Racial/ethnic and socioeconomic disparities for both 30- and 90-day readmissions.</li> <li>Patients who identified as Black, had Medicare or Medicaid, lived in areas with the lowest median income quartile, and were treated at low procedure volume hospitals were independently associated with higher likelihoods of 30- and 90-day readmissions, compared with those who identified as White, had private insurance, lived in wealthier areas, and were treated at higher-procedure volume hospitals.</li> </ul>																		
Singh et al., 2019	Data from Pennsylvania Health Care Cost Containment Council Database, 2012–2015 107,768 patients.	To examine the relationship of race/ethnicity and discharge disposition and 90-day hospital readmission after elective TKA.	<ul style="list-style-type: none"> <li>Blacks &lt;65 years were more likely than White patients to be discharged to an inpatient rehabilitation facility or a skilled nursing facility.</li> <li>Blacks ≥65 years were more likely to be discharged to a skilled nursing facility.</li> <li>Difference in posthospital care remained significant even after adjusting for confounders, such as demographic characteristics, comorbidity, and facility characteristics.</li> <li>Blacks had higher odds of 90-day hospital readmission.</li> <li>For all age groups, discharge to an SNF was associated with higher odds of 90-day readmission.</li> </ul>																		
Amen et al., 2020	National Inpatient Sample queried Black and White patients who underwent TKA or THA between 2006 and 2015. The study included: 5,442,646 TKA procedures 2,644,193 THA procedures	To use a nationally representative sample to investigate trends in racial disparities in TJA (TKA and THA) perioperative metrics between Black and White patients from 2006 to 2015.	<ul style="list-style-type: none"> <li>Persistent White–Black disparities in LOS for both TKA and THA<sup>a</sup> (2006: 2.8 days vs. 3.0 days; 2015: 2.1 days vs. 2.3 days).</li> <li>Blacks had higher rates of discharge to a facility vs. home for both THA and TKA—this disparity increased over time.</li> </ul> <table border="1" data-bbox="687 478 891 919"> <thead> <tr> <th>Discharge to a Facility</th> <th>White</th> <th>Black</th> </tr> </thead> <tbody> <tr> <td>TKA 2006</td> <td>2006</td> <td>2015</td> </tr> <tr> <td>TKA 2015</td> <td>40.3%</td> <td>47.2%</td> </tr> <tr> <td>THA 2006</td> <td>23.4%</td> <td>34.2%</td> </tr> <tr> <td>THA 2015</td> <td>42.6%</td> <td>41.7%<sup>b</sup></td> </tr> <tr> <td>THA 2015</td> <td>23.4%</td> <td>29.2%</td> </tr> </tbody> </table>	Discharge to a Facility	White	Black	TKA 2006	2006	2015	TKA 2015	40.3%	47.2%	THA 2006	23.4%	34.2%	THA 2015	42.6%	41.7% <sup>b</sup>	THA 2015	23.4%	29.2%
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THA 2015	42.6%	41.7% <sup>b</sup>																			
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Wu et al., 2021	54,582 patients drawn from 2018 data in the American College of Surgeons National Surgical Quality Improvement Program (ACSNSQIP) database.	To examine differences and predictors of operative location and perioperative metrics after TKA between racial groups.	<ul style="list-style-type: none"> <li>TKA: After controlling for age, sex, smoking status, medical comorbidities, hospital characteristics, socioeconomic status, and insurance type, Black race was associated with higher rates of discharge to a facility and longer LOS.</li> <li>Blacks had the highest mean body mass index and comorbidity burden.</li> <li>Blacks had the lowest rate of outpatient TKA and were more likely to undergo inpatient surgery.</li> <li>Asians, Hispanics, and Whites were more likely to have outpatient surgery.</li> <li>Blacks had the highest rate of discharge to acute rehab/skilled nursing facility (19.3%).</li> <li>When controlling for comorbidities: <ul style="list-style-type: none"> <li>no significant difference in readmission rates by race</li> <li>race was not a predictor of inpatient vs. outpatient TKA</li> </ul> </li> <li>Whites were more likely to undergo outpatient surgery and less likely to be discharged to rehab/SNFs.</li> </ul>																		

Note. AHA = American Hospital Association; CMS = Centers for Medicare & Medicaid Services; LOS = length of stay; SNF = skilled nursing facility; THA = total hip arthroplasty; TJA = total joint arthroplasty; TKA = total knee arthroplasty.  
<sup>a</sup>All reported results are statistically significant unless specifically reported as nonsignificant.  
<sup>b</sup>Nonsignificant.

**TABLE 4. POSTOPERATIVE OUTCOMES: COMPLICATION, MORTALITY, AND FUNCTIONING**

Citation	Sample	Aims	Significant Findings <sup>a</sup>
Kamath et al., 2010	Sample of 185 patients receiving TKA in 2004.	To determine the influence of race, gender, and BMI on primary TKA functional scores and ROM before gender-specific implants and whether comorbidities influence ROM and functional scores.	<ul style="list-style-type: none"> <li>Gender and race affected ROM and knee function scores.</li> <li>Blacks had longer delays to presentation, higher BMI, and worse 2-year knee function score.</li> <li>Women (all races) had higher BMI and worse preoperative flexion/arc ROM.</li> <li>Black women had worse final ROM.</li> </ul>
Lavernia et al., 2010	Patients with a diagnosis of end-stage osteoarthritis who were scheduled for either primary or revision hip or knee arthroplasty.	<ol style="list-style-type: none"> <li>To determine and compare function and quality of life between Blacks and Whites at clinical presentation and at an average follow-up of 5 years after surgery.</li> <li>To determine whether differences in fear and anxiety of pain exist between races before surgery; and</li> <li>To explore the relationship of anxiety and fear of pain before surgery with function and quality of life before and after surgery as a function of race.</li> </ol>	<ul style="list-style-type: none"> <li>Blacks presented with worse scores on function, pain, physical function, and general health as compared with Whites both pre- and postoperatively.</li> <li>Blacks reported worse perceived general health and higher fear preoperatively compared with Whites.</li> </ul>
Singh et al., 2014	Data from the U.S. Medicare Program (MedPAR data) for 1991–2008 to identify four separate cohorts of patients (primary TKA, revision TKA, primary THA, revision THA).	To examine 30-day mortality following TKA and THA among Black and White Medicare beneficiaries at different time points.	<ul style="list-style-type: none"> <li>30-day mortality disparities decreased over time for Blacks compared with Whites having primary TKA and THA.</li> <li>30-day mortality disparities continued for Blacks undergoing revision TKA and THA.</li> </ul>
Lavernia & Villa, 2015	Retrospective sample using an institutional arthroplasty registry. 2,010 arthroplasties of which 1,446 were TKA and 564 were THA.	<ol style="list-style-type: none"> <li>To examine whether Black patients have more severe or more frequent preoperative pain, well-being, general health, and disease-specific scores when compared with White patients.</li> <li>To examine whether there are differences between Black patients and White patients after hip or knee arthroplasty on those same measures.</li> </ol>	<ul style="list-style-type: none"> <li>Black patients had more severe preoperative pain intensity and lower well-being and function scores.</li> <li>Black patients had more severe postoperative pain intensity and lower well-being and function scores.</li> <li>The differences were statistically significant but the differences were narrow and questioned the clinical significance.</li> </ul>
Goodman et al., 2016	4,035 patients undergoing TKA enrolled in a hospital-based registry between 2007 and 2011 who provided 2-year outcomes and lived in New York, Connecticut, or New Jersey.	<ol style="list-style-type: none"> <li>Are race and socioeconomic factors at the individual level associated with patient-reported pain and function 2 years after TKA?</li> <li>What is the interaction between race and community poverty and patient-reported pain and function 2 years after TKA?</li> </ol>	<ul style="list-style-type: none"> <li>Fewer Blacks had a college education or above, Blacks had significantly higher BMI and significantly more comorbidities than Whites. More Blacks lived in high-poverty neighborhoods.</li> <li>Race, education, patient expectations, and baseline WOMAC scores are all associated with 2-year WOMAC pain and function; however, the effect sizes was small, and below the threshold of clinical importance.</li> <li>Whites and Blacks from census tracts with less than 10% poverty have similar levels of pain and function 2 years after TKA.</li> <li>With increasing community poverty, pain and function worsened; from census tracts with &gt; 50% poverty Blacks had clinically meaningful worse pain and function compared with Whites.</li> <li>Comorbidities and preoperative pain and function scores were associated with worse outcomes.</li> </ul>

(continues)

**TABLE 4. POSTOPERATIVE OUTCOMES: COMPLICATION, MORTALITY, AND FUNCTIONING (Continued)**

Citation	Sample	Aims	Significant Findings <sup>a</sup>
Goodman et al., 2018	4,170 THA cases who agreed to be part of an institutional registry for THA between May 1, 2007, and February 5, 2011, and with complete data.	Determine whether neighborhood socioeconomic factors have a differential effect in Blacks and Whites on WOMAC pain and function 2 years after undergoing THA at the same high-volume hospital.	<ul style="list-style-type: none"> <li>Blacks had worse pain and function at baseline than White patients (7 points lower) despite presenting at a younger age and had more comorbidities than Whites at the time of surgery.</li> <li>WOMAC pain and function 2 years after THA are similar among Blacks and Whites in communities with little deprivation (low percent census tract Medicaid coverage).</li> <li>WOMAC function at 2 years is worse among Blacks in areas of higher deprivation.</li> <li>After controlling for relevant confounding variables, found that in addition to race and poverty, comorbidities and preoperative pain and function scores were associated with worse outcomes.</li> </ul>
Zhang et al., 2016	Using all-payer state inpatient databases.	Examined racial disparities in the THA outcomes including mortality and complications.	<ul style="list-style-type: none"> <li>Rates of complications were significantly higher for Blacks and mixed-race individuals as compared with Whites.</li> <li>Minorities found to have an increased comorbidity burden overall.</li> <li>Obesity much higher for Blacks and Hispanics.</li> <li>The risk of perioperative mortality was significantly higher for Blacks, Native Americans, and mixed-race individuals compared with Whites.</li> </ul>
Larrieux, 2017	CMS assessment and claims file from CMS Chronic Conditions Data Warehouse. <i>n</i> = 249,060 beneficiaries undergoing THA in 2012 and receiving postacute care physical rehabilitation through a Medicare-certified home healthcare agency.	To examine whether there are racial disparities in functional outcomes (transfer abilities, ambulation) and hospital outcomes (home care days) in patients undergoing THA.	<ul style="list-style-type: none"> <li>Differences in function were found between Black and White patients after controlling for potentially confounding factors such as comorbidities, age, gender, and/or SES.</li> <li>69% of Whites independent with transfer compared with 62% Black, 55% Hispanic.</li> <li>Hispanics five times more likely to be dependent compared with Whites.</li> <li>At time of discharge from home care, Blacks were 33% more likely to be dependent compared with Whites and Hispanics were 2.5 times more likely to be dependent when compared with Whites.</li> <li>Age and the number of comorbidities were predictors of the two primary outcomes of interest: transfers and ambulation/locomotion.</li> </ul>
Okike et al., 2019	U.S. health-care system total joint replacement registry of persons undergoing elective primary THA between 2001 and 2016.	To assess whether racial/ethnic disparities in THA outcomes persist in a universally insured population of patients enrolled in an integrated healthcare system.	<ul style="list-style-type: none"> <li>The results demonstrate generally similar or better THA outcomes in minority populations (Black, Hispanic, and Asian compared with White) in the Kaiser Permanente network, a multihospital, multiregion integrated health system.</li> <li>The study population was largely a working population with reasonably high income and education levels across all racial groups.</li> <li>The controlled, closed-system environment of Kaiser Permanente is different from the community, insurance, and practice environment of the rest of the nation.</li> <li>Lifetime all-cause revision was lower for Black, Hispanic, and Asian patients.</li> <li>Ninety-day emergency department visits were more common among Black and Hispanic patients.</li> <li>For all other postoperative events (90-day deep infection, 90-day venous thromboembolism, 90-day mortality, and 90-day readmission), similar outcomes were achieved for Black patients although they had several risk factors for adverse outcomes (such as lower income, lower educational attainment, and a greater number of comorbidities). Minority patients had similar or lower rates compared with White patients.</li> </ul>

(continues)

**TABLE 4. POSTOPERATIVE OUTCOMES: COMPLICATION, MORTALITY, AND FUNCTIONING (Continued)**

Citation	Sample	Aims	Significant Findings <sup>a</sup>
Amen et al., 2020	Medicare and Medicaid services 2006–2015 5,442,646 TKA procedures 2,644,193 THA procedures.	To use a nationally representative sample to investigate trends in racial disparities in TJA (TKA and THA) complications between Black and White patients from 2006 to 2015.	<ul style="list-style-type: none"> <li>Black patients undergoing TKA had more complications across the study period and significantly worsened between 2006 and 2015 (2006: 5.1% vs. 6.1%; 2015: 3.9% vs. 6.0%).</li> <li>Inpatient mortality higher for Black patients although overall rare and downward trending for both races.</li> <li>TKA: After controlling for age, sex, smoking status, medical comorbidities, hospital characteristics, socioeconomic status, and insurance type, Black race was associated with increased mortality and complications (PE, DVT, wound dehiscence, sepsis, UTI, and acute renal failure).</li> <li>THA: After controlling for age, sex, smoking status, medical comorbidities, hospital characteristics, socioeconomic status, and insurance type, Black race was associated with increased mortality and total complications (PE, DVT, cardiac arrest, sepsis, UTI, and acute renal failure).</li> </ul>
Cavanaugh et al., 2020	Data drawn from the Women's Health Initiative prospective study linked with Medicare claims data. Total sample size 10,325 women who underwent TKA between October 1, 1993, and December 31, 2014.	To examine trajectories of physical functioning (PF) by race/ethnicity before and after TKA among older women.	<ul style="list-style-type: none"> <li>Black women had significantly poorer PF than White women during the decades before and after TKA.</li> <li>Hispanic women also had slightly lower preoperative PF scores than White women, but this difference was not statistically significant.</li> <li>Poorer PF after surgery was associated with poorer preoperative PF.</li> <li>Differences in pre-TKA PF between Black and White women were more pronounced among women with SES characteristics below median levels compared with those with higher SES levels.</li> <li>Reducing disparities should target maintenance of function preoperatively in the early stages of arthritic disease and/or reduction of delays to receiving TKA once need arises.</li> </ul>
Trivedi et al., 2020	American College of Surgeons National Surgical Quality Improvement Program—all Black patients who underwent primary elective TKA between 2011 and 2017. $n = 19,496$	To examine recent annual trends in 30-day outcomes after primary elective TKA in a sample over time of Black patients.	<ul style="list-style-type: none"> <li>Over the study period, there were declining annual rates in LOS &gt;2 days, any surgical complication, pulmonary embolism, DVT, and sepsis.</li> <li>40% decline in 30-day adverse outcomes.</li> </ul>

Note. BMI = body mass index; CMS = Centers for Medicare & Medicaid Services; DVT = deep vein thrombosis; LOS = length of stay; PE = pulmonary embolism; PF = physical functioning; ROM = range of motion; SES = socioeconomic status; THA = total hip arthroplasty; TKA = total joint arthroplasty; TJA = total joint arthroplasty; TKA = total knee arthroplasty; UTI = urinary tract infection; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

<sup>a</sup>All reported results are statistically significant unless specifically reported as nonsignificant.

compared with home/home health (Amen et al., 2020; Lan & Kamath, 2017; Lasater & Mchugh, 2016; Singh et al., 2014, 2019), which is of concern, as discharge to locations other than home is associated with lower patient satisfaction and poorer clinical outcomes (Wu et al., 2021). Also, 30- and 90-day readmissions are greater for Black patients (Arroyo et al., 2019; Oronce et al., 2015; Wu et al., 2021).

There are other influencing and interacting factors contributing to these disparities. Older age and greater comorbidity burden were significantly associated with longer LOS (Larrieux, 2017). Comorbidity burden also influenced whether surgery was done as an inpatient or outpatient, and was a factor in readmission rates. Wu et al. (2021) found that Black patients were more likely than White, Asian, and Hispanic patients to have TKA in the inpatient versus outpatient setting and reported that, after controlling for comorbidities, there was no significant difference in readmission rates by race and race was not a predictor of inpatient versus outpatient TKA. The following variables also increased the odds of readmission: lower socioeconomic status (Arroyo et al., 2019; Oronce et al., 2015), Medicare, Medicaid, or uninsured status (Oronce et al., 2015; Xu et al., 2017), being treated at a low-procedure volume hospital (Arroyo et al., 2019), and being discharged to a skilled nursing facility (Wu et al., 2021).

Of note is that Black populations have greater social disadvantage as compared with Whites. These unfavorable social and economic conditions are factors in the health disparities experienced, potentially contributing to the more negative hospital metrics. Additionally, delayed timing in surgical intervention results in patients presenting with greater pain and dysfunction than patients receiving surgery earlier in the course of osteoarthritis. A number of authors found that African Americans experienced significantly greater pain, lower physical function, and lower well-being in THA/TKA preoperative function (Goodman et al., 2018; Kamath et al., 2010; Lavernia et al., 2010; Lavernia & Villa, 2015; Slover et al., 2010). Slover et al. (2010) report that lower physical functioning was also present in Hispanic patients.

## POSTOPERATIVE OUTCOME DISPARITIES

Although total joint arthroplasties generally have low complication rates, low readmission rates, and overall high patient satisfaction, racial disparities in postoperative outcomes are well documented with complication rates higher for patients from minority groups than for Whites, as shown in Table 4. Black patients have been shown to have higher postoperative pain (Lavernia & Villa, 2015; Mehta et al., 2018) and poorer functional outcomes (Goodman et al., 2018; Lavernia et al., 2010; Larrieux, 2017; Mehta et al., 2018; Shahid & Singh, 2016). Larrieux (2017) similarly found postoperative functional differences among Hispanic patients undergoing THA with Hispanic patients five times more likely to be dependent with transfer compared with Whites. Okike et al. (2019) examined whether racial/ethnic disparities in THA outcomes persist in a universally insured population of patients enrolled in a large, integrated healthcare system. Of note, they found similar or better THA outcomes in patients of color (Black,

Hispanic, and Asian) compared with White patients. Lifetime all-cause revision was significantly lower for all minority groups. There was no difference in 90-day complications (90-day deep infection, venous thromboembolism, readmission, and mortality) when comparing minority groups with the White group.

The similarity in outcomes between Black and White patient groups is especially important considering that Black patients had several risk factors for adverse outcomes such as lower income, lower educational attainment, and a greater number of comorbidities. The authors suggest that these positive results can be linked to universal access to care associated with membership in the health maintenance organization, standardized protocols associated with treatment in a managed care system that minimizes care variability, and the majority of THAs were performed by high-volume surgeons and facilities. The only disparity found in the study was higher rates of 90-day emergency department visits among Black and Hispanic patients compared with White patients.

## Factors Associated With Racial Disparity in Arthroplasty Utilization

The research is clear that racial and ethnic disparities in THA and TKA metrics exist. However, the contributing factors associated with these differences are not as clear and not as well researched. We do know that differences cannot be explained based on prevalence of osteoarthritis, as osteoarthritis of the hip and knee is equally prevalent across all racial and ethnic groups. Rather, there appears to be a multifaceted web of potential reasons (patient-level, provider-level, and system-level) that might explain why these racial and ethnic disparities in joint replacement have been so intransigent. Although multifaceted and complex, the outcomes reported by Okike et al. (2019) and Aseltine et al. (2019) are a testament to the reality that eliminating racial disparities is possible. Categories of factors attempting to explain variation among racial/ethnic groups have been identified as patient-specific, provider-specific, or system-related. This provides a mechanism for discussing relevant factors, but it must be noted that they are closely related (Irgit & Nelson, 2011).

## PATIENT-LEVEL FACTORS

As THA or TKA is an elective procedure, it seems apparent that patient preference plays an important role in decision-making on utilization of THA/TKA and time to THA/TKA. Hausmann et al. (2010) used patient survey data rating sociodemographic and clinical variables that could influence preferences for osteoarthritis treatment and concluded that there were racial differences in preferences for total joint replacement that accounted for disparities in utilization rates. This difference in preference has been linked with understanding, expectations, coping approaches, and fear.

Ibrahim et al. (2001) examined variations in self-care practices between elderly Black and White patients and found that those who identified as Black relied more heavily on home remedies, complementary care, and coping with the use of prayer for managing the symptoms of osteoarthritis. Figaro et al. (2004) held focus groups

of Black patients with advanced osteoarthritis and reported that the participants expressed preferences for natural remedies and against undergoing surgery.

Compared with Whites, Ibrahim et al. (2002a) and Cavanaugh et al. (2020) found that Black patients were less likely to have a comprehensive understanding of joint replacement as a form of treatment. Black patients also were less likely to have a family member or friend who had undergone the procedure (Cavanaugh et al., 2020; Ibrahim et al., 2002a; Mingo et al., 2013). Several studies show differing expectations of arthroplasty among White and Black patients, reporting that those who identified as Black did not believe TKA would improve knee pain or improve walking (Cavanaugh et al., 2020; Figaro et al., 2004; Ibrahim et al., 2001, 2002a; 2002b). Ang (2009) also found that Black patients perceived fewer benefits and greater risks from THA/TKA than White patients.

Suarez-Almazor et al. (2005) and Kwoh et al. (2015) examined determinants of preferences for TKA in patients with symptomatic osteoarthritis. Suarez-Almazor et al. examined White, Hispanic, and Black patients and Kwoh et al. examined White and Black patients. Willingness to undergo TKA was significantly higher among Whites. Shared factors across studies that contributed to the willingness among Black or Hispanic patients to undergo TKA included knowledge or a better understanding of the procedure, and more positive expectations about procedural outcomes—perceptions of a short hospital course, less postsurgical pain, and preoperative walking difficulty. Kwoh et al. also reported that Black patients who were less religious and tended to trust physicians were more willing to undergo TKA.

Although patient-level factors are often used to explain disparities, it is critical that nurses and other health providers stop placing the blame or rationale for deficits primarily at the patient level. It is time to ask additional questions to uncover the underlying causes for patient-level preferences. If a patient is unfamiliar with or unknowledgeable about a procedure, is the underlying problem the patient or the fact that there has not been appropriate individual or community education to inform and discuss expectations? Is the underlying problem the fact that only 12% of U.S. adults have proficient health literacy (HHS, n.d.) and the education provided to them does not take this into account? If the patient delays care and opts out of a surgical intervention, could the problem be that there is a lack of patient-provider racial and ethnic concordance? Minorities are underrepresented in the ranks of orthopaedic surgery—only 4.3% of orthopaedic surgeons are Black and 4.4% Hispanic or Latino (Poon et al., 2019). Or is the prevalence disparity a result of “mistrust, resignation, helplessness, hopelessness, and other manifestations of internalized racism based in the patient’s real or perceived mistreatment within healthcare” (Dykes & White, 2009, p. 2599)? If the problem is lack of trust in the provider or the healthcare system, is the real problem the patient or the fact that for many ethnic minorities there have been unethical abuses in medicine, ongoing mistreatment along with structural and institutional drivers that have allowed this mistreatment to occur, which contribute to hesitancy, lack of trust, and fear?

## PROVIDER-LEVEL FACTORS

Provider-level factors that have been identified include referral patterns, problems in patient-provider communication, and decision-making, which may be influenced by implicit bias.

*Ineffective communication* between patients and providers is a critical factor contributing to healthcare disparities. A systematic review by Shen et al. (2018) examined the effects of race and racial concordance on patient-physician communication. They found that Black patients experienced poorer communication quality, information giving, patient participation, and participatory decision-making in comparison to their White counterparts. Stereotype threat, the activation of negative stereotypes about stigmatized groups, can disrupt communication by creating patient anxiety and negative expectations impairing patients’ communication abilities, which may result in discounting of information from the provider, and failure to seek care (Williams & Mohammed, 2013).

Ibilbor and Moses (2021) note that shorter visit times, less rapport-building behaviors and statements, and lower participatory decision-making are unfortunate characteristics of patient-physician interactions for Black patients in racially discordant pairs. As there is a link between patient-centered communication and patient trust in their physician, poor-quality interactions may contribute to lower postvisit trust in physicians that Black patients report. Hamel et al. (2021) summarize problems in discordant physician-patient communication to include the patient’s tendency to “ask fewer questions and participate in decision making, and the physicians’ tendency to be less patient-centered, more verbally dominant, more contentious, exhibit fewer rapport building non-verbal behaviors and provide less information” (p. 1080). Using a nonverbal coding system to examine video recordings, Hamel et al. examined the data for nonverbal synchrony or the coordination of physical movement that occurs between two individuals during an interaction. They found that positive interactions occurred when physicians focus on immediacy behaviors such as smiling, gazing, and laughter, as these behaviors elicit a favorable and matching response from patients.

Shen et al. (2018) stressed the importance of educating providers to improve communication by focusing on patient-centeredness, information giving, partnership building, and patient engagement in communication. Provider communication that demonstrates cultural humility, a process of being aware of how people’s culture can impact their health behaviors and in turn using this awareness to cultivate sensitive approaches in treating patients (Prasad et al., 2016), has been linked with deeper connections and understanding between patients and providers.

Necessary for both cultural humility and reducing implicit bias is reflection on one’s own identity and its impact on how we view and receive others. Implicit bias operates on a largely unintentional basis and many providers may not even be aware of how it influences their behavior (Dykes & White, 2009), yet *implicit bias* is a factor in racial, socioeconomic, and gender inequities in



healthcare. Implicit bias may unconsciously alter one's perceptions and consequently affect behaviors, interactions, and decision-making (Marcelin et al., 2019). Chapman et al. (2013) suggest that uncertainty and time pressure may contribute to reliance on stereotypes during decision-making. They further identify that these stereotypes may be reinforced through a preservice educational approach that emphasizes population-level risk factors that may portray some minority groups in unfavorable circumstances. As these generalizations may be presented as research-based, the reader may believe that their perspective or actions based on those generalizations are objective.

Even in the absence of direct measurement of implicit bias, there are compelling data around pain medication treatment decisions for patients with musculoskeletal disorders that providers divide patients with similar clinical presentations along lines of race or ethnicity. Studies have shown that Hispanic and Black patients receive less analgesia compared with White patients even after adjusting for confounders (Dickason et al., 2015; Heins et al., 2006; Miner et al., 2006; Terrell et al., 2010). Although the assessment of pain severity was accurate, less analgesia was prescribed/administered to Black and Hispanic patients. Moreover, the perception of whether a patient was exaggerating symptoms was associated with the patient's ethnic background and the perceived quality of both the physician's and patient's perception of their interaction. It is essential to acknowledge how our implicit biases about our patients can contribute to unintended healthcare disparities.

Similarly, studies have shown the presence of implicit gender bias among physicians that unknowingly may sway decisions about arthroplasty treatment. Women are three times less likely than men to receive knee arthroplasty when clinically appropriate (Chapman et al., 2013). Although most physicians would deny that gender influences their decision-making, Borkhoff and colleagues' study (Borkhoff et al., 2008) challenged this. In the study, orthopaedic surgeons and family practitioners received identical vignettes of a patient with moderate unilateral knee pain and a radiograph revealing osteoarthritis with the exception that some vignettes involved a female patient and others a male patient. The odds of an orthopaedic surgeon recommending TKA to a male patient was 22 times that for a female patient. The odds of a family physician recommending TKA to a male patient was two times greater. Explanations for these differences were grounded in the implicit assumptions that men are more stoic than women or that men were more apt to engage in rigorous activities that would benefit from joint replacement.

## SYSTEM-LEVEL FACTORS

Healthcare system factors that lead to disparities are diverse in themselves and include factors such as lack of systems to screen for or consider social determinants of health, lacking a diverse workforce, lack of interpreters, poor access to care, and time constraints of practitioners. Decades of adverse effects of *social determinants of health* have influenced disparate health outcomes (Owen et al., 2020). We know that populations burdened by adverse social determinants face disproportionately

greater challenges and have more negative outcomes. Poverty overly affects people of color and most significantly Black patients (Noonan et al., 2016). Black and White patients living in communities with little poverty have similar patient-reported TKA outcomes, whereas in communities with high levels of poverty, there are important racial disparities with those in poverty experiencing more pain and worse function. Within these same communities with high levels of poverty, greater percentages of the population have earned no more than a high school degree. Education plays a role in mitigating the effect of poverty on TKA outcomes. In examining populations with advanced osteoarthritis, those with no college have worse pain and function and the interaction of education and community poverty produces even greater deficits (Goodman et al., 2018).

Communities experiencing greater social determinant barriers and poverty have a higher prevalence of obesity, a comorbid risk factor that may influence arthroplasty outcomes. It is critical to recognize that in these communities the social deprivations make it more difficult to lose weight. These areas have inadequate resources in terms of fresh produce and healthy food, often referred to as food deserts, but are rich in fast food options that are energy-dense, low-nutrient but more affordable. Moreover, the communities generally have higher rates of crime making them less safe for outdoor exercise, often recommended as an adjuvant to weight loss. Clearly modifying body mass index (BMI) is a greater challenge for these individuals due to the social and financial situations. Other social determinant factors found to be associated with disparities include built environment (i.e., transportation, healthcare systems, and informational networks), which can be lacking in neighborhoods with greater poverty. Although it is imperative that individuals be assessed for social needs, if we are to change the conditions that create disparities, it requires attention to social policy and laws across all governmental levels regarding allocation of resources. Also important are the development of guidelines for accreditation of institutions, the review of criteria for initial issuance, and renewal of professional licensing, as well as promulgation of Medicare (Centers for Medicare & Medicaid Services) regulations that recommend professional education on approaches to ensure health equity and the passing of local, state, and national laws and policies that promote health equity.

*Insurance regulations and bundled payments* are examples of regulations that may have a differential impact on health equity. Cost-containment strategies may discourage hospitals/surgeons from performing surgery for patients with preexisting risk factors such as smokers, those with high BMI, those with high hemoglobin A1c (HbA1c), or a high comorbidity index (Wang et al., 2018). These risk factors do not appear in equal proportions across the population, with higher proportions in the Black and Hispanic population. The question must be asked, if we use inflexible criteria for lower extremity joint arthroplasty to select those patients most likely not to have problems are we potentially widening the disadvantage or disparities for existing racial-ethnic, gender, and socioeconomic groups? Are we denying access

to an operation that can improve health and quality of life for those most in need (Leopold, 2018; Wang et al., 2018)? Is this true medical justification or is this decision-making driven by a system of bundled payment models where the incentive is to care for the healthier patients and avoid the sicker ones? These “benign cutoffs are in fact complex issues intertwined with economic, social, and racial biases that can restrict access to total joint arthroplasty in under-represented populations” (Chun et al., 2021, p. 2).

The National Collaborating Centre for Chronic Conditions (2008) in the U.K. in collaboration with the National Institute for Health and Care Excellence recommends that patient-specific factors (including age, gender, smoking, obesity, and comorbidities) should not be barriers to referral for surgery. They advise that decisions on referral thresholds should be based on discussions between patients and clinicians rather than on scoring tools. This decision should take place in the context of a conversation about risks and benefits that varies from patient to patient and occurs within a shared decision-making construct. Although optimization programs have met with some success, it must be asked what optimization and to what degree to ensure that they are not a deterrent to surgery (Zhang et al., 2016). Many of these risk factors may be much less modifiable than practitioners assume, leaving persons with moderate to advanced arthritic symptoms not being offered surgery (Leopold, 2018).

## Conclusion

Healthcare inequities are shockingly prevalent in the U.S. healthcare system, including among patients with a wide range of musculoskeletal issues. Nurses have a professional responsibility to work to lessen disparities through individual, provider, and structural-level interventions. This includes the ethical mandate for nurses to understand how racism and other forms of discrimination and bias lead to poorer health outcomes. This article sought to define and explore the main concepts of health equity and apply them to orthopaedic nursing. It is meant to serve as an introduction to concepts and processes that truly take a lifetime to fully understand and work to change. As the bedrock of the healthcare system, nurses have the power to make an extraordinary contribution to the health of our country by working individually and collectively to maximize the health of all people.

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