Research Square

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GLP-1 Receptor Agonist Utilization for Obesity Among Medicaid Beneficiaries in Rural vs. Urban U.S. States, 2020–2024

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Abstract

Background

GLP-1 receptor agonists, including Semaglutide and Tirzepatide, have transformed obesity pharmacotherapy, demonstrating substantial weight reduction in randomized trials. Rural populations experience higher obesity prevalence, limited specialty care access, and structural barriers to treatment that may widen disparities. We evaluated trends in Medicaid-funded GLP-1 anti-obesity prescribing across rural, urban, and mixed states from 2020 to 2024.

Methods

We conducted a retrospective study using Medicaid State Drug Utilization Data (SDUD) and quarterly enrollment data (MBES). Obesity-indicated GLP-1 agents (Wegovy, Saxenda, Zepbound) were identified by product name; diabetes formulations were excluded. Prescriptions per 1,000 enrollees were calculated using quarterly state denominators. States were classified as rural, urban, or mixed using USDA Rural-Urban Continuum Codes and U.S. Census criteria. Descriptive statistics, percent change calculations, and year-to-year comparisons were used to analyze trends. Outcomes included quarterly prescribing rates and Medicaid reimbursement.

Results

GLP-1 anti-obesity prescribing increased substantially across all groups. Rural states rose from 0.022 to 0.747 prescriptions per 1,000 enrollees (3,346% increase); urban states from 0.030 to 0.845 (2,724%); and mixed states from 0.049 to 1.331 (2,598%). Medicaid reimbursement grew from $0.1M to $27.6M in rural states, $7.8M to $928.9M in urban states, and $19.2M to $2,135.1M in mixed states. Despite the highest proportional growth, rural states accounted for only 0.74% of total national GLP-1 anti-obesity prescriptions.

Conclusions

While GLP-1 utilization rose sharply across all groups, rural Medicaid beneficiaries remained markedly underserved in absolute terms. Policy interventions addressing formulary coverage, prescriber availability, and pharmacy access are urgently needed to reduce these disparities.

1. Introduction

Obesity has become a major public health crisis worldwide and a significant risk factor for cardiovascular health diseases, diabetes, and other chronic diseases [1]. Over 40% of adults in the United States are obese [1], with projections reaching up to 50% by 2030 [2]. As obesity rates continue to rise,

policymakers and clinicians have increasingly focused on addressing its multifactorial drivers, allowing pharmacotherapy to emerge as a key component of evidence-based management.

Among the most promising pharmacotherapeutic interventions are glucagon-like peptide-1 (GLP-1) agonists, which have largely changed the management approaches for obesity. GLP-1 agonists such as Semaglutide, Liraglutide and Tirzepatide act by mimicking the incretin hormone GLP-1, thereby enhancing insulin secretion, reducing appetite, delaying gastric emptying, and ultimately promoting weight loss in individuals with obesity [3]. These medications have been demonstrated to achieve weight loss of up to 15–20%, reduce cardiovascular morbidity and mortality, improve glycemic control and halt the transition from pre-diabetes to diabetes [4, 5]; thereby repositioning obesity treatment from a largely behavioral and often low-efficacy model toward a more effective chronic disease management model.

Despite their proven therapeutic efficacy, the adoption and utilization of GLP-1 agonists for obesity management in the U.S. are influenced by a complex mix of economic, regulatory, healthcare system, and sociodemographic factors. Between 2020 and 2024, evidence indicates that their use remains substantially below expected clinical need, with fewer than 3% of eligible U.S. adults receiving these medications within that period, alongside marked disparities across race, income, and geographic location particularly between patients in rural areas and states compared to their urban counterparts [6–10].

Rural areas in the United States, broadly defined as regions outside major metropolitan centers [11], often experience higher obesity prevalence, limited access to specialty care, higher out-of-pocket costs for prescriptions, longer travel distances to care, and fewer pharmacies with comprehensive formularies [11–15]. A cohort study [9] examining GLP-1 reception among patients living with obesity and obstructive sleep apnea revealed that individuals in rural areas had lower chances of receiving GLP-1 agonists compared to those in urban areas after adjusting for confounding factors. These challenges may widen disparities in the use of effective anti-obesity medications, further exacerbating health inequities among these populations.

Medicaid, jointly funded by the federal and state governments, is the public health insurance program and has an important role in financing care for eligible low-income adults, children, pregnant persons, older adults, people with disabilities, and people from racial and ethnic minority groups [16, 17]. Medicare and Medicaid pay for nearly half of the direct medical costs of overweight and obesity [18]. Medicaid beneficiaries have a disproportionately high burden of obesity and related conditions, yet, paradoxically, they often encounter significant barriers to accessing newer, costlier medications, including GLP-1 agonists [19]. The insurance coverage of GLP-1 agonists for obesity treatment remains highly variable across the U.S. with current reports indicating that only 13 states have Medicaid programs that formally cover GLP-1s for obesity treatment, while the majority exclude them from formularies, even as the total number of anti-obesity medications prescriptions among all Medicaid recipients has surged [20–23], with a 6,674% increase in prescription between 1993 and 2003 [22].

Despite the clinical promise of GLP-1 agonists, there is an important gap regarding how these therapies are utilized among Medicaid beneficiaries across rural and urban contexts in the U.S. The Medicaid population uniquely intersects high chronic disease burden with socioeconomic vulnerabilities, making it essential to understand not only how many beneficiaries receive GLP-1 therapy, but who is left behind and why.

This study aims to address this gap by assessing the utilization of GLP-1 agonists for obesity treatment among Medicaid beneficiaries in rural, urban, and mixed states from 2020 to 2024 and also examine trends in prescribing patterns and the factors influencing access to these treatments. It is expected that the findings will highlight the disparities faced by rural populations in accessing effective obesity treatments and provide evidence that can guide policy recommendations to address these disparities and ultimately improve the availability and affordability of GLP-1 agonists and ensure that all patients have equal access to this life-changing therapy.

2. Methods

2.1. Study Design and Data Sources

We conducted a retrospective longitudinal ecological study examining trends in Medicaid-funded glucagon-like peptide-1 (GLP-1) receptor agonist utilization for obesity treatment across U.S. states from January 2020 through December 2024. Prescription utilization data were obtained from the Centers for Medicare & Medicaid Services (CMS) Medicaid State Drug Utilization Data (SDUD) database, a publicly available national administrative dataset containing outpatient Medicaid pharmacy claims aggregated at the state-quarter level [24]. Quarterly Medicaid enrollment data were obtained from the Medicaid Budget and Expenditure System (MBES) enrollment reports published by CMS [25]. Enrollment denominators were used to standardize prescribing rates across states with differing Medicaid population sizes. Because the study used publicly available, deidentified aggregate data, institutional review board approval was not required.

2.2. Identification of GLP-1 Anti-Obesity Medications

GLP-1 receptor agonists approved for obesity management during the study period were identified using product names within SDUD. Included medications were Semaglutide (Wegovy), Liraglutide (Saxenda), and Tirzepatide (Zepbound) [26, 27]. Semaglutide (Wegovy) entered the dataset following FDA approval for obesity in 2021, while Tirzepatide (Zepbound) entered following FDA approval in late 2023. Quarterly prescription counts, National Drug Codes (NDCs), and reimbursement amounts associated with these formulations were extracted. Diabetes-indicated GLP-1 formulations, including Ozempic, Trulicity, Victoza, and Mounjaro, were excluded to improve specificity for obesity-directed prescribing. However, because SDUD does not contain patient-level diagnostic or indication data, some off-label use of diabetes formulations for obesity could not be captured.

2.3. Variables and Outcome Measures

The primary outcome was quarterly GLP-1 anti-obesity prescriptions per 1,000 Medicaid enrollees. Prescription rates were calculated by dividing quarterly prescription counts by quarterly Medicaid enrollment and multiplying by 1,000. Secondary outcomes included total quarterly prescription counts, quarterly Medicaid reimbursement amounts, relative percentage growth in prescribing over time, and comparisons of prescribing trends across rurality groups. Prescription counts and reimbursement amounts were aggregated at the state-quarter level.

2.4. State Rurality Classification

Because SDUD is available only at the state level, rurality classification was adapted from county-level rurality frameworks developed by the United States Department of Agriculture (USDA) Rural-Urban Continuum Codes and U.S. Census urban-rural definitions [28, 29]. States were categorized into rural, urban, or mixed groups based on overall population distribution and rurality characteristics. Rural states were defined as predominantly non-metropolitan states, urban states as predominantly metropolitan states, and mixed states as those with substantial rural and metropolitan population heterogeneity. This simplified classification was based on overall population distribution rather than formal quantitative thresholds. States were classified as rural, urban, or mixed using an ecological framework adapted from USDA Rural-Urban Continuum Codes and U.S. Census urban-rural definitions. States with predominantly metropolitan population distributions were classified as urban, states with predominantly nonmetropolitan population distributions were classified as rural, and states with substantial representation of both metropolitan and nonmetropolitan populations were classified as mixed. Classification was based on statewide population distribution patterns and rurality characteristics rather than prespecified quantitative thresholds. State classifications are provided in Supplementary Table 1, and the classification framework is illustrated in Fig. 3.

2.5. Data Cleaning and Processing

Data cleaning, analysis, and visualization were performed using Python version 3.12 with the pandas and matplotlib libraries. Annual SDUD files from 2020 through 2024 were imported and filtered for obesity-indicated GLP-1 products using product names and NDC identifiers. Quarterly Medicaid enrollment files were merged with SDUD prescription data using state and quarter identifiers. State-quarter observations with missing enrollment denominators or incomplete prescription data were excluded from rate calculations.

2.6. Statistical Analysis

Descriptive statistics were used to summarize prescribing trends and reimbursement patterns across rural, urban, and mixed state groups. Prescription utilization was reported as prescriptions per 1,000 Medicaid enrollees. Relative percentage growth from 2020 to 2024 was calculated for each rurality category. Aggregate prescription counts and reimbursement totals were compared across groups. Given the ecological design and use of aggregate administrative data, formal significance testing was not performed, as the unit of analysis was the state-quarter rather than the individual patient. Similar

geographic analyses of GLP-1 prescribing patterns using aggregated regional data have been described previously [30].

3. Results

3.1. Overall Prescribing Trends

From 2020 through 2024, Medicaid-funded GLP-1 anti-obesity prescribing increased substantially across all rurality groups. A total of 4,036,751 obesity-directed GLP-1 prescriptions were identified during the study period across the 50 states and the District of Columbia. Mixed states accounted for the largest share of prescriptions by rurality group, followed by urban jurisdictions, while rural states represented only 0.74% of total national GLP-1 anti-obesity prescriptions. Quarterly prescribing rates increased progressively over the study period, with the most pronounced acceleration observed after 2022 and continuing through 2024 (Fig. 1).

3.2. Rural, Urban, and Mixed State Comparisons

Mean quarterly prescribing rates increased across all rurality categories between 2020 and 2024 (Table 1). Rural states increased from a mean quarterly rate of 0.022 prescriptions per 1,000 Medicaid enrollees in 2020 to 0.747 per 1,000 in 2024, representing a 3,346% relative increase. Urban jurisdictions increased from 0.030 to 0.845 prescriptions per 1,000 enrollees, representing a 2,724% relative increase. Mixed states demonstrated the highest mean quarterly prescribing rates overall, increasing from 0.049 to 1.331 prescriptions per 1,000 enrollees, representing a 2,598% relative increase (Fig. 2). Despite substantial relative growth across all groups, rural states consistently demonstrated lower absolute prescribing rates than urban and mixed states throughout the entire study period, reflecting a persistent disparity in per-capita utilization.

Table 1 Mean Quarterly GLP-1 Anti-Obesity Prescribing Rates and Total Annual Reimbursement by Rurality Group, Medicaid 2020–2024

Rurality Group	Mean Quarterly Rx/1,000 (2020)	Mean Quarterly Rx/1,000 (2024)	% Growth	2020 Total Reimbursement	2024 Total Reimbursement
Rural	0.022	0.747	3,346%	$0.1M	$27.6M
Urban	0.030	0.845	2,724%	$7.8M	$928.9M
Mixed	0.049	1.331	2,598%	$19.2M	$2,135.1M

Abbreviations: Rx = prescriptions; M = million. Prescribing rates reflect mean quarterly prescriptions per 1,000 Medicaid enrollees, calculated using quarterly enrollment denominators from MBES. Reimbursement values represent total annual Medicaid reimbursement aggregated across all

jurisdictions within each rurality group. Urban group includes the District of Columbia. Classification covers all 50 states and the District of Columbia (n=51 jurisdictions total)

3.3. Medicaid Reimbursement Trends

Total Medicaid reimbursement for obesity-directed GLP-1 medications increased markedly during the study period across all rurality groups. Rural-state reimbursement increased from approximately $0.1 million in 2020 to $27.6 million in 2024. Urban-state reimbursement increased from $7.8 million to $928.9 million. Mixed-state reimbursement increased from $19.2 million to approximately $2.14 billion. The increase in total reimbursement paralleled the observed increases in quarterly prescription utilization across all rurality groups.

3.4. Temporal Trends Following FDA Approvals

Utilization trends accelerated following the introduction of newer obesity-directed GLP-1 therapies. Semaglutide (Wegovy), approved for obesity treatment in June 2021, was associated with increasing quarterly prescription utilization beginning in 2021–2022. A further acceleration in prescribing was observed following the approval of Tirzepatide (Zepbound) in November 2023. Although quarterly prescribing rates increased across all rurality groups following these approvals, rural states remained substantially lower in both per-capita utilization and total prescription volume relative to urban and mixed states throughout the observation period.

3.5. Geographic Variation

Substantial geographic variation in prescribing patterns was observed across states and the District of Columbia (Fig. 3). States classified as predominantly rural included West Virginia, Mississippi, Montana, Vermont, Maine, Alabama, Arkansas, Kentucky, New Hampshire, and South Dakota. California, New York, New Jersey, Florida, Texas, Washington, and Oregon were among the states categorized as urban; the District of Columbia was also classified as urban. States such as Pennsylvania, Illinois, North Carolina, Ohio, and Michigan demonstrated mixed urban-rural population distributions and were classified as mixed. Mixed states generally demonstrated the highest mean quarterly per-capita prescribing rates across the study period.

4. Discussion

Findings from the current study demonstrate a dramatic expansion in GLP-1 receptor agonist utilization for obesity among Medicaid beneficiaries across all state rurality groups between 2020 and 2024, coinciding with the FDA approvals of semaglutide and tirzepatide for chronic weight management. Despite rural states achieving the highest proportional increase at 3,346%, they accounted for only 0.74%

of total national GLP-1 anti-obesity prescriptions, revealing persistent underrepresentation in obesity-directed GLP-1 utilization. Rural Medicaid programs spent approximately $27.6 million compared to $928.9 million in urban states and over $2.1 billion in mixed states, reflecting a profound gap in the capacity of rural Medicaid programs to deliver effective obesity treatment to their enrollees.

The proportional growth figures observed in this study are misleading without absolute context. Existing literature demonstrates that fewer than 1% of eligible adults received pharmacotherapy for obesity prior to the GLP-1 era, reflecting provider knowledge gaps, weight stigma, and competing clinical demands, creating a near-zero prescribing baseline in rural Medicaid populations before these agents entered the market [31]. This deficit was structurally reinforced by a near-complete absence of obesity medicine specialists in rural communities, with prior studies showing more than two-thirds of all US counties lack a single obesity specialist entirely [32]. Despite a more than fivefold national surge in GLP-1 spending between 2018 and 2023, published data confirm that states with higher obesity prevalence did not consistently record higher prescribing rates, suggesting that structural capacity may play an important role in determining access [33]. Existing evidence further establishes that GLP-1 receptor agonists remain significantly less accessible than diabetes medications due to systemic provider biases and inadequate obesity pharmacotherapy education [34] and nationally representative studies confirm that rural adults were significantly less likely to receive GLP-1 prescriptions than metropolitan counterparts, with absolute gains most pronounced in metropolitan areas, widening the rural-urban gap in real terms [10].

The current study's findings align with multiple structural barriers documented in the literature. Prior research establishes that the obesity medicine specialist workforce is overwhelmingly concentrated in urban areas, leaving rural primary care providers, who prescribe GLP-1 agents at significantly lower rates than endocrinologists, as the sole prescribing resource for rural Medicaid patients [32, 34]. Even when prescriptions are written, rural patients face compounding pharmacy-level barriers: Medicaid coverage exclusions disincentivize rural pharmacies from stocking these medications, monthly out-of-pocket costs exceeded $900 in 2024 for uninsured patients, and patients with obesity alone face the lowest prescription fill rates of any group [35]. Survey-based evidence further confirms that endocrinologists recommended anti-obesity medications to a significantly larger proportion of eligible patients than primary care physicians, yet rural communities are served almost exclusively by primary care providers with only a small minority of obesity-focused prescribers practicing rurally [36].

These structural barriers are compounded by Medicaid-specific policy constraints. Only one in five state Medicaid programs covered anti-obesity medications as of early 2023, a direct consequence of a federal legislative exemption under the Medicaid Drug Rebate Program [37]. Even where coverage exists, prior authorization requirements, step therapy protocols, and non-preferred formulary placement impose significant administrative burdens that fall disproportionately on rural providers and patients with limited health insurance literacy [38].

Annual list prices for GLP-1 anti-obesity agents range from $12,720 to $16,188, with net prices after rebates remaining prohibitive for most Medicaid programs, while marketplace plans broadly cover diabetes-indicated GLP-1 agents, virtually none cover obesity-indicated formulations, creating a two-tiered system that disproportionately disadvantages rural Medicaid beneficiaries [39].

The findings of this study carry significant health equity implications. Only a small fraction of eligible patients receive obesity pharmacotherapy despite its proven efficacy [34], and existing literature confirms this gap falls most heavily on rural communities, where several predominantly rural states record adult obesity rates surpassing 40% and on Medicaid enrollees who are disproportionately low-income and burdened by obesity-related comorbidities [22]. The result is an inverse care paradox in which the therapeutic revolution represented by GLP-1 receptor agonists has largely bypassed the populations who stand to benefit most, underscoring the urgent need for targeted policy interventions that prioritize equitable access over fiscal convenience.

This study has several limitations, including the absence of patient-level characteristics, prescription-level details, and clinical outcomes in the Medicaid State Drug Utilization Data, precluding assessment of individual clinical factors or treatment effectiveness. State-level rurality classification may obscure intrastate variation, heterogeneity in Medicaid formulary policies limits cross-state comparisons, and prescriptions through managed care organizations are not captured, potentially underestimating true utilization. The exclusion of diabetes-indicated GLP-1 formulations may modestly undercount obesity-relevant prescribing, and external influences including pharmaceutical marketing and COVID-19-related shifts in obesity awareness may have differentially affected prescribing trends across rurality groups [22]. Nonetheless, notable strengths include the use of a nationally comprehensive Medicaid dataset spanning all 50 states and the District of Columbia over four years, inclusive of both prescribing volume and reimbursement data, rurality classifications adapted from USDA and Census frameworks, and quarterly enrollment denominators, collectively ensuring that observed disparities reflect genuine differences in access rather than population size effects.

5. Conclusion

This study demonstrates that Medicaid-funded GLP-1 receptor agonist utilization for obesity management expanded substantially across rural, urban, and mixed states from 2020 to 2024, driven in large part by FDA approvals of Semaglutide and Tirzepatide. Prescribing rates grew substantially across all groups, with rural states recording the highest proportional increase at 3,346%. Yet this headline figure obscures a stark inequity: rural states accounted for just 0.74% of total national GLP-1 anti-obesity prescriptions over the study period, and rural Medicaid programs spent approximately $27.6 million compared to over $2.1 billion in mixed states. The data reveal an expanding gap. Growth from a near-zero baseline has left rural Medicaid beneficiaries, who carry a disproportionate burden of obesity and its comorbidities, largely unreached by one of the most significant pharmacotherapeutic advances in modern obesity medicine.

These findings carry clear policy implications. First, formulary reform is urgently needed: with only a minority [37] of state Medicaid programs formally covering GLP-1 agents for obesity, coverage exclusions function as structural barriers that fall hardest on the populations least equipped to absorb out-of-pocket costs. Expanding Medicaid formulary inclusion for obesity-indicated GLP-1 formulations, alongside reductions in prior authorization requirements and step-therapy protocols that impose disproportionate administrative burdens on rural providers and patients, would represent a meaningful first step toward equitable access. Second, targeted incentives for rural prescribers are warranted. Given the near-absence [32] of obesity medicine specialists in rural communities, primary care providers bear the full weight of GLP-1 prescribing in these settings, yet prescribe at significantly lower rates [32, 34] than endocrinologists. Workforce development programs, telehealth-enabled specialist support, and reimbursement structures that reward obesity pharmacotherapy in primary care could help narrow this gap. Third, coverage expansion must be designed with rural Medicaid beneficiaries explicitly in mind. This should account for pharmacy-level access barriers, limited health system infrastructure, and the geographic concentration of high-obesity, low-resource populations in predominantly rural states.

Future research should build on these findings by drawing on data sources that go beyond aggregate administrative records. Patient-level analyses are needed to characterize who, within rural Medicaid populations, is accessing GLP-1 therapy and who is not. These should incorporate demographic variables such as race, ethnicity, income level, and disability status that are obscured in state-level ecological data. Longitudinal studies linking prescription data to clinical outcomes, including weight reduction, cardiovascular events, and progression to diabetes, would establish the downstream consequences of current access disparities and strengthen the evidence base for targeted intervention. Additionally, research capturing GLP-1 utilization through managed care organizations, which are not reflected in SDUD, would provide a more complete picture of the true prescribing landscape. As these medications continue to reshape the treatment of obesity, ensuring that their benefits reach the populations bearing the greatest disease burden must become a central priority for health equity research and Medicaid policy alike.

Declarations

Ethics approval

This study used publicly available, de-identified, aggregate data. No individual patient data was accessed or used. Therefore, ethics approval was not required.

Competing interests

The authors declare no competing interests.

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Author contributions

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Data availability

The data supporting the findings of this study are publicly available. State Drug Utilization Data (SDUD) and Medicaid Budget and Expenditure System (MBES) data are accessible via the Centers for Medicare & Medicaid Services (CMS) at https//:www.medicaid.gov.

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Figures

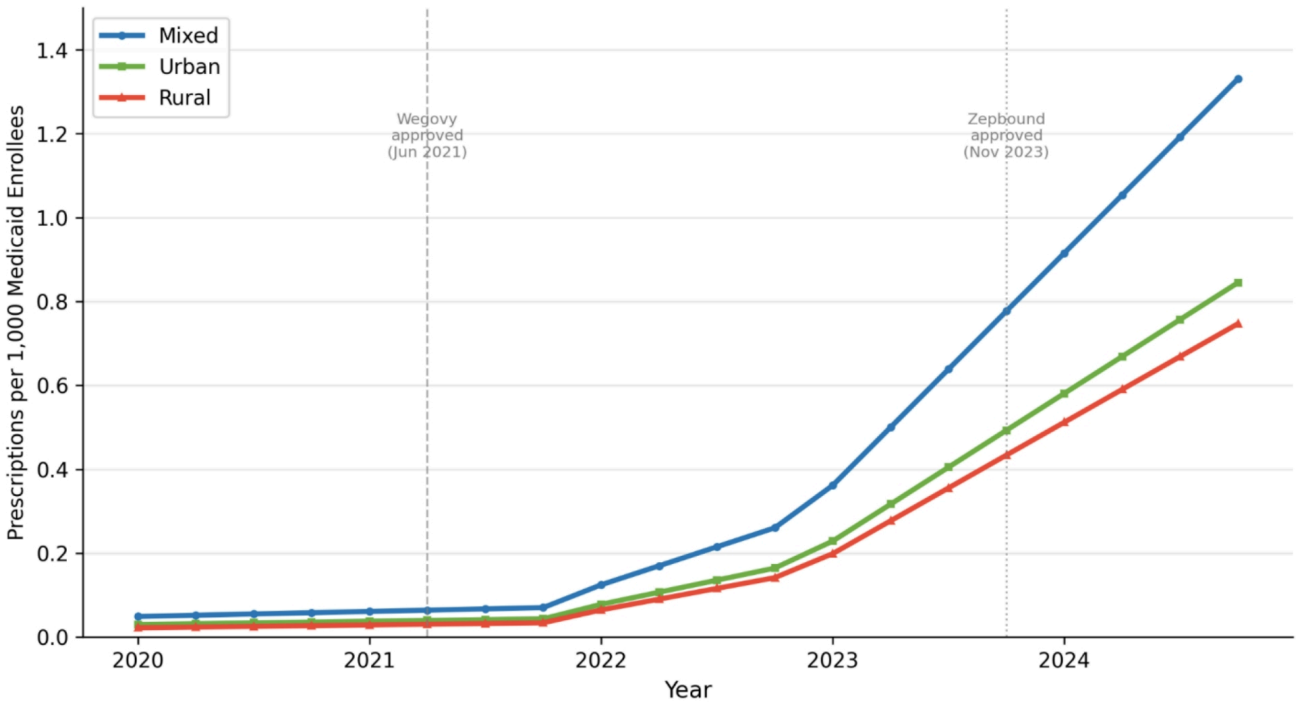


Figure 1

Mean quarterly GLP-1 anti-obesity prescriptions per 1,000 Medicaid enrollees by rurality group across 50 states and the District of Columbia, 2020–2024. Values represent mean quarterly prescribing rates per rurality group per quarter. Vertical dashed lines indicate FDA approval dates for Semaglutide (Wegovy, June 2021) and Tirzepatide (Zepbound, November 2023). Data derived from CMS Medicaid State Drug Utilization Data (SDUD) and Medicaid Budget and Expenditure System (MBES) enrollment reports

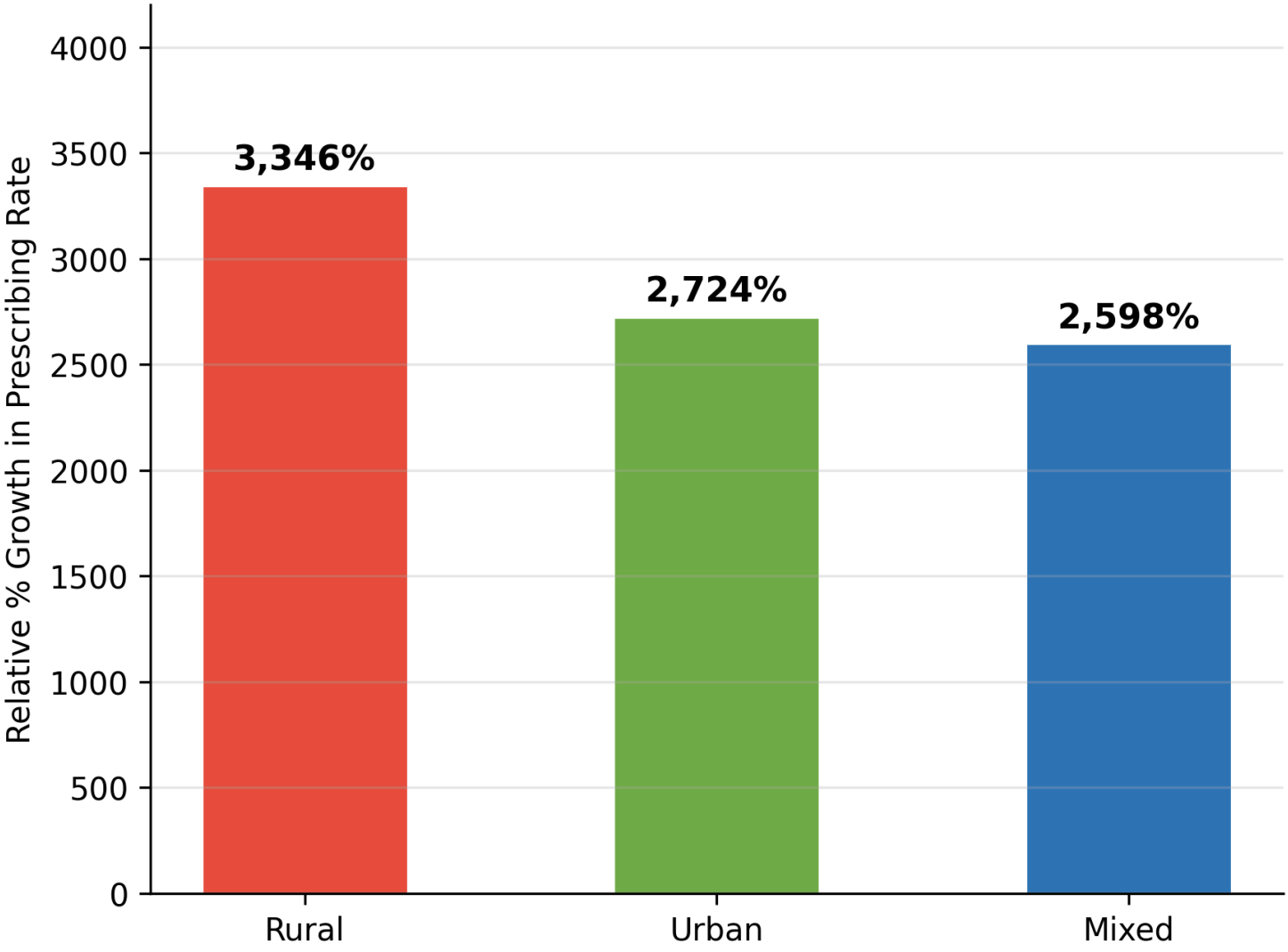


Figure 2

Relative percentage growth in mean quarterly GLP-1 anti-obesity prescribing rate (prescriptions per 1,000 Medicaid enrollees) by rurality group, comparing 2020 to 2024. Rural states demonstrated the highest relative growth (3,346%); however, absolute per-capita prescribing rates remained substantially lower in rural states compared to urban and mixed states throughout the study period, reflecting a persistent utilization gap

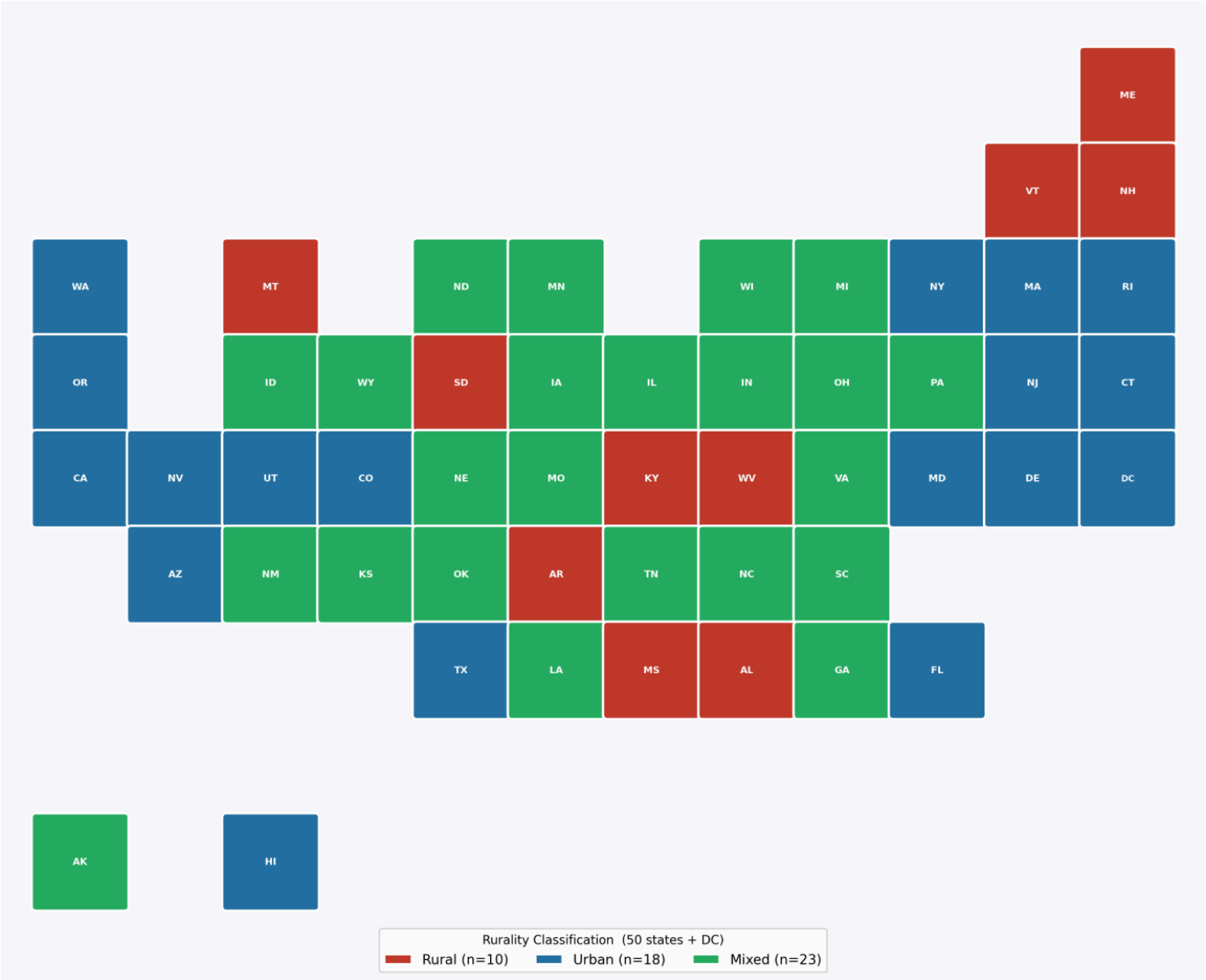


Figure 3

State-level rurality classification framework used for ecological analysis across 50 states and the District of Columbia (n=51 jurisdictions). Rural jurisdictions (n=10, red) were defined as predominantly non-metropolitan; urban jurisdictions (n=17, blue) as predominantly metropolitan, including the District of Columbia; and mixed jurisdictions (n=24, green) as those with substantial rural and metropolitan population heterogeneity. Classification adapted from USDA Rural-Urban Continuum Codes and U.S. Census Bureau urban-rural definitions. See Supplementary Table 1 for complete jurisdiction assignments

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTable1RuralityClassification.docx