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MEDICAID COVERAGE FOR OBESITY MEDICATIONS: UTILIZATION AND NET-OF-REBATE SPENDING

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ABSTRACT

We document state variation in Medicaid coverage for obesity-indicated GLP-1 medications over time, and use a stacked difference-in-differences design to estimate the effects of coverage on utilization and net-of-rebate spending. Nine quarters out, coverage increases prescriptions for obesity-indicated GLP-1 medications by 0.82 per 100 enrollee-months (SE = 0.10). Coverage had no effect on GLP-1 prescribing for diabetes or cardiovascular indications, suggesting that off-label prescribing of diabetes formulations for obesity is not very common in the Medicaid program. The expansions do not appear to affect consumer spending at major online GLP-1 compounding firms, which suggests that the utilization response in our main analysis reflects new utilization rather than crowd-out. We find that coverage increases net-of-rebate Medicaid spending by $751.6 per 100 enrollee-months (SE = $92.0), compared to $986.9 in gross reimbursements—manufacturer rebates reduce the state's net spending by approximately 24 percent. Across the 17 states that ever covered obesity-indicated GLP-1 medications by mid 2025, coverage increased Medicaid net spending by around $2.68 billion per year. Extending Medicaid coverage in the remaining states would generate a further $3.63 billion in annual net spending.

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1 — Introduction

GLP-1 receptor agonists are an important class of medications used to treat diabetes, cardiovascular disease, and obesity (Drucker 2018). In randomized trials, they generate weight loss, improve glycemic control, prevent transitions from pre-diabetes to diabetes, and reduce major adverse cardiac events and mortality (Drucker 2018; Marso et al. 2016; Wilding et al. 2021; Jastreboff et al. 2022; Lincoff et al. 2023; Le Roux et al. 2017; Kahn et al. 2024; Jastreboff et al. 2025). Different dosages of the same GLP-1 molecule are marketed under different brand names for different FDA-approved uses—e.g., semaglutide is sold as Ozempic for diabetes and Wegovy for obesity. The purpose of the drug matters for coverage in public insurance programs. Nearly all FDA-approved drugs—including GLP-1 medications for diabetes and cardiovascular disease—are covered by Medicare Part D and Medicaid. Under federal law, however, Medicare Part D plans *must exclude* and state Medicaid plans *may exclude* FDA-approved drugs if they are "used for anorexia, weight loss, or weight gain" (Social Security Act 2003, 1990). Policy makers have pushed to make the drugs more accessible by negotiating lower prices for GLP-1 medications for public insurance programs and consumers (Centers for Medicare & Medicaid Services 2025a; The White House 2025). Federal legislative proposals have sought to expand coverage of obesity medications under Medicare Part D and Medicaid but have not become law (United States Congress 2025). In 2026, a Medicare Part D final rule declined to reinterpret the statutory exclusion administratively (Centers for Medicare & Medicaid Services 2025c), though CMS has since launched demonstration programs to expand access (Centers for Medicare & Medicaid Services 2025a).

Despite their clinical benefits, GLP-1 medications are unlikely to pay for themselves over the short to medium run. Recent research suggests that the drugs are improving health in real-world settings (Bock, Moshfegh, and Zhang 2026; Lu et al. 2025), but treating patients with GLP-1 medications increases other health care spending over 1–5 year horizons (Wing et al. 2026; Wennberg et al. 2025). This makes the question of who pays—and how much—central to the policy debate over expanding access.

Because coverage is discretionary, there is substantial variation in whether state Medicaid programs pay for obesity-indicated GLP-1 medications. Previous research examines cross-sectional variation in state Medicaid coverage for GLP-1 medications, but does not measure the effects of coverage changes on utilization and costs (Liu and Rome 2024; Klebanoff, Chetty, and Doshi 2025). Since 2022, seventeen states have offered Medicaid coverage for at least one obesity-indicated GLP-1 medication. However, four of these states recently rescinded coverage, citing budget pressures and unsustainable pharmacy costs. There are good reasons to expect the fiscal burden to be large. Around 40 percent of adult Medicaid enrollees meet clinical criteria for obesity, and 70 percent meet criteria for overweight or obesity (Mylona et al. 2020). A large literature shows that

insurance coverage increases health care utilization (Manning et al. 1987; Finkelstein et al. 2012), suggesting that extending Medicaid coverage for GLP-1 medications to this population could generate substantial new costs for state budgets. Such large changes in Medicaid spending may strain or distort federal and state budget priorities in ways not directly related to health or health care (Baicker and Staiger 2005; Gruber and Sommers 2017; Clemens and Ippolito 2018). The Medicaid Drug Rebate Program (MDRP) requires manufacturers to pay substantial rebates to states, which could significantly reduce the net cost of coverage. However, the effects of these rebates on state government costs are not well understood, and some research suggests that substantial Medicaid purchases can drive up the drug prices paid by non-Medicaid consumers as manufacturers set prices and design products strategically (Duggan and Scott Morton 2006).

We make three contributions. First, we compile data on the timing and details of Medicaid coverage for obesity-indicated GLP-1 medications across states. Second, using a stacked difference-in-differences estimator that identifies an enrollment-weighted average treatment effect for early adopter states, we show that coverage increased Medicaid prescriptions by 0.82 per 100 enrollee-months nine quarters after adoption, and did not affect GLP-1 prescribing for diabetes or cardiovascular indications. This suggests that coverage did not induce substitution away from diabetes formulations, which could have been used off-label to treat obesity. We also find no evidence that Medicaid coverage displaced private out-of-pocket purchases from GLP-1 compounding platforms, which we measure using credit and debit card transactions data. This suggests that Medicaid coverage generated new GLP-1 utilization rather than crowding out existing private purchases. Third, we estimate the net fiscal cost of coverage to state budgets, accounting for manufacturer rebates under the MDRP. Nine quarters after adoption, coverage increased net-of-rebate Medicaid expenditures by $751.6 per 100 enrollee-months, compared to gross reimbursements of $986.9. The results suggest that MDRP rebates for obesity-indicated GLP-1 drugs reduce program costs by about 24 percent and that manufacturer best prices and drug specific inflation are not key drivers of the rebates for these drugs.

Our estimates help put decisions about Medicaid coverage of GLP-1 drugs into perspective. California, for example, started covering obesity-indicated GLP-1 medications in 2023 and rescinded coverage in 2026. There were 12.0 million people enrolled in California's Medicaid program in September 2025. Our nine-quarters out utilization effect estimates imply that by covering the drugs, California's Medicaid program was paying for about 98 thousand people to receive obesity-indicated GLP-1 medications each month, with an annual net-of-rebate cost of $1.08 billion. Thus, the savings from rescinding coverage are not small. Aggregating across all seventeen coverage states suggests that Medicaid coverage for obesity-indicated GLP-1s costs about $2.68 billion per year. Extending coverage to the thirty-three states that do not offer coverage would generate another $3.63 billion in annual net spending.

2 — Background

Three GLP-1 based medications are FDA-approved for chronic weight management in adults with obesity (BMI $\geq$ 30) or overweight (BMI $\geq$ 27) with at least one weight-related chronic condition. Saxenda (liraglutide), a GLP-1 receptor agonist, was approved on December 23, 2014. Wegovy (semaglutide), also a GLP-1 receptor agonist, was approved on June 4, 2021. The newest drug is a dual GIP/GLP-1 receptor agonist called Zepbound (tirzepatide), approved on November 8, 2023. Saxenda is administered as a once-daily injection; Wegovy and Zepbound are typically given as once-weekly injections.[1] All three drugs start with a low dose and are titrated up to a maintenance dose to mitigate side effects, which include nausea, vomiting, diarrhea/constipation, abdominal pain, and decreased appetite. An umbrella review of meta-analyses suggests side effects remain common and are an important factor in discontinuation of GLP-1 therapy (Kong et al. 2026). Weight loss efficacy has improved with each generation: in major trials, percent weight loss relative to placebo was 5.4 percentage points lower for Saxenda patients (Pi-Sunyer et al. 2015), 12.5 percentage points lower for Wegovy patients (Wilding et al. 2021), and 17.8 percentage points lower for 15mg Zepbound patients (Jastreboff et al. 2022).

Prescription drug pricing in the United States is often opaque. Manufacturers, pharmacy benefit managers, and insurers use discounts, rebates, and cross-subsidies that obscure the true cost of a drug to any given payer. With that caveat, Table 1 shows three publicly available measures of the price of obesity-indicated GLP-1 medications. The National Average Drug Acquisition Cost (NADAC) is based on a CMS survey of pharmacy reports of purchase invoices that reflects what pharmacies pay wholesalers for each drug. The Federal Supply Schedule (FSS) price is a contract price negotiated between the VA and drug manufacturers for eligible federal purchasers. The Big 4 price is a further statutory discount available to the VA, Department of Defense, Coast Guard, and Public Health Service—typically the lowest price available to any government purchaser. At NADAC prices, monthly costs are approximately $1,300 for Saxenda and Wegovy and $1,050 for Zepbound. These prices do not include coupons or rebates, which may be substantial. But even at the Big 4 price, monthly costs are about $1,000 for Saxenda and Wegovy and $800 for Zepbound. And these prices have been relatively stable since each drug's launch. Although the nominal prices are high, GLP-1 drugs represent a major improvement in the quality of medical care for obesity. Quality improvement across the three generations of drugs is substantial, even in more recent formulations. The monthly NADAC divided by the percentage point treatment effect—a crude quality-adjustment—implies that the price of a one percent reduction in body weight fell from approximately $241 with Saxenda to $104 with Wegovy, and to only $59 with

1. In December 2025, the FDA approved the Wegovy Pill, a once-daily oral form of semaglutide; it became available in pharmacies in January 2026.

Zepbound. Nevertheless, at current prices, the absolute cost of covering these drugs for the Medicaid population is apt to be a substantial new fiscal commitment.

Under the Medicaid Drug Rebate Program (MDRP), in order for *any and all of their products* to be covered by Medicaid, pharmaceutical manufacturers must enter into rebate agreements with the federal government and pay quarterly rebates to states according to a formula that depends on confidential information about their average and best prices and product-specific inflation. In exchange, states participating in the MDRP are required to cover all FDA-approved drugs made by participating manufacturers. However, Section 1927(d)(2) of the Social Security Act carves out several categories of drugs that states *may* exclude from coverage, including "agents when used for anorexia, weight loss, or weight gain" (Social Security Act 1990). This statutory exclusion means that obesity-indicated GLP-1 medications are not automatically covered by Medicaid. States must make an affirmative decision to add them to their formularies. The result is substantial cross-state variation in whether Medicaid pays for GLP-1 obesity drugs, which forms the basis of our identification strategy.

We compiled data on Medicaid coverage for obesity-indicated GLP-1 medications, searching over years 2019 to 2026, tracking both the timing of coverage and the use of utilization management strategies for each drug in each state.[2] Our primary source is the Medicaid Preferred Drug List (PDL) for each state and year. PDLs designate preferred drugs accessible without prior authorization, and typically specify the conditions—such as prior authorization, step therapy, or quantity limits—under which non-preferred drugs may be obtained (Simon, Tennyson, and Hudman 2009; Dolan and Tian 2019). We reviewed PDLs for all 50 states from 2019 through 2026, recording whether Wegovy, Saxenda, or Zepbound appeared with an explicit obesity indication and under what utilization management conditions. When PDL listings were ambiguous, we corroborated with secondary sources including pharmacy program amendments, Pharmacy and Therapeutics Committee minutes, prior authorization criteria documents, and state Medicaid pharmacy portal NDC lookups. The replication archive includes archived PDLs, supplementary policy documents, a state-specific SDUD utilization graph, and a summary memorandum with primary source citations.[3]

Our coverage dates reflect fee-for-service (FFS) Medicaid policy. While most Medicaid beneficiaries under 65 are enrolled in managed care organizations (MCOs), FFS PDL policy is an increasingly reliable signal of MCO coverage. States have rapidly adopted uniform PDL requirements that bind MCOs to the same formulary as FFS: as of July 2019, 16 MCO states had

2. Our work builds on earlier work by the Kaiser Family Foundation, which cataloged coverage of obesity-indicated GLP-1 medications in mid-2024 and 2026 (Kaiser Family Foundation 2024; Williams 2026).

3. A browsable page with state-by-state evidence sources and full citations is available at https://gist.github.com/coadywing/14061c2322ad07fcd042d1aca7a65694.

uniform PDLs, rising to 19 of 30 MCO pharmacy carve-in states by July 2023 (Gifford et al. 2020; Health Management Associates 2024). Even in states without uniform PDLs, most require MCO prior authorization to be no more restrictive than FFS (Gifford et al. 2020). We validated the classifications by examining FFS and MCO prescription volume in the State Drug Utilization Data (SDUD), confirming that the first quarter with substantial utilization matched or immediately followed our PDL-documented coverage date for both FFS and MCO utilization.

Michigan was the first state to cover GLP-1 obesity medications, adding Saxenda and Wegovy to its Medicaid formulary in February 2022 (2022-Q1). New Hampshire followed in September 2022 (2022-Q3), and Rhode Island in October 2022 (2022-Q4). Four states—California, Delaware, Pennsylvania, and Virginia—adopted coverage in January 2023 (2023-Q1). By the end of 2022, three states had coverage; by 2023-Q1, seven; by 2023-Q4, ten; and by mid-2025, 17 states had adopted coverage for at least one GLP-1 obesity drug. Early adopters typically covered Saxenda and Wegovy simultaneously. Zepbound, approved in November 2023, was subsequently added by covering states beginning in early 2024; Pennsylvania and Virginia were among the first to add Zepbound in January 2024. Figure 1 displays the geographic distribution of coverage adoption. Table 4 summarizes the timing of first coverage across states, and Table 2 provides the complete set of coverage start dates by state and drug.

Of the 17 states that covered at least one GLP-1 obesity drug during our study period, 16 implemented prior authorization (PA) at the time of initial coverage; Rhode Island was the exception, initially covering Wegovy and Saxenda without PA in October 2022 before adding PA requirements in 2025. California employed quantity limits rather than prior authorization. Prior authorization criteria vary but typically require a documented obesity diagnosis (BMI $\geq$ 30, or $\geq$ 27 with comorbidities) and evidence of prior lifestyle modification. Table 3 classifies covering states into tiers by the stringency of their PA requirements. Three states (Minnesota, Pennsylvania, and Tennessee) implemented both prior authorization and quantity limits from the start of coverage.

Very recently, four states have rescinded coverage for obesity-indicated GLP-1 medication. California, New Hampshire, Pennsylvania, and South Carolina announced coverage terminations effective in late 2025 and early 2026, citing budgetary pressures. Two states have contined with coverage but have adopted more restrictive eligibility criteria. Massachusetts restricted eligibility to individuals with BMI of 35 or greater, and Virginia restricted eligibility to individuals with BMI of 40 or greater. These changes do not affect the results of our analysis, which analyzes outcomes out to 2025 Q2.

3 — Empirical Strategy

We estimate enrollment-weighted average effects of Medicaid coverage on utilization and spending on GLP-1 medications using a stacked difference-in-differences strategy that is robust to treatment effect heterogeneity in staggered adoption settings (Wing, Freedman, and Hollingsworth 2024; Goodman-Bacon 2021; Chaisemartin and D'Haultfœuille 2020). Our main outcome variables are measures of Medicaid prescriptions and spending per 100 enrollee-months for obesity-indicated and diabetes/cardiovascular-indicated GLP-1 medications. We also examine consumer spending at companies known to sell a mix of compounded and branded GLP-1 medications at low prices, which may be an important source in the absence of insurance coverage.

We use s and t to index states and calendar quarters. A_s is the quarter s starts covering at least one obesity-indicated GLP-1 medication; never-adopting states have $A_s = NT$. $Y_{st}(a)$ and $Y_{st}(0)$ are potential outcomes for the same state and quarter with and without coverage, and $Y_{st} = Y_{st}(0) + \sum_a (Y_{st}(a) - Y_{st}(0)) \times 1[A_s = a]$ is the observed outcome. Let Ω_κ represent the set of adoption events that occur early enough to be followed for and event window with κ_{pre} pre-periods and κ_{post} post-periods. Our *target estimand* is an average of enrollment-weighted group-time effects across a fixed set of adoption groups over the event window:

$$\theta^e_{\Omega_\kappa} = \sum_{a \in \Omega_\kappa} \text{ATT}(a,\, a+e) \times \frac{M_a}{M_{\Omega_\kappa}}$$

The aggregate effect is an enrollment weighted average of group-time effects. For adoption group a, $\text{ATT}(a, a+e) = \mathbb{E}_{M^\kappa_s}[Y_{s,a+e}(a) - Y_{s,a+e}(0) \mid A_s = a]$ is the enrollment-weighted average treatment effect of adopting coverage in period a on outcomes experienced in period $a+e$.[4] Each adoption group's effect is weighted by the the group's share of total enrollee-months in the event window, $\frac{M_a}{M_{\Omega_\kappa}}$.[5] Since the study population of states is fixed across event time periods, changes in $\theta^e_{\Omega_\kappa}$ across event times reflect treatment effect dynamics rather than compositional shifts.

We estimate $\theta^e_{\Omega_\kappa}$ using stacked difference-in-differences with never-treated states serving as clean controls. To construct the analytic sample, we build a sub-experimental dataset for each adoption cohort. The dataset of sub-experiment a consists of the treated states with $A_s = a$, the never-treated control states, and observations from time periods inside the event window. We vertically concatenate the sub-experimental datasets into a single stacked dataset in which Y_{sae} is

4. The expectation is taken over the cross-state distribution of total enrollee-months over the event window. For state s, $M^\kappa_s = \sum_{t=a-\kappa_{pre}}^{a+\kappa_{post}} M_{st}$, where M_{st} is the state's total enrollee-months of Medicaid coverage in the quarter.

5. Specifically, let $M_a = \sum_{s|A_s=a} M^\kappa_s$ be total enrollee-months across all states in adoption group a. Then $M_{\Omega_\kappa} = \sum_{a \in \Omega_\kappa} M_a$ is total enrollee-months in the study population. The weights sum to one across the adoption groups.

the observed outcome for state s in sub-experiment a at event time e. We estimate the aggregate effects using a weighted least squares regression that is saturated in event time and treatment status:

$$Y_{sae} = \alpha_0 + \alpha_1 \, 1\left[A_s = a\right] + \sum_{h \neq -1} \gamma_h \, 1\left[e = h\right] + \sum_{h \neq -1} \theta_h \left(1\left[A_s = a\right] \times \, 1\left[e = h\right]\right) + \varepsilon_{sae},$$

The regressions are weighted to correct for differences in the share of treated and control observations across the sub-experiments and to weight states according to enrollment.[6] Standard errors are clustered at the state level. The stacked difference-in-differences coefficients identify $\theta^e_{\Omega_\kappa}$ under three assumptions within each sub-experiment: (i) *common trends*, (ii) *no-anticipation*; and (iii) *no spillovers*. The event study coefficients from pre-treatment event times should equal zero if the common trend and no-anticipation assumption hold, providing a partial test of these restrictions.

There is a tradeoff between the length of the event window and the number of states that can be included in the analysis: for states that expanded coverage recently, not enough time has elapsed for a long follow up. We consider two designs that resolve the tradeoff in different ways. The *10-state design* allows for 4 pre-treatment quarters and 7 post-treatment quarters and includes all states that covered at least one GLP-1 obesity drug by 2023-Q4, The *7-state design* restricts the sample to states that covered a GLP-1 obesity drug by 2023-Q1, allowing for a 4 pre-treatment quarters and 10 post-treatment quarters. Table 4 lists the treated states in the two designs. In both designs, the 33 states that had not adopted coverage by the end of 2025-Q2 serve as controls.

4 — Data

The basic data set underlying our empirical work is a balanced panel of 50 states over 26 quarters from 2019-Q1 to 2025-Q2. We examine three main groups of outcomes: GLP-1 prescription drug utilization, gross Medicaid spending on GLP-1 prescriptions, and net-of-rebate Medicaid spending on GLP-1 prescriptions. All three outcomes are computed separately for obesity-indicated and diabetes/cardiovascular-indicated GLP-1 drugs and are measured at the state-quarter level. We use State Drug Utilization Data (SDUD) to measure total prescriptions and total gross spending for each group of drugs by state and quarter. To estimate per-unit rebates for each GLP-1 NDC code, we use drug pricing data from CMS National Average Drug Acquisition Cost (NADAC) and

6. The weights are derived in Wing, Freedman, and Hollingsworth (2024). In our case, let N_a^{treat} and $N_a^{control}$ represent the number of treated and control states in sub-experiment a. Then $N_{\Omega_\kappa}^{treat}$ and $N_{\Omega_\kappa}^{control}$ are the total number of treated and control states across the study population. The corrective weights are $Q_{sa} = \frac{M_a / M_{\Omega_\kappa}}{N_a^{\text{treat}} / N_{\Omega_\kappa}^{\text{treat}}}$ if $A_s = a$, and $Q_{sa} = \frac{M_a / M_{\Omega_\kappa}}{N_a^{\text{control}} / N_{\Omega_\kappa}^{\text{control}}}$ if $A_s = NT$.

VA Federal Supply Schedule (FSS) as proxies for the confidential elements of the MDRP rebate formula. The per-unit rebates are combined with SDUD data on total Medicaid financed units of each NDCs to compute the basic and inflationary rebates, which are then aggregated to used to compute total net-of-rebate Medicaid spending for each group of drugs by state and quarter. We scale the prescription, spending, and net-spending totals by the Medicaid enrollee-months, which we compute using the monthly enrollment data in CMS Medicaid and CHIP Performance Indicators (CMSPI). These enrollee-month counts are also used to construct enrollment weights in our analysis.

State Drug Utilization Data. The SDUD reports total prescriptions, units dispensed, and Medicaid reimbursements by state, plan type (MCO vs FFS), and quarter for every NDC code that had any Medicaid prescriptions during the quarter (2019-Q1 to 2025-Q2). We restricted the SDUD sample to NDC codes for GLP-1 medications, classifying each NDC as an obesity-indicated (Saxenda, Wegovy, and Zepbound) or diabetes/cardiovascular-indicated formulation (Victoza, Ozempic, Rybelsus, Mounjaro, exenatide, dulaglutide, and lixisenatide).[7] The SDUD suppresses information on the number of prescriptions for cells with fewer than 11 prescriptions. We take the midpoint and assume that each suppressed cell had 5 prescriptions. We compute the corresponding units dispensed during the quarter for each cell by multiplying the 5 imputed prescriptions by the unit size embedded in the NDC code. Then we multiply by the per-unit gross reimbursement price to obtain total reimbursements. We also corrected data irregularities in 609 out of the $32{,}683$ state $\times$ NDC $\times$ quarter cells that contribute to our analysis. In these cases, the SDUD units reimbursed were positive but the corresponding Medicaid dollar amount was missing, zero, or implausible relative to per-unit price of the drug. Appendix C describes the three-tier procedure we used to resolve these cases.

MDRP Rebates. The SDUD reimbursement data reflect gross payments to pharmacies at the point of dispensing. They do not include information about the quarterly rebates that manufacturers pay the states through the Medicaid Drug Rebate Program (MDRP). Under the MDRP, the per-unit rebate for *brand-name drugs* depends on three manufacturer-reported prices—current quarter average manufacturer price (AMP), current quarter best price (BP), and

7. We identified NDC codes for GLP-1 medications using the National Library of Medicine (NLM)'s RxMix database. Our list includes all NDCs for liraglutide (Saxenda, Victoza), semaglutide (Wegovy, Ozempic, Rybelsus), tirzepatide (Zepbound, Mounjaro), and other GLP-1 receptor agonists (exenatide, dulaglutide, lixisenatide). The complete list of NDCs is available in the replication archive.

launch quarter AMP—and equals the sum of a *basic rebate* and an *inflationary rebate*:

$$R^b_{dt} = \underbrace{\max\left\{(0.231 \times AMP_{dt}),(AMP_{dt} - BP_{dt})\right\}}_{\text{basic rebate}} + \underbrace{\max\left\{0,\ AMP_{dt} - AMP_{dl} \times \frac{CPI_t}{CPI_l}\right\}}_{\text{inflationary rebate}}$$

The total rebate for a given NDC in a state-quarter is the per-unit rebate multiplied by units dispensed; net Medicaid spending is gross reimbursement minus the total rebate.[8]

Although the rebate formula is public, its key inputs (AMP, BP, and launch AMP) are confidential. We use the National Average Drug Acquisition Cost (NADAC) to proxy for the current and launch-quarter AMP, and the Big 4 price from the VA Federal Supply Schedule as proxy for the manufacturer's best price. Substituting the proxies and the CPI-U into the rebate formula gives an estimate of the per-unit rebate for each NDC code in each quarter; we multiply by units dispensed to obtain the total rebate for each NDC code in each state and quarter.[9] The NADAC rate is based on invoice costs from retail pharmacies. These costs include wholesale markups, so NADAC should probably be viewed as an upper bound on AMP. In contrast, the Big 4 price reflects deep federal discounts that are likely below the manufacturer's true best price. If these relationships hold, our method likely overstates rebate somewhat and yields a lower bound on net spending.

Compounded GLP-1 Spending. We supplement the SDUD with debit and credit card transaction data from the Consumer Edge Brand Tracker, accessed via Dewey Data (Consumer Edge 2025). Consumer Edge aggregates credit and debit card transactions from a panel of U.S. cardholders, reporting spending and transaction counts for over 12,000 brands by state and day. We searched for brands in four categories relevant to the GLP-1 market. The first group, which we label *online GLP-1 compounding platforms*, consists of six companies that have become major distributors of compounded GLP-1 medications: Hims & Hers, Roman, Lemonaid Health, Mochi Health, Henry Meds, and Medvi. These platforms expanded rapidly after the FDA placed semaglutide on its drug shortage list beginning in 2022, which permitted compounding pharmacies to legally sell on-patent drugs.[10] The second group—*online GLP-1 prescribing platforms*—consists of nine telehealth companies that primarily facilitate prescriptions for FDA-approved GLP-1 medications: Push Health, Sequence, Form Health, Hone Health, PlushCare, Sesame Health, LifeMD, Nurx,

8. For generic drugs, the basic rebate is 13% of AMP, with no best-price comparison: $R^g_{dt} = 0.13 \times AMP_{dt} + \max\left\{0, AMP_{dt} - AMP_{dl} \times \frac{CPI_t}{CPI_l}\right\}$. Before 2024-Q1, total rebates were capped at 100 percent of AMP; the American Rescue Plan removed this cap.

9. Appendix B describes our method for computing the rebates in more detail.

10. The FDA resolved the tirzepatide shortage in October 2024 and the semaglutide shortage in February 2025, after which compounding of these products was required to wind down.

and Peter MD. We combine the compounding and prescribing platforms into a single *online GLP-1* spending measure for our event study analysis.[11] These companies also sell other health and wellness products; our spending measure captures all card transactions with each merchant, not just GLP-1 purchases. The third group—*weight-loss platforms*—consists of spending at eight non-GLP-1 subscription-based diet and weight management companies, including Noom, Weight-Watchers, Nutrisystem, Medifast, Jenny Craig, Found, Calibrate, and Rugiet Health. The fourth is the manufacturer direct-to-consumer channel, Lilly Direct.[12] We aggregate daily brand-level transactions to the state-quarter level and scale spending per 100 Medicaid enrollee-months for comparability with the SDUD outcomes. Importantly, the Consumer Edge data clearly does not capture all private out-of-pocket spending on compounded or non-compounded GLP-1-related products. Thus, the level outcomes are probably less interesting than the trends and patterns across states.

5 — Results

Figure 2 shows level outcomes in the stacked treatment and control groups. Before coverage, obesity-indicated GLP-1 prescriptions were near zero in both treated and control states. Coverage increased GLP-1 obesity prescribing immediately and the size of the effect grew over time. Figure 3 presents event study estimates of the effect of Medicaid GLP-1 obesity coverage on prescriptions per 100 enrollee-months. In the 10-state design, obesity GLP-1 prescriptions per 100 enrollee-months increased by 0.06 (SE = 0.01) in the quarter of adoption, and grew to 0.54 (SE = 0.05) six quarters later. The 7-state design, which allows longer follow-up, shows continued growth: prescriptions per 100 enrollee-months increased by 0.06 (SE = 0.01) in the quarter of adoption, and reached 0.82 (SE = 0.10) nine quarters after adoption. Coverage for GLP-1 obesity drugs had no effect on diabetes or cardiovascular-indicated GLP-1 prescriptions in either design; point estimates are close to zero and statistically insignificant at every post-treatment event time. This finding is consistent with physicians not having previously prescribed GLP-1 obesity medications off-label under diabetes indications to circumvent coverage exclusions: if such off-label prescribing had been common, we would expect diabetes-indicated prescriptions to decline as obesity coverage provided a direct channel.

Gross Medicaid reimbursements for obesity-indicated GLP-1 drugs closely track prescriptions. Figure 4 shows quarterly gross spending per 100 enrollee-months in the treated and control states,

11. Noom, WeightWatchers, Found, and Calibrate also have GLP-1 prescribing arms but are classified as weight-loss platforms because their core business model centers on diet and weight management subscriptions.

12. We also searched for additional firms from the telehealth and compounding space: Empower, Hallandale, Strive, Olympia, BelMar, Ro, Sesame Care, ShedRx, and Ivim Health. But these brands were not represented in the Consumer Edge data.

and Figure 5 presents the corresponding event studies. These spending figures reflect Medicaid reimbursements before manufacturer rebates. In the 10-state design, coverage increased gross reimbursements per 100 enrollee-months by \$672.7 (SE = \$67.4) six quarters after adoption. In the 7-state design, coverage increased gross reimbursements per 100 enrollee-months by \$203.8 (SE = \$25.6) after four quarters, and by \$986.9 (SE = \$120.9) after nine quarters. There were no significant effects on spending for diabetes or cardiovascular-indicated GLP-1 drugs. Total gross Medicaid reimbursements per 100 enrollee-months for all GLP-1 drugs (obesity, diabetes, cardiac) increased by \$912.3 (SE = \$150.4) at six quarters in the 10-state design and by \$964.9 (SE = \$158.5) at nine quarters in the 7-state design, driven almost entirely by the obesity indication.

Under the Medicaid Drug Rebate Program (MDRP), manufacturers pay rebates to state Medicaid programs, so net spending is lower than the gross reimbursements reported in the SDUD. We estimate net spending by applying statutory MDRP rebate floors to drug-level price data (see Appendix B for details). Figure 6 shows net spending levels and Figure 7 presents net spending event studies. In the 10-state design, the effect on net obesity spending per 100 enrollee-months was \$515.9 (SE = \$52.2) six quarters after adoption, compared to \$672.7 in gross reimbursements—a reduction of approximately 23 percent. In the 7-state design, net obesity spending per 100 enrollee-months was \$751.6 (SE = \$92.0) nine quarters after adoption, compared to \$986.9 in gross reimbursements—a reduction of approximately 24 percent. MDRP rebates thus reduce the estimated spending effect by roughly one quarter. The pattern for diabetes or cardiovascular-indicated GLP-1 net spending mirrors the gross results: no significant effects in either design.

The pre-treatment event study coefficients support the parallel trends assumption. Pre-treatment coefficients are quantitatively small for all outcomes. For obesity-indicated GLP-1 outcomes, pre-treatment coefficients are close to zero in substantive terms but statistically significant, because pre-treatment prescriptions are near zero in both treated and control states, residual variance is very small, and even trivial differences reach significance.

Although not substantively important, the pre-treatment patterns show that obesity-indicated GLP-1 utilization is very low but not literally zero before coverage: 9 of 10 treated states and 30 of 33 control states have some pre-treatment prescriptions, mostly filled through MCOs. This suggests that some MCOs may offer restricted coverage even when the state formulary does not.[13]

To gauge the aggregate fiscal implications of the per-enrollee estimates, we scale the ATTs from the 7-state enrollee-month weighted design by each state's September 2025 Medicaid enrollment to project monthly users and annual net spending. We report two benchmarks: an "average post-period" estimate based on the mean ATT across event times 0–9, and an "event time

13. California is an exception: it had some pre-treatment utilization from both FFS and MCO claims.

9" estimate reflecting more mature utilization nine quarters after adoption. Table 5 presents projections for the 17 states that adopted coverage during our study period. At the average post-period benchmark, these states would have approximately 104,600 enrollees filling a GLP-1 obesity prescription each month, generating $1.18 billion in annual net Medicaid spending.[14] At event time 9, projected utilization grows to roughly 243,600 monthly users and $2.68 billion in annual net spending. California alone accounts for $1.08 billion of the event-time-9 total, driven by its 12.0 million Medicaid enrollees.

Table 6 extends the projections to the 33 states that had not adopted coverage by mid-2025. If these states were to cover GLP-1 obesity drugs and experience similar per-enrollee effects, projected annual net spending would be $1.61 billion at the average post-period benchmark and $3.63 billion at event time 9. The largest non-covering states drive much of the total: New York ($530 million at event time 9), Texas ($347 million), and Florida ($314 million). Combining all 50 states, projected annual net Medicaid spending on GLP-1 obesity drugs ranges from approximately $2.8 billion at the average post-period benchmark to roughly $6.3 billion at event time 9. These projections assume uniform per-enrollee effects across states and do not account for differences in demographics, formulary design, or supplemental rebates.

The SDUD results show that Medicaid coverage increased GLP-1 utilization and spending within the program, but a separate question is whether this coverage displaced private out-of-pocket spending on GLP-1 products. Figure 8 uses Consumer Edge transaction data to document the rapid growth of a parallel private market. National spending on online GLP-1 compounding platforms—telehealth companies selling compounded semaglutide and tirzepatide—grew roughly 35-fold between 2019 and 2026, while Lilly Direct, a manufacturer direct-to-consumer channel launched in late 2024, reached spending levels comparable to those of the compounding platforms within months. In contrast, spending on weight loss platforms such as Noom and WeightWatchers declined over the same period. If Medicaid coverage of manufacturer-produced GLP-1 drugs crowded out private spending—for example, because some Medicaid-eligible individuals were previously paying out of pocket for compounded GLP-1 products—we would expect online GLP-1 platform transactions to fall in states that adopt coverage. Figure 9 shows online GLP-1 spending levels in the treated and control groups and presents event study estimates. Post-treatment point estimates are negative at every event time in both designs, directionally consistent with crowd-out. In the 10-state design, the estimated effect on online GLP-1 spending per 100 enrollee-months was $-$\$5.89 (SE = \$7.30) six quarters after adoption. In the 7-state design, the effect was $-$\$12.69 (SE = \$8.13) nine quarters after adoption. None of the estimates are statistically significant, and pre-treatment coefficients show no differential trends (joint F-test $p > 0.01$ for all outcome-design

14. The enrollee-month weighted design is our main specification; see Section 3 for details.

combinations). Lilly Direct launched too recently for event study analysis in either design. The negative point estimates are directionally consistent with some displacement of private spending, but the effects are imprecisely estimated and do not support a strong crowd-out conclusion.[15]

6 — Discussion

GLP-1 receptor agonists represent a major therapeutic advance for obesity, a chronic condition affecting approximately 40 percent of adult Medicaid enrollees. Despite proven effectiveness in treating obesity and type 2 diabetes, insurance coverage for obesity-indicated GLP-1 medications remains somewhat controversial. The drugs are expensive and most state Medicaid programs have opted not to cover GLP-1 medications for weight management. Several states that initially adopted coverage have since restricted or eliminated it, underscoring the fiscal pressures these drugs create. We exploited this policy variation to estimate the effects of coverage on utilization and spending in the Medicaid program.

Our findings indicate that Medicaid coverage substantially increases prescribing of obesity-indicated GLP-1 medications. In states that expanded formulary coverage, prescriptions increased by 0.06 per 100 enrollee-months in the first quarter of adoption. The effects grew over time: by nine quarters after adoption, prescriptions had increased by 0.82 per 100 enrollee-months—equivalent to roughly 1 additional prescription per 120 enrollee-months, or per 10 enrollee-years. These rates are computed over *all* Medicaid enrollees, not only those who might be clinically indicated for the drugs because of obesity or overweight. Given that approximately 40 percent of adult Medicaid enrollees meet clinical criteria for obesity and that the denominator includes children, the per-eligible-enrollee effect would be correspondingly larger. Coverage for obesity-indicated GLP-1 drugs did not meaningfully affect prescriptions for diabetes or cardiovascular indications, suggesting that coverage generated new utilization rather than substitution or relabeling of existing prescriptions. The results also indicate no positive spillovers in prescribing—no additional prescriptions for diabetes indications as a result of a newly covered (obesity) indication.

A related question is whether Medicaid coverage displaced private out-of-pocket spending on *compounded GLP-1 products*, which grew rapidly over this period through online telehealth platforms that entered the market when key on-patent GLP-1s were in shortage. Our Consumer Edge analysis yields negative point estimates for compounding platform spending in states that adopted coverage, directionally consistent with some displacement, but the effects are small and not statistically significant. The utilization increases we document thus appear to reflect predominantly new access to GLP-1 obesity medications rather than substitution from lower priced compounded GLP-1 drugs.

15. Even taking the point estimates at face value, the implied displacement would be less than 2 percent of net Medicaid spending on obesity-indicated GLP-1s, indicating that coverage generated predominantly new utilization.

A central challenge for assessing the budget implications of Medicaid coverage for obesity-indicated GLP-1 medications is that publicly available spending data reflect gross Medicaid reimbursements before manufacturer rebates. We addressed this constraint by estimating net spending using the statutory MDRP rebate formula and publicly available price proxies. Our estimates indicate that rebates reduce the spending effect by approximately 24 percent relative to gross reimbursements. Although rebates are substantial, covering obesity-indicated GLP-1 medications represents a very large new outlay even on a net-of-rebate basis.

These results are informative for ongoing debates about Medicaid coverage of GLP-1 obesity drugs. Several states that initially adopted coverage have since scaled back or eliminated it, citing budget pressures. Our estimates provide a basis for projecting the fiscal consequences of such decisions: if coverage effects are approximately symmetric, terminating coverage would reduce utilization and spending by magnitudes similar to those we estimate for adoption. Our findings are also relevant to proposals to expand Medicare Part D coverage of weight management medications. Although Medicaid and Medicare populations differ (Medicare enrollees are older and may have different obesity prevalence and comorbidity profiles, which could affect both uptake rates and the cost-effectiveness calculations), our estimates of coverage effects on utilization provide a starting point for projecting Medicare impacts.

Our analysis has several limitations. First, we relied on a binary classification of coverage that does not distinguish variation in utilization management stringency. Most states that cover obesity-indicated GLP-1 medications have implemented prior authorization requirements with different criteria and enforcement stringency. Future research could examine how prior authorization stringency affects the utilization response to coverage (Liu and Rome 2024; Klebanoff, Chetty, and Doshi 2025). Second, we used aggregate state-quarter data from the SDUD rather than individual-level claims. This limits our ability to examine heterogeneity in coverage effects across enrollee subgroups defined by health status, demographics, or geography. It also precludes analysis of individual adherence patterns or health outcomes. Third, our net spending estimates rely on price proxies rather than actual rebate data. Validation against actual state fiscal data would strengthen confidence in the approach. Some states publish aggregate net-of-rebate pharmacy spending in budget documents, which could serve as an external benchmark, though differences in supplemental rebate inclusion and reporting conventions would complicate direct comparisons. Fourth, our analysis focuses on the direct fiscal costs of drug coverage and does not estimate potential offsets from reduced spending on obesity-related conditions. Recent evidence suggests that such offsets are limited in the short run (Wing et al. 2026; Bock, Moshfegh, and Zhang 2026; Wennberg et al. 2025), but longer-run effects remain uncertain. Fifth, our projections extrapolate per-enrollee utilization at event time 9, which may not reflect steady-state prescribing if discontinuation rates are high or if new formulations alter long-run adherence patterns.

The policy landscape for GLP-1 obesity coverage continues to evolve. Since July 2025, four states have eliminated Medicaid coverage of obesity-indicated GLP-1 medications: California[16], New Hampshire[17], Pennsylvania[18], and South Carolina.[19] Michigan has substantially restricted its coverage, limiting eligibility exclusively to individuals classified as morbidly obese who have failed all other weight-loss interventions.[20] North Carolina temporarily eliminated coverage in October 2025 due to a legislative budget stalemate but reinstated it in December 2025 following a governor's directive.[21] Rhode Island, Wisconsin, and Connecticut are planning or considering restrictions.[22] No states have newly added Medicaid coverage of GLP-1s for weight loss in 2026 thus far; KFF's 2025 Medicaid budget survey reported that state interest in expanding obesity drug coverage is waning, with cost cited as the primary barrier (Kaiser Family Foundation 2026). Looking ahead, the federal BALANCE (Better Approaches to Lifestyle and Nutrition for Comprehensive hEalth) Model, announced by CMS in December 2025, will allow state Medicaid agencies to voluntarily opt in to cover GLP-1 medications for weight management at prices negotiated directly between CMS and participating manufacturers, launching as early as May 2026.[23] State decisions about coverage will depend on negotiated prices, evolving clinical evidence, and budget constraints.

16. California's 2025-26 state budget eliminated Medi-Cal coverage of GLP-1s (Wegovy, Zepbound, Saxenda) for weight loss effective January 1, 2026. The state projected costs would have reached nearly $800 million annually without the cut (KFF Health News 2026; California Department of Health Care Services 2025).

17. New Hampshire ended Medicaid GLP-1 coverage for weight loss effective January 1, 2026 (Kaiser Family Foundation 2026).

18. Pennsylvania ended Medicaid coverage of GLP-1s for weight loss for adults aged 21 and older effective January 1, 2026. Coverage may continue for individuals under 21 under the EPSDT mandate. Pennsylvania spent $650 million on GLP-1 prescriptions for Medicaid recipients in 2024, up from $223 million in 2022 (Spotlight PA 2025; Pennsylvania Health Law Project 2025).

19. South Carolina eliminated Medicaid coverage of GLP-1s for weight loss effective January 1, 2026, reversing a policy that had been in place since November 2024 (Kaiser Family Foundation 2026).

20. Michigan's FY2026 bipartisan state budget directed MDHHS to implement stricter criteria for GLP-1 medications prescribed for weight loss, effective January 1, 2026. Approval requires morbid obesity classification, documented failure of all other clinically appropriate weight-loss interventions and PDL-preferred anti-obesity agents, with coverage limited to averting the need for bariatric surgery (Meridian Health Plan of Michigan 2025; Priority Health 2025).

21. North Carolina Medicaid ended GLP-1 coverage for obesity on October 1, 2025, citing shortfalls in state funding, but reinstated coverage on December 12, 2025, reverting to pre-October criteria (NC Medicaid 2025).

22. See KFF Health News (2026) and Stateline (2025). Connecticut's Governor Lamont proposed repealing the state's 2023 Medicaid GLP-1 coverage requirement amid a $290 million Medicaid deficit (Monk 2025).

23. Under BALANCE, CMS negotiates drug pricing and coverage terms with GLP-1 manufacturers on behalf of participating state Medicaid agencies and Medicare Part D plan sponsors. Participation is voluntary for manufacturers, states, and plans (Centers for Medicare & Medicaid Services 2025b, 2025a).

Table 1 — GLP-1 Obesity Drug Acquisition Costs

			Per Pen			Monthly		
Drug	Wt. loss effect (pp)	Pens/ month	NADAC	FSS	Big 4	NADAC	FSS	Big 4
Panel A: Most recent prices (Q1 2025)								
Saxenda	5.4	5	$260.46	$259.02	$201.78	$1,302	$1,295	$1,009
Wegovy	12.5	4	$325.61	$309.12	$252.13	$1,302	$1,236	$1,009
Zepbound	17.8	4	$261.85	$205.05	$198.31	$1,047	$820	$793
Panel B: Earliest available prices								
Saxenda (Q1 2019)	5.4	5	$239.81	$236.46	$174.13	$1,199	$1,182	$871
Wegovy (Q3 2021)	12.5	4	$325.42	$260.99	$248.17	$1,302	$1,044	$993
Zepbound (Q1 2024)	17.8	4	$255.02	$266.30	$197.88	$1,020	$1,065	$792

Notes: NADAC is the National Average Drug Acquisition Cost, representing the average price pharmacies pay wholesalers. FSS is the Federal Supply Schedule price negotiated by the VA. Big 4 is the further-discounted price available to the VA, DoD, Coast Guard, and Public Health Service. Per-pen prices equal the NADAC per-mL rate times the pen volume. Monthly costs equal per-pen price times pens per month. Maintenance doses: Saxenda 3 mg/day, Wegovy 2.4 mg/week, Zepbound 15 mg/week. Each Saxenda pen contains 3 mL (18 mg); each Wegovy pen contains 0.75 mL (2.4 mg); each Zepbound pen contains 0.5 mL (15 mg). Earliest available prices reflect the first quarter in which NADAC, FSS, and Big 4 prices are all observed for each drug. RCT weight loss is the placebo-adjusted percent body weight reduction from the pivotal trial for each drug's obesity maintenance dose: Saxenda (Pi-Sunyer et al. 2015), Wegovy (Wilding et al. 2021), Zepbound (Jastreboff et al. 2022).

Table 2 — Medicaid State Coverage of GLP-1 obesity-indicated medications, 2022-2026.

State	First Coverage	Wegovy	Saxenda	Zepbound	In Analysis
MI	2022-Q1	2022-Q1	2022-Q1	2024-Q4	Both
NH	2022-Q3	2022-Q3	2022-Q3	2024-Q3	Both
RI	2022-Q4	2022-Q4	2022-Q4	2024-Q2	Both
CA	2023-Q1	2023-Q1	2023-Q1	2024-Q4	Both
DE	2023-Q1	2023-Q1	2023-Q1	2024-Q3	Both
PA	2023-Q1	2023-Q1	2023-Q1	2024-Q1	Both
VA	2023-Q1	2023-Q1	2023-Q1	2024-Q1	Both
MN	2023-Q2	2023-Q2	2023-Q2	2024-Q4	10-State
WI	2023-Q2	2023-Q2	2023-Q2	2024-Q3	10-State
MS	2023-Q4	2023-Q4	2023-Q4	–	10-State
MA	2024-Q1	2024-Q1	2024-Q1	2024-Q4	–
KS	2024-Q2	2024-Q2	2024-Q2	2024-Q2	–
NC	2024-Q3	2024-Q3	2024-Q3	2024-Q3	–
MO	2024-Q4	2025-Q1	–	2024-Q4	–
SC	2024-Q4	2024-Q4	2024-Q4	–	–
TN	2025-Q3	2025-Q3	2026-Q1	2025-Q3	–
UT	2025-Q3	2025-Q3	2025-Q3	2025-Q3	–

Note: "First Coverage" indicates when the state first added any GLP-1 obesity-indicated medication to the Medicaid formulary. Subsequent columns show the quarter each specific drug was added. In the "In Analysis" column,"Both" indicates inclusion in both the 7-state and 10-state research designs; "10-State" indicates inclusion only in the 10-state design. "-" indicates not studied in this paper due to lack of adequate follow up data, for policies that take effect past our study window. All states not listed here do not cover GLP1 medications for obesity indications. Table current as of Q1 2026. Further information and evidence sources for all states are available at https://gist.github.com/coadywing/14061c2322ad07fcd042d1aca7a65694.

Table 3 — Prior Authorization Tier Classification for Obesity-Indicated GLP-1 Drugs

Tier	BMI Threshold	Additional PA Requirements	States
Panel A: Wegovy and Saxenda			
I	BMI $\geq$ 30		RI
II	BMI $\geq$ 30	Agree to weight management plan	MA, MS, PA, TN, UT
III	BMI $\geq$ 30	Documented weight management plan	MN, NC, WI
IV	BMI $\geq$ 30	Documented failed weight management plan	DE, MI, NH, VA
V	BMI $\geq$ 40		KS, SC
Panel B: Zepbound			
I	BMI $\geq$ 30		MO
II	BMI $\geq$ 30	Agree to weight management plan	KS, TN, UT
III	BMI $\geq$ 30	Documented weight management plan	NC
IV	BMI $\geq$ 30	Documented failed weight management plan	MA, VA

Notes. This table classifies covering states by the stringency of their prior authorization (PA) requirements for obesity-indicated GLP-1 drugs. Tier requirements are cumulative: each tier includes all requirements from lower tiers plus the listed additional requirement. Tier I requires only a BMI threshold. Tier V (Wegovy/Saxenda only) raises the BMI threshold to 40. States not listed do not cover the drug for the obesity indication. Classification is based on state PDLs, PA criteria documents, and Medicaid policy statements as of early 2025. See notes under Table 2.

Table 4 — States included in the stacked difference-in-differences analysis.

State	Adoption	Initial Drugs	7-State	10-State
MI	2022-Q1	Saxenda, Wegovy	✓	✓
NH	2022-Q3	Saxenda, Wegovy	✓	✓
RI	2022-Q4	Saxenda, Wegovy	✓	✓
CA	2023-Q1	Saxenda, Wegovy	✓	✓
DE	2023-Q1	Saxenda, Wegovy	✓	✓
PA	2023-Q1	Saxenda, Wegovy	✓	✓
VA	2023-Q1	Saxenda, Wegovy	✓	✓
MN	2023-Q2	Saxenda, Wegovy		✓
WI	2023-Q2	Saxenda, Wegovy		✓
MS	2023-Q4	Saxenda, Wegovy		✓
Design summary				
Treated states			7	10
Control states (never-treated)			33	33
Pre-treatment periods			4	4
Post-treatment periods			10	7

Note: Initial drugs reflect the drugs covered at the time of first adoption. Zepbound (tirzepatide) received FDA approval for obesity in November 2023 and was subsequently added by covering states beginning in early 2024; it therefore enters the analysis later than Saxenda and Wegovy. 7 additional states (KS, MA, MO, NC, SC, TN, UT) adopted GLP-1 obesity coverage between 2024-Q1 to 2025-Q3, too late for inclusion in either research design given SDUD data availability through 2025-Q2.

Table 5 — Projected budget impact of Medicaid GLP-1 obesity coverage: covering states

State	Adoption	Enrollment (September 2025)	Average Post-Period		Event Time 9	
			Monthly Users	Annual Net Spending ($)	Monthly Users	Annual Net Spending ($)
California	2023-Q1	11,978,256	42,238	477,682,515	98,341	1,080,410,097
Pennsylvania	2023-Q1	2,757,077	9,722	109,949,852	22,636	248,681,764
North Carolina	2024-Q3	2,535,360	8,940	101,107,969	20,815	228,683,420
Michigan	2022-Q1	2,174,909	7,669	86,733,495	17,856	196,171,600
Virginia	2023-Q1	1,512,223	5,332	60,306,149	12,415	136,398,905
Massachusetts	2024-Q1	1,411,397	4,977	56,285,295	11,588	127,304,640
Tennessee	2025-Q3	1,251,458	4,413	49,907,065	10,274	112,878,524
Minnesota	2023-Q2	1,185,328	4,180	47,269,858	9,732	106,913,756
Missouri	2024-Q4	1,133,687	3,998	45,210,459	9,308	102,255,861
Wisconsin	2023-Q2	1,033,372	3,644	41,209,984	8,484	93,207,688
South Carolina	2024-Q4	890,091	3,139	35,496,061	7,308	80,284,083
Mississippi	2023-Q4	512,797	1,808	20,449,902	4,210	46,253,065
Kansas	2024-Q2	333,192	1,175	13,287,410	2,736	30,053,123
Utah	2025-Q3	302,064	1,065	12,046,052	2,480	27,245,452
Rhode Island	2022-Q4	271,469	957	10,825,950	2,229	24,485,856
Delaware	2023-Q1	230,166	812	9,178,822	1,890	20,760,424
New Hampshire	2022-Q3	162,604	573	6,484,507	1,335	14,666,493
Subtotal (17 states)		29,675,450	104,643	1,183,431,344	243,635	2,676,654,748

Notes. Projected monthly GLP-1 obesity drug users and annual Medicaid spending by state, extrapolating per-enrollee ATT estimates from the 7-state enrollee-month weighted stacked difference-in-differences design. "Average post-period" uses the mean ATT across event times 0–9 (approximately 2.5 years post-adoption). "Event time 9" uses the ATT at 9 quarters post-adoption, reflecting a more mature utilization level. Users is the implied number of enrollees filling a GLP-1 obesity prescription in a given month. Enrollment is total Medicaid enrollment in September 2025 from CMS monthly enrollment reports. Net spending subtracts estimated statutory Medicaid Drug Rebate Program (MDRP) rebates from gross reimbursement (see Appendix B). Projections assume uniform per-enrollee effects across states and do not account for differences in demographics, formulary design, or supplemental rebates.

Table 6 — Projected budget impact of Medicaid GLP-1 obesity coverage: non-covering states

State	Enrollment (September 2025)	Average Post-Period		Event Time 9	
		Users/mo	Annual Net ($)	Users/mo	Annual Net ($)
New York	5,873,147	20,710	234,216,035	48,218	529,743,839
Texas	3,851,991	13,583	153,614,078	31,625	347,440,393
Florida	3,476,089	12,258	138,623,430	28,539	313,534,930
Illinois	2,773,141	9,779	110,590,471	22,767	250,130,698
Ohio	2,534,444	8,937	101,071,440	20,808	228,600,799
Washington	1,730,508	6,102	69,011,166	14,207	156,087,691
Georgia	1,711,876	6,037	68,268,138	14,054	154,407,129
Arizona	1,628,913	5,744	64,959,645	13,373	146,924,064
New Jersey	1,511,726	5,331	60,286,329	12,411	136,354,076
Indiana	1,472,252	5,192	58,712,140	12,087	132,793,616
Louisiana	1,310,796	4,622	52,273,414	10,762	118,230,670
Kentucky	1,227,929	4,330	48,968,749	10,081	110,756,264
Maryland	1,218,641	4,297	48,598,352	10,005	109,918,509
Oregon	1,125,025	3,967	44,865,026	9,236	101,474,569
Colorado	1,057,804	3,730	42,184,311	8,685	95,411,396
Oklahoma	910,072	3,209	36,292,886	7,472	82,086,322
Connecticut	889,736	3,137	35,481,904	7,305	80,252,063
Alabama	756,883	2,669	30,183,841	6,214	68,269,040
Arkansas	732,961	2,585	29,229,852	6,018	66,111,332
Nevada	689,962	2,433	27,515,089	5,665	62,232,925
New Mexico	646,450	2,280	25,779,868	5,307	58,308,247
Iowa	586,619	2,069	23,393,860	4,816	52,911,633
West Virginia	458,947	1,618	18,302,410	3,768	41,395,924
Hawaii	366,401	1,292	14,611,756	3,008	33,048,496
Maine	315,226	1,112	12,570,941	2,588	28,432,633
Nebraska	301,632	1,064	12,028,824	2,476	27,206,486
Idaho	295,732	1,043	11,793,537	2,428	26,674,320
Alaska	202,632	715	8,080,789	1,664	18,276,923
Montana	193,524	682	7,717,570	1,589	17,455,403
Vermont	148,404	523	5,918,223	1,218	13,385,687
South Dakota	122,307	431	4,877,498	1,004	11,031,799
North Dakota	102,021	360	4,068,509	838	9,202,051
Wyoming	54,433	192	2,170,741	447	4,909,727
Subtotal (33 states)	40,278,224	142,031	1,606,260,824	330,684	3,632,999,652

Notes. See Table 5.

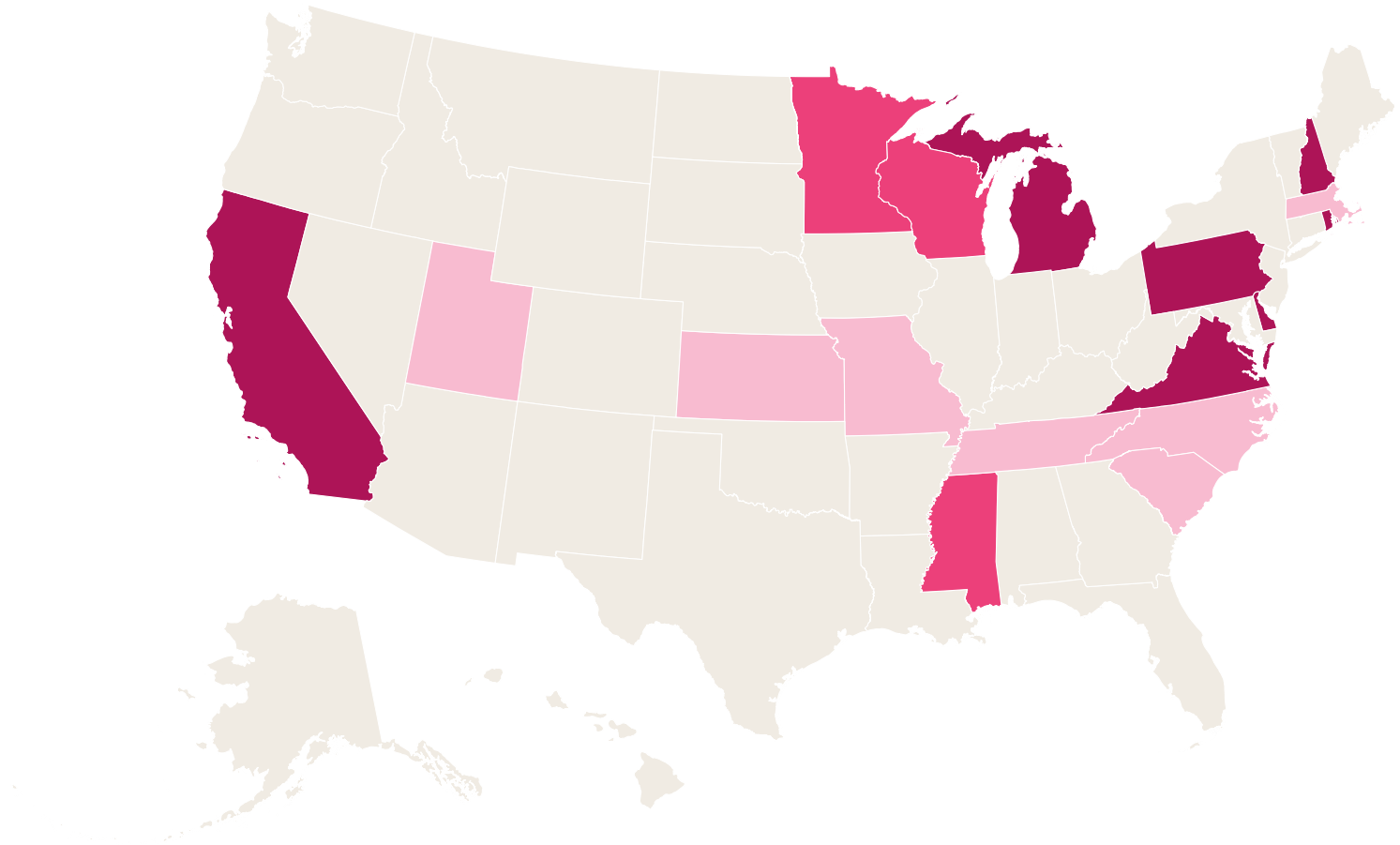
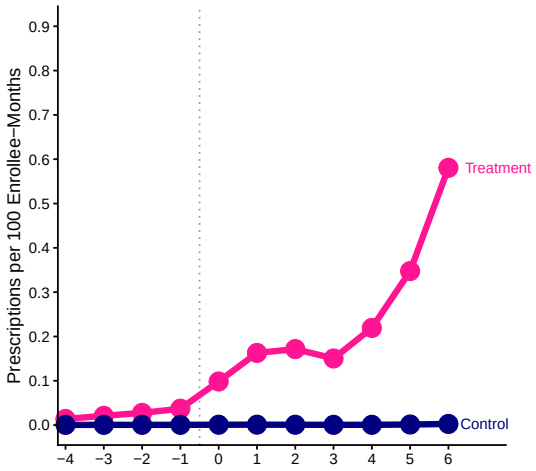
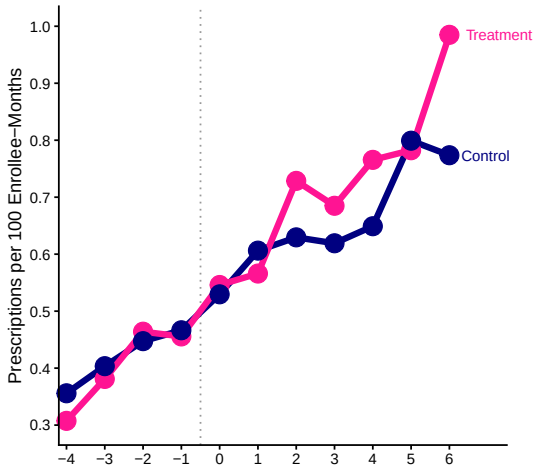


Figure 1 — Medicaid coverage of GLP-1 obesity drugs. Dark shading indicates the seven states included in both stacked difference-in-differences designs; medium shading indicates the three additional states included only in the 10-state design; light shading indicates states that adopted coverage after 2023 and are not included in either design. Unshaded states had not adopted Medicaid coverage of GLP-1 obesity drugs as of mid-2025.

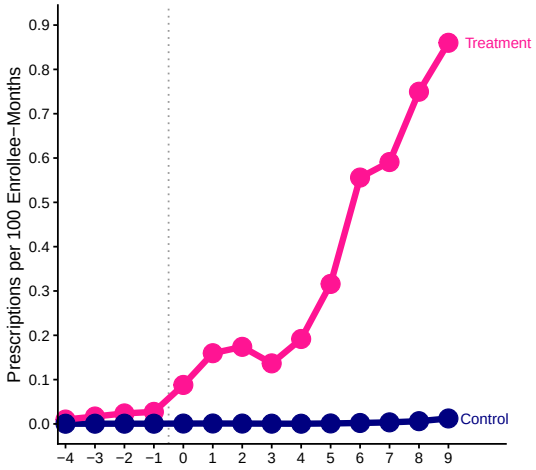
(a) Obesity GLP-1 Prescriptions (10 State Design)



(b) Diabetes GLP-1 Prescriptions (10 State Design)



(c) Obesity GLP-1 Prescriptions (7 State Design)



(d) Diabetes GLP-1 Prescriptions (7 State Design)

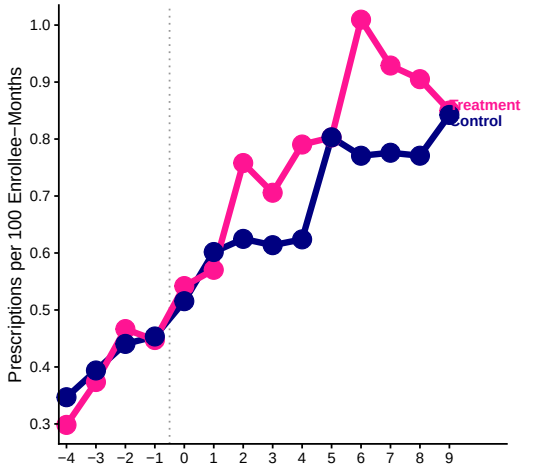
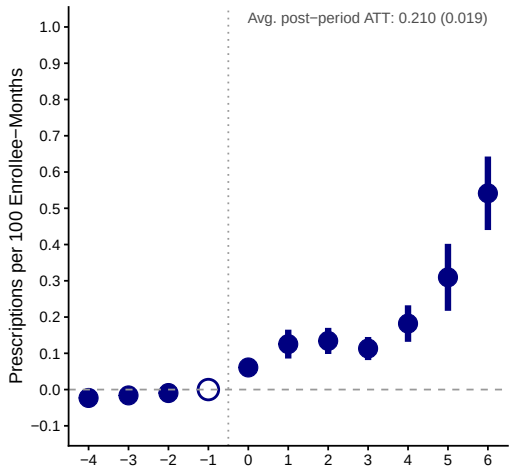
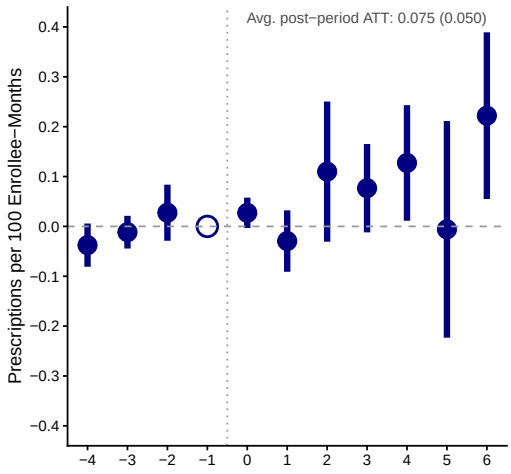


Figure 2 — Mean GLP-1 prescription levels by event time for treatment and control groups (enrollee-month weighted).

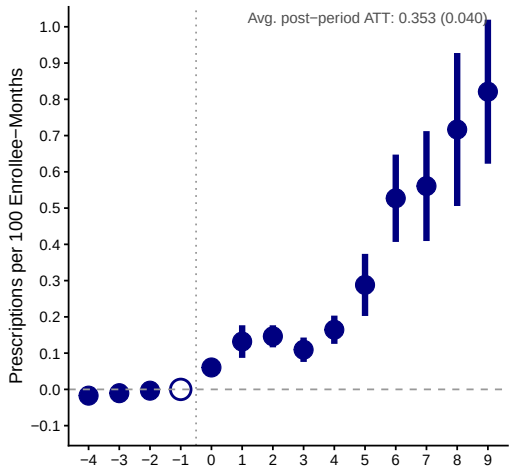
(a) Obesity GLP-1 Prescriptions (10 State Design)



(b) Diabetes GLP-1 Prescriptions (10 State Design)



(c) Obesity GLP-1 Prescriptions (7 State Design)



(d) Diabetes GLP-1 Prescriptions (7 State Design)

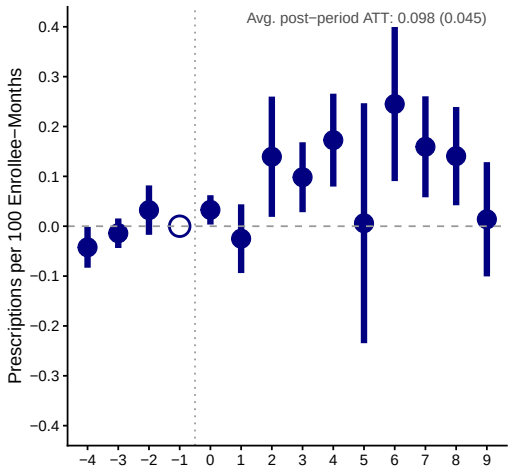
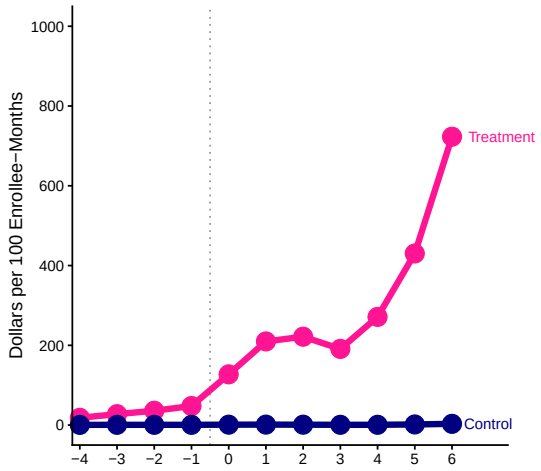
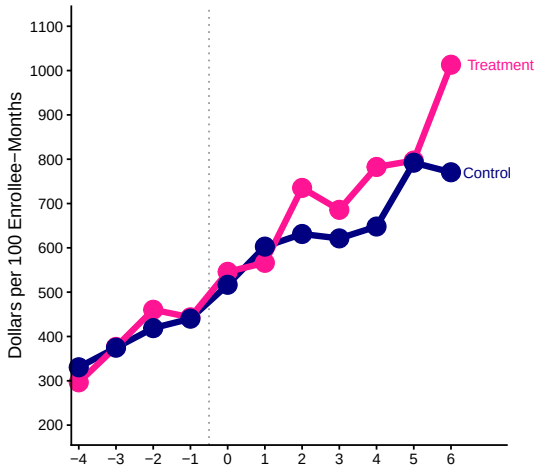


Figure 3 — Effects of Medicaid GLP-1 obesity coverage on prescriptions (enrollee-month weighted). Panels (a) and (b) show effects using the 10-state design; panels (c) and (d) show effects using the 7-state design.

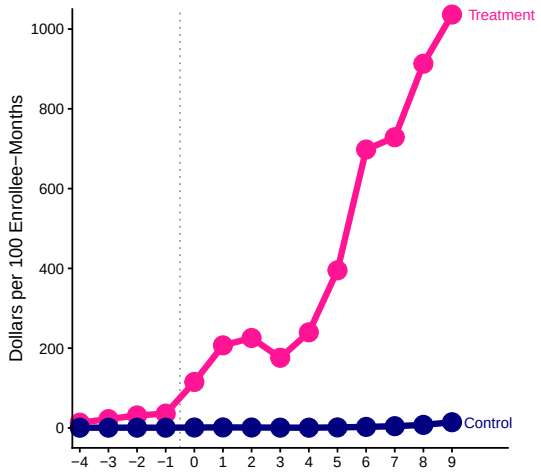
(a) Obesity GLP-1 Spending (10 State Design)



(b) Diabetes GLP-1 Spending (10 State Design)



(c) Obesity GLP-1 Spending (7 State Design)



(d) Diabetes GLP-1 Spending (7 State Design)

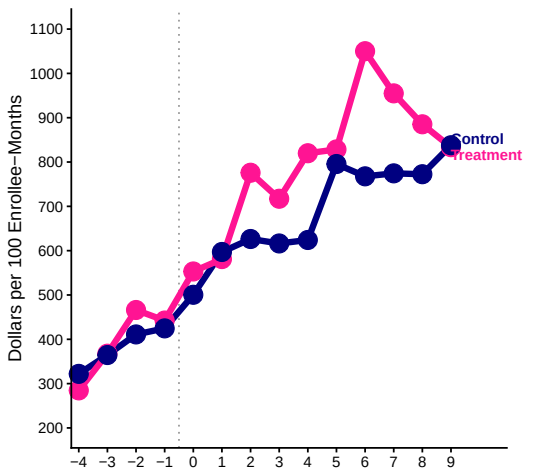
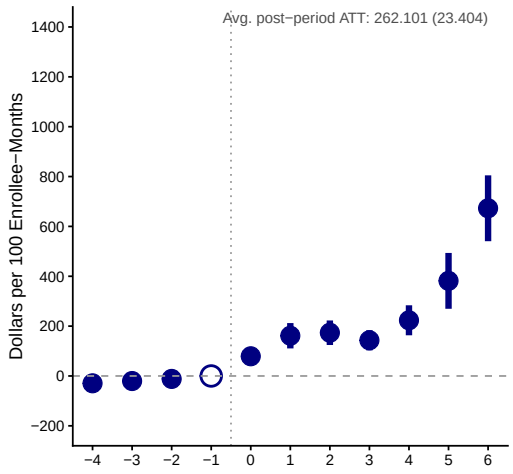
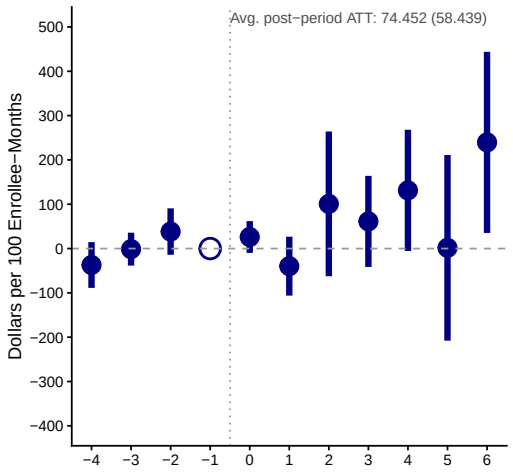


Figure 4 — Mean GLP-1 spending levels by event time for treatment and control groups (enrollee-month weighted).

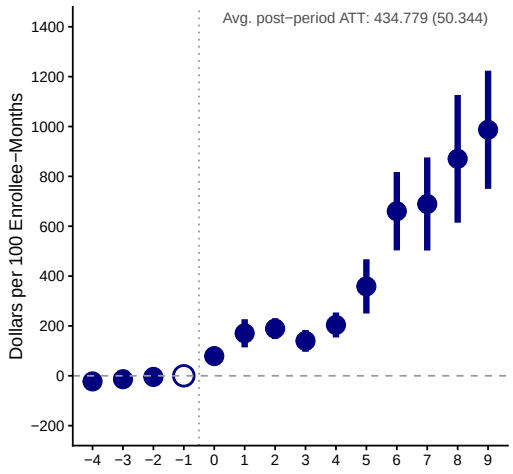
(a) Obesity GLP-1 Spending (10 State Design)



(b) Diabetes GLP-1 Spending (10 State Design)



(c) Obesity GLP-1 Spending (7 State Design)



(d) Diabetes GLP-1 Spending (7 State Design)

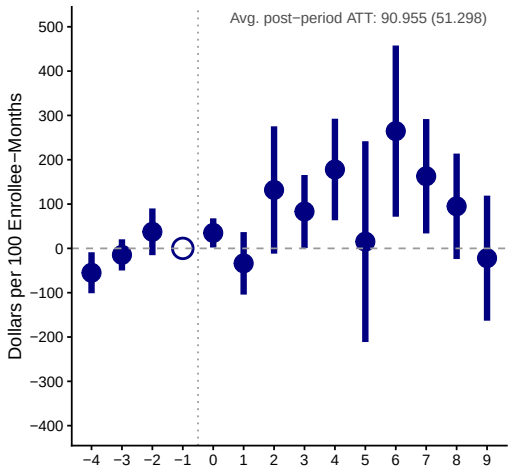
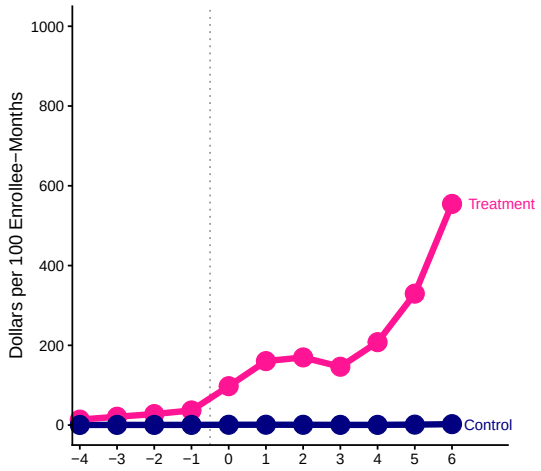
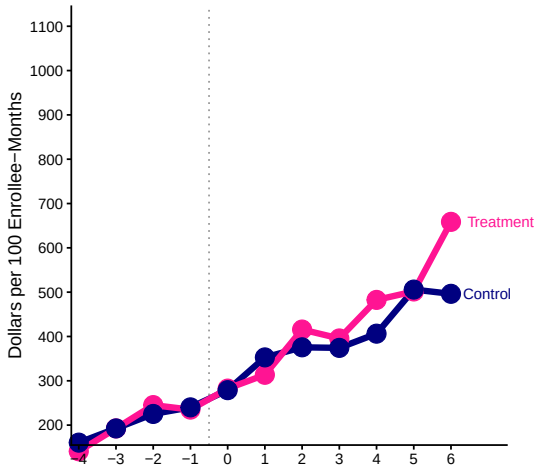


Figure 5 — Effects of Medicaid GLP-1 obesity coverage on spending (enrollee-month weighted). Panels (a) and (b) show effects using the 10-state design; panels (c) and (d) show effects using the 7-state design.

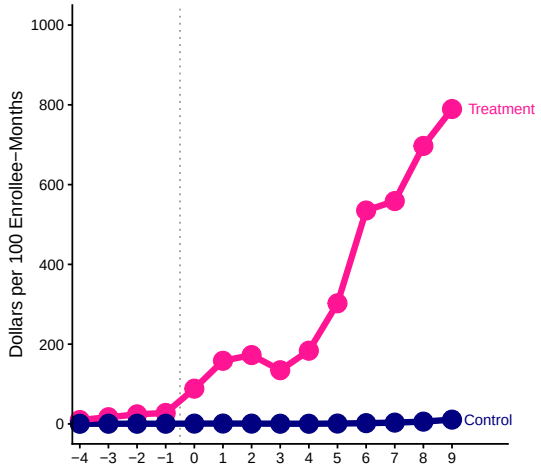
(a) Obesity GLP-1 Net Spending (10 State Design)



(b) Diabetes GLP-1 Net Spending (10 State Design)



(c) Obesity GLP-1 Net Spending (7 State Design)



(d) Diabetes GLP-1 Net Spending (7 State Design)

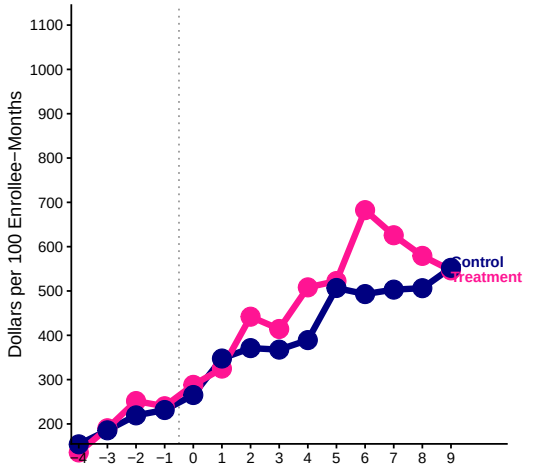
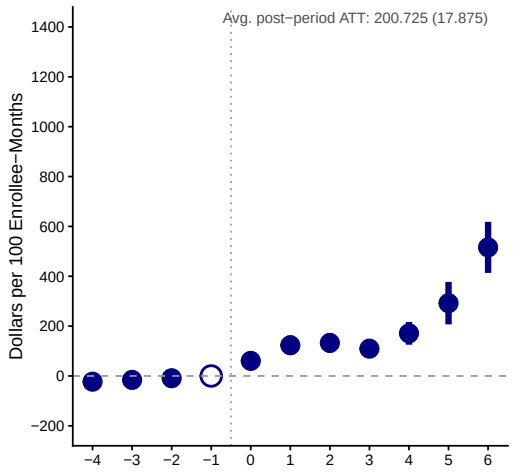
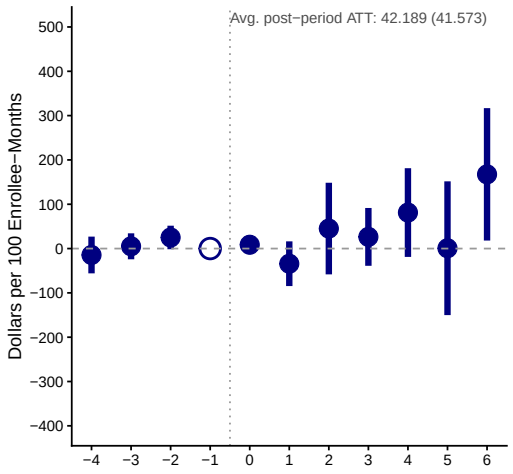


Figure 6 — Mean GLP-1 net spending levels (after estimated MDRP rebates) by event time for treatment and control groups (enrollee-month weighted).

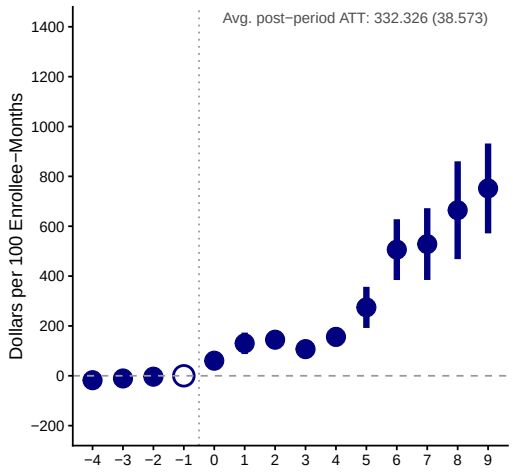
(a) Obesity GLP-1 Net Spending (10 State Design)



(b) Diabetes GLP-1 Net Spending (10 State Design)



(c) Obesity GLP-1 Net Spending (7 State Design)



(d) Diabetes GLP-1 Net Spending (7 State Design)

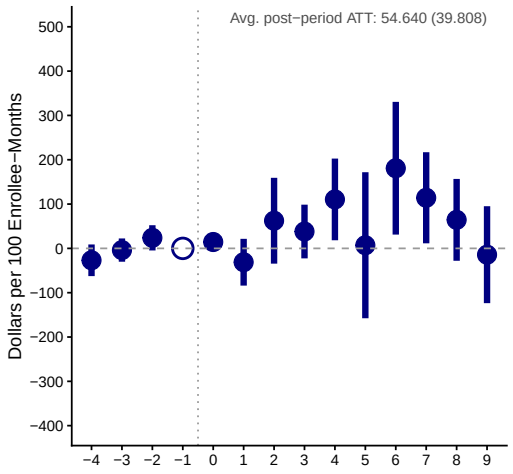


Figure 7 — Effects of Medicaid GLP-1 obesity coverage on net spending after estimated MDRP rebates (enrollee-month weighted). Panels (a) and (b) show effects using the 10-state design; panels (c) and (d) show effects using the 7-state design.

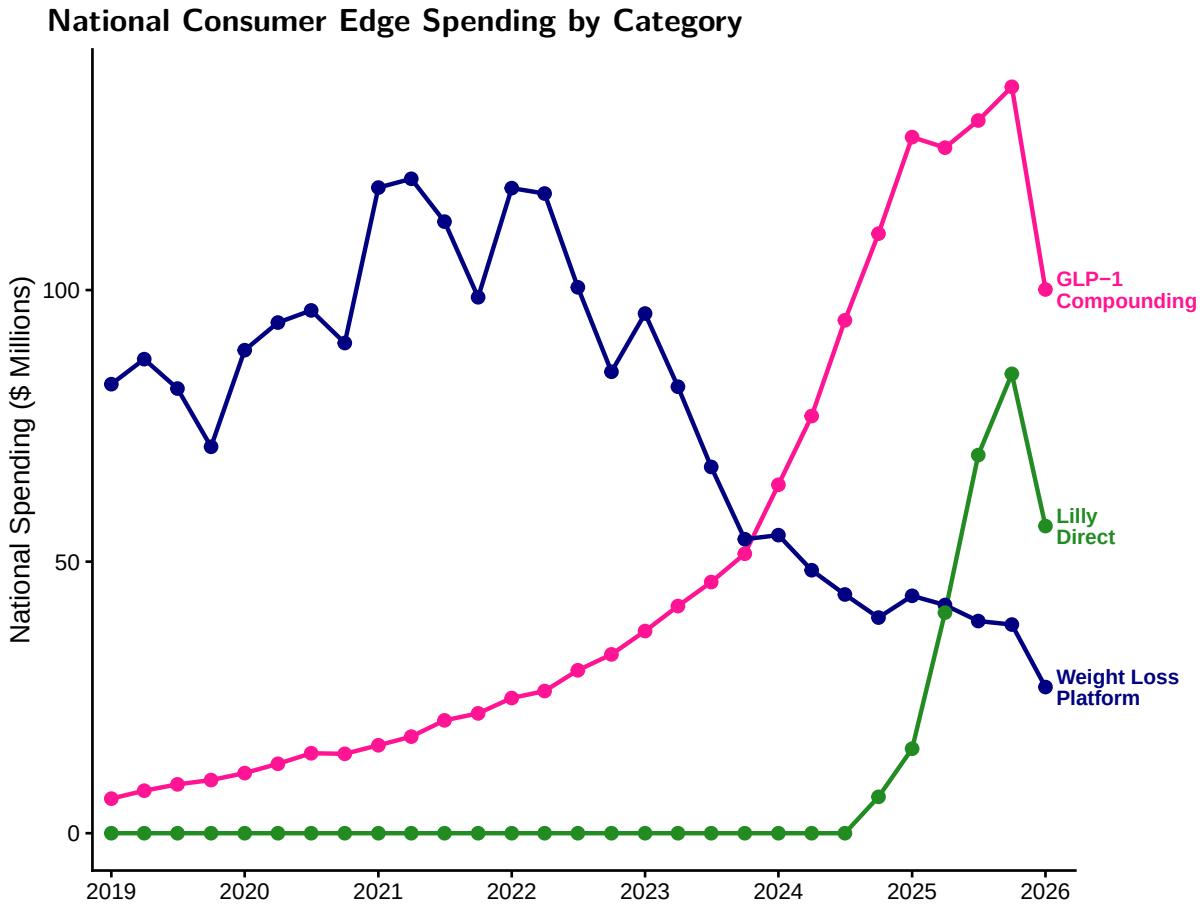
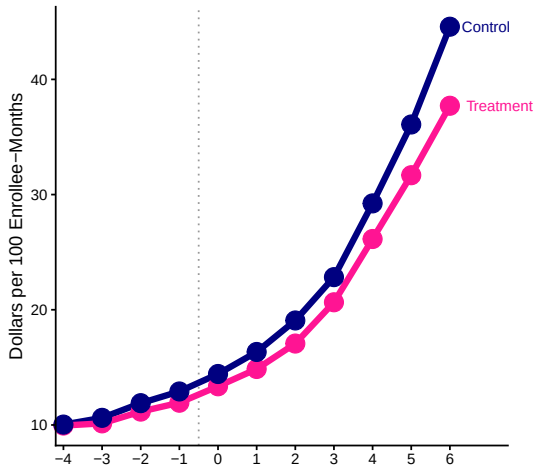
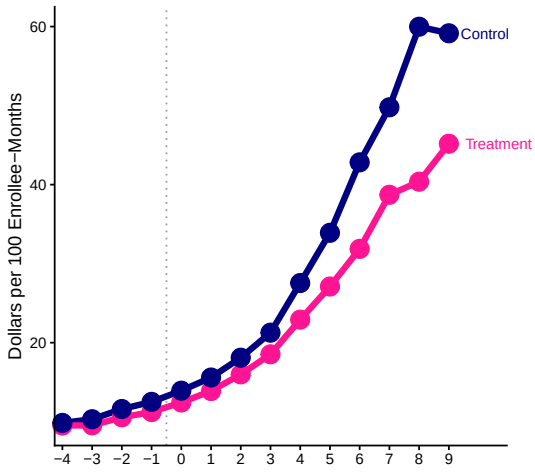


Figure 8 — National spending on GLP-1 compounding platforms, weight loss platforms, and Lilly Direct from Consumer Edge transaction data, 2019–2025. GLP-1 compounding spending grew rapidly beginning in 2022, surpassing weight loss platform spending by mid-2023.

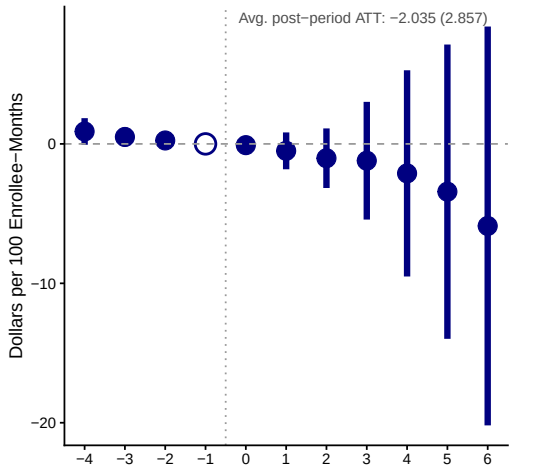
(a) Online GLP-1 Spending Levels (10 State Design)



(b) Online GLP-1 Spending Levels (7 State Design)



(c) Online GLP-1 Spending Effects (10 State Design)



(d) Online GLP-1 Spending Effects (7 State Design)

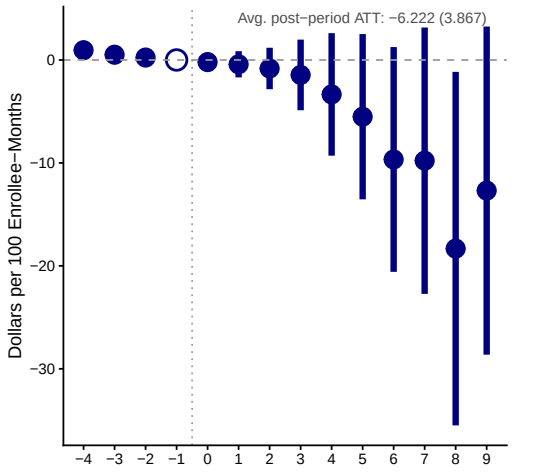


Figure 9 — Online GLP-1 spending from Consumer Edge data (enrollee-month weighted). Panels (a) and (b) show mean spending levels by event time for treatment and control groups; panels (c) and (d) show event study estimates. Left panels use the 10-state design; right panels use the 7-state design.

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Appendix

A — Causal Estimands

In this appendix, we lay out notation in more detail and use it to define the causal estimand that is the target parameter of the analysis in the paper. We also compare our enrollment-weighted parameter of interest with a simpler unit-weighted effect.

A.1. Notation, Sample Sizes, and Enrollment

We use s to index states and t to index calendar quarters. As in the main text, A_s denotes the quarter in which state s first covered at least one obesity-indicated GLP-1 medication, with $A_s = NT$ for states that never adopted coverage during our study period. Use κ_{pre} and κ_{post} to define the length of the pre- and post-periods in a given research design. Ω_κ represents the set of adoption cohorts that are feasible to study given the event window, and we use $a \in \Omega_\kappa$ to index adoption cohorts or "sub-experiments" in the set.

Within sub-experiment a, $N_a^{\text{treat}} = \sum_s 1[A_s = a]$ is the number of treated states, and $N_a^{\text{control}} = \sum_s 1[A_s = NT]$ is the number of clean control states. $N_{\Omega_\kappa}^{\text{treat}} = \sum_{a \in \Omega_\kappa} N_a^{\text{treat}}$ and $N_{\Omega_\kappa}^{\text{control}} = \sum_{a \in \Omega_\kappa} N_a^{\text{control}}$ give the number of treated and control states across all of the sub-experiments in the design.

In the original data, we observe end of month Medicaid enrollment counts for each state. Let E_{stm} denote the total number of people enrolled in Medicaid in state s during month m of quarter t. Since the SDUD data are quarterly, we aggregate the monthly enrollment data so that $M_{st} = \sum_m E_{stm}$ represents the total enrollee-months for state s in quarter t.

- Inside sub-experiment a, a state's total enrollee-months across all *event times* is $M_s^a = \sum_{e=-\kappa_{pre}}^{\kappa_{post}} M_{s,a+e}$.
- Aggregating to the cohort level, $M_a^{\text{treat}} = \sum_{s|A_s=a} M_s^a$ is total enrollee-months across all treated states and all event times in cohort a. Total enrollee-months among the clean controls across all event times is $M_a^{\text{control}} = \sum_{s|A_s=NT} M_s^a$.
- Aggregating across adoption cohorts, $M_{\Omega_\kappa}^{\text{treat}} = \sum_{a \in \Omega_\kappa} M_a^{\text{treat}}$ represents total enrollee-months across all treated units in the study population. $M_{\Omega_\kappa}^{\text{control}} = \sum_{a \in \Omega_\kappa} M_a^{\text{control}}$ is total enrollee-months for the clean controls.

A.2. Enrollment Weighted Average Causal Effects

Let $Y_{st}(a)$ and $Y_{st}(0)$ represent potential outcomes for the same state and quarter with and without coverage. The observed outcome is $Y_{st} = Y_{st}(0) + \sum_a (Y_{st}(a) - Y_{st}(0)) \times 1[A_s = a]$.

The enrollment-weighted group time ATT is:

$$\begin{aligned} ATT(a, a+e) &= \mathbb{E}_{M_s^a}[Y_{s,a+e}(a) - Y_{s,a+e}(0) \mid A_s = a] \\ &= \sum_{s|A_s=a} (Y_{s,a+e}(a) - Y_{s,a+e}(0)) \times \frac{M_s^a}{M_a^{\text{treat}}} \end{aligned}$$

The aggregate causal effect that we study in our main analysis is the enrollee-month weighted average of these group-time ATTs across adoption cohorts:

$$\theta^e_{\Omega_\kappa} = \sum_{a \in \Omega_\kappa} ATT(a, a+e) \times \frac{M_a^{\text{treat}}}{M_{\Omega_\kappa}^{\text{treat}}}$$

Thus, the aggregate is an enrollment-weighted average of enrollment-weighted group-time ATTs. Note that because the weights are based on total enrollee-months across all event times, they are fixed and do not change over event time. This avoids the mechanical relationship between time-varying weights and the denominator used to construct the per-enrollee-month dependent variable.

A.3. Unit-Weight Average Causal Effects

An alternative way to aggregate effects across sub-experiments is to ignore enrollment variation entirely and give equal weight to each state. In this case, the group-time ATT treats each state inside a sub-experiment equally:

$$\begin{aligned} ATT^{uw}(a, a+e) &= \mathbb{E}[Y_{s,a+e}(a) - Y_{s,a+e}(0) \mid A_s = a] \\ &= \sum_{s|A_s=a} (Y_{s,a+e}(a) - Y_{s,a+e}(0)) \times \frac{1}{N_a^{\text{treat}}} \end{aligned}$$

The corresponding aggregate is:

$$\theta^e_{\Omega_\kappa, uw} = \sum_{a \in \Omega_\kappa} ATT^{uw}(a, a+e) \times \frac{N_a^{\text{treat}}}{N_{\Omega_\kappa}^{\text{treat}}}.$$

This unit-weighted aggregate represents the effect of coverage on the average treated state in the study population rather than the average treated enrollee-month.

A.4. Comparison of Estimates

Tables A.1 and A.2 compare enrollment-weighted and unit-weighted point estimates and standard errors for the 10-state and 7-state designs. Figures A.1-A.4 show the level plots and event study plots. In the 7-state design, the two estimands agree closely for prescriptions and differ modestly

for spending. In the 10-state design, the pattern is similar. Regardless of the precise definition of the target parameter of interest, the basic results of our study are quite consistent.

Table A.1 — Comparison of Estimands: Obesity-Indicated GLP-1 Outcomes (10-State Design)

	Prescriptions per 100		Spending per 100 ($)	
Event Time	θ_e^{uw}	θ_e^{emw}	θ_e^{uw}	θ_e^{emw}
-4	-0.0249 (0.0081)	-0.0231 (0.0060)	-29.8 (9.9)	-29.4 (7.6)
-3	-0.0196 (0.0073)	-0.0161 (0.0047)	-23.2 (9.0)	-20.3 (5.8)
-2	-0.0163 (0.0069)	-0.0096 (0.0047)	-19.8 (8.4)	-11.8 (5.7)
0	0.0504 (0.0108)	0.0610 (0.0091)	63.5 (13.8)	79.0 (11.4)
1	0.1024 (0.0203)	0.1254 (0.0203)	128.4 (26.2)	161.4 (25.9)
2	0.0995 (0.0184)	0.1341 (0.0184)	125.8 (23.8)	173.5 (25.1)
3	0.1170 (0.0195)	0.1132 (0.0162)	145.0 (25.4)	143.2 (20.7)
4	0.1878 (0.0310)	0.1820 (0.0257)	227.6 (36.6)	223.4 (30.7)
5	0.3056 (0.0513)	0.3095 (0.0471)	372.0 (60.6)	381.6 (57.1)
6	0.4424 (0.0733)	0.5413 (0.0517)	538.2 (88.2)	672.7 (67.4)
Post-Period ATT	0.1864	0.2095	228.6	262.1

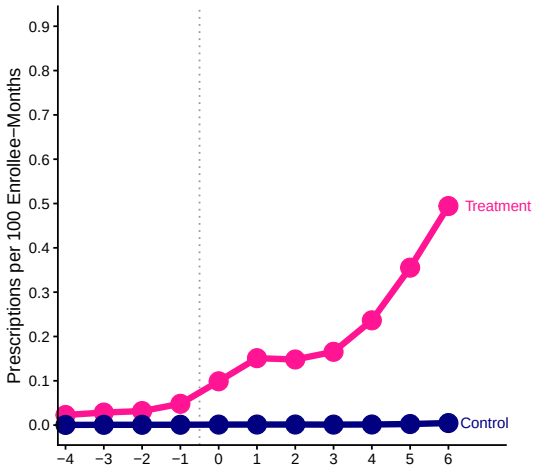
Notes. Each cell reports the coefficient (standard error) from a stacked difference-in-differences regression of the indicated outcome on treatment $\times$ event time indicators. Standard errors clustered by state. θ_e^{uw} = unit-weight ATT; θ_e^{emw} = enrollee-month weighted ATT. Post-Period ATT is the unweighted average of the post-treatment coefficients.

Table A.2 — Comparison of Estimands: Obesity-Indicated GLP-1 Outcomes (7-State Design)

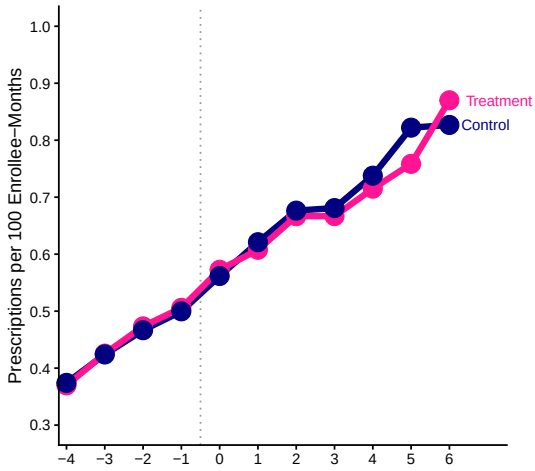
	Prescriptions per 100		Spending per 100 ($)	
Event Time	θ_e^{uw}	θ_e^{emw}	θ_e^{uw}	θ_e^{emw}
-4	-0.0117 (0.0036)	-0.0173 (0.0067)	-14.2 (4.8)	-22.7 (9.0)
-3	-0.0076 (0.0022)	-0.0105 (0.0040)	-9.0 (2.8)	-13.8 (5.4)
-2	-0.0039 (0.0016)	-0.0035 (0.0012)	-4.7 (1.9)	-4.5 (1.5)
0	0.0474 (0.0141)	0.0604 (0.0102)	60.3 (18.2)	79.0 (12.9)
1	0.1132 (0.0273)	0.1319 (0.0230)	142.5 (35.2)	170.5 (28.8)
2	0.1124 (0.0201)	0.1464 (0.0155)	140.9 (26.7)	189.2 (21.4)
3	0.1006 (0.0206)	0.1094 (0.0172)	126.0 (26.2)	139.9 (22.3)
4	0.1418 (0.0248)	0.1645 (0.0199)	173.0 (31.8)	203.8 (25.6)
5	0.2516 (0.0539)	0.2881 (0.0437)	309.8 (67.9)	358.6 (55.5)
6	0.3713 (0.0856)	0.5271 (0.0614)	454.3 (107.2)	660.2 (80.2)
7	0.4278 (0.0971)	0.5607 (0.0773)	518.4 (120.0)	689.2 (95.3)
8	0.5668 (0.1214)	0.7167 (0.1076)	680.6 (149.6)	870.4 (130.7)
9	0.6847 (0.1447)	0.8210 (0.1013)	815.9 (174.4)	986.9 (120.9)
Post-Period ATT	0.2818	0.3526	342.2	434.8

Notes. Each cell reports the coefficient (standard error) from a stacked difference-in-differences regression of the indicated outcome on treatment $\times$ event time indicators. Standard errors clustered by state. θ_e^{uw} = unit-weight ATT; θ_e^{emw} = enrollee-month weighted ATT. Post-Period ATT is the unweighted average of the post-treatment coefficients.

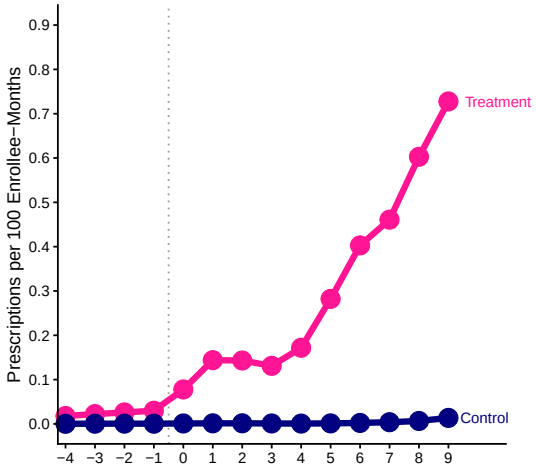
(a) Obesity GLP-1 Prescriptions (10 State Design)



(b) Diabetes GLP-1 Prescriptions (10 State Design)



(c) Obesity GLP-1 Prescriptions (7 State Design)



(d) Diabetes GLP-1 Prescriptions (7 State Design)

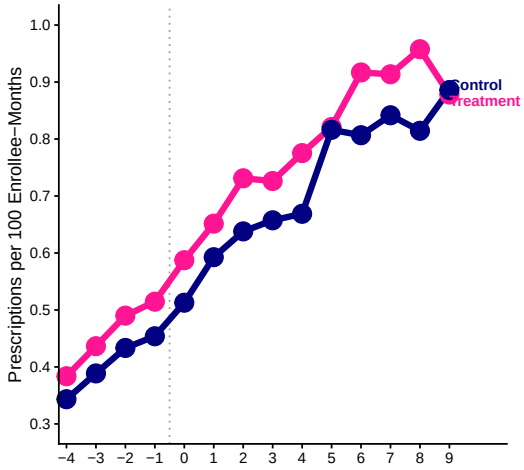
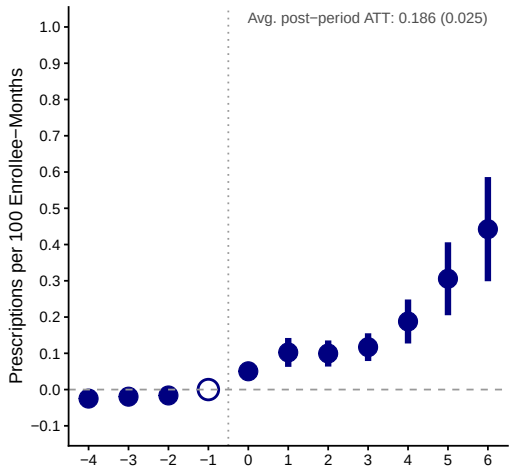
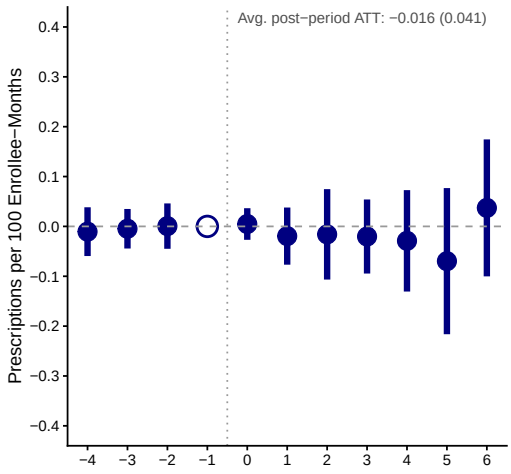


Figure A.1 — Mean GLP-1 prescription levels by event time for treatment and control groups (unit weighted).

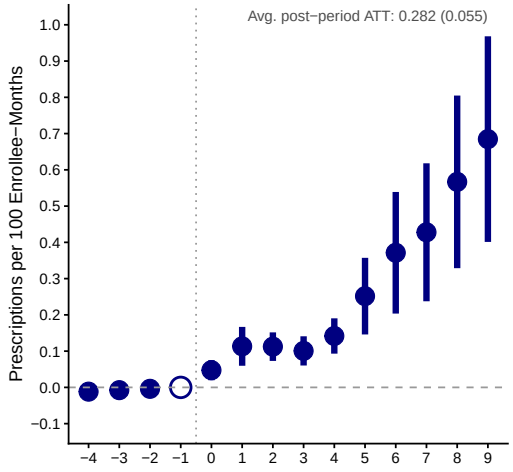
(a) Obesity GLP-1 Prescriptions (10 State Design)



(b) Diabetes GLP-1 Prescriptions (10 State Design)



(c) Obesity GLP-1 Prescriptions (7 State Design)



(d) Diabetes GLP-1 Prescriptions (7 State Design)

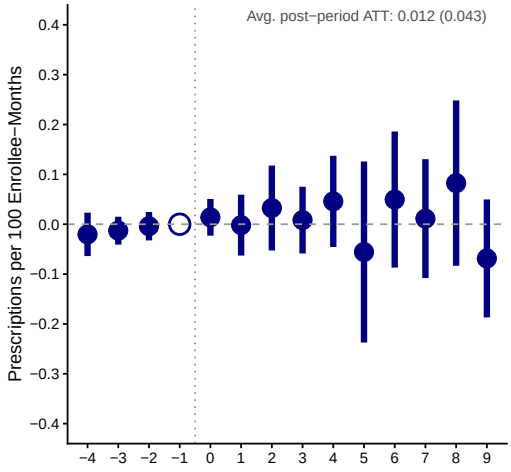
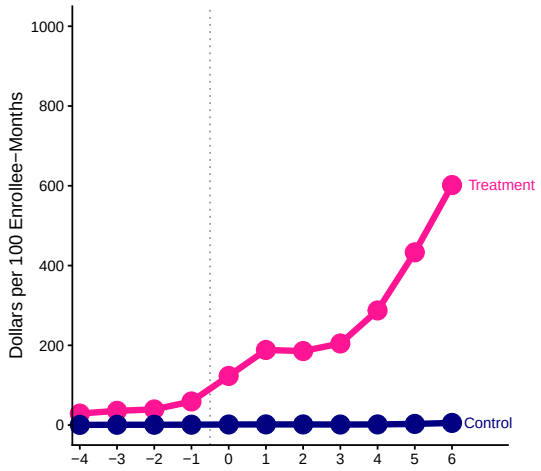
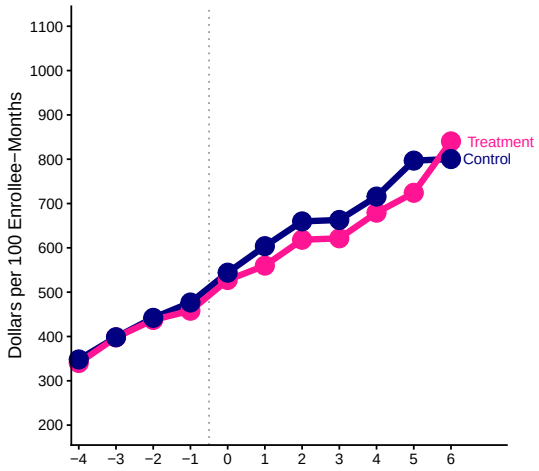


Figure A.2 — Effects of Medicaid GLP-1 obesity coverage on prescriptions (unit weighted). Panels (a) and (b) show effects using the 10-state design; panels (c) and (d) show effects using the 7-state design.

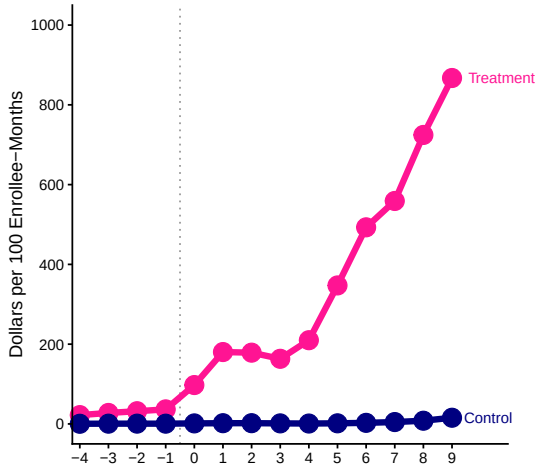
(a) Obesity GLP-1 Spending (10 State Design)



(b) Diabetes GLP-1 Spending (10 State Design)



(c) Obesity GLP-1 Spending (7 State Design)



(d) Diabetes GLP-1 Spending (7 State Design)

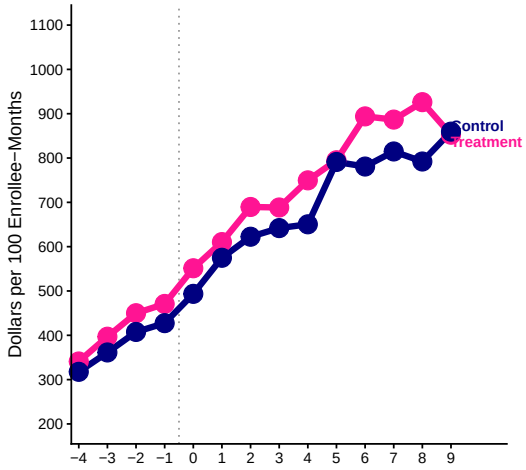
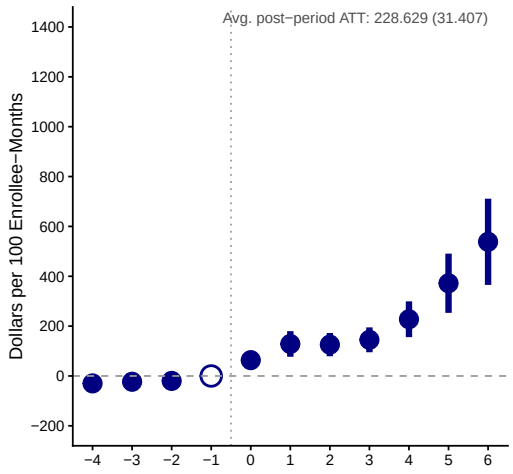
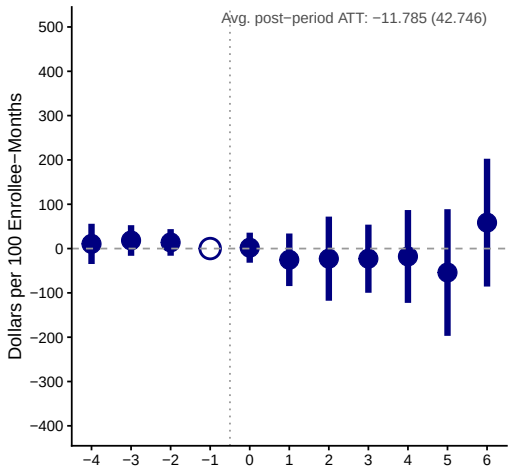


Figure A.3 — Mean GLP-1 spending levels by event time for treatment and control groups (unit weighted).

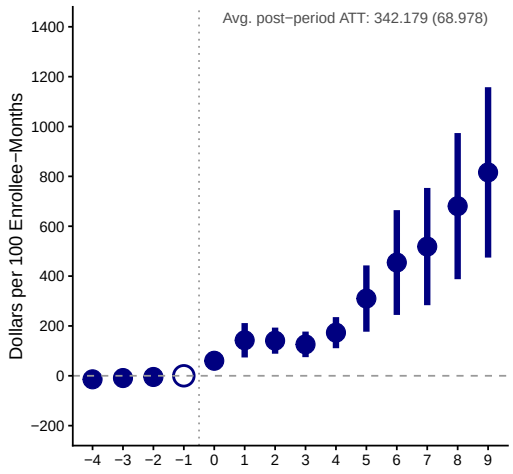
(a) Obesity GLP-1 Spending (10 State Design)



(b) Diabetes GLP-1 Spending (10 State Design)



(c) Obesity GLP-1 Spending (7 State Design)



(d) Diabetes GLP-1 Spending (7 State Design)

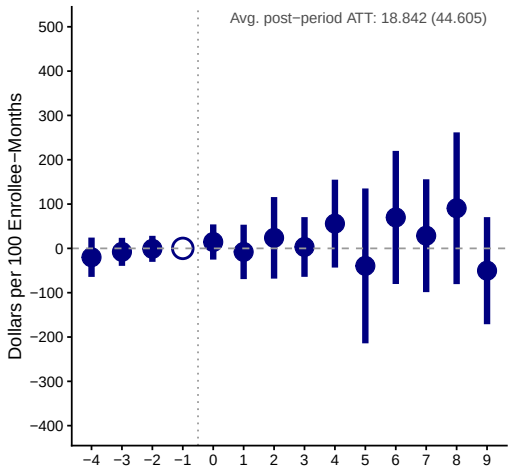


Figure A.4 — Effects of Medicaid GLP-1 obesity coverage on spending (unit weighted). Panels (a) and (b) show effects using the 10-state design; panels (c) and (d) show effects using the 7-state design.

B — Rebates and Net Spending

The State Drug Utilization Data (SDUD) reports detailed information on Medicaid prescription drug reimbursements in state × quarter × plan type (FFS/MCO) × NDC code. The reimbursements reflect payments made to pharmacies at the point of dispensing; they are gross payments that do not include rebates that manufacturers are required to pay to state governments under the Medicaid Drug Rebate Program (MDRP). This appendix explains how we estimate the value of MDRP rebates for GLP-1 drugs using the NADAC and FSS as proxies for the unknown inputs to the MDRP rebate formula, building on earlier studies of drug rebates by Clemans-Cope et al. (2023) and Congressional Budget Office (2021).

B.1. MDRP Rebate Formula

The structure of the Medicaid Drug Rebate Program (MDRP) is outlined in Section 1927 of the Social Security Act. The law stipulates that in order for any of its drugs to be eligible for Medicaid reimbursement, a manufacturer must establish an agreement with the Secretary of Health and Human Services committing it to provide information needed to compute a quarterly rebate using a specified formula.

For brand name drugs, the per-unit rebate for NDC code d in quarter t depends on the (i) current quarter Average Manufacturer Price (AMP_{dt}), (ii) launch quarter Average Manufacturer Price (AMP_{dl}), and (iii) current quarter Best Price (BP_{dt}).

Although the per-unit rebate is determined by a known formula, the inputs to the formula are confidential.

Average Manufacturer Price. AMP_{dt} is the average price paid to the manufacturer by wholesalers and retail community pharmacies during quarter t. Manufacturers are required to make confidential quarterly reports of the AMP for each drug to CMS.

Best Price. BP_{dt} is the lowest price that the manufacturer offers to any non-exempt purchaser in the United States. As with the AMP, manufacturers must confidentially report the best price for each drug to CMS.

Inflation. AMP_{dl} is the AMP for drug d in the drug's launch quarter. CPI_t/CPI_l is the ratio of the Consumer Price Index for All Urban Consumers (CPI-U) in quarter t to the CPI-U in the launch quarter.

Under current law[24], the per-unit rebate amount is the sum of a *basic rebate* and an *inflationary*

24. Before 2024-Q1, total rebates were capped at 100% of AMP; the American Rescue Plan removed this cap.

rebate:

$$R^b_{dt} = \underbrace{\max\left\{(0.231 \times AMP_{dt}), (AMP_{dt} - BP_{dt})\right\}}_{\text{basic rebate}} + \underbrace{\max\left\{0,\ AMP_{dt} - AMP_{dl} \times \frac{CPI_t}{CPI_l}\right\}}_{\text{inflationary rebate}}$$

For generic drugs, the basic rebate is 13% of AMP, with no best-price comparison:

$$R^g_{dt} = 0.13 \times AMP_{dt} + \max\left\{0, AMP_{dt} - AMP_{dl} \times \frac{CPI_t}{CPI_l}\right\}$$

The total rebate for a given brand name NDC in a given state and quarter is $R^b_{dt} \times Q_{dt}$, where Q_{dt} is the number of units of the drug dispensed. (For generic drugs, the generic per-unit rate is used.) Net-of-rebate Medicaid spending is then gross reimbursement minus the total rebate.

B.2. Proxies for MDRP Inputs

We use data from the National Average Drug Acquisition Cost (NADAC) to approximate the AMP for each drug in each quarter. The earliest NADAC price is used to approximate each drug's AMP during the launch quarter. To approximate the best price, we use the Big 4 price from the VA Federal Supply Schedule (FSS) Pharmaceutical Pricing Data.

NADAC Data. The NADAC is computed from a monthly survey of retail community pharmacies that report invoice-based acquisition costs for each drug. In principle, the AMP is the average price paid to the manufacturer by wholesalers and retail community pharmacies, whereas the NADAC measures prices paid by retail pharmacies, many of which purchase from wholesalers. The NADAC therefore approximates the sum of the AMP and wholesale mark-ups:

$$NADAC_{dt} = AMP_{dt} + Wholesale_{dt}$$

To the extent that wholesalers charge a net markup on drugs they sell to pharmacies, we expect $NADAC > AMP$. In this sense, using the NADAC in place of the true AMP will tend to overestimate the size of the rebate and underestimate the net Medicaid spending on the drug.

Federal Supply Schedule. The Department of Veterans Affairs (VA) Federal Supply Schedule (FSS) Pharmaceutical Pricing Data is a publicly available catalog of contract prices for prescription drugs that may be purchased by eligible federal agencies. The information in the file comes from federal procurement contract records rather than retail transactions.

For most drugs, the data contains two prices: the FSS price, and the Big 4 price. The FSS price is the price negotiated for federal agencies not eligible for the Big 4 price, which is available

to the "Big 4" federal purchasers: Department of Defense, VA, Public Health Service, and the U.S. Coast Guard. The FSS price cannot exceed the Federal Ceiling Price, and the Big 4 price is often negotiated to be even lower than the ceiling. The Big 4 price is likely to fall below the manufacturer's best price, since Big 4 purchasers are exempt from the best-price calculation.

B.3. Stylized Example

Table B.1 illustrates the rebate calculation for each GLP-1 drug using California SDUD data for the fourth quarter of 2024. For each drug, the table reports the NADAC-based AMP proxy, the FSS and Big4 price proxies, the earliest observed NADAC (launch AMP proxy), the CPI inflation multiplier, and the estimated per-unit rebate implied by the statutory formula from Section B.1.

The inflationary rebate equals the positive part of the difference between the current NADAC and the inflation-adjusted launch NADAC. For recently launched drugs, i.e., Wegovy (2021), Mounjaro (2022), and Zepbound (2023), cumulative inflation since launch is modest, so the inflationary component is small or zero. Older drugs such as Trulicity (2014) and Byetta (2005) face substantial inflationary rebates because their current prices exceed the inflation-adjusted launch price by a wide margin.

Across the obesity-indicated GLP-1s in Panel A, the estimated rebate equals 23.1% of the NADAC because in all three cases the gap between the NADAC and Big 4 price is smaller than 23.1% of the NADAC. In Panel B, estimated rebates range from 13% (generic liraglutide) to 57% (Byetta), with the variation driven almost entirely by the inflationary component.

Table B.1 — Illustrative MDRP Rebate Calculation: California Medicaid, Q4 2024

		Per-Unit Prices and Rebate ($)						Aggregate ($000s)		
Drug (FDA Approval)	Units	NADAC	FSS	Big4	Launch NADAC	$\frac{CPI_t}{CPI_l}$	Unit Rebate	Gross	Total Rebate	Net
Panel A: Obesity-Indicated Drugs										
Wegovy (2021)	457,123	529.34	503.16	409.81	528.26	1.153	122.28	242,042	55,895	186,147
Zepbound (2023)	100,692	511.02	410.10	396.10	509.46	1.017	118.05	51,009	11,886	39,123
Saxenda (2014)	68,482	86.74	86.34	67.21	69.23	1.330	20.04	5,956	1,372	4,584
Panel B: Diabetes / Cardiac Drugs										
Ozempic (2017)	773,016	311.84	307.22	229.91	287.63	1.088	84.38	235,922	65,229	170,693
Trulicity (2014)	92,562	471.72	436.30	339.48	291.68	1.294	233.53	43,658	21,615	22,043
Mounjaro (2022)	71,690	515.86	395.85	380.03	467.13	1.064	154.76	37,022	11,095	25,928
Rybelsus (2019)	1,131,232	31.16	30.72	22.73	24.70	1.222	9.39	35,217	10,627	24,590
Victoza (2010)	36,002	87.43	89.22	86.69	53.12	1.355	35.67	3,173	1,284	1,888
Bydureon (2012)	2,473	234.24	211.33	175.01	186.06	1.255	59.88	582	148	433
Soliqua (2016)	4,966	57.10	40.93	40.53	40.41	1.290	21.57	280	107	172
Liraglutide[g]	3,244	72.86	—	—	73.49	1.002	9.47	219	31	189
Xultophy (2016)	1,396	82.99	72.12	59.97	61.39	1.280	27.46	117	38	78
Byetta (2005)	65	466.25	438.90	349.58	233.73	1.355	266.33	30	17	13

Notes. Each row is one GLP-1 drug dispensed to California Medicaid enrollees in Q4 2024. Units is total units reimbursed from the SDUD, measured in ML for injectables and EA (each) for oral tablets. Per-unit prices are in dollars. NADAC is the units-weighted National Average Drug Acquisition Cost. FSS and Big4 are prices from the VA Federal Supply Schedule, converted from per-package prices using SDUD units per prescription. Launch NADAC is the earliest observed NADAC for the drug. CPI_t/CPI_l is the ratio of Q4 2024 CPI-U to CPI-U in the quarter of the earliest NADAC observation. Rebate is the per-unit rebate from the statutory MDRP formula: $\max(0.231 \times \text{NADAC},\ \text{NADAC} - \text{Big4}) + \max(0,\ \text{NADAC} - \text{Launch NADAC} \times CPI_t/CPI_l)$. Aggregate columns are in thousands of dollars. Gross is total SDUD reimbursement. Rebate = per-unit rebate × units. Net = Gross − Rebate. Dashes indicate prices not applicable to the rebate calculation. Drugs are sorted by descending gross reimbursement within each panel.

[g] Generic drug; basic rebate is 13% of AMP with no best-price comparison.

Our estimates are designed to approximate the MDRP rebate. States may negotiate supplemental rebates with manufacturers in exchange for preferred formulary placement, which can add substantially to effective rebate rates. Evidence from other drug classes suggests supplemental rebates may add 10–20 percentage points to the statutory minimum (Medicaid and CHIP Payment and Access Commission 2019).

C — SDUD Sample Construction and Data Quality

This appendix describes how we use the annual public use State Drug Utilization Data (SDUD) to construct a state × quarter balanced panel measuring prescription and reimbursement levels for GLP-1 prescription drugs. We started by compiling a list of 171 National Drug Codes (NDC codes) for GLP-1 receptor agonist medications using the National Library of Medicine's RxNorm/RxMix database.[25] Table C.1 summarizes the list by brand name, classified as an *obesity-indicated* or a *diabetes/cardiovascular-indicated* GLP-1 drug based on the drug's FDA-approved labeling.

Our analysis uses SDUD data from 2019-Q1 through 2025-Q2. In the raw data, each observation is a state × quarter × utilization type (FFSU, MCOU) × NDC cell reporting units_reimbursed, number_of_prescriptions, and medicaid_amount_reimbursed. We restrict to the 50 U.S. states and to the 171 GLP-1 NDC codes, yielding 46,271 observations on 84 unique NDC codes. Of these, 15,202 (32.9%) are suppressed (fewer than 11 prescriptions) and 206 non-suppressed cells report missing or zero Medicaid spending. Table C.2 reports summary statistics for the initial sample. We impute utilization and spending for suppressed and missing cells, identify and correct outlier spending amounts, and collapse the cleaned data to form a balanced state × quarter panel with separate outcome variables for obesity and diabetes/cardiovascular GLP-1 drugs. These corrections affect a small fraction of total prescriptions and spending and have a negligible effect on the analysis.

C.1. Suppressed Cells

In cells with fewer than 11 prescriptions, the values of units_reimbursed, number_of_prescriptions, and medicaid_amount_reimbursed are suppressed because of small-cell rules. By definition, these cells represent a tiny fraction of GLP-1 prescriptions and spending in any given state and quarter. Nevertheless, leaving them out of the analysis would bias our estimates of total utilization and spending down. For every suppressed cell, we set number_of_prescriptions $= 5$, the midpoint of the $[1, 10]$ range. Next, for each NDC code, we compute the median units-per-prescription ratio (UPR) across all unsuppressed records for that same NDC code. Since NDC codes define products with a fixed package size, the UPR is nearly constant across states (76% of unsuppressed records fall within 10% of the cross-state median; 90% within 20%). Provided that there are at least 3 unsuppressed observations from which to compute the median UPR for an NDC code, we set for suppressed cells units_reimbursed $= 5 \times$ median UPR. This resolves 14,657 of the 15,202 suppressed cells. For suppressed cells with NDC codes that have fewer than 3 unsuppressed cells in the data, we repeat the procedure using the cross-state median UPR computed at the brand

25. The complete list of 171 NDC codes is available in the replication archive (`raw_data/ndc/GLP1_Meds_FULL.csv`).

Table C.1 — GLP-1 NDC Codes by Brand Name

Brand name	Active ingredient	Classification	NDCs in reference list	NDCs observed in SDUD
Obesity-indicated				
Saxenda	liraglutide	Obesity	5	1
Wegovy	semaglutide	Obesity	13	10
Zepbound	tirzepatide	Obesity	21	15
Diabetes/cardiovascular-indicated				
Adlyxin	lixisenatide	Diab./CV	4	2
Bydureon	exenatide ER	Diab./CV	7	4
Byetta	exenatide	Diab./CV	19	4
Exenatide	exenatide (generic)	Diab./CV	2	2
Liraglutide	liraglutide (generic)	Diab./CV	10	4
Mounjaro	tirzepatide	Diab./CV	19	12
Ozempic	semaglutide	Diab./CV	21	11
Rybelsus	semaglutide	Diab./CV	12	6
Soliqua	lixisenatide/insulin glargine	Diab./CV	4	1
Trulicity	dulaglutide	Diab./CV	22	9
Victoza	liraglutide	Diab./CV	9	2
Xultophy	liraglutide/insulin degludec	Diab./CV	3	1
Total			171	84

Notes. The reference list contains 171 NDC codes identified through the National Library of Medicine's RxNorm/RxMix database. "NDCs observed in SDUD" is the number of distinct NDC codes appearing in the SDUD sample across all 50 states and quarters (2019-Q1 to 2025-Q2). The difference between the reference list and observed counts reflects NDC codes for package sizes or formulations that had no Medicaid prescriptions during the study period.

level (pooling all NDC codes for the same brand). This resolves the remaining 545 suppressed cells.

After imputing prescriptions and units, we impute medicaid_amount_reimbursed using the following procedure.

Tier 1: Within-state cross-type donor. For each state × NDC × quarter, we compute the per-unit Medicaid reimbursement rate from the other utilization type (e.g., FFSU for a missing MCOU record) in the same cell. If a valid rate exists, we impute by setting medicaid_amount_reimbursed = units_reimbursed × per_unit_rate. This resolves 4,828 suppressed cells.

Table C.2 — Summary Statistics: Pre-Aggregation SDUD Sample

Variable	Mean	SD	Min	Max	N
Units reimbursed	4,284.1	17,986.8	5.5	873,912.5	31,069
Prescriptions	975	3,342	11	108,462	31,069
Medicaid reimbursement ($)	961,034.70	3,520,741.19	0.01	108,738,189.82	30,863
Suppressed	0.329	0.470	0	1	46,271
Observations: 46,271					
Unique states: 50					
Unique NDC codes: 84					
Plan types: 2 (FFSU, MCOU)					

Notes. The sample contains all GLP-1 SDUD records for 50 U.S. states from 2019-Q1 through 2025-Q2, before any imputation or aggregation. Each observation is a state × quarter × plan type × NDC code cell. Units reimbursed and prescriptions are missing for suppressed cells (fewer than 11 prescriptions). Medicaid reimbursement statistics exclude suppressed cells and 206 non-suppressed cells with zero amounts. The suppressed indicator equals one for cells below the disclosure threshold.

Tier 2: Cross-state median. For records where no within-state donor is available, we compute the median per-unit Medicaid reimbursement rate across all states that report valid data for the same NDC × quarter × utilization type and impute by multiplying the cell's units_reimbursed by the cross-state median. This resolves an additional 9,042 suppressed cells.

The remaining 1,332 suppressed cells have no valid Medicaid spending anywhere in the country for that NDC × quarter × utilization type. For these, we turn to acquisition-cost data:

Tier 3: NADAC per-unit price. We impute spending using the NADAC per-unit price for the same NDC and quarter. This resolves 345 suppressed cells.

Tier 4: Brand-level median NADAC. For records whose product group is not yet covered by NADAC at the time of the SDUD quarter, we impute using the median NADAC per-unit price across all records for the same brand name. This resolves 906 additional suppressed cells.

Tier 5: Drug-class median NADAC. The remaining 81 suppressed cells belong to brands with no NADAC coverage at all (Adlyxin and generic exenatide). For these records, we impute using the median NADAC per-unit price across all GLP-1 drugs in the same therapeutic class (obesity-indicated or diabetes/cardiovascular-indicated). This resolves all remaining suppressed cells.

Table C.3 — Non-Suppressed SDUD Records with Missing or Zero Medicaid Amounts

State	MCOU records affected	% of state MCOU records	Imputation tier
Delaware	183	26.4	Tier 2 (cross-state median)
Wisconsin	8	34.8	Tier 1 (within-state donor)
New York	7	1.0	Tier 1 (within-state donor)
Hawaii	4	0.7	Tier 2 (cross-state median)
Oregon	3	0.4	Tier 2 (cross-state median)
Kentucky	1	0.1	Tier 1 (within-state donor)
Total	206	0.9	

Notes. This table covers the 206 non-suppressed records with positive units_reimbursed but missing or zero medicaid_amount_reimbursed. All 206 are managed-care (MCOU) utilization type. The percentage column divides affected records by total MCOU records for the state (or all 50 states for the total row; 23,615 MCOU records overall).

C.2. Missing or Zero Medicaid Amounts

Beyond the suppressed cells, there were 206 non-suppressed records that report positive units but missing or zero Medicaid spending. All of these are managed-care (MCOU) records. Table C.3 shows their distribution across states. Delaware accounts for the vast majority (183 of 206). The remaining cases are scattered across Wisconsin (8), New York (7), Hawaii (4), Oregon (3), and Kentucky (1).

Delaware illustrates how suppression and missing-amount problems can interact. Its fee-for-service records are entirely suppressed—every FFS cell has fewer than 11 prescriptions, so prescriptions, units, and spending were all imputed in the previous step. Meanwhile, Delaware's managed-care records are not suppressed but they report $0 in medicaid_amount_reimbursed across the board.

We apply Tiers 1 and 2 of the spending imputation procedure described above. Tier 1 resolves 16 records from Kentucky (1), New York (7), and Wisconsin (8)—the states where FFSU data is available to compute a within-state per-unit reimbursement rate. The remaining 190 records from Delaware (183), Hawaii (4), and Oregon (3) are resolved by Tier 2.

C.3. Aggregation: Combining Plan Types

After resolving all missing-amount records, we aggregate across plan types by summing units_reimbursed, number_of_prescriptions, and medicaid_amount_reimbursed within each state $\times$ quarter $\times$ NDC code cell, collapsing the separate FFSU and MCOU rows into a single row. This yields 32,683 post-aggregation cells. All subsequent corrections operate on these aggregated records.

C.4. Implausible Positive Medicaid Amounts

After aggregation, 416 records have positive medicaid_amount_reimbursed but a per-unit rate that falls below 50% or above 300% of the cross-state median for the same NDC $\times$ quarter, computed from states with at least five valid observations. These outliers inflate the mean ratio of National Average Drug Acquisition Cost (NADAC) to Medicaid per-unit price from 1.04 to 255, while the median remains stable at 1.01.

To distinguish whether outliers reflect errors in dollars or in units, we exploit the cross-state stability of the UPR established above. When a record's per-unit rate is implausible but its UPR is normal, the error is in the dollar amount; when the UPR is also anomalous, the units themselves are suspect.

For every state $\times$ NDC $\times$ quarter cell, let r_{std}^{mpu} be the record's per-unit Medicaid rate divided by the cross-state median per-unit rate for that NDC. A record is flagged as an outlier if $r_{std}^{mpu} < 0.5$ or $r_{std}^{mpu} > 3.0$. To distinguish errors in dollar amounts from errors in units, we define two additional ratios:

- r_{std}^{upr} is the record's units per prescription divided by the cross-state median of units per prescription.
- r_{std}^{rx} is the record's number_of_prescriptions divided by the cross-state median prescription count.

We classify the outliers as follows:

- **Type A (dollar error):** If $r_{std}^{upr} \in [0.5, 2.0]$ then units appear correct and we assume that the case is an outlier because medicaid_amount_reimbursed is wrong. We correct the error by replacing medicaid_amount_reimbursed with the cross-state median per-unit rate multiplied by the record's units_reimbursed. This accounts for 376 records, concentrated in DE, HI, WV, MO, KS, and NJ.
- **Type B (unit error):** If $r_{std}^{upr} \notin [0.5, 2.0]$ but $r_{std}^{rx} \in [0.5, 2.0]$, prescriptions are plausible but units_reimbursed are likely wrong. Correction: reconstruct units as number_of_prescriptions multiplied by the cross-state median UPR, then set dollars equal to the median per-unit rate multiplied by corrected units. This accounts for 14 records.
- **Type C (both wrong):** Both r_{std}^{upr} and r_{std}^{rx} fall outside $[0.5, 2.0]$. Neither units nor prescriptions are reliable. Correction: set units_reimbursed equal to reported dollars divided by the cross-state median per-unit rate, preserving the spending level while correcting the per-unit rate by construction. This accounts for 26 records.

When the UPR ratio cannot be computed due to suppressed number_of_prescriptions, the record defaults to the Type A correction (units are assumed correct). When the UPR is abnormal but the prescription ratio cannot be computed, the record defaults to the Type B correction (prescriptions

Table C.4 — SDUD Data Quality Corrections

Tier	Type	Records corrected	% of dataset	Field(s) replaced
1	Within-state cross-type donor	16	0.05	Medicaid amount
2	Cross-state median	190	0.58	Medicaid amount
3A	Dollar error	376	1.15	Medicaid amount
3B	Unit error	14	0.04	Units, Medicaid amount
3C	Both wrong	26	0.08	Units
Total		622	1.90	

Notes. The dataset contains 32,683 post-aggregation state × NDC × quarter records covering 50 states from 2019-Q1 to 2025-Q2. Tiers 1 and 2 operate on pre-aggregation utilization-type records and impute spending for all records with missing or zero Medicaid amounts—15,202 suppressed cells and 206 non-suppressed records. Counts shown reflect only the 206 non-suppressed records; the five-tier spending imputation for suppressed cells (resolving all 15,202) is described in the Suppressed Cells subsection. Tier 3 in this table operates on post-aggregation records and corrects implausible positive amounts. Each corrected record is flagged with the imputation tier and type.

are assumed correct).

C.5. Collapse to State × Quarter Panel

The final step aggregates the 32,683 NDC-level records into a balanced state × quarter panel. For each state and quarter, we sum prescriptions, units reimbursed, gross Medicaid spending, estimated rebates, and net-of-rebate spending across all NDC codes, producing separate totals for obesity GLP-1 drugs, diabetes/cardiovascular GLP-1 drugs, and all GLP-1 drugs combined. Net spending is defined as $\max(\text{gross Medicaid spending} - \text{estimated rebates}, 0)$; see Appendix B for the rebate estimation methodology.

We construct a complete grid of 50 states × 26 quarters (2019-Q1 through 2025-Q2) and merge the aggregated SDUD totals onto this frame. State × quarter cells with no observed GLP-1 prescriptions in the SDUD—for example, early quarters for newly launched drugs like Zepbound—are filled with zeros for all outcome variables. The resulting balanced panel of 1,300 state × quarter observations is merged with Medicaid enrollment data and GLP-1 coverage information to form the analysis dataset used in the main results.