MILLIMAN GLP-1 DRUGS HEALTHCARE IMPACT DASHBOARD

# Measuring how GLP-1 medications impact the total cost of care

## Approaches to assessing and managing the effects of GLP-1 drugs on health and financial outcomes

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Leading practice strategies to achieve informed cost and outcome management for glucagon-like peptide-1 (GLP-1) drugs require flexible analytics—these enabling tools help measure the effects of GLP-1 medications on an expanding range of clinical conditions, both on-and off-label, monitor patient adherence, and ascertain the total cost of care after drug rebates.

Long-term effects on metabolic rate, chronic disease progression, and inflammation are not yet fully elucidated, which adds to the complexity of patient care management and coverage decisions. Configurable dashboards facilitate continuous monitoring and equip stakeholders with actionable insights to fine-tune care strategies as new evidence emerges.

Evoking taglines such as “miracle drugs”[1] or “wonder drugs”[2, 3], glucagon-like peptide-1 (GLP-1) medications have contributed to an increase in prescription drug expenditures for Medicare, Medicaid, and commercial payers that cover these drugs in the U.S. With potentially beneficial effects on a large number of chronic conditions, flexible real-world analytics are needed to inform coverage policy, patient care management, cost management, and patient support. This paper summarizes central themes and provides illustrative examples from the Milliman GLP-1 Drugs Healthcare Impact Dashboard suite of analytics (hereafter referred to as the Milliman GLP-1 Impact Dashboard) to facilitate the strategic management of GLP-1-related care.

## Potential benefits of GLP-1 drugs

Public demand for GLP-1 receptor agonist medications (such as Ozempic[4], Wegovy[5], Mounjaro[6], Zepbound[7], Victoza[8], Saxenda[9], Rybelsus[10], and Trulicity[11]) spiked in recent years due to widely advertised and scientifically confirmed positive effects on weight loss in patients with obesity or overweight[5, 7, 9], control of blood

1. Reardon, S. (2024, November 5). How “miracle” weight-loss drugs will change the world. Nature, 635(8037), 22-24 https://doi.org/10.1038/d41586-024-03589-7.
2. Ravella, S. (2024, April 30). Is Ozempic the new anti-inflammatory wonder drug? Time. https://time.com/6972086/ozempic-anti-inflammatory-drug/.
3. Yale School of Medicine (The Aspen Institute). (2024, July 2). GLP-1 Agonists: Wonder Drugs of the 21st Century? July 02, 202 Retrieved May 18, 2025, from https://medicine.yale.edu/media-player/glp-1-agonists-wonder-drugs-of-the-21st-century/
4. FDA. Ozempic prescribing information. Last revised January 2025. https://www.accessdata.fda.gov/drugsatfda_docs/label/2025/209637s025lbl.pdf.
5. FDA. Wegovy prescribing information. Last revised November 2024. https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/215256s015lbl.pdf.
6. FDA. Mounjaro prescribing information. Last revised November 2024. https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/215866s010s015s022lbl.pdf.
7. FDA. Zepbound prescribing information. Last revised February 2025. https://www.accessdata.fda.gov/drugsatfda_docs/label/2025/217806Orig1s020lbl.pdf.
8. FDA. Victoza prescribing information. Last revised November 2024. https://www.accessdata.fda.gov/drugsatfda_docs/label/2025/022341Orig1s042lbl.pdf.
9. FDA. Saxenda prescribing information. Last revised November 2024. https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/206321s019lbl.pdf.
10. FDA. Rybelsus prescribing information. Last revised December 2024. https://www.accessdata.fda.gov/drugsatfda_docs/label/2025/213051Orig1s020,213051Orig1s021lbl.pdf.
11. FDA. Trulicity prescribing information. Last revised November 2024. https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/125469s061s062lbl.pdf.

sugar in diabetes[4, 6, 8, 10], cardiovascular disease[4, 5, 8], obstructive sleep apnea[7], and chronic kidney disease[4]. Due to the wide applicability of these drugs, several broad sustainability questions arise in the healthcare industry. These include how providers, payers, medical technology, and pharmaceutical sectors might adapt to future changes in the prevalence, diagnosis, and referrals for chronic conditions, as well as how care delivery and interventions might be reshaped in the GLP-1 era. Affordability and patient access to these therapies are key topics of active public debate.

GLP-1 agonists mimic the effects of the GLP-1 hormone made by the small intestine, which stimulates insulin release from the pancreas, blocks glucagon secretion, slows stomach emptying, and augments feeling full after eating.[12] GLP-1 agonists also exhibit anti-inflammatory properties that may have beneficial effects on multiple diseases that have associations with chronic inflammation.[13]

Beyond the specific U.S. Food and Drug Administration (FDA)-approved indications for each drug, GLP-1 drugs are being evaluated in phase III clinical trials for potential expanded indications[14] to treat clinical conditions such as metabolic liver disease (metabolic dysfunction-associated steatohepatitis [MASH])[15], knee osteoarthritis[16], peripheral artery disease[17], diabetic retinopathy[18], and Alzheimer's disease[19]. There are also early-phase studies that are investigating the effects of GLP-1 drugs on substance-use disorders[20], chronic obstructive pulmonary disease[21], polycystic ovary syndrome[22], asthma[23], and Parkinson's disease[24].

GLP-1 and another hormone called glucose-dependent insulinotropic polypeptide (GIP) are the two predominant hormones secreted by the intestine upon ingestion of food.

Known as "incretins," these hormones increase insulin release, lower blood glucose, and attenuate appetite.[25] At this time, the only FDA-approved medication with a dual effect on both GLP-1 and GIP receptors is tirzepatide (Mounjaro, Zepbound)[6,7].

Other researchers have noted that weight reduction, controlled blood sugar, and lower blood pressure only partially explain the benefits of GLP-1 and dual GLP-1/GIP medications on diabetic kidney disease and cardiovascular outcomes, and these clinical scientists described microscopic and molecular evidence that an important underlying mechanism may be the anti-inflammatory effects of these drugs.[26]

Figure 1 on page 3 notes the tissues and organs where GLP-1 and GIP medications exert biological effects.

12. Cleveland Clinic. GLP-1 Agonists. Last reviewed on July 03, 2023. Retrieved May 18, 2025, from https://my.clevelandclinic.org/health/treatments/13901-glp-1-agonists.
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16. Bliddal, H., et al. (2024, October 31). Once-weekly semaglutide in persons with obesity and knee osteoarthritis. New England Journal of Medicine, 391(17). 1573–1583. Retrieved May 18, 2025, from https://www.nejm.org/doi/full/10.1056/NEJMoa2403664.
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24. Hogg, E., et al. (2022). A phase II, randomized, double-blinded, placebo-controlled trial of liraglutide in Parkinson's disease. The Lancet. Retrieved May 18, 2025, from http://dx.doi.org/10.2139/ssrn.4212371.
25. Rizvi A. A., & Rizzo M. (2022). The emerging role of dual GLP-1 and GIP receptor agonists in glycemic management and cardiovascular risk reduction. Diabetes Metabolic Syndrome and Obesity: Targets and Therapy, 1023–1030. Retrieved May 18, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC8994606/.
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**FIGURE 1: GLP-1 AND GIP RECEPTORS IN THE HUMAN BODY**

| GLP-1 (i) | | GIP (ii) |
|---|---|---|
| Brain |  | Brain |
| Cardiovascular | | Cardiovascular |
| Stomach and intestines | | Adipose (fat) tissue |
| Liver | | Pancreas |
| Pancreas | | Bone |
| Kidney | | |

(i) GLP-1 receptors are activated by drugs like Ozempic and Wegovy (semaglutide), Saxenda (liraglutide), orforglipron (phase 3 trial), and many other GLP-1 drugs.
(ii) GLP-1 and GIP receptors are activated by Mounjaro and Zepbound (tirzepatide).

## Longer-term unknowns

The long-term impact of GLP-1 and GLP-1/GIP drugs, as well as the long-term impact of weight loss, on health and physiology is still being unraveled. Some studies of dramatic weight loss without GLP-1 or GLP-1/GIP medications found that weight loss also resulted in a slowing of each patient's natural metabolic rate, which may persist after stopping weight management strategies.[27,28,29,30,31] This is an important factor, considering the challenges typically associated with maintaining weight loss over time. For example, in a clinical study of participants in the televised series "The Biggest Loser" who had achieved dramatic weight loss, every participant regained weight six years after the program and several became heavier than they were at the start of the program.[32] The effect of GLP-1s on metabolic rate is not yet fully understood, and some studies have identified dependencies for the observed effects on metabolic rate.[33]

Implications are not yet known for patients who initially lose weight while using GLP-1 drugs, but cannot sustain adherence to the prescribed dose regimen, or lose access to GLP-1 medications due to insurance coverage changes or drug shortages.

- Will the anti-inflammatory benefits and positive impact on chronic conditions persist if weight is regained? [34]
- How long do patients have to take the medication to maintain the clinical benefits?[35]
- Will fewer costly exacerbations of chronic conditions offset GLP-1 drug expenses? [36]
- Could re-evaluating previous care plans and discontinuation of other medications or therapies, where clinically appropriate, reduce total costs? Is lifelong therapy necessary? [35, 37]

27. Rosenbaum M., et al. (2008). Long-term persistence of adaptive thermogenesis in subjects who have maintained a reduced body weight. American Journal of Clinical Nutrition, 88(4), 906–912. Retrieved May 19, 2025, from https://pubmed.ncbi.nlm.nih.gov/18842775/.
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30. Greenway F. L. (2015). Physiological adaptations to weight loss and factors favouring weight regain. International Journal of Obesity (London), 39(8),1188–1196. Retrieved May 19, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC4766925/.
31. Ochner C. N., et al. (2013). Biological mechanisms that promote weight regain following weight loss in obese humans. Physiology & Behavior, 120, 106–113. Retrieved May 19, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC3797148/.
32. Fothergill E., et al. (2016). Persistent metabolic adaptation 6 years after "The Biggest Loser" competition. Obesity (Silver Spring), 24(8), 1612–1619. Retrieved May 19, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC4989512/.
33. Martins C., et al. (2020). Metabolic adaptation is an illusion, only present when participants are in negative energy balance. American Journal of Clinical Nutrition, 112(5), 1212–1218. Retrieved May 19, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC7657334/.
34. Swarup S., et al. Metabolic Syndrome. (2024, March 7). NIH, National Library of Medicine. Retrieved May 19, 2025, from https://www.ncbi.nlm.nih.gov/books/NBK459248/.
35. Piccini S., et al. (2023). Time-dependent effect of GLP-1 receptor agonists on cardiovascular benefits: A real-world study. Cardiovascular Diabetology, 22(1), 69. Retrieved June 6, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC10039680/.
36. Hwang J. H., et al. (2025). Lifetime Health Effects and Cost-Effectiveness of Tirzepatide and Semaglutide in US Adults. JAMA Health Forum, 6(3), e245586. Retrieved June 6, 2025, from https://jamanetwork.com/journals/jama-health-forum/fullarticle/2831205.
37. Wilding J. P. H., et al. (2022). Weight regain and cardiometabolic effects after withdrawal of semaglutide: The STEP 1 trial extension. Diabetes Obesity and Metabolism, 24(8), 1553–1564. Retrieved June 6, 2025, from https://dom-pubs.onlinelibrary.wiley.com/doi/10.1111/dom.14725.

Two of the studies cited above[35,37] describe time-dependent reductions in cardiovascular risk with prolonged GLP-1 treatment. After GLP-1 discontinuation, both studies reported weight regain and a reduction in the positive effects on cardiometabolic risk factors observed while patients were taking GLP-1 drugs.

However, both studies detected sustained benefits on glycemic control, and one study found sustained improvements in blood lipids compared to placebo, after patients stopped GLP-1 therapy.

New GLP-1 medications are on the horizon. These include orforglipron, which is a daily oral GLP-1 pill that achieved similar results to weekly injectable GLP-1 drugs in a late-stage clinical trial.[38] Other new formulations are being investigated, such as a monthly injectable GLP-1 medication,[39] and drugs that combat skeletal muscle loss, which is a problematic side effect of GLP-1 treatment in older adults.[40]

## Decision-support analytics for payers

Given the evolving picture for GLP-1 drugs, payers and risk-bearing providers are facing challenging decisions about coverage for costly medications that potentially could benefit patients with a wide range of chronic illnesses (including conditions associated with obesity), but whose long-term cost-benefits and cost-effectiveness are yet to be determined.

There is an increased need for thorough data analysis to understand the impact on specific populations, determine which patients would benefit most from GLP-1 therapy coverage, project total cost of care trajectories, and identify opportunities for active medical management and re-evaluation of previous chronic conditions.

Additional strategies that providers could undertake to facilitate successful outcomes include holistic care management, such as lifestyle and dietary support, and individual patient outreach to improve GLP-1 medication adherence and monitor other chronic conditions. Purchasers of healthcare services (such as employers) might incentivize payers to offer supportive programs in partnership with providers and population health management firms.

Identifying and following rising-risk cohorts of patients who had been predicted to incur the greatest increases in costs may be informative to providers managing care for at-risk patients and insightful for payers and employers making decisions regarding health plan design and coverage for GLP-1 therapy, especially those measuring overall value in healthcare.

To facilitate the analytics needed to support a strategic approach to GLP-1 management, we developed the Milliman GLP-1 Impact Dashboard suite for healthcare payers, providers, employers, life sciences firms, and other healthcare organizations.

The authors applied the dashboard to a study cohort from a nationally representative research database of deidentified healthcare claims for 45 million individuals with medical and pharmacy coverage and varying access to GLP-1 coverage for weight loss. The cohort includes 1.9 million continuously enrolled patients who were prescribed GLP-1 drugs for diabetes and/or obesity from 2018 to 2023. This multi-payer real-world dataset is a large, credible sample of random patients; comprises claims data submitted by approximately 90–100 healthcare organizations across the U.S.; and is refreshed several times per year to bring in recently adjudicated claims for healthcare services.

The following charts are illustrative examples. When run on an organization's specific data, actual patterns of cost and outcomes trends may vary depending on insurance coverage, provider prescribing patterns, GLP-1 drug availability, patient adherence to GLP-1 medications, management of side effects, and care management of concurrent medical conditions, as well as holistic patient support such as dietary, behavioral, and psychological counseling.[41]

38. Lilly Investors. (2025, April 17). Lilly's oral GLP-1, orforglipron, demonstrated statistically significant efficacy results and a safety profile consistent with injectable GLP-1 medicines in successful phase 3 trial. Retrieved May 19, 2025, from https://investor.lilly.com/news-releases/news-release-details/lillys-oral-glp-1-orforglipron-demonstrated-statistically.

39. Davies, M. J., et al. (2025, June 20–23). Once-monthly MariTide for the treatment of obesity in people with or without type 2 diabetes—A 52-week phase 2 study [Symposium]. American Diabetes Association 85th Scientific Sessions, Chicago, IL, United States. Retrieved June 28, 2025, from https://eppro02.ativ.me/web/index.php?page=Session&project=ADA25&id=S243.

40. Eli Lilly (Sponsor). (2025, February 28). Safety and efficacy of Bimagrumab and Semaglutide in adults who are overweight or obese. National Library of Medicine, National Center for Biotechnology Information. Retrieved June 28, 2025, from https://clinicaltrials.gov/study/NCT05616013.

41. Brill, J. V., et al. (2017). White paper AGA: An episode-of-care framework for the management of obesity—Moving toward high value, high quality care: A report from the American Gastroenterological Association Institute Obesity Episode of Care and Bundle Initiative Work Group. Clinical Gastroenterology and Hepatology, 15(5), 650–664. Retrieved May 18, 2025, from https://www.cghjournal.org/article/S1542-3565(17)30146-5/fulltext.

## Assessing medication adherence

The following example from the Milliman GLP-1 Impact Dashboard shows adherence to GLP-1 therapies in a sample cohort of nondiabetic patients with obesity who began GLP-1 drug therapy in 2021.

The year 2021 was selected as an index year because it was the year in which Ozempic (semaglutide) started experiencing significant off-label use to treat obesity with or without diabetes and Wegovy (semaglutide at a higher dose) was approved by the FDA for weight management.

The year 2021 also preceded the spike in demand for GLP-1 drugs for weight loss and temporary shortages of semaglutide[42] (Ozempic and Wegovy) from 08/23/2022 to 02/21/2025 and tirzepatide[43] (Mounjaro and Zepbound) from 12/15/2022 to 12/19/2024. Mounjaro[44] was FDA-approved for type 2 diabetes in May 2022, and Zepbound[45] received FDA approval for obesity treatment (chronic weight management) in November 2022. Although patients who began GLP-1 treatment in 2021 would have had to navigate drug shortages in later years, 2021 was a reasonable starting point for a multi-year analysis.

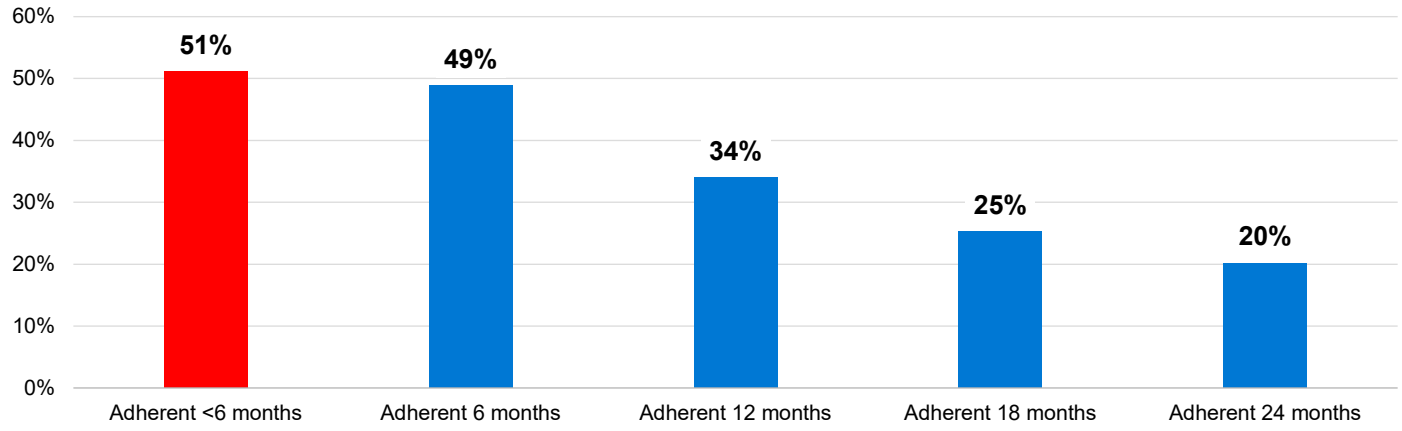
The patients in our cohort, who were enrolled in a health plan at the time of the study, met the following criteria:

- Commercial insurance coverage
- Continuous enrollment from 2019 to 2023
- Eligible for both medical and pharmacy benefits
- Naïve[46] GLP-1 users who started GLP-1 therapy in 2021
- Have obesity[47] without diabetes.

Proportion of days covered (PDC) is the adherence measure preferred by the Utilization Review Accreditation Commission (URAC)[48] and the Pharmacy Quality Alliance (PQA)[49]. It is a more conservative measure than the other commonly used adherence measure, medication possession ratio (MPR), which can be overstated if patients refill their prescriptions early or early dose titrations are taking place.[50]

Adherence was defined in this study as 80% or greater PDC, which counts the number of days the prescription was covered within a specified period. A PDC of 80% is often considered to be acceptable adherence for many drug regimens.[51]

**FIGURE 2: DISTRIBUTION OF GLP-1 ADHERENCE LEVELS IN NONDIABETIC PATIENTS WITH OBESITY WHO BEGAN GLP-1 DRUG THERAPY IN 2021**




42. FDA Drug Shortages.(2025, February 21). Semaglutide injection. U.S. Food & Drug Administration. Retrieved May 18, 2025, from https://dps.fda.gov/drugshortages/activeingredient/semaglutide-injection.

43. FDA. Declaratory Order: Resolution of Shortages of Tirzepatide Injection Products (Mounjaro and Zepbound). Retrieved May 18, 2025 from https://www.fda.gov/files/drugs/published/2024.12.19_tirzepatide_declaratory_order.pdf.

44. FDA. (2022, May 13). Drug trials snapshots: Mounjaro. Retrieved May 18, 2025, from https://www.fda.gov/drugs/drug-approvals-and-databases/drug-trials-snapshots-mounjaro.

45. FDA. (2023, November 8). FDA approves new medication for chronic weight management. Retrieved May 18, 2025, from https://www.fda.gov/news-events/press-announcements/fda-approves-new-medication-chronic-weight-management.

46. "Naïve" is a medical term meaning "no previous exposure to a particular drug."

47. Obesity was defined with ICD-10 codes Z6830-845 and HCPCS codes, including E668, E6601, E6609, E661, E662, and E669.

48. URAC. (2025). 2024 Pharmacy benefit management performance measurement. Retrieved May 19, 2025, from https://2297879.fs1.hubspotusercontent-na1.net/hubfs/2297879/URAC_PBM_Aggregate%20Summary%20Report_2024_FINAL.pdf.

49. Pharmacy Quality Alliance. (2025, May). PQA adherence measures. Retrieved May 19, 2025, from https://www.pqaalliance.org/adherence-measures.

50. Pharmacy Times. (2015). Do you know the difference between these adherence measures? Retrieved February 15, 2025, from https://www.pharmacytimes.com/view/do-you-know-the-difference-between-these-adherence-measures.

51. Ochner C. N., et al. (2013). Biological mechanisms that promote weight regain following weight loss in obese humans. Physiology & Behavior, 120, 106–113. Retrieved May 19, 2025, from https://pmc.ncbi.nlm.nih.gov/articles/PMC3797148/.

Figure 2 shows that 51% of patients in this sample cohort maintained GLP-1 adherence for fewer than six months, which we consider to be "not adherent." Side effects are more frequent during the initiation of therapy, which is one reason why dosage is increased gradually during that period.

The remaining 49% of patients in this cohort were adherent to any drug in the GLP-1 medication class for at least six months, and 20% of the cohort achieved 24 months of GLP-1 adherence. All of these GLP-1 adherent groups in the cohort exhibited a PDC above 91%, indicating that these patients achieved consistency of GLP-1 adherence throughout the specified period.

## Measuring effects on the medical cost of care

Once GLP-1 adherence groups have been defined, the impact of GLP-1 medications on the total cost of care can be measured per patient per year (PPPY). The medical cost of care (Figure 3A) and the pharmaceutical cost of care (Figure 4) together comprise the total cost of care (Figure 5).

Figure 3A shows the total medical cost of care for each level of GLP-1 adherence in an illustrative commercial population, filtered to patients with "obesity without diabetes" who began GLP-1 treatment in 2021. These were patients who did not have a prior diabetes diagnosis on any claim since January 1, 2019.

In the two years before starting GLP-1 therapy, average medical expenditures were similar for patients in this cohort, measured by the allowed cost PPPY. Allowed cost refers to the contractual maximum amount that a health plan will pay for a healthcare service.[52]

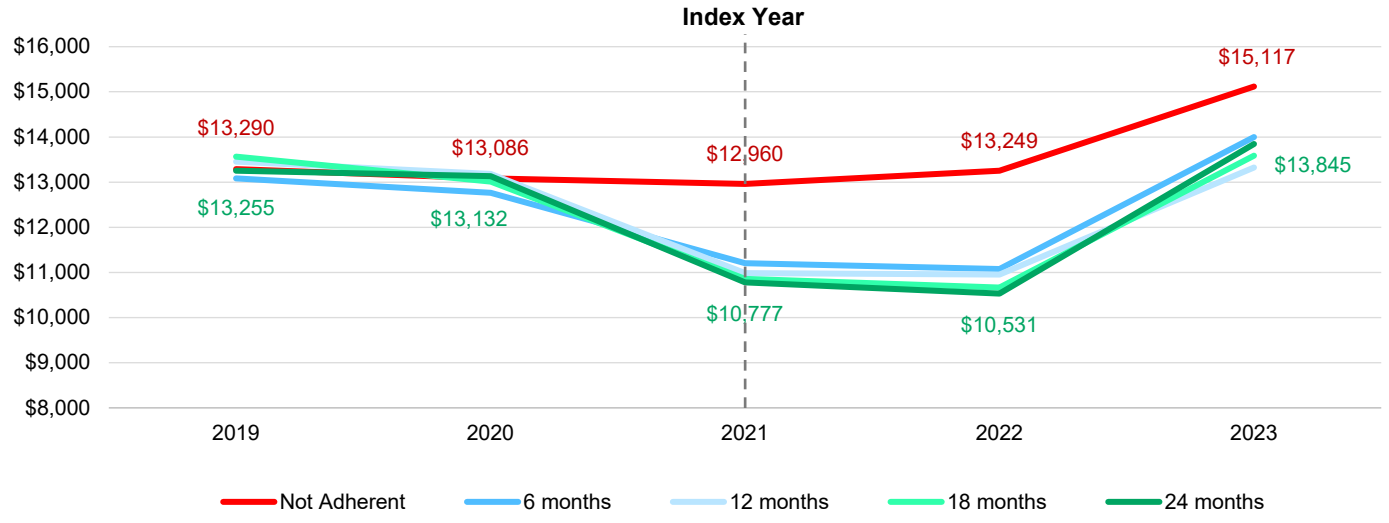
Patients who sustained six months of adherence to GLP-1 medications or longer adherence incurred 20–26% lower total medical costs PPPY than nonadherent patients in 2021 and 2022. In this cohort of nondiabetic patients with obesity, the longer the duration of GLP-1 adherence, the more profound the lowering of total medical costs PPPY in 2021 and 2022.

In 2021 and 2022, the six-month adherent group incurred:

- Fewer hospital inpatient admissions for spine surgery, joint replacement, and cardiovascular surgeries
- Fewer emergency department visits for cardiovascular care, diabetes, stroke, and pulmonary conditions
- Fewer outpatient surgical procedures for cardiovascular conditions and osteoarthritis in hospital outpatient settings or ambulatory surgical centers

The 12-month adherent group experienced similar decreases in emergency department visits for cardiovascular problems, back pain, and stroke in 2022 and 2023, as well as fewer hospital admissions for cardiovascular medical and surgical care, fewer outpatient visits for cardiology and spine conditions, and lower durable medical equipment costs for respiratory conditions (such as continuous positive airway pressure [CPAP] machines for sleep apnea).

**FIGURE 3A: MEDICAL SPEND PPPY BY GLP-1 ADHERENCE LEVEL FOR NONDIABETIC PATIENTS WITH OBESITY WHO BEGAN GLP-1 IN 2021**




52. "Allowed cost" refers to the maximum amount a plan will pay for a covered healthcare service. It is also known as the "allowed amount" or "negotiated rate." See https://www.healthcare.gov/glossary/allowed-amount/.

All groups in this study cohort experienced a rise in medical costs PPPY in 2023, although an 8–9% gap between the adherent groups and the nonadherent group was sustained.

- The nonadherent group incurred increased inpatient costs for cardiovascular care and chronic kidney disease in 2023, in addition to an increase in cancer care services
- The 6-month adherent group experienced 2023 increases in hospital outpatient surgeries related to osteoarthritis, physician-administered nononcologic drugs in hospital outpatient clinics or nonhospital physician offices, and inpatient cerebrovascular care
- In the 12-month and 18-month adherent groups, cancer care services were the dominant driver of medical cost increases in 2023, including hospital admissions for medical and surgical cancer care, outpatient chemotherapy, and office administered chemotherapy

These types of healthcare services are not elective and are therefore unlikely to be delayed care following the COVID-19 public health emergency. These services were also not unique to 2023 in any of the adherent or nonadherent groups. Outliers occurred in each group and in each year. On average across all adherent and nonadherent groups, the number of outlier patients with at least one high-cost hospital admission or emergency department claim (>$25,000) grew from 1.1% in 2021 to 2.5% in 2023, the number of high-cost claims grew by 2.6 fold, and the average allowed payment for a high-cost claim was about $62,000 in all three years.

"Regression to the mean" is a statistical phenomenon expressing that outliers in one sampling of a population are unlikely to re-occur in a subsequent sampling of the same population. In practical terms, a patient who had a joint replacement would only incur that procedure once on that particular joint, unless complications necessitated an intervention or surgical revision. Larger populations are less susceptible to potential misleading statistical artifacts described by "regression to the mean".

As a sensitivity analysis to consider whether the groups differed in their underlying risk of healthcare needs, we measured the distribution of the pre-existing medical spend in each adherent or nonadherent group in the 12 months preceding the initiation of each patient's GLP-1 therapy. In all groups, the majority of patients were low risk and very few patients were high risk; however, the proportion of patients at medium risk was greater in the 6-month and 12-month adherent groups.

About 1.8% of patients in the nonadherent group underwent bariatric surgery after attempting GLP-1 treatment, whereas 1.7% of total patients in the 6-month and 12-month adherent groups, and 0.2% of total patients in the 18-month and 24-month adherent groups also received a bariatric procedure.

**FIGURE 3B: DISTRIBUTION OF PRE-EXISTING MEDICAL SPEND BEFORE GLP-1 THERAPY IN NONDIABETIC PATIENTS WITH OBESITY**

| | Medical spend in the 12 months before starting GLP-1 therapy PPPY (000) | | | | |
|---|---|---|---|---|---|
| GLP-1 adherence level | Low risk ≤$10 | Med-Low risk >$10 to ≤$30 | Med-High risk >$30 to ≤$80 | High risk >$80 | Number of patients |
| **Not Adherent** | 67% | 23% | 8% | 2% | 2,226 |
| **6-mo only adherent** | 68% | 19% | 10% | 2% | 618 |
| **12-mo adherent** | 59% | 31% | 7% | 3% | 325 |
| **18-mo adherent** | 66% | 25% | 7% | 2% | 245 |
| **24-mo adherent** | 64% | 26% | 8% | 2% | 1,726 |
| | | | **Total patients in the Obesity without Diabetes cohort (GLP-1 index year 2021)** | | **5,140** |

Note: Percentages may not total 100% due to rounding

## Effects of drug shortages

In 2023, semaglutide (Wegovy and Ozempic) and tirzepatide (Zepbound and Mounjaro) were in short supply. Medical costs PPPY were only 9% lower for GLP-1 adherent patients in 2023, in contrast to 20–26% lower medical costs for GLP-1 adherent patients in 2021 and 2022, compared to nonadherent patients.

During the shortages, compounding pharmacies and telemedicine firms prescribed non-FDA-approved copies of semaglutide and tirzepatide injections,[53, 54] many of which were purchased directly by patients without submitting a health insurance claim.[55] It is not compulsory for compounded drugs to be issued a National Drug Code (NDC) product identifier, and none of the drugs on the FDA's list of NDCs for compounded formulations of semaglutide and tirzepatide were found in the Milliman database.

Patients who appear to be nonadherent to prescribed GLP-1 medications in the health claims data might still be taking compounded GLP-1 drugs.

## Measuring effects on the pharmaceutical cost of care

Figure 4 shows the total pharmaceutical spend PPPY for an illustrative commercial population, filtered to patients with "obesity without diabetes" who began GLP-1 treatment in 2021, using the contractually allowed costs (Figure 4.1) or factoring in estimated manufacturer rebates (Figure 4.2).

**FIGURE 4.1: TOTAL PHARMACEUTICAL SPEND PPPY BY GLP-1 ADHERENCE LEVEL, BEFORE MANUFACTURER REBATES, IN THE COMMERCIAL COHORT OF NONDIABETIC PATIENTS WITH OBESITY WHO BEGAN GLP-1 IN 2021**

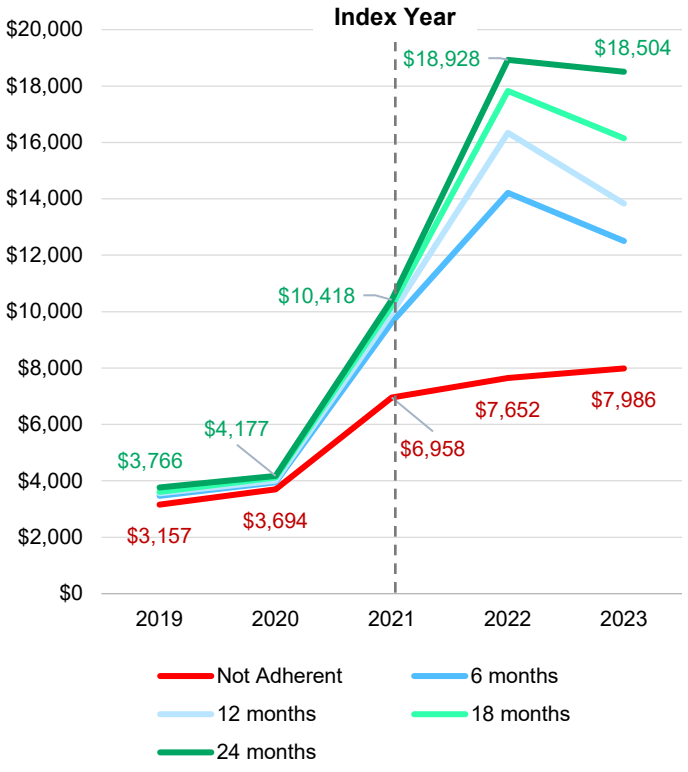
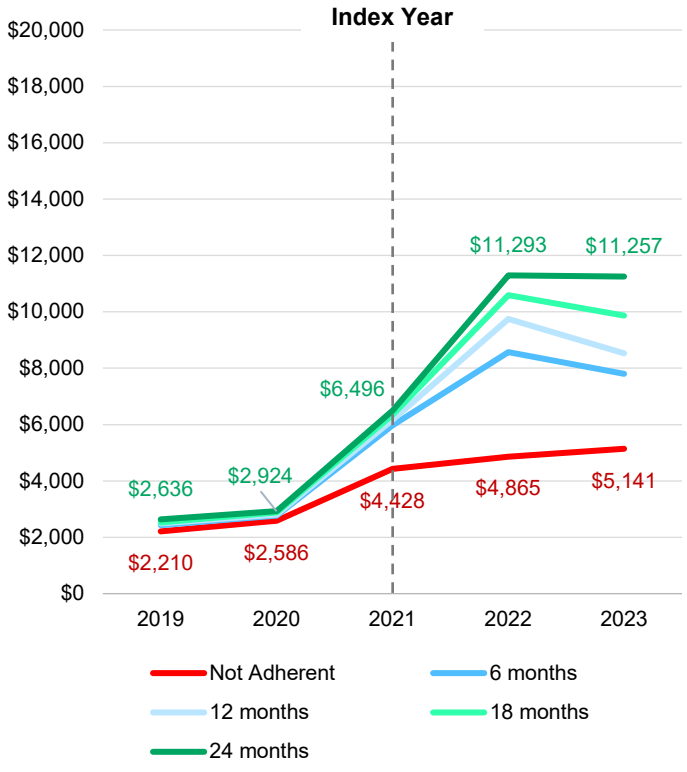



**FIGURE 4.2: TOTAL PHARMACEUTICAL SPEND PPPY BY GLP-1 ADHERENCE LEVEL, NET OF MANUFACTURER REBATES, IN THE COMMERCIAL COHORT OF NONDIABETIC PATIENTS WITH OBESITY WHO BEGAN GLP-1 IN 2021**




53. Novo Nordisk. (n.d.). Think you know the truth about compounded "semaglutide"? Retrieved May 18, 2025, from https://www.novomedlink.com/semaglutide/patient-safety/difference-fda-approved-compounded-semaglutide.html.

54. Eli Lilly. (2024, July 17). Where is the tirzepatide used in compounding coming from? Retrieved May 18, 2025, from https://medical.lilly.com/us/products/answers/where-is-the-tirzepatide-used-in-compounding-coming-from-232908.

55. Self-pay utilization of compounded GLP-1 medications does not appear in the claims research database, which is a limitation of the current study.

It is important to factor in drug rebates to estimate the actual drug spend. The precise rebate amounts are controlled by confidential contracts between payers, pharmacy benefit manager firms, and drug manufacturers. Modest estimates of rebates were used in the Milliman GLP-1 Impact Dashboard, based on third-party reference sources and Milliman's research databases.

An estimated 45% rebate for all GLP-1 drugs and a 30% rebate (as a percentage of allowed drug spend) for all non-GLP-1 drugs (brand, specialty, or generic) were deducted from the maximum contractually allowed costs. Dashboard users can easily adjust the rebate percentage to reflect the actual contracted rebate amounts, if known. For adherent patients, approximately 65–70% of total pharmaceutical expenditures went to GLP-1 drugs. For nonadherent patients, about 40% of total pharmacy expenditures was spent on GLP-1 medications.

The pharmacy spend of the nonadherent group following the initial GLP-1 use was elevated for all three years (2021–2023) compared to the 2020 baseline. It is possible that these patients tried GLP-1 medications throughout the study period but were unable to sustain adherence at 80% or higher PDC for at least six months.

## Measuring effects on the total cost of care

Figure 5 displays the overall total cost of care, which is the sum of the medical cost of care and the pharmaceutical cost of care for this illustrative commercial population, filtered to patients with "obesity without diabetes" who began GLP-1 treatment in 2021 on all prescribed drugs for any clinical condition. Figure 5.1 shows the overall total cost of care before drug rebates, whereas Figure 5.2 shows the overall total cost of care net of drug rebates.

Figures 5.1 and 5.2 show that the expense of the GLP-1 drugs was not completely offset by the improvements in medical costs for this commercial population during the period viewed in this illustrative example.

**FIGURE 5.1: OVERALL TOTAL COST OF CARE BY GLP-1 ADHERENCE LEVEL, BEFORE DRUG REBATES, IN THE COMMERCIAL COHORT OF NONDIABETIC PATIENTS WITH OBESITY WHO BEGAN GLP-1 IN 2021**

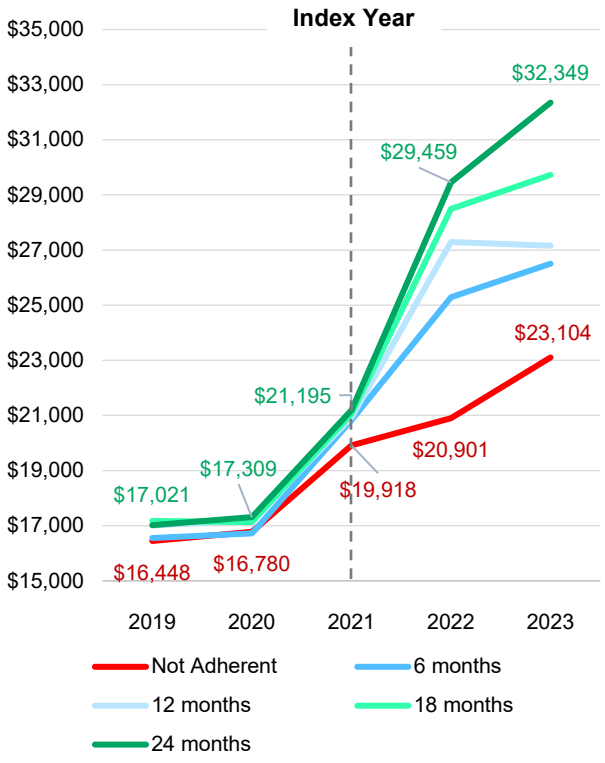
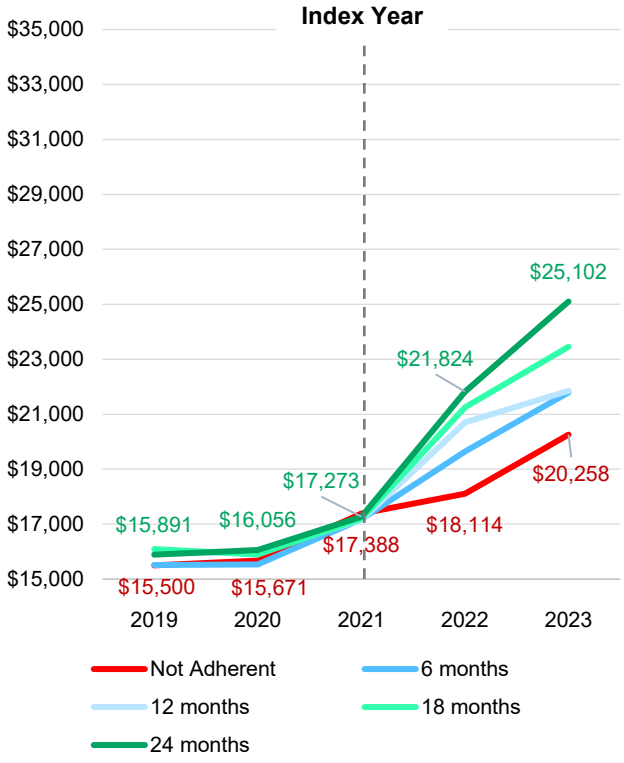



**FIGURE 5.2: OVERALL TOTAL COST OF CARE BY GLP-1 ADHERENCE LEVEL, NET OF DRUG REBATES, IN THE COMMERCIAL COHORT OF NONDIABETIC PATIENTS WITH OBESITY WHO BEGAN GLP-1 IN 2021**




The full dashboard extends through 2024 and is refreshed every two months to bring in the current year. It enables selection of specific insurance types, easy adjustment of rebates, and use of preset filters to examine a particular clinical condition or several comorbidities at once. It also allows user selection of age bands, gender groups, and the start date of GLP-1 therapy.

## Identifying and addressing opportunities

The dashboard provides referential data insights and can be applied to any organization's actual claims experience. It is designed to ingest claims data and output relevant analytics to assess trends for the GLP-1 drug class or specific GLP-1 and non-GLP-1 medications, and evaluate adherence, outcomes, and costs for potentially impacted clinical conditions, particularly prevalent and costly chronic conditions.

Chronic conditions drive the majority of medical costs, and studies have ascribed 90% of medical expenditure to patients with chronic conditions.[56, 57] A recent analysis of observational data in Milliman research databases estimated that care services for chronic conditions account for 75% of overall total cost of care for patients on average.[58] Studies from the U.S. Centers for Disease Control and Prevention (CDC) report sociodemographic and geographic variation in chronic disease prevalence.[59] Managing chronic conditions is also the area of greatest opportunity for cost-savings while prioritizing high-quality care.

Conditions that may have benefited from the effects of GLP-1 and GLP-1/GIP drugs could be re-evaluated periodically. For example, if a patient no longer suffers from symptoms of sleep apnea as a result of GLP-1 treatment, their ongoing need for CPAP therapy could be reassessed, and insurance-covered costs and/or out-of-pocket costs for CPAP machine maintenance, cleaning, replacement parts, and mask accessories might be reduced.[60] For patients whose chronic conditions improved on GLP-1 therapy, it is possible medication adjustment, dose reduction, or even discontinuation of some therapies by clinical providers could occur, which would lower the ongoing cost of care.

The Milliman GLP-1 Drugs Healthcare Impact Dashboard, which includes 19 relevant chronic conditions, is designed to adapt to new indications or off-label use in real-time without any re-engineering. It facilitates longitudinal analyses of patients with chronic conditions and offers insights into benchmarks and outcomes. Organizations that receive claims data for their patients can apply this dashboard to conduct GLP-1 analytics for their specific populations. Based on a nationally representative real-world multi-payer dataset spanning 2017–2024, the referential dashboard is frequently updated to monitor an evolving picture.

## Conclusion

Flexible analytics are valuable tools to inform the management of costs and outcomes for therapies such as GLP-1s that have a significant impact on payer spend and trend. This preliminary observational study of real-world data suggests that increased GLP-1 adherence may lower the medical cost of care for an expanding number of chronic conditions; however, this does not offset the cost of the GLP-1 medications. Unknowns exist around the role of GLP-1 in anti-inflammatory effects and long-term changes in metabolic rate and disease progression. Although it may be too early to determine the true impacts of GLP-1 and GLP-1/GIP medications on the overall total cost of care, creating the analytic framework to monitor emerging trends can identify potentially actionable opportunities to re-evaluate care intensity for conditions influenced by GLP-1 drugs.

## Study limitations and caveats

The dashboard examples presented in this report have several limitations. First, as these are observational analyses, it is not possible to draw definitive conclusions about the causal relationship between adherence and medical cost. The results shown in this paper represent a commercially insured population; these results do not apply to other populations that are available in the dashboard. Since this study focused on a period of 24–36 months from 2021 to 2023, it did not assess longer-term effects.

The healthcare claims data that were relied on for this analytic dashboard are documented and collected primarily for administrative purposes and often lack clinical details such as lab values, clinician notes, and plans of care. Despite this limitation, claims data has the advantage of providing a comprehensive view of all healthcare services incurred and billed to insurance from any healthcare professional or facility.

The database does not contain any claims data related to compounded GLP-1 formulations. Cash-pay or coupon-pay self-purchases of compounded GLP-1 medications and FDA-approved GLP-1 drugs from telehealth companies circumvent health insurance plans, and do not generate claims data for analysis of dispensed medications. These missing data prevent analyses of compounded medications and self-pay purchases of GLP-1 drugs.

56. CDC. (2024, July 12). Fast facts: Health and economic costs of chronic conditions. Last updated July, 2024. Accessed on May 20, 2025 from https://www.cdc.gov/chronic-disease/data-research/facts-stats/index.html.

57. National Institute for Health Care Management Foundation. (2025, April 3). The growing burden of chronic diseases. Accessed on May 20, 2025 from https://nihcm.org/publications/the-growing-burden-of-chronic-diseases.

58. Milliman MedInsight. High-level cost analyses of chronic conditions in the Milliman MedInsight Emerging Experience research database.

59. Benavidez, G. A., et al. (2024, February 29). Chronic disease prevalence in the US: Sociodemographic and geographic variations by Zip Code Tabulation Area. CDC. Accessed on May 19, 2025 from https://www.cdc.gov/pcd/issues/2024/23_0267.htm.

60. Hovav, K. (2023, December 13). CPAP machines for sleep apnea: Types, cost, and tips. GoodRx. Accessed on May 19, 2025 from https://www.goodrx.com/conditions/sleep-apnea/cpap-machine.

The Milliman research database is a random real-world sample of de-identified healthcare claims data submitted by a large number of healthcare organizations across the U.S. We performed a limited review of the data used directly in our analysis for reasonableness and consistency and have not found material defects in the data. We have not audited or verified this data and other information.

## Acknowledgments

The authors are grateful to James Price for his skillful designs in Power BI; Anne Lin, MBA, MS, for her technical advice; Mark Gruenhaupt, RPh and Michael T. Hunter, PharmD, for their valuable comments; and Katie Holcomb, FSA, MAAA and Gabriela Dieguez, FSA, MAAA for their insightful reviews.

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