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Lower Income and Nonheterosexual Orientation Are Associated With Poor Access to Care in Patients With Knee Osteoarthritis

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ABSTRACT

Background: Social determinants of health are implicated in the experience of knee osteoarthritis, a key component of which is access to care and healthcare utilization. The objective of this study was to describe difficulties in access to care and healthcare utilization in the United States knee osteoarthritis population.
Methods: The publicly available All of Us Database was utilized to conduct a retrospective cohort study. Patients with a diagnosis of knee osteoarthritis were included and matched to a control group who did not have knee osteoarthritis. The association of knee osteoarthritis and patient-specific demographic features with self-reported domains of access to care was analyzed.
Results: Among 15,718 patients with knee osteoarthritis, 27.6% reported delayed care (n = 4343), 25.6% reported inability to afford care (n = 4015), 12.8% reported skipped medications (n = 2011), and 1.6% reported not seeing a healthcare provider in over 1 year (n = 247). Patients with knee osteoarthritis were more likely to be unable to afford care (odds ratio 1.21, $P < .001$) or skip medications (odds ratio 1.12, $P = .004$) in comparison to matched patients without knee osteoarthritis. Among the knee osteoarthritis cohort, low income and nonheterosexual orientation were both associated with increased rates of delayed care and an inability to afford care.
Conclusions: Patients with knee osteoarthritis report significant challenges with delayed care, affordability of care, and medication adherence. Among patients with knee osteoarthritis, patients who are younger age, female sex, low-income, low-education, nonheterosexual orientation, or have poor physical and mental health are at increased risk of having decreased access to treatment.
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Introduction

Knee osteoarthritis is prevalent in a significant portion of the adult population and is estimated to affect over 1 in 10 adults in the United States. Further, it has been shown to be the 11th leading cause of disability around the world [1,2]. Despite being such a prevalent and debilitating condition, well-proven and effective treatment modalities ranging from physical therapy and intra-articular injections to total knee arthroplasty are available [3].

While it is encouraging that knee osteoarthritis is often treatable, it is essential to acknowledge that this disease differentially affects patients from diverse socioeconomic backgrounds. Previous studies have identified increased prevalence rates of osteoarthritis among older individuals, females, those who are overweight/obese, individuals with lower education levels, and individuals from low-income backgrounds [4,5]. The impact of social determinants of health extends beyond prevalence, as factors such as divorced marital status, living in food deserts, and residing in proximity to tobacco stores have also been associated with an increased length of stay and a higher 30-day total cost of care following total knee arthroplasty [6].

Access to and utilization of healthcare services play a crucial role in the context of social determinants of health. International studies have highlighted disparities in healthcare service utilization

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and access to surgery in the knee osteoarthritis population based on patient-specific demographic factors such as sex, rurality, ethnicity, age, and healthcare coverage [7,8]. In the United States, one study found high-income Medicare enrollees experience better access to care for knee osteoarthritis compared to low-income enrollees, despite similar insurance coverage [9]. Other studies in the field of orthopaedics have found patient-specific factors to be associated with delays in accessing care for anterior cruciate ligament reconstruction patients [10]. However, research examining access to care in the United States knee osteoarthritis population has been limited primarily to qualitative studies [11,12].

This study aims to address this research gap by utilizing the All of Us database. The All of Us database is a publicly available United States database launched by the National Institutes of Health in 2018 that offers a large, diverse, and broadly accessible dataset that focuses on human health and health disparities. The database offers a wide range of data, including genomic variants, survey responses, physical measurements, electronic health record information, and more [13,14]. This study aims to utilize the All of Us database to describe the difficulties in access to care and healthcare utilization in the United States' knee osteoarthritis population.

Material and methods

Study design and data source

This retrospective cohort study was conducted using the All of Us database (National Institutes of Health, Bethesda, Maryland), which includes data collected from May 2018 to May 2023. Adults in the United States over the age of 18 are recruited to join the database. The study included all patients with a diagnosis of knee osteoarthritis, identified using Systematized Nomenclature of Medicine clinical term 239,873,007 (osteoarthritis of the knee), who also completed the "Healthcare Access and Utilization Survey" within the All of Us database. This survey was derived from the National Health Interview Survey, a validated patient-reported outcome measure (PROM) that collects data on socioeconomic characteristics and health topics such as conditions, medications, and access to medical care [15]. Patients who were diagnosed with knee osteoarthritis and eventually underwent total knee arthroplasty were further categorized using Current Procedural Terminology 4th Edition code 27,447.

Patient matching and control cohort

The patient cohort diagnosed with knee osteoarthritis was matched with a control cohort without knee osteoarthritis using a nearest match approximation with a one-to-one ratio based on demographic factors including age, sex, race, physical health scores, and mental health scores. Physical health scores and mental health scores were derived from the Patient-Reported Outcomes Measurement Information System Global Health short form, a validated PROM that assesses overall physical and mental health [16]. In the All of Us database, patients responded to the following questions: "In general, how would you rate your physical health?" and "How would you rate your mental health, including your mood and ability to think?" on a five-point scale ranging from poor to excellent. Higher scores were indicative of better health for the patient.

Primary and secondary outcomes

The primary outcome was the patients' self-reported ability to access care across 4 domains: (1) patient delayed care due to transportation, cost, availability issues, or other causes; (2) patient could not afford care; (3) patient skipped medications due to financial burden; and (4) patient went more than 1 year since seeing a healthcare provider. The following domains of delayed care, could not afford care, and skipped medications were created by aggregating multiple subsurvey questions coded by this research team. Each domain was considered positive ("yes") if any of the subquestions were selected by the patients. The survey questions for all 4 outcomes assessed the patient's access to care and healthcare utilization within the past 12 months from the time the survey was completed. For instance, the domain of inability to afford care was based on the question, "During the past 12 months, was there any time when you needed any of the following but didn't get it because you couldn't afford it?" The corresponding subsurvey question options were "prescription medicines, mental health care or counseling, emergency care, dental care, eyeglasses, to see a regular doctor or general health care provider, to see a specialist, follow-up care," to which patients could respond "yes," "no," or "don't know." The survey questions utilized for this study can be found online (https://www.researchallofus.org/data-tools/survey-explorer/healthcare-access-utilization-survey/). These domains were compared between the knee osteoarthritis and control cohorts to evaluate the association of knee osteoarthritis diagnosis with overall healthcare utilization outcomes. Secondary analyses were performed to identify how undergoing total knee arthroplasty and various patient-specific factors were associated with each domain of access to care.

Statistical analysis

Kruskal-Wallis H tests and chi-squared tests were utilized to compare continuous and categorical variables. Univariate and multivariable logistic regression analyses were conducted for both primary and secondary analyses for each outcome of interest: (1) delayed care; (2) could not afford care; (3) skipped medications; (4) more than 1 year since seeing the provider. Variables that showed significance ($P < .05$) on univariate analysis, in addition to total knee arthroplasty, were included in the multivariable regression analysis of patient-specific factors. All statistical tests were two-sided, and a P-value less than .05 was deemed significant. Analysis was conducted in the All of Us workbench online using Jupyter Notebooks.

Results

Patient characteristics

A total of 15,718 patients with knee osteoarthritis were included and matched to a control group of 15,718 patients without knee osteoarthritis. The mean age of patients in the knee osteoarthritis cohort was 67.5 (SD: 11.4). Of these patients, 68.0% were female (n = 10,690/15,718), 81.7% were White (n = 12,834/15,718), 14.2% were Black or African American (n = 2230/15,718), and 1.3% were Hispanic or Latino (n = 207/15,718). Compared to the control group without knee osteoarthritis, there was a statistically significant difference in age (mean: 68.1, SD: 11.1, $P < .001$). This small difference in age across cohorts despite matching can be attributed to using a "near-match" approximation across multiple metrics, making a perfect match less likely. A higher proportion of patients with knee osteoarthritis had income below $50,000 (32.0% vs 27.2%, $P < .001$), and a smaller proportion graduated from college (56.6% vs 64.7%, $P < .001$) compared to the control group (Table 1).

Knee osteoarthritis and access to care

Among the 15,718 patients with knee osteoarthritis, 27.6% reported delayed care (n = 4343/15,718), 25.6% reported inability to

Table 1
Patient demographics of matched knee osteoarthritis and control cohorts.

Demographics	No osteoarthritis (n = 15,718)	Osteoarthritis (n = 15,718)	Total (n = 31,436)	*P*-value
Age				<.001[a,c]
Mean (SD)	68.1 (11.1)	67.5 (11.4)	67.8 (11.2)	
Range	21.2 - 90.4	22.7 - 90.4	21.1 - 90.4	
Sex at birth				1.00[b]
Female	10695 (68.0%)	10690 (68.0%)	21385 (68.0%)	
Male	5023 (32.0%)	5028 (32.0%)	10051 (32.0%)	
Race				.224[b]
Asian	183 (1.2%)	209 (1.3%)	392 (1.2%)	
Black or African American	1603 (10.2%)	2230 (14.2%)	3833 (12.2%)	
Multi-racial	187 (1.2%)	210 (1.3%)	397 (1.3%)	
White	13548 (86.2%)	12834 (81.7%)	26382 (83.9%)	
Ethnicity				.199[b]
Hispanic or Latino	646 (4.1%)	207 (1.3%)	853 (2.7%)	
Not Hispanic or Latino	14935 (95.0%)	15348 (97.6%)	30283 (96.3%)	
Income				<.001[b, c]
>200k	1490 (9.5%)	1263 (8.0%)	2753 (8.8%)	
100-200k	3748 (23.8%)	3336 (21.2%)	7084 (22.5%)	
50-100k	4558 (29.0%)	4251 (27.0%)	8809 (28.0%)	
0-50k	4273 (27.2%)	5030 (32.0%)	9303 (29.6%)	
Education				<.001[b, c]
College graduate or advanced degree	10167 (64.7%)	8892 (56.6%)	19059 (60.6%)	
College but did not finish	3743 (23.8%)	4505 (28.7%)	8248 (26.2%)	
High school graduate or graduate equivalency degree	1425 (9.1%)	1875 (11.9%)	3300 (10.5%)	
Less than a high school degree	249 (1.6%)	298 (1.9%)	547 (1.7%)	

[a] Kruskal-Wallis H test.
[b] Pearson's chi-squared test.
[c] Indicates *P*-value <.05.

afford care (n = 4015/15,718), 12.8% reported skipped medications (n = 2011/15,718), and 1.6% reported not seeing a healthcare provider in over 1 year (n = 247/15,718). Compared to the control cohort, patients with knee osteoarthritis had higher proportions of delayed care (27.6% vs 26.4%, *P* = .02), inability to afford care (25.6% vs 21.8%, *P* < .001), and skipped medication (12.8% vs 10.6%, *P* < .001). Yet, patients without knee osteoarthritis had a higher proportion of patients that have gone over 1 year since seeing a healthcare provider (3.5% vs 1.6%, *P* < .001) (Fig. 1).

On multivariable analysis, patients with knee osteoarthritis were still more likely to be unable to afford care (odds ratio [OR] 1.21, 95% confidence interval [CI] [1.14-1.29], *P* < .001) or skip medications (OR 1.12, 95% CI [1.04-1.21], *P* = .004) compared to matched patients without knee osteoarthritis. Patients with knee osteoarthritis were also less likely to go more than 1 year without seeing a healthcare provider (OR 0.43, 95% CI [0.37-0.5], *P* < .001),

Figure 1. Association of knee osteoarthritis and difficulty in accessing healthcare.

and there was no statistically significant increase in delayed care compared to the control group (Table 2).

Patient-specific factors and access to care

Among the knee osteoarthritis cohort, multivariable analysis of treatment and demographic factors revealed income less than $50,000 (OR: 1.45, *P* < .001) and nonheterosexual orientation (OR: 1.20, *P* = .01) were factors associated with a higher likelihood of delayed care. Conversely, undergoing total knee arthroplasty (OR: 0.83, *P* = .02), older age (OR: 0.96, *P* < .001), male sex (OR: 0.69, *P* < .001), income over $100,000 (OR: 0.78, *P* < .001), high school education (OR: 0.66, *P* = .03), high physical health scores (OR: 0.75, *P* < .001), and high mental health scores (OR: 0.79, *P* < .001) were protective factors associated with lesser likelihood of delayed care. Race was associated with neither a reduced nor an increased likelihood of delayed care (Table 3).

Further multivariable analysis found income less than $50,000 (OR: 1.80, *P* < .001) and nonheterosexual orientation (OR: 1.22, *P* = .005) were associated with an increased likelihood of inability to afford care. Protective factors included older age (OR: 0.97, *P* < .001), male sex (OR: 0.72, *P* < .001), income between $50,000 and $100,000 (OR: 0.81, *P* = .003), income greater than $100,000 (OR: 0.45, *P* < .001), high physical health scores (OR: 0.72, *P* < .001), and high mental health scores (OR: 0.80, *P* < .001). Race was associated with neither a reduced nor an increased likelihood of delayed care (Table 3).

Analysis of factors associated with skipped medications showed income less than $50,000 (OR: 1.85, *P* < .001) and college education (OR: 1.64, *P* < .001) increased likelihood. In contrast, receiving total knee arthroplasty (OR: 0.79, *P* = .03), older age (OR: 0.98, *P* < .001), male sex (OR: 0.65, *P* < .001), income greater than $100,000 (OR: 0.59, *P* < .001), high physical health scores (OR: 0.69, *P* < .001), and high mental health scores (OR: 0.83, *P* < .001) were associated with decreased likelihood of skipped medications. Race was associated
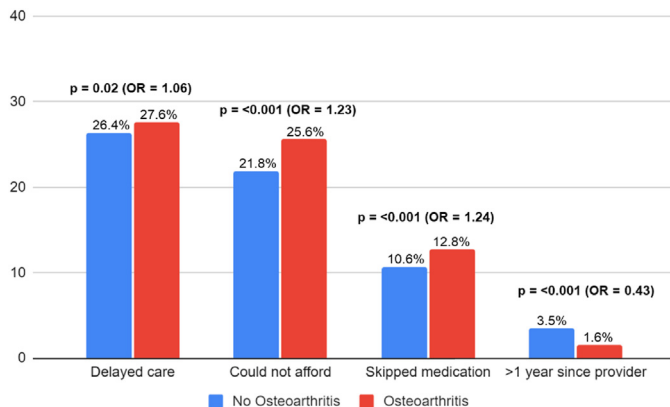
Table 2
Univariate and multivariable analysis of knee osteoarthritis as a predictor of access to care.

Domain of access to care	No osteoarthritis (n = 15,718)	Osteoarthritis (n = 15,718)	Total (n = 31,436)	OR	95% CI lower	95% CI upper	P-value
Univariable analysis							
Delayed care	4161 (26.4%)	4343 (27.6%)	8504 (27.1%)	1.06	1.01	1.11	.02[a]
Could not afford	3429 (21.8%)	4015 (25.6%)	7444 (23.7%)	1.23	1.17	1.29	<.001[a]
Skipped medication	1667 (10.6%)	2011 (12.8%)	3678 (11.7%)	1.24	1.15	1.32	<.001[a]
>1 year since provider	552 (3.5%)	247 (1.6%)	799 (2.5%)	0.44	0.38	0.51	<.001[a]
Multivariable analysis							
Delayed care	4161 (26.4%)	4343 (27.6%)	8504 (27.1%)	0.97	0.92	1.02	.24
Could not afford	3429 (21.8%)	4015 (25.6%)	7444 (23.7%)	1.21	1.14	1.29	<.001[a]
Skipped medication	1667 (10.6%)	2011 (12.8%)	3678 (11.7%)	1.12	1.04	1.21	.004[a]
>1 year since provider	552 (3.5%)	247 (1.6%)	799 (2.5%)	0.43	0.37	0.5	<.001[a]

[a] Indicates *P*-value <.05.

with neither a reduced nor an increased likelihood of delayed care (Table 3).

Additional analysis of factors revealed higher physical health scores (OR: 1.51, *P* < .001) increase likelihood, while older age (OR: 0.97, *P* < .001) and college education (OR: 0.68, *P* = .03) decrease likelihood of having gone over 1 year since seeing a healthcare provider. Race was associated with neither a reduced nor an increased likelihood of delayed care (Table 3).

Discussion

This study aimed to investigate access to care and healthcare utilization among individuals with knee osteoarthritis in the United States, utilizing the All of Us database. By analyzing a large dataset, this study provides valuable insights into the factors influencing access to care in this population. This study found that patients with knee osteoarthritis experience increased difficulties with affording healthcare and medication adherence, and that patients of low-income and nonheterosexual orientation are especially susceptible to poor access to care. Our findings apply to the overall healthcare access and utilization of patients with knee osteoarthritis, but we focus on the implications of these findings as they relate to treatment of knee osteoarthritis.

Our findings indicate that patients with knee osteoarthritis face significant challenges in accessing care. First, when controlling for age, sex, race, and functional/mental health status, patients with knee osteoarthritis were found to have a lower income and a lower education level. This is important to acknowledge, as it is well-documented that advanced osteoarthritis limits ability to work and often induces a vicious cycle of decreased mobility, decreased ability to work, decreased resources, and advancement of disease [17,18]. Furthermore, a substantial proportion of patients in this study with knee osteoarthritis reported experiencing delayed care, inability to afford healthcare services, and skipped medications. Notably, the rates of difficulties in affording care and medication adherence were higher compared to the control group. These findings are concerning, as timely access to appropriate care is crucial for managing knee osteoarthritis, mitigating progression of other diseases, and reducing associated complications [19]. We also observed that patients with knee osteoarthritis were less likely to go more than 1 year without seeing a healthcare provider compared to the control group. It is interesting that although patients with knee osteoarthritis are seeing doctors frequently, they still face challenges such as delayed care, inability to afford services, and decreased medication adherence that may prevent optimal treatment of disease.

In addition to the primary outcomes, our study also identified patient-specific factors associated with poor access to care among individuals with knee osteoarthritis. Specifically, low-income individuals and patients who identify as nonheterosexual are at increased risk of experiencing delayed care and facing challenges in affording healthcare. The association between income and poor access to care aligns with previous research highlighting the impact of socioeconomic factors in the context of knee osteoarthritis [4–9]. However, the finding that nonheterosexual orientation is associated with poor access to care in the context of knee osteoarthritis is novel and warrants further attention. While findings of older age, male sex, higher income, and better physical and mental health scores being associated with better access to care suggest that these are protective factors in accessing healthcare services, it is important to recognize that these associations may be influenced by various cultural, social, and healthcare system-related factors. Furthermore, this sheds light on the possibility that younger age, female sex, lower education, and poor physical and mental health may be associated with an increased risk of poor access to care, similar to the low-income and nonheterosexual orientation subgroups identified in this study. Additionally, receiving total knee arthroplasty was also identified as a protective factor. This is confounded by the possibility that patients who have better access to care are the ones receiving surgery for knee osteoarthritis.

It is noteworthy that our study did not find a statistically significant association between race and any domain of poor access to care. This is somewhat surprising based on previous findings in the field of orthopedics [5,10]. However, this finding is aligned with recent socioeconomic research demonstrating that racial disparities in total joint arthroplasty seem to be mitigated when adjusted for the area deprivation index, suggesting that generalized socioeconomic disadvantage is a more direct driver of disparity than race alone [18]. This may explain why race was not predictive of any outcome measure in our study, while income and education level were more strongly associated with worsened outcomes.

Interestingly, unlike race, identifying as nonheterosexual or lesbian, gay, bisexual, transgender, intersex, queer/questioning, asexual (LGBTQIA+) was an independent risk factor for delayed care. Patients identifying as LGBTQIA+ have previously been associated with health disparities including increased rates of anxiety, cardiovascular disease, diabetes, depression, and sexually transmitted infections [20,21]. Similar to our finding, patients from this population have been found to utilize healthcare at decreased rates [21]. However, the relationship between sexual orientation and healthcare access is often studied within the realm of primary care. There is little research exploring healthcare access for LGBTQIA+ patients within orthopedics or musculoskeletal medicine. Our finding that LGBTQIA+ patients with knee osteoarthritis delay care at increased rates may represent an important avenue for targeted intervention to remedy this disparity. Current literature presents reducing stigma, training against LGBTQIA+-related

Table 3
Multivariable analysis of total knee arthroplasty and demographic factors as predictors of access to care in patients with knee osteoarthritis.

Variable	Odds ratio	95% CI lower	95% CI upper	P-value
Delayed care				
Total knee arthroplasty	0.83	0.71	0.97	.02[a]
Age	0.96	0.95	0.96	<.001[a]
Male sex	0.69	0.64	0.76	<.001[a]
White race	0.90	0.75	1.08	.27
Black race	0.90	0.74	1.10	.32
Income: <$50,000	1.45	1.27	1.65	<.001[a]
Income: $50,000 to $100,000	0.95	0.83	1.09	.46
Income: >$100,000	0.78	0.68	0.90	<.001[a]
Education: college	0.79	0.54	1.14	.21
Education: high school	0.66	0.45	0.97	.03[a]
Education: < high school	0.65	0.41	1.01	.05
No partner	1.04	0.95	1.13	.38
Sexuality: not heterosexual	1.20	1.04	1.37	.01[a]
PROMIS Physical	0.75	0.71	0.78	<.001[a]
PROMIS Mental	0.79	0.76	0.83	<.001[a]
Could not afford care				
Total knee arthroplasty	0.87	0.74	1.01	.08
Age	0.97	0.97	0.97	<.001[a]
Male sex	0.72	0.66	0.79	<.001[a]
White race	0.86	0.68	1.08	.19
Black race	0.95	0.75	1.22	.70
Multiracial	0.97	0.66	1.42	.88
Income: <$50,000	1.80	1.58	2.05	<.001[a]
Income: $50,000 to $100,000	0.81	0.71	0.93	.003[a]
Income: >$100,000	0.45	0.39	0.53	<.001[a]
Education: college	0.94	0.65	1.38	.76
Education: high school	0.77	0.52	1.13	.18
Education: < high school	0.88	0.56	1.37	.56
No partner	1.02	0.94	1.12	.62
Sexuality: not heterosexual	1.22	1.06	1.41	.005[a]
PROMIS Physical	0.72	0.69	0.76	<.001[a]
PROMIS Mental	0.80	0.77	0.84	<.001[a]
Skipped medications				
Total knee arthroplasty	0.79	0.64	0.97	.03[a]
Age	0.98	0.97	0.98	<.001[a]
Male sex	0.65	0.57	0.73	<.001[a]
White race	0.91	0.63	1.31	.60
Black race	0.88	0.61	1.29	.52
Asian race	0.55	0.29	1.03	.06
Multiracial	1.00	0.60	1.68	>.99
Income: <$50,000	1.85	1.56	2.20	<.001[a]
Income: $50,000 to $100,000	0.97	0.81	1.17	.76
Income: >$100,000	0.59	0.48	0.72	<.001[a]
Education: college	1.64	1.24	2.18	<.001[a]
Education: high school	1.27	0.94	1.72	.13
No partner	0.90	0.80	1.00	.05
Sexuality: not heterosexual	1.09	0.92	1.30	.30
PROMIS Physical	0.69	0.65	0.74	<.001[a]
PROMIS Mental	0.83	0.78	0.87	<.001[a]
>1 year since seeing provider				
Total knee arthroplasty	0.94	0.55	1.60	.83
Age	0.97	0.96	0.98	<.001[a]
White race	0.79	0.58	1.08	.14
Income: $50,000 to $100,000	0.81	0.59	1.10	.17
Education: college	0.68	0.48	0.96	.03[a]
Education: < high school	1.37	0.65	2.88	.41
PROMIS Physical	1.51	1.29	1.77	<.001[a]
PROMIS Mental	0.95	0.81	1.11	.50

PROMIS, Patient-Reported Outcomes Measurement Information System.
Only variables significant on univariate analysis were included for multivariable regression.
[a] Indicates P-value <.05.

We also found that higher scores for Patient-Reported Outcomes Measurement Information System physical health and mental health were associated with reduced rates of delayed care, inability to afford care, and medication nonadherence. Other studies within orthopedics have demonstrated the utility of such PROMs to predict clinical outcomes in surgical patients [24,25]. Expanded incorporation of PROM collection into routine clinical practice may present an important opportunity for risk assessment. Additionally, this practice may highlight patients with poor physical and mental health who may need further interdisciplinary support from their primary care physician in addressing their overall health, which could lead to improved surgical outcomes downstream.

This study possesses several notable strengths. The utilization of the All of Us database enabled a comprehensive analysis of access to care and healthcare utilization in the knee osteoarthritis population with its large patient population. The inclusion of traditionally underrepresented populations in medicine, such as racial and ethnic minorities, provides valuable insights into disparities that may exist within these subgroups. Additionally, the study explored various domains of access to care, including delays in care and affordability, providing a holistic view of the challenges faced by individuals with knee osteoarthritis.

Limitations include that this study was observational and retrospective in nature, which limits the ability to establish causality or determine temporal relationships between variables. The utilization of mathematical modeling with logistic regression may reveal associations such as between patient specific factors and access to care, but similarly, it does not establish causality. There is significant contextualization between demographic and socioeconomic factors that drives access to care, which logistic regression is unable to fully delineate. The demographic factors that we assess may be proxy measures for something not currently measured that leads to decreased access to care. Additionally, this study does not analyze insurance status as a patient-specific factor. This was not feasible within our analysis due to it being part of a different survey set than the one we utilized. Insurance status, along with socioeconomic status and other patient-specific factors, is likely associated with varying levels of healthcare access and should be explored in further studies. We are also unable to comment on geographic variation in the observed trends. This is an important area of future focus for targeting where interventions are most needed. The reliance on self-reported survey data introduces the possibility of selection bias or misinterpretation, as just under 50% of all patients with knee osteoarthritis within the database completed the "healthcare access and utilization survey." However, we had a large sample size, which strengthens this paper. An additional limitation of health-related surveys and PROMs are that patients of minority and low socioeconomic status are less likely to complete such surveys which may influence study results [26]. Our study mitigates this limitation by utilizing the All of Us database, which has increased participation of such populations. Future efforts should be targeted at equitable participation in such surveys to ensure their accuracy. Lastly, the patient population represented by the All of Us database may not be fully representative of the entire United States population. There is an increased rate of female participation in the database, but racial distribution more closely resembles the demographics of the United States. The All of Us database has broad recruiting efforts across the country focused on improving representation.

Conclusions

Patients with knee osteoarthritis report significant challenges with delayed care, affordability of care, and medication adherence. Among patients with knee osteoarthritis, patients who are younger

bias, and promoting inclusive environments within healthcare spaces as one avenue for promoting healthcare utilization in this population [22,23]. Certainly, further research is warranted to better explore the relationships between race, sexual identity, and access to care in the United States.

age, female sex, low-income, low-education, nonheterosexual orientation, and have poor physical and mental health are at increased risk of having poor access to treatment. Healthcare practitioners should be aware of these trends in order to help mitigate disparities in healthcare access by participating in and creating interventions for equitable care across different patient populations. More research is needed to better delineate how these factors are associated with difficulties accessing care to allow for targeted interventions and reduction of health disparities.

Acknowledgments

Conflicts of interest

D. Deckey is an editorial board member of the Journal of Arthroplasty; his wife is employed by Stryker Corp; and he is a board/committee member of AAHKS and AAOS. All other authors declare no potential conflicts of interest.

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CRediT authorship contribution statement

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