ORIGINAL RESEARCH

Exploring Racial Disparities in Chronic Pain Management

Anthony J Vargas[1], Leah Tobey-Moore[2], Geoffrey M Curran[3], Rania Elkhateb[4], Kevin W Sexton[5], Brett J Bailey[6], Corey Nagel[7], Johnathan H Goree [ID][4]

[1]Arkansas College of Osteopathic Medicine, Fort Smith, AR, USA; [2]Department of Psychiatry, Center for Health Services Research, and Department of Geriatrics, University of Arkansas for Medical Sciences, Little Rock, AR, USA; [3]College of Pharmacy, University of Arkansas for Medical Sciences, Little Rock, AR, USA; [4]Department of Anesthesiology, University of Arkansas for Medical Sciences, Little Rock, AR, USA; [5]Department of Surgery, University of Arkansas for Medical Sciences, Little Rock, AR, USA; [6]Department of Clinical Informatics, University of Arkansas for Medical Sciences, Little Rock, AR, USA; [7]Department of Biostatistics, University of Arkansas for Medical Sciences, Little Rock, AR, USA

Correspondence: Johnathan H Goree, Department of Anesthesiology, University of Arkansas for Medical Sciences, Little Rock, AR, USA, Email Jhgoree@uams.edu

Introduction: Addressing racial disparities in chronic pain management referrals and prescribing is critical for ensuring equitable healthcare outcomes. Understanding these disparities is crucial for developing effective, patient-centered treatment strategies.

Patients and Methods: A cross-sectional retrospective study of 19,919 patients diagnosed with chronic non-cancer pain between 7/1/2020 and 7/1/2022 was conducted at a major academic medical center. Patients' demographics, pain types, and treatment modalities were analyzed using chi-square tests and logistic regression models to evaluate racial differences in pain management referrals and opioid prescriptions.

Results: Non-Hispanic Black (NHB) and Hispanic patients had significantly lower odds of receiving interventional pain (Odds Ratio [OR] = 0.72 and 0.40, respectively) and neurosurgical referrals (OR = 0.66 and 0.49, respectively) compared to Non-Hispanic White (NHW) patients. Conversely, NHB patients were more likely to receive orthopedic surgery (OR = 1.40) and physical therapy referrals (OR = 1.16). Additionally, both NHB and Hispanic patients had lower odds of receiving opioid therapy (OR = 0.75 and 0.47, respectively) compared to NHW patients.

Conclusion: This study highlights significant racial disparities in chronic pain management, with NHB and Hispanic patients receiving fewer referrals to specialist care and lower opioid prescription rates compared to NHW patients. Strategies to address these disparities include provider education on implicit bias, cultural sensitivity training, and ensuring equitable access to healthcare resources. Further research is needed to explore the root causes of these disparities and develop targeted interventions to improve healthcare equity for all patients.

Keywords: health inequality, health outcomes, discrepancies

Introduction

The unequal treatment of patients with chronic pain based on race is a known and pressing issue in healthcare. There is a growing body of evidence surrounding racial disparities in the treatment of patients with chronic pain.[1–3] Research indicates that race is a significant predictor of both back pain and disability related to back issues. Rundell et al reported that Non-Hispanic Black (NHB) patients, when compared to Non-Hispanic White (NHW) patients, are more likely to have persistent disability related to chronic back pain.[4] Additionally, NHB patients are less likely to receive an opioid prescription for their low back pain (LBP) when compared to NHW patients.[5] Minority populations frequently face challenges such as limited access to care, inadequate insurance coverage or underinsurance, and a scarcity of resources essential for pain management; these factors create opportunities for disparities in healthcare to occur.[6] The origins of these disparities are multifactorial, and include negative stigma, racial segregation of health care, discrepant incarceration rates, and disproportionate enrollment in Medicaid.[7] One such example is the findings by Hoffman et al, that suggest that individuals with some medical training may

hold and use inaccurate beliefs about biological differences between Black and White patients to inform their medical judgments, potentially contributing to racial disparities in pain assessment and treatment.[8] These disparities also raise concerns of whether there are iatrogenic reasons due to differences in treatment modalities used and referrals to specialty providers in these NHB individuals who experience poorer outcomes.

In addition to the burden associated with chronic pain, it is shown that risk factors and management vary systematically with social determinants of health such as race, ethnicity, and socioeconomic status (SES).[9] People experiencing chronic pain encounter multiple challenges including declines in work and in-home productivity, strained interpersonal and social connections due to negative emotional impacts caused by chronic pain, in addition to escalating healthcare treatment expenditures.[10] Chronic pain and pain-related diseases are the leading cause of disability and disease burden globally.[11] Chronic pain has significant economic impacts, costing the US $61.2 billion per year in lost productivity from work, and an estimated national total cost ranging from 560 to 635 billion.[12,13] The chronic pain population has higher healthcare utilization costs and higher Medicare claims as compared to their healthier counterparts.[14,15] There still exists some dispute to disparity in care of patients in chronic pain, specifically when looking at patients being treated in the Southeastern United States.[16] There is a great need to develop effective, patient-centered, multi-disciplinary treatment strategies to better address the growing number of patients with chronic pain.

The objective of this retrospective study was to evaluate inherent differences in the rate of chronic non-cancer pain management referrals and how opioids are prescribed amongst NHB and NHW individuals respectively at a major academic medical center. Based on the large evidence of racial disparity in the treatment of NHB individuals' chronic pain, we hypothesized the following: 1) NHB and Hispanic adult patients with chronic pain will receive fewer specialty referrals when compared to NHW adults with chronic pain, 2) NHW adults with chronic pain will receive a greater quantity of opioid prescriptions when compared to NHB and Hispanic adults with chronic pain. By specifically examining both referral patterns and opioid prescribing rates within a major academic institution in the Southern United States, this study aims to provide further insight into the occurrence of race-based disparity in care in the management of chronic pain.

Materials and Methods

This is a cross-sectional retrospective study of 19,919 patients diagnosed with chronic non-cancer pain from 7/1/2020 to 7/1/2022 at a major academic medical center. This study complies with the Declaration of Helsinki and was reviewed by the University of Arkansas Medical Sciences' (UAMS) Institutional Review Board (IRB# 274978). It was determined as a non-human subject research project and thus due to its retrospective nature informed consent was waived, as all patient information was obtained in a de-identified manner. Patients were identified via retrospective chart review (RCR) based on ICD-10 codes in the Electronic Medical Record (EMR) within the study timeframe. Their treatment referral patterns were then tracked during the study window. ICD-10 codes were selected based on published literature and the authors' perspectives on chronic non-cancer pain diagnoses (Supplemental Table 1). Patients were identified and selected via retrospective chart review (RCR). Upon the input of a diagnosis that corresponds with the ICD-10 code in the Electronic Medical Record (EMR) within the chosen time frame, patients were added to the study. Their subsequent treatment referral patterns and treatment protocols were documented. ICD-10 codes were selected according to the published literature and the authors' perspectives in defining chronic non-cancer pain-related diagnoses (Supplemental Table 1). Variables collected included patients' sex, race/ethnic identification, pain type, referral type and opioid usage. Patient characteristics and demographics are described in Table 1, stratified by race with occurrence of pain type and referral types and opioid usage in each race cohort. We combined discrete EMR fields for race and Hispanic ethnicity into a single indicator of racial/ethnic identity. The race/ethnicity variable was then categorized into non-Hispanic White (NHW), Non-Hispanic Black (NHB), and Hispanic, with the other race/ethnicity categories dropped from the analysis due to inadequate sample sizes. Determination of opioid usage was based on the occurrence of opioids after one of the included ICD-10 diagnoses was made for the patient and was operationalized into a dichotomous indicator of opioid use.

Referrals recorded included referrals to the following clinical services: Interventional Pain, Neurosurgery, Orthopedic Surgery, and Physical Therapy (PT). Similar to the opioid use variable, these were operationalized as binary indicators of receipt of each referral type.

Table 1 Demographics of Patient Population and Type of Referral/Treatment Given

Characteristic (%)	NH White, N = 12,186	NH Black, N = 7478	Hispanic, N = 255[a]	Overall, N = 19,919	p-value[b]
Sex					<0.001
Male	4862 (39.9)	2475 (33.1)	92 (36.1)	7429 (37.3)	
Female	7324 (60.1)	5003 (66.9)	163 (63.9)	12,490 (62.7)	
Pain Type					<0.001
Dorsalgia	5432 (44.6)	3669 (49.1)	144 (56.5)	9245 (46.4)	
Back Pain-Other	538 (4.4)	252 (3.4)	8 (3.1)	798 (4.0)	
CPS	3925 (32.2)	2280 (30.5)	72 (28.2)	6277 (31.5)	
CRPS	39 (0.3)	17 (0.2)	1 (0.4)	57 (0.3)	
Hip OA	523 (4.3)	218 (2.9)	4 (1.6)	745 (3.7)	
Knee OA	1206 (9.9)	733 (9.8)	15 (5.9)	1954 (9.8)	
Neuropathic Pain	247 (2.0)	158 (2.1)	6 (2.4)	411 (2.1)	
DN	184 (1.5)	143 (1.9)	4 (1.6)	331 (1.7)	
PSPS	92 (0.8)	8 (0.1)	1 (0.4)	101 (0.5)	
Interventional Pain					<0.001
No	10,884 (89.3)	6867 (91.8)	244 (95.7)	17,995 (90.3)	
Yes	1302 (10.7)	611 (8.2)	11 (4.3)	1924 (9.7)	
Neurosurgery					<0.001
No	10,779 (88.5)	6936 (92.8)	242 (94.9)	17,957 (90.2)	
Yes	1407 (11.5)	542 (7.2)	13 (5.1)	1962 (9.8)	
Orthopedic Surgery					<0.001
No	9224 (75.7)	5256 (70.3)	207 (81.2)	14,687 (73.7)	
Yes	2962 (24.3)	2222 (29.7)	48 (18.8)	5232 (26.3)	
Physical Therapy					<0.001
No	7826 (64.2)	4490 (60.0)	152 (59.6)	12,468 (62.6)	
Yes	4360 (35.8)	2988 (40.0)	103 (40.4)	7451 (37.4)	
Opioid Therapy					<0.001
No	6694 (54.9)	4713 (63.0)	191 (74.9)	11,598 (58.2)	
Yes	5492 (45.1)	2765 (37.0)	64 (25.1)	8321 (41.8)	

Notes: [a]n (%). [b]Pearson's Chi-squared Test; Fisher's Exact Test for Count Data with simulated p-value (based on 10000 replicates).
Abbreviations: NH, Non-Hispanic; CPS, Chronic Pain Syndrome; CRPS, Complex Regional Pain Syndrome; OA, Osteoarthritis; DN, Diabetic Neuropathy; PSPS, Post-Surgical Pain Syndrome.

Statistical Methods

We calculated descriptive statistics to characterize patient demographics, used chi-square tests and Fisher's exact tests to compare the proportion of pain types and treatment modalities across racial/ethnic groups. We then fit a series of logistic

regression models, with each model evaluating the association of race/ethnicity with a dichotomous indicator of whether a patient received one of the pain treatment modalities (ie opioid use, Interventional Pain referral, Neurosurgery referral, Orthopedic Surgery referral, and Physical Therapy referral) after controlling for sex, primary pain type, and concurrent receipt of the other pain treatment modalities. For each model, we assessed interaction effects between race/ethnicity and sex. We exponentiated model coefficients to yield odds ratios and specified an alpha of 0.05 for statistical significance and did not adjust p-values for multiple comparisons due to the models examining distinct outcomes.[17] Analyses were performed using R (version 4.3.1).

Results

Of the 19,919 patients reviewed for this study, 12,490 patients (62.7%) were female. Patient race and ethnicity break-down includes 12,186 patients identified as NHW, 7478 patients identified as NHB, and 255 patients identified as Hispanic. The most common pain types of the pain types evaluated in this patient population (Table 1) included dorsalgia (9245 patients,46.4%), chronic pain syndrome (CPS) (n = 6277, 31.5%), and knee osteoarthritis (OA) (n = 1954, 9.8%). The most frequent specialists/treatment given to patients were opioid therapy (41.8%), followed by referrals to PT (37.4%) and Orthopedic Surgery (26.3%). Data were stratified into different referral treatment modalities and controlled for sex, pain type, and receipt of other pain treatment modalities.

Our primary analysis compared the odds of receiving a referral or opioid prescription in different race/ethnicity groups after controlling for confounding factors. The results of our regression analysis (Table 2) demonstrate that both NHB (Odds Ratio [OR]) = 0.72, 95% Confidence Interval (CI): 0.65–0.8, P-value: < 0.001) and Hispanic (OR = 0.40,

Table 2 Logistic Regression Model with Race/Ethnicity, Sex, Referral Type and Pain Treatment within a 95% Confidence Interval

Characteristic	OR	95% CI	p-value
Interventional Pain			
Race/Ethnicity			
NH White	–	–	
NH Black	0.72	0.65, 0.80	<0.001
Hispanic	0.40	0.20, 0.72	0.004
Sex			
Male	–	–	
Female	1.09	0.99, 1.21	0.088
Neurosurgery			
Race/Ethnicity			
NH White	–	–	
NH Black	0.66	0.60, 0.74	<0.001
Hispanic	0.49	0.26, 0.83	0.013
Sex			
Male	–	–	
Female	0.73	0.66, 0.81	<0.001

(*Continued*)

Table 2 (Continued).

Characteristic	OR	95% CI	p-value
Orthopedic Surgery			
Race/Ethnicity			
NH White	–	–	
NH Black	1.40	1.31, 1.50	<0.001
Hispanic	0.83	0.59, 1.15	0.27
Sex			
Male	–	–	
Female	0.97	0.91, 1.04	0.42
Physical Therapy			
Race/Ethnicity			
NH White	–	–	
NH Black	1.16	1.09, 1.23	<0.001
Hispanic	1.42	1.09, 1.84	0.009
Sex			
Male	–	–	
Female	1.22	1.14, 1.29	<0.001
Opioid Therapy			
Race/Ethnicity			
NH White	–	–	
NH Black	0.75	0.70, 0.79	<0.001
Hispanic	0.47	0.35, 0.63	<0.001
Sex			
Male	–	–	
Female	0.86	0.81, 0.91	<0.001

Abbreviations: OR, Odds Ratio; CI, Confidence Interval.

95% CI: 0.2–0.72, P-value:0.004) individuals had significantly lower odds of receiving interventional pain referrals compared to NHW individuals. Similarly, after controlling for sex, pain type, and other pain treatment modalities, both NHB (OR = 0.66, 95% CI: 0.6–0.74, P-value: <0.001) and Hispanic individuals (OR = 0.49, 95% CI: 0.26–0.83, P-value:0.013) had lower odds of receiving neurosurgical referrals compared to NHW individuals. Additionally, females had significantly lower odds (OR = 0.73, 95% CI: 0.66–0.81, P-value: <0.001) of receiving a neurosurgery referral compared to males, regardless of race/ethnicity.

In contrast, NHB individuals had significantly higher odds (OR = 1.40, 95% CI: 1.31–1.5, P-value: <0.001) of receiving orthopedic surgery referrals compared to NHW individuals. However, there was no significant difference between Hispanic individuals and NHW individuals or between males and females in receiving orthopedic surgery referrals. When evaluating the referral rate for PT, NHB individuals had significantly higher odds (OR = 1.16, 95% CI: 1.09–1.23, P-value: <0.001) of referral to PT compared to NHW individuals, after controlling for sex, pain type, and

receipt of other pain treatments. Moreover, the difference in referral rate to PT between Hispanic individuals and NHW individuals increased and was statistically significant (OR = 1.42, 95% CI: 1.09–1.84, P-value:0.009) after adjusting for sex. Females also had significantly greater odds (OR=1.22, 95% CI: 1.14–1.29, P-value: <0.001) of receiving a PT referral compared to males.

Regarding opioid therapy, both NHB (OR = 0.75, 95% CI: 0.7–0.79, P-value: <0.001) and Hispanic individuals (OR = 0.47, 95% CI: 0.35–0.63, P-value: <0.001) had significantly lower odds of receiving opioid therapy compared to NHW individuals, even after controlling for sex, pain type, and receipt of other pain treatments. Additionally, females had significantly lower odds (OR = 0.86, 95% CI: 0.81–0.91, P-value: <0.001) of receiving opioid therapy compared to males. Although we tested the interaction between race/ethnicity and sex in each model, we did not find any statistically significant interactions. As a result, the interaction terms were not included in the final models that were reported.

The Forest plot in Supplemental Figure 1 shows the combined results of fully adjusted logistic regression models for each pain treatment/referral modality. The OR with 95% CI indicated the likelihood of receiving a specific referral or pain treatment among NHB and Hispanic individuals compared to NHW individuals and among females compared to males. Values less than 1 indicated lower odds of receiving the treatment than the comparison group, while values greater than 1 indicated higher odds of receiving the treatment.

Discussion

The findings of our study among 19,919 patients with chronic non-cancer pain indicate significant differences among racial groups when comparing referrals to specialists, and whether opioids were prescribed. Hispanic and NHB patients were referred to neurosurgeons and interventional pain specialists at notable lower rates than NHW patients. Additionally, Hispanic and NHB patients received opioid prescriptions at a significantly lower rate compared to NHW patients. Interestingly, NHB patients were referred to PT and orthopedic surgery more frequently than NHW patients. These findings confirm what has been demonstrated in the literature. Disparities in pain care exist for people of color in the U.S not just in pain specialties but also in primary care.[5]

Primary care algorithms for the treatment of back pain start with oral over-the-counter medications, lifestyle modifications, and rest. After 6 weeks, if there is no improvement, patients are then referred to PT. Early identification and intervention with PT help address acute pain in patients, leading to improved functional capability, decreased pain and opioid/non-steroidal anti-inflammatory drug usage (NSAID).[18] When this is not successful, referral to specialty care is the next step.

Our findings show that NHB patients are referred to PT at a higher level than NHW patients. This potentially suggests that the physicians are more compliant with the initial steps of the algorithm with NHB patients. This could also suggest that NHW patients are referred to more advanced treatment earlier in their pathology, leading to lower PT referrals. Previously published research has shown that the rate of referrals to PT can be influenced by a patient's household income and race/ethnicity.[19] Further exploration of a patient's socioeconomic status is needed in future analyses. The statistically higher referral rates of NHW patients to chronic pain physicians and neurosurgeons, and higher rates of opioid prescriptions could be due to one of two causes: 1) higher rates of PT for NHB patients lead to higher rates of pain improvement, or 2) NHW patients are likely to get more aggressive treatment leading to higher rates of referral to specialists.

We do not understand the increase in referral to orthopedics after common chronic pain diagnoses. While we did not study the incidence of concomitant diagnosis of hip or knee arthritis with back pain, the authors wonder if NHB and Hispanic patients were more likely to have concomitant orthopedic complaints with their chronic pain conditions. The authors believe that chronic pain in NHB patients may be more likely to lead to additional orthopedic diagnoses rather than referrals to treatments aimed at improved quality of life (QOL), such as referrals to chronic pain specialists or opioid therapy. However, this hypothesis needs to be explored further.

Since referral to specialist and opioid prescribing is influenced by clinicians as well as patients' symptoms and decisions, we can target providers as a target audience of future interventions to help improve disparities in guideline concordance. Additionally, the authors suggest further research into social determinants of health to better understand the links between racial and social discrimination and chronic pain.

As with any RCR study, we must acknowledge certain limitations. The study population was restricted to individuals with a pain diagnosis and given the evidence of racial/ethnic disparities in pain diagnoses, this limitation may affect the

generalizability of the findings to populations with varying diagnostic rates.[8,20] Additionally, since the data was collected from a single large medical center in the Southern United States, the findings may not be generalizable to other areas with different patient demographics. Our Hispanic patient population was significantly smaller than our NHB patients and NHW patients. This difference in population size could stem from how the electronic health record defines ethnicity versus race, which could disproportionately affect Hispanic patients and lead to missing data. While we addressed this difference with a monte carlo simulation, this led to large confidence intervals, diminishing the accuracy of the data. Also, the study was conducted within a singular large academic center in the southern US, and the results may not be generalizable to other regions or healthcare settings. Our study was limited to the EMR system of a single medical center, which means referrals outside of our system may be missing. This could pose as an additional limitation of this study. Furthermore, the study did not explore in-depth the specific factors that can potentially contribute to the observed disparities, such as: age, chronicity of pain, use of drugs or addictive substances, patient-reported experiences, pain levels experienced by each patient, provider perspectives and cultural beliefs to pain, or community-level factors. The authors hope that a multi-center follow up study with qualitative data could provide more information about generalizability and potential causes. Future study examining the effects of socioeconomic factors and cultural beliefs on the referral pattern to specialists may be needed for case level analysis.

Conclusion

This single center study confirms that NHB and Hispanic patients with chronic pain are less likely to receive referrals to chronic pain specialists, referred to neurosurgeons, or prescribed opioids than NHW patients. Conversely, NHB patients were more likely to be referred to PT and orthopedic surgery. The results of this study highlight a trend of disparities in chronic pain care that is consistent with literature findings. This study speaks to the need for improved vigilance and necessity for future research when it comes to these types of disparities. Also, identifying solutions to increase standardization of care and care pathways and mitigation of implicit bias may lead to improved outcomes and potentially inform future policy changes to reduce the rate in the disparity between referral rates and opioid treatment in patients with chronic pain. We strongly believe this study will continue to bring awareness to the issue of racial disparities and propagate continued conversations on how to alleviate them and improve patient outcomes.

Funding

Disclosure

Dr. Goree has received consultant fees from Abbott Medical, Saluda, and Stratus Medical. He receives research support from Mainstay Medical and SPR Therapeutics. Dr. Sexton has equity in HoopCare, Inc; hDrop Technologies, Inc; and Qventus, Inc. Dr. Sexton has licensed intellectual property owned by Vanderbilt University Medical Center and the University of Arkansas for Medical Sciences. All other authors report no conflicts of interest in this work.

References

1. Marin JR, Rodean J, Hall M, et al. Racial and ethnic differences in emergency department diagnostic imaging at US Children's Hospitals, 2016–2019. *JAMA Network Open*. 2021;4(1):e2033710. doi:10.1001/jamanetworkopen.2020.33710
2. Cooper LA, Roter DL, Carson KA, et al. The associations of clinicians' implicit attitudes about race with medical visit communication and patient ratings of interpersonal care. *Am J Public Health*. 2012;102(5):979–987. doi:10.2105/AJPH.2011.300558
3. Mills AM, Shofer FS, Boulis AK, et al. Racial disparity in analgesic treatment for ED patients with abdominal or back pain. *Am J Emerg Med*. 2011;29(7):752–756. doi:10.1016/j.ajem.2010.02.023
4. Rundell SD, Sherman KJ, Heagerty PJ, et al. Predictors of persistent disability and back pain in older adults with a new episode of care for back pain. *Pain Med*. 2017;18(6):1049–1062. doi:10.1093/pm/pnw236
5. Chen Q, Vella SP, Maher CG, et al. Racial and ethnic differences in the use of lumbar imaging, opioid analgesics and spinal surgery for low back pain: a systematic review and meta-analysis. *Eur J Pain*. 2023;27(4):476–491. doi:10.1002/ejp.2075

6. Anderson KO, Green CR, Payne R, et al. Racial and ethnic disparities in pain: causes and consequences of unequal care. *J Pain*. 2009;10 (12):1187–1204. doi:10.1016/j.jpain.2009.10.002

7. Saloner B, Levin J, Chang HY, et al. Changes in buprenorphine-naloxone and opioid pain reliever prescriptions after the Affordable Care Act Medicaid expansion. *JAMA Network Open*. 2018;1(4):e181588. doi:10.1001/jamanetworkopen.2018.1588

8. Hoffman KM, Trawalter S, Axt JR, Oliver MN. Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between blacks and whites. *Proc Natl Acad Sci U S A*. 2016;113(16):4296–4301. doi:10.1073/pnas.1516047113

9. Morales ME, Yong RJ. Racial and ethnic disparities in the treatment of chronic pain. *Pain Med*. 2021;22(1):75–90. doi:10.1093/pm/pnaa427

10. Chou R, Turner J, Devine E, et al. The effectiveness and risks of long-term opioid therapy for chronic pain: a systematic review for a national institutes of health pathways to prevention workshop. *Ann Intern Med*. 2015;162:276–286. doi:10.7326/M14-2559

11. GBD 2016 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016 [published correction appears in Lancet. 2017;390(10106):e38]. *Lancet*. 2017;390(10100):1211–1259. doi:10.1016/S0140-6736(17)32154-2

12. Stewart WF, Ricci JA, Chee E, et al. Lost productive time and cost due to common pain conditions in the US workforce. *JAMA*. 2003;290 (18):2443–2454. doi:10.1001/jama.290.18.2443

13. Gaskin DJ, Richard P. The economic costs of pain in the United States. *J Pain*. 2012;13(8):715–724. doi:10.1016/j.jpain.2012.03.009

14. Hurwitz EL, Randhawa K, Yu H, et al. The global spine care initiative: a summary of the global burden of low back and neck pain studies. *Eur Spine J*. 2018;27(Suppl 6):796–801. doi:10.1007/s00586-017-5432-9

15. Vos T, Allen C, Arora M, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990– 2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;388:1545–1602.

16. Kapoor S, Thorn BE. Healthcare use and prescription of opioids in rural residents with pain. *Rural Remote Health*. 2014;14(3):2879.

17. Rothman KJ. No adjustments are needed for multiple comparisons. *Epidemiology*. 1990;1(1):43–46. doi:10.1097/00001648-199001000-00010

18. Martin S, Tallian K, Nguyen VT, et al. Does early physical therapy intervention reduce opioid burden and improve functionality in the management of chronic lower back pain? *Ment Health Clin*. 2020;10(4):215–221. doi:10.9740/mhc.2020.07.215

19. Ratnasamy PP, Oghenesume OP, Rudisill KE, Grauer JN. Racial/ethnic disparities in physical therapy utilization after total knee arthroplasty. *J Am Acad Orthop Surg*. 2023;31(7):357–363. doi:10.5435/JAAOS-D-22-00733

20. Friesen P, Gligorov N. White ignorance in pain research: racial differences and racial disparities. *Kennedy Inst Ethics J*. 2022;32(2):205–235. doi:10.1353/ken.2022.0012