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REVIEW

Racial Disparities in Opioid Prescribing in the United States from 2011 to 2021: A Systematic Review and Meta-Analysis

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Background: This meta-analysis is an update to a seminal meta-analysis on racial/ethnic disparities in pain treatment in the United States (US) published in 2012. Since then, literature has accumulated on the topic and important policy changes were made.

Objective: Examining racial/ethnic disparities in pain management and investigating key moderators of the association between race/ethnicity and pain outcomes in the US.

Methods: We performed a systematic search of publications (between January 2011 and February 2021) from the Scopus database. Search terms included: race, racial, racialized, ethnic, ethnicity, minority, minorities, minoritized, pain treatment, pain management, and analgesia. All studies were observational, examining differences in receipt of pain prescription medication in various settings, across racial or ethnic categories in US adult patient populations. Two binary analgesic outcomes were extracted: 1) prescription of "any" analgesia, and 2) prescription of "opioid" analgesia. We analyzed these outcomes in two populations: 1) Black patients, with White patients as a reference; and 2) Hispanic patients, with non-Hispanic White patients as a reference.

Results: The meta-analysis included twelve studies, and the systematic review included forty-three studies. Meta-analysis showed that, compared to White patients, Black patients were less likely to receive opioid analgesia (OR 0.83, 95% CI [0.73–0.94]). Compared to non-Hispanic White patients, Hispanic patients were less likely to receive opioid analgesia (OR 0.80, 95% CI [0.72–0.88]).

Conclusion: Despite a decade's gap, the findings indicate persistent disparities in prescription of, and access to opioid analgesics for pain among Black and Hispanic populations in the US.

Keywords: race, ethnicity, pain management, disparities

Introduction

In 2020, the sensation of pain was redefined as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage".[1] Prior to this, the last augmentation of the definition was in 1979.[1] The process of defining chronic pain, however, is more convoluted. By some definitions, once the initial

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experience of pain has extended beyond the average healing time, it can be considered chronic.[2] By others, the persistence of pain beyond three months meets the requirements for chronic pain.[3,4] The experience of chronic pain in the United States is becoming increasingly common, with recent reports finding that one in five Americans experience chronic pain. Moreover, 7.4% of Americans report functional limitations from their chronic pain that adversely impacts their daily lives.[5] The same report also found significant variability in the endorsement of chronic pain among different racial and ethnic identities.[5]

Pain management, especially pharmacological pain management, has proven to be a complex matter in the United States. The direct and indirect costs of chronic pain in America have risen substantially in recent years, surpassing many other chronic health conditions.[6] An additional contributing factor, with implications for patient care and public health, is the ongoing opioid epidemic. In the last decade, there have been increasing efforts to establish policies regarding pain assessment, treatment, and compliance in an effort to better regulate pain management practice.[7] As a result, the Centers for Disease Control and Prevention (CDC) released guidelines in 2016 that recommend non-opioid, non-pharmacologic agents as first line therapies for pain.[8] The CDC guidelines were again updated in 2022 after several reports documented inadequately managed pain, severe withdrawal symptoms, worsening pain outcomes, and adverse psychiatric events for patients after improper implementation of the 2016 guidelines. The 2022 guidelines also acknowledged longstanding racial and ethnic disparities in pain management, and specifically opioid access, for patients in the US. Their report suggests that clinician bias is a root cause of this inequity and demands "immediate and sustained attention and action.".[9]

Racial disparities in the context of pain management have been well established in medical literature. Before patients even step foot in a hospital, myriad factors, including racial inequalities in distribution of healthcare resources, employment, income, and structural racism within the field of healthcare itself, inhibit equitable access to care for patients with minoritized racial and ethnic identities.[10] Once patients have had access to, and sought, care for their pain, these inequities are exacerbated.[10] In a cross-sectional study performed by Ezenwa et al, African Americans reported worse pain management and quality of life in comparison to Caucasians.[11] These findings were corroborated in a systematic review and meta-analysis conducted by Meghani et al in 2012 which aggregated 20 years' worth of evidence demonstrating consistent racial and ethnic disparities in pain management, most notably for African-American and Hispanic patients.[12] The goal for our meta-analysis and systematic review is to add to the current body of research a synthesis of the evidence that has accumulated since the publication of Meghani 2012. Specifically, we aim to evaluate to what extent the disparities found by Meghani 2012 persist despite recent updates to CDC guidelines for opioid prescribing. The goals of this meta-analysis additionally include exploring the moderating role of study size, setting, and timing on analgesic treatment disparities.

Methods

Overview

In order to improve the quality and transparency of reporting, we followed MOOSE (Meta-analysis of Observational Studies in Epidemiology) guidelines for our meta-analysis.[13] These guidelines provide a standardized framework for reporting critical elements such as study design, population characteristics, exposure and outcome variables, and statistical methods. By employing these guidelines, we aimed to enhance the transparency and reproducibility of our analysis while minimizing the risk of bias (see Supplemental Figure 1). Using the Cochrane Handbook as a guide, best practices for planning the review, grouping of studies, interventions and outcome synthesis were implemented in the creation of this study.[14,15]

Search Strategy

We performed a systematic search of published studies (between January 2011 and February 2021) from the Scopus database. Search terms were consistent with the search strategy designed and used by Meghani et al to ensure consistency among these studies. The Scopus database includes articles from MEDLINE and EMBASE. Our original search resulted in 688 records. We did not explicitly exclude non-English articles but did specify only English keywords in the search and no non-English records were returned. Results of the search are documented in a PRISMA flow diagram in Figure 1, and a complete list of the 43 evaluated studies,[16–58] including 21 considered for meta-analysis (11 accepted + 10 rejected)

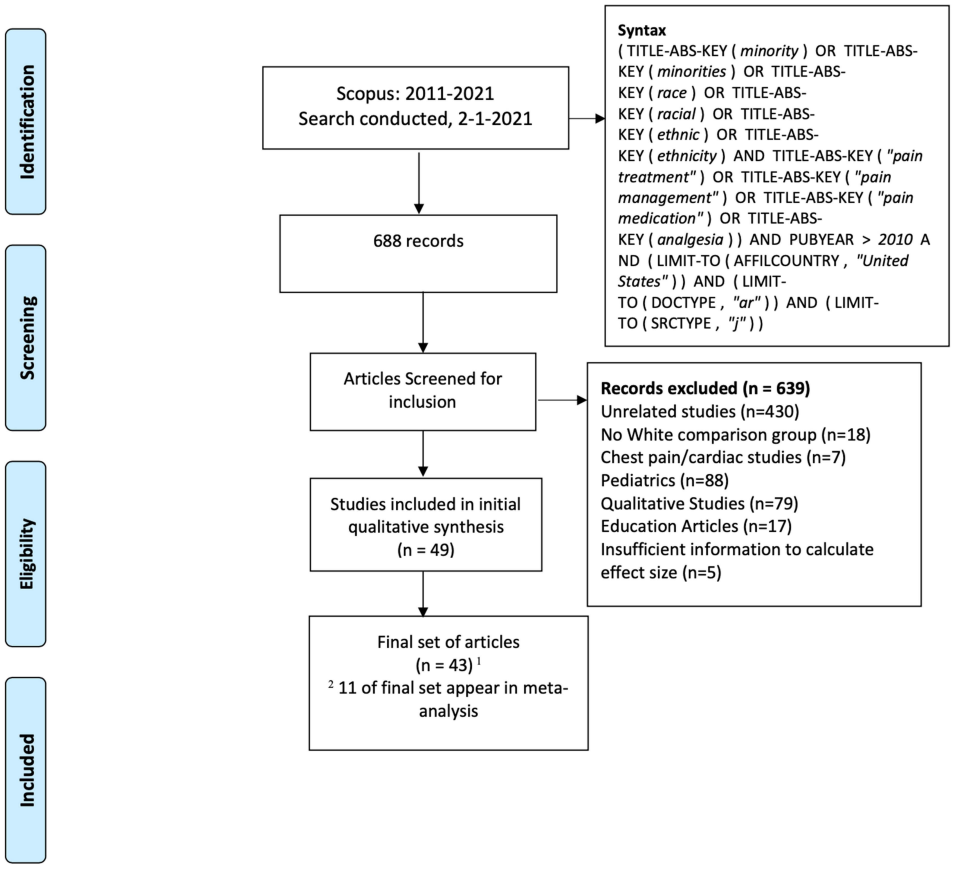

Figure 1 Prisma Flow Diagram. Preferred reporting items for systematic and meta-analyses flowchart. (**A**) These studies included randomized controlled trials, prospective observational cohort and retrospective studies. (**B**) Studies were included in meta-analysis if they contained all of the following: specified analgesic outcomes, odds-ratio results, reported dates for study period and data collection, sample size, type of pain, pain treatment setting, provided racial and ethnic breakdown, reported relevant disparity outcomes and study confounders.
Notes: [1]Supplementary Table 1; [2]Supplementary Table 2.

appears in Supplemental Table 1. All studies included in the meta-analyses were observational (secondary use of EHR cohort data), examining (at minimum) discrepancies in receipt of pain prescription medication across predefined race or ethnicity categories in US adult patient populations. No attempt was made to contact any study authors directly in cases where the reported outcomes did not meet our criteria for meta-analysis, and we also did not make any effort to expand the search beyond the database (eg by mining reference lists). We relied completely on the returned results from the Scopus database.

Search Terms/Keywords

Minority, Minorities, Race, Racial, Ethnic, Ethnicity, Pain treatment, Pain management, Pain medicine, Analgesia

Data Extraction and Coding

Three investigators (TO, HF, and ZH) performed data extraction and validation. Two investigators (TO and AA) used a structured form to extract specific analgesic outcomes, racial and ethnic breakdowns, type of pain, pain treatment setting, dates of studies, study quality, and effect size data.

Outcomes

Three binary analgesic outcomes were collected from the studies: 1) prescription of "any" analgesia; 2) prescription of "opioid" analgesia; and 3) prescription of "non-opioid" analgesia. If a study had more than one of the outcomes, each one

was extracted and recorded separately. Note that we were unable to collect enough examples of the third outcome (prescription of non-opioid analgesia), so this outcome was dropped from consideration in our meta-analyses.

Racial and Ethnic Groups

Racial and ethnic subgroups were divided based on the National Institutes of Health (NIH) criteria: Hispanic/Latino vs non-Hispanic for ethnicity; White/Caucasian, Black/African American, Asian, American Indian/Alaskan Native, Native Hawaiian/Pacific Islander, and Multiracial for race. The category Other was sometimes used within a few studies to describe race as well.

Inclusion of 2012 Meta-Analysis

We conceived of this project as a follow-up to and updating of Meghani 2012,[12] and thus included the meta-analytic results of Meghani 2012 as a necessary and sufficient summary of all relevant publications up to that point. We also felt that, in light of the publication of the CDC's guidelines for prescribing opioids for chronic pain in 2016,[8] studies published after that year might show trends that differ from those seen in Meghani 2012. Unfortunately, even the most recent relevant studies published after 2012 did not survey pain-prescription-receiving populations beyond 2016, so we were unable to assess any change in practice across this horizon, but we did opt to implement systematic sensitivity analyses removing Meghani 2012 from each outcome meta-analysis and report the results both with and without the Meghani 2012 data point. This strategy allowed us to maintain continuity with Meghani 2012 in an unbiased way and to test for possible trends "since Meghani 2012" via meta-regression on the study year.

Statistical Methods

Meta-analysis and meta-regression were performed using empirical Bayes random-effects models; see Supplemental Methods for additional details, including about outcome coding and synthesis, asymmetry (funnel-plot) analyses, and further sensitivity analyses.

Results

The final data analysis included 12 studies (Supplemental Table 1). Of these, 11 were secondary use of EHR cohort data),[17,20,23,34,35,37,45,46,48,55,56] and 1 was a meta-analysis that covers studies prior to 2012.[12] The quality of these studies was judged as high for 3 of them (scores 10–13 out of 13), moderate for 7 (scores 7–9), and low for 1 (score <7) using an adaptation of the Downs and Black instrument.[59] We observed Newcastle-Ottawa "star" counts in ranges of 4–6 (moderate quality, 4 studies) and 7–9 (high quality, 7 studies). The results of both assessments are shown in Supplemental Tables 2 and 3.

Outcomes were derived for each population that was independently analyzed in these papers as outlined in the Methods section and Supplemental Methods; hence papers studying multiple distinct populations contributed multiple outcomes to the meta-analysis. We performed meta regressions on three specific covariates (study size, time of study, and whether an inpatient or outpatient study) to evaluate for association between those factors and the effect size of the study. The results of these analyses are presented in a series of bubble plots (Supplemental Figures 2–5). Importantly, we did not see compelling evidence of an association between effect size and study size for any of the meta-analyzed outcomes (an apparent trend for the outcome of any analgesia versus no analgesia when comparing Hispanic to non-Hispanic White patients is not significant, being based on just 4 studies, and is better explained as a regression leverage effect). Asymmetry and sensitivity analyses for each meta-analyzed outcome, as well as evaluation of the impact of individual study weights on the results, are presented in Supplemental Results.

Results of the Meta-Analysis

i. Likelihood of receiving opioids for pain, comparing Black patients to White patients

Among 15 cohorts studied, 7 showed that Black patients were less likely to receive opioid analgesia, whereas 1 showed they were more likely to receive opioid analgesia compared to White patients. In the remaining 7 cohorts, there was no statistically significant difference in receipt of opioids between Black and White patients. Overall, our meta-analysis showed

that Black patients were less likely to receive opioid analgesia than White patients, with an odds ratio of 0.83 (95% CI [0.73–0.94]) (Figure 2A and B).

ii. Likelihood of receiving any analgesic for pain, comparing Black patients to White patients

Among 8 cohorts included, 4 showed Black patients were less likely to receive any analgesia medication for pain compared to White patients; 4 others included in this category did not reach statistical significance, and 2 of those reported large effects in the opposite direction (White patients being less likely to receive analgesia). Our meta-analysis with these datasets showed no significant difference between Black patients and White patients (OR 0.87; 95% CI [0.68–1.11]) (Figure 3A and B).

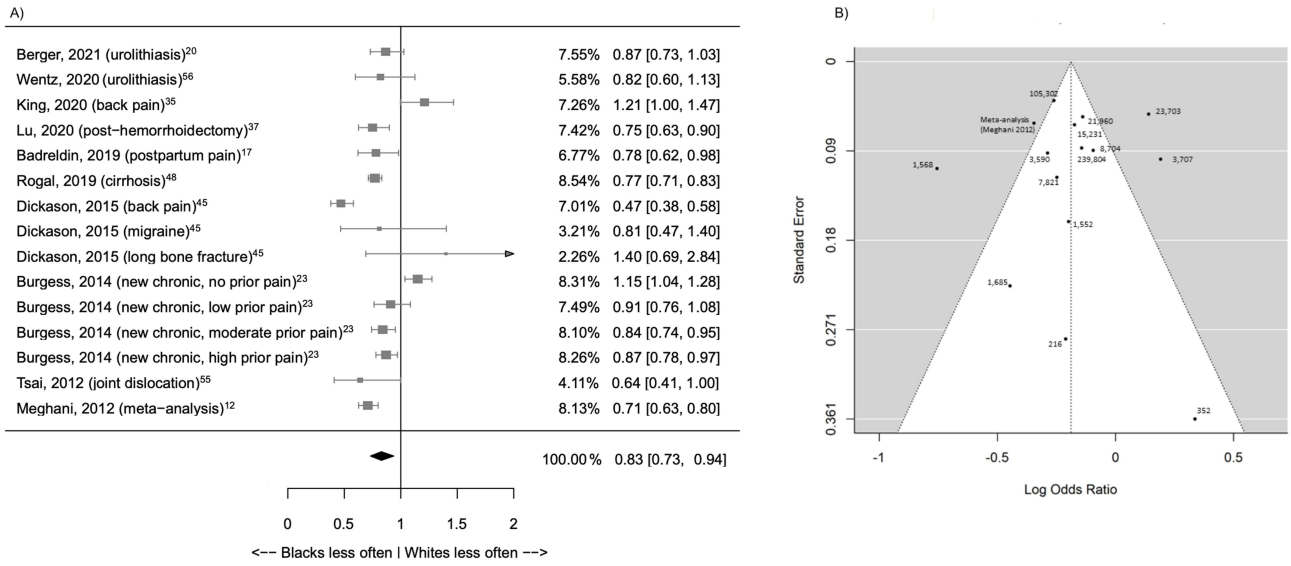

Figure 2 Receipt of opioids, Black vs White (**A**) Meta-Analysis; (**B**) Asymmetry Analysis.
Notes: Table Headings: (**A**) Study; Weights; OR [95% CI]; (**B**) [Black v White, Opioids v No Opioids]. RE Model (Q = 97/08, *df* = 14, p = 0.00; I^2 = 87.6%).

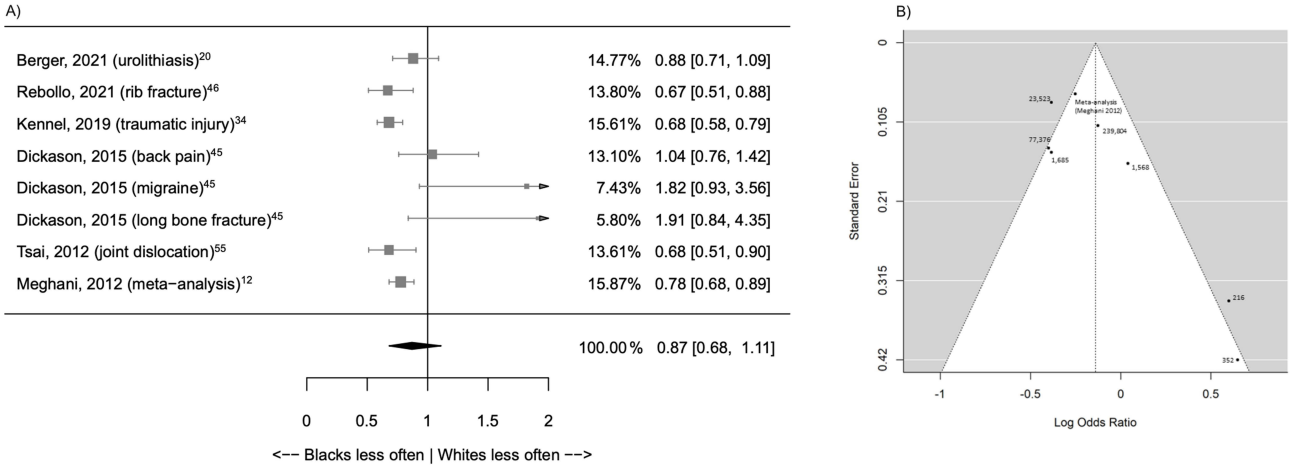

Figure 3 Receipt of any analgesic, Black vs White (**A**) Meta-Analysis; (**B**) Asymmetry Analysis.
Notes: Table Headings: (**A**) Study; Weights; OR [95% CI]; (**B**) [Black v White, Analgesic v No Analgesic]. RE Model (Q = 20.28, *df* = 7, p = 0.00; I^2= 86.5%).

iii. Likelihood of receiving opioids for pain, comparing Hispanic patients to Non-Hispanic White patients

Seven cohorts were selected for analysis in this category. Of those, 4 showed that Hispanic patients were less likely to receive opioid analgesia, and the remaining 3 did not show a significant effect. In our analysis, the odds ratio for receiving opioid medication for pain in Hispanic patients versus White patients was 0.80 (95% CI [0.72–0.88]) (Figure 4A and B).

iv. Likelihood of receiving any analgesic for pain, comparing Hispanic patients to Non-Hispanic White patients

Two of the 5 cohorts in this category showed that Hispanic patients were less likely to receive any type of analgesia, while the remaining 3 did not show a significant difference, with all reported odds ratios close to 1. Our meta-analysis did not show a significant difference between the rates of receiving any analgesia in Hispanic patients compared to Non-Hispanic White patients (OR 0.88, 95% CI [0.74–1.04]) (Figure 5A and B).

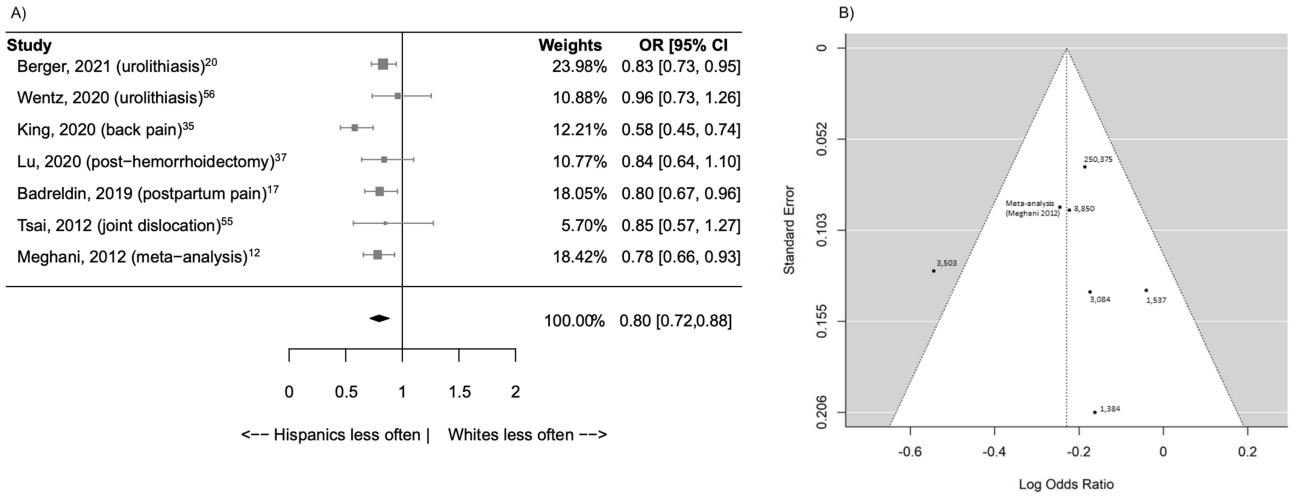

Figure 4 Receipt of opioids, Hispanic vs Non-Hispanic White (**A**) Meta-Analysis; (**B**) Asymmetry Analysis.
Notes: Table Headings: (**A**) Study; Weights; OR [95% CI]; (**B**) [Hispanic v Non-Hispanic White, Opioids v No Opioids]. RE Model (Q = 8.82, *df* = 6, p = 0.18; I^2= 39.0%).

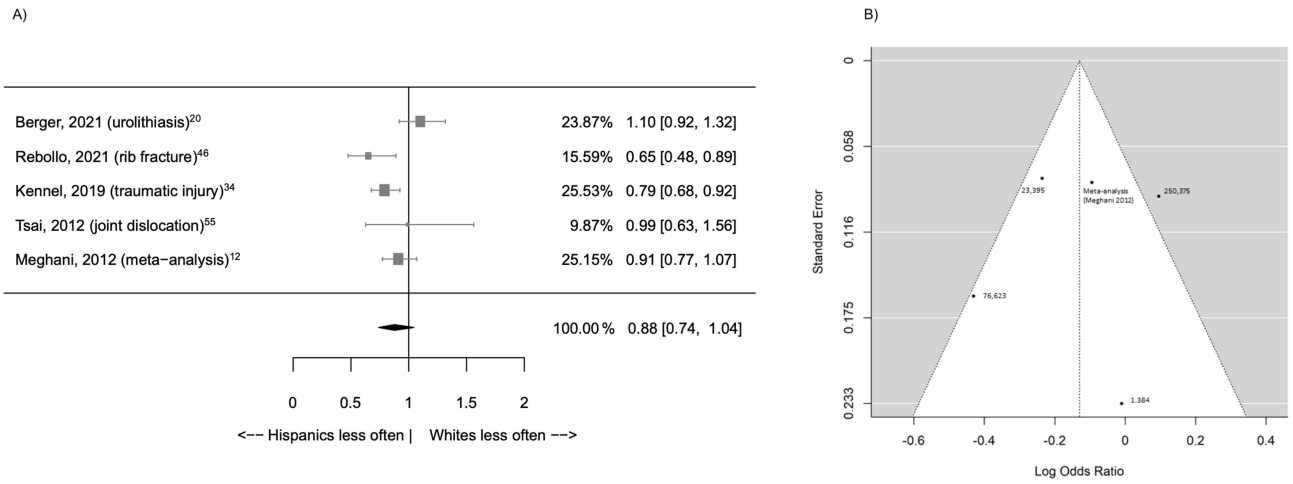

Figure 5 Receipt of any analgesic, Hispanic vs Non-Hispanic White (**A**) Meta-Analysis; (**B**) Asymmetry Analysis.
Notes: Table Headings: (**A**) Study; Weights; OR [95% CI]; (**B**) [Hispanic v Non-Hispanic White, Analgesic v No Analgesic]. RE Model (Q = 11.65, *df* = 4, p = 0.02; I^2 = 67.5%).

Discussion

This meta-analysis builds upon an earlier meta-analysis documenting concerning racial and ethnic disparities in the treatment of pain in the United States.[12] As a follow-up to Meghani et al's study, and using a similar methodology, we provide further insights on racial disparities in analgesic treatment for pain in the United States.

Our findings were consistent with Meghani et al's conclusion despite a decade's gap between the two studies, and do not show evidence of any particular trend across study year, indicating a persistent disparity in access to opioid analgesics for Black and Hispanic populations. Recent literature published after the data collection of this study remains in line with our findings over a wide range of conditions including long bone fractures, appendicitis, and advanced cancer (Beletsky, 2021;[60] Guedj, 2021;[61] Lamba, 2020,[62] Morden, 2021).[63]

Since the previous meta-analysis in 2012, and due to the subsequent publication of the 2016 CDC opioid prescribing guidelines, several opioid prescribing practices have changed nationally.[8,64,65] We would expect that these policy changes might have reduced the overall size of the observed disparities in the outcomes of opioid receipt as policies have reduced opioid prescriptions generally and clinical use of opioids nationally. However, the observed disparities have remained staunch in terms of racial differences in access to opioids for pain.[8,64,65] From a clinical practice perspective, this study shows that more efforts are needed to create an environment of equal and appropriate treatment in the field of pain management as well as patients' access to effective non-opioid and non-pharmacological treatments. Accumulated evidence on sustained racial and ethnic differences in pain management, as well as unfounded misconceptions among clinicians about biological bases for differences in race and pain perception, warrants more comprehensive training in pain and pain care disparities of clinicians and practicing pain management specialists.[30]

Interpretation of our findings and the sensitivity analyses suggesting Black patients may have a lower likelihood of receiving any analgesia, especially in "adjusted" studies, should be tempered by study limitations and the heterogeneity of adjustment variables. Nonetheless, one could look to variables adjusted across each study for plausible reasons for observed disparities. The disappearance of significance in adjusted analysis could simply reflect the complex interactions of race and socioeconomic (SES) variables with health disparities. Due to long-term consequences of structural racism, which disproportionately affects Blacks in the United States, prior studies have questioned the assumption that race has no effect on pain outcomes when controlling for SES.[66] Persistence of racial disparities in opioid analgesia among Blacks and Hispanics underscores a need for continued attention to understanding sources and consequences of these disparities in pain care and need for strategies to address them.[12,66] It should be further noted that these disparities are heightened when considering racial inequities that limit access to healthcare for patients with minoritized identities.

More than six years after the release of its first opioid guidelines for chronic pain, at the end of 2022, the CDC updated its opioid guidelines. These guidelines expand the scope of the guideline to include acute (duration of <1 month), and subacute (duration of 1–3 months) pain. In the recently released guidelines, it is recommended that opioids should not be considered first-line or routine therapy for acute or subacute pain and that nonopioid therapies can be as effective as opioids for many common types of acute pain and subacute pain. It is recommended that clinicians maximize the use of nonpharmacologic and nonopioid pharmacologic therapies and only consider opioid therapy for acute pain if benefits are anticipated to outweigh risks to the patient. It is also recommended that clinicians should not treat acute pain with extended-release or long-acting (ER/LA) opioids or initiate opioid treatment for subacute or chronic pain with ER/LA opioids.[9] Given the new guidelines, it is critical that we continue to revisit this topic in the coming years and examine whether future studies demonstrate closing of gap in pain treatment disparities and access to non-opioid, non-pharmacological treatments with these revised clinical guidelines.

Limitations

Some limitations of our review deserve attention. Our aim was to conduct a meta-analysis since the publication of the previous meta-analysis on the topic. However, to be comprehensive and to capture a larger time frame we included Meghani et al's 2012 meta-analysis in the present study. However, to prevent any duplication of data we included only the studies that were published after Meghani et al's meta-analysis. In addition, to understand the influence of this earlier meta-analysis on our findings, we conducted sensitivity analyses excluding Meghani et al's study. Our results remained consistent, and were in line with overall conclusions, arguing in favor of the

robustness of our findings. However, unlike the previous meta-analysis, we have not differentiated between types of pain (ie traumatic vs non-traumatic/nonsurgical) due to our smaller sample size.

One of the main limitations of this study was the heterogeneity of the eligible studies in terms of study settings and pain etiologies. We addressed this issue by handling every cohort in each study separately, as conditions were more homogeneous within the cohorts in comparison to the entirety of those studies. This strategy helped us homogenize data and reflect a larger sample pool, as the aim of our study was to draw relatively generalized conclusions without delving deeper into subgroup analyses based on different independent variables such as pain etiology, pain severity, or surgical status. Also, we have included only cohorts with clear classifications of the treatment offered as "opioid" analgesia or "any analgesia". Notably, our sensitivity analyses probing for the impact of study setting (inpatient vs outpatient) were consistent with primary findings of the study, arguing against study setting being a contributing factor (Supplemental Figures 2–5). In order to address heterogeneity, we performed asymmetry analyses (Supplemental Results) and multiple sensitivity analyses leaving out potentially influential studies to assess whether results would differ if the heterogeneity was less (Supplemental Table 4), which did not reveal any significant change to our conclusions. By including adjusted studies, our approach was to assume that the results presented in these papers were adjusted for the most likely confounders identified by the respective paper's authors. In contrast, the unadjusted studies were used only to obtain raw data for the meta-analysis. Naturally, further caution is required in interpreting these results as the net influence of those confounding factors cannot be determined given the differences in the adjustment choices from one study to another. Another inherent bias in our meta-analysis was a possible publication bias, which has the risk of creating a downstream selection bias in terms of populations/datasets we included in our analysis.

Further studies with clear inclusion criteria, details on medication types and doses, and post-intervention outcome measures are needed to better assess the different racial groups' access to analgesic treatment. Prospective enrollment studies would also be very valuable as they would be able to standardize interventions and outcome measures, hence improving the accuracy of the conclusions. Our study is further limited to patient populations in a healthcare setting. Given what has already been established regarding racial and ethnic disparities in healthcare status and access, we expect that inequities in pain management are, in reality, greater than our findings may suggest.

Conclusion

This meta-analysis confirms persistent racial disparities in opioid analgesic treatment of pain in the United States. Clinicians must make a concerted effort to align analgesic pain management with that of evidence-based clinical guidelines, the recommendations of the CDC opioid guidelines, as well as Pain Management Best Practices Inter-Agency Task Force Report. This could help improve patients' access to multimodal and effective non-opioid, non-pharmacological approaches when possible and clinically appropriate. In the future, studies may investigate the role of interval and widespread policy changes, such as the CDC opioid guidelines, for pain in addressing and ameliorating these clinical disparities.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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