RACIAL AND ETHNIC DIFFERENCES IN OSTEOARTHRITIS: PREVALENCE, OUTCOMES, AND MEDICAL CARE

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Osteoarthritis (OA) is the most common chronic condition and a leading cause of disability among older adults. Studies indicate there are important racial and ethnic differences in the prevalence of OA, as well as in the associated outcomes and medical care. In general, research suggests some minority groups, especially African-American and Hispanic individuals, may be at risk for poorer outcomes (such as pain and disability), and are less likely to undergo arthroplasty, compared to Caucasian Americans. Racial and ethnic differences in OA and its medical care are poorly understood. Research is needed to examine biological, psychosocial, and lifestyle factors that may contribute to these disparities. (*Ethn Dis*. 2004;14:558–566)

Key Words: Ethnic Groups, Osteoarthritis, Race

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INTRODUCTION

Arthritis is the most common chronic disease and the leading cause of disability among individuals over the age of 65 years.[1–4] Osteoarthritis (OA), in particular, has been recognized as a pressing public health issue in the United States (US) , United Kingdom (UK), and other developed countries, due to the rapid growth in the older adult population.[5–11] In the United States, for example, OA affects approximately 58% of men and 68% women older than 65 years.[12] Examining the relationships of sociodemographic characteristics to OA is an important step toward understanding this epidemic, modifying preventable risk factors, and providing optimal medical care.[13] This review focuses specifically on the influence of race and ethnicity on OA. Our primary objective is to summarize published literature on racial and ethnic differences in the following 4 areas: 1) prevalence; 2) pain; 3) physical disability; and 4) medical care. For each of the 4 topic areas, we first summarize the existing literature. We then provide a discussion of limitations of previous studies, and recommendations for future research.

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METHODS

We sought to identify all literature relevant to racial and ethnic differences in OA, specifically with regard to our 4 topic areas (prevalence, pain, disability, and medical care). We conducted a comprehensive Medline search (1966 to 2003) on race and OA, as well as searches on OA and each of our 4 specific topic areas. For the latter searches, we then reviewed each potential manuscript to determine whether race or ethnicity was included in any analyses. Key words used in our searches were: race, ethnicity, arthritis, osteoarthritis, epidemiology, pain, disability, physical function, health services, physician visits, medications, arthroplasty.

In this review, we focus specifically on OA, rather than rheumatoid arthritis (RA) or other rheumatological disorders. However, some studies included individuals with any kind of arthritis, and did not provide specific diagnoses of OA or RA. Because OA is far more prevalent than RA,[6] population-based studies involving patients with both types of arthritis are likely to include a very high proportion of individuals with OA. Rather than exclude these important studies from this review, we chose to include this information, noting when samples comprised patients with OA only, vs those with a broader defi-

nition of arthritis. Even among studies that included only individuals with OA, selection criteria differed. Some studies required radiographic evidence of OA, while larger epidemiological studies often relied on varying self-report screening instruments. The scope of this review does not allow for a comprehensive, detailed methodological review of each study described. However, we have included a brief description of the selection criteria for each study. Table 1 provides a summary of findings from key studies reviewed in this paper.

RACIAL AND ETHNIC DIFFERENCES IN THE PREVALENCE OF OA

Studies have demonstrated striking geographic variations in the prevalence rates of OA. For example, studies indicate that the prevalence rates of hip OA are very low among individuals in Jamaica, South Africa, Nigeria, and Liberia (1%–4%), compared to individuals in European countries (7%–25%).[5,14] Low prevalence rates of hip OA (1%–5%) have also been reported in several regions of China.[15–17] However, recent data show a greater prevalence of radiographic knee OA among women in Beijing, China, compared to Caucasian-American women,[18] as well as a higher prevalence of lateral knee OA among Chinese men and women, compared to Caucasian Americans.[19]

In addition to these geographic variations, racial and ethnic differences have been observed within countries. Data collected from 2 teaching hospitals in Pakistan demonstrated that Pakistani patients were less likely to have Heberden's nodes, hip OA, and generalized OA compared to British patients.[20] However, Pakistani patients were significantly more likely to have isolated knee OA than were British patients. Several US studies have also shown racial and ethnic differences in OA prevalence. Data from the US National Health Interview Survey (NHIS) showed that the prevalence of arthritis (including, but not limited to OA) was lowest among Asian/Pacific Islanders (7%), followed by Hispanics (11%), Caucasian and African Americans (both 15%), and American Indians (17%).[21] The first US National Health and Nutrition Examination Survey (NHANES-I) showed no overall differences in the age-adjusted odds of hip or knee OA between African-American and Caucasian men; however, African-American women exhibited greater age-adjusted odds of knee OA than did Caucasian women (OR=2.88, $P<.001$).[22,23] At least one other study has shown increased age-adjusted odds of knee OA among African-American women, compared to Caucasian-American women (OR=2.96, $P<.05$).[24] In contrast with the NHANES-I data, a study of rural North Carolinians reported that African-American men were 35% more likely to have hip OA than were Caucasian-American men.[25]

RACIAL AND ETHNIC DIFFERENCES IN OA PAIN

Racial, ethnic, and cultural factors are particularly important in a variety of acute and chronic pain-related conditions, including OA.[26–36] Creamer et al[35] found that among a group of patients with knee OA, African Americans reported greater pain severity than did Caucasian Americans. However, a recent study reported that among male veterans with OA, African Americans and Caucasians did not differ significantly in self-reported pain severity, when stratified according to radiographic severity.[37] These results suggest that objective level of OA severity may explain differences in self-reported pain severity between African Americans and Caucasians. However, additional studies are needed to confirm this finding in different populations, including women. In addition to studies of pain severity, Ibrahim et al recently reported that African Americans and Caucasians differed in their descriptions of the quality of their OA-related pain.[38] Data among other racial and ethnic groups are sparse. One study reported that among a group of Asian patients with OA, Chinese individuals experienced less pain than other racial groups, including Indians and Malays.[39]

Racial differences in severity and quality of arthritis-related pain are not completely understood, but they likely result from not only physiological factors, but also social, environmental, and cultural dimensions.[27,40] Culture influences how individuals adjust to environmental changes, and interpret and respond to physical and psychological symptoms of health, such as pain.[41] Studies show that the meaning individuals' ascribe to pain, as well as attitudes and responses to the pain experience, differ across racial and ethnic groups.[40] Many ethnic/cultural groups have "specific rituals" that shape individuals' expectations about pain, as well as strategies to help individuals tolerate the pain experience.[28,33,42,43]

RACIAL AND ETHNIC DIFFERENCES IN OA-RELATED PHYSICAL DISABILITY

Population-based data from the United States indicate that while the prevalence of arthritis (including OA and other arthritic conditions) is similar among Caucasian Americans and non-Caucasians, Caucasians have lower rates of arthritis-related activity limitation.[2,21,44] Specifically, in the 1989–1991 NHIS, African Americans were more likely than Caucasian Americans to report some activity limitation due to arthritis (25% vs 18%, respectively), and Asian Americans were least likely to report arthritis-related activity limitation (13%).[21] Results further showed that arthritis was ranked as the primary cause of physical limitation among African

Table 1. Racial and ethnic differences in arthritis prevalence, pain, disability, and medical care: summary of key studies

Authors, Publication Date	Setting/Sample, Year (when specified)	Sample Size, Racial/Ethnic Groups Included	Diagnosis Method	Summary of Key Findings
Anderson & Felson 1988	NHANES-I 1971–1975	*N*=5,193 African American, Caucasian	Radiograph (knee)	African-American women had an increased risk for knee OA compared to Caucasian women; no significant racial difference among men.
Tepper & Hochberg 1993	First US National Health and Nutrition Examination Study (NHANES-I) 1971–1975	*N*=2,358 African American, Caucasian	Radiograph (hip)	No racial difference in prevalence of hip OA.
Lau et al 1995	Convenience sample of men from regional hospitals in Hong Kong and Britain 1987–1990	Hong Kong: *N*=999 Britain: *N*=1,315 Chinese, English	Radiograph (hip)	Lower prevalence of hip OA among Chinese men than British men.
Centers for Disease Control and Prevention 1996	US National Health Interview Survey (NHIS) 1989–1991	*N*=59,289 African American, American Indian/Alaska Native, Asian/Pacific Islander, Caucasian, Hispanic	Self-report	Arthritis prevalence lower among Asian/Pacific Islanders than other racial groups. Arthritis prevalence lower among Hispanics than non-Hispanic Whites and African Americans.
Hameed & Gibson 1996	Convenience sample of outpatients from hospitals in Karachi, Pakistan and London, England.	British: *N*=44 Pakistani: *N*=44	Radiograph	Isolated knee OA more common in Pakistianis than British
Nevitt et al 2002	NHANES-I: 1971–1975 US Study of Osteoporotic Fractures (SOF): 1986–1988 Beijing OA Study: 1997–2001	NHANES-I: *N*=314 SOF: *N*=7,998 Beijing: *N*=1,506 Chinese, Caucasian	Radiograph (hip)	Chinese women had a lower prevalence of hip OA than Caucasian women in SOF and NHANES-I. Chinese men had a lower prevalence of hip OA than men in NHANES-I.
Sowers et al 2000	Two population/community-based studies of women in Michigan. 1996	*N*=831 African American, Caucasian	Radiograph (hand and knee)	Knee OA prevalence higher in African-American than Caucasian women. No racial difference in prevalence of hand OA.
Zhang et al 2001	Framingham OA study: 1983–1985 Beijing OA Study: 1997–2001 (Both population-based studies of older adults)	Framingham: *N*=1,084 Beijing: *N*=1,787 Chinese, Caucasian	Radiograph (knee)	Chinese women had a higher prevalence of knee OA than Framingham women. No significant difference among men.
Felson et al 2002	Framingham OA Study: 1983–1985 Beijing OA Study: 1997–2001	Framingham: *N*=1,084 Beijing: *N*=1,781 Chinese, Caucasian	Radiograph (knee)	Prevalence of medial knee OA lower among Chinese men than Framingham men. Lateral knee OA twice as prevalent among Chinese men and women than Framingham men and women.
Yoshida et al 2002	Hizen-Oshima Study (population-based, Japan): 1998-1999 Framingham OA Study: 1983–1985	Hizen-Oshima (Japanese): *N*=358 for knee. *N*=157 for hand Framingham (Caucasian): *N*=815 for knee, *N*=655 for hand	Radiograph (hand and knee)	Higher prevalence of knee OA but lower prevalence of hand OA among Japanese than Caucasian women.
Pain				
Creamer et al 1999	Convenience sample of outpatients	*N*=68 African American, Caucasian	Physician diagnosis and American College of Rheumatology criteria for knee OA	African Americans had higher pain scores (WOMAC) than Caucasians, controlling for radiographic features.
Thumboo et al 2002	Consecutive patients in tertiary care center in Singapore	*N*=126 Chinese, Malays, Indians	Radiograph (hip or knee)	Chinese had lower levels of pain than non-Chinese.

Table 1. Continued

Authors, Publication Date	Setting/Sample, Year (when specified)	Sample Size, Racial/Ethnic Groups Included	Diagnosis Method	Summary of Key Findings
Ibrahim et al 2003	Male patients from Veterans Administration Medical Center	*N*=300 African American, Caucasian	Self-reported chronic hip or knee pain	African-American and Caucasian subjects described the quality of their pain differently.
Ang et al 2003	Male patients at a US Veterans Administration Medical Center	*N*=596 African American, Caucasian	Radiograph (hip or knee)	No racial difference in pain after controlling for radiographic severity.
Physical Disability				
Centers for Disease Control and Prevention 1996	US NHIS 1989–1991	*N*=36,207 African American, American Indian/Alaska Native, Asian/Pacific Islander, Caucasian, Hispanic	Self-report	Arthritis-related activity limitation highest among African Americans, followed by American Indians, Caucasian American, and Asians. Activity limitation higher among Hispanics than non-Hispanic Whites.
Jordan et al 1996 (Reference #47)	Community sample from a rural North Carolina county	*N*=1,272 African American, Caucasian	Radiograph (knee)	No difference in self-reported disability (Health Assessment Questionnaire) between African Americans and Caucasians.
Jordan et al 1996 (Reference #48)	Community sample from a rural North Carolina county	*N*=1,197 African American, Caucasian	Radiograph (knee)	African Americans more likely than Caucasians to report difficulty with three functional tasks.
Thumboo et al 2002	Consecutive patients in tertiary care center in Singapore	*N*=126 Chinese Malays, Indians	Radiograph (hip or knee)	No difference in physical function between Chinese and non-Chinese.
Ang et al 2003	Male patients at a US Veterans Administration Medical Center	*N*=596 African American, Caucasian	Radiograph (hip or knee)	No racial difference in WOMAC function subscale after controlling for radiographic severity.
Physician Visits, Medication Use, Complementary and Alternative Medication				
Bill-Harvey et al 1989	Two urban, low income minority communities in Connecticut	*N*=160 African American, Caucasian	Self-reported arthritis	African Americans commonly used massage, aspirin, rest, and prayer. Hispanics most commonly used heat, massage, rest, and prayer.
Coulton et al 1990	Five-county area surrounding Cleveland, Ohio	*N*=317 African American, Caucasian, Hispanic	Self-reported joint pain	African Americans and Hispanics had greater odds of currently being under physician care for joint symptoms.
Dexter & Brandt 1993	Convenience sample from apartment complexes in Indianapolis, Indiana	*N*=110 African American, Caucasian	American College of Rheumatology Criteria for OA of hip and/or knee	African Americans more likely to be currently seeing physician for OA but less likely to see a physician in a private setting and to see the same physician each visit.
Yelin et al 1995	Random household sample from San Mateo County, California	*N*=645 Non-Caucasian, Caucasian	Self-reported arthritis or related condition	Caucasians more likely to report ever seeing a physician for arthritis and receiving a diagnosis. No racial difference in physician visit for arthritis in past year.
Arcury et al 1996	Non-metropolitan county in North Carolina	*N*=219 African American, Caucasian	Medical records and physical examination by rheumatologist	Caucasians more often used conventional therapies, African Americans more likely to use some alternative therapies.
Rao et al 1997	NHIS 1989	*N*=2,944 African American, Caucasian, Hispanic	Self-reported arthritis and other rheumatic conditions	No racial/ethnic difference in report of never seeing a physician for arthritis.
Rao et al 1999	Six rheumatology practices (university and private)	*N*=232 Non-Caucasian, Caucasian	Medical record review of clinician diagnosis	No racial differences in complementary and alternative medicine (CAM) use.

Table 1. Continued

Authors, Publication Date	Setting/Sample, Year (when specified)	Sample Size, Racial/Ethnic Groups Included	Diagnosis Method	Summary of Key Findings
Ibrahim et al 2001	Male patients at a US Veterans Administration Medical Center 1997–2000	*N*=593 African American, Caucasian	Self-reported arthritis	African Americans had greater use of OTC medications and topical creams than Caucasians and were more likely to cut down on activities to relieve pain.
Ang et al 2002	Male patients at a US Veterans Administration Medical Center 1997–2000	*N*=596 African American, Caucasian	Self-report	African Americans were more likely to perceive prayer as helpful and use prayer for arthritis.
Dominick et al 2003	Patients at US Veterans Administration Medical Center 1998–2000	*N*=2,473 African American, Caucasian	ICD-9 code for OA	African Americans less likely to be prescribed COX-2 inhibitors and narcotic analgesics. African Americans used some medications for shorter durations.
Arthroplasty				
Wilson et al 1993	US Medicare Claims: 1980–1988	*N*=290,675 TKA's African American, Caucasian	IDC-9 code for TKA	African Americans had lower rate of TKA than Caucasians.
Hoaglund et al 1995	San Francisco County hospital records 1984–1988	*N*=1,623 THA's Asian (Chinese, Filipino, Japanese), African American, Hispanic, Caucasian	Hospital record of THA	Caucasians had greater rates of THA than African Americans, Hispanics, and Asians.
Baron et al 1996	US Medicare claims (5% random population sample) 7/1/1986–6/30/1989	*N*=5,579 African American, Caucasian	ICD-9 code for THA	African Americans had lower rate of THA than Caucasians.
Katz et al 1996	US Medicare claims 1985–1990	*N*=414,079 TKA's African American, Caucasian	ICD-9 code for TKA	African Americans had lower rate of TKA than Caucasians.
Oishi et al 1998	Hawaii hospital records 1985–1989	*N*=754 THA's Chinese, Filipino, Hawaiian, Japanese, Caucasian	Hospital record of THA	Rate of THA higher for Caucasians than Japanese, Chinese, Filipinos, and Hawaiians.
Blake et al 2002	Medicare beneficiaries in New York City	*N*=970 African American, Caucasian	Self-reported hip or knee pain	African Americans less likely to know someone who were helped by surgery for hip or knee pain.
Escalante et al 2002	Medicare claims from 4 US states: 7/1/1995–6/30/1996	*N*=19,311 (6,437 THR cases, 12,874 controls) Hispanic, Non-Hispanic	ICD-9 codes for THA	Hispanics had lower odds of THR than non-Hispanics.
Ibrahim et al 2001, 2002 Ang, 2002	Male patients at a US Veterans Administration Medical Center 1997–2000	*N*=596 African American, Caucasian	Self-report	African Americans less familiar with arthroplasty, less likely to have friend or family member with arthroplasty, less likely to have good understanding of arthroplasty expected poorer outcomes, less willing to consider arthroplasty. Relationship between race and willingness to consider surgery was mediated by perceived helpfulness of prayer.
Mahomed et al 2003	US Medicare claims 7/1/1995–6/30/1996	*N*=61,568 total hip arthroplasties (THA) African American, Caucasian	ICD-9 code for elective total hip replacement (THA)	African Americans had lower rates of THR than Caucasians. African Americans had greater risk of adverse outcomes than Caucasians.
Skinner et al 2003	US Medicare claims 1998–2000	*N*=430,726 total knee arthroplasties (TKA) African American, Caucasian, Hispanic	ICD-9 codes for TKA	Rate of TKA lower for African America men than non-Hispanic White men. Other racial/ethnic differences were related to geographic variations.

Americans, and ranked second among Caucasian Americans, Asian/Pacific Islanders, and American Indians/Alaskan Natives. The NHIS data also showed that Hispanics had a lower self-reported prevalence of arthritis than that of non-Hispanic Whites (11% vs 16%, respectively), but a higher prevalence of self-reported arthritis-related activity limitation (22% vs 18%, respectively).[21]

In contrast to the NHIS data, 2 recent studies reported no significant differences in physical function between African-American and Caucasian subjects with OA. Ang et al found that scores on the function subscale of the Western Ontario and McMaster Universities OA Index (WOMAC) did not differ significantly between African-American and Caucasian veterans with OA.[37] Similarly, Jordan et al reported no significant racial differences in the mean Health Assessment Questionnaire (HAQ) disability subscale in a sample of rural African Americans and Caucasians with OA.[46] However, African Americans were more likely to report difficulty with 3 specific tasks (standing from a chair, opening jars, and climbing steps).[45] Several methodological differences may underlie the disparities between results of the NHIS data and these 2 recent studies: sample characteristics (ie, population-based vs single site with less socioeconomic heterogeneity), diagnosis strategy (ie, self-report vs radiographic evidence) and measurement of activity limitation or disability (ie, single-item vs multiple-item measure). The role of race and ethnicity in arthritis-related disability is still unclear, and further study is needed to clarify these relationships.

RACIAL/ETHNIC DIFFERENCES IN MEDICAL CARE FOR OA

Because of the importance of appropriate medical care for optimal symptom management, examining racial and ethnic differences in medical care for OA is vital. However, studies comparing OA-related medical care among racial and ethnic groups have only begun to emerge. Studies examining racial and ethnic differences in physician visits for OA have reported conflicting results. At least 2 US studies have reported no racial differences in the use of physician services.[47,48] In other studies, African-American and Hispanic individuals have been more likely than Caucasian Americans to report seeing a physician for OA.[49,50] The conflicting results of these studies may be attributable to differences in patient samples (eg, socioeconomic status, age, and access-to-care characteristics). Some data also suggest that there may be racial differences in characteristics of OA-related physician visits. For example, one study reported that among a community sample of patients with symptomatic OA, African Americans were less likely than Caucasian Americans to see a physician in a private setting (33% vs 88%, respectively, $P<.001$) and less likely to see the same physician at each visit (50% vs 90%, respectively, $P<.001$).[49]

Although pharmacotherapy is a cornerstone of treatment for OA, little has been reported about racial or ethnic differences in the use of analgesic and anti-inflammatory medications for this condition. One US-based study of rural adults with arthritis (including, but not limited to, OA) reported no racial differences in current prescription medication use. However, African Americans were less likely to report current use of over-the counter (OTC) medications (OR=0.54, $P<.05$).[51] Similarly, in a study of adults with self-reported joint symptoms, a smaller proportion of African Americans reported using OTC medication compared to both Caucasian-American and Hispanic participants (43%, 60%, and 61%, respectively, $P<.01$).[50] In contrast, a study of male US veterans with OA (from one VA Medical Center) found that African Americans were more likely than Caucasian Americans to report using OTC medications (OR=1.76, $P<.05$).[52] Another study among US veterans with OA found that although similar proportions of African Americans and Caucasians used prescription analgesic and anti-inflammatory medications, there were other racial differences in medication use.[53] African Americans were less likely than Caucasians to be prescribed COX-2 inhibitors and narcotic analgesics. In addition, African Americans used some common analgesic and anti-inflammatory medications for shorter durations than Caucasians.

Over the past decade, increasing attention has been given to patients' use of complementary and alternative medicine (CAM) for OA.[51,54–56] This is a particularly crucial area of research because of the widespread use of CAM, as well as out-of pocket costs, and, in some cases, unproven efficacy.[57–59] Studies of racial differences in CAM use for OA have also produced mixed results. In a sample of patients from 3 US rheumatology practices (including, but not limited to, patients with OA), no differences were observed between Caucasian-American and non-Caucasian-American patients in lifetime, current, or regular CAM use.[55] However, several studies identified racial differences in the use of specific alternative therapies.[50–52] For example, one study of patients with arthritis (the majority with OA), from a non-metropolitan North Carolina sample, reported that African Americans were less likely than Caucasian Americans to report using rest, heat, and positive thinking, but were more likely to report going to church services and using lotions, creams, and turpentine/kerosene/gasoline.[51] Studies have concluded that few arthritis patients use the more hazardous CAM therapies, and that CAM use does not typically replace patients' use of traditional medical care.[50]

At the later stages of OA, the effectiveness of medications and other treatments are limited, and arthroplasty is a critical component of treatment.

Future studies should take an integrated approach, examining interactions between physiological, cultural, lifestyle, and medical factors that may contribute to the onset, progression, and treatment of OA.

Among all facets of care for OA, the most striking racial and ethnic differences have been reported in the use of arthroplasty. Two large US studies have reported markedly lower rates of hip arthroplasty among Asians, compared to Caucasians.[60,61] This is likely attributable to lower rates of hip OA among Asians. Among national samples of US Medicare patients, African Americans have been found to undergo both hip and knee arthroplasty at about half the per capita rate (adjusting for age) of Caucasian Americans.[62–66] This difference is more pronounced among men than women.[65] Recent data also demonstrate that rates of hip and knee arthroplasty are lower among Hispanics, compared to non-Hispanics.[65,67]

Since many of the studies of racial and ethnic differences in arthroplasty have been conducted among the Medicare population, it is unlikely that these differences are completely attributable to health insurance coverage. Some recent data suggest that lower use of arthroplasty among Hispanics may be due to geographic differences in utilization.[65] However, geographic variations did not explain the lower rates among African Americans. Recent studies have addressed possible patient-related reasons for differences in arthroplasty among African Americans and Caucasians.[42,68,69] These studies reported that, compared to Caucasian Americans, African-American patients were less willing to consider having arthroplasty, less likely to have family or friends who had arthroplasty, and less likely to report a good understanding of arthroplasty. African Americans expected a longer hospital stay, and more pain and difficulty walking following surgery. Ang et al also reported that the racial difference in willingness to consider arthroplasty was mediated by perceived helpfulness of prayer in the treatment of arthritis.[43]

SUMMARY AND RECOMMENDATIONS FOR FUTURE RESEARCH

Research has demonstrated important racial and ethnic differences in the prevalence, outcomes, and medical care associated with OA. However, reasons for these differences are not well defined. In order to reduce these disparities, underlying factors must be identified. This review has described specific areas of research that will advance current understanding. Future studies should take an integrated approach, examining interactions between physiological, cultural, lifestyle, and medical factors that may contribute to the onset, progression, and treatment of OA.

The following is a summary of key limitations of prior studies, as well as recommendations for future research that will advance our current understanding of racial and ethnic differences in OA:

1. Many studies on racial differences in OA prevalence, outcomes, and medical care have focused on African-American and Caucasian-American subjects. There is a clear need to extend research in these areas to include other geographic regions, and additional racial and ethnic groups.
2. Studies of racial and ethnic differences in OA prevalence have rarely included examination of potential risk factors that may underlie these disparities. Future studies should include measurement of known and suspected risk factors for OA, such as diet and body mass, genetic factors, socioeconomic status, bio-mechanical characteristics, joint trauma, and daily work and leisure activities.[22,25,70–72] This is a critical next step toward understanding the OA disease process, and reducing the impact of OA among the racial and ethnic groups that are most affected.
3. Studies of racial and ethnic differences in OA-related pain have typically measured overall pain severity. Pain-related outcomes should be expanded to include specific dimensions and perceptions of pain, as well as physical, social, and behavioral factors that influence the interpretation of the pain experience. A greater understanding of these issues is critical for developing racially and ethnically appropriate treatment strategies.
4. Little is known about racial and ethnic differences in the verbal and non-verbal expression of pain. This is an important area for further investigation, since communication about pain may influence healthcare providers' evaluations and subsequent treatment decisions.
5. Results of studies of racial and ethnic differences in OA-related disability and function have yielded disparate results. There is a need for additional studies that involve socioeconomically diverse samples with radiographic evidence of OA, as well as validated measures of physical function.
6. Studies of OA-related disability should also examine specific

pathways and factors that may lead to racial and ethnic differences in disability. These investigations should take an interdisciplinary approach, including biological, psychosocial, economic, and treatment factors.

7. Previous studies on racial and ethnic differences in medical care for OA have focused on very general outcomes (ie, use vs non-use of physician services or medications). Future studies should expand outcomes to include specific qualities of physician visits (ie, counseling about self-management, patient-physician communication) and pharmacotherapy (ie, specific medications and doses prescribed).
8. Little is known about whether racial and ethnic groups respond differently to various OA-related medications and other treatments. Additional research is needed to examine outcomes associated with key OA therapies across ethnic and racial groups. This information will help clinicians to tailor OA care when appropriate.
9. Research is needed to disentangle the contributions of patient preferences, physician recommendations, and access-to-care issues to racial differences in medical care, especially use of arthroplasty.
10. There is a need to develop and test intervention strategies to ensure that minority patients (particularly those with advanced OA) are adequately informed about the process, benefits, and risks of arthroplasty.

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