In Crisis, Again

Understanding the Endurance of Opioids & Combatting the Modern Epidemic

Molly Cook

M.S. Data Visualization Candidate, Parsons School of Design

B.H.A. Art and Hispanic Studies, Carnegie Mellon University

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Abstract

Over a century before the mis-marketing of OxyContin dominated news outlets, the nation faced its first widespread opioid epidemic. The emergence, exploitation, and eruption of both epidemics follow the same arcs in history, yet the de-escalation of the 19th century epidemic has faded into distant memory and recovery from the most recent has yet to be seen.

During the first epidemic, pharmaceutical companies and federal regulations laid the groundwork for the stigmatization of opioid addiction that created an isolating environment for those struggling with opioid dependence today. Accessible recovery in conjunction with de-stigmatizing what was left by the earlier epidemic is needed to prevent future devastation and build a system that can prevent history from repeating itself once again.

Alleviating future escalation of the modern opioid crisis requires understanding the onset of the first opioid epidemic, sympathizing with the physiology of addiction, and making proven treatments such as MAT, or Medication-Assisted Treatment, widely available. *In Crisis, Again* visualizes each of these factors necessary for the nation's recovery and tells the story of opioid's overwhelming grip on the United States since its inception.

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Introduction

An epidemic is defined by the oxford dictionary as "a widespread occurrence of an infectious disease in a community at a particular time." The opioid epidemic that has commanded public attention for the past three decades is however not the first time that opioids have inflicted devastation on individuals, families, and communities alike. Disheartening as this may be, learning from the earlier epidemic, sympathizing with the physiology of addiction, and making proven treatments such as MAT, or Medication-Assisted Treatment, widely available can help to alleviate future devastation of a crisis that has taken more than 107,000 lives this past year alone. (CDC 2021)

In the late 18th and early 19th centuries, communities faced what would be the first opioid epidemic a century before the infamous mismarketing of OxyContin and impact of widespread opioid abuse that we see dominating news outlets today. Just as opioids such as OxyContin were mismarked in the 1990s as a wonder drug; Morphine, Opium, and Heroin became over-the-counter miracle drugs that could treat everything from a cough to a major wartime injury. Soon after widespread opiate use became common, doctors began to observe the adverse effects on their patients' health and that those who became addicted suffered a worse fate than the illness that they were initially medicated for. Legislation, restrictions on prescribing, public health improvements, and medical advances such as technology and new pain relievers like aspirin helped communities overcome the nation's first opioid epidemic. (Trickey, Smithsonian Magazine, 2018) The fact that a century later we are fighting another opioid epidemic that is arguably the largest epidemic faced in the nation's history is no longer by accident, but a sinister act caused by greed and manipulation by pharmaceutical companies. (House Hearing, 117 Congress, June 2021)

While opioids were considered a last resort by most physicians during the 20th century because of their known addictive qualities, Purdue Pharma was able to manipulate data and implement a widespread mis-marketing campaign for their opioid OxyContin in the tail end of the same century. The overprescribing of OxyContin increased national accessibility and introduced whole new demographics of people addicted to opioids. (Van Zee, American Journal of Public Health, 2009) Although restrictions on opioids have been reintroduced and Purdue has faced charges on their crimes since then, overdoses have steadily increased since the 1990s and the demand for opioids has not diminished. Addicts and users have been forced to seek more potent, often illicit drugs to supply their habit. (CDC 2021) Medical advances in the 19th

century helped communities shake the first opioid wave, but advances in medicine this time around have only provided more potent, and frankly dangerous, synthetic opioids. (Trickey, Smithsonian Magazine, 2018) The gripping effect that opioids have on our brain combined with the increased availability of highly potent drugs is an indicator that this crisis is not going anywhere unless we address it differently than we had the first opioid epidemic.

MAT, or Medication-Assisted Treatment, has become the medical standard of care in the treatment of addiction. (SAMHSA 2021) Long-term use of medications, like Buprenorphine, Methadone, and Suboxone show greater impact in recovery because they address the body's reliance on the drug and the physiological way that the brain shifts when a person has grown dependent. MAT medications are classified as opioids, but they do not provide the same euphoria that other, more addictive opiates do. They instead help to regulate the brain and prevent cravings or withdrawals. There is no telling how long it will take for the body's natural baseline to return to normal, but until then, to avoid more lives being lost, we must make MAT available to those who need it. Only about 25% of recovery facilities offer MAT, as they are mainly centered around abstinence-based recovery. (Sinha et al., The New York Times, 2018) The success rate is unfortunately low for these centers, and while they are more available than MAT, they are unfortunately still widely unavailable to those who need help. Only a slim minority of those struggling with opioid use disorder achieve long-term sobriety without the help of MAT. (Macy 287) The lingering stigma of opioid abuse creates an isolating environment to those in need, and leaves them with economic, cultural, social, and geographical barriers to recovery. During the AIDS epidemic, similar issues were raised when those who needed antiretroviral therapy were ostracized or stigmatized for their disease. Just as with the AIDS crisis, the existence of MAT treatment centers does not mean that those suffering from opioid addiction can and will obtain assistance. (Hirsch et al., Columbia Public Health, 2019)

We must encourage structural and social networks to demand that MAT be made more available, otherwise we will remain in a world where more potent, addictive opioids such as fentanyl are more accessible than treatment. With those odds, it will be difficult to combat this crisis and prevent future devastation. In using tools such as QGIS, we can identify and outline lack of treatment for those struggling with opioid use disorder, visualized by geographical scarcity as a result of the stigmatization and widespread physiological dependence that was manufactured and weaponized by pharmaceutical companies during both of the nation's epidemics.

Part 1: The Making of an Epidemic

1.1 Perceptions of Pain:

While pain has always been and remains a highly subjective part of the human experience, regardless of how pharmaceutical companies and the pharma-funded American Pain Society sought to deem it the '5th vital sign' in 1996, (FDA 2019) that hasn't stopped modern medicine from trying to quantify and diagnose pain itself. On the contrary, prior to the available treatment of pain, religious officials and enlightenment thinkers interpreted pain through the human experience, defining it differently for gender, class, religion, and other demographic markers. Karl Marx even analogized that "religion was the opium of the people" in 1846. (Morris, 210) Before we could numb our pain, we allowed it to inexplicably tell us something about ourselves. The rapid acceptance of anesthesia in 1846 aided in the secularization of pain, and perception of disease and pain lost religious connotations, gaining more notoriety as biological phenomena which could be treated successfully with drugs. (Caton 498) Once medicine evolved to use substances for the purpose of controlling pain, the division between religion and medicine grew and pain was now a symptom of illness which could be treated as such. While a revelation in science and a relief to those who imminently suffered, the treatment of pain would soon become an avenue for pharmaceutical companies to take advantage of the human condition and overprescribe opioids, creating a new market for exploitation.

Once the FDA approved Purdue's drug OxyContin in 1995, 'the war on pain' was initiated. To treat pain, we had to be able to quantify it, and so the American Pain Society began pushing the adoption of pain amongst doctors as the 'fifth vital sign'. (FDA 2019) Disseminating pamphlets, posters, and other ephemera that touted the 'pain as the 5th vital sign' slogan throughout hospitals and doctors' offices across the US became a regular trend. Pain assessment tools, a chart in which one could rate their pain numerically, were widely used to quantify pain. Of course, unlike blood pressure or heart rate, there was and still is not a reliable, objective way to understand pain, as each individual experiences pain differently. Vocabulary for describing pain even varies in specificity and characterization between languages, individualizing the experience even further. (Caton 498) As Beth Macy puts it in her novel *Dopesick*, "No one questioned whether the notion of pain, invisible to the human eye, could actually be measured simply by asking the patient for his or her subjective opinion. Quantifying pain made it easy to standardize procedures, but experts would later concede that it was

objective only in appearance… transition labor and a stubbed toe could both measure as a ten, depending on a person's tolerance. And not only did reliance on pain scales not correlate with improved outcomes, it also had the effect of increasing opioid prescribing and opioid abuse."

Despite more generative efforts, measurement by subjective report is still by far the most common type of procedure for quantifying pain. Patients may indicate pain levels verbally, mark simple scales, or fill out complex questionnaires. In all cases, the patient determines the data, opening a world of possibility for prescribing opiates and over-medicating those who don't necessarily need such radical treatment. (Osterweis et al., 1987) While opioids have made some positive contributions, such as for end-of-life pain, pharmaceutical companies marketed their products to doctors and patients as a viable treatment option for those in moderate to severe chronic pain. Specifically, OxyContin became a household name after Purdue Pharma mis-marketed its 'slow-release coating' and claimed it to be 'nonaddictive'. Data, infographics, and studies were manipulated to make false claims that a patient wouldn't feel the same addictive euphoria as frequently and intensely as Morphine and other opioids, which were knowingly very addictive at this point in time. As the saga plays out, pain clinics and general practitioners alike were prescribing OxyContin to a much larger demographic of pain patients than necessary, and the widely available opioid ignited an epidemic which rendered millions of people struggling with opioid use disorder. Given that opioids were a 'quick fix' with extensive damage in the long term, the numbing of pain during this time had lasting repercussions on our collective perception of pain.

Long term opioid use depletes the brain and rewires it to require the synthetic opioid, leaving a user severely ill without their increase in consistent dosage. In addition, while opioids numb certain physical aspects of pain, they have proven to reduce a user's pain threshold in long term use. In the aftermath of the opioid epidemic, we are left with stigma for chronic pain patients as well as mistrust in doctors. While opioids are continued to be debated in medicine and government, opioid overdoses continue to increase while pain is stigmatized with little progress made in diagnosing or objectively quantifying it.

1.2 Widespread Medical Use of Opiates:

In the mid to late 1800s, opiates such as Morphine and Opium were considered an over-the-counter drug that could be used for a wide range of different ailments. In fact, prior to the 20th century, opiates could be purchased from a physician or a pharmacist or even ordered from a catalog without governmental interference. (Redford and Powell, 518). Pain relief,

bronchitis, diarrhea, even soothing a teething baby were cause for an opiate prescription due to the lack of other available treatment. Another advantage of opiates at this time was that they gave immediate relief to those who were imminently suffering. Courtwright argued in his book *Dark Paradise,* "Though it could cure little, it could relieve anything," he wrote, "Doctors and patients alike were tempted to overuse."

While there was some knowledge and understanding that Morphine and Opium could be abused, due to lack of alternative treatments, doctors widely prescribed them for a variety of ailments, believing that the relief patients felt outweighed the adverse side effects. In 1874, however, a British chemist discovered an alternative that he considered to be non-addictive. Heroin was twice as powerful as Morphine – which was already ten times stronger than Opium – and according to Bayer's testimonials, "addiction can be scarce as possible". (Macy 24) Because of its potency, Heroin could be taken as a smaller dose and less frequently. (Redford and Powell, 519) For all these reasons, Heroin was seen as the first prescription opioid that claimed to have 'non-addictive' qualities, over 100 years before Purdue would make the same claims for OxyContin.

Between the 1900s and the 1990s, opioid pain medications were primarily used for acute and cancer pain. (FDA 2019). Fears of the addictive qualities and abuse of opioids from the early epidemic had doctors relying on alternative treatments in chronic pain patients. After our nation's first opioid crisis subsided and retreated from modern memory, studies showing inadequate treatment of chronic non-cancer pain by physicians started to surface and pharmaceutical companies motivated and encouraged the questioning of opioid restrictions. With a building campaign for untreated pain, OxyContin (oxycodone controlled-release) was approved in 1995. (FDA 2019) At the time of its approval, OxyContin was marketed to be 'less addictive' due to the tablet's controlled-release coating, and therefore the potential of abuse was thought to be lower because the drug would be absorbed slowly into the patient's system without an immediate euphoric high when consumed. (FDA 2019)

Just as Morphine, Opium, and Heroin came into widespread use for common ailments, OxyContin was promoted in an extensive national commercial campaign that claimed it was safe for use in acute to chronic pain. Dental procedures, broken bones, back pain, and more were cause for an OxyContin prescription. Purdue Pharma advertised OxyContin in hospitals, medical offices, and conferences, citing the convoluted research of renowned medical experts and scientists. Representatives distributed pamphlets, posters, CDs, teddy bears, hats, and other paraphernalia to advertise their drug. During this period, their infamous "I got my life back"

promotional video showed patients talking about how OxyContin changed their lives and made unsubstantiated claims regarding the drug's effect on patients' quality of life. (Quinones 136) Purdue pharmaceutical representatives even solicited doctors and receptionists with extravagant meals and other perks, promising their drug was uniquely nonaddictive, and therefore safe for long-term use.

Purdue and its OxyContin campaign successfully changed the indication from severe end of life pain to moderate to severe pain. In 2000, an executive from Purdue gave a welcoming speech to their sales staff in Palm Beach where they referenced the initiative to “raise awareness of undertreated pain” and to “Make the whole pie bigger, not only for us but for our competition as well.” (Lurie, Mother Jones, 2019) In essence, this executive was referring to the new demographic of people reliant on opioids built by Purdue’s commercial success of OxyContin and the growing market for even more potent opioids to be put on the market and made available to the consumer.

The nation’s two opioid epidemics were shown to arc in the same direction by the same catalyst. Widely available prescription opioids that were believed by the public to be safe and effective initiated the crises and laid the groundwork for devastating addiction. An article in the American Journal of Public Health written in 1915 could easily be mistaken for modern day conditions in that “various factors, such as the careless prescribing of these drugs by physicians, the spread of habit from person to person, the cupidity of druggists and patent medicine manufacturers, and vice and dissipation are responsible for the existing conditions.” (Terry, 1912)

Part 2: The Breaking Point

2.1 Cause for Concern:

The American Civil War is seen as a major determinant of the original opioid epidemic, when soldiers were treated with opiates to cope with injuries sustained from combat. Doctors at the time knew of the risk of opium, and that it had a high risk of dependence and need for regular increase of dosage. Without many alternatives and an insurmountable number of injured soldiers, those who endured painful injuries were treated with morphine to combat their distress. With time, they found themselves addicted to the medication that was meant to cure them of their discomfort, and thus the term 'soldier's disease' was invented to describe the veterans who became long-term opioid addicts. People of that era lacked modern understanding of opioid addiction, and so the disgraced term lived with these veterans who would not likely find adequate assistance for recovery in their lifetime. Data aggregation and record keeping were weak during this time, but it's evidenced in various writings that public officials and medical professionals alike were shocked by the number of people suffering from addiction post-war, which is suggested to be an estimate of several hundred thousand American veterans. (Ruane, The Washington Post, 2021)

After the Civil War, opiates were still used regularly to treat acute to severe medical conditions despite the growing rate of opioid use disorder. The sick and wounded veterans found that opioids were easily available in hometown stores, and so they continued using what had helped them during the conflict. (Ruane, The Washington Post, 2021) While concern for addiction and long-term effects escalated for decades, they were brushed aside due to the lack of alternative treatments and absence of necessary, universal education for medical practitioners and communities in distress. Throughout the late 19th century, medical journals were filled with warnings about the dangers of addiction. (Trickey, Smithsonian Magazine, 2018) The demand for opioids was high and only around the peak of the epidemic in 1895 did doctors begin slow prescribing and reduce the use of opiates, nearly 3 decades after the end of the Civil War. (Ruane, The Washington Post, 2021) A Brooklyn doctor wrote at the time "Many cases of the morphine habit could have been avoided had the family physician not given the drug in the first place". By 1900, more than 250,000 Americans were addicted to opium derived painkillers. (Macy 25) While heroin was initially praised for its 'nonaddictive' qualities, in 1906 the American Medical Association finally sounded an alarm due to the increase of abuse found with the drug.

The New York City commissioner of health then proclaimed the well-known 'soldier's disease' had become 'the American Disease', as hospitals began to fill with people addicted to heroin in the 1910s and 1920s. (Macy 25)

Like the warning signs of the late 19th century, the modern opioid crisis began to unravel when doctors and other members of the community began to note the apparent dangers of opioid use in the late 1990s and early 2000s. Art Van Zee, a family doctor in Pennington Gap, Virginia, famously wrote to Purdue Pharma in hopes that they would heed his concern and reformulate or remarket the drug. When his letters went unanswered, he and other community activists "…launch(ed) a petition drive in 2001 to convince the F.D.A. to take OxyContin off the market until it could be reformulated and made safer." (Meier, The New York Times, 2019) In a senate hearing during that same year, he pleaded that there were three major elements involved in the OxyContin abuse problem. He declared that "First, there has been an obvious problem with physicians mis-prescribing and over-prescribing of this drug. Secondly, this epidemic has been a vicious indicator of the alarming degree of prescription drug abuse in this society. Thirdly, and perhaps the one closest to this committee and the FDA, is that the promotion and marketing of OxyContin by Purdue Pharma has played a major role in this problem." (Senate Hearing 107-287, 2002). With growing evidence of abuse and pressure from the public to act, Purdue instead incited blame onto those who became addicted. Richard Sackler, president of Purdue Pharma at the time, wrote in an email to his constituents in 2001 that "We have to hammer on abusers in every way possible… They are the culprits and the problem. They are reckless criminals." (Meier, New York Times 2019) Like those suffering from 'soldier's disease' after the Civil War, the modern victims of the opioid crisis now not only suffered from addiction, but they were shroud in stigma and shame for having become addicted in the first place despite their lack of autonomy in their opioid dependence.

For many years, it was difficult to account for the number of lives lost to the modern opioid epidemic or the amount of people who became addicted as a direct result of their prescription opioid use. The true number of opioid deaths were concealed by inconsistent language in databases. An overdose could be annotated as "narcotics overdose", "polydrug overdose", "acute intravenous narcotism", "heroin overdose", and so on. (Quinones 118) Crime rates were rising in counties that had high rates of abuse, drug overdoses climbed, unemployment rates increased, and yet with what was considered circumstantial data such as this it would take years for the federal government to step in and regulate the prescribing of opioids.

2.2 Legislation, Discrimination, and the Consequences of Regulation

New state level regulations were passed between 1895 and 1915 which restricted the sale of opiates to patients with a valid prescription, which meant they were no longer available over the counter. (Trickey, Smithsonian Magazine, 2018) The image of a drug user also changed from a wealthy, white addict in the late 19th to the early 20th century to a "…young tough on a street corner, hanging out with his friends and snorting heroin, that's a very different and less sympathetic picture of narcotic addiction." (Trickey, Smithsonian Magazine, 2018) This less sympathetic view ignited even more state and federal government interventions on narcotic markets, creating the enduring dynamic of an imbalanced judicial system and criminalization for non-white drug users that we would see for the next century and beyond.

With new restrictions on the prescription of opioids, users were forced to find alternative substances and markets to supplement their addiction. A law passed in 1909 that banned the importation, possession, and use of smoking-opium with a punishable offense of up to two years in prison created a new market for illicit opium along with more potent drugs like Morphine and Heroin. (Trickey, Smithsonian Magazine, 2018) In response to this new revelation that the demand for opiates was increasing rather than decreasing, the Harrison Narcotics Tax Act was passed in 1914 to address these unintended consequences and prices for opiates soared. An article in the American Journal of Public Health at the time criticized the legislation and wrote, "It would appear that the utmost to be hoped from the Harrison Act… is an accumulation of data relating to the extent of drug addictions in this country that may shock the nation into demanding of Congress suitable legislation." (Terry 1912)The Harrison Act severely restricted the sale and possession of Heroin and other narcotic drugs but did little else or address the ongoing crisis. This, the article claimed, could have been due to the affiliations that patent medicine and doctors had with congress.

By 1924 the manufacturing of Heroin was outlawed and by the 1930s and 1940s, the upper- and middle-class addicts had begun to die out and the remaining addicts were reclassified as junkies and criminals. (Macy 25, 26) The stigmatization and disregard for those remaining struggling with an opioid use disorder made room for the devastation caused by the nation's first epidemic to recede from memory. When again the overprescribing of opioids was questioned in the early 2000s, Purdue used this same stigma to their advantage and weaponized the century long discrimination of people with addiction to claim that abuse was no fault of the pharmaceutical industry.

Despite Purdue's efforts to deflect blame and maintain their bolstering industry, abuse eventually became too rampant to ignore and legislation once again was enforced to attempt to govern the already out-of-control opioid crisis. In 2007, Purdue faced what would be the first in a series of trials and was forced to pay $634.5 million in fines for misrepresenting the dangers of OxyContin. As part of the settlement, Purdue's board "…signed a corporate integrity agreement with the federal government promising that the company would not violate the law in the future." (Meier, The New York Times, 2019) This marked the initial step into restrictions of opioids in the 21st century but was not enough to curb the opioid crisis and stop hundreds of thousands to overdose before Purdue finally retreated. In March of 2022, as of the time that this is being written, Purdue has reached a new deal with states regarding its involvement in the opioid crisis. "If Judge Robert Drain, who has presided over Purdue's bankruptcy proceedings in White Plains, N.Y., approves the agreement, the Sacklers (whose family members have resided over Purdue for decades) would pay as much as $6 billion to help communities address the damage from the opioid crisis." (Hoffman, The New York Times, 2022)

Opioid prescribing began to drop in 2012 due to public concern over Purdue's mis-marketing of OxyContin and the rise of opioid overdose deaths. New guidelines for treating pain outlined by the CDC have also been in development for the past decade. Initially, guidelines from 2016 were reactive to the agony that overprescribing caused, limiting the prescription of opioids so much that many medical professionals felt that the pendulum was being swung too far in the opposite direction. Since then, the guidelines have been reformulated and are considering a more middle of the road approach, acknowledging the benefits of certain opioid use while still considering the crisis at hand. (Hoffman, The New York Times, 2022) While prescription rates steadily dropped and doctors, governmental officials, and Purdue Pharma were acknowledging the damage done, It was unfortunately too late for an epidemic that had already taken hold of the nation.

In 2018, opioid legislation was passed that included an "…expansive package focus(ed) on improving access to treatment services by lifting certain restrictions on Medicaid and Medicare coverage, as well as backing the creation of comprehensive opioid recovery centers... There (were) also measures that (sought) to curtail foreign shipments of illegal drugs to the United States." (NPR, 2018) Despite the intentions of this bill, the federal government at the time also cut funding to the Affordable Health Care Act, which subsidized Medicaid insurance covering roughly 40% of Americans receiving opioid treatment, as well as to the Office of National Drug Control Policy (ONDCP), which had been tasked since 1988 with developing and

coordinating the nation's drug addiction efforts. (NPR, 2018) Fentanyl, a drug that has been known to be illegally imported from China in large quantities, has also been a leading cause of overdose deaths in recent years. (CDC 2020) As seen in the aftermath of early 20th century legislation, attempting to limit the import of illicit drugs proves inconsequential to the rise of the opioid epidemic. Once the market has already been established, as it had been by pharmaceutical companies and overprescribing doctors, it would be nearly impossible to stop the flow of illicit drugs. With the potency of modern opioids completely eclipsing those from the nation's first opioid epidemic, reliance on restrictive legislation alone will prove equally inconsequential in the current ongoing crisis.

2.3 'Advances' in Medicine and the Aftermath:

Restrictions to prescription opiates led to smuggling and illicit drug use, according to Redford and Powell in *Dynamics of Intervention in the War on Drugs.* While legislative intentions were to limit the import of opiates and strategically reduce the number of users, restrictions on imports ultimately led to a new market for illicit drug trade and a demand for alternatives which were consequently more potent. (Redford and Powell, 521) The unintended consequence of greater numbers of individuals using more potent and addictive opiates such as Heroin or Morphine following the Opium Exclusion Act of 1909 is not dissimilar to the steady increase in illicit Fentanyl and Heroin overdoses that we saw after restrictions on prescription opioids made them more difficult to acquire in the early 21st century. (CDC 2021) The tragic aftermath from decades of overprescribing and mismarketing of prescription opiates was such that any action from the federal government or medical practitioners felt unsubstantial. While medicine in the late 19th and early 20th centuries evolved and alleviated some of the factors that were determinants in the early opioid crisis, it cannot be said that modern medicine and pharmaceutical intervention has done much to mitigate the ongoing crisis.

Breakthroughs in medicine were essential in the descending trend of the first opioid epidemic. "Advances in medicine and public health played a role: acceptance of the germ theory of disease, vaccines, x-rays, and the debut of new pain relievers, such as aspirin in 1899. Better sanitation meant fewer patients contracting dysentery or other gastrointestinal diseases, then turning to opiates for their constipating and pain-relieving effects." (Trickey, Smithsonian Magazine, 2018) When doctors no longer had to rely on opioids for the treatment of so many ailments, in many ways they were able to leave the drugs and their dangerous side effects behind. This unfortunately, is not the case for the modern opioid epidemic. The dangers of

opioids are well-known, yet more potent opioids are still being researched and approved by the FDA such as Dsuvia, an opioid 10 times more powerful than Fentanyl and 1000 times more powerful than Morphine. Questions on whether pharmaceutical companies can prevent addiction and reckless distribution of this new, powerful drug during a peaking opioid epidemic remain unanswered. (Hasan Minhaj, Patriot Act, 2019)

Part 3: Waiting for Recovery

3.1 The Enduring Physiological Dependence on Opioids:

Opioids have become increasingly more potent, making their addictiveness exponentially more dangerous than ever. Combined with reckless mis-marketing and overprescribing, the potency of opioids has made the opioid epidemic increasingly more dangerous, and addiction has become harder than ever to overcome. There are generally 5 phases leading up to opioid use disorder:

Phase 1: The Brain Before Opioids

Your body naturally produces endorphins, which is the body's natural version of opioids, and this is the same reward circuit that is accessed after working out, falling in love, or eating a good meal. Endorphins relieve pain and create a general feeling of wellbeing. (Sinha et al., 2018)

Phase 2: The Mesolimbic (Middle Brain) Reward System

When an opioid is first taken, it "…creates a tidal wave in the reward circuits of the brain". (Sinha et al., 2018) It floods your brain with dopamine and replaces pain receptors with euphoria, encouraging repeated use and making the user seek the same high as their first dose. (Kosten & George, 2002) "The brain balances its own endorphins like a thermostat. When an external source keeps flooding the brain, it throws that system off." (Sinha et al., 2018)

Phase 3: The Locus Coeruleus & The Dependence to Feel Normal

The locus coeruleus (LC) is an area of the brain that is critically involved in the production of opioid dependence and withdrawal. The mesolimbic reward system changes, which is the primary dopamine pathway in the brain. Dependence means that users no longer feel pleasure in activities they used to without opioids. The brain functions more or less normally when the drugs are present and abnormally when they are not. Opioid tolerance occurs because the brain cells that have opioid receptors on them gradually become less responsive to the opioid stimulation. (Kosten & George, 2002)

Phase 4: The Changed Set Point Model

In this phase, your baseline is altered, no longer producing natural opioids, and depending entirely on the drug to regulate. This is what opioid dependence disorder looks like. Under this model, both the positive (drug liking) and negative (drug withdrawal) aspects of drug addiction are accounted for. Withdrawal symptoms become unbearable, known as 'dopesick'. Cortisol, the stress hormone, is increased, making stress a driver for many addicts. (Kosten & George, 2002)

Phase 5: The Normalizing Effects of MAT Medications

Drugs such as Methadone, Buprenorphine, and Suboxone are long-acting opioid medications. While these drugs cause dependence, because of their steadier influence on the MU opioid receptors, they produce minimal tolerance and alleviate cravings and compulsive drug use. They moderate the exaggerated cortisol stress response that increases the danger of relapse in stressful situations. Pharmacological interventions for opioid addiction are highly effective; however, given the complex biological, psychological, and social aspects of the disease, they must be accompanied by appropriate psychosocial treatments. (Kosten & George, 2002)

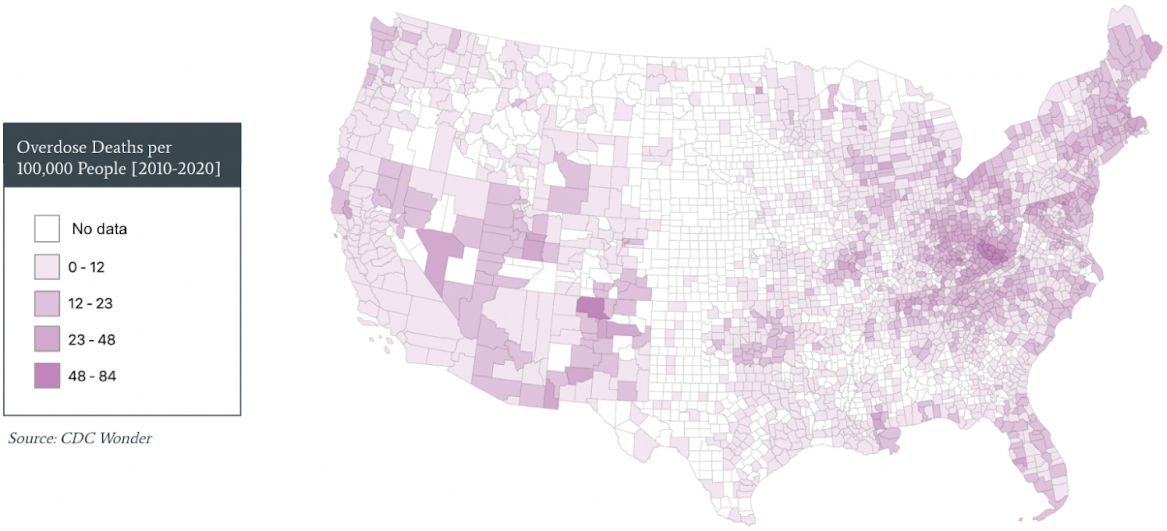
3.2 MAT Treatment and Barriers in Recovery

Comparing opioid pill distribution at the height of prescriptions in 2012 to the current availability of Medication-Assisted Treatment (MAT) emphasizes the lack of recovery from the ongoing opioid epidemic and the need for an equal distribution of MAT providers in vulnerable counties where pill prescribing was once high. In processing this data, a glaring gap within the middle of the country exhibits a relationship between a lack of data and lack of recovery providers, creating an image of the opioid epidemic which hasn't yet been revealed. A multivariate analysis on all counties in the United States helps to determine risk status of a country that has been ravaged by the opioid crisis, emphasizing the gaps in recovery and data as well as weighing the most vulnerable areas.

Significance and Methodology:

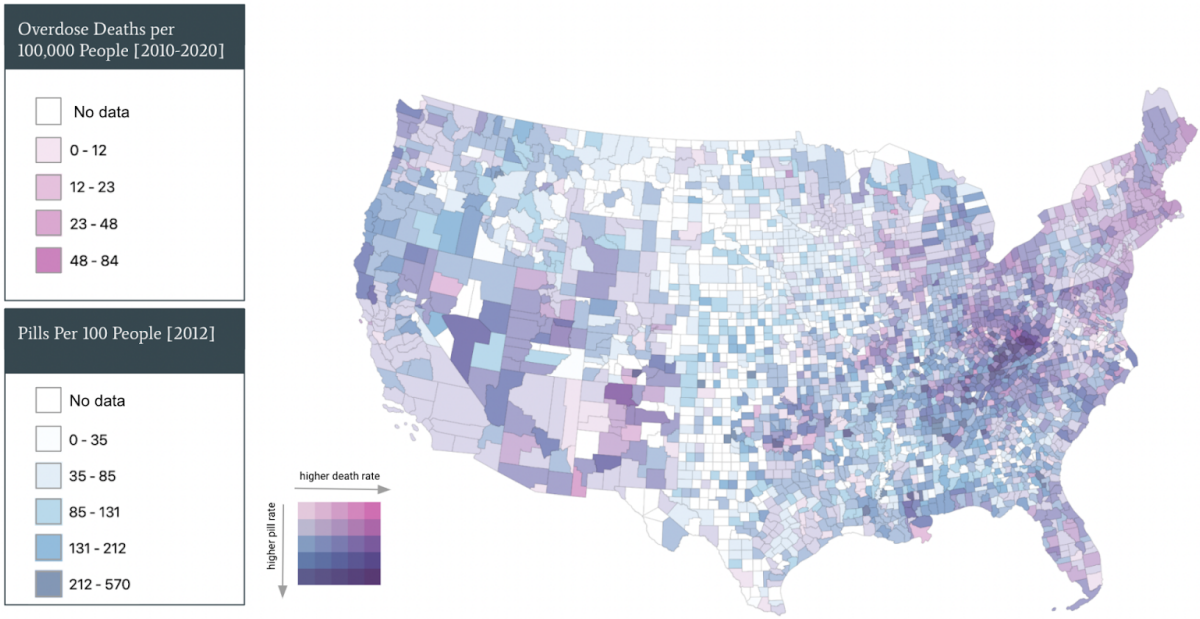
While opioids were considered a last resort by most physicians during the 20th century because of their known addictive qualities, Purdue Pharma was able to manipulate data and implement a widespread mis-marketing campaign for their opioid OxyContin during the late 20th and early 21st century. This increased accessibility to opioids most notably in vulnerable counties in Appalachia and other low-income areas. Although restrictions on opioids have been

reintroduced and Purdue has faced charges on their crimes since then, overdoses have steadily increased since the 1990s and the demand for opioids has not diminished. (CDC 2021) Opioid overdoses are exploding in areas that have all kinds of social indicators, such as high poverty and high levels of disability. (Quinones 312) CDC data on overdose deaths from 2010 - 2020 was calculated per 100,000 people to determine vulnerability on a county level.



Marginalization and the disadvantages of poverty made already vulnerable counties a target for the overprescription of opioids, where an evident relationship between high rates of pill availability and high rates of overdose deaths remain pertinent. Since expensive opioid prescriptions were widely covered by Medicaid insurance, pharmaceutical companies targeted low-income counties in the heavy marketing and prescribing of opioids during the onset of the epidemic. (Quinones 209)

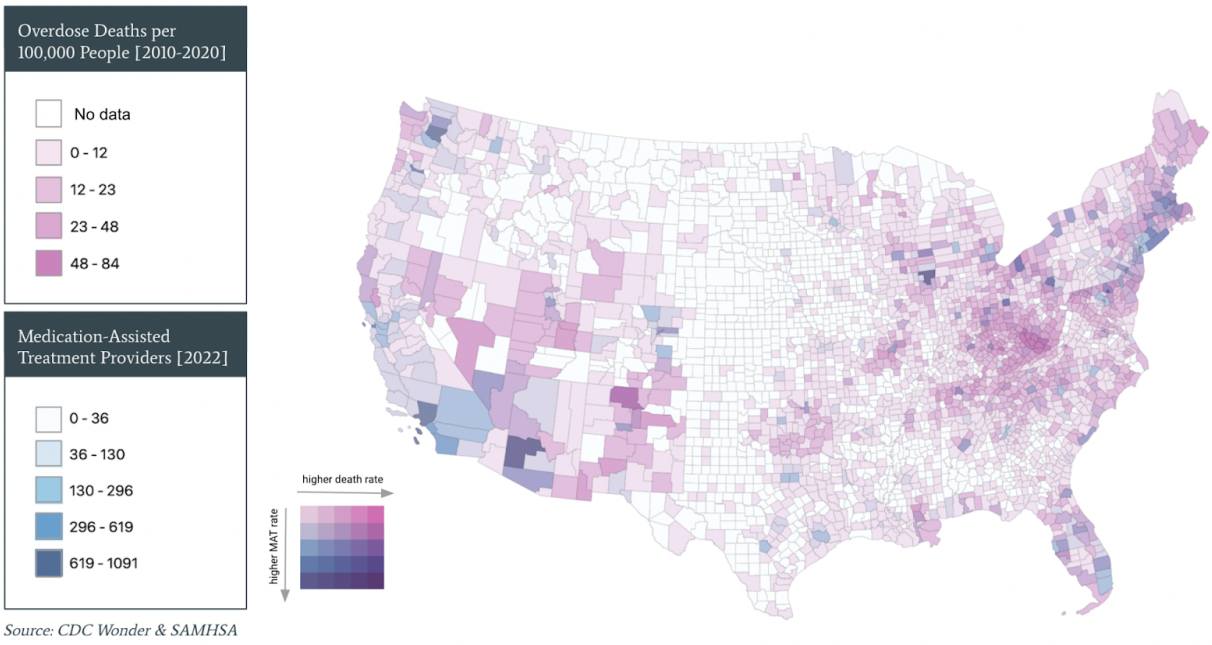
The peak of opioid prescribing was in 2012, according to the CDC. Around this time, public awareness of the dangers of opioids re-emerged after years of communities expressing concern, and doctors slowed down their prescriptions of so-called 'non-addictive' opioids such as OxyContin. Opioid pills per 100 people from CDC data in 2012 were compared to vulnerable counties in order to visualize a strong correlation between the overprescription of opioids and overdose deaths, underlining the onset of the crisis.



Source: CDC Wonder

Low-income counties that had much of its population on Medicaid were disproportionately impacted, and as a result overdose deaths in these counties remain the highest in the nation. (Macy 97) While these counties were targeted for their vulnerability during the inception of the epidemic, many do not have geographical access to Medication-Assisted Treatment centers. Pharmaceutical companies pushed opioid pills on vulnerable counties and created a widespread physiological dependence on opioids in populations that have remained vulnerable long after prescriptions had slowed down.

MAT medications provide a more comprehensive, individually tailored program of medication and behavioral therapy that addresses the needs of most patients. Long-term use of MAT medications, like Buprenorphine, Methadone, and Suboxone, show greater impact in recovery because they address the body's reliance on the drug and the physiological way that the brain shifts when a person has grown dependent on opioids. (SAMHSA 2022) MAT treatment centers, including listed Buprenorphine providers and MAT clinics, were geocoded and aggregated from the Substance Abuse and Mental Health Services Administration, or SAMHSA, website and overlaid onto the same overdose vulnerability map, emphasizing the geographical barriers to recovery in comparison to the previous widespread availability of opioid pills which addicted the nation in the first place.



Source: CDC Wonder & SAMHSA

MAT medications are administered by providers and doses can be given weekly or biweekly, or in some cases even once or twice a day. Patients typically receive treatment indefinitely, for months, years, or even an entire lifetime, thus this geographical barrier is a severe constraint on recovery. (SAMHSA 2022) To avoid more lives being lost, we must make MAT available to those who need it. The lack of MAT treatment providers means that those suffering from opioid addiction can't and won't obtain assistance. To make matters worse, while physicians or other qualifying practitioners can apply to treat up to 100 patients during the first year of their license, most providers can only treat up to 30 patients. This means that while there are approximately 50,000 providers listed on SAMHSA's website that can administer the drug, only about 2,000 have not yet met their patient limit, implementing yet another barrier to recovery. (SAMHSA 2022)

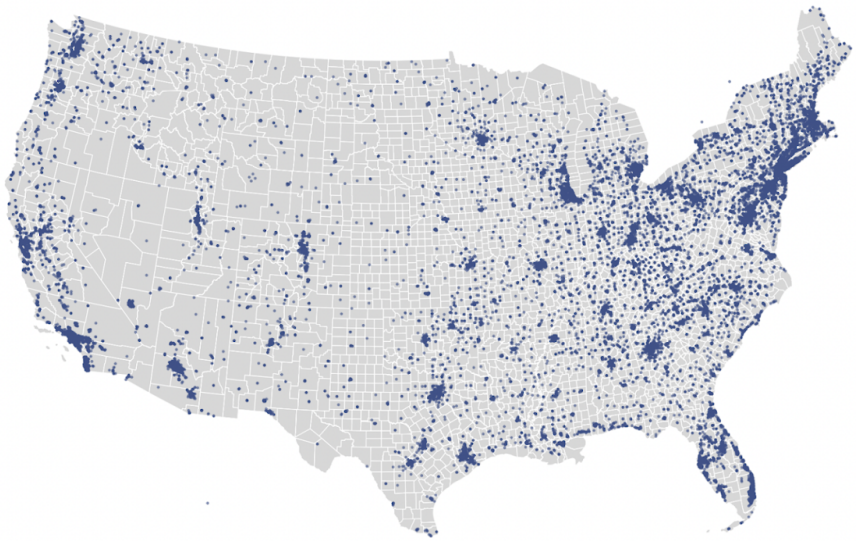
Listed Buprenorphine Providers from SAMHSA's website:

Medication-Assisted Treatment Providers [2022]

MAT providers were pulled and geocoded from the Substance Abuse and Mental Health Services website.

These are the locations of each provider before they were binned.

Source: SAMHSA



Listed Buprenorphine Providers who are haven't met their patient limit:

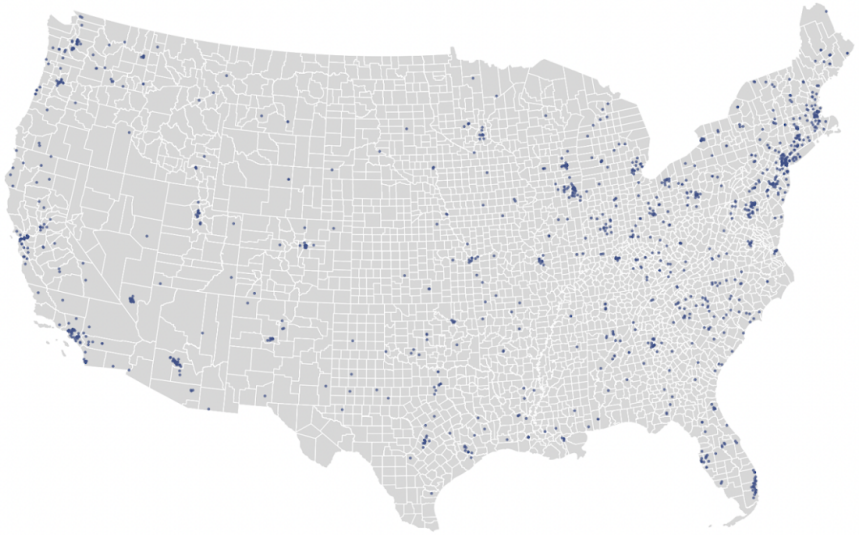
Medication-Assisted Treatment Providers [2022]

As seen in the previous maps, there are not enough MAT providers to sufficiently treat vulnerable counties.

To make matters worse, **while providers can apply to treat up to 100 patients, existing providers can typically only treat up to 30** patients each within their state.

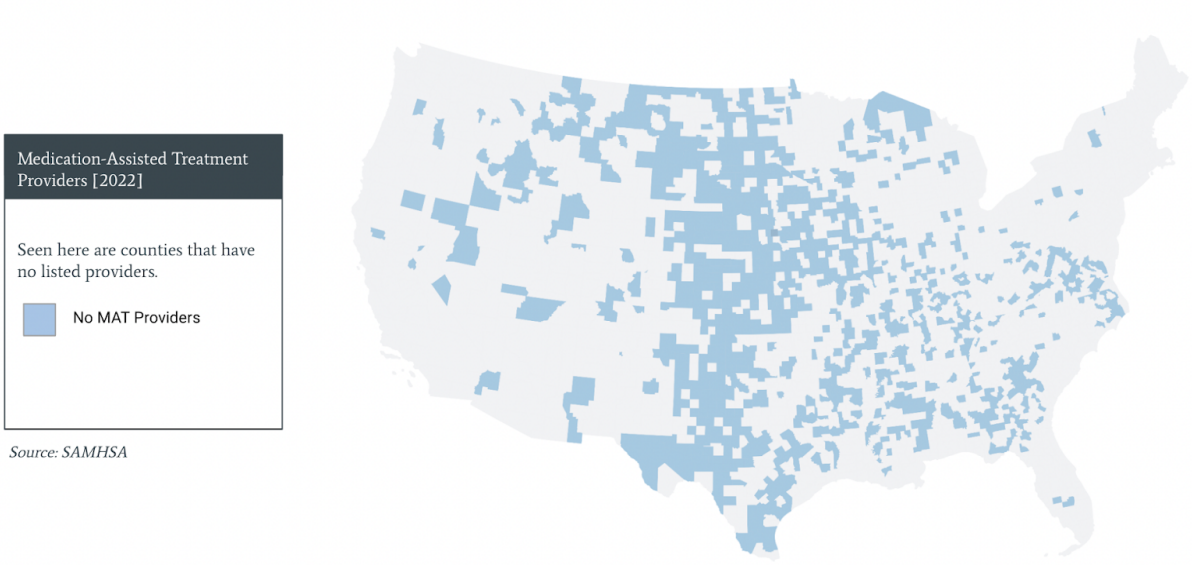
This means that out of about 50,000 listed providers, only about 2,000 have not met their patient limit.

Source: SAMHSA

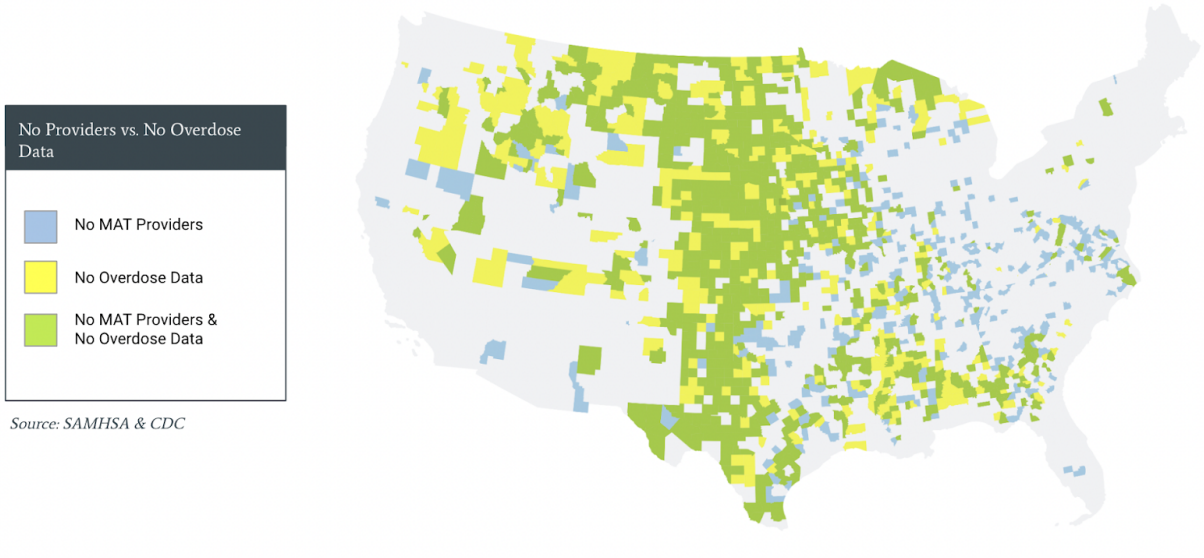


Analysis and Results:

The threat of low access to Medication-Assisted Treatment is even more severe where there is a complete absence of MAT, especially in those counties geographically located within the middle of the country.

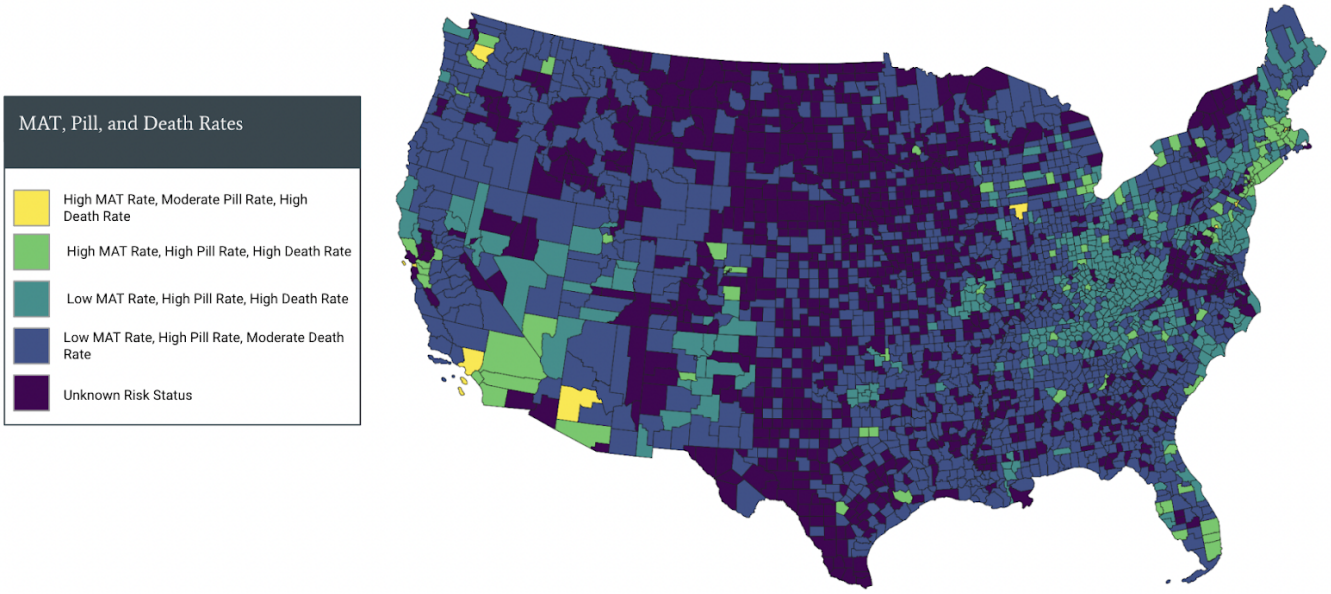


In processing overdose data from the CDC, there was a glaring gap in data within the middle of the country as well, even in data as far back as 1999. (CDC 2020) As a result of this missing data, a relationship emerges between no available overdose data and no MAT providers. In essence, where there is no information on the vulnerability status of counties there is consequently even less availability of recovery. Therefore, no risk status can be determined for the below outlined counties in green.



Attribute clustering was implemented in a final analysis of the three variables identified as important factors in the ongoing opioid epidemic (overdose deaths per 100,000 people [2010-2020], opioid pills prescribed per 100 people [2012], and MAT providers [2022]). The three variables were run through a KMeans algorithm to create 5 clusters and determine levels of risk status in counties. In analyzing the results, determinations on the risk status of counties with sufficient data were made based on rates of pills prescribed, rates of overdose deaths, and rates of MAT providers. As expected, counties are noted as the most vulnerable in the region of Appalachia, among other low-income counties. There are 4 counties that were clustered and classified as the least vulnerable due to a sufficient number of average MAT providers, lower pill distribution rate, and moderate overdose death rate. Lastly, counties that were earlier highlighted due to lack of data were also clustered and risk status is determined to be unavailable as a result.

Cluster	Determined Risk Status	Pills per 100 people (average)	MAT Providers (average)	Deaths per 100,000 people (average)
c1 - navy	2	110.064	9.76609	7.26139
c2 - purple	unavailable	27.0791	2.66896	2.09286
c3 - teal	1 (highest)	129.963	16.1364	23.987
c4 - green	3	73.1915	206.33	15.617
c5 - yellow	4 (least)	59.1111	754.667	19



Conclusion

The targeting of vulnerable counties for the treatment of ‘pain’ and overprescribing of opioids, the high rate of overdose deaths in these counties as a result, and the distance and inaccessibility of MAT treatment providers in these afflicted areas leaves them without much opportunity to recover from the damage that has been done by the opioid epidemic. Efforts to increase surveillance of overdose incidences and identify vulnerable communities will allow stakeholders to realign resources to help these struggling communities. Ideally, with more surveillance, these gaps that lack data can be filled in over time and further analysis of vulnerable communities may continue as well.

Stigma remains a withholding factor in seeking or providing opioid treatment, due to over prescription and false realities of the epidemic’s early stages. The lingering stigma of opioid use disorder creates an isolating environment for those in need and leaves them with multilayered geographical, social, and economic barriers to recovery. The gripping effect that opioids have on the brain combined with the inaccessibility of MAT leaves the nation crippled with little chance of recovery. Alleviating future escalation of the modern opioid crisis requires understanding the onset of the first opioid epidemic and the stigma that it left behind, sympathizing with the physiology of addiction, and making MAT treatment accessible.

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