Comparing the Racial Disparities in the Prescription of Opioid Drugs in the United States

Kathy-Ann Cadet[1*], Jasmine Nkwocha[1*], and Myiah Smothers[1*]
[1]Geisinger Commonwealth School of Medicine, Scranton, PA 18509
*Master of Biomedical Sciences Program
Correspondence: kcadet@som.geisinger.edu

Abstract

In the United States, racial disparities in health care are evident throughout history. The rising of the opioid epidemic results in the misuse of prescription opioid medications causing addiction and even drug overdoses; a deeper look into the racial disparities in the opioid epidemic was of interest. The census was used to find the total population in all states in 2011 and the population of African Americans in these states. Automated Reports and Consolidated Ordering System (ARCOS) data from the Drug Enforcement Act (DEA) was used to find the amount of the top 5 opioids that were purchased by pharmacies in 2011. Heatmaps and correlational studies were then created to analyze the data. No significance was found in the linear correlation between percent African American population versus oxycodone weight per population. When comparing the percent African American heatmap with the oxycodone drug weight heatmap, there were significant differences in saturation found. Discrepancies were found when comparing the heatmaps, thus more detailed research needs to be done to determine why. Data analysis showed a nonsignificant data correlation, although the heatmaps and literature review proved otherwise.

Introduction

In 2002, Congress requested that the Institute of Medicine (IOM) convene a committee to evaluate racial and ethnic disparities within the United States health care system (1). The committee disclosed that there were apparent, significant sources of racial and ethnic disparities in healthcare received by minorities (1–3). One of the committee's indispensable findings was that when patients' economic status, insurance status, age, and health conditions were similar, racial bias and ethnic disparities persisted (1–3). Prior studies have shown that racial discrimination in healthcare began long before 2002 and has been occurring since African slaves were forced to leave their various countries and come to this country over 400 years ago (2). In *Four Hundred Years Since Jamestown: An American Journal of Public Health (AJPH) Dossier*, Theodore M. Brown explains to readers how the era of slavery had an impact on U.S. medicine and public health (4). Africans were believed to be of a different nature or species, they did not have the same human makeup as their Caucasian counterparts and were thought to be medically and biologically different (4). This theory was sustained by slave owners, physicians, and scientists to justify why the slaves were property and could be used as such (4). During the time of the yellow fever, John Lining, a physician from Charleston, SC, would insist that African Americans were immune to yellow fever because the mortality rate was thought to be low (5–6). Because Lining was a credible physician, this provoked other physicians to not only support this claim but to motivate African Americans to help during the epidemic, assuring them that they could not contract the disease, which was completely false (5–6). These claims fueled racial disparities in the United States health care system, leaving African Americans susceptible to unethical experimentations and inadequate care (4, 7–9).

Tests and experiments executed using African Americans were callous and brutal. An example of this is the Tuskegee Syphilis Study, where African American men were injected with syphilis and left untreated from 1932 to 1972, or the experimentation of Thomas Hamilton, a physician from Georgia, who would test medications for heatstroke by placing slaves in extremely hot temperatures until they collapsed and then proceed to test his remedies on the slaves (4, 7–9). As explicated by Rana Asali Hogarth (5) in the article *From the 1793 Yellow Fever Epidemic in Philadelphia, Pennsylvania*, it is critical to note that these ideas do not only emanate from the time of slavery and these ideas did not dissipate as the time went on. These assumptions and postulations are entrenched in the medical knowledge of health care professionals today (5). In previous studies, scholars have scrutinized the earlier events of racial bias and compared them to situations that transpired more recently (4). Their findings propose that there is profound, unconscious racial bias that accounts for the finding that medical students, residents, and practicing physicians believe that African Americans feel less pain than Caucasian people do and are less likely to receive the proper treatment or correct dosage of a drug, if necessary (4).

Many studies examine how likely African American patients are to receive analgesics compared to their Caucasian counterparts. For example, a study analyzed whether African American patients with isolated long-bone fractures were less likely to receive any pain medication compared to Caucasian patients, and found that Caucasian patients were 17% more likely to receive the needed pain medications (9, 10, 14). In another study, dealing with opioid prescription to children, it was found that Caucasian children are more likely to receive opioid prescriptions when compared to minorities who are possibly comparable in terms of medical needs (11).

Pain is a subjective phenomenon and there is no accurate way to assess a patient's pain level (12). Physicians are forced to rely on what the patient is telling them and what they can observe, thus leaving pain susceptible to social psychological influences such as explicit or implicit biases — and leaving African American patients susceptible to not getting proper treatment for their condition (12). Multiple studies analyzed whether these racial biases, if any, are explicit or implicit,

examining cognitive indications from medical students, residents, and laypeople (7, 12–13). Most of the articles found approached the topic of racial disparities in opioid prescription with medical professionals directly, creating tests to rate how they viewed pain on different subjects throughout the study. The studies mentioned support the idea that physicians are not prescribing African Americans the same amount of opioids they prescribe Caucasians because they believe that African Americans feel less pain, which leads to inadequate care for those African American patients. In our study, we wanted to examine the differential distribution of opioids for any health condition at the year opioid prescriptions reached their peak, which was in 2011. We wanted to evaluate which states had the most prescriptions of these drugs and compare it to the states that had the highest African-American populations. The goal of this investigation was to identify if the states with the highest African American populations had the lowest opioid prescriptions, supporting our claim that physicians prescribe African American individuals opioids less than they do Caucasians.

Research engines such as PubMed helped to guide the framework for this research paper. Key words such as African Americans or African Americans and pain or opioid or prescription proved to yield the best results in terms of background information. A number of the articles found have previously investigated the racial bias associated with pain in different communities especially in African American communities. Mathur et al. explain that the racial differences seen in pain treatment are a direct result of physicians providing less treatment to African Americans when compared to other races based on the notion that they have a higher pain tolerance (13). All of the articles helped to frame the purpose of this paper — were African Americans being prescribed the same amount of opioid drugs compared to other races during the peak opioid year of 2011?

Methods

Procedures

The total population of individuals was collected in every state including the District of Columbia in 2011 using the United States Census. The total number of African Americans was then looked at in each state in 2011 using the U.S. Census data. This number was then divided by the total population of all individuals to produce what we will refer to as our control data. These data would then be compared the top 5 drugs in 2011, including the peak drug during that year as oxycodone. The drug data was found using the Automated Reports and Consolidated Ordering System (ARCOS), which is a data collection system where pharmacies and hospitals and other distributors report the number of controlled substances they have to the Drug Enhancement Administration (DEA). The 2011 Retail Drug Summary ARCOS Report 5: Statistical Summary for Retail Drug Purchases was used. This project examined the distribution (in total grams) of oxycodone, buprenorphine, hydrocodone, and codeine across pharmacies in all of the United States and the District of Columbia. Lisdexamfetamine

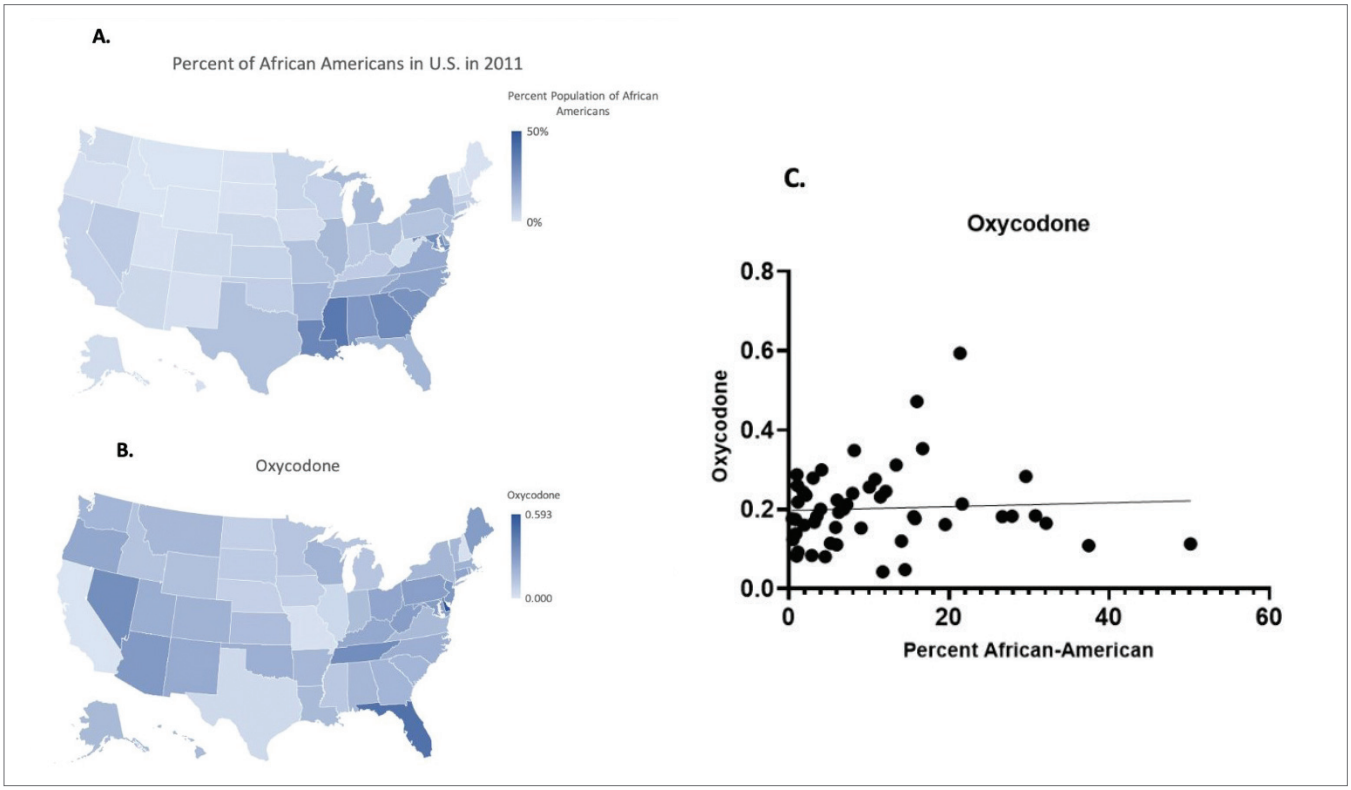

Figure 1. (A) Heatmap of percent African American population in the United States. (B) Heatmap of oxycodone distribution in the United States. (C) Linear correlation for percent African American versus the oxycodone weight per person (r= (1,49), 0.7663).

was used as a non-opioid drug control. This number was recorded and then divided by the total population of individuals in the state. This data was then compiled into 5 different heatmaps, with oxycodone, buprenorphine, hydrocodone, and codeine all being compared to the control lisdexamfetamine.

Data analysis

A simple linear regression analysis is used to compare the relationship between the top 5 drugs to the control lisdexamfetamine using Prism 8 software database. This analysis helped to determine the correlation between percent African Americans in each state and the total grams of oxycodone, buprenorphine, hydrocodone, codeine, and lisdexamfetamine per person in each state. A simple linear regression analysis encompasses best fit values and confidence intervals for all states per drug used. Microsoft Excel was then used to create the heatmaps for each of the 5 drugs.

Results

The peak year of opioid use was found to be 2011 (14). In addition to the District of Columbia, the states with the highest percent of African Americans in the year 2011 were Mississippi, Louisiana, Georgia, and Mississippi. The percent of African Americans heatmap Figure 1A was compared with the heat maps of drug weight per person of oxycodone, Figure 1B, along with buprenorphine, hydrocodone, codeine, and lisdexamfetamine. The oxycodone map showed lower opioid distribution for the top percent population African American states of Louisiana, Mississippi, Alabama, and Georgia.

A simple linear regression was calculated to predict oxycodone use based on African American population. No significant regression equation was found ($F(1,49)= 0.1367$, $p= 0.7135$), with an $R2$ of .002. Figure 1C. For the remaining opioids examined (buprenorphine, codeine, hydrocodone), no regression equation was found with the percentage of African American population ($F(1,49)= 0.0002$), $p= 0.9881$, with an $R2$ of 0.000, $F(1,49)= 0.3714$, $p= 0.4214$), with an $R2$ of 0.01324, $F(1,49)= 0.1953$, $p= 0.4216$), with an $R2$ of 0.01323).

The heatmaps of buprenorphine, codeine, and hydrocodone varied in retail distribution throughout the United States, when compared to the percent African American heatmap, Figure 2. Codeine had the least retail distribution in Louisiana, Mississippi, Alabama, and Georgia.

For the control drug lisdexamfetamine, a significant regression equation was found, ($F(1,49)= 5.034$, $p= .0294$), with an $R2$ of .09316, Figure 3A. Visual comparisons were made when observing the lisdexamfetamine and percent African-American heatmaps (Figure 3B and 3C).

The percent African American heatmap was compared with a heatmap of percent African American uninsured in the United States, Figure 4.

Discussion

Our data is inconsistent with multiple published reports showing significant racial disparities in opioid prescriptions.

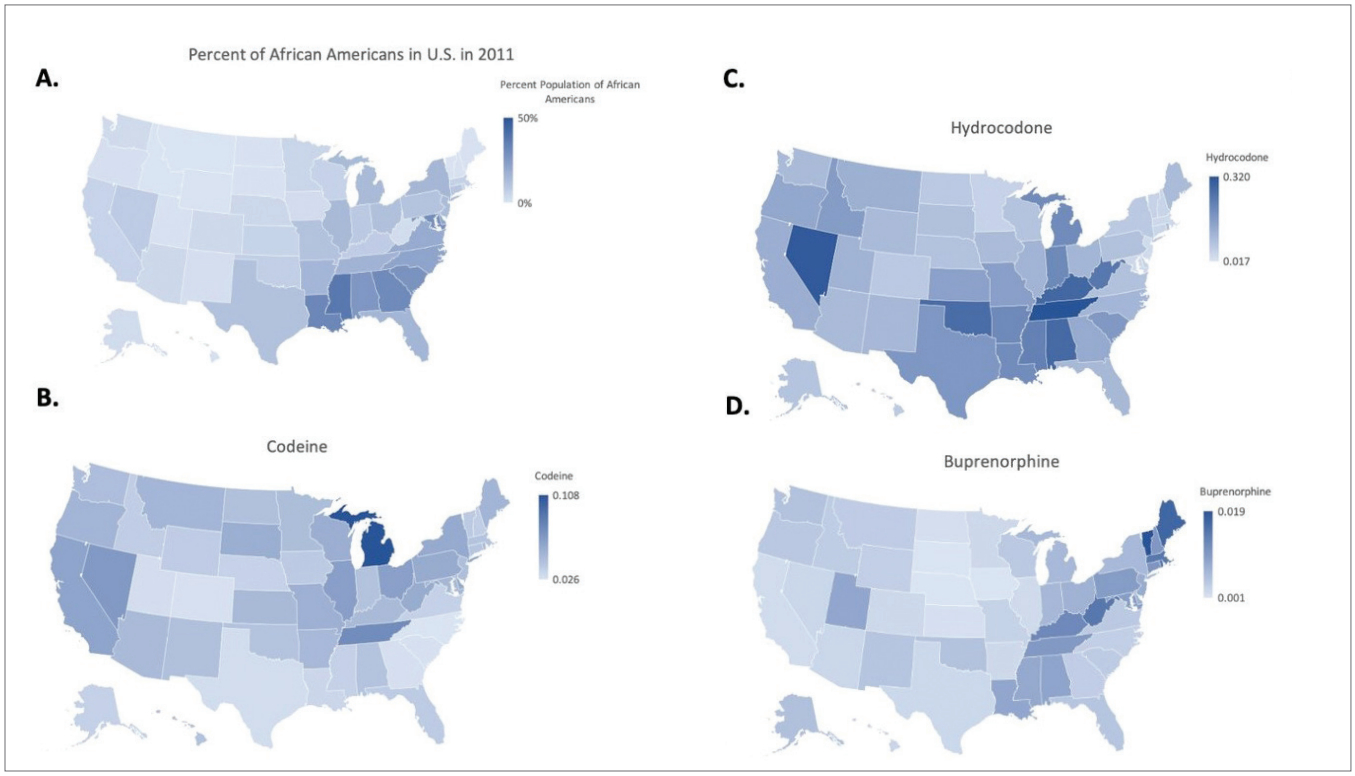

Figure 2. (A) Heatmap of percent African American population in the United States. (B) Heatmap of codeine distribution in the United States. (C) Heatmap of hydrocodone distribution in the United States. (D) Heatmap of buprenorphine distribution in the United States.

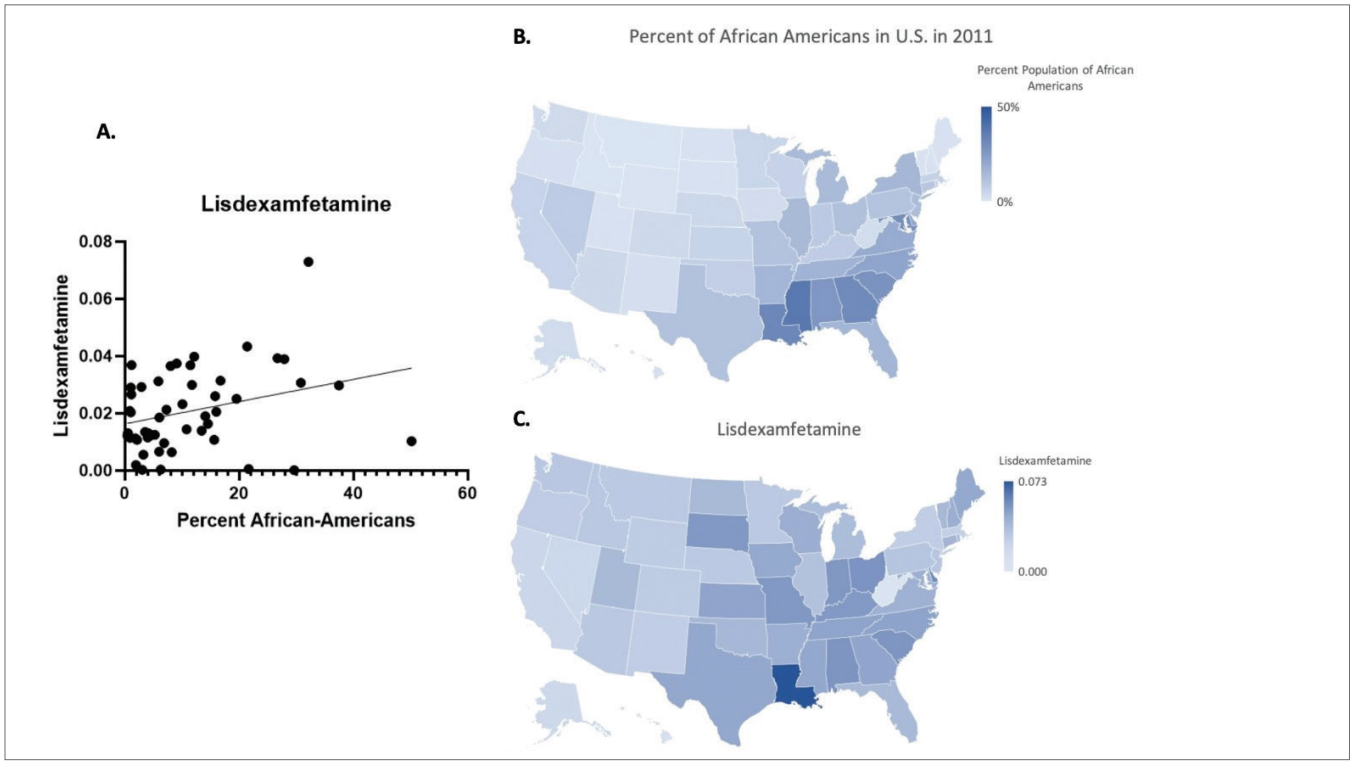

Figure 3. (A) Linear correlation for percent African American versus the lisdexamfetamine distribution in the United States. (B) Heatmap of percent African American population in the United States. (C) Heatmap of lisdexamfetamine distribution in the United States.

Studies with these findings saw significant differences in opioid and non-opioid prescribing based on children's race and ethnic status and significant racial and ethnic disparities in opioid prescription and administration at emergency department visits for back pain and abdominal pain (11, 15). Unlike our research, both studies used secondary analyses of data from Medical Expenditure Panel Surveys and the National Hospital Ambulatory Medical Care Survey (11, 15). This data provided information on what prescription drugs were given to patients, having the ability to show if African Americans were prescribed opioids (11, 15). Other studies focused on implicit and explicit biases, suggesting that known disparities in pain treatment could be caused by automatic rather than deliberate biases (12, 13). Conflicting with our study, these findings focused on the origin of racial biases within medical professionals. Our focus was to investigate whether medical professionals prescribe fewer opioids per capita to states with a larger population percentage of African Americans.

When comparing the various opioids (oxycodone, buprenorphine, hydrocodone, and codeine) and the non-opioid control (lisdexamfetamine) heatmaps to the percent of African American population in 2011 heatmap, visual differences were apparent, warranting further analysis. Comparing Figure 1A to Figure 1B heat maps show a decrease in color saturation in Louisiana, Mississippi, Alabama, and Georgia — the states that had the highest percent African American population percentage. This meant that in the states with the highest percent of African American population, there was a decrease in oxycodone retail distribution. Yet, when the simple linear regression was run, significance was not found

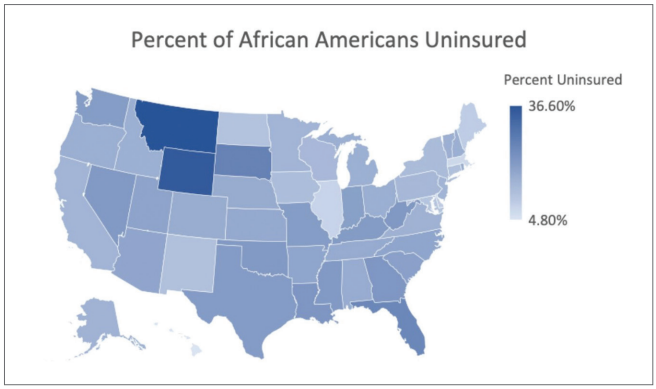

Figure 4. Percent of the African American population that is uninsured in the United States; data from the U.S. Census.

(p= 0.7135). Interestingly, a significant regression equation was found between the percentage African American population and the control drug lisdexamfetamine, a drug that specifically treats attention-deficit/hyperactivity disorder (ADHD) and is used for binge-eating disorder symptoms.

ADHD is classified by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) as a disorder most common in children and adolescents who show the inability to remain attentive paired with hyperactivity (16). When discussing racial differences in ADHD diagnosis, Morgan et al. found that African American and Hispanic children were less likely to receive an ADHD diagnosis and treatment compared to

Caucasian children (17). Figure 3C is the heatmap of the ADHD control drug lisdexamfetamine. The most saturated state for lisdexamfetamine retail distribution, Louisiana, has also one of the highest percent African American populations, resulting in a significant linear correlation. The U.S. Centers for Disease Control and Prevention (CDC) found that 15.8% of children in Louisiana vs. the national level of 11% were diagnosed with ADHD in 2011, though when looking specifically at race, it was Caucasian males who received the highest amount of ADHD prescriptions (16). The most common age for prescriptions was received at 10 years old, with African American males receiving 21.8% of the prescriptions while Caucasian males received 35.8% (16). Kumar and Morgan relate these disparities to genetic, prenatal, and environmental factors that have long-term negative effects on child development (16).

Another opioid that showed a similar change in color saturation was codeine, Figure 2B. This figure shows the heatmap of codeine drug weight per state having a decrease in color in Louisiana, Mississippi, Alabama, and Georgia. Figure 2D (buprenorphine) shows gradual increase in color in states while Figure 2C (hydrocodone) is even more saturated in color in these same areas and other regions throughout the United States. The change in distribution in the states with the highest percent African American population could be due to differing levels of insurance coverage among the residents of these states, as shown in Figure 4. A study using data from the 2006–2013 National Health Interview Survey found that compared to whites, African Americans were more likely to choose to be without medical care; this trend increased post-economic-recession between June 2010 and December 2013 (18). Since there are more African Americans who lack health insurance compared to other races, that could explain the vast differences in the heat maps. When looking into reasons why this disparity exists, Levesque et al. found that lack of access to health care was the main component in reasons why individuals may opt out (19).

When comparing these heatmaps, the focus states (Louisiana, Mississippi, Alabama, Georgia) were deeper in saturation representing more uninsured African Americans in Figure 4, as anticipated. Surprisingly, Montana and Wyoming have a large African American uninsured population.

As previously stated, the studies that focused on the amount of opioids being distributed to patients falling into different racial or ethnic groups did find significance to support their claims (11, 15). In these studies, researchers used data from the National Hospital Ambulatory Medical Care Survey and the Medical Expenditure Panel Surveys (11, 15). These databases provided information on what prescription drugs were prescribed to each patient, showing the authors clearly if African Americans are getting opioid prescriptions or not. We did not use a survey database to give us those details explicitly; instead we gathered data regarding the total grams of an opioid in a specific state and compared it to the percent of African Americans in that state.

Limitations for this study include the U.S. Census only reporting every 10 years. The peak year of oxycodone use was 2011, therefore the population data that we used was an estimation and is most likely underestimated.

Conclusion

In conclusion, though the simple linear regression done through Prism 8 yielded no significant results, our literature review and heat map comparisons demonstrated a different result. As mentioned earlier, a number of articles highlighted the differences seen in different races and how their physicians handled their pain level. Our next steps would be to look more closely at the insurance data and determine if there is a correlation between prescription of opioids and the lack of insurance in African American communities. A deeper look into Louisiana and the distribution of ADHD medication is also a potential area for more research.

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