



## Review

## Racial and ethnic disparities in the management of acute pain in US emergency departments: Meta-analysis and systematic review

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## ABSTRACT

**Objective:** This review aims to quantify the effect of minority status on analgesia use for acute pain management in US Emergency Department (ED) settings.**Methods:** We used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology to perform a review of studies from 1990 to 2018 comparing racial and ethnic differences in the administration of analgesia for acute pain. Studies were included if they measured analgesia use in white patients compared to a racial minority in the ED and studies were excluded if they focused primarily on chronic pain, case reports and survey studies. Following data abstraction, a meta-analysis was performed using fixed and random-effect models to determine primary outcome of analgesia administration stratified by racial and ethnic classification.**Results:** 763 articles were screened for eligibility and fourteen studies met inclusion criteria for qualitative synthesis. The total study population included 7070 non-Hispanic White patients, 1538 Hispanic, 3125 Black, and 50.3% female. Black patients were less likely than white to receive analgesia for acute pain: OR 0.60 [95%-CI, 0.43–0.83, random effects model]. Hispanics were also less likely to receive analgesia: OR 0.75 [95%-CI, 0.52–1.09].**Conclusion:** This study demonstrates the presence of racial disparities in analgesia use for the management of acute pain in US EDs. Further research is needed to examine patient reported outcomes in addition to the presence of disparities in other groups besides Black and Hispanic. *Trial registration: Registration number CRD42018104697 in PROSPERO.*

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## 1. Introduction

ED provision of care is weighted toward traditionally vulnerable populations such as racial and ethnic minorities [1]. Administering analgesia for painful illness and injury is critical to many clinical encounters in the ED and multiple prior studies have shown that race and ethnicity may be associated with adequacy of analgesia administered [2–10]. Prior systematic reviews have examined the provision of analgesia in ethnic minorities in chronic cancer pain, post-operative pain, and palliative pain [11–13]. This is the first systematic review to address the association of relative analgesic administration to racial and ethnic minorities with acute pain in the ED.

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## 2. Methods

We used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology to perform this systematic review [14]. With librarian assistance, we used electronic search engine centered on the following key terms: minority, minorities, race, racial, ethnic, ethnicity, pain treatment, pain management, pain medication, analgesia, acute, and acute services (full search strategy available in the Appendix section). Inclusion criteria include research conducted between 1990 and 2018, US-based ED or urgent care settings, adult patients, and studies that compared white patients to an ethnic or racial minority for acute pain. Exclusion criteria included research that focused primarily on chronic pain, chest pain, post-operative pain, case reports or survey studies (Table 1). The title and abstract of all identified studies were screened for relevance to study aims. Abstracts were then screened to identify inclusion criteria. Finally, the full text of the remaining potentially eligible articles were reviewed and appraised in

**Table 1**  
Inclusion and exclusion criteria.

Inclusion	Exclusion
<ul style="list-style-type: none"> <li>• United States based Emergency Departments or acute care settings</li> <li>• United States studies in English (conducted in the US)</li> <li>• Published between 1990 and June 2018</li> <li>• At least one aim or analysis comparing administration of analgesia for pain between a racial or ethnic minority and majority (white group)</li> <li>• Adults</li> <li>• Analgesic pain treatment</li> </ul>	<ul style="list-style-type: none"> <li>• Non-United States studies</li> <li>• Published before 1990</li> <li>• Single race studies or comparison with minority groups only</li> <li>• Children</li> </ul>
<ul style="list-style-type: none"> <li>• Primary studies, electronic medical records, chart reviews</li> <li>• Acute pain</li> </ul>	<ul style="list-style-type: none"> <li>• Non-analgesic pain treatment</li> <li>• Literature reviews, systematic reviews, surveys, database studies, vignettes, experimental studies</li> <li>• Pain experiences without treatment</li> <li>• Studies limited to chronic pain or condition</li> <li>• Post-op pain</li> <li>• Chest pain</li> <li>• No match with study goals</li> <li>• Eligible, but outcomes do not accumulate across studies or insufficient information to calculate effect size</li> </ul>

detail for final selection. Data was abstracted with structured data sheets. Acute pain was categorized by traumatic or non-traumatic causes and analgesia was categorized by opiate or non-opiate class. We attempted to contact first authors if data were missing in any published material. For the meta-analysis, we compared the odds for receiving any analgesia between individual ethnic minorities and the index group of Whites. Two independent reviewers were involved in each stage of review and in data selection. Any discrepancies were resolved by consultation with a third reviewer. (See Table 2.)

**2.1. Study quality**

Study quality was assessed per the Downs and Black criteria, which has been used for both randomized and nonrandomized observational studies [11,15]. Individual studies were assessed on a 13-item scale

(Appendix) that analyzed study design, sample size, clarity of reporting, and adjustment of confounding variables. An assignment of *high-quality* was given if a study fulfilled 76% or more of the criteria, *moderate-quality* if a study fulfilled 51–75%, and *low-quality* if a study fulfilled <50%.

**3. Results**

Database search by key terms yielded 756 articles, and eleven other potentially relevant articles were identified by reference search of discovered articles. Following the removal of duplicates and application of inclusion and exclusion criteria (Table 1), seventeen full-text articles were evaluated. Out of these seventeen full-text articles, fourteen contained information on analgesic prescription patterns (Fig. 1) and thirteen contained quantitative information appropriate to answering the primary objective. Ten of the fourteen studies were retrospective

**Table 2**  
Summary of studies.

Source	Relevant outcome (s)	Racial and ethnic groups	Design	Setting	Pain type	Data period	Study quality	Adjustment for confounders
Bartfield et al. (1997)	Any analgesia	C, NC	P	ED	LBP	1994	L	No statistical adjustment
Bijur et al. (2008)	Any analgesia, opioids	AA, H, W	P	ED	LBF	2002–2006	H	Age, sex, education, insurance, base-line patient-rated pain, hospital, whether accompanied to ED
Bijur et al. (2008)	Any analgesia, opioids	AA, H, W	R	ED	LBF	2000–2002	H	Age, sex, marital status, insurance, mechanism of injury, mode of arrival, reduction, fracture type, disposition
Fuentes et al. (2002)	Any analgesia	AA, H, AS, W	R	ED	LBF	1998–1999	H	Sex, bone fractured, need for reduction
Heins et al. (2006)	Any analgesia, opioids	B, W, O	R	ED	MSP	2004	M	Age, sex, insurance status, chronic pain, trauma, provider training, provider experience
Infinger et al. (2014)	Any analgesia	B, W, O	R	EMS	PF	2011	M	Age, sex, pain severity, injury location, distance of fall
Karpman et al. (1997)	Any analgesia	H, W	R	ED	LBF	1992	M	No statistical adjustment
Miner et al. (2006)	Any analgesia	AA, H, NA, AS, W	P	ED	PRV	2003–2004	M	Age, sex, income, education, occupation, subjective pain severity, time under pre-hospital care
Minick et al. (2012)	Any analgesia, opioids	B, W, O	R	ED	LBF	2010	M	Age, sex, severity of pain, fracture location
Stover et al. (2006)	Opioids	H, W, O	P	WC	BP	2002–2003	M	Age, sex, BMI, pain intensity, height, education, household income, tobacco use
Todd et al. (1990)	Any analgesia	H, W	R	ED	LBF	1990–1991	H	Age, sex, insurance status, primary language, type of fracture, mechanism of injury, occupational injury, reduction, time of presentation, total time in ED, admitted
Todd et al. (2000)	Any analgesia, opioids	B, W	R	ED	LBF	1992–1995	H	Time since injury, total time in ED, time of presentation, payer status, need for reduction
Ware et al. (2012)	Any analgesia	AA, C	R	ED	LBF	NR	L	Age, gender, fracture location, type of analgesia, route of dose, pain instrument used, pain score
Young et al. (2013)	Any analgesia	C, AA, AS, H, O	R	EMS	BTI	2009	H	Age, sex, pain score, prehospital time

Racial and ethnic groups: AA = African American, AS = Asian, B = Black, C = Caucasian, H = Hispanic, NA = Native American, NC = non-Caucasian, O = Other, W = White. Design: P = prospective, R = retrospective. Setting: ED = Emergency Department, EMS = Emergency Medical Services, WC = Worker's Compensation. Pain type: BP = back pain, BTI = blunt trauma injury, LBF = long bone fracture, LBP = low back pain, MSP = musculoskeletal pain, PF = post fall pain, PRV = pain related visit. NR = not reported. Study quality: Downs and Black criteria adapted, Low = 0–50%; Medium = 51–75%; High = 76–100% [15].

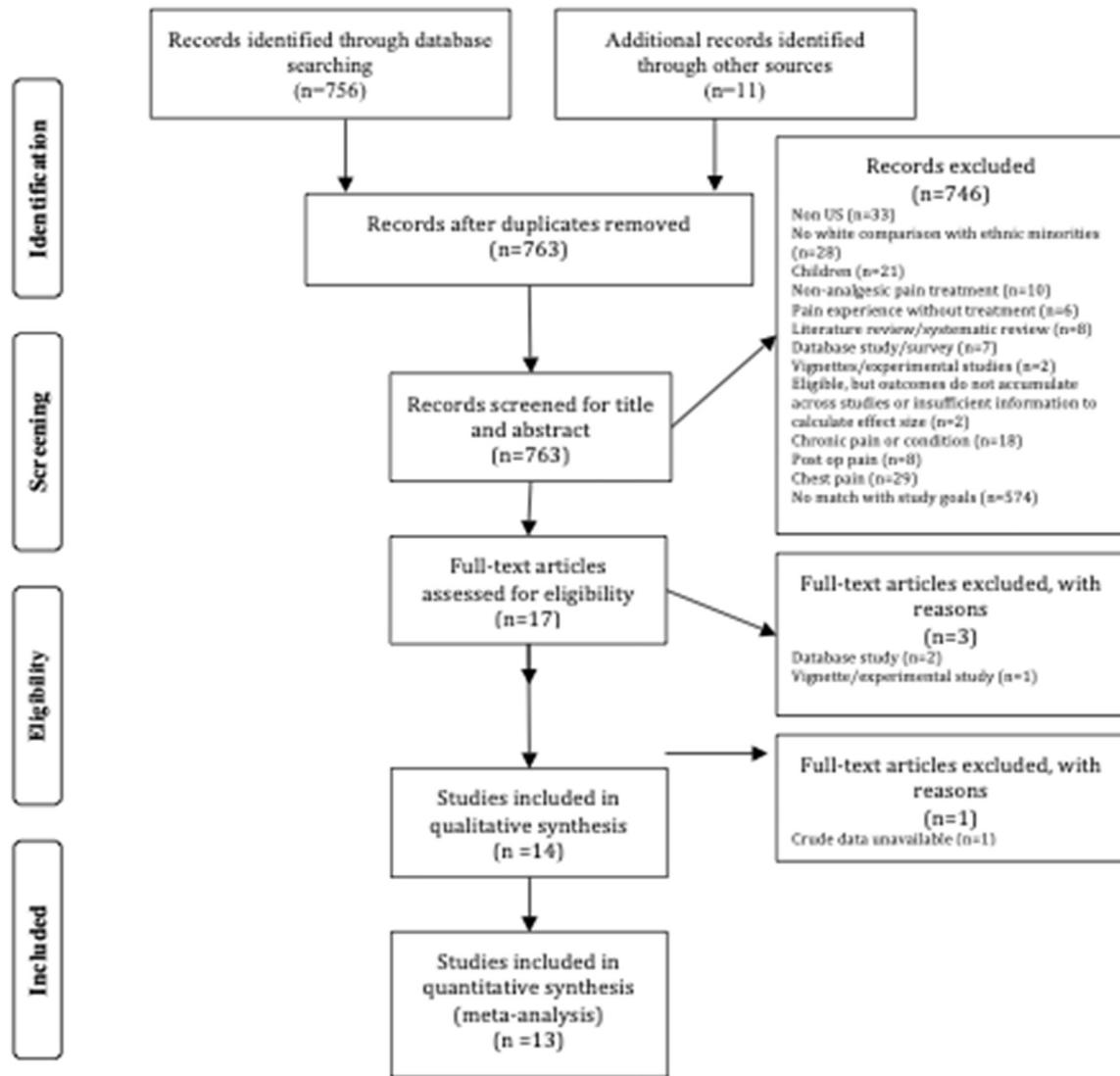


Fig. 1. PRISMA diagram describing search strategy.

studies and four were prospective. Eleven of the fourteen studies were conducted in a traditional ED while three were conducted in urgent care-like settings. Eight studies examined analgesia use for pain from long bone fractures, two for back pain, and single studies examined analgesic administration for blunt trauma injury, musculoskeletal pain, post-fall pain, and pain related visits. Five studies also included data on opioid-specific analgesia in addition to total analgesia. One study focused solely on opioid analgesia and did not report on administration of other analgesia classes. In terms of racial categorization, all fourteen articles included data from “Whites” (also referred to as “Caucasian” or “non-Hispanic Whites”). Six studies included the terms “non-Caucasian” or “Other” when grouping racial and ethnic subgroups.

Black patients were 36% less likely to receive any analgesia compared to white patients in the fixed effect model, OR 0.64 [95%-CI: 0.55–0.75] and 40% less likely in the random effects model, OR 0.60 [95%-CI, 0.43–0.83] (Fig. 2A). Hispanic patients were 30% less likely to receive analgesia compared to non-Hispanic White patients in the fixed effects model, OR 0.70 [95%-CI, 0.57–0.87] and 25% less likely with a random effects model, 0.75 [95%-CI, 0.52–1.09] (Fig. 2B). We also analyzed the likelihood of receiving opioid analgesia between Black and White patients and between Hispanic and non-Hispanic White patients (Fig. 3A–B). Black patients were 35% less likely to receive opioids for acute pain in the fixed effects model, OR 0.65 [95%-CI,

0.46–0.91] and 34% less likely to receive opioids in the random effects model, OR 0.66 [95%-CI, 0.42–1.02]. Hispanic patients were 23% less likely to receive opioids in the fixed effects model, OR 0.77 [95%-CI, 0.59–1.01] and 13% less likely in the random effects model, OR 0.87 [95%-CI, 0.51–1.51]. The effect of pain type was also stratified by category of acute pain: long bone fracture or traumatic pain versus no fracture or non-traumatic pain (Fig. 4A–B). In long-bone fracture or traumatic pain, Black patients were significantly less likely to receive analgesia, OR 0.59 [95%-CI, 0.42–0.82]; in those with no fracture or non-traumatic pain, Black patients were also less likely to receive analgesia although the CI was not significant, OR 0.51 [95%-CI, 0.15–1.72]. Although we also ran analysis for Asian and “Other” racial and ethnic categories that yielded decreased odds ratios, the study populations were small and therefore less robust (Fig. 2C–D).

#### 4. Discussion

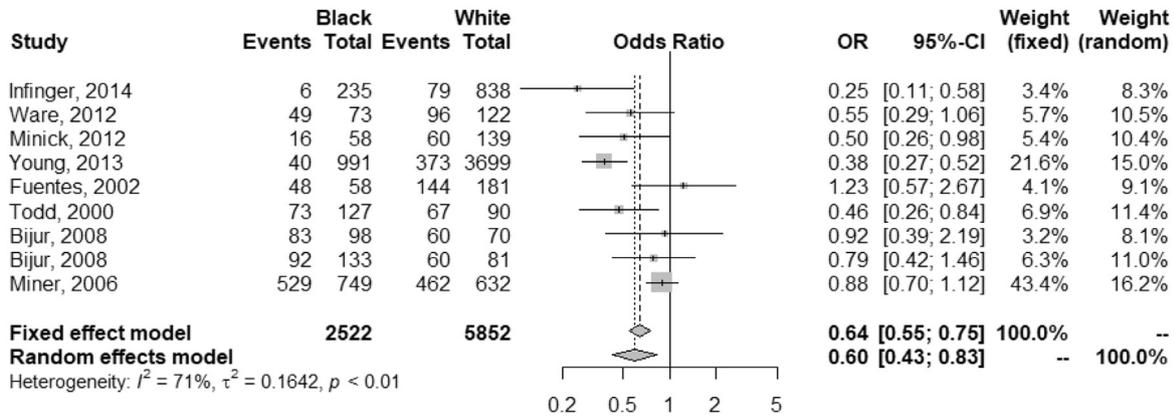
This study aimed to synthesize the mixed results of prior ED-based studies to determine if a discrepancy in analgesia use exists for White patients versus Black and Hispanic. Prior small studies on acute pain that have examined the association between race, ethnicity and analgesia use have produced mixed results. For example, Todd et al. reported that non-Hispanic White patients were twice as likely as Hispanic

patients to receive pain medication for isolated long-bone fractures in the ED [10]. Likewise, another study by Todd on long bone fractures in the ED demonstrated that White patients were more likely than Black patients to receive analgesia despite similar pain complaints [9]. However, five other studies on long bone fractures found no significant association between analgesia use and the race or ethnicity of the patients [16–20]. When we analyzed the studies as a function of time, we did not discern a trend that the disparity is getting better or worse. In this meta-analysis of all available literature, analgesia was prescribed less commonly to Black and Hispanic patients treated for acute pain. This difference was most pronounced in the prescription of opioid analgesia for Black patients who sustained a long bone fracture or traumatic pain. The magnitude of analgesia disparity may be underestimated in

Hispanic patients as some studies excluded patients who were non-English speaking.

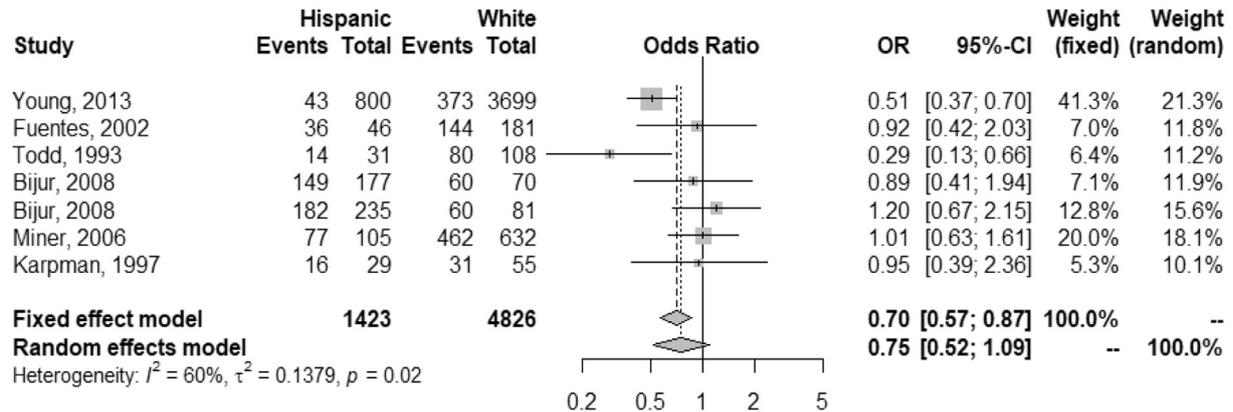
The reasons for differences in analgesia use are likely to be multifold. Pain is a complex topic that involves biology, culture, and psychology, and may not be adequately described by the commonly used “0 to 10” pain intensity score [20]. It is possible that the disparity reflects cultural differences regarding the perception or communication of pain [13,21]. For example, it has been suggested that some groups in the African American community may place more value on stoicism than on relief of discomfort with reluctance to complain of pain [3,22]. Another study looked at the Mexican American veteran population and how the role of “machismo” influenced the expression and daily experience of pain with the conclusion that strict gender standards and pain

### Analgesia: Black and White



A

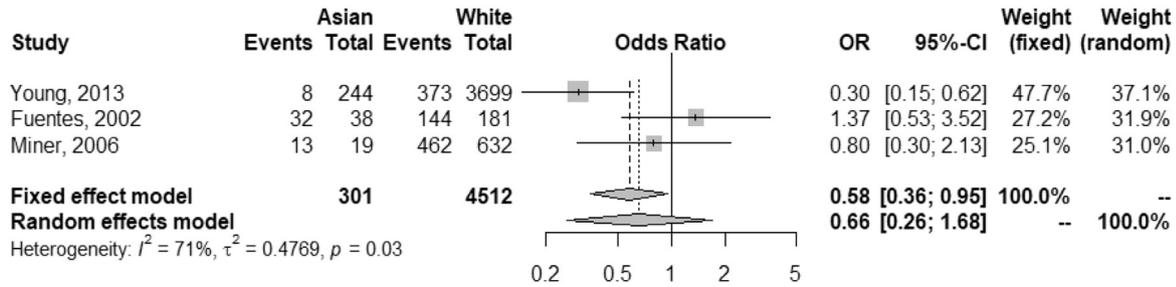
### Analgesia: Hispanic and White



B

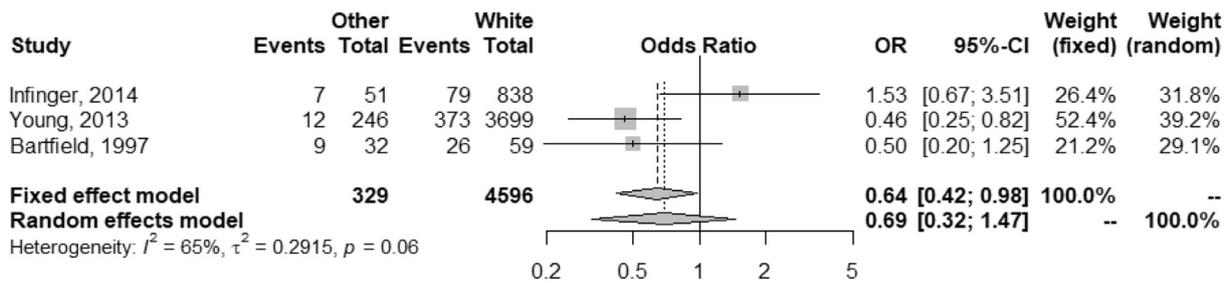
Fig. 2. A. Analgesia: Black and White. B Analgesia: Hispanic and White. C Analgesia: Asian and White. D Analgesia: Other and White.

### Analgesia: Asian and White



C

### Analgesia: Other and White



D

Fig. 2 (continued).

expression was influenced by their ethnic identity [23]. There was also no evidence to suggest that racial or ethnic minorities requested analgesia more or less than non-Hispanic white patients. Only one study reported rates of opioid request in addition to overall consumption. This study was a prospective cohort study of patients with work-related back injury [6]. It is also possible that the disparities do not exist on an individual doctor-patient level which would suggest individual physician bias but reflect practice differences in EDs as all studies were in urban settings that treat predominately White versus Black or Hispanic patients. Physician provider race may also influence analgesia administration, but this was reported in only two studies where neither reported a relative risk of differential analgesia administration [9,10]. Moreover, the lack of patient-centered outcomes in our analysis regarding pain relief means that we must infer that less analgesia equals less pain relief but, in reality, those parameters may not be equivalent. In addition, while relief of pain is a well-established quality measure in medicine, the use of more opioid analgesia for acute pain may not signal better quality care as many negative outcomes are associated with opioid use [24].

We took several steps to account for the heterogeneity seen in our studies. First, we grouped similar outcomes and analyzed each outcome in the context of defined racial and ethnic groups. Second, we analyzed with a random effects model and a fixed effects model and included a measurement of heterogeneity for each analysis. Third, we limited our review to only primary studies that addressed acute pain in the ED.

### 5. Conclusion

This meta-analysis synthesizes all available primary studies on analgesia use in the ED broken down by race and ethnicity. In the meta-analysis, we have shown that Black and Hispanic patients are less likely to receive the equivalent analgesia medication as non-Hispanic White patients. In the future, more research is needed to understand disparities of care and institute effective corrective interventions for all US ED patients.

### Meetings

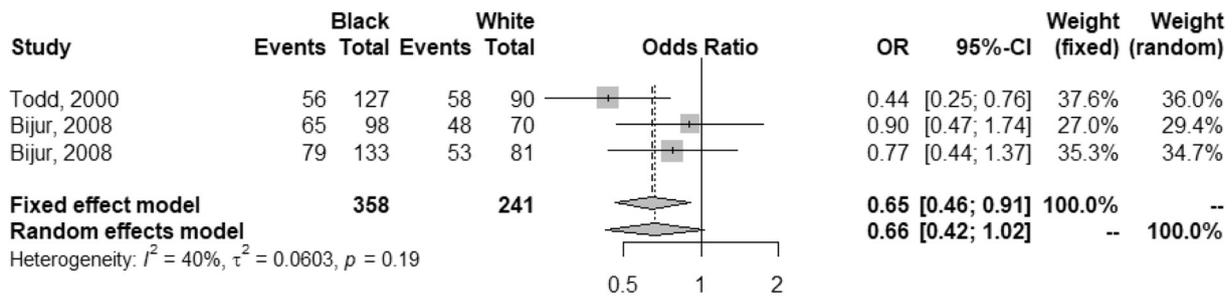
- March 30, 2019 – Lightning Oral Abstract Presentation at Mid-Atlantic Society of Academic Emergency Medicine in Washington, DC.
- May 16, 2019 – Oral Abstract Presentation at Society of Academic Emergency Medicine 2019 in Las Vegas, NV.

This research was unfunded.

### Declaration of Competing Interests

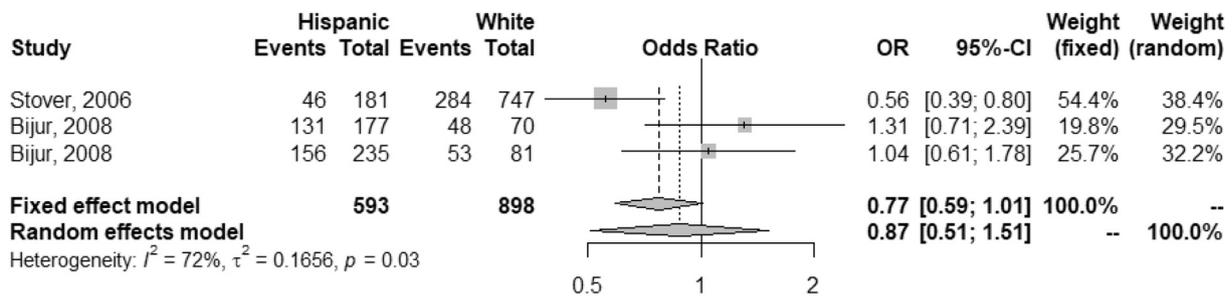
None.

### Opioid Specific: Black and White



**A**

### Opioid Specific: Hispanic and White



**B**

Fig. 3. A. Opioid specific: Black and White. B. Opioid specific: Hispanic and White.

**Author contributions**

PL and AM contributed to study concept and design, acquisition of the data.

AM, YM, CC and PL contributed to analysis and interpretation of the data.

YM and CC contributed statistical expertise.

PL, ML, RS, MG, CC, YM and ACM contributed to drafting and critical revision of the manuscript.

ACM takes responsibility for the paper as a whole.

**Appendix**

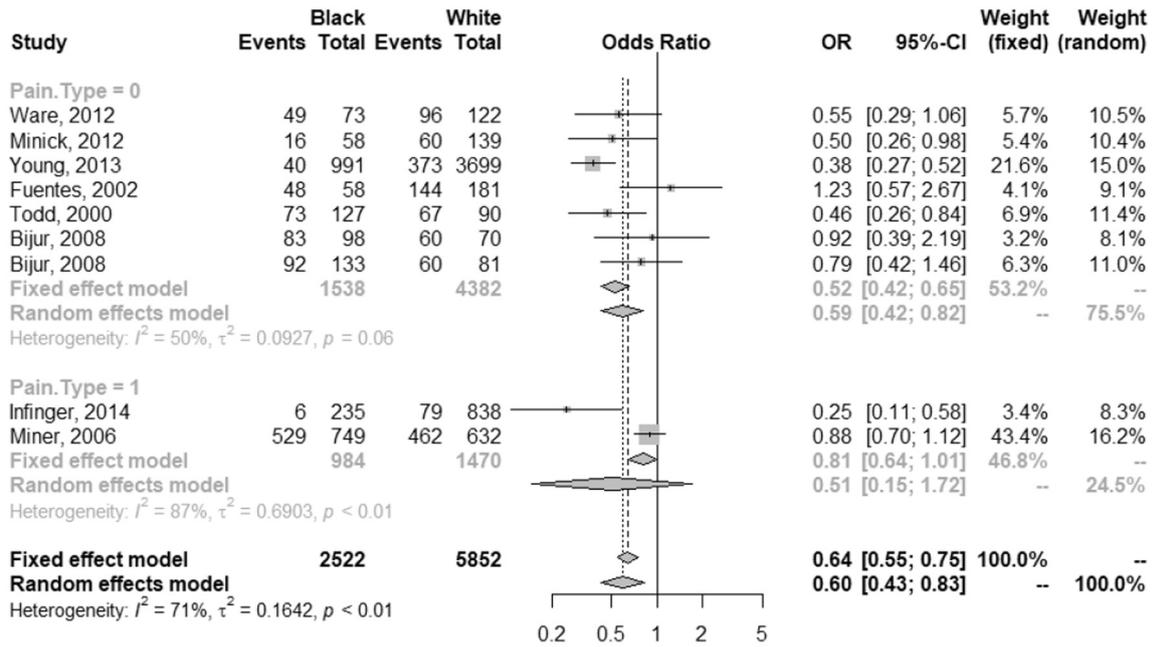
Search strategy: (TITLE-ABS-KEY (minority) OR TITLE-ABS-KEY (minorities) OR TITLE-ABS-KEY (race) OR TITLE-ABS-KEY (racial) OR TITLE-ABS-KEY (ethnic) OR TITLE-ABS-KEY (ethnicity) AND TITLE-ABS-KEY (pain AND treatment) OR TITLE-ABS-KEY (pain AND management) OR TITLE-ABS-KEY (pain AND medication) OR TITLE-ABS-KEY (analgesia) AND TITLE-ABS-KEY (acute) OR TITLE-ABS-KEY (acute AND services)) AND (PUBYEAR > 1989) AND (EXCLUDE (DOCTYPE, "cp")) AND (LIMIT-TO (LANGUAGE, "English"))

Downs and Black checklist adaptation for quality assessment:

1. What was the study design? 1 point for prospective. 0 for retrospective.
2. Is the hypothesis/aim/objective of the study clearly described? 1 point for yes. 0 for no.

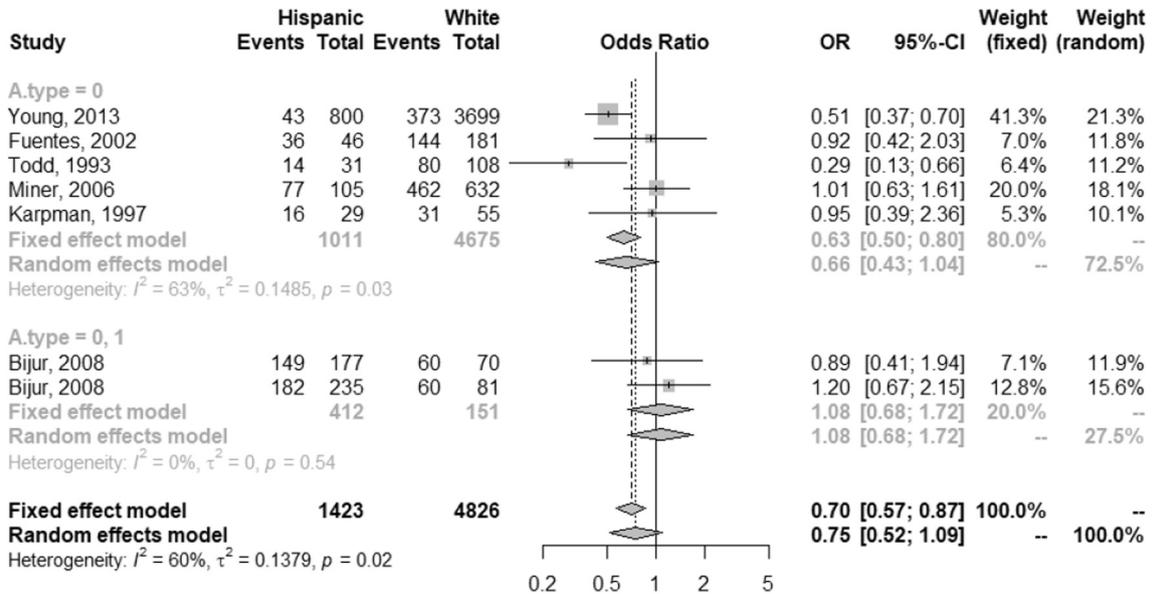
3. Are the main outcomes to be measured clearly described in the Introduction or Methods section? If the main outcomes are first mentioned in the Results section, the question should be answered no. 1 point for yes. 0 for no.
4. Is the racial/ethnic group breakdown of the subjects included in the study clearly described? 1 point for yes. 0 for no.
5. Are the distributions of principal confounders in each group of subjects to be compared clearly described? A list of principal confounders is provided. 1 point for yes. 0 for no.
6. Are the main findings of the effect of race/ethnicity on the pain treatment outcome clearly described? 1 point for yes. 0 for no.
7. Have actual probability values been reported (e.g., 0.035 rather than <0.05) for the main outcomes except where the probability value is <0.001? 1 point for yes. 0 for no.
8. Were the subjects asked to participate in the study representative of the entire population from which they were recruited? The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. 1 point for yes. 0 for no. 0 for unable to determine.
9. Were the statistical tests used to assess the main outcomes appropriate? The statistical techniques used must be appropriate to the data. For example non-parametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not

### Analgesia: Black and White



A

### Analgesia: Hispanic and White



B

Fig. 4. A. Analgesia: Black and White. B. Analgesia: Hispanic and White.

described it must be assumed that the estimates used were appropriate and the question should be answered yes. 1 point for yes. 0 for no. 0 for unable to determine.

10. How was race/ethnicity used in the analysis? 1 point for analysis presented by subgroups. 0 for lumping of racial/ethnic groups.

11. Were the racial/ethnic subgroups recruited from the same population? For example, patients for all comparison groups should be selected from the same hospital (unmeasured characteristics or the setting related to variables). *1 point for yes. 0 for no. 0 for unable to determine.*
12. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn? (Inclusion of theoretically significant and statistically significant confounders i.e., those found significant in preliminary analysis). *1 point for yes. 0 for no. 0 for unable to determine.*
13. Were the procedures to estimate sample size described? If power analysis provided, did study have at least 80% power to detect the differences. *1 point for adequate power. 0 for no. 0 for unable to determine.*

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