Receipt of Buprenorphine and Naltrexone for Opioid Use Disorder in Medicare: Inequities and State Policies that Reduce Gaps

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1.0 EXECUTIVE SUMMARY

Background

Medicare enrollees represent a growing proportion of those with opioid use disorders (OUD), yet little is known about heterogeneities in utilization of medications for OUD (MOUD). To inform interventions and improve outcomes, this study applied a socio-ecological framework to examine sociodemographic, health-related and policy-related predictors of MOUD utilization among Medicare fee-for-service (FFS) enrollees with OUD.

Methods

Retrospective study of a national cohort of FFS enrollees with OUD in 2018 (n=530,248), using 2018 Medicare administrative claims merged with enrollee sociodemographic and state policy data. Multivariate logistic regression analysis identified enrollee characteristics and state policies associated with MOUD utilization. Policies reflected prior authorization removal and MOUD coverage. The outcome was MOUD utilization, defined as use of buprenorphine or naltrexone in 2018, as a function of enrollee sociodemographic (e.g., race, dual-eligibility) and health characteristics, and presence of MOUD-supportive policies in enrollees' state of residence. Absolute risk differences (ARDs) were reported.

Key Findings

13.3% of Medicare FFS enrollees with OUD utilized Medicare-covered MOUD. Black enrollees were less likely to utilize MOUD than Whites enrollees, (ARD, -5.4%; 95% CI, -5.6% to -5.1%), as were enrollees with more physical conditions (e.g., ARD, -15.6%; 95% CI, -16.9% to -14.2%, for those with >2 physical and >6 mental comorbidities vs. no comorbidities), not Medicare-Medicaid dually-eligible (ARD, -1.4%; 95% CI, -1.6% to -1.2%) or in states with fewer MOUD-supportive policies (e.g., ARD, -4.3%; 95% CI, -4.8% to -3.8% for 0 vs. 4 MOUD-supportive policies). Conversely, enrollees disability-eligible for Medicare were more likely to utilize MOUD than those age-eligible for Medicare (ARD, 8.7%; 95% CI, 8.5%-9.0%).

Conclusions

Efforts to improve MOUD utilization must consider the interplay of race, health complexities, insurance status and policies. Public policies addressing financial and logistic barriers to MOUD hold promise in combating utilization gaps.

2.0 INTRODUCTION

In 2020, an estimated 2.7 million individuals in the United States had an opioid use disorder (OUD), a condition associated with increased mortality and comorbid health conditions (Substance Abuse and Mental Health Services Administration, 2021). Three Food and Drug Administration (FDA)-approved medications for treating OUD (MOUD)—methadone, buprenorphine, naltrexone—have been shown to reduce overdose-related deaths, relapse, and treatment dropout related to use of prescription and illegal opioids (National Academies of Sciences, Engineering, and Medicine, 2019). Despite the availability of these evidence-based treatments, fewer than 20% of individuals with OUD utilize medication treatment (Substance Abuse and Mental Health Services Administration, 2020).

Medicare enrollees represent a growing proportion of individuals with OUD (Lembke et al., 2016; Roland et al., 2019). Amongst this population, OUD treatment is complicated by the prevalence of comorbidities, and the use of opioids to treat pain-associated conditions more common among older adults and people with disabilities (Reid et al., 2015; Dahlhamer et al., 2018). One study found increasing use of MOUD among Medicare enrollees (Office of Inspector General, 2019), but there is a paucity of research that identifies whether inequities in utilization of medication treatment exist.

Understanding heterogeneity in MOUD utilization is important for several reasons. First, while federal efforts have been implemented to increase MOUD utilization in Medicare – including removal of prior authorization requirements for buprenorphine in 2019 (Centers for Medicare & Medicaid Services, 2018). and Medicare coverage of methadone and opioid treatment programs in 2020 (Centers for Medicare & Medicaid Services, 2022) – these efforts may not have resulted in uniform outcomes across all Medicare enrollees. Among general adult populations, there have been regional variability (Lund et al., 2019) and racial and ethnic disparities in MOUD utilization in treatment programs, with less utilization among Black/African American and Hispanic individuals relative to whites (Lagisetty et al., 2019; Goedel et al., 2020). Racial disparities in the ability to pay for medication treatment or treatment retention—which both relate to utilization of treatment—have also been found (Lagisetty et al., 2019; Stahler et al., 2018).

Second, the use of MOUD may be complicated by the presence of comorbid physical and mental health conditions (Hser et al., 2017). This issue is salient for Medicare enrollees, given their higher prevalence of comorbid conditions (Lochner et al., 2013; Lim et al., 2018). In commercially-insured and general adult populations, higher rates of adverse opioid events are associated with pain-related physical conditions and multiple comorbid conditions (Bernard et al., 2019; Rajbhandari-Thapa et al., 2019) – rates that are exacerbated by co-occurring mental and behavioral health conditions (Edlund et al., 2010). This has spurred calls for enhanced collaborative models to address the interplay between physical versus mental health needs for those with OUD (Watkins et al., 2017).

Third, state Medicaid policies that facilitate MOUD utilization may differentially influence MOUD utilization between Medicare enrollees who are dually-eligible for Medicare and Medicaid and those who are not eligible for Medicaid – since Medicaid, as a secondary insurer, may remove administrative and financial barriers impeding treatment, including MOUD, and may affect enrollees' propensity to seek treatment (Orgera et al., 2019). These policies include removal of Medicaid prior authorization requirements for buprenorphine – addressing an administrative barrier (Weber et al., 2019), implementation of Medicaid section 1115 demonstrations – expanding flexibility in MOUD coverage and treatment (Centers for Medicare & Medicaid Services, 2020), Medicaid coverage of methadone – addressing a financial barrier (Kaiser Family Foundation, 2018), and Medicaid expansion – allowing flexibility in Medicaid eligibility and thus OUD treatment coverage (Centers for Medicare & Medicaid Services, n.d.). In contrast, Medicare did not widely remove prior

authorization requirements until 2019 or cover methadone until 2020. These policy distinctions may facilitate OUD treatment for Medicaid over Medicare enrollees; among non-older adults, there is evidence that those with Medicaid were more likely to receive OUD treatment, including MOUD, than those with Medicare (Orgera et al., 2019).

This study adapts a socio-ecologic lens (Jalali et al., 2020) and uses national data to characterize race and other sociodemographic, health-related and policy-related predictors of MOUD utilization among Medicare fee-for-services (FFS) enrollees with OUD. We hypothesize that enrollees who are racial/ethnic minorities or with more complex health needs may be at risk for lower MOUD utilization, and that state policies expanding coverage may facilitate MOUD utilization. This study uses data on race/ethnicity to understand health care differences, because such data remains important in population-based studies for identifying and addressing inequities stemming from structural racism (Tong et al, 2021), and because existing methodological challenges remain in the development of valid measures of structural racism in public health (Hardeman et al., 2022). This study also uses a broader definition of OUD, based on diagnoses and aberrant opioid-related events, to avoid undercounting of OUD. The study provides a baseline to assess key disparities in MOUD utilization and monitor progress against broader Medicare policies implemented after 2018. Understanding MOUD utilization and drivers of disparities in utilization is critical, given the inequities unmasked by the COVID pandemic and the pandemic's exacerbation of the opioid crisis (Centers for Disease Control and Prevention, 2020).

3.0 METHODS

3.1 Data and Sample

Data were primarily from the 2017 and 2018 Master Beneficiary Summary File (MBSF) and administrative claims in the Centers for Medicare and Medicaid Services' (CMS) Chronic Conditions Data Warehouse (CCW), the latest available data at the time this analysis was conducted between 2020 and 2021. The CCW includes data on Medicare FFS enrollee sociodemographic characteristics, and Medicare FFS inpatient (Part A), outpatient (Part B) and prescription drug (Part D) claims. To contextualize the external policy environment in which Medicare enrollees were receiving OUD treatment, additional information on four state-specific policies that facilitate MOUD utilization were drawn from Kaiser Family Foundation databases on Medicaid behavioral health policies: state Medicaid expansion status (Kaiser Family Foundation, 2020), removal of Medicaid prior authorization requirements for buprenorphine (Kaiser Family Foundation, 2018), approved state section 1115 Medicaid demonstrations (Kaiser Family Foundation, 2021; Centers for Medicare & Medicaid Services, n.d.) and state Medicaid coverage of methadone (Kaiser Family Foundation 2018). State policy information was merged with CCW data based on enrollees' state of residence.

The analysis focused on an initial population of Medicare FFS enrollees 18 years or older living in the United States in 2018, with continuous Medicare Parts A, B and D coverage between January 1, 2017, and December 31, 2018, and who met claims criteria for the CCW's Overarching OUD Chronic Conditions Indicator algorithm for 2018 (Centers for Medicare & Medicaid Services, 2020). This algorithm captured diagnosis codes for opioid use, abuse and dependence, opioid poisonings and other adverse opioid-related events and procedure codes for select treatments associated with OUD for 2018. From the initial population of 18,906,171 individuals enrolled in FFS Medicare in 2017 and 2018, those who were hospice patients were excluded (n=682,367, 3.7% of the initial population), and of these, a final sample of 530,248 enrollees (2.8% of the initial population) were identified in the CCW as having OUD. Inclusion of patients under age 65 provides results that generalize to all FFS enrollees, not just older adults in Medicare (Maciejewski et al., 2021) This was a key consideration as many younger enrollees face the same greater need for health services and closer provider management, and higher health costs, as older enrollees (Dubow, 1996).

3.2 Outcome

Utilization of MOUD reflected utilization of buprenorphine or naltrexone, the MOUD covered by Medicare in 2018, expressed as a binary indicator, and defined as the presence of one or more Part D drug claims or administrative claims for buprenorphine or naltrexone between January 1 and December 31, 2018. Buprenorphine and naltrexone administered in an office-based setting were identified using Healthcare Common Procedural Coding System (HCPCS) codes and dispensed in a pharmacy using National Drug Codes (NDC) consistent with Medicare's definition of MOUD (**Supplementary Table S1**).

3.3 Predictor Variables

The study included individual- and state-level independent variables assessed for their association with MOUD utilization. The primary enrollee sociodemographic and health characteristics of interest were race and ethnicity, dual eligibility for Medicare and Medicaid during 2018, and history of 17 chronic and potentially disabling physical and mental health conditions. The Research Triangle Institute (RTI) Race Code in the CCW is based on enrollee race and ethnicity data from the Social Security Administration and the RTI algorithm; the algorithm improves classification of Asian or Hispanic enrollees based on enrollees' names (Eicheldenger et al., 2008). Due to small sample size, Asian/Pacific Islander, American Indian/Alaska Native and Other race and ethnicity categories were collapsed into a single group for use in regression models.

Seventeen clinical conditions in 2018 of greatest interest to CMS leadership were identified using diagnosis-based algorithms from the CCW. These conditions were chosen in collaboration with co-authors and the CMS Office of Minority Health leadership, as they may be associated with OUD risk and MOUD treatment (Maciejewski et al., 2020). Given published evidence indicating the influence physical vs. mental health conditions can have on OUD-related outcomes (Bernard et al., 2019; Rajbhandari-Tapa et al., 2019; Edlund et al., 2010; Watkins et al., 2017), conditions were organized into two groups of 10 physical health-related and 7 mental health-related conditions (**Supplementary Table S2**). Following CMS reporting, counts of physical health and mental health conditions (0, 1, 2–3, 4–5, 6 or more) separately and as interactions were calculated. Model performance collapsing physical health-related conditions count of 2–3 and above was similar to the more complex model. The more parsimonious physical health condition variable (0, 1, 2 or more) was included in the final model.

For the four state-specific Medicaid MOUD-supportive policies, we first explored regression model fit using each separate policy as a predictor and then using the total number of policies as a predictor. Statistical performance based on Akaike and Bayesian information criteria was similar for both models. For ease of interpretation, the total count of policies was chosen for the final model, expressed as a count of 0–4, calculated based on the summed number of policies present as of January 1, 2018, in enrollees' state of residence.

The study controlled for several other individual-level covariates: age, sex, original reason for Medicare entitlement, census region of residence (Northeast, South, Midwest, West), rurality of enrollee residence as defined using core-based statistical areas (metropolitan, nonmetropolitan). It also controlled for health care utilization, based on inpatient, outpatient (excluding emergency department [ED]) and ED utilization during 2018; counts for each type of utilization were calculated by identifying the number of claims separated by at least 1 day for each enrollee (0, 1, 2 or more). (See **Supplementary Table S2** for health utilization details). Because Medicare entitlement can be based on age, a variable combining age and original reason for entitlement was used: age 65 years and older and age-eligible for Medicare, under 65 years and disability-eligible for Medicare, 65 years and older and disability-eligible, under 65 years and end stage renal disease (ESRD)-eligible and 65 years and older and ESRD-eligible. (See **Supplementary Table S3** for all covariates.)

3.4 Analysis

The enrollee was the unit of analysis. Cohort characteristics were summarized, stratified by utilization of MOUD. Multivariable logistic regression was used to examine the association between enrollee sociodemographic and health characteristics, as well as policy influence on MOUD utilization (count of MOUD-supportive policies in enrollee state of residence), and the binary indicator of MOUD utilization. We used predictive margins to report average adjusted probability of utilization of MOUD and average marginal effects representing the absolute risk difference (ARD) between a given characteristic and the specified reference group, with 95% confidence intervals. For categorical variables, ARD represents the difference in the average adjusted probability of MOUD utilization between enrollees with a given characteristic and the specified reference group. All analyses were conducted using SAS Enterprise Guide 7.12 (SAS Institute, Inc., Cary, NC).

4.0 RESULTS

4.1 Characteristics of the Medicare FFS Population with OUD

The majority of FFS enrollees with OUD were female (58.8%), non-Hispanic White (79.5%), resided in metropolitan areas (76.6%) and were dually eligible for Medicare and Medicaid (55.1%; **Table 1**). Almost half were under age 65 and disability-eligible for Medicare without ESRD (49.2%), followed by 32.2% who were age-eligible without ESRD. The majority had both a physical and mental health condition (71.1%) and almost half had 6 or more comorbid medical conditions (48.3%). A large proportion resided in the South (41.4%) and in states with 2 (of 4) MOUD-supportive policies (46.8%). The most common policies were coverage of methadone (87.5%) and Medicaid expansion (64.5%) (data not shown).

Less than one-fifth (13.3%) of FFS enrollees with OUD utilized MOUD in 2018 (**Table 1**). Among those who utilized MOUD, Whites were slightly overrepresented (84.3% vs. their 79.5% distribution in the OUD population), whereas Black/African Americans were almost twice as underrepresented (7.1% vs. their 11.7% distribution in the OUD population). Compared with the overall population of enrollees with OUD, a higher percentage of those under 65 years and disability-eligible for Medicare without ESRD (76.2% vs 49.2%) and dually eligible (69.6% vs. 55.1%) utilized MOUD. Conversely, lower percentages of those age-eligible for Medicare without ESRD (14.6% vs. 32.3%), or non-dually eligible (30.4% vs.44.9%), utilized MOUD.

There were also differences in MOUD utilization based on the complexity and number of comorbid health conditions. Among enrollees who utilized MOUD, those with (non-OUD) mental health condition(s) alone were thrice overrepresented (13.5% vs. their 3.8% distribution in the OUD population; **Table 1**), whereas those with physical condition(s) alone (13.2% vs. their 23.6% distribution in the OUD population) or with both physical and mental health conditions (68.1% vs. their 71.1% distribution in the OUD population) were underrepresented. A higher percentage of those with 3 or fewer other conditions, but lower percentages of those with 4 or more other conditions, utilized MOUD.

Each MOUD-supportive state policies conferred a small advantage in utilization of MOUD (generally, <5 percentage points; data not shown for individual policies). Taken together, compared to the overall population of FFS enrollees with OUD, utilization of MOUD was proportionately higher among those who live in states with 3 (42.6% vs. 33.7% overall) or 4 MOUD-supportive policies (5.8% vs. 5.1% overall).

4.2 Sociodemographic and Comorbid Condition Predictors of MOUD Utilization

Compared to non-Hispanic white enrollees, Black/African American (ARD, -5.4%; 95% CI, -5.6% to -5.1%; **Table 2**) or Hispanic (ARD, -3.3%; 95% CI, -3.7% to -3.0%) enrollees were less likely to utilize MOUD. Individuals who were dually eligible for Medicare and Medicaid were also more likely to utilize MOUD than those who were non-dually eligible (ARD, 1.4%; 95% CI, 1.2% to 1.6%).

Enrollees with OUD who did not have another physical or mental medical condition had the highest average adjusted probability of MOUD utilization (40.6%; **Table 2**). However, when examining the effect of comorbid physical or mental health conditions, the likelihood of MOUD utilization changed. In general, among enrollees with no physical health conditions, each additional mental health condition reduced the likelihood of MOUD utilization. Among this group, for example, relative to those without any (OUD-related) mental health condition, 2–3 additional mental health conditions resulted in an ARD of -6.9% (95% CI, -8.3% to -5.6%), 4–5 additional mental health conditions in an ARD of -10.8% (95% CI, -12.5% to -9.2%) and 6 or more mental health conditions in an ARD of -11.8% (95% CI, -14.4% to -9.2%). Each additional physical health condition also decreased the likelihood of MOUD utilization (for example, compared to enrollees without any mental health

condition, 1 additional physical health condition resulted in an ARD of -23.2% [95% CI, -24.4% to -22.0%]; 2 or more additional physical conditions in an ARD of -33.8% [95% CI, -34.9% to -32.7%]; **Table 2**).

Among enrollees with a physical health condition, each additional mental health condition increased the likelihood of MOUD utilization—the opposite of the pattern observed among enrollees without physical health conditions. For example, among those with one physical health condition, the likelihood of MOUD utilization increased from an average adjusted probability of 17.4% to 30.6%, respectively, for those with 0–6 or more comorbid mental health conditions. Similarly, among those with 2 or more physical health conditions, the likelihood of MOUD utilization increased from an average adjusted probability of 6.8% to 25.0%, respectively, for those with 0–6 or more comorbid mental health conditions (**Table 2; Figure 1**).

4.3 State Policies Associated with MOUD Utilization

In this adjusted analysis, enrollees residing in states with all 4 MOUD-supportive policies had the highest average adjusted probability of utilizing MOUD (15.5%). However, compared to enrollees in states with all 4 policies, the likelihood of MOUD utilization decreased as the number of MOUD-supportive policies decreased – exhibiting a declining 'dose response' (3 policies, ARD, -1.1%, 95% CI, -1.6% to -0.6%; 2 policies, ARD, -2.8%, 95% CI, -3.2 to -2.4; 1 policy, ARD, -3.8%, 95% CI, -4.2% to -3.3%; no policies, ARD -4.3%, 95% CI, -4.8% to -3.8%; **Table 2; Figure 2**).

5.0 DISCUSSION

This study highlighted racial and ethnic, other sociodemographic, and health condition-based disparities in MOUD utilization among Medicare FFS enrollees with OUD. To our knowledge, these disparities have not been previously documented among Medicare FFS enrollees with OUD. While utilization of MOUD was low overall (13.3%) among FFS enrollees with OUD, Black/African American and Hispanic enrollees were less likely to utilize MOUD than whites. Yet, the presence of up to four MOUD-supportive policies in enrollees' state of residence was associated with MOUD utilization, wherein the likelihood of utilization decreased as the number of policies decreased. This noticeable 'dose response' effect suggests the "protective" role that MOUD-supportive policies may play in facilitating utilization, including among racial/ethnic minorities.

Findings of racial/ethnic inequities in MOUD utilization are consistent with previous studies of commercial- and Medicaid-insured individuals with OUD. Given this, studies of MOUD utilization in Medicare that do not explicitly examine race and ethnicity likely underreport the extent of racial and ethnic inequities in medication treatment for OUD. Previously, we found that Black/African American enrollees were overrepresented among FFS enrollees with OUD, compared with the overall FFS population (Niles et al., 2020), and thus face the "double jeopardy" of being overrepresented in the FFS OUD population yet underrepresented among those who utilize MOUD. Without understanding and characterizing such inequities, it is more difficult for public health officials to challenge and address them. Despite calls to move away from the use of race/ethnicity data, such data remains important in identifying and addressing inequities in health care (Tong et al., 2022). Due to current methodological challenges in developing measures of structural racism in public health, race/ethnicity data continue to be useful proxies in population-based studies (Hardeman et al., 2022). However, future studies could consider still-evolving approaches to measuring structural racism, including the use of a structural racism-related state law database under development (Agenor et al., 2021) or U.S. Census data on housing and residential segregation – although Census data still rely on race/ethnicity data (Hardeman et al., 2022; U.S. Census Bureau, 2021).

Notably, we found that enrollees dually eligible for Medicare and Medicaid were more likely to utilize MOUD. It is possible that Medicaid coverage, acting as a back-up insurer, removes financial barriers frequently cited as a key impediment for MOUD treatment (Orgera et al., 2019). By 2018, many states' Medicaid programs covered MOUD and had removed buprenorphine prior authorization requirements. Both insurance coverage and reduced administrative barriers are effective policy tools that influence both propensity to seek treatment and treatment utilization. New policies using such strategies (e.g., Medicare's coverage of opioid treatment programs) further bolster utilization (Centers for Medicare & Medicaid Services).

Our study showed that enrollees who live in states where more policies have been implemented to promote MOUD utilization were more likely to utilize it, highlighting the value these policies may have in influencing enrollees' propensity to seek MOUD treatment. All policies facilitated MOUD utilization by reducing financial or administrative barriers. Exploratory analyses did not indicate large differences in MOUD utilization based on each individual policy, but suggest a cumulative effect. In this case, the effect of each policy may have mattered less than the "sum of parts."

This study also pointed to the role of comorbid physical and mental health conditions as complications to treatment for enrollees with OUD. For example, all else being equal, Medicare FFS enrollees with OUD who also had any physical condition were generally less likely to utilize MOUD than those without physical comorbidities. We saw a "dose response" effect in that the likelihood of MOUD utilization was progressively lower as the number of physical comorbidities increased. Similarly, among enrollees with mental health

comorbidities alone, MOUD utilization decreased with increasing numbers of mental health comorbidities. We speculate that enrollees with physical comorbidities were more likely to be treated in primary care settings, where there may be less attention or capacity to manage OUD; those with higher numbers of physical comorbidities may also have had other medical (and pain-related) needs that complicate prescribing of MOUD. Among enrollees with only comorbid mental health conditions, we speculate that stigma or concerns about opioid use disorders may discourage clinicians from prescribing MOUD, particularly as treatment complexity increases with the number of mental health comorbidities. The variable use of MOUD among those with complex clinical comorbidities suggests the need for more research to help guide clinical care and provide better training and supports for primary care physicians. Care models that promote integrated behavioral and primary care are critical and may require targeted financial incentives; for example, by reimbursing collaborative care (Watkins et al., 2017).

This study has several limitations. First, it focuses on MOUD utilization among Medicare FFS enrollees diagnosed with OUD and is not generalizable to all individuals with OUD. Second, OUD is a stigmatized health condition that is likely underdiagnosed and undertreated; it relies on a willingness by both provider and enrollee to address the condition. This study's reliance on claims data may undercount the number of enrollees with OUD. However, this may be mitigated by using the broadest indicator of OUD from the data source, which includes enrollees with OUD diagnoses or aberrant opioid-related events. Third, this study captured Medicare 2018 FFS MOUD utilization, prior to Medicare coverage for methadone; findings may undercount the extent of methadone treatment, or treatment paid by other insurance (e.g., self-pay, private insurance, state-sponsored programs, Medicaid alone). Given methadone also tends to be prescribed to Black individuals (Hansen et al., 2013), findings may further undercount the extent to which Black enrollees receive MOUD outside of Medicare. Future studies should address MOUD utilization as Medicare expands coverage.

Despite these limitations, this study provides important baseline information for understanding the impact of evolving policies being implemented to improve care for enrollees who are at greatest risk for poor treatment outcomes due to OUD. Follow-up studies on MOUD utilization after 2020 could shed light on the impact of such policies on MOUD utilization and highlight underserved Medicare populations most affected by changes related to coverage and delivery of treatment for OUD. This baseline is therefore critical because it provides a point of reference for monitoring utilization disparities across populations, so starkly unmasked by COVID-19, and how new MOUD policies may affect inequities.

5.1 Implications

Our findings suggest that among Medicare enrollees, being Black/African American, Hispanic, having more complex clinical status, particularly having more physical health conditions, and residence in states with fewer MOUD-supportive policies are associated with lower likelihood of utilizing MOUD. Conversely, dual-eligibility status increased the likelihood of MOUD utilization – indicating that those with Medicaid, as a backup to Medicare, may be more willing to seek MOUD. The findings highlight the importance of improving integration of behavioral health and primary care services, by reimbursing collaborative care for example, and the need for policies that reduce financial or other impediments to MOUD utilization, including expanded MOUD coverage and reduced administrative requirements for treatment. The findings also provide an important baseline for assessing how policies instituted during the COVID-19 pandemic are implemented in ways that support equitable care for underserved groups.

6.0 TABLES

Table 1: Characteristics of Medicare Fee-for-Service Enrollees with Opioid Use Disorder (OUD), Stratified by Utilization of Medications for OUD (MOUD), 2018

Patient Characteristics	Total Enrollees with OUD (n=530,248)		No MOUD Utilization (n=459,616)		MOUD Utilization (n-70,632)	
Characteristics	N (%)		N (%)		N (%)	
Original Reason for Medicare Eligibility						
Aged (≥65 years)	171,408	(32.3)	161,118	(35.1)	10,290	(14.6)
Disabled (age <65)	260,892	(49.2)	207,087	(45.1)	53,805	(76.2)
Disabled (age ≥65)	89,357	(16.9)	83,138	(18.1)	6,219	(8.8)
ESRD (age <65)	7,097	(1.3)	6,806	(1.5)	291	(0.4)
ESRD (age ≥65)	1,494	(0.3)	1,467	(0.3)	27	(0.0)
Medicare and Medicaid Dual Eligibility						
Not Dually Eligible	237,848	(44.9)	216,358	(47.1)	21,490	(30.4)
Dually Eligible	292,400	(55.1)	243,258	(52.9)	49,142	(69.6)
Sex						
Male	218,507	(41.2)	183,788	(40.0)	34,719	(49.2)
Female	311,741	(58.8)	275,828	(60.0)	35,913	(50.8)
Race and Ethnicity						
Non-Hispanic White	421,389	(79.5)	361,833	(78.7)	59,556	(84.3)
Black/African American	62,197	(11.7)	57,189	(12.4)	5,008	(7.1)
Hispanic	29,336	(5.5)	25,760	(5.6)	3,576	(5.1)
Asian/Pacific Islander	4,412	(0.8)	4,023	(0.9)	389	(0.6)
American Indian/ Alaska Native	5,611	(1.1)	4,867	(1.1)	744	(1.1)
Other	2,734	(0.5)	2,324	(0.5)	410	(0.6)
Unknown	4,569	(0.9)	3,620	(0.8)	949	(1.3)
Urbanicity						
Metropolitan	406,272	(76.6)	353,025	(76.8)	53,247	(75.4)
Non-Metropolitan	123,976	(23.4)	106,591	(23.2)	17,385	(24.6)
Census Region						
Northeast	97,932	(18.5)	78,185	(17.0)	19,747	(28.0)
West	106,655	(20.1)	94,596	(20.6)	12,059	(17.1)
Midwest	106,067	(20.0)	92,037	(20.0)	14,030	(19.9)
South	219,594	(41.4)	194,798	(42.4)	24,796	(35.1)

Patient Characteristics	Total Enrollees with OUD (n=530,248)		No MOUD Utilization (n=459,616)		MOUD Utilization (n-70,632)	
Characteristics	N (%)		N (%)		N (%)	
Count of MOUD-Supportive State Policies (of 4)						
0	33,740	(6.4)	30,319	(6.6)	3,421	(4.8)
1	42,373	(8.0)	37,932	(8.3)	4,441	(6.3)
2	248,358	(46.8)	219,759	(47.8)	28,599	(40.5)
3	178,913	(33.7)	148,811	(32.4)	30,102	(42.6)
4	26,864	(5.1)	22,795	(5.0)	4,069	(5.8)
Total Number of 17 Other (Non-OUD) Health Conditions						
No other condition (0)	8,026	(1.5)	4,420	(1.0)	3,606	(5.1)
1 condition	19,169	(3.6)	13,372	(2.9)	5,797	(8.2)
2-3 conditions	96,847	(18.3)	79,566	(17.3)	17,281	(24.5)
4-5 conditions	149,996	(28.3)	131,281	(28.6)	18,715	(26.5)
6+ conditions	256,210	(48.3)	230,977	(50.3)	25,233	(35.7)
Presence of Other (Non-OUD) Physical Health (PH) & Mental Health (MH) Conditions						
No other condition	8,026	(1.5)	4,420	(1.0)	3,606	(5.1)
PH condition(s) only	125,014	(23.6)	115,660	(25.2)	9,354	(13.2)
MH condition(s) only	20,389	(3.8)	10,824	(2.4)	9,565	(13.5)
Both PH and MH conditions	376,819	(71.1)	328,712	(71.5)	48,107	(68.1)

Note: ESRD = End-stage renal disease.

Table 2: Average Adjusted Probability of Utilization of Medications for Opioid Use Disorder (MOUD) among for Medicare Fee-for-Service Enrollees with OUD, 2018

Patient Characteristics	Average Adjusted Probability[a] of MOUD % (95% CI[b])	Absolute Risk Difference % (95% CI[c])
Race and Ethnicity		
Other	14.0 (13.5-14.5)	-0.2% (-0.7% to 0.3%)
Black/African American	8.8 (8.6- 9.0)	-5.4% (-5.6% to -5.1%)
Hispanic	10.8 (10.4-11.1)	-3.4% (-3.7% to -3%)
Non-Hispanic White	14.1 (14.0-14.2)	[Reference]
Medicare and Medicaid Dual Eligibility		
Not Dually Eligible	12.4 (12.3-12.6)	-1.4% (-1.6% to -1.2%)
Dually Eligible	13.8 (13.7-13.9)	[Reference]
Count of MOUD-Supportive State Policies		
0 state policies	11.2 (10.9-11.5)	-4.3% (-4.8% to -3.8%)
1 state policies	11.7 (11.4-12.0)	-3.8% (-4.3% to -3.3%)
2 state policies	12.7 (12.6-12.8)	-2.8% (-3.2% to -2.4%)
3 state policies	14.4 (14.2-14.6)	-1.1% (-1.6% to -0.6%)
4 state policies	15.5 (15.1-15.9)	[Reference]
Count of Other (Non-OUD) Physical Health (PH) and Mental Health (MH) Conditions		
2 or more PH conditions, plus:		
6 or more MH conditions	25.0 (24.2-25.8)	-15.6% (-16.9% to -14.2%)
4-5 MH	16.3 (16.0-16.6)	-24.3% (-25.5% to -23.1%)
2-3 MH	10.4 (10.2-10.5)	-30.2% (-31.3% to -29.1%)
1 MH	8.7 (8.5- 8.8)	-31.9% (-33% to -30.8%)
No MH	6.8 (6.6- 6.9)	-33.8% (-34.9% to -32.7%)
1 PH condition, plus:		
6 or more MH conditions	30.6 (28.7-32.5)	-10% (-12.2% to -7.8%)
4-5 MH	27.4 (26.3-28.4)	-13.2% (-14.7% to -11.8%)
2-3 MH	25.5 (24.8-26.1)	-15.1% (-16.4% to -13.9%)
1 MH	22.5 (21.8-23.3)	-18% (-19.3% to -16.7%)
No MH	17.4 (16.8-18.0)	-23.2% (-24.4% to -22%)
No PH condition, plus		
6 or more MH conditions	28.8 (26.4-31.2)	-11.8% (-14.4% to -9.2%)
4-5 MH	29.8 (28.5-31.0)	-10.8% (-12.5% to -9.2%)
2-3 MH	33.7 (32.8-34.6)	-6.9% (-8.3% to -5.6%)
1 MH	39.6 (38.5-40.8)	-0.9% (-2.5% to 0.6%)
No MH	40.6 (39.5-41.7)	[Reference]

[a]Estimated with logistic regression model using predictive margins. Average adjusted probability is the adjusted rate, holding all other covariates at their observed values. Note: This table presents variables of primary interest only; covariates included in the model as control variables are presented in Supplementary Table 3.
[b] CI: Confidence Interval.

[c] Absolute risk difference (ARD) represents the difference between a given characteristic and the reference group.

7.0 FIGURES

Figure 1: Adjusted Predicted Probability of Medications for Opioid Use Disorder (MOUD) Access by Count of Physical Health (PH) and Mental Health (MH) Related Conditions, 2018
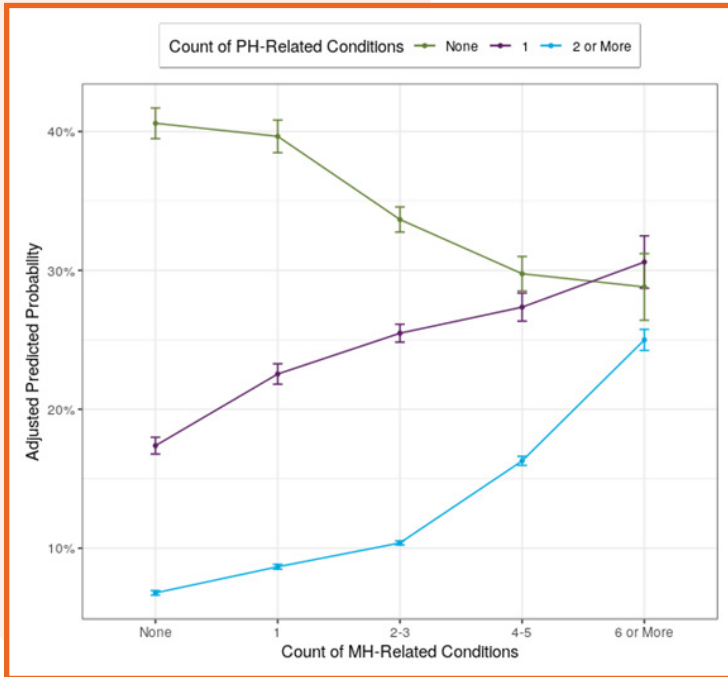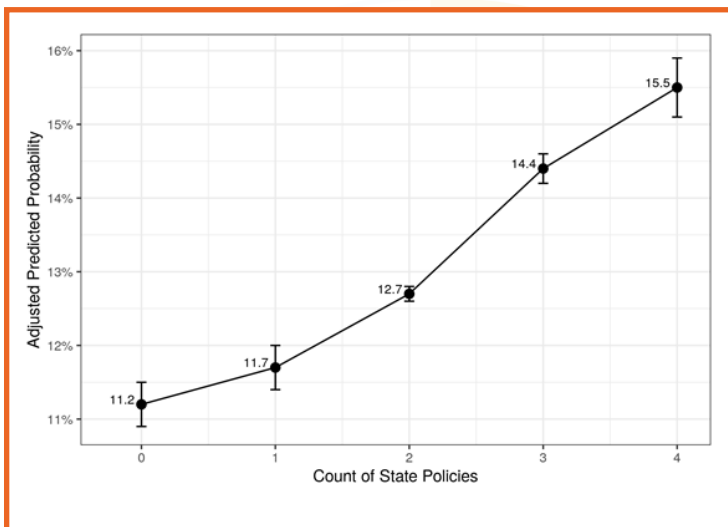

Figure 2: Adjusted Predicted Probability of Medications for Opioid Use Disorder (MOUD) Access by Count of MOUD-Supportive State Policies, 2018

8.0 REFERENCES

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9.0 SUPPLEMENTAL MATERIALS

Supplementary Table S1. Criteria for Identifying Medications for Treating Opioid Use Disorder (MOUD)

Description
One or more administrative claims with the following Healthcare Common Procedure Coding System (HCPCS) codes: J0570, Q9991, Q9992, J0572, J0573, J0574, J0575, J0571, J2315, J1230 One or more Part D claims with the following National Drug Codes (NDC): • NDCs for Buprenorphine: 54017613, 54017713, 54018813, 54018913, 93537856, 93537956, 93572056, 93572156, 228315303, 228315403, 228315473, 228315503, 228315573, 228315603, 378092393, 378092493, 406192303, 406192403, 490005100, 490005130, 490005160, 490005190, 12496120201, 12496120203, 12496120401, 12496120403, 12496120801, 12496120803, 12496121201, 12496121203, 12496127802, 12496128302, 12496130602, 12496131002, 16590066605, 16590066630, 16590066705, 16590066730, 16590066790, 23490927003, 23490927006, 23490927009, 35356000407, 35356000430, 35356055530, 35356055630, 42291017430, 42291017530, 43063018407, 43063018430, 49999039507, 49999039515, 49999039530, 49999063830, 49999063930, 50383028793, 50383029493, 50383092493, 50383093093, 52959030430, 52959074930, 53217013830, 41230114301, 54123091430, 54123092930, 54123095730, 54123098630, 54569573900, 54569573901, 54569573902, 54569639900, 54569640800, 54569657800, 54868570700, 54868570701, 54868570702, 54868570703, 54868570704, 54868575000, 55045378403, 55700014730, 55700018430, 55700030230, 55700030330, 59385001201, 59385001230, 59385001401, 59385001430, 59385001601, 59385001630, 63629402801, 63629403401, 63629403402, 63629403403, 63629409201, 63874108403, 63874108503, 63874117303, 65162041503, 65162041603, 66336001630, 68071138003, 68071151003, 68258299103, 68258299903, 68308020230, 68308020830 • NDCs for Naltrexone: 56001122, 56001130, 56001170, 56007950, 56008050, 185003901, 185003930, 406009201, 406009203, 406117001, 406117003, 555090202, 555090202, 16729008101, 16729008110, 42291063230, 43063059115, 47335032683, 47335032688, 50436010501, 51224020630, 51224020650, 51285027501, 51285027502, 52152010502, 52152010504, 52152010530, 54868557400, 63459030042, 65694010003, 65694010010, 65757030001, 65757030202, 68084029111, 68084029121, 68094085362, 68115068030

Supplementary Table S2. Detailed Comorbid Condition and Health Care Utilization Characteristics: Medicare Fee-for-Service Enrollees with Opioid Use Disorder (OUD), Stratified by Utilization of Medications for OUD (MOUD), 2018

Characteristic	Total Enrollees with OUD (n=530,248) N (%)		No MOUD Utilization (n=459,616) N (%)		MOUD Utilization (n-70,632) N (%	
Physical Health-Related Conditions						
Hypertension	365,615	(69.0)	332,241	(72.3)	33,374	(47.3)
Rheumatoid Arthritis or Osteoarthritis	345,249	(65.1)	317,609	(69.1)	27,640	(39.1)
Diabetes	189,361	(35.7)	173,827	(37.8)	15,534	(22.0)
Heart Failure	133,661	(25.2)	126,117	(27.4)	7,544	(10.7)
Chronic Kidney Disease	210,790	(39.8)	196,672	(42.8)	14,118	(20.0)
COPD	155,679	(29.4)	141,780	(30.8)	13,899	(19.7)
Asthma	64,545	(12.2)	57,386	(12.5)	7,159	(10.1)
Cancer	42,576	(8.0)	40,135	(8.7)	2,441	(3.5)
Fibromyalgia, Chronic Pain and Fatigue	406,393	(76.6)	367,197	(79.9)	39,196	(55.5)
Migraine and Chronic Headache	66,931	(12.6)	59,100	(12.9)	7,831	(11.1)
Mental Health-Related Conditions						
Schizophrenia and Other Psychotic Disorders	52,568	(9.9)	43,098	(9.4)	9,470	(13.4)
Anxiety Disorders	296,318	(55.9)	253,570	(55.2)	42,748	(60.5)
Depressive Disorders	277,946	(52.4)	239,990	(52.2)	37,956	(53.7)
Bipolar Disorder	94,376	(17.8)	74,014	(16.1)	20,362	(28.8)
PTSD	45,761	(8.6)	34,538	(7.5)	11,223	(15.9)

Characteristic	Total Enrollees with OUD (n=530,248)		No MOUD Utilization (n=459,616)		MOUD Utilization (n-70,632)	
	N (%)		N (%)		N (%	
Alcohol Use Disorder	62,997	(11.9)	50,044	(10.9)	12,953	(18.3)
Other Drug Use Disorders[a]	124,098	(23.4)	98,359	(21.4)	25,739	(36.4)
Presence of Other Health Conditions						
No Condition	8,026	(1.5)	4,420	(1.0)	3,606	(5.1)
Physical Health-Related Only	125,014	(23.6)	115,660	(25.2)	9,354	(13.2)
Mental Health-Related Only	20,389	(3.8)	10,824	(2.4)	9,565	(13.5)
Both Physical and Mental Health-Related	376,819	(71.1)	328,712	(71.5)	48,107	(68.1)
Total out of 10 Physical Health-Related Conditions						
No condition (0)	28,415	(5.4)	15,244	(3.3)	13,171	(18.6)
1 condition	44,839	(8.5)	31,584	(6.9)	13,255	(18.8)
2-3 conditions	173,818	(32.8)	148,393	(32.3)	25,425	(36.0)
4-5 conditions	177,096	(33.4)	163,160	(35.5)	13,936	(19.7)
6+ conditions	106,080	(20.0)	101,235	(22.0)	4,845	(6.9)
Total out of 7 Mental Health-Related Conditions						
No condition (0)	133,040	(25.1)	120,080	(26.1)	12,960	(18.3)
1 condition	121,335	(22.9)	106,860	(23.2)	14,475	(20.5)
2-3 conditions	199,880	(37.7)	173,439	(37.7)	26,441	(37.4)
4-5 conditions	60,257	(11.4)	47,812	(10.4)	12,445	(17.6)
6+ conditions	15,736	(3.0)	11,425	(2.5)	4,311	(6.1)
Health Care Utilization						
No Service Utilization	3,862	(0.7)	2,921	(0.6)	941	(1.3)
Inpatient Admissions						
No Utilization (No admissions)	291,519	(55.0)	242,046	(52.7)	49,473	(70.0)
1-3 admissions	200,003	(37.7)	182,137	(39.6)	17,866	(25.3)
4+ admissions	38,726	(7.3)	35,433	(7.7)	3,293	(4.7)
Emergency Department (ED) Visits						
No Utilization (No ED visits)	181,284	(34.2)	150,852	(32.8)	30,432	(43.1)
1-3 ED visits	231,965	(43.7)	203,890	(44.4)	28,075	(39.7)
4+ ED visits	116,999	(22.1)	104,874	(22.8)	12,125	(17.2)

Characteristic	Total Enrollees with OUD (n=530,248)		No MOUD Utilization (n=459,616)		MOUD Utilization (n-70,632)	
	N (%)		N (%)		N (%	
Outpatient Visits (Excluding ED Visits)						
No Outpatient Visits	10,049	(1.9)	8,414	(1.8)	1,635	(2.3)
1-3 Outpatient Visits	23,026	(4.3)	18,981	(4.1)	4,045	(5.7)
4+ Outpatient Visits	497,173	(93.8)	432,221	(94.0)	64,952	(92.0)

Note: COPD = Chronic obstructive pulmonary disease, ESRD = End-stage renal disease; PTSD = Post-traumatic stress disorder.
[a]Other drug use disorders does not include opioid use disorder, and are based on the Centers for Medicare & Medicaid Services Chronic Condition Warehouse (CCW) indicator.

Supplementary Table S3. Average Adjusted Probability of Covariates in Utilization of Medications for Opioid Use Disorder (MOUD) among Medicare Fee-for-Service Enrollees with OUD, 2018

Patient Characteristics	Average Adjusted Probability[a] of MOUD % (95% CI[b])	Absolute Risk Difference % (95% CI[c])
Original Reason for Medicare Eligibility		
Aged (≥65 years)	4.3 (2.8- 5.8)	-3.8% (-5.3% to -2.3%)
Disabled (age <65)	8.4 (7.5- 9.2)	0.3% (-0.6% to 1.1%)
Disabled (age ≥65)	9.0 (8.8- 9.2)	0.9% (0.7% to 1.2%)
ESRD (age <65)	16.8 (16.7-17.0)	8.7% (8.5% to 9%)
ESRD (age ≥65)	8.1 (8.0- 8.3)	[Reference]
Sex		
Male	14.8 (14.6-14.9)	2.6% (2.4% to 2.7%)
Female	12.2 (12.1-12.3)	[Reference]
Urbanicity		
Non-Metropolitan	13.6 (13.4-13.8)	0.4% (0.2% to 0.6%)
Metropolitan	13.2 (13.1-13.3)	[Reference]
Census Region		
West	12.3 (12.1-12.5)	-3.1% (-3.3% to -2.8%)
Midwest	13.1 (12.9-13.3)	-2.3% (-2.6% to -2%)
South	12.7 (12.6-12.9)	-2.7% (-3% to -2.4%)
North East	15.4 (15.2-15.6)	[Reference]

Patient Characteristics	Average Adjusted Probability[a] of MOUD % (95% CI[b])	Absolute Risk Difference % (95% CI[c])
Inpatient Admissions		
4+ admissions	15.3 (15.1-15.4)	6.3% (5.9% to 6.6%)
1-3 admissions	10.8 (10.7-11.0)	1.8% (1.5% to 2.1%)
No inpatient admissions	9.0 (8.7- 9.3)	[Reference]
Outpatient Visits (Excluding Emergency Department [ED] Visits)		
4+ outpatient visits	5.7 (5.4- 5.9)	-8.3% (-8.6% to -8%)
1-3 outpatient visits	9.1 (8.9- 9.4)	-4.8% (-5.1% to -4.5%)
No outpatient visits	14.0 (13.9-14.1)	[Reference]
ED Visits		
4+ ED visits	14.6 (14.5-14.8)	3% (2.7% to 3.3%)
1-3 ED visits	13.0 (12.9-13.1)	1.4% (1.1% to 1.6%)
No ED visits	11.6 (11.4-11.8)	[Reference]

[a] Estimated with logistic regression model using predictive margins. Average adjusted probability is the adjusted rate, holding all other covariates at their observed values. Note: This table presents covariates included in the model as control variables; variables of primary interest are included in the main text (Table 2).
[b] CI: Confidence Interval.
[c] Absolute risk difference (ARD) represents the difference between a given characteristic and the reference group.