THE IMPACT OF THE AFFORDABLE CARE ACT'S MEDICAID EXPANSION PROVISION ON ACCESS TO OPIOID USE DISORDER TREATMENT

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ABSTRACT

The United States has been in the midst of an opioid epidemic for over two decades. With nearly 50,000 Americans dying each year as a result of opioid overdoses and an estimated annual economic toll of over $500 billion, there is a need to understand how best to increase treatment and prevent overdoses. The most commonly reported barriers to treatment for a patient with a substance use disorder are financial and the lack of health insurance coverage. This thesis assesses the impact of Affordable Care Act (ACA) Medicaid expansion on health care access and treatment completion for patients with substance use disorders (including opioid use disorders) utilizing the Substance Abuse and Mental Health Services Administration's (SAMHSA) Treatment Episode Data Set - Discharges (TEDS-D) files for the years 2012 through 2018. This thesis finds that, when comparing patients in expansion states against those in non-expansion states, Medicaid expansion was associated with an increased likelihood that an individual with an opioid use disorder received medication-assisted opioid treatment and successfully completed treatment.

The research and writing of this thesis are dedicated to my parents who have always supported my career and encouraged the pursuit of my interests, wherever they may lead.

Thank you to Ella for her constant support not only throughout the entire thesis process, but also throughout the challenges brought by the pandemic. I could not have accomplished this without you by my side.

With immense gratitude,
Christopher Kei Helm

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CHAPTER 1. INTRODUCTION

The United States is in the midst of a national opioid crisis. For more than two decades, the country has witnessed an epidemic of opioid misuse and overdoses. As of 2018, Americans are more likely to die due to an opioid overdose than a motor vehicle accident according to an analysis by the National Safety Council (2019). In 2019 alone, the Centers of Disease Control and Prevention (CDC) estimated that nearly 50,000 Americans died due to an overdose involving any opioid (National Institute on Drug Abuse [NIDA], 2021). This death tolls reflects a roughly fivefold increase in opioid-related overdose deaths compared to 1999, which the CDC considers the beginning of the "first wave" of rising opioid deaths (NIDA, 2021; CDC, 2021). In addition to the tragedy of lives lost, the burden of the opioid crisis is immense in its toll on both the physical and socioeconomic health of the United States. Opioid misuse and overdoses in 2013 were associated with an annual economic burden of $78.5 billion arising from increased health care and treatment costs, as well as in lost productivity and criminal justice costs (Florence *et al.*, 2016). According to a more recent estimate, the annual costs associated with the opioid epidemic has increased to $504 billion in 2015 (Council of Economic Advisers, 2017). Consequently, the country has an immense interest, both for the sake of public health and the economy, to take action to resolve this national crisis.

The opioid crisis represents a particularly severe aspect of a broader national issue of mental health and substance abuse. Studies have found that roughly 20.2 million individuals 18 and older had a substance use disorder (SUD) in the past year (Lipari *et al.*, 2017). This included 16.3 million with alcohol use disorder, 6.2 million with an illicit drug use disorder, and roughly 2.3 million adults with both (Lipari *et al.*, 2017). With regards to opioids specifically, adults with mental health disorders are twice as likely to use opioids than adults without a mental health

disorder (Davis *et al.,* 2017). The proportion who received treatment among adults with co-occurrent mental health and SUDs was extremely low at only 3.4 percent (Office of Disease Prevention and Health Promotion [ODPHP], n.d.). Unfortunately, the prevalence of abuse combined with the lack of treatment meant that there were an estimated 20.7 drug overdose deaths per 100,000 population in 2018 (ODPHP, n.d.). In particular, approximately 70 percent of the 67,367 drug overdose deaths that year involved an opioid (Wilson *et al.,* 2020).

The common barriers to receiving treatment for SUDs are often financial, especially health insurance coverage. In 2015 and in 2018, a third of Americans with SUDs reported that they did not receive treatment specifically because they lacked coverage (Reilly & Arsenault, 2017; SAMHSA, 2018). Even if individuals have insurance coverage, the extent of benefits vary widely. For example, although Medicaid offers some coverage for treatment medications and behavioral services, specific coverage varies by state given that each state maintains their own program (Reilly & Arsenault, 2017). In addition, although mental health parity laws exist and apply to private health insurance, plans such as short-term limited duration plans (that are increasingly available) may not offer consistent benefits. Compounding this issue further are the racial disparities that exist in access to treatment. Whereas the Substance Abuse and Mental Health Services Administration's (SAMHSA) 2018 National Survey on Drug Use and Health (NSDUH) found that only 43.4 percent of adults with mental illness received treatment, the statistic worsens when considering specific demographics. According to the National Association of Mental Illness (2021) the corresponding rate is lower for Asians (24.9 percent), African Americans (30.6 percent), and Hispanic/Latinos (32.9 percent). It is clear that not enough Americans are getting the care they need to support their mental health and their SUDs.

Although the number of opioid-related overdoses deaths appeared to have modestly declined in 2018 compared to the year prior (Ahmad *et al.*, 2021), the advent of the novel coronavirus disease 2019 (COVID-19) pandemic in 2020 has reversed any semblance of a resolved crisis. From the early days of the pandemic in the United States, experts have expressed concern that the disruptions caused by the country's response to COVID-19 (ex. physical distancing and lockdowns) would have detrimental effects on individuals' mental health (Galea *et al.*, 2020). The deterioration in mental health was consequently expected to lead to increases in substance use disorders and overdoses, among other issues such as domestic violence. Unfortunately, early findings appear to confirm these trends.

One study of emergency department (ED) visits across the country found that the number of visits involving an opioid overdose was significantly higher between March and October 2020 compared to the same period in 2019 (Holland *et al.*, 2021). Similarly, analysis conducted by The Commonwealth Fund using recent provisional CDC data, found that the estimated total overdose deaths reached a record high between September 2019 and August 2020 (Baumgartner & Radley, 2021). This twelve-month timespan had an estimated 88,295 deaths compared to roughly 19,000 less deaths in the prior twelve-month period. The researchers noted that the increases in fatal overdoses were driven in large part by increases in opioid overdoses, with a peak of 7,257 fatal opioid overdoses in May 2020. In comparison, 3,035 fewer opioid overdose deaths occurred in February 2020, immediately prior to start of the United States' response to COVID-19. While the CDC has yet to publish the finalized numbers, it is clear that not only has the United States' opioid crisis continued, but it has also worsened during the COVID-19 pandemic. Consequently, now more than ever, there is a pressing need for the United States to

better understand how to increase the prevention of opioid overdoses and the treatment of opioid use disorders.

Given that one of the main barriers to accessing appropriate treatment for substance use disorders is health insurance coverage, this thesis investigates whether recent reforms expanding health insurance coverage have led to greater access to substance use treatment for opioids. Specifically, this thesis analyzed a national dataset of annual discharges (SAMHSA's Treatment Episode Data Set – Discharge (TEDS-D)) for the years 2012 through 2018 to investigate whether states' expansion of Medicaid program eligibility was associated with increased access to treatment for opioid use disorders and improved treatment completion rates.

CHAPTER 2. BACKGROUND

Opioids have long been utilized as a pain reliever due to their strong analgesic properties arising from the activation of opioid receptors found throughout the human body including in the brain, spinal cord, and the digestive system. At the same time, opioids also produce a sense of euphoria. As a result, while opioids have a bona fide medical use, they also present high potential for misuse and addiction (i.e., opioid use disorder, or OUD).

Although opioids have been commonly used for cancer-related pain and acute injuries, clinicians were hesitant to prescribe opioids for chronic pain for much of the 1900s due to concerns of addiction and overdoses. However, the use of prescription opioids in the United States grew exponentially in the late 1990s due in large part to a broad campaign to address what advocates described as a widespread undertreatment of pain (Wilkerson *et al.*, 2016). Notably, the Veterans Health Administration introduced the "Pain as the 5th Vital Sign" (P5VS) initiative in 1999 that mandated greater treatment of pain, often through the prescribing of opioids (Mularski *et al.*, 2006). This initiative prompted the broader medical field (e.g.,, medical professionals, professional societies, and advocacy organizations) to also direct their attention towards better treating pain, instigating pressure on physicians to prioritize treatment over mitigating the risks associated with opioids. Unfortunately, even though studies eventually indicated that initiatives such as P5VS did little to improve the quality of pain management, the increased dispensing of prescription opioids was soon followed by an increase in OUDs and opioid overdoses (Wilkerson *et al.*, 2016; Mularski *et al.*, 2006).

According to the CDC (2021), there have been three distinct waves of rising opioid overdoses in the United States that have taken the life of over 500,000 Americans since 1999. The first wave of overdoses began with the aforementioned focus on treating pain and primarily

featured overdoses due to prescription opioids. That is not to say that most individuals that were prescribed opioids suffered overdoses. Instead, the rapid increases in the availability and use of prescription opioids were associated with a parallel rise in the nonmedical use of prescription opioids (Wilkerson *et al.*, 2016). For example, one study found that between 1996 and 2011, the medical use of prescription opioids such as hydromorphone and oxycodone had a 1,448 percent increase while the non-medical misuse of the same opioids increased by 4,680 percent (Atluri *et al.*, 2014). Federal and state governments responded by implementing initiatives such as prescription-drug monitoring programs and increased enforcement against improper opioid distribution in order to curb the concerning trend. Unfortunately, although these efforts to control prescription opioid misuse appeared to produce desired results, the decline in the nonmedical use of prescription opioids coincided with a rise in the use of heroin and heroin overdoses (Compton *et al.*, 2016). One hypothesis has been that individuals addicted to opioids turned to heroin as a cost-effective alternative when prescription opioids became harder to obtain due to government intervention (Compton *et al.*, 2016). The CDC (2021) considers this abrupt increase in heroin overdoses around 2010 as the second wave of opioid overdoses. Lastly, the CDC's third wave of overdoses refers to the dramatic increase in overdoses starting in 2013 that were associated with illicit, synthetic opioids such as fentanyl.

While the federal government, states, and the medical field continue to implement and improve monitoring programs, prescription drug laws, and quality improvement programs to prevent OUDs and overdoses, the proper treatment of patients with OUDs remains a crucial component of addressing the opioid epidemic. The treatment of OUD is similar to the treatment for other forms of drug addiction, often featuring detoxification and behavioral therapies (NIDA,

2019). In addition, medication-assisted treatment (MAT) is a particularly effective method of treating OUDs.

MAT refers to the use of opioid agonists (i.e., methadone, buprenorphine, and naltrexone) to reduce withdrawal, block the effects of opioids, and/or eliminate cravings (SAMHSA, 2020). The use of MAT has been demonstrated to be effective at reducing opioid use in randomized control trials, reducing the likelihood of fatal overdoses, and increasing treatment retention (Simoens *et al.*, 2005; SAMHSA, 2020; Mattick *et al.*, 2009). Despite its proven effectiveness, few individuals with OUDs receive MAT or any treatment at all. Between 2009 and 2013, only 21.5 percent of individuals with OUDs received any form of treatment (SAMHSA, 2020). Less than 10 percent are estimated to have received MAT specifically (Askari *et al.*, 2020). The reason for not receiving MAT to treat OUDs vary. However, prior research has found that it is influenced by geographic factors (e.g., whether sufficient health resources are locally available), patient demographic characteristics (e.g., disparities by race and gender), and insurance coverage (Pro *et al.*, 2020; Dunn *et al.*, 2019). For this reason, the major health insurance reforms introduced in 2010 were anticipated to help improve access to OUD treatment.

The Patient Protection and Affordable Care Act (ACA) of 2010 included a variety of reforms to the nation's health insurance system. These changes included expanding the income eligibility threshold for Medicaid (up to 138% of the federal poverty level [FPL]), creating the health insurance marketplace, and requiring the coverage of essential benefits (including SUD services) (Kaiser Family Foundation [KFF], 2013). Despite opposition to some of the reforms both immediately after and since implementation, such as the refusal of some states to expand Medicaid and the elimination of the individual mandate under the Trump administration, studies

have consistently demonstrated that the ACA has reduced the number of uninsured Americans and broadly expanded access to care (Shartzer *et al.*, 2016; Blumberg *et al.*, 2016; Baumgartner *et al.*, 2020).

In addition to expanding the accessibility of health insurance coverage, the ACA also included reforms related to mental health and substance use in the form of standardizing and formalizing parity regulations. Prior to the new law in 2010, whereas some regulations such as the Mental Health Parity Act of 1996 and the Mental Health Parity and Addiction Equity Act of 2008 required parity coverage in large-group plans, those requirements did not apply to individual and small-group plans. Moreover, without the protection of pre-existing coverage instituted by the ACA, a patient's mental health history could often result in higher premiums, caps on mental health services, and denial of insurance coverage (Baumgartner *et al.*, 2020).

Although many studies have reported the ACA's impact on improving the uninsured rate, the new regulation's effects on mental health and substance use in the country are not yet as certain. Promisingly, people with mental health conditions and SUDs are more likely to have health insurance now than prior to ACA (Baumgartner *et al.*, 2020). Specifically, Medicaid expansion was associated with coverage increases among low-income adults with depression (Baumgartner *et al.*, 2020). The number of young adults that now have improved coverage for mental health and SUDs services has also increased as a result of the ACA, given that more are able to affordably enroll in individual and small-group health insurance plans (Baumgartner *et al.*, 2020). With regards to the access to these services, at least one study found that there was a greater decline of access problems due to costs in Medicaid expansion states compared to non-expansion states (Fry & Sommers, 2018). As for outcomes, Medicaid expansion does appear to be associated with fewer "poor mental health days" especially for low-income, childless adults

(Cawley *et al.*, 2018). However, some studies suggest that Medicaid expansion and increased insurance coverage are more tied to lessening severe stress than improvements in actual mental health outcomes, while other reports find that out-of-pocket spending for young adults with mental health or substance use conditions have decreased as a result of these reforms (Baumgartner *et al.*, 2020).

Despite positive findings regarding the expansion of mental health treatment as a result of the ACA, the effect of the reforms on OUD treatment specifically are less conclusive. One early concern was that ACA's Medicaid expansion was exacerbating the prevalence of OUDs. Given that prior research has found that Medicaid beneficiaries are twice as likely to receive prescription opioids, critics were concerned that expanding Medicaid eligibility would lead to more individuals abusing and/or dying from opioids (Goodman-Bacon & Sandoe, 2017). Fortunately, research has shown that this is unlikely to be the case (Goodman-Bacon & Sandoe, 2017; Sharp *et al.*, 2018). Nevertheless, given the continued challenge of OUDs to the United States, there remains interest in understanding how beneficial ACA reforms have been towards OUD treatment and what can be learned to further address the opioid epidemic.

CHAPTER 3. LITERATURE REVIEW

Numerous studies have sought to discern the precise changes in OUD treatment as a result of the ACA and its reforms, however, results have varied. Potential reasons for varying results include differences in the payer source of the datasets used, as well as distinctions in the geographical scale of analysis. Accordingly, the evidence of impact on opioid abuse treatment in the United States as a result of the ACA and Medicaid expansion policy continues to be developed.

3.1 ACA Reforms & Access to Mental Health/Substance Use Treatment

As highlighted prior, the ACA reforms were hypothesized to increase treatment access for individuals with SUDs given that SUD treatment were included as a required essential benefit of new insurance plans and because Medicaid expansion newly provided insurance coverage to many previously uninsured Americans. Early studies found that the ACA reforms were associated with increase mental health treatment, which is related to SUD, but findings were limited for effects on SUD treatments specifically (Creedon & Cook, 2016; Breslau *et al.*, 2020). An analysis of the Behavioral Risk Factor Surveillance System (BRFSS) between 2011 and 2015 confirmed the prior findings, in that Medicaid expansion was associated with improved access to mental health care and improved mental health outcomes for low-income adults (Winkelman & Chang, 2018). However, this study did not examine the effects of ACA reforms on substance use treatment.

An early study examining NSDUH data between 2008 and 2014 reported that after the ACA was implemented, individuals with OUDs were less likely to be uninsured and less likely to point to finances as a barrier to received SUD treatment than prior to the ACA (McKenna, 2017). Similarly, a study of NSDUH data between 2010 and 2015 found that Medicaid

expansion was associated with a dramatic reduction in the uninsured rates among individuals with heroin use disorders (Feder *et al.*, 2017). However, despite the fact that more individuals that received OUD treatment had their services paid for by insurance after Medicaid expansion than previously, the same study did not observe an increased prevalence of treatment. That is not to minimize the importance of health insurance coverage towards improving access to substance use treatment. A separate study of adults in Maryland with a history of intravenous drug use found that the receipt of SUD treatment significantly increased after a patient gained insurance coverage (Feder *et al.*, 2019). Indeed, the association between increased insurance coverage rates and greater receipt of SUD treatment is supported by Maclean & Saloner's (2020) study that found that the number of SUD treatment prescriptions (including drugs used for OUD treatments) paid for by Medicaid increased by 43 percent in Medicaid expansion states compared to non-expansion states. Furthermore, a cross-sectional study of overdose rates across the country between 2001 and 2017 found that counties in Medicaid expansion states had, on average, a six percent lower rate of opioid overdose deaths than counties in non-expansion states (Kravitz-Wirtz *et al.*, 2020). Although not certain, the reduction in fatal opioid overdoses might suggest that the Medicaid expansion states are having greater successes in OUD treatment.

There are some studies providing evidence regarding the impact of Medicaid expansion on OUD treatment, specifically (Meinhofer & Witman, 2018; Sharp *et al.*, 2018). For example, the application of a difference-in-difference analysis on Medicaid State Drug Utilization Data found that Medicaid expansion was associated with a 70 percent increase in the number of Medicaid-covered buprenorphine prescriptions (i.e., the most commonly prescribed medication for OUD treatment as part of MAT) (Wen *et al.*, 2017). A separate analysis of the Medicaid State Drug Utilization Data from 2011 through 2016 also observed similar trends. Sharp *et al.* (2018)

found that although opioid prescriptions per Medicaid enrollee similarly increased during the study period for both expansion states and non-expansion states, the per-enrollee prescription rates of two OUD MAT treatment drugs (buprenorphine and naltrexone) increased over 200 percent in the former compared to less than 50 percent in the latter.

3.2 Prior Studies on Treatment Episode Data Sets

SAMHSA's Treatment Episode Data Sets (TEDS) have been examined by a number of prior studies to better understand SUD and OUD treatment. One analysis used the 1992-2017 Treatment Episode Data Set - Admissions (TEDS-A) data to study the impact of Medicaid expansion on the use of MAT for OUD among pregnant women referred to treatment by the criminal justice system (Winkelman *et al.*, 2020). This analysis found that only 26.3 percent of such women received medication treatment compared to 45 percent among pregnant women who sought treatment on their own. Moreover, the rates of MAT use have been observed to be higher in Medicaid expansion states compared to non-expansion states (Winkelman *et al.*, 2020). This paper noted that although Medicaid coverage benefits during pregnancy did not necessarily change after the ACA, the broader expansion of behavioral health services and increased coverage broadly may have led to increased access and uptake of medication-assisted treatment.

A study by Meinhofer & Witman (2018) provided some of the strongest evidence for Medicaid expansion's positive effect on OUD treatment access. In addition to examining the TEDS-A data between 2007 and 2016 for changes in OUD treatment utilization after Medicaid expansion, they also explored changes in the number of OUD treatment facilities in states and the availability of MAT medications (measured by the number of prescriptions financed by Medicaid). Using these data, they found that Medicaid expansion was associated with increased

utilization of OUD treatment, increased number of OUD treatment facilities, and increased dispensation of MAT medications.

Another study by Arndt *et al.* (2013) used the TEDS-D data from 2006 to 2008 to explore patterns of racial disparity regarding the completion of outpatient substance abuse treatment. The authors investigated treatment completion rates given that it is a process outcome measure that predicts longer-term outcomes such as fewer readmissions. While recognizing that a wide range of factors contribute to each state's treatment patterns, the researchers concluded that there were significant disparities by race even when other individual patient characteristics were held constant. Building upon the prior study, Mennis & Stahler (2015) also examined outpatient treatment completion using the TEDS-D data for 2011. In addition to reaffirming the presence of racial and ethnic disparities in completion rates, the study noted how the disparities varied by the substance abused. Whereas the disparities in treatment completion rates between Hispanics/ Latinos and Whites were driven by the difference in heroin abuse rates, their analysis suggested that African Americans were less likely to complete treatment than their White peers across all substances (Mennis & Stahler, 2016). More recently, these racial trends were further reinforced by an analysis of the 2015-2017 TEDS-D data that found that Latinos completed substance use treatment at rates greater than White or Black patients (Sahker *et al.*, 2020). However, this study did not investigate the effects of a patient's location (i.e., State or Medicaid expansion status).

In addition, the studies examining the relationship between Medicaid expansion, MAT treatment, and treatment completion have produced mixed results. For example, Mutter *et al.* (2015) analysis of 2010 TEDS-D data for SUD treatment completion rates found that receipt of MAT was associated with an increased odds of treatment completion. In contrast, Askari *et al.* (2020) examined the 2016 TEDS-D data from 47 states and found that although the receipt of

MAT for OUDs was associated with an increase in treatment retention, it was associated with a decrease in treatment completion. However, the contrasting results of the prior studies may be due to their analysis of completion rates for only one year of data. Stahler & Mennis (2020) also examined TEDS-D for MAT use and treatment completion rates but utilized data from 2015 to 2017. They found that the use of MAT was associated with increased treatment completion rates, though the extent of the increase differed by where a patient received services (e.g., short-term versus long-term residential treatment facilities). Notably however, Stahler & Mennis (2020) did not initially incorporate health insurance coverage as part of their model. When insurance coverage was considered as part of post-hoc analysis, they found that MAT receipt was only associated with a lower likelihood of treatment completion for Medicaid covered patients.

CHAPTER 4. DATA AND METHODS

4.1 Data

To investigate the effect of Medicaid expansion on the use of medication-assisted opioid treatment and treatment completion for individuals with OUDs, this thesis uses SAMHSA's publicly available Treatment Episode Data Set – Discharge (TEDS-D) for years 2012 through 2018. The dataset is a compilation of discharge records with a linked admission record, pulled from state agency data systems, from substance use treatment facilities across the United States. Each state regularly requests treatment facilities, that receive public funding, to submit admission and discharge information for a given year. Data reflects client-level information and include demographics, substance type, treatment referral source, and type of treatment service. However, each observation corresponds to a unique treatment episode rather than a specific individual.

Although TEDS is a large dataset with information on a large proportion of substance use treatment discharges in the country, it is not a complete, universal record. There are limitations to the dataset due to differences in state data collection systems and regulations. For example, some state substance abuse agencies regulate and require TEDS reporting from private facilities and individual providers. Other states may not regulate or require such facilities to submit data, though they may accept voluntary data submissions. However, TEDS capture a broad cross-section of discharges across the country and is considered a national sample by SAMHSA. In addition, although extent of client-level variables collected and reported may vary by state, SAMHSA standardizes the data format of all records in TEDS.

Due the differences in reporting by state and by year, not all observations available in the TEDS-D dataset was utilized for analysis. Combined across all states that reported their data to

SAMHSA, 10,921,662 discharges in total were recorded in TEDS-D between 2012 and 2018. Of this total, 867,061 observations accounting for discharges in Florida, Georgia, Kansas, Mississippi, New Mexico, Oregon, Puerto Rico South Carolina, and Washington were excluded due to years with no data. This left 10,054,601 observations across 42 states included in the sample. Furthermore, in order to exclusively focus on individuals with OUDs, discharge observations were only included in the sample if the patient was recorded having had heroin, non-prescription methadone, or other opiates in their system at the time of admission. Accordingly, 6,207,757 observations were dropped, leaving 3,846,844 discharges in the final study sample.

4.2 Measures

4.2.1 Dependent Variables

To investigate the effect of Medicaid expansion on OUD treatment, this thesis utilizes two key dependent variables. Medication-assisted treatment (MAT) refers to the use of certain medications approved by the U.S. Food and Drug Administration (FDA), in combination with behavioral counseling, to treat patients experiencing OUD by alleviating their withdrawal symptoms. Three specific medications (buprenorphine, methadone, and naltrexone) are approved for use in the case of MAT for OUDs (National Institute for Occupational Safety and Health, 2019). The use of these medications for MAT has been demonstrated to be clinically effective at reducing the need for inpatient services and increasing treatment retention (SAMHSA, 2021; Fullerton *et al.,* 2014). As such, receiving MAT as part of OUD treatment is an indicator of improved access to and better opioid SUD treatment. Moreover, all state Medicaid programs reimburse at least some form of MAT due to its demonstrated effectiveness (SAMHSA, 2018). Accordingly, this thesis expects that Medicaid expansions as a result of the ACA should lead to

more individuals receiving MAT to treat their OUD. This thesis therefore utilizes an indicator variable captured in the TEDS-D data for whether a given patient received MAT as a dependent variable.

The TEDS-D data also captures the reason an individual was discharged by their respective medical facility. The reported reasons for discharge range from treatment completion, death, a patient dropping out of treatment, as well as termination by facility. Given that this thesis investigates whether the expansion of Medicaid eligibility has led to improved treatment access and outcomes for patients with OUDs, an indicator variable for treatment completion was utilized as a dependent variable to signal outcome changes in expansion states.

4.2.2 Independent Variables

The primary independent variable was whether a state had elected to expand their Medicaid program after the passage of the ACA. The thesis referenced the expansion timeline published by Kaiser Family Foundation (2021) to appropriately designate expansion and non-expansion as well as the year of expansion. Based on the timeline, 14 states included in the study sample were designated as non-expansion states[1], and 28 states were marked as expansion states.[2] Although the effective date for most states that elected to expand their Medicaid program was the beginning of a given calendar year (i.e., January 1st), some states such as Michigan and New Hampshire had effective dates in April and August of their expansion year. Due to the fact that

[1] List of non-expansion states: Alabama, Idaho, Maine, Missouri, Nebraska, North Carolina, Oklahoma, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, and Wyoming.

[2] List of expansion states: Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Hawaii, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, and Vermont.

the TEDS-D dataset does not capture date information beyond the year of discharge, the thesis treats states that expanded during a given year the same as states that implemented the expansion at the beginning of the calendar year. However, states are separately flagged depending on the specific year of their expansion.

In addition to the expansion status of the state and the year of a patients' discharge, this thesis also controlled for patient-level covariates including gender, race, age, employment status, and the source of payment for services received (i.e., private insurance, Medicare, or Medicaid).

Due to few observations for certain subpopulations in the sample, certain categories of patient characteristics were aggregated. For patient age, observations were grouped into four categories: ages over 55, ages 25 to 54, ages 18 tot 24, and ages under 18. Although another category of patients over 65 years old would ideally be incorporated since they would have different insurance patterns than individuals aged 55 through 64 (i.e., those aged 65 and over are covered by Medicare), the TEDS data reports them as one age group.

For race, the majority of patients included in the study sample were recorded as White or Black/African American. For this thesis, three separate categories for Asian, Pacific Islander, Native Hawaiian were merged into one 'Asian' category due to inconsistent data collection for these categories across states. Additionally, a separate 'other race' category reflects the aggregation of observations reported as Alaskan Natives, American Indian, other single race, and two or more races.

As for patient employment characteristics, the sample was simplified to two categories. Patients were considered employed in this thesis if they were reported as working full-time or part-time at the time of admission. Observations where patients were recorded as either unemployed or not in the labor force were merged and categorized as unemployed.

Lastly, similar sample consolidation was conducted for the source of payment for services provided to a patient. While observations where private insurance, Medicaid, and Medicare were recorded as the primary payer of services were kept as is, a fourth category of self-pay/uninsured incorporated the remaining categories of self-pay, other government payments, no charge, and other. This thesis uses these variables (referred to here on as "Payment Source for Services") as an indicator for a patient's type of insurance coverage for analysis purposes. In addition, due to a large portion of the sample missing this information in the original dataset, a fifth category of "Missing Payment Source for Services" was imputed for the analysis.

4.3 Empirical Strategy

This thesis uses a logistic regression model to compare changes in MAT receipt and treatment completion as a result of the expanded Medicaid eligibility in expansion states, using non-expansion states as a counterfactual controlling for exogenous trends. Additionally, the thesis also examines how MAT receipt and treatment completion were influenced by patient-level characteristics such as gender, race, education, employment, and insurance coverage.

To examine the changes in MAT receipt due to Medicaid expansion, the thesis utilized the following multivariate logistic regression model:

$$P(Y_i = 1 \mid X) = \beta_0 + \beta_1 YEAR + \beta_2 EXPAND + \beta_3 (YEAR * EXPAND) + \gamma X_i + \varepsilon_i$$

Where β_0 is the constant, *YEAR* is a continuous variable denoting when a patient was discharged (with the year 2012 set to 1), *EXPAND* is a binary indicator for whether the state had expanded their Medicaid program in a given year, *(YEAR*EXPAND)* captures the post Medicaid expansion effect relative to the pre-Medicaid expansion, and *X* is the patient-level covariates (including age, gender, race, education, employment, and source of payment for services). Using

this model, we have estimated the effect of Medicaid expansion on the likelihood that a patient with OUD received MAT as part of their treatment (i.e., where $Y = 1$ if a patient received MAT) and separately, the effect of expansion on the likelihood that a patient with OUD completed their treatment (i.e., where $Y = 1$ if a patient completed treatment). In discussing the two separate estimates, they will be referred to as specification 1 and specification 2, respectively.

Of the 28 states categorized as expansion states in this sample, 23 states (including the District of Columbia) expanded their Medicaid program in 2014. Of the remaining five states, three states (Alaska, Indiana, and Pennsylvania) expanded their program in 2015. The two outstanding states (Louisiana and Montana) expanded in 2016. The model described above does not account for potential differentiation in the effect of Medicaid expansion on either dependent variable due to temporal differences in expansion between states. Consequently, the thesis re-ran the estimation for specifications 1 and 2 using separate sample subsets of only 2014 expansion states [specifications 1a and 2a], only 2015 expansion states [specifications 1b and 2b], and only 2016 expansion states [specifications 1c and 2c] against non-expansion states.

The primary empirical model described above attempt to assess the effects of post-Medicaid expansion on our select outcomes with respect to pre-Medicaid expansion while controlling for a broad range factors for both expansion and non-expansion states. While the model includes the control states, it does not fully isolate the pre-post differences in estimates between Medicaid expansion states and non-expansion states. These empirical challenges may question the validity of our results. Therefore, we estimated our model with the following modification: We re-defined the EXPAND variable as a time-invariant binary indicator for whether the state ever expanded their Medicaid program and estimated the model. The *(YEAR * EXPAND)* now potentially serves as a proxy for the difference-in-difference estimator for the

effect of the treatment (i.e., Medicaid expansion). However, the results from this initial modification may still not be precise due differential years of Medicaid expansion across states.

Furthermore, the use of a true difference-in-difference approach to estimate treatment effects generally requires a number of assumptions to demonstrate causality. Of particular import is the parallel trends assumption, where the average outcome for the control and treatment group would have continued in a parallel direction if it were not for the treatment (Callaway & Sant'Anna, 2020). Although the study design presumably satisfies other assumptions necessary for difference-in-difference estimation, this thesis makes the assumption that the relative use of MAT and the treatment completion rates for patients with OUDs would have remained parallel in expansion and non-expansion states were it not for the implementation of expanded Medicaid program eligibility. Moreover, although states vary in their specific population's demographics and health, the aggregation of observations across 14 non-expansion states and 28 expansion states should further support the parallel trend assumption.

Analyses were conducted using STATA version 16.1 (StataCorp LLC, College Station, TX).

CHAPTER 5. RESULTS

5.1 Descriptive Results

Descriptive analysis was conducted to understand the characteristics of the patients included in the sample to compare demographics and health characteristics across the years and between Medicaid expansion states and non-expansion states.

5.1.1. Demographic Characteristics

Table A1 depicts the demographic of patients that had opioids or opiates detected in their system at the time of admission, captured in the TEDS-D set between the years 2012 and 2018. The samples are grouped by year and by Medicaid expansion and non-expansion states, and include characteristics such as age, sex, race, education, and employment status.

According to the CDC's National Vital Statistics System (NVSS), opioid overdose deaths in the United States for 2016 were concentrated among individuals aged 25 to 55 (72 percent) (KFF, n.d., "Overdose Deaths by Age Group"). The sample examined in this study appear to have a similar demographic with the 25-54 age group consistently accounting for the largest segment of the sample for all years and for both expansion and non-expansion states. This segment was followed in proportion by the 18-24 age group. Notably, this age group incrementally decreased through 2018 as a proportion of the sample for both expansion and non-expansion states.

As for the sex of the patients included in the sample, the proportion of males to females remained relatively consistent between the years examined. However, the distribution differed slightly between the non-expansion and expansion states. Whereas males consistently accounted for approximately 56 percent of the sample from non-expansion states, males were about 63

percent of the sample in expansion states. The distribution of males to females among the expansion states was closer to national opioid overdose rates, according to NVSS, where 69 percent of overdose deaths in 2018 were among males (KFF, n.d., "Overdose Deaths by Gender"). In comparison, the U.S. Census Bureau's 2019 estimated that females account for 50.8 percent of the national population (United States Census Bureau, 2019).

The racial demographics of the sample were largely consistent across the years examined, though expansion and non-expansion states slightly differed in racial distributions. While Whites consistently accounted for an overwhelming majority of the sample for both groups of states, Whites made up a smaller portion of patients in expansion state than in non-expansion states. Black patients were the second largest racial group in both state groups, though they made up a larger portion of the expansion states' patient population. Interestingly, whereas 'Other' races consistently accounted for no more than five percent of the patient sample from non-expansion states, the same demographic was greater than 11 percent of the expansion states' sample. For comparison, Kaiser Family Foundation's analysis of CDC data on opioid overdose deaths in 2018 found that 76 percent of deaths were among non-Hispanics Whites and 13 percent were among non-Hispanic Blacks (KFF, n.d., "Overdose Deaths by Race/Ethnicity"). These rates are nearly identical to general population demographics in 2019, where an estimated 76.3 percent of the population are non-Hispanics Whites and 13.4 percent are African Americans (United States Census Bureau, 2019).

The education distributions and the employment status of patients were similar across the sample years and between both expansion and non-expansion state samples. Notably, the unemployed and non-participating demographic accounted for greater than 77 percent of all patients admitted with opioids and/or opiates in their system across all years and for both

expansion and non-expansion state. Similarly, although the primary income source of many patients was not captured by TEDS-D, a large portion of the sample had no income at all throughout all of the examined years.

5.1.2. Health Characteristics

Tables A2 and A3 provides additional descriptive statistics of the sample studied, with regards to the health characteristics of the patients that had opioids or opiates detected in their system at the time of admission. With regards to health insurance coverage, we see that non-expansion and expansion states have comparable distributions. The one exception is that non-expansion states had roughly double the proportion of uninsured patients than expansion states. This difference expectedly widens post-2014, at which point a presumably large portion of the uninsured newly gained Medicaid coverage in expansion states. However, a potential counterbalance to this contrast between the sample groups is that expansion states had a larger proportion of observations where the insurance information was not recorded for many years. Relatedly, both non-expansion and expansion states have similar distributions regarding the primary source of payment for a patient's treatment services prior to 2014 (Figure A1). Of particular relevance is that Medicaid was recorded as the primary source of payment for a near equal portion of patients in expansion and non-expansion states prior to 2014. This would lend credence to our parallel trends assumption. Notably though, the proportion of patients that had Medicaid serving as the primary payor of treatment services were much larger in expansion states after 2014.

Non-expansion and expansion state samples were largely commensurate across most of the health characteristic categories included in Table A2, especially in 2012 and 2013. This includes similarities in the distribution of patient lengths of stay, reasons for patient discharge,

primary DSM diagnosis, and service setting. These similarities also lend support to this thesis' assumption of parallel trends pre-Medicaid expansion.

Interestingly, there were some differences in the distribution of MAT receipt (Table A2) and the type of the opioids detected in patients at the time of admission (Table A3). Non-expansion states had noticeably smaller portion patients who received MAT services compared to patients in expansion states (ex. 8.25 percent and 20.04 percent in 2012, respectively). In addition, the distributions of detected opioids were reversed in the two samples. Whereas a consistent majority of patients in non-expansion states were admitted with 'other opiates' in their system, the majority of patients in non-expansion states were admitted with heroin in their system (Table A3). While not investigated by this thesis, this pattern may be attributed to the fact that non-expansion states had the highest rates of opioid prescriptions (largely synthetic opiates) dispensed per population during the study period (CDC, 2020).

5.1.3. Pairwise Correlation of Variables

Table A4 presents the coefficient results from Spearman's correlation analysis of study variables. The correlation analysis finds that few variables had a significant correlation with our primary variables of interest. In particular, no variable was significantly correlated with either of the two dependent variables (receipt of MAT or treatment completion). There were some expected significant correlations with regards to whether a state was a Medicaid expansion state and their expansion status. However, these correlations did not raise significant concerns for conducting the subsequent logistic regressions.

5.2 Regression Results

This thesis utilized logistic regression analyses to explore the association between Medicaid expansion and either the likelihood that a patient with OUD received MAT as part of their treatment or the likelihood that an OUD patient completed their treatment successfully.

5.2.1. Use of Medication-Assisted Opioid Treatment

Table A5 presents results from the multivariate logistic regression performed to understand the effects of Medicaid expansion on the likelihood that a patient admitted with an OUD received MAT as part of their treatment. Table A5 includes four separate specifications using the same model. Specification 1 estimates the model including all expansion states as part of the experimental treatment group. Specification 1a estimates the model using the same variables and controls but only includes states that expanded their Medicaid program in 2014 as the experimental treatment group. Specification 1b and 1c are identical to Specification 1a except that they only include states that expanded their Medicaid program in 2015 or 2016, respectively, as the experimental group. In all specifications included in Table A5, the reference category was an employed white male, aged 55 or older, without a college education, paying for their treatment out of pocket, and living in a non-expansion state.

The effects of Medicaid expansion on the likelihood a patient received MAT as part of their OUD treatment was mixed. When all expansion states were considered regardless of the year of implementation (Specification 1), the expanded eligibility in the public insurance program was associated with an increased likelihood in the provision of MAT ($p < 0.001$). The odds of MAT receipt were similarly greater when only regressing states that implemented Medicaid expansion in 2014 (Specification 1a) ($p<0.001$). However, the pattern reversed when analyzing only states that expanded in 2015 or 2016. Medicaid expansion was associated with a

lower likelihood of MAT provision when comparing states that expanded in 2015 (Specification 1b) or 2016 (Specification 1c), with both estimates being statistically significant ($p < 0.001$). The payment source for services also appeared to be associated with the odds that a patient received MAT as part of their treatment. Compared to individuals who paid for the services themselves, patients that had their services paid for by insurance were significantly more likely to receive MAT. Whether the patient had private insurance, Medicaid, or Medicare pay for the behavioral health services, the odds of receiving MAT were significantly greater ($p < 0.001$) than uninsured patients in all specification included in Table A5.

5.2.3. Treatment Completion

Table A6 presents results from the multivariate logistic regression examining the effect of Medicaid expansion on the likelihood that a patient with OUD completed their treatment. Table A6 includes four separate specifications. Specification 2 estimates the model including all expansion states as part of the experimental treatment group. Specification 2a estimates the logistic regression using the same variables and controls but only includes states that expanded their Medicaid program in 2014 as the experimental treatment group. Specification 2b and 2c are identical to Specification 2a except that they only include states that expanded their Medicaid program in 2015 or 2016, respectively, as the experimental treatment group.

On average, Medicaid expansion was associated with an increased likelihood of treatment completion for patients with OUD. When all expansion states were considered regardless of the year of implementation (Specification 2), the expanded program was associated with an increased likelihood that a patient was discharged for successfully completing their treatment ($p < 0.001$). Notably, this association persisted across all specifications. Whether the regression was run with non-expansion states and only states that expanded in 2014 (Specification 2a), 2015

(Specification 2b), or 2016 (Specification 2c), Medicaid expansion was associated with a significantly greater likelihood of OUD patients completing treatment ($p < 0.001$).

The payment source for treatment services also had a notable association with the likelihood of treatment completion. Those covered by private insurance were significantly more likely to complete their SUD treatment compared to uninsured individuals in all specifications ($p < 0.001$), with the exception of Specification 2b. In contrast, if a patient's services were covered by Medicaid or Medicare, their odds of completing treatment were significantly lower in across all specifications compared to self-paying individuals.

Table A7 presents the empirical estimates of our sensitivity analysis. The results show that even when the time-invariant binary indicator for Medicaid expansion is used, OUD patients in expansion states were significantly more likely than similar patients in non-expansion to complete their treatment after Medicaid expansion ($p < 0.001$). This significant association between likelihood of treatment completion and Medicaid expansion persisted whether the difference-in-difference model only compared non-expansion to states that expanded in 2014, 2015, or 2016.

CHAPTER 6. DISCUSSION

The results from our analysis are largely consistent with the existing literature. The results of the multivariate logistic regressions reveal that Medicaid expansion was associated with the increased likelihood of a patient receiving MAT as part of their OUD treatment, and the likelihood that the patient successfully completed their treatment.

The association between Medicaid expansion and an OUD patient's increased likelihood of a receiving MAT fits with findings from previous studies. For example, Wen *et al.*'s (2017) finding that buprenorphine prescriptions covered by Medicaid increased by 70 percent in expansion states after implementation would logically correspond with our finding that patients were more likely to receive MAT. This pattern is further supported by a similar analysis by Sharp *et al.*'s (2018) that reported that the rate of per-enrollee Medicaid-covered prescriptions of buprenorphine and naltrexone (two drugs used for MAT) increased by 200 percent in expansion states compared to less than 50 percent in non-expansion states between 2011 and 2016.

However, both of the aforementioned studies describe trends exclusively regarding Medicaid covered MAT prescriptions. The result of our analysis in Specification 1 suggests that the likelihood of a patient receiving MAT was significantly greater after a state expanded Medicaid, regardless of the primary source of payment for a patient's treatment services. Meinhofer & Witman (2018) observed that Medicaid expansion was associated with market entry of new MAT providers. This may help explain our findings in that patients were was more likely to receive MAT regardless of payer because there was a supply side response to the reforms. Greater supply in the form of more MAT providing facilities and providers would logically benefit both non-Medicaid covered patients and Medicaid enrollees.

The increased likelihood in a patient receiving MAT for their OUD may explain our finding that Medicaid expansion was also associated with an increased likelihood for patients completing their treatment (Specification 2). While not considered in this thesis, Stahler & Mennis (2020) analysis of the 2015-2017 TEDS-D data previously found that a patient was more likely to complete their treatment and have greater treatment retention in short-term residential facilities if they received MAT. Separately, the ACA was also associated with expansion in private health insurance coverage and private health insurance has been observed to be associated with a greater likelihood of treatment completion (Mutter *et al.,* 2015). This may also be a contributing factor for our finding that there was a greater likelihood of treatment completion after Medicaid expansion was implemented. However, much of the non-clinical research on factors associated with OUD treatment completion in the past decade utilized the same datasets as used by this thesis (i.e., SAMHSA's TEDS-D). Consequently, the overlap between our findings and the results of prior studies may be attributed to the use of the same underlying data. Future investigations on this topic would benefit from the use of additional data sources to confirm our findings.

Although this thesis leveraged the fact that all Medicaid programs cover some form of MAT, each state may still vary on whether all MAT drugs are covered by Medicaid and states also have the discretion to add any additional barriers or limitations to treatment. Prior to the implementation of the ACA, some states cited concerns about the potential risks with buprenorphine and introduced regulations such as lifetime prescription duration limits and prior authorization requirements that may have limited care access (Clark & Baxter, 2013). Consequently, vestiges of such regulations may persist and make it difficult for Medicaid enrollees to access or complete treatment even after expansion. This may partially account for

that fact that individuals who had their service paid for by Medicaid were generally far less likely than self-paying individuals to complete treatment (Specification 2), although this odds ratio does not incorporate time or expansion effects.

While some patient-level characteristics were accounted for in the analysis, many other relevant characteristics (e.g., household income) were not captured by SAMHSA as part of TEDS-D. Moreover, it was beyond the scope of this thesis to account for socio-economic characteristics of the underlying population from which a patient was admitted. For example, if a patient was admitted in a state and county with high standards of living and immense health resources, their likelihood of completing treatment will likely be greater than a nearly identical patient admitted in less advantaged communities.

Relatedly, this thesis did not examine differential effects by race of Medicaid expansion on treatment completion. Racial disparities in treatment patterns are a well-documented, as previously discussed (Arndt *et al.*, 2013; Mennis & Stahler, 2015; Sahker *et al*., 2020). Further analysis of the data used in this thesis' analysis could examine whether Medicaid expansion may have helped reduce such disparities.

6.1 Limitations

This thesis has several limitations that should be explored in future research on this topic. First and foremost, the thesis assumes that the underlying sample satisfied the parallel trends condition. Specifically, the thesis assumed that the likelihood of a patient with OUD receiving MAT or completing treatment in an expansion state would have mirrored the likelihood of similar patients in non-expansion states were it not for Medicaid expansion. If this parallel trend condition was confirmed, the results of the thesis demonstrate that Medicaid expansion increased the likelihood of the two dependent variables examined.

Second, the TEDS-D dataset is not a complete dataset of all substance use treatment records in the United States. The submission of administrative records to SAMHSA for TEDS inclusion varies from state to state. Although states have the option of reporting all potential records, many states only report records from eligible facilities that receive state and federal funding for alcohol and/or drug treatment services. Furthermore, eligibility of facilities can vary based on state-specific licensure, accreditation, and other regulations. Moreover, given that every state collects reports data using different systems, SAMHSA acknowledges that some errors may arise from the aggregation and standardization of all states' record into a harmonious dataset. Nevertheless, the TEDS is an established dataset used extensively by researchers for insight into substance use treatment in the United States.

Additionally, the scope of this thesis' analysis was limited to data included in TEDS-D and lacks additional control variables that would improve the validity of the findings. In particular, the TEDS dataset includes some geographic information for each observation in the form of "Core Based Statistical Area" (CBSA) codes. Using the CBSA codes for metropolitan and micropolitan statistical areas, others have some capacity to crossmatch TEDS records with precise geographic socio-economic and health data available in other national datasets such as HRSA's Area Health Resource Files (AHRF). Doing so could allow other researchers to replicate the regression models conducted here while incorporating additional covariates that control for precise geodemographics.

Finally, this thesis' results may be limited by the staggered implementation of Medicaid expansion and by not accounting for cumulative effects of Medicaid expansion. As highlighted previously, states that expanded Medicaid in this sample may have implemented the change in 2014, 2015, or 2016. While the thesis accounted for potential differences due to different

implementation timelines (see Specifications 1a-1c and Specification 2a-2c), the analysis' sample size varied greatly between 2014 expansion states (where n was greater than 3.5 million) and both 2015 and 2016 expansion states (where n was less than 800,000). Moreover, due to the temporal differences, there may have been cumulative effects that were not accounted for by this thesis. For example, a future study may find it useful to run a revised model that adds an additional indicator variable of 'time since implementation' for an additional control.

CHAPTER 7. CONCLUSION

This study suggests that Medicaid expansion has had a desirable influence on Americans with opioid use disorders being able to access and receive the care they need. Specifically, analysis of the TEDS-D sample from 2012 through 2018 found that patients with OUD admitted to treatment facilities were significantly more likely to receive MAT as part of their treatment and complete their treatment if they were in a state that expanded their Medicaid program eligibility compared to states that did not.

These findings are potentially valuable as opioid addiction and abuse continue to plague our country and a number of states have resisted expanding their Medicaid programs. Such concerns have only been exacerbated by the ongoing COVID-19 pandemic. While further research is necessary to demonstrate causal effects, the results may further embolden advocates of Medicaid expansion to further challenge policymakers' inaction in non-expansion states. Furthermore, even if state-level policymakers are reluctant, the patterns observed in this thesis could inform policy reform efforts at the federal level.

APPENDIX: SUPPLEMENTARY EXHIBITS

Table A1. Demographics of Patients Admitted with Opioids in System

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Age (%)														
Under 18	2.04	2.13	1.84	1.64	1.31	0.65	0.65	1.47	1.19	1.00	0.81	0.62	0.48	0.32
18 - 24	21.92	21.01	19.45	18.11	16.28	11.98	10.41	22.65	22.21	20.16	17.99	15.63	13.13	10.94
25 - 54	73.05	73.50	75.16	76.59	78.53	83.12	84.37	70.37	71.04	73.09	75.03	77.19	79.01	80.87
Over 54	2.98	3.36	3.54	3.66	3.88	4.25	4.57	5.51	5.56	5.75	6.17	6.56	7.38	7.87
Sex (%)														
Missing/Unknown	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.02	0.02
Male	56.90	56.21	55.44	56.38	56.80	58.18	57.27	63.16	63.29	63.90	64.07	63.63	63.50	62.62
Female	43.09	43.79	44.56	43.60	43.19	41.81	42.72	36.83	36.69	36.08	35.90	36.35	36.48	37.35
Race (%)														
Missing/Unknown	0.59	0.98	0.57	0.71	0.60	0.43	0.52	0.48	0.76	1.08	1.36	1.61	1.29	2.30
White	86.18	85.67	85.88	84.81	85.25	85.22	84.51	73.86	75.24	75.14	73.87	72.87	72.34	72.56
Black or African American	9.11	8.99	8.86	9.52	9.32	9.98	10.10	12.68	11.47	11.08	10.69	10.19	11.06	12.23
Asian	0.32	0.31	0.33	0.43	0.39	0.34	0.32	0.68	0.68	0.70	0.84	0.83	0.85	0.87
Other	3.80	4.05	4.36	4.52	4.43	4.03	4.55	12.31	11.84	12.00	13.24	14.50	14.46	12.04

Table A1. (Cont.)

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Education (%)														
Missing/Unknown	1.08	0.99	2.07	2.51	1.98	1.96	2.43	1.02	2.64	2.46	2.89	2.02	1.24	5.33
Less than 8 years	4.76	5.28	5.39	5.43	4.80	3.70	3.56	7.14	6.80	7.05	7.24	6.80	6.10	5.98
9 to 11 Years	23.67	23.37	22.08	21.69	21.46	19.78	19.38	21.67	20.24	19.48	18.77	18.69	18.80	17.70
12 Years	46.30	46.06	45.17	45.64	47.61	47.34	47.51	45.31	45.36	45.88	46.33	47.87	48.84	47.48
13-15 Years	20.84	20.91	20.63	19.33	20.56	23.81	23.33	20.66	20.82	20.77	20.21	20.01	20.21	18.81
16+ years	3.34	3.40	4.66	5.39	3.59	3.42	3.79	4.20	4.15	4.36	4.57	4.61	4.80	4.70
Employment Status (%)														
Missing/Unknown	0.38	0.40	0.57	0.79	0.87	1.13	1.36	1.00	1.19	0.81	0.84	1.01	1.52	5.01
Employed	10.10	10.39	11.66	11.91	11.83	12.05	12.83	9.90	10.33	10.48	11.33	12.06	12.26	12.08
Unemployed/ Not in Labor Force	83.22	82.51	80.57	80.52	80.76	79.52	77.67	83.76	82.73	83.02	81.97	81.13	80.46	77.46
Primary Income Source (%)														
Missing/Unknown	42.31	37.44	36.74	33.79	42.37	64.44	58.88	32.77	33.10	30.04	31.12	32.52	34.71	31.53
Wages/Salary	11.68	13.07	13.84	14.62	13.39	8.52	9.38	12.13	12.73	13.38	13.60	13.59	13.50	14.07
Public Assistance	4.52	5.01	4.59	4.17	3.04	1.63	1.62	7.81	7.66	8.17	7.83	7.23	6.62	6.76

Table A1. (Cont.)

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Primary Income Source (%)														
Retirement/ Pension/Disability	3.33	3.86	3.85	4.33	3.40	1.90	2.18	4.05	4.09	4.34	4.06	3.96	4.00	4.26
Other	10.39	9.62	8.71	8.46	6.26	3.46	3.87	16.59	15.24	14.84	14.78	14.72	13.54	13.61
None	27.75	31.00	32.27	34.63	31.54	20.03	24.08	26.66	27.18	29.23	28.61	27.99	27.63	29.78

Note: Observations based on data from SAMHSA's TEDS-D Datasets (2012-2018). Observations reflect unique discharge events, not unique patients. Observations only include patients admitted with opioids (heroine, non-prescription methadone, and/or other opiates and synthetics) detected in their system. States excluded for not-reporting data or missing data: Florida, Georgia, Kansas, Mississippi, New Mexico, Oregon, Puerto Rico South Carolina, and Washington.

Table A2. Health Characteristics of Patients Admitted with Opioids in System

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Health Insurance (%)														
Missing/Unknown	40.26	34.36	32.90	29.81	39.40	63.77	57.94	58.59	56.60	57.58	61.67	62.15	61.62	53.57
Private Insurance	2.37	2.69	2.98	4.26	3.67	1.59	1.69	5.01	6.05	5.57	3.37	3.30	2.92	2.91
Medicaid	12.88	14.38	13.78	15.05	13.09	7.80	9.29	14.34	14.37	15.89	18.36	20.58	22.41	31.08
Medicare, Other (TriCare, CHAMPUS)	1.95	2.29	2.66	2.50	1.98	1.16	1.40	2.73	4.41	6.63	5.64	4.85	4.39	4.17
None	42.55	46.28	47.68	48.38	41.86	25.68	29.68	19.33	18.58	14.33	10.95	9.12	8.66	8.26
Payment Source for Services (%)														
Missing/Unknown	56.06	52.79	51.45	44.42	51.69	71.03	66.16	73.15	70.62	71.08	68.97	68.79	68.37	61.20
Self-Pay & Other	36.97	38.90	40.31	43.13	36.94	22.71	26.49	19.28	21.25	19.32	16.43	14.10	12.29	11.25
Private Insurance	1.00	0.97	1.19	2.73	2.46	0.98	1.13	2.37	2.39	1.56	1.98	2.45	2.24	2.21
Medicare	0.13	0.19	0.22	0.27	0.23	0.15	0.17	0.21	0.18	0.19	0.39	0.80	0.42	0.47
Medicaid	5.84	7.15	6.83	9.46	8.69	5.13	6.05	5.00	5.56	7.85	12.22	13.86	16.69	24.88
Length of Stay (%)														
Missing/Unknown	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-
1-15 days	45.05	40.68	38.23	41.25	43.59	56.22	55.34	45.66	45.35	44.92	45.42	45.45	44.84	46.04
16-30 days	13.17	14.25	13.55	13.70	12.72	9.06	9.47	12.65	12.63	12.17	12.13	12.15	12.17	11.93
31-60 days	12.16	12.82	12.43	12.49	11.92	9.63	9.71	9.99	10.21	10.09	9.91	9.98	10.22	10.40
61-120 days	12.68	13.62	14.33	13.79	13.94	10.88	10.94	11.43	11.60	12.35	11.71	11.50	12.10	11.82
121-365 days	12.90	14.19	16.38	14.07	13.58	10.60	11.00	13.71	13.73	14.20	14.12	13.75	13.57	12.89
More than year	4.05	4.44	5.08	4.69	4.24	3.61	3.54	6.56	6.48	6.27	6.70	7.16	7.10	6.92

Table A2. (Cont.)

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Reasons for Discharge (%)														
Missing/Unknown	0.02	-	-	-	-	-	-	0.01	-	-	-	-	-	-
Treatment Completed	32.08	36.33	34.96	34.92	35.94	25.07	20.64	39.79	38.50	38.33	37.97	37.65	36.05	36.90
Dropped Out of Treatment	26.66	25.84	28.02	27.17	26.51	18.61	17.32	28.96	28.10	29.34	30.34	30.73	29.42	28.85
Terminated by Facility	8.41	10.21	10.42	10.27	8.70	5.53	6.66	7.89	7.93	7.68	7.66	7.38	7.05	7.24
Transferred	24.74	20.38	19.34	20.09	22.10	46.46	50.42	15.67	17.31	16.96	16.46	17.02	20.94	19.64
Incarcerated	2.69	1.87	1.85	2.41	2.24	1.40	1.42	2.30	2.39	2.52	2.42	2.36	2.15	2.17
Death	0.12	0.20	0.22	0.25	0.24	0.22	0.20	0.37	0.36	0.38	0.40	0.45	0.42	0.43
Other	5.28	5.17	5.19	4.90	4.26	2.72	3.33	5.00	5.42	4.79	4.75	4.41	3.97	4.76
Received Medication-Assisted Opioid Therapy (%)														
Missing/Unknown	0.93	0.98	1.02	0.06	0.04	0.06	0.15	2.39	3.52	2.19	2.28	3.16	3.19	3.81
Yes	8.25	9.19	9.32	9.40	9.20	13.71	18.71	20.04	19.47	19.65	25.44	29.04	31.75	31.53
No	90.82	89.83	89.66	90.53	90.76	86.23	81.14	77.58	77.00	78.16	72.28	67.81	65.06	64.66
DSM Diagnosis (%)														
Missing/Unknown	37.56	38.53	43.44	63.35	95.31	21.17	23.09	67.86	64.75	69.35	80.65	94.21	40.38	22.44
Alcohol-Induced Disorder	0.15	0.14	0.16	0.05	0.00	0.09	0.15	0.06	0.04	0.03	0.03	0.02	0.05	0.05
Substance-Induced Disorder	1.07	1.23	1.40	0.77	0.02	2.34	1.78	1.23	1.14	1.07	0.73	0.20	1.80	2.08
Alcohol Intoxication	0.06	0.05	0.05	0.01	-	0.08	0.09	0.13	0.11	0.11	0.04	0.00	0.19	0.17
Alcohol Dependence	5.01	4.50	3.89	2.51	0.53	5.06	4.00	1.93	1.77	1.45	0.89	0.24	3.60	4.63
Opioid Dependence	32.55	34.54	32.74	21.43	2.52	56.82	56.51	21.63	24.92	21.80	13.11	3.71	39.52	49.13

Table A2. (Cont.)

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
DSM Diagnosis (%) (Cont.)														
Cocaine Dependence	1.58	0.97	0.84	0.51	0.03	1.95	1.77	0.63	0.52	0.37	0.25	0.08	1.06	1.59
Cannabis Dependence	2.75	2.16	1.91	1.41	0.24	1.76	1.69	0.79	0.78	0.67	0.51	0.15	1.13	1.32
Other Substance Dependence	10.96	10.18	8.58	5.96	0.78	6.08	6.06	3.45	3.49	2.77	1.97	0.61	2.56	3.68
Alcohol Abuse	0.87	0.56	0.51	0.35	0.04	0.36	0.29	0.27	0.25	0.21	0.12	0.03	0.33	0.41
Cannabis Abuse	1.11	0.81	0.71	0.50	0.06	0.50	0.48	0.23	0.20	0.17	0.14	0.05	0.24	0.29
Other Substance Abuse	0.77	0.53	0.50	0.41	0.03	0.64	0.62	0.11	0.11	0.12	0.12	0.08	0.31	0.48
Opioid Abuse	1.98	1.70	1.54	0.91	0.12	2.18	2.49	0.75	0.76	0.71	0.56	0.25	1.46	1.87
Cocaine Abuse	0.37	0.13	0.13	0.08	0.01	0.36	0.20	0.09	0.08	0.05	0.03	0.01	0.09	0.15
Anxiety Disorders	0.26	0.31	0.36	0.19	0.04	0.12	0.14	0.14	0.19	0.33	0.13	0.06	0.33	0.31
Depressive Disorders	0.68	0.77	0.68	0.69	0.10	0.26	0.32	0.29	0.34	0.38	0.30	0.11	0.33	0.35
Schizophrenia/Other Psychotic Disorders	0.08	0.12	0.16	0.12	0.04	0.03	0.05	0.02	0.03	0.03	0.03	0.01	0.05	0.07
Bipolar Disorders	0.36	0.40	0.45	0.57	0.09	0.09	0.10	0.10	0.19	0.15	0.21	0.07	0.12	0.15
Attention Deficit/Disruptive Behavior Disorders	0.07	0.08	0.05	0.02	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01
Other Mental Health Condition	0.27	0.37	0.32	0.14	0.03	0.10	0.14	0.17	0.26	0.21	0.18	0.10	6.44	10.83
Other Condition	1.47	1.94	1.60	-	-	-	-	0.10	0.05	0.01	-	-	-	-
Service Setting At Discharge (%)														
Missing/Unknown	0.04	0.04	0.04	-	-	-	-	0.04	0.03	0.08	-	-	-	-

Table A2. (Cont.)

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Service Setting At Discharge (%) (Cont.)														
Detox, 24-hour, Hospital Inpatient	0.82	0.93	0.69	0.57	0.38	0.21	0.18	6.08	4.70	4.45	4.59	4.70	4.07	3.95
Detox, 24-hour, Free-Standing Residential	17.61	17.80	16.59	18.18	18.01	13.74	11.80	22.28	23.47	24.14	23.25	22.23	21.04	19.59
Rehab/Residential, Hospital (Non-Detox)	0.66	0.55	0.38	0.42	0.33	0.20	0.07	0.41	0.34	0.15	0.19	0.24	0.21	0.25
Rehab/Residential, Short Term (30 Days or Fewer)	18.85	19.53	18.06	19.12	17.24	9.56	9.24	12.07	12.41	11.95	11.68	11.81	11.84	12.58
Rehab/Residential, Long Term (More than 30 Days)	4.20	4.56	4.62	4.83	4.67	5.36	4.26	9.16	8.77	8.83	8.64	8.69	9.37	8.25
Ambulatory, Intensive Outpatient	18.96	19.29	20.98	21.12	19.33	24.91	23.54	8.95	9.78	9.71	9.50	10.51	10.92	10.73
Ambulatory, Non-Intensive Outpatient	37.03	35.81	37.22	34.51	38.58	45.75	50.53	38.40	37.96	38.41	40.03	40.07	40.78	43.68
Ambulatory, Detoxification	1.83	1.48	1.41	1.24	1.46	0.28	0.38	2.60	2.55	2.27	2.12	1.76	1.78	0.96

Note: Observations based on data from SAMHSA's TEDS-D Datasets (2012-2018). Observations reflect unique discharge events, not unique patients. Observations only include patients admitted with opioids (heroine, non-prescription methadone, and/or other opiates and synthetics) detected in their system. States excluded for not-reporting data or missing data: Florida, Georgia, Kansas, Mississippi, New Mexico, Oregon, Puerto Rico South Carolina, and Washington.

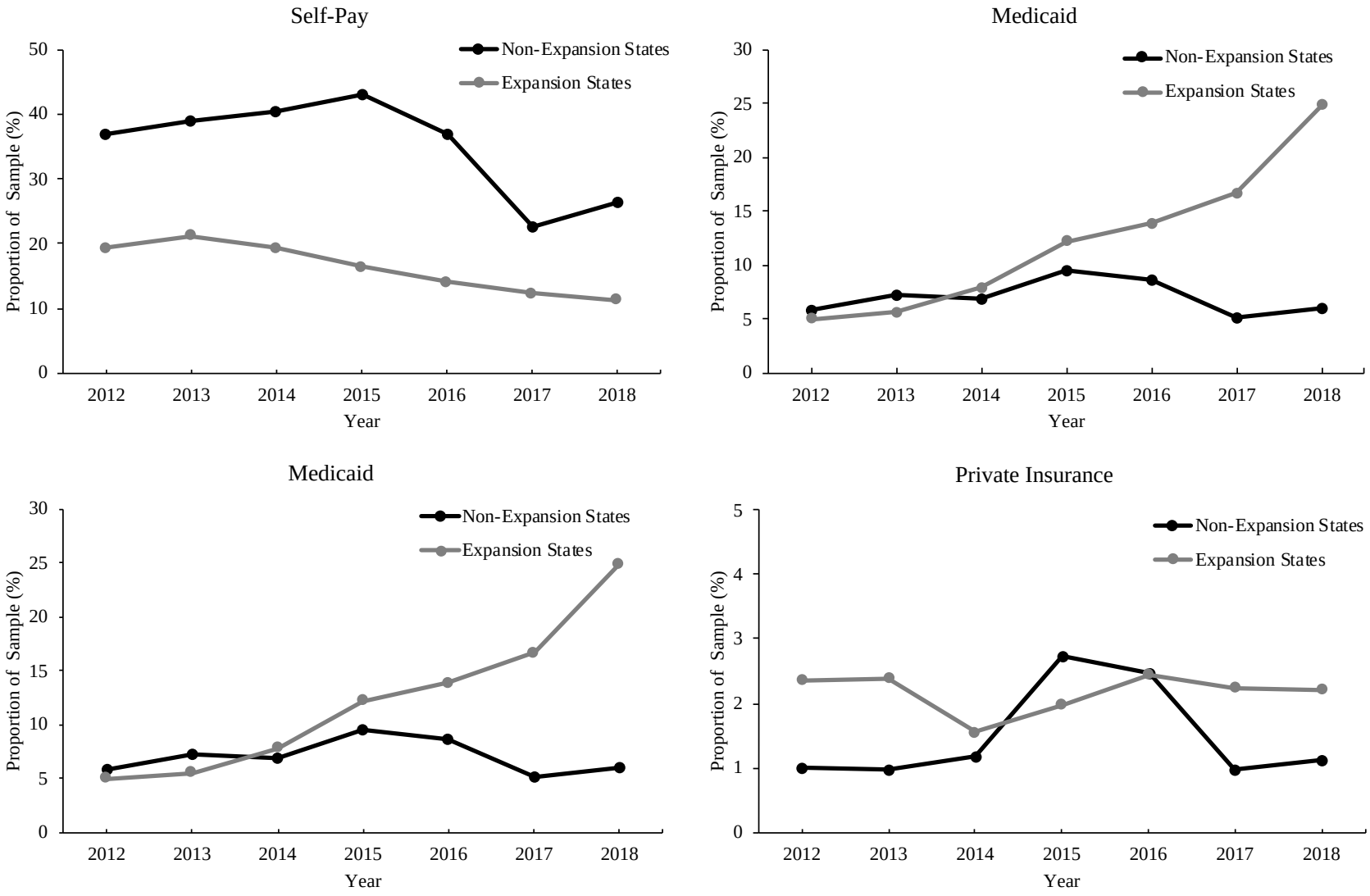

Figure A1. Distribution of Payment Sources for Treatment Services

Figure depicts distributions within the sample (by year) for the primary sources of payment that paid for a patient's treatment services, categorized by expansion or non-expansion state, based on data from SAMHSA's TEDS-D Datasets (2012-2018).

Table A3. Type of Opioids Detected at Admission

	Non-Expansion States (14 States)							Expansion States (28 States)						
Discharge Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
(%)														
Heroin	37.94	41.47	44.19	49.64	51.17	53.19	56.45	66.15	70.21	74.32	76.95	78.50	79.46	79.18
Non-Prescription Methadone	3.09	2.90	2.71	2.10	1.64	1.94	1.76	1.87	1.58	1.40	1.28	1.15	1.12	1.02
Other Opiates	68.08	65.31	62.20	57.83	56.75	54.48	50.99	42.23	39.12	34.88	31.96	30.05	28.06	27.90

Note: Observations based on data from SAMHSA's TEDS-D Datasets (2012-2018). Observations reflect unique discharge events, not unique patients. Observations only include patients admitted with opioids (heroine, non-prescription methadone, and/or other opiates and synthetics) detected in their system. States excluded for not reporting data or missing data: Florida, Georgia, Kansas, Mississippi, New Mexico, Oregon, Puerto Rico South Carolina, and Washington.

Table A4. Spearman's Correlation Coefficients

Variable	**Received Medication Assisted Opioid Therapy**	**Discharged for Treatment Completion**	**State's Medicaid Expansion Status in Given Year**	**Medicaid Expansion State**
Received Medication Assisted Opioid Therapy	1.000	-	-	-
Discharged for Treatment Completion	-0.090	1.000	-	-
State's Medicaid Expansion Status in Given Year	0.085	-0.018	1.000	-
Medicaid Expansion State	0.080	0.004	0.577*	1.000
Age: >54	0.054	-0.005	0.035	0.024
Age: 25 - 54	0.042	-0.008	0.058	-0.002
Age: 18 - 24	-0.061	0.009	-0.069	0.001
Age: <18	-0.047	0.006	-0.049	-0.041
16+ Years of Education	0.008	0.013	0.023	0.023
Some College Education	-0.018	0.025	-0.020	-0.014
High School Education	0.007	0.016	0.024	0.010
Female	0.039	-0.086	-0.027	-0.036
Race: White	-0.017	0.036	-0.038	-0.052
Race: Black	0.056	-0.059	0.018	0.034
Race: Asian	-0.011	-0.004	0.019	0.021
Race: All Other	-0.046	0.023	0.032	0.032
Employed	0.052	-0.014	0.014	-0.011
Unemployed	-0.052	0.014	-0.014	0.011
Private Insurance Coverage	0.008	0.022	0.007	0.077
Medicaid Coverage	0.107	-0.056	0.281*	0.226*
Medicare Coverage	-0.029	-0.003	0.068	0.114
Uninsured	-0.095	0.046	-0.331*	-0.344*

*$r^2 > 0.05$

Table A4. (Cont.)

Variable	**Received Medication Assisted Opioid Therapy**	**Discharged for Treatment Completion**	**State's Medicaid Expansion Status in Given Year**	**Medicaid Expansion State**
Self-Paid For Services	0.021	0.024	0.024	0.036
Private Insurance Paid for Services	0.096	-0.193	0.239*	0.113
Medicaid Paid for Services	0.016	-0.012	0.013	0.011
Medicare Paid for Services	-0.045	0.022	-0.243*	-0.248*
Missing Payment Source for Services	-0.047	0.134	0.031	0.139
Heroin Reported at Admission	0.114	0.049	0.173	0.171
Non-Rx Methadone Reported at Admission	0.066	-0.026	-0.036	-0.038
Other Opiates Reported at Admission	-0.079	-0.062	-0.167	-0.156

*$r^2 > 0.05$

Note: Results are based on data from Substance Abuse and Mental Health Services Administration's (SAMHSA) TEDS-D files for years 2012-2018.

Table A5. Logistic Regression for Receipt of Medication-Assisted Opioid Therapy

Dependent Variable: *Received Medication-Assisted Opioid Treatment*	***Specification 1***		***Specification 1a***		***Specification 1b***		***Specification 1c***	
	odds ratio	***z***	***odds ratio***	***z***	***odds ratio***	***z***	***odds ratio***	***z***
Year	0.940***	-52.04	0.936***	-55.50	1.109***	54.95	1.139***	65.24
Medicaid Expansion Status	0.786***	-34.15	0.747***	-40.89	2.239***	19.61	2.409***	14.33
Year * Medicaid Expansion Status	1.222***	123.64	1.240***	131.13	0.939***	-8.72	0.869***	-12.89
Age: 25-54 years	0.566***	-116.97	0.567***	-115.55	0.664***	-25.70	0.644***	-25.88
Age: 18-24 years	0.376***	-165.90	0.375***	-164.48	0.455***	-42.87	0.436***	-41.60
Age: <18 years	0.038***	-78.15	0.038***	-76.53	0.037***	-30.43	0.035***	-27.57
16+ Years of Education	0.819***	-32.14	0.814***	-32.71	0.847***	-8.93	0.789***	-11.66
Female	1.279***	93.29	1.296***	96.58	1.065***	8.92	1.102***	12.55
Race: Black	1.108***	25.10	1.111***	25.63	0.962**	-3.11	0.949***	-3.94
Race: Asian	1.287***	17.60	1.278***	16.97	1.229***	3.88	1.256***	3.92
Race: Other	1.280***	64.94	1.287***	65.76	0.728***	-17.25	0.761***	-13.20
Unemployed	0.706***	-106.81	0.698***	-108.39	0.687***	-45.90	0.618***	-53.75
Private Insurance Paid For Services	1.175***	15.66	1.123***	10.96	1.776***	21.29	1.742***	17.45
Medicaid Paid For Services	1.336***	56.41	1.291***	47.72	2.828***	85.60	3.058***	79.82
Medicare Paid For Services	1.400***	15.97	1.335***	13.35	3.915***	24.86	4.016***	22.35
Missing Payment Source For Services	1.460***	99.31	1.417***	86.40	1.130***	15.57	1.553***	47.50
Constant	0.387***	-127.95	0.406***	-118.66	0.158***	-91.90	0.118***	-98.26
n	**3,592,494**		**3,449,981**		**751,039**		**684,179**	
Pseudo R squared	**0.0433**		**0.0439**		**0.0378**		**0.041**	

Odds ratios and z-values displayed. * p<0.05, ** p<0.01, *** p<0.001

Note: Results are based on data from Substance Abuse and Mental Health Services Administration's (SAMHSA) TEDS-D files for years 2012-2018.

Table A6. Logistic Regression for Completing Treatment

Dependent Variable: *Discharged for Completing Treatment*	***Specification 2***		***Specification 2a***		***Specification 2b***		***Specification 2c***	
	odds ratio	***z***	***odds ratio***	***z***	***odds ratio***	***z***	***odds ratio***	***z***
Year	0.886***	-128.60	0.883***	-131.28	0.908***	-74.18	0.923***	-60.11
Medicaid Expansion Status	0.914***	-14.86	0.881***	-20.69	0.796***	-6.84	0.318***	-20.54
Year * Medicaid Expansion Status	1.110***	75.55	1.121***	81.83	1.056***	9.09	1.144***	13.53
Age: 25-54 years	0.986	-3.04	0.993	-1.57	0.942***	-4.42	0.911***	-6.61
Age: 18-24 years	0.991***	-1.65	0.998	-0.38	0.911***	-6.35	0.911***	-6.03
Age: <18 years	1.099***	7.57	1.116***	8.55	1.282***	9.63	1.363***	11.94
16+ Years of Education	1.252***	43.10	1.259***	43.28	1.204***	14.57	1.141***	9.92
Female	0.776***	-108.97	0.780***	-104.78	0.852***	-31.06	0.881***	-22.86
Race: Black	0.930***	-19.92	0.942***	-15.99	0.700***	-36.47	0.683***	-38.07
Race: Asian	0.877***	-9.97	0.872***	-10.27	1.138**	3.27	1.165***	3.67
Race: Other	0.932***	-20.31	0.926***	-21.72	0.932***	-5.70	0.995	-0.36
Unemployed	1.159***	49.90	1.169***	51.29	1.067***	10.15	1.029***	4.03
Private Insurance Paid for Services	1.207***	24.08	1.218***	24.51	0.961	-1.93	1.111***	4.80
Medicaid Paid for Services	0.381***	-203.65	0.371***	-200.26	0.456***	-68.30	0.537***	-49.96
Medicare Paid for Services	0.517***	-31.64	0.515***	-31.00	0.785***	-4.42	0.957	-0.75
Missing Payment Source for Services	0.900***	-36.51	0.902***	-33.80	0.641***	-84.06	0.830***	-32.13
Constant	0.836***	-27.52	0.834***	-27.24	0.983	-1.08	0.773***	-15.37
n	**3,683,588**		**3,528,172**		**767,639**		**688,137**	
Pseudo R squared	**0.0202**		**0.0209**		**0.0218**		**0.0151**	

Odds ratios and z-values displayed. * p<0.05, ** p<0.01, *** p<0.001

Note: Results are based on data from Substance Abuse and Mental Health Services Administration's (SAMHSA) TEDS-D files for years 2012-2018.

Table A7. Sensitivity Analysis – Difference-in-Difference Logistic Regression for Completing Treatment

Dependent Variable: *Discharged for Completing Treatment*	All Expansion Years		Only 2014 Expansion States		Only 2015 Expansion States		Only 2016 Expansion States	
	odds ratio	***z***	***odds ratio***	***z***	***odds ratio***	***z***	***odds ratio***	***z***
Year	0.902***	-76.30	0.902***	-76.02	0.909***	-69.12	0.905***	-72.41
Medicaid Expansion State	0.981**	-2.78	0.992	-1.14	1.049***	3.35	0.367***	-50.32
Year * Medicaid Expansion State	1.099***	63.69	1.100***	63.90	1.016***	5.31	1.115***	23.92
Age: 25-54 years	0.987**	-2.84	0.994	-1.25	0.942***	-4.41	0.909***	-6.69
Age: 18-24 years	0.991	-1.68	0.998	-0.36	0.908***	-6.56	0.909***	-6.18
Age: <18 years	1.104***	7.93	1.123***	9.08	1.295***	10.02	1.369***	12.06
16+ Years of Education	1.250***	42.81	1.258***	43.15	1.205***	14.64	1.173***	11.93
Female	0.778***	-108.23	0.781***	-104.18	0.854***	-30.45	0.880***	-23.12
Race: Black	0.928***	-20.37	0.940***	-16.62	0.707***	-35.48	0.687***	-37.35
Race: Asian	0.875***	-10.17	0.869***	-10.59	1.133**	3.17	1.190***	4.16
Race: Other	0.928***	-21.40	0.923***	-22.70	0.931***	-5.78	1.015	1.15
Unemployed	1.158***	49.48	1.168***	51.26	1.067***	10.14	1.042***	5.89
Private Insurance Paid for Services	1.202***	23.58	1.203***	22.93	0.965	-1.72	1.107***	4.65
Medicaid Paid for Services	0.381***	-203.41	0.368***	-201.36	0.458***	-67.96	0.521***	-52.25
Medicare Paid for Services	0.518***	-31.56	0.511***	-31.33	0.784***	-4.44	0.981	-0.33
Missing Payment Source for Services	0.903***	-35.55	0.892***	-36.87	0.646***	-82.17	0.801***	-38.20
Constant	0.744***	-34.86	0.736***	-35.83	0.954**	-2.93	0.882***	-7.45
n	**3,683,588**		**3,528,172**		**767,639**		**688,137**	
Pseudo R squared	**0.0203**		**0.021**		**0.022**		**0.0195**	

Odds ratios and z-value displayed. * p<0.05, ** p<0.01, *** p<0.001

Note: Results are based on data from Substance Abuse and Mental Health Services Administration's (SAMHSA) TEDS-D files for years 2012-2018.

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