MILLIMAN REPORT

Relationship of medication adherence and inpatient and emergency department utilization in Medicaid

Commissioned by PhRMA

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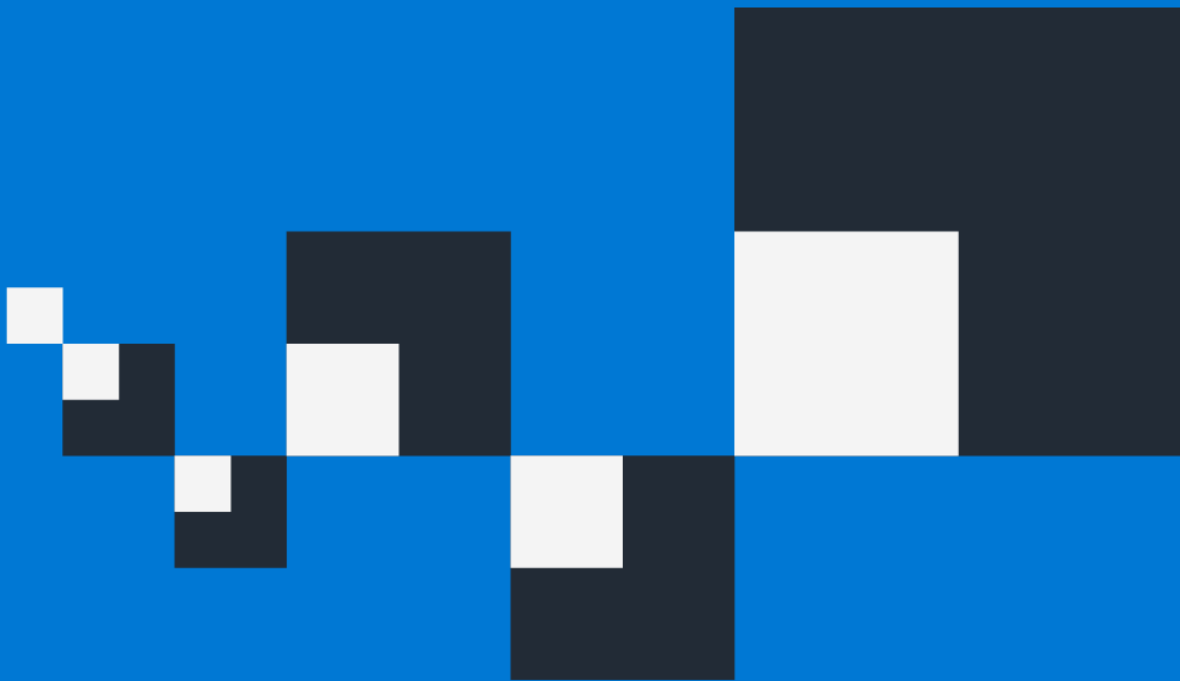

Milliman

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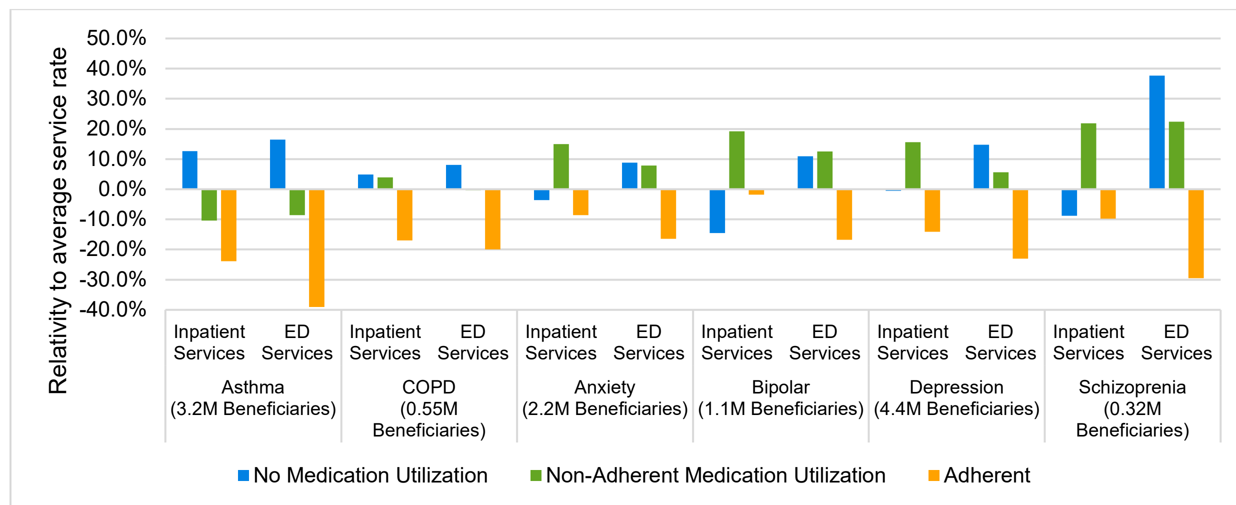
I. Executive summary

PhRMA engaged Milliman to analyze the relationship between medication adherence and inpatient (IP) and emergency department (ED) service rates within the U.S. nationwide Medicaid program, focusing specifically on beneficiaries diagnosed with respiratory conditions (asthma or chronic obstructive pulmonary disease (COPD)) or mental health conditions (anxiety, depression, bipolar disorder, or schizophrenia). In this analysis, a beneficiary was considered adherent if their proportion of days covered (PDC) reached at least 80%.[1]

Figure 1 summarizes the relative rates of IP and ED services by condition. We found the frequency of IP and ED services was nearly always lower for adherent beneficiaries diagnosed with asthma, COPD, or a mental health disorder compared to beneficiaries who were non-adherent or not using medication.

More broadly, we found that medication adherence among Medicaid beneficiaries was low: Fewer than 50% of beneficiaries adhered to their medication regimens across all conditions and risk score levels.

Figure 1: Inpatient and emergency department service rates by condition and adherence cohort[2]



This report adds to the existing body of evidence, which shows that beneficiaries with respiratory or mental health conditions who adhere to their prescribed medication regimens generally experience significantly fewer IP and ED encounters than their non-adherent peers. These findings are observational and do not imply causality. This analysis was limited to these diagnosis cohorts and to IP and ED use as markers of acute care. It is a narrow, targeted assessment and results may not be applicable to other conditions or other service categories. Differences may reflect confounding factors (e.g., disease severity, access to care, socioeconomic barriers, or self-management). This report leverages more recent data and a nationwide scope, strengthening the existing evidence base and largely aligning prior conclusions. In claims-based studies of Medicaid-covered children and adults with asthma, increased improvement in controller-medication adherence has been linked to reductions in ED services and hospitalizations.[3] Parallel findings emerge in behavioral health. Among Medicaid beneficiaries with major depressive disorder, higher antidepressant adherence is associated with reduced hospital services.[4] In bipolar disorder, adherent beneficiaries show fewer psychiatric hospitalizations.[5] The pattern is most pronounced in schizophrenia: Nonadherence to antipsychotics raises the likelihood of any psychiatric service.[6]

[1] PDC is calculated as the sum of days of medication received divided by the number of total days in the time frame. For more information, visit www.pqaalliance.org/adherence-measures.
[2] Utilization metrics are risk-adjusted using Chronic Illness and Disability Payment System (CDPS) + Rx.
[3] Rust, G., Zhang, S., & Reynolds, J. (September 2013). Inhaled corticosteroid adherence and emergency department utilization among Medicaid-enrolled children with asthma. Journal of Asthma, 50(7), 769–75. Available from https://pubmed.ncbi.nlm.nih.gov/23734973.
[4] Khanna, R., Pace, P.F., Mahabaleshwarkar, R., Sankar Basak, R., Datar, M., & Banahan, B. (October 2012). Medication adherence among recipients with chronic diseases enrolled in a state Medicaid program. Population Health Management, 15(5), 253–60. Retrieved April 30, 2026, from https://journals.sagepub.com/doi/10.1089/pop.2011.0069.
[5] Lang, K., Korn, J., Muser, E., Choi, J.C., Abouzaid, S., & Menzin, J. (2011). Predictors of medication nonadherence and hospitalization in Medicaid patients with bipolar I disorder given long-acting or oral antipsychotics. *Journal of Medical Economics*, 14(2), 217–26. Retrieved April 30, 2026, from https://www.tandfonline.com/doi/full/10.3111/13696998.2011.562265#d1e170.
[6] Gilmer, T.P., Dolder, C.R., Lacro, J.P., Folsom, D.P., Lindamer, L., Garcia, P., & Jeste, D.V. (April 2004). Adherence to treatment with antipsychotic medication and health care costs among Medicaid beneficiaries with schizophrenia. *American Journal of Psychiatry*, 161(4), 692–9. Retrieved April 30, 2026, from https://psychiatryonline.org/doi/10.1176/appi.ajp.161.4.692.

II. Background

BRIEF OVERVIEW OF MEDICAID

Medicaid provides coverage to millions of low-income individuals and families. As of June 2025, Medicaid covered nearly 80 million people, including children, pregnant women, parents, seniors, and individuals with disabilities.[7] Eligibility and benefits vary by state, but the program is designed to serve vulnerable populations who might otherwise lack access to affordable healthcare. Individuals may qualify for Medicaid through various eligibility pathways, including income level, disability status, pregnancy, age (such as children and seniors), or through expanded coverage for adults established under the Affordable Care Act in participating states. Medicaid expansion allows states to provide coverage to more low-income adults, specifically those with incomes up to 138% of the federal poverty level.[8] States can choose whether to expand Medicaid, and as a result, coverage varies across the country. Medicaid benefits can be administered through a traditional fee-for-service (FFS) model, where providers are paid for each service delivered, or through managed care, where states contract with managed care organizations (MCOs) to deliver a comprehensive set of benefits for a fixed payment per beneficiary. MCOs help manage costs and coordinate care for Medicaid beneficiaries, aiming to improve health outcomes and efficiency within the Medicaid system.

Medicaid drug coverage, though technically optional under federal law, is part of the Medicaid benefit in all states. Medicaid covers most FDA-approved outpatient prescription medications and some prescribed over-the-counter medications. Each state administers its own benefit, resulting in state variation in preferred drug lists, prior authorizations, and quantity limits to manage utilization. Many states also use Medicaid MCOs to deliver pharmacy benefits.

Medicaid benefits differ by state, creating an inherently complex system. This complexity lends itself to variations in beneficiary experience regarding access, cost sharing, and support for medication adherence across the nation.

THE ROLE OF PHARMACEUTICALS IN MANAGING CHRONIC CONDITIONS

Many Medicaid beneficiaries manage their chronic conditions, like respiratory conditions and mental illnesses, with medications. Evidence suggests that appropriate pharmacotherapy can improve outcomes while lowering avoidable costs. For example, a study of adults enrolled in Medicaid showed that beneficiaries with higher adherence to guideline-recommended drug regimens experienced fewer preventable hospitalizations.[9] Within this context, appropriate pharmacotherapy serves as a vital tool for tertiary prevention—managing symptoms, potentially restoring function, and minimizing the adverse health and economic consequences associated with these long-term illnesses.

STUDY OBJECTIVE AND METHODOLOGY

PhRMA engaged Milliman to analyze the relationship between medication adherence and IP and ED service rates within the Medicaid program, focusing specifically on beneficiaries diagnosed with respiratory or mental health conditions. This report leverages recent data and a nationwide scope by using comprehensive T-MSIS datasets. The findings in this report strengthen the existing evidence base, largely align with prior conclusions, and show that earlier, more limited findings are consistent with a nationwide analysis.

ASTHMA IN MEDICAID

Asthma is a chronic respiratory disease characterized by inflammation and narrowing of the airways, leading to recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing. Uncontrolled asthma can lead to frequent use of ED services and hospitalizations. Asthma is the third-leading cause of pediatric ED services resulting in hospitalization,[10] and disproportionately burdens the Medicaid population, where prevalence, ED use, and hospitalization rates are roughly double those seen in privately insured cohorts.[11]

[7] Centers for Medicare and Medicaid Services. (January 2026). January 2026 Medicaid & CHIP enrollment data highlights. Retrieved April 30, 2026, from https://www.medicaid.gov/medicaid/program-information/medicaid-and-chip-enrollment-data/report-highlights.

[8] KFF. (2026, March 12). Status of state Medicaid expansion decisions. Retrieved April 30, 2026, from https://www.kff.org/medicaid/status-of-state-medicaid-expansion-decisions.

[9] Khanna, R., Pace, P.F., Mahabaleshwarkar, R., Sankar Basak, R., Datar, M., & Banahan, B. (October 2012). Medication adherence among recipients with chronic diseases enrolled in a state Medicaid program. *Population Health Management*, 15(5), 253–60. Retrieved April 30, 2026, from https://journals.sagepub.com/doi/10.1089/pop.2011.0069.

[10] Pearson, W.S., Goates, S.A., Harrykissoon, S.D., & Miller, S.A. (2014, June 26). State-based Medicaid costs for pediatric asthma emergency department visits. *Preventing Chronic Disease*, 11. Retrieved April 30, 2026, from https://www.cdc.gov/pcd/issues/2014/14_0139.htm.

[11] Asthma and Allergy Foundation of America. (January 2025). Cost of asthma on society. Retrieved April 30, 2026, from https://aafa.org/advocacy/key-issues/access-to-health-care/cost-of-asthma-on-society.

Medications, particularly inhaled corticosteroids and other controller therapies, are central to controlling asthma. One study showed that Medicaid-covered children with asthma who had low adherence to controller medications were significantly more likely to experience emergency department services and hospitalizations compared to those with better adherence.[12] Complementing these findings, in an analysis of Medicaid claims data for beneficiaries with asthma, researchers found that individuals with higher adherence to rescue medications experienced significantly fewer ED and IP services compared to those with lower adherence.[13] Medicaid beneficiaries often experience greater underlying health risks compared to those with private insurance because of environmental factors and socioeconomic challenges, magnifying the consequences of sub-optimal pharmacotherapy.

MENTAL HEALTH IN MEDICAID

Medicaid is a major provider of care for individuals with mental health conditions. One-third of nonelderly adult Medicaid beneficiaries have some form of mental illness or substance use disorder.[14] Medicaid's coverage of psychiatric medications (e.g., antidepressants, antipsychotics, and mood stabilizers) is vital for this population. Medicaid is the largest source of funding for U.S. behavioral health services.[15] Notably, care for beneficiaries with mental health conditions contributes significantly to Medicaid expenditures. One analysis showed that average Medicaid spending for individuals with mental health conditions was two times that of other beneficiaries.[16] These higher costs are driven in part by hospitalizations and complex care needs. For example, psychiatric hospital services and crisis services can be frequent for beneficiaries with schizophrenia or bipolar disorder who are not adequately treated. Medications can help manage symptoms and reduce the need for such intensive services, highlighting the value of Medicaid's pharmacy benefit for mental health. Researchers found that adherence is shaped by beneficiary factors, the immediate care environment (family / caregivers and care team), and broader system and community contexts, and that higher adherence is associated with better clinical and social outcomes, stronger treatment commitment, and higher quality of care.[17]

[12] Rust, G., Zhang, S., & Reynolds, J. (September 2013). Inhaled corticosteroid adherence and emergency department utilization among Medicaid-enrolled children with asthma. *Journal of Asthma,* 50(7), 769–75. Available from https://pubmed.ncbi.nlm.nih.gov/23734973.

[13] Nittala, A., Nahmens, I., Ikuma, L., & Thomas, D. (November–December 2019). Effects of medication adherence on healthcare services use among asthma patients. *Journal of Healthcare Quality Research*, 34(6), 301–307. Retrieved April 30, 2026, from https://www.sciencedirect.com/science/article/abs/pii/S2603647919300971?via%3Dihub.

[14] Saunders, H., Euhus, R., Burns, A. & Rudowitz, R. (2025, February 21). 5 key facts about Medicaid coverage for adults with mental illness. KFF. Retrieved April 30, 2026, from https://www.kff.org/mental-health/issue-brief/5-key-facts-about-medicaid-coverage-for-adults-with-mental-illness.

[15] Medicaid and CHIP Payment and Access Commission. (n.d.) Behavioral health. Retrieved April 30, 2026, from https://www.macpac.gov/topic/behavioral-health.

[16] Saunders, H., Euhus, R., Burns, A. & Rudowitz, R. (2025, February 21). 5 key facts about Medicaid coverage for adults with mental illness. KFF. Retrieved April 30, 2026, from https://www.kff.org/mental-health/issue-brief/5-key-facts-about-medicaid-coverage-for-adults-with-mental-illness.

[17] Laranjeira, C. et al. (2023, February 22). Therapeutic adherence of people with mental disorders: An evolutionary concept analysis. International *Journal of Environmental Research and Public Health*, 20(5), 3869. Retrieved April 30, 2026, from https://www.mdpi.com/1660-4601/20/5/3869.

III. Results

An adherent beneficiary is defined as a beneficiary with above 80% PDC for a medication regimen for the analyzed condition within a calendar year. Figure 2 summarizes the percentage of beneficiaries by the following adherence category by condition:

1. Diagnosed and no medication utilization
2. Diagnosed and non-adherent
3. Diagnosed and adherent

Figure 2: Percentage of Medicaid beneficiary utilizers by adherence bucket

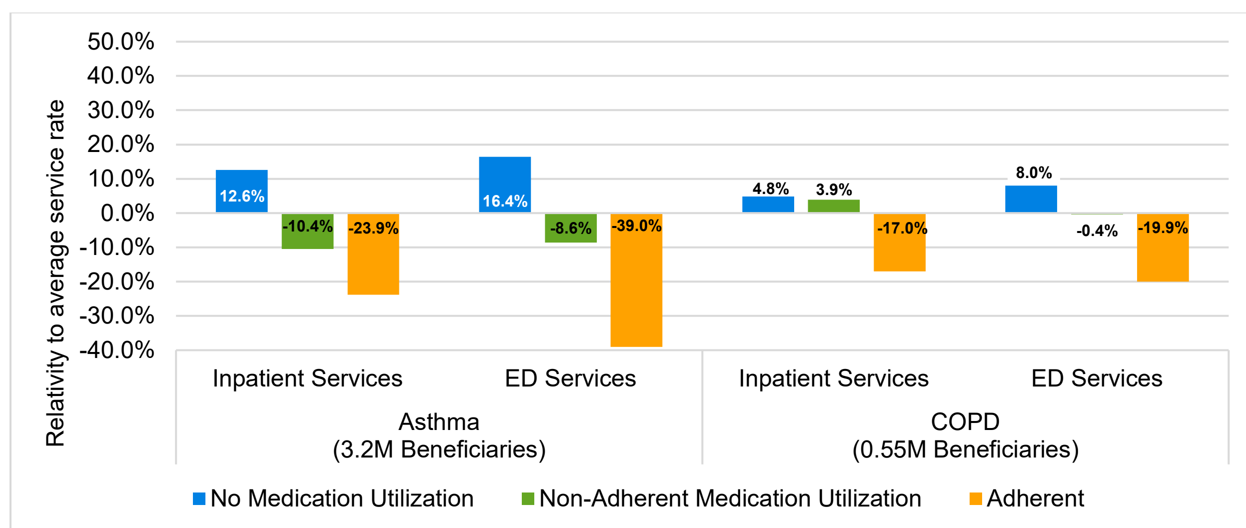
CATEGORY	CONDITION	NO MEDICATION UTILIZATION	NON-ADHERENT MEDICATION UTILIZATION	ADHERENT
Respiratory condition	Asthma	65.8%	24.1%	10.1%
Respiratory condition	COPD	57.8%	23.4%	18.7%
Mental health condition	Anxiety	48.6%	25.6%	25.8%
Mental health condition	Bipolar	37.9%	25.7%	36.3%
Mental health condition	Depression	48.4%	26.7%	24.9%
Mental health condition	Schizophrenia	24.4%	28.3%	47.3%

We observe that Medicaid beneficiaries with respiratory conditions have a lower rate of medication adherence compared to mental health conditions. Medication adherence within these conditions is low among the Medicaid population, with 10% of beneficiaries adherent if diagnosed with asthma and less than 50% of beneficiaries adherent across any of the conditions analyzed.

Figures 3 and 4 below summarize the relationship between medication adherence and IP and ED service rates for beneficiaries with a respiratory or mental health diagnosis.

The results compare the relativity in average service rate by adherence status to the aggregate average service rate among all Medicaid beneficiaries diagnosed for each condition.

Figure 3: Inpatient and emergency department relativity—respiratory conditions+



+ Service rate metrics are risk-adjusted using Chronic Illness and Disability Payment System (CDPS) + Rx.

As shown in Figure 3, IP and ED service rates for beneficiaries with respiratory conditions were lowest for adherent beneficiaries. As an example of how to interpret the data points in Figure 3, IP service rates for beneficiaries with asthma without medication utilization were 12.6% higher compared to the average beneficiary with asthma. The differential between adherent and other groups was largest for ED services, most notably for beneficiaries with asthma.

For beneficiaries with respiratory conditions, we observe the following:

- Beneficiaries with no medication use show higher-than-average service rates of both IP and ED services.
- Beneficiaries with asthma who have non-adherent medication utilization show lower-than-average IP (-10.4%) and ED service rates (-8.6%). However, their IP and ED service rates exceed those of adherent beneficiaries.
- Beneficiaries with COPD who have non-adherent medication patterns show higher-than-average IP service rates (+3.9%) and lower-than-average ED service rates (-0.4%), but higher service rates than adherent beneficiaries.
- Beneficiaries with asthma show the largest reduction to service rates for adherent beneficiaries relative to the average for both IP (-23.9%) and ED services (-39.0%).

Figure 4A: Inpatient relativity—mental health conditions+

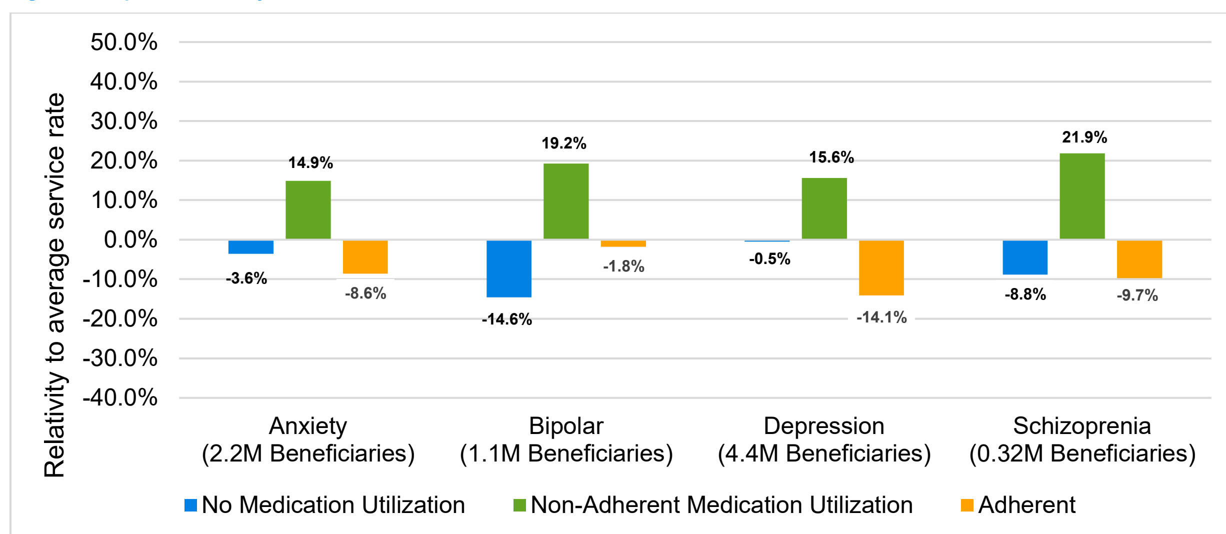
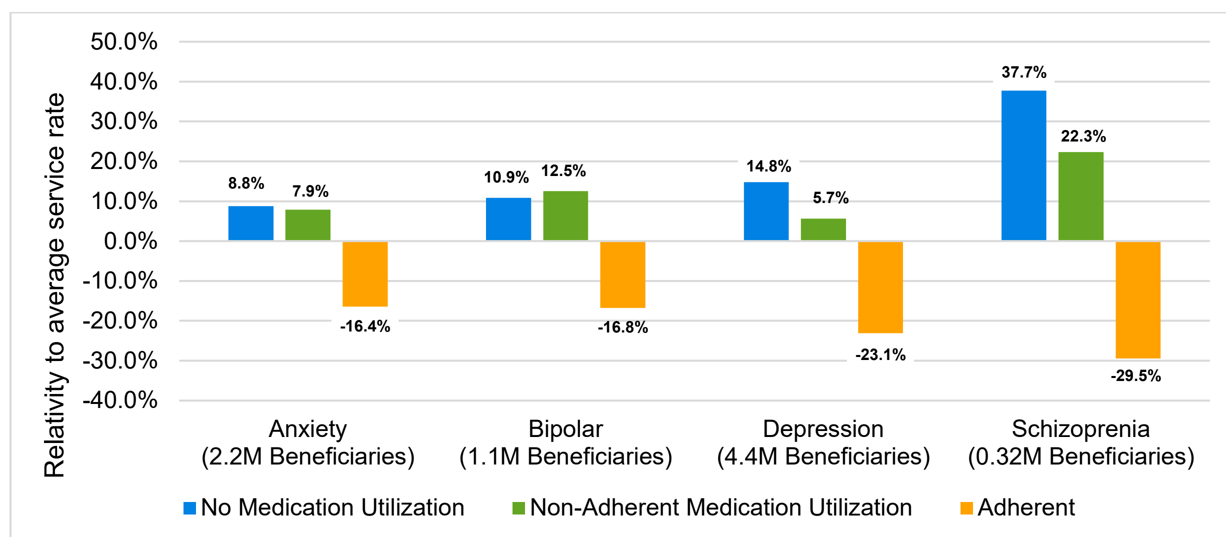


Figure 4B: Emergency department relativity—mental health conditions+



+ Service rate metrics are risk adjusted using Chronic Illness and Disability Payment System (CDPS) + Rx.

As shown in figures 4A and 4B above, IP and ED service rates were generally lowest among adherent beneficiaries with mental health conditions, except for IP services for those with bipolar disorder. Typically, the differential between adherent and other groups was largest for ED services, most notably for beneficiaries with schizophrenia.

For beneficiaries with mental health conditions, we observe the following:

- Beneficiaries with no medication use show higher-than-average ED service rates.
- Beneficiaries with no medication use show lower-than-average IP service rates, but higher service rates than adherent beneficiaries, for all conditions except for beneficiaries with bipolar disorder. This finding is contrary to expectations and may suggest that beneficiaries who do not use have less severe cases of these mental illnesses, with acute health issues that can be managed without hospitalization.
- Beneficiaries with non-adherent medication patterns show higher-than-average IP and ED service rates for all mental health conditions.
- Adherent beneficiaries with schizophrenia show the lowest relative ED service rates (-29.5%).
- Adherent beneficiaries with depression show the lowest relative IP service rates (-14.1%).

IV. Discussion

PATIENT ADHERENCE

Adherence functions as an upstream investment in health, where consistent use of prescribed medications can lead to better chronic condition management and reduce the likelihood of costly downstream events, such as ED services and hospitalizations, as shown in this analysis. These findings are observational and do not imply causality. Differences may reflect confounding factors (e.g., disease severity, access to care, socioeconomic barriers, or self-management). These lower relative acute care service rates among adherent beneficiaries not only improve individual outcomes but also help ease overall system strain and healthcare costs.[18,19]

Many factors can contribute to suboptimal adherence, including dose-skipping due to side effects, attempting to medication rationing, and inconsistent routines. Low adherence can reduce medication effectiveness by preventing patients from reaching therapeutic doses, potentially leading to suboptimal treatment. Medication discontinuation can lead to unmanaged conditions, undermining long-term outcomes and the efficient allocation of state resources. Numerous studies have shown that improved medication adherence may lead to better health outcomes and can reduce downstream utilization.[20,21] Poor adherence is associated with higher rates of potentially preventable hospitalizations, ED services, and other costly interventions that may be avoidable.

Across nearly all respiratory and mental health conditions analyzed, adherent beneficiaries have the lowest IP and ED service rates across beneficiaries with the same conditions. Differences in IP service rates among adherent beneficiaries are particularly pronounced for beneficiaries with COPD and beneficiaries with asthma when compared to the average rates of service within those conditions. ED service rate differences among adherent beneficiaries are particularly pronounced for beneficiaries with schizophrenia and asthma. We bifurcated the analysis based on Medicaid expansion status and risk level and found similar results for adherent beneficiaries relative to non-adherent beneficiaries and those not taking any medication for their condition.

ELIGIBILITY GROUP

Appendix A contains more granular results by condition and eligibility group. The differences in service rates among the various levels of adherence analyzed differ by eligibility group depending on condition:

- Nondisabled adults have the lowest IP and ED service rates for adherent beneficiaries compared to the various levels of adherence analyzed for all conditions.
- Nondisabled children with mental health conditions have the lowest ED service rates for adherent beneficiaries compared to the various levels of adherence analyzed, but the highest IP service rates. Nondisabled children with respiratory conditions have the lowest IP and ED service rates for adherent beneficiaries.
- The disabled eligibility group has the lowest IP and ED service rates for adherent beneficiaries compared to the various levels of adherence analyzed for all conditions, except for IP services for beneficiaries with schizophrenia and bipolar disorder.

The relationship between medication adherence and IP and ED service rates may differ among certain conditions and eligibility groups, such as children or severe mental illnesses like schizophrenia. Medication adherence may have a smaller impact on the rates of IP and ED services for these beneficiaries in the Medicaid population compared to other eligibility groups and conditions. For example, for pediatric Medicaid beneficiaries, especially those with chronic or complex conditions, caregiver capacity could play a key role. Even when medications are administered as prescribed, caregivers may seek the ED for reassurance or due to limited access to after-hours pediatric expertise. Alternatively, for beneficiaries with schizophrenia and other serious mental illnesses, behavioral crises can occur due to triggers like

[18] Lang, K., Korn, J., Muser, E., Choi, J.C., Abouzaid, S., & Menzin, J. (2011). Predictors of medication nonadherence and hospitalization in Medicaid patients with bipolar I disorder given long-acting or oral antipsychotics. *Journal of Medical Economics*, 14(2), 217–26. Retrieved April 30, 2026, from https://www.tandfonline.com/doi/full/10.3111/13696998.2011.562265#d1e170.

[19] Gilmer, T.P., Dolder, C.R., Lacro, J.P., Folsom, D.P., Lindamer, L., Garcia, P., & Jeste, D.V. (April 2004). Adherence to treatment with antipsychotic medication and health care costs among Medicaid beneficiaries with schizophrenia. *American Journal of Psychiatry*, 161(4), 692–9. Retrieved April 30, 2026, from https://psychiatryonline.org/doi/10.1176/appi.ajp.161.4.692.

[20] Sokol, M.C., McGuigan, K.A., Verbrugge, R.R., & Epstein, R.S. (June 2005). Impact of medication adherence on hospitalization risk and healthcare cost. *Medical Care*, 43(6), 521–30. Available from https://pubmed.ncbi.nlm.nih.gov/15908846.

[21] Khanna, R., Pace, P.F., Mahabaleshwarkar, R., Sankar Basak, R., Datar, M., & Banahan, B. (October 2012). Medication adherence among recipients with chronic diseases enrolled in a state Medicaid program. *Population Health Management*, 15(5), 253–60. Retrieved April 30, 2026, from https://journals.sagepub.com/doi/10.1089/pop.2011.0069.

stress, trauma, substance use, or lack of psychosocial support—factors that medication alone cannot address but that can result in use of IP or ED services.

Adherence and service rates among nondisabled children have greater variability compared to other eligibility groups and may be driven more by caregiver behavior. Caregivers act as the primary gatekeepers to care for children on Medicaid, making decisions about when, where, and whether to seek services based on their awareness of needs, satisfaction with providers or plans, and ability to navigate the system. Their own mental health, stress levels, and available time or resources can significantly shape patterns of utilization, influencing both access to preventive care and reliance on higher-cost IP and ED services.

RISK SCORE

Risk scores, which typically aggregate beneficiary characteristics, such as comorbidities, demographics, and prior health behaviors, could influence medication adherence. Beneficiaries with higher risk scores often have more complex medical regimens and greater disease burden. Conversely, beneficiaries with lower risk scores may have fewer obstacles. Therefore, we stratified the results by risk score to determine if the same relationships between service rate and medication adherence were consistent among different levels of risk scores.

When analyzing adherence rates across risk score groups, we generally observed consistent frequencies of adherence within each risk score cohort and condition combination. The widest spread between the percentage of adherent and non-adherent patients is typically in the lowest risk cohort (0-3.0), with the spread decreasing as risk score increases. While some conditions have higher rates of adherence at lower risk levels (e.g., schizophrenia), the pattern of higher adherence is consistent regardless of the risk level.

Generally, for mental health conditions, individuals with lower risk scores appear to have higher-than-average service rates when untreated, while individuals with higher risk scores appear to have lower-than-average service rates when untreated. There are many factors that could play into these dynamics, including socioeconomic status, access to care, health literacy, and complexity of treatment regimens.

Appendix B outlines adherence rates by condition and risk score grouping and the IP and ED service rate relativity by condition grouping (respiratory vs. mental health) and risk score grouping.

OVERLAPPING CONDITIONS

Since many of these conditions could overlap, we reviewed populations with overlapping conditions (e.g., ICD-10 codes indicating both asthma and COPD diagnoses, or multiple different mental health conditions) as a sensitivity test. We analyzed all overlapping conditions with sufficient beneficiary sample size. We reviewed the impact of overlapping conditions on the relationship of medication adherence and IP and ED service rates and noted similar results as the single conditions discussed above. IP and ED service rates were lowest for adherent beneficiaries with an overlapping condition combination of asthma and COPD and for beneficiaries with both depression and bipolar disorder. Typically, the differential between adherent and other groups was largest for ED services.

V. Methodology, assumptions, limitations

DATA SOURCE

This analysis utilized the Transformed Medicaid Statistical Information System (T-MSIS) Analytic Files (TAF) from the Centers for Medicare and Medicaid Services (CMS) as the primary data source. We relied on the TAF files for calendar years (CYs) 2021 and 2022. We reconciled our eligibility to totals reported by DQ Atlas;[22] this includes removing records missing valid eligibility records and removing beneficiaries with restricted benefits as identified by the restricted benefits code.[23] Once we reconciled to DQ Altas, we applied additional claims and eligibility exclusions specific to the analysis:

- We excluded institutionalized beneficiaries during all months of a long-term care stay.
- We excluded beneficiaries with limited Medicaid benefits identified under the restricted benefits code; this is above and beyond the deletion applied by DQ Atlas and additionally omitted beneficiaries in restricted benefits categories 4 and 5.
- We excluded beneficiaries outside the 50 U.S. states and Washington, D.C. This excluded approximately 1.3% of claims from U.S. territories or claims with a missing or invalid location for the submitting state.
- We excluded claims missing a State MSIS ID, as the claims data could not be linked to the beneficiary-level demographic or diagnosis information without this field. From initial data processing, less than 0.1% of claims were excluded.
- The analysis excluded dual eligible beneficiaries. Medicare is the primary payer for dual-eligible beneficiaries; thus, most of their healthcare costs are covered by Medicare rather than Medicaid.
- The time period (2021 and 2022) reflected continuous coverage and a higher volume of Medicaid beneficiaries during the federal public health emergency (PHE) due to COVID-19. The analysis limited the Medicaid population to only beneficiaries with 24 consecutive months of enrollment and with at least one medical or pharmacy claim in 2022. This was done to limit the impact of PHE-related non-utilizers who, in absence of the PHE, would not have been enrolled in Medicaid.

This analysis applied version 7.0 of the Chronic Illness and Disability Payment System plus Prescription Drug (CDPS+Rx) risk score model developed by The University of California San Diego (UCSD).[24] We applied the CDPS+Rx risk adjustment model concurrently; CY 2022 diagnoses and National Drug Code(NDCs) were used to assign CY 2022 risk scores. We assigned standard nationwide CDPS+Rx cost weights for each resulting CDPS+Rx demographic and chronic condition. This analysis assessed the medical risk associated with each beneficiary but did not assess the drug costs associated with those same beneficiaries. As a result, we applied the standard CDPS+Rx cost weights associated with medical costs only. These cost weights are specific to each beneficiaries' categorization as a Supplemental Security Income (SSI), nondisabled adult, or nondisabled child beneficiary.

State Medicaid agencies may face challenges reporting this data, including incomplete or inconsistent data collection processes, variations in state reporting practices, and data entry errors.[25] It should be noted that the demographic mix in this analysis could be skewed to the extent that the demographic mix of states with a larger proportion of missing data differs from the states with populated data. Additionally, due to data censoring for small cell counts, there may be challenges in fully understanding utilization patterns at a granular level. The removal or masking of data can introduce bias, especially if redaction disproportionately affects certain groups or regions. This can impact the accuracy and generalizability of research findings that rely on T-MSIS data. We include results based on all states regardless of concern level in order to minimize the introduction of bias from exclusions.

[22] Medicaid.gov. (n.d.) DQ Atlas. Retrieved April 30, 2026, from https://www.medicaid.gov/dq-atlas/welcome.
[23] Medicaid.gov. (2025, February 18). CMS guidance: Reporting restricted-benefits-code in the T-MSIS Eligible file. Retrieved April 30, 2026, from https://www.medicaid.gov/tmsis/dataguide/t-msis-coding-blog/cms-guidance-reporting-restricted-benefits-code-in-the-t-msis-eligible-file.
[24] Institute for Medicaid Innovation and University of California San Diego. (n.d.) Medicaid risk adjustment: Fact sheet. Retrieved April 30, 2026, from https://medicaidinnovation.org/wp-content/uploads/2023/04/CDPS_April_Fact-Sheet_FINAL.pdf.
[25] Saunders, H., & Chidambaram, P. (2022, April 28). Medicaid administrative data: Challenges with race, ethnicity, and other demographic variables. KFF. Retrieved April 30, 2026, from https://www.kff.org/medicaid/issue-brief/medicaid-administrative-data-challenges-with-race-ethnicity-and-other-demographic-variables.

MEMBER CONDITION AND MEDICATION IDENTIFICATION

The analysis includes about 9 million unique beneficiaries, of which 3.6 million had an asthma or COPD diagnosis and 6.2 million had a mental health diagnosis in 2021. Beneficiaries with multiple diagnosed conditions would be included in each respective condition in the table below.

Figure 5: Count of beneficiaries by condition*

<table>
<tr><th>CONDITION</th><th colspan="3">BENEFICIARIES (IN 1,000s)</th></tr>
<tr><td>Asthma</td><td>3,202</td><td rowspan="2">3,640</td><td rowspan="6">9,033</td></tr>
<tr><td>COPD</td><td>549</td></tr>
<tr><td>Anxiety</td><td>2,204</td><td rowspan="4">6,153</td></tr>
<tr><td>Bipolar</td><td>1,123</td></tr>
<tr><td>Depression</td><td>4,360</td></tr>
<tr><td>Schizophrenia</td><td>316</td></tr>
</table>

*A beneficiary may be diagnosed with one or more specific conditions, resulting in sums that are lower than the sum of each individual condition.

The analysis identified each condition using International Classification of Diseases (ICD-10) diagnosis codes in claims at any time in CY 2021 for nonlaboratory and nonradiology claims. Diagnosis codes are listed in Appendix C.1. We then determined whether the beneficiary had any corresponding medication fills related to these conditions and their adherence level to those medications in CY 2022. We relied on clinical treatment guidelines, clinical pharmacology, and relevant research literature to define what constituted appropriate medication therapy for these conditions. Please see Appendix C.2 for a list of drug classes considered by condition.

ADHERENCE DEFINITION

Adherence refers to the degree to which a beneficiary correctly takes their medication as prescribed by their provider. Participant adherence is typically calculated using the proportion of days covered (PDC) calculation.[26] As defined by the CDC, PDC is the number of days covered by a relevant prescription to their condition divided by the number of days during the measurement period.[27] According to industry standards, a beneficiary is deemed adherent if their PDC was at least 80%.[28] In this analysis, a beneficiary was considered adherent if their PDC rate reached at least 80% during CY 2022,[29] and a beneficiary was considered to use no medications if their PDC rate was less than or equal to 10%. The calculation was performed by measuring days of therapy rather than prescription count to account for extended fills. Additionally, days during which a beneficiary is known to be in an IP setting do not contribute toward the numerator or denominator of PDC calculations. In cases where a beneficiary takes multiple different clinically approved medications for a given condition throughout the year, we considered each medication as interchangeable and identified the beneficiary as adherent for the combined spans of each medication.

It is useful to categorize Medicaid beneficiaries by their level of adherence. This report considers three key cohorts related to medication adherence for each condition:

- Diagnosed but without a prescription medication regimen: These beneficiaries have a documented diagnosis in CY 2021 but filled no corresponding prescription medications in CY 2022 for the condition analyzed, reflected by a PDC of less than or equal to 10% over the measurement period. From a pharmacotherapy standpoint, these individuals are untreated for their condition, for example, an asthma beneficiary with no controller medication claims, or a beneficiary diagnosed with depression but not filling any antidepressant prescriptions. This group may include individuals who forego treatment due to various barriers, those with milder illnesses not deemed to need medication, or those with miscoded diagnosis code.
- Diagnosed and non-adherent: These beneficiaries have a documented diagnosis in CY 2021 and have at least one medication fill in CY 2022 for the condition analyzed but are not taking medications consistently, reflected by a PDC greater than 10% and less than 80% over the measurement period. For instance, an asthma beneficiary who fills one inhaler and uses it sporadically (covering less than 80% of days) or a beneficiary with schizophrenia

[26] CDC (May 2024), Pharmacy-Based Interventions to Improve Medication Adherence. Retrieved May 18, 2026 from https://www.cdc.gov/cardiovascular-resources/php/medication-adherence/index.html.
[27] Ibid.
[28] https://www.cdc.gov/cardiovascular-resources/php/medication-adherence/index.html
[29] https://www.cdc.gov/cardiovascular-resources/php/medication-adherence/index.html

who starts an antipsychotic but has frequent gaps in refills would fall into this category. Non-adherent beneficiaries demonstrate partial or sporadic use of medication, indicating difficulty in maintaining therapy.

- Diagnosed and adherent: These beneficiaries have a documented diagnosis in CY 2021 and are actively and consistently taking medications as prescribed for the condition analyzed, reflected by a PDC greater than or equal to 80% over the measurement period. These individuals generally obtain refills on time. For example, an asthma beneficiary who refills controller inhalers regularly or a bipolar beneficiary consistently refilling mood stabilizers both represent the ideal scenario for management of chronic conditions.

OTHER METHODOLOGICAL CONSIDERATIONS

Filling a prescription does not guarantee the beneficiary took the medication. Our “adherent” group could include beneficiaries who pick up refills but do not consume all doses, and our “non-adherent” group could include those who took some medication but had circumstances that made refills unnecessary (thus appearing non-adherent in claims). Additionally, not every beneficiary can tolerate medications, and not every non-adherent case is due to system failure. Some beneficiaries have legitimate reasons for stopping a medication (e.g., intolerable side effects or pregnancy as a contraindication). The analysis assumed that diagnoses like asthma, bipolar, and schizophrenia generally warrant medication, which is supported by guidelines, but acknowledge there are exceptions and personal treatment preferences.

The “no medication utilization” cohort may include individuals with milder illnesses not deemed to need any medication or regular maintenance treatment. These individuals are likely to have lower severity of illness than others with the same diagnosis but with prescribed maintenance medications, and therefore the service rate relativities may be understated in this cohort compared to if this analysis excluded these individuals. The results compare the relativity in average service rate by adherence status to the aggregate average service rate within each condition. The magnitude of the relativity is dependent on the proportion of people in each cohort and would not be translatable to populations with different characteristics.

The significant heterogeneity across state Medicaid programs—in terms of eligibility rules, benefits covered, utilization management strategies, provider payment rates, and population demographics—combined with varying data quality makes national aggregation complex. National averages derived from public summaries can mask critical state-level differences and may not be representative of any single state's experience.

The analysis did not dive into each state’s Medicaid pharmacy policies (including managed care pharmacy benefits, formularies, prior authorization rules, and adherence support programs). There is variation—some states have implemented medication therapy management programs or have strict prior authorization that might inadvertently cause gaps. These factors could influence adherence rates and outcomes.

The analyses presented are largely based on observational studies, establishing correlations between adherence and utilization, but cannot definitively prove causation. Unmeasured confounding factors may influence the observed relationships. The data currently cover at most 12 months of observations. Therefore, our analysis can speak about short-term adherence but any extrapolation to long-term outcomes cannot be made. Future case studies could consider the impact of costs of care and include an avoided waste calculation.

VI. Caveats, limitations, and qualifications

This report was commissioned by PhRMA to analyze the relationship between medication adherence and IP and ED service rates within Medicaid, focusing specifically on beneficiaries diagnosed with asthma / COPD and mental health conditions: depression, bipolar disorder, and schizophrenia.

This study may not be appropriate for and should not be used for other purposes. This work has been prepared for PhRMA to share with third-party stakeholders. We do not intend this information to benefit or create a legal liability to any third party, even if we permit the distribution of our work product to such third party. The information in this report is technical in nature, and no party should rely on this information without conducting a thorough review, having expert understanding of the assumptions and methodology of the study.

Milliman has developed certain models to estimate the values included in this report. The intent of the models was to analyze the relationship between medication adherence and IP and ED service rates within Medicaid, focusing specifically on beneficiaries diagnosed with asthma / COPD and mental health conditions: depression, bipolar disorder, and schizophrenia. These findings are observational and do not imply causality. Differences may reflect confounding factors (e.g., disease severity, access to care, socioeconomic barriers, or self-management). We have reviewed the models, including their inputs, calculations, and outputs, for consistency, reasonableness, and appropriateness to the intended purpose and in compliance with generally accepted actuarial practice and relevant actuarial standards of practice (ASOP).

The models rely on data and information as input to the models. We have relied upon certain data and publicly available information and the T-MSIS TAF datasets from CMS for this purpose and accepted it without audit, though we reviewed for reasonability. To the extent that the data and information provided is not accurate, or is not complete, the values provided in this report may likewise be inaccurate or incomplete. The models, including all input, calculations, and output, may not be appropriate for any other purpose. Actual results will certainly vary for specific stakeholders due to differences in demographics, trends, discount arrangements, formulary, utilization patterns, and rebate arrangements, among other factors.

Differences between the projected utilization and actual experience will depend on the extent to which future experience conforms to the assumptions made in the development calculations. It is certain that actual experience will not conform exactly to the assumptions used. Actual amounts will differ from projected amounts to the extent that actual experience is higher or lower than expected.

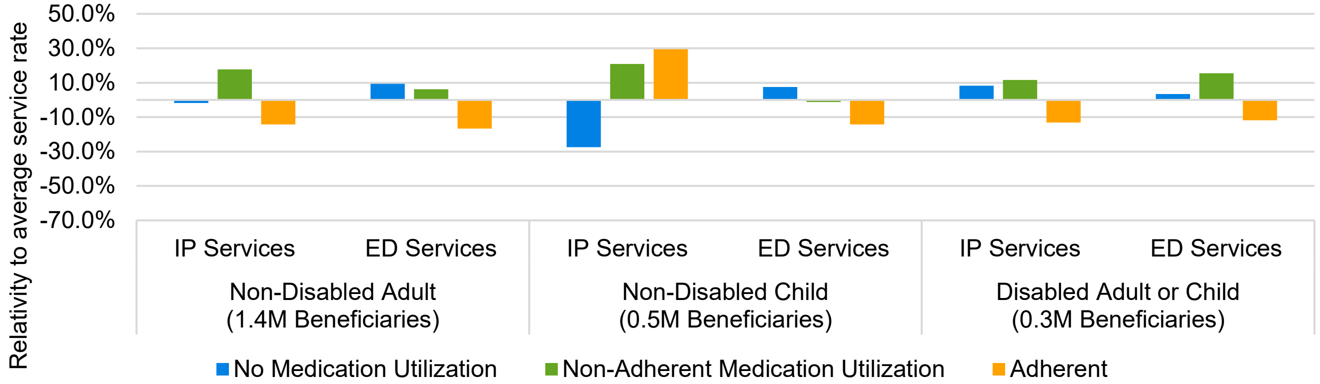
Jake Klaisner, Briana Botros, and Ryan LeRoy are actuaries for Milliman, members of the American Academy of Actuaries, and meet the qualification standards of the Academy to render the actuarial opinion contained herein. To the best of their knowledge and belief, this information is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. This report outlines the review and opinions of the authors and not necessarily those of Milliman. Milliman does not endorse any public policy or advocacy position on matters discussed in this report.

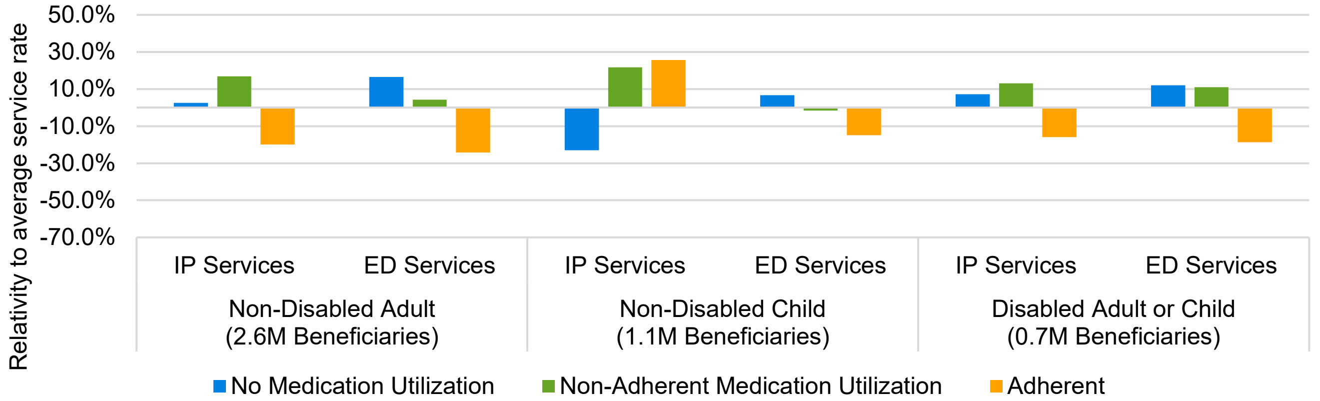
APPENDICES

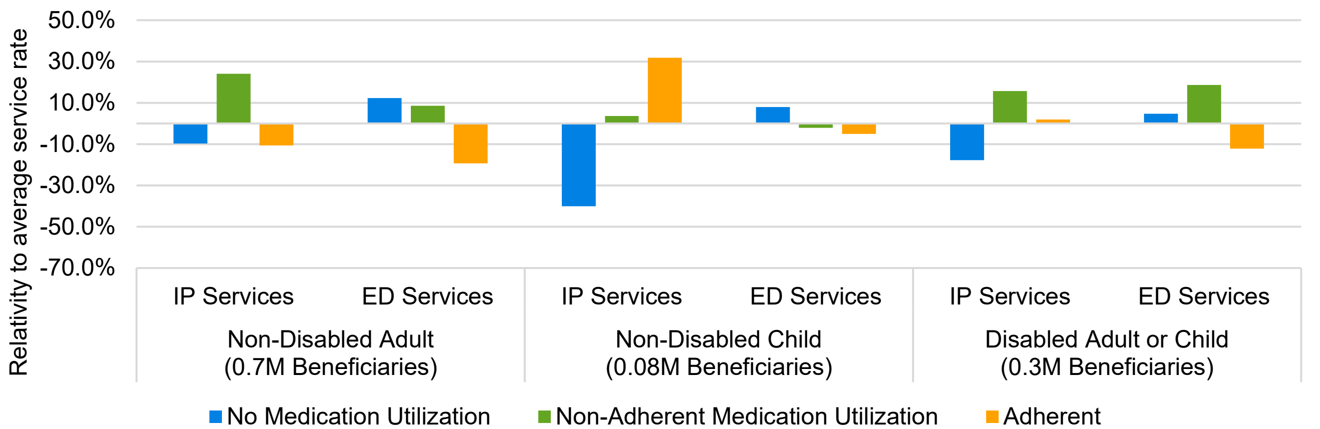
APPENDIX A:

INPATIENT AND EMERGENCY DEPARTMENT RELATIVITY BY CONDITION AND ELIGIBILITY GROUP

Note: Disability status is defined based on the Medicaid eligibility pathway.

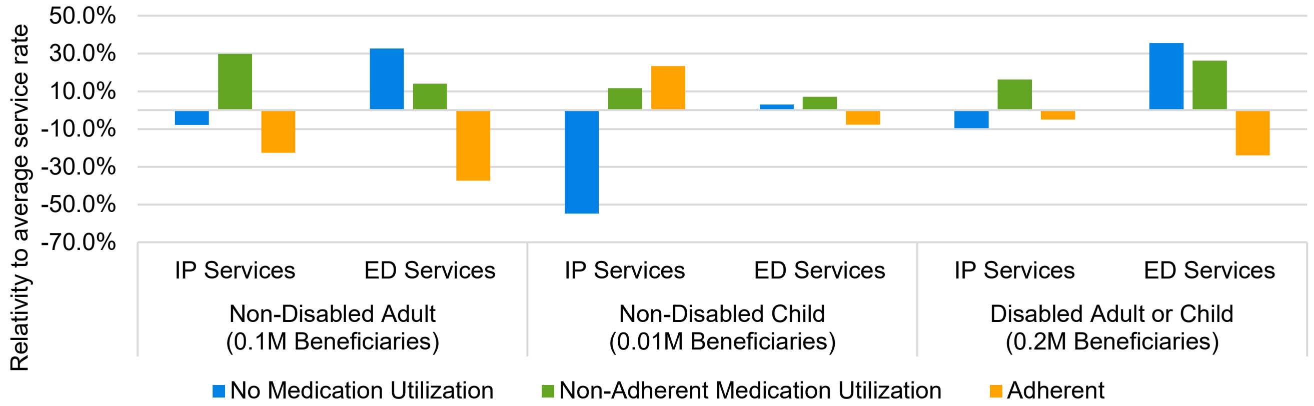


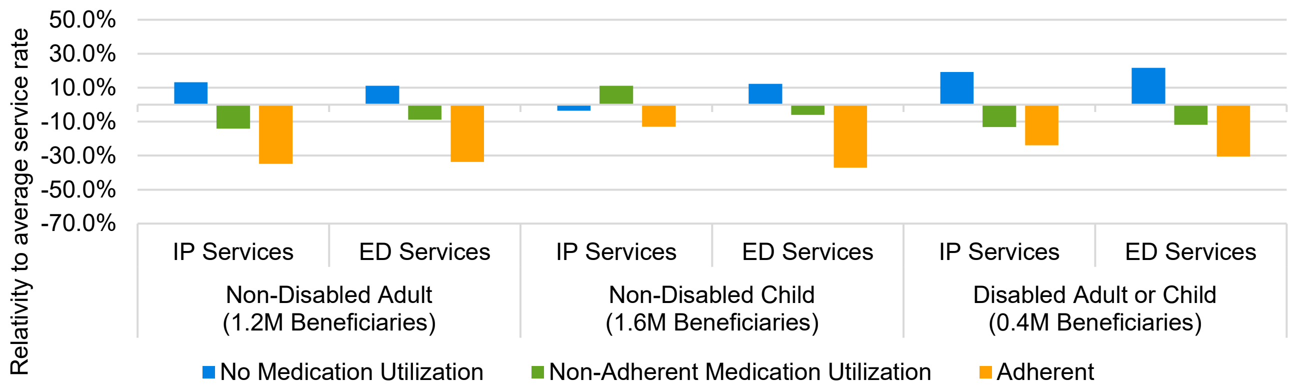


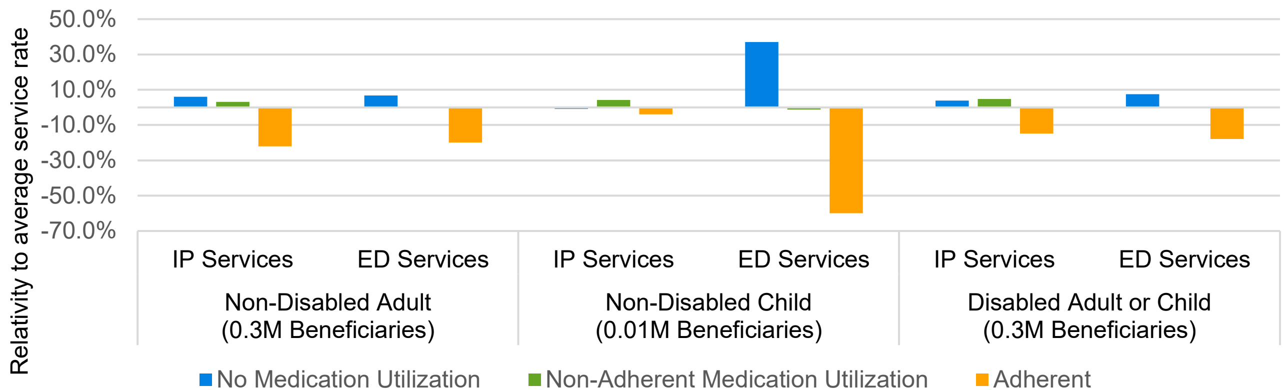


APPENDIX A:

INPATIENT AND EMERGENCY DEPARTMENT RELATIVITY BY CONDITION AND ELIGIBILITY GROUP

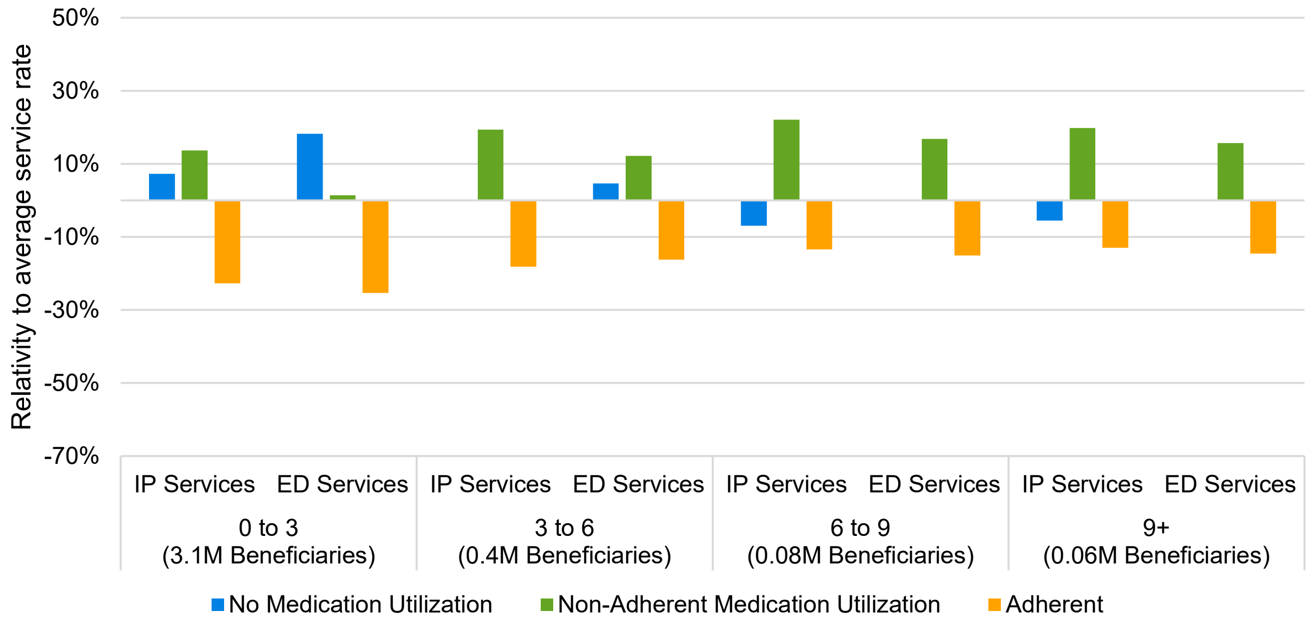


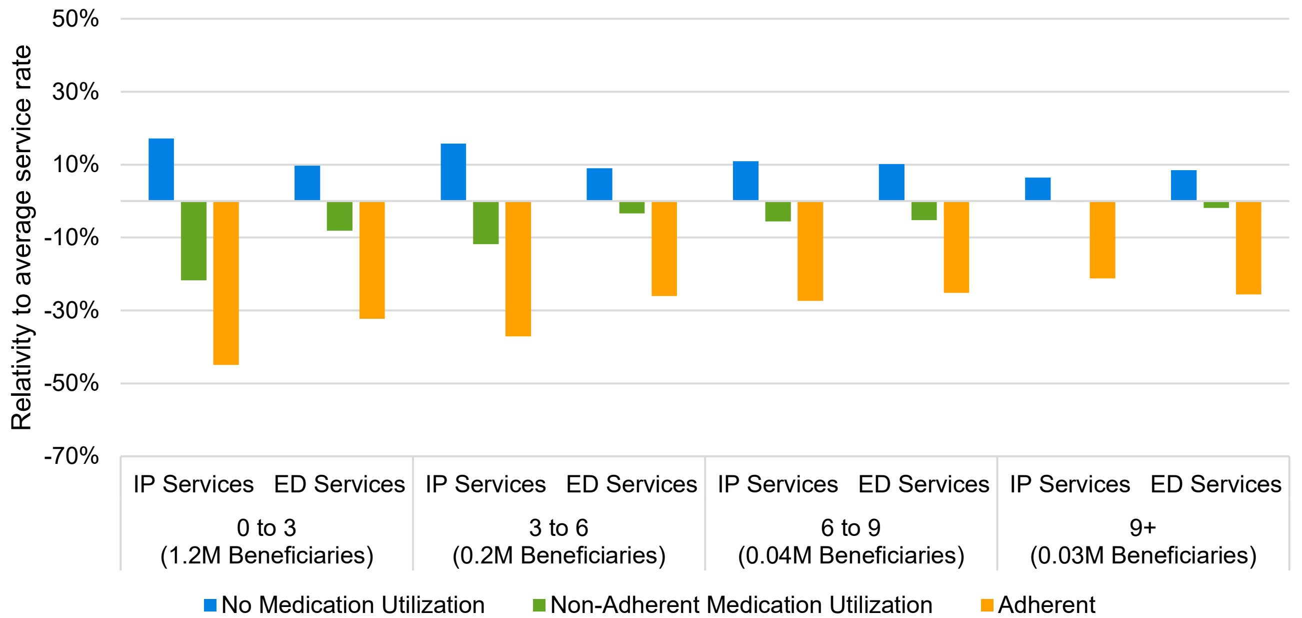




APPENDIX B.1:

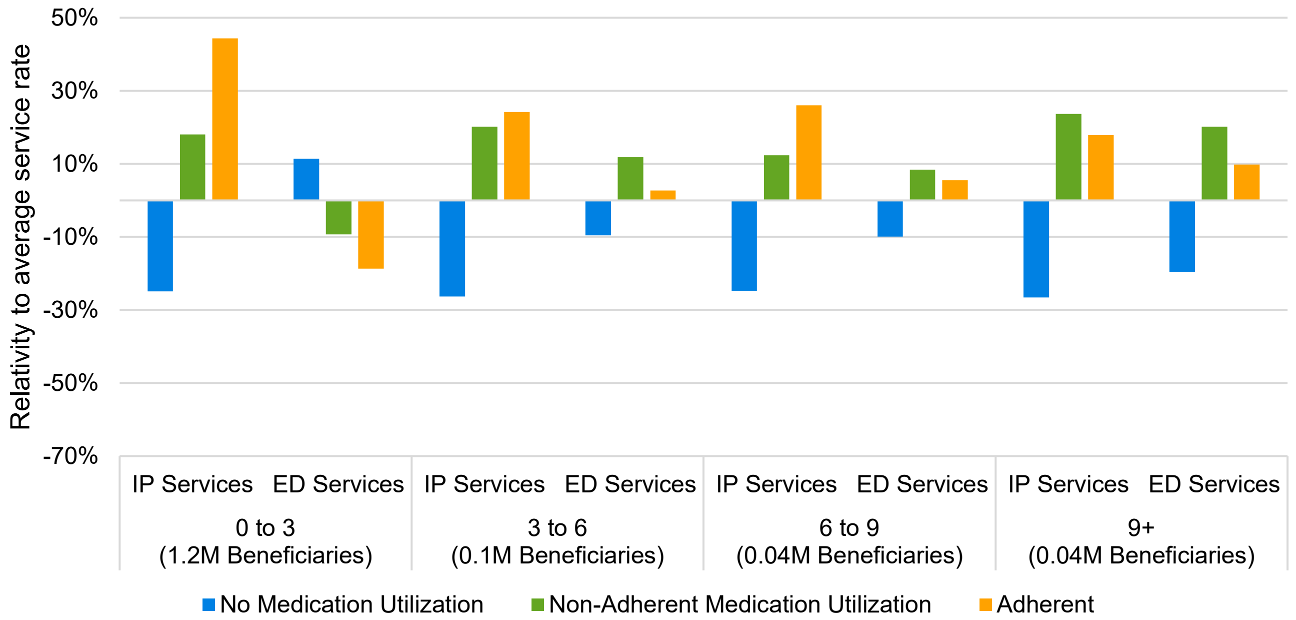
INPATIENT AND EMERGENCY DEPARTMENT RELATIVITY BY CONDITION AND RISK SCORE GROUP—ADULT

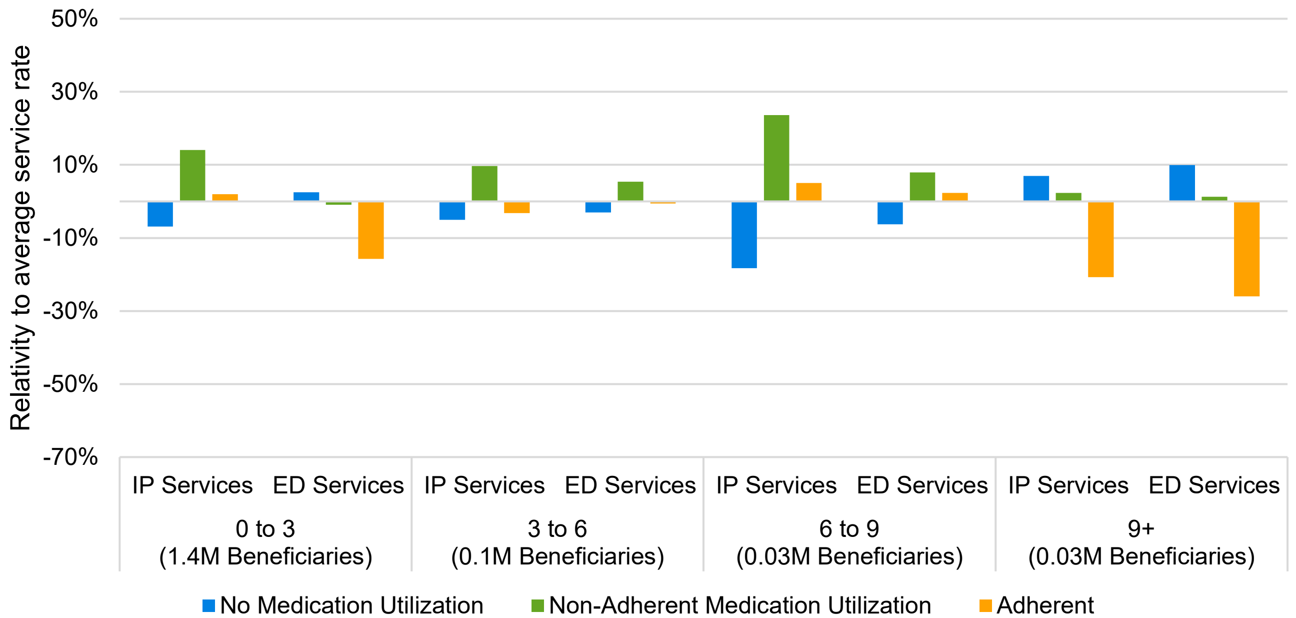




APPENDIX B.2:

INPATIENT AND EMERGENCY DEPARTMENT RELATIVITY BY CONDITION AND RISK SCORE GROUP—CHILD

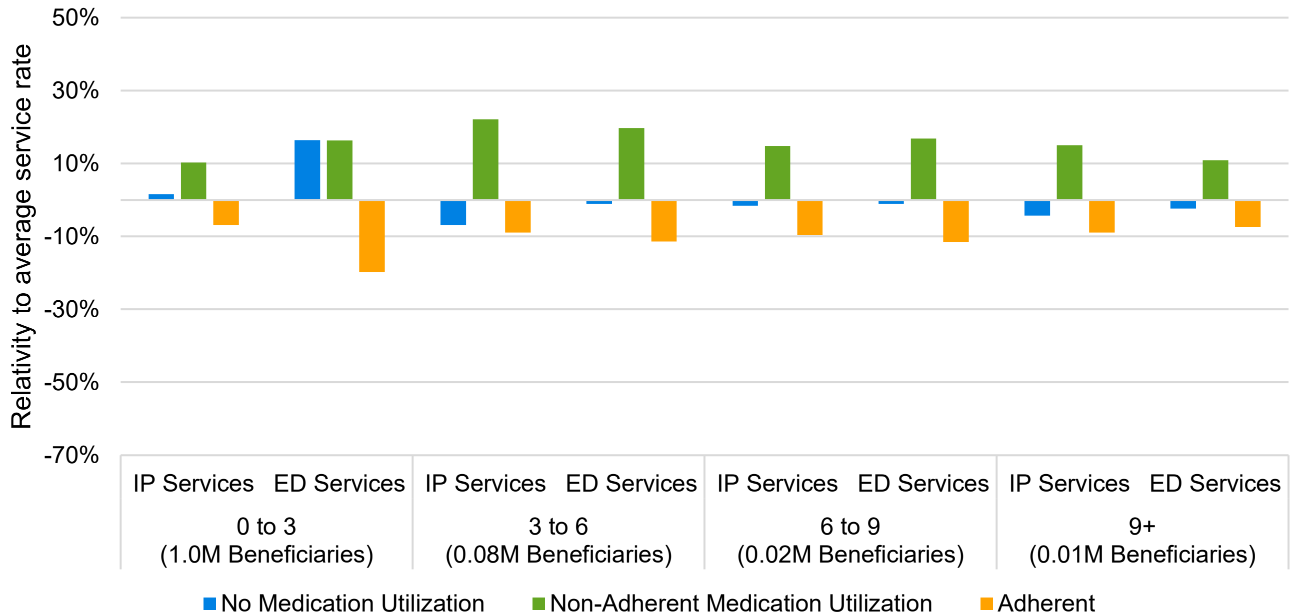


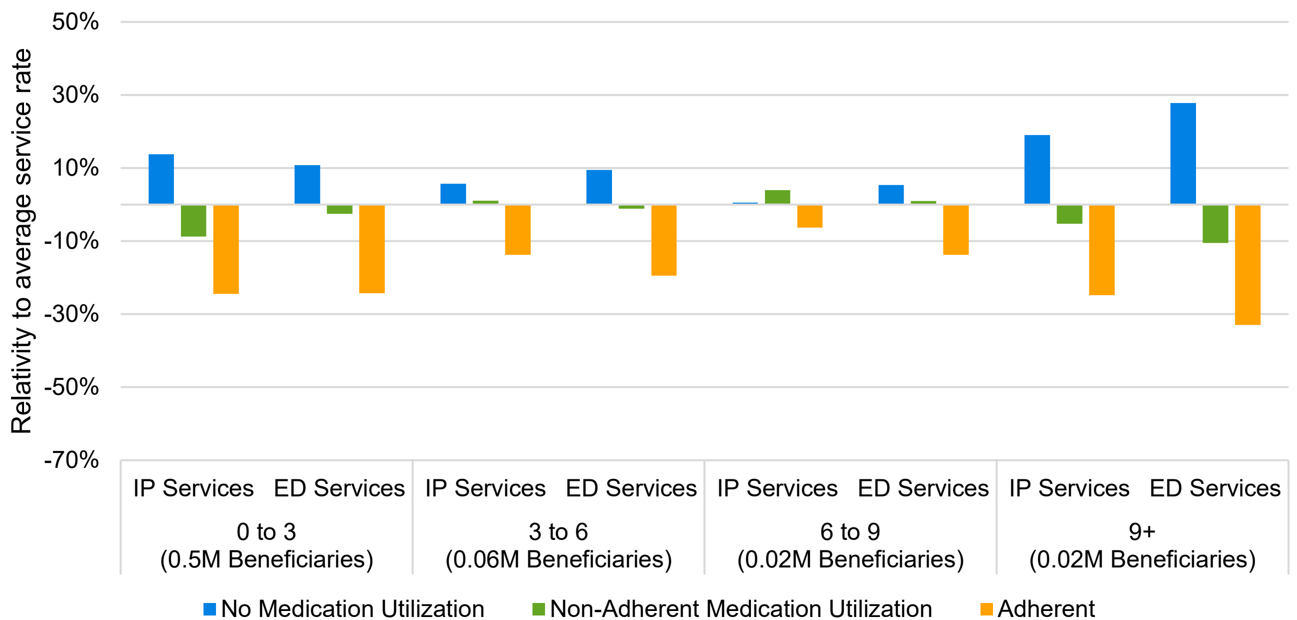


APPENDIX B.3:

INPATIENT AND EMERGENCY DEPARTMENT RELATIVITY BY CONDITION AND RISK SCORE GROUP—DISABLED

Note: Disability status is defined based on the Medicaid eligibility pathway.

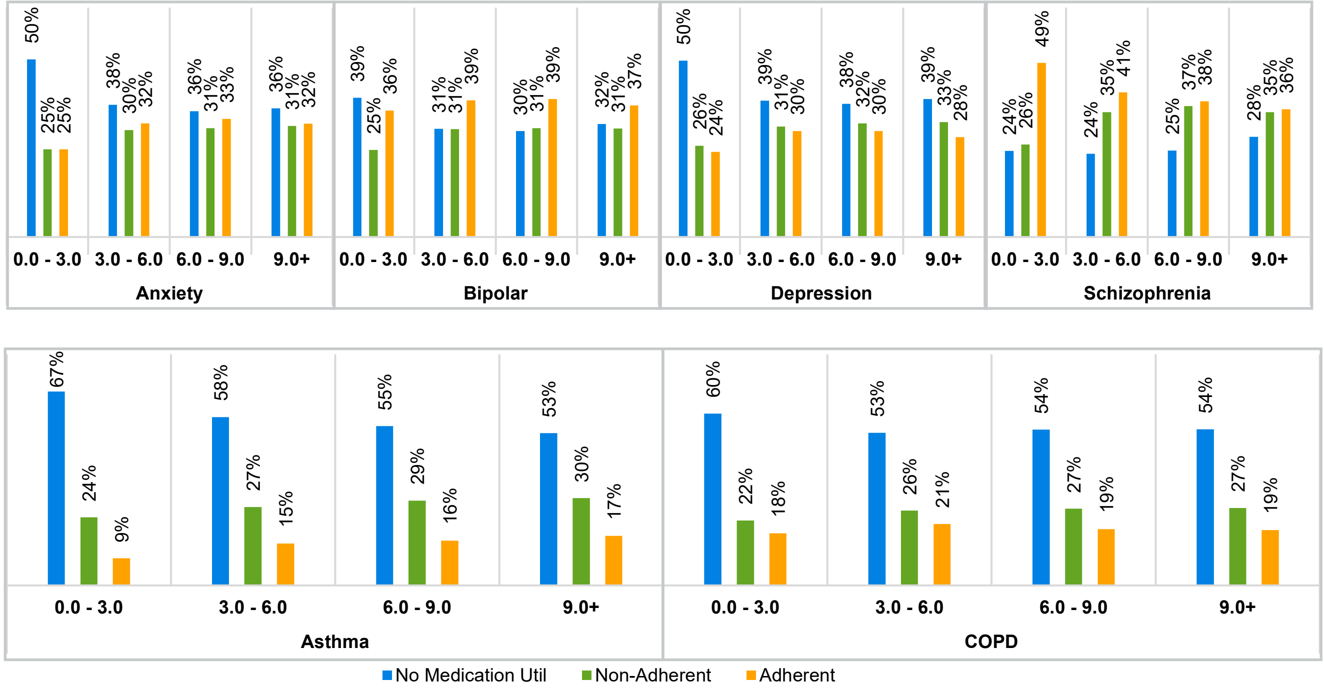




APPENDIX B.4:

ADHERENCE RATES BY CONDITION AND RISK SCORE GROUPING

Note: These values are risk scores, where 1.0 represents the costs of an average Medicaid beneficiary.



APPENDIX C.1:

CONDITION DIAGNOSIS CODES

CONDITION	PARENT AND SPECIFIC ICD-10 CODES[1]	ICD-10 DESCRIPTION
Anxiety	F41.1	Generalized anxiety disorder
Asthma	J45*	Asthma
Bipolar	F30*	Manic episode
Bipolar	F31*	Bipolar disorder
COPD	J44*	Chronic obstructive pulmonary disease, unspecified
Depression[2]	F32*	Depressive episode
Depression	F33*	Major depressive disorder, recurrent
Depression	F34*	Persistent mood [affective] disorders
Schizophrenia	F20*	Schizophrenia

[1] Parent codes are marked with an asterisk (*). Parent codes include specific ICD-10 codes that were used to capture the condition, unless otherwise noted.
[2] Exclude F3281.

APPENDIX C.2:

DRUG CLASSES CONSIDERED FOR PDC ANALYSIS BY CONDITION

CONDITION	DRUG THERAPY CLASS
Anxiety	Antianxiety Agents - Misc.
Anxiety	Anticonvulsants - Misc.
Anxiety	Benzodiazepines
Anxiety	Phenothiazines
Anxiety	Postherpetic Neuralgia (PHN) / Neuropathic Pain Agents
Anxiety	Selective Serotonin Reuptake Inhibitors (SSRIs)
Anxiety	Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs)
Asthma	Antiasthmatic - Monoclonal Antibodies
Asthma	Bronchodilators - Anticholinergics
Asthma	Eczema Agents
Asthma	Leukotriene Modulators
Asthma	Steroid Inhalants
Asthma	Sympathomimetics
Bipolar	Anticonvulsants - Misc.
Bipolar	Antimanic Agents
Bipolar	Antipsychotics - Misc.
Bipolar	Benzisoxazoles
Bipolar	Butyrophenones
Bipolar	Combination Psychotherapeutics
Bipolar	Dibenzapines
Bipolar	Quinolinone Derivatives
Bipolar	Valproic Acid
Depression	Alpha-2 Receptor Antagonists (Tetracyclics)
Depression	Antidepressant Combinations
Depression	Antidepressants - Misc.
Depression	Bulk Chemicals - D's
Depression	Combination Psychotherapeutics
Depression	N-Methyl-D-aspartic acid (NMDA) Receptor Antagonists
Depression	Selective Serotonin Reuptake Inhibitors (SSRIs)
Depression	Serotonin Modulators
Depression	Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs)
Depression	Tricyclic Agents
Schizophrenia	Antiparkinson Dopaminergics
Schizophrenia	Antipsychotics - Misc.
Schizophrenia	Benzisoxazoles
Schizophrenia	Butyrophenones
Schizophrenia	Combination Psychotherapeutics
Schizophrenia	Dibenzapines
Schizophrenia	Dihydroindolones
Schizophrenia	Phenothiazines
Schizophrenia	Quinolinone Derivatives
Schizophrenia	Thioxanthenes

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