Real-World Safety Trends of GLP-1 Receptor Agonists in the United States: Analysis of FAERS Reports (2015-2025)

RWD3

Daniel O. Umoru,[1] Zhouzhou Chu, MSc[2], Ariel Tran, PharmD [2], Lawrence M. Brown, PharmD, PhD.[1] Sherry Yun WANG, BSc, MPhil., PhD[2]

[1]Pharmaceutical Economics and Policy, Chapman University School of Pharmacy, Irvine, California.

[2]Biomedical and Pharmaceutical Sciences, Chapman University School of Pharmacy, Irvine, California

BACKGROUND

- Glucagon like Peptide 1 receptor agonist (GLP-1 RA) use has increased significantly: "155% increase" in GLP-1 use among adults with diabetes from 2018 to 2022 and more than one in four (26.5%) adults with diabetes used GLP-1 injectables in 2024 [1,2].
- Recent introduction of newer agents such as semaglutide and tirzepatide has accelerated prescribing trends due to superior glycemic control and weight loss benefits [3,4].
- Nearly 11.8% of Americans have used GLP-1 drugs for weight loss and prescriptions and spending have surged, with use increasing more than threefold from 2018 to 2022 [5,6].
- Rare but serious adverse events such as pancreatitis have been reported, with incidence estimates of approximately 4.6 to 7.9 cases per 1000 person years, highlighting the need for continued pharmacovigilance using real world data sources such as Food and Drug Administration Adverse Event Reporting System (FAERS) [7,8].
- Real world safety data are essential to capture rare, delayed, or population specific adverse events not fully observed in pre-approval studies [9].

OBJECTIVE

- To analyze and summarize safety trends and patterns of reported adverse events for GLP-1 receptor agonists in real-world clinical use in the United States.

METHODS

- U.S. Food and Drug Administration Adverse Event Reporting System (FAERS) reports from 2015 to 2025.
- Drug names were standardized and mapped to generic names to ensure consistent identification of all glucagon like peptide 1 receptor agonists were extracted for all GLP-1 receptor agonists, including albiglutide, dulaglutide, exenatide, liraglutide, lixisenatide, semaglutide (injectable and oral), and tirzepatide.
- Reports were summarized by role codes (PS/SS), patient demographics (age and sex), reporter type, reported indication, clinical outcomes and Medical Dictionary for Regulatory Activities (MedDRA)-coded adverse event terms.
- Analyses were stratified by drug, year, and adverse event category to evaluate temporal and agent specific patterns
- Data cleaning and analysis were conducted in Python using libraries such as pandas and matplotlib to ensure reproducibility.
- Descriptive statistics were performed in the dataset using Python, with trend visualization used to assess reporting patterns over time across individual GLP-1 agents.

RESULTS

Figure 1. GLP-1 RA US Report Counts

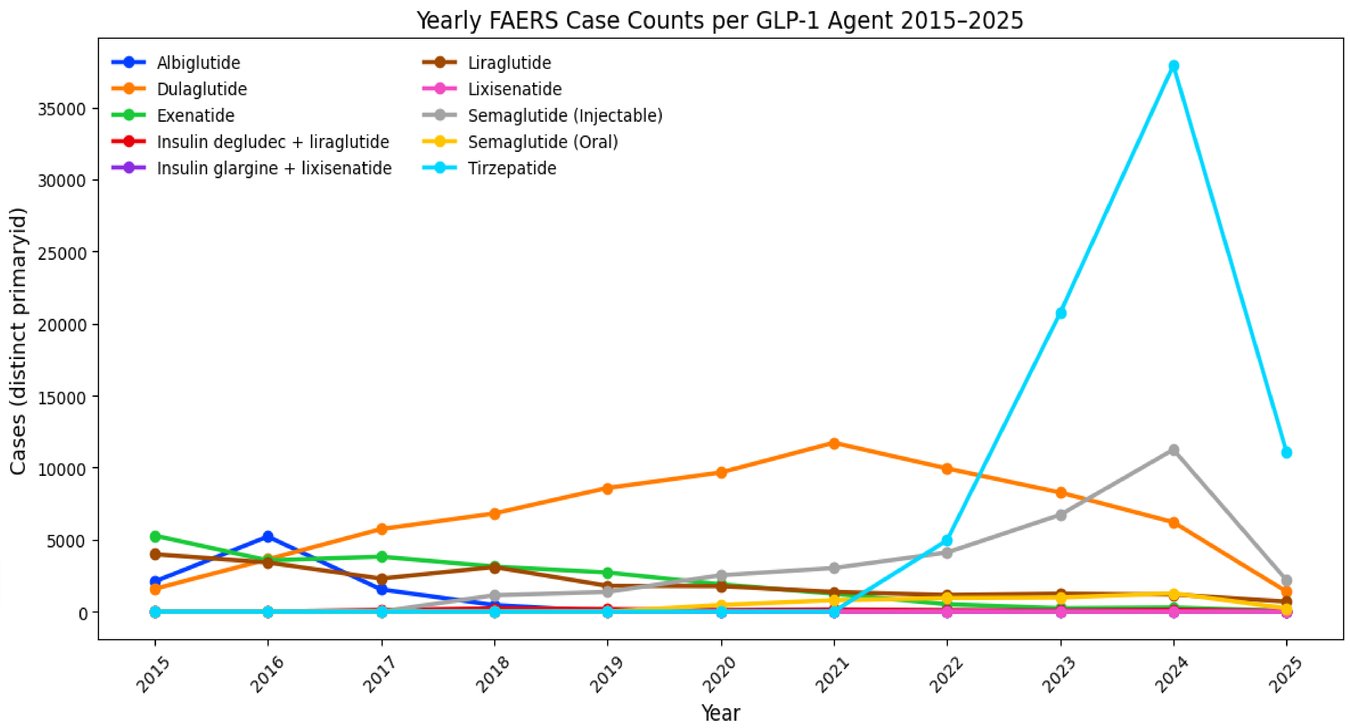
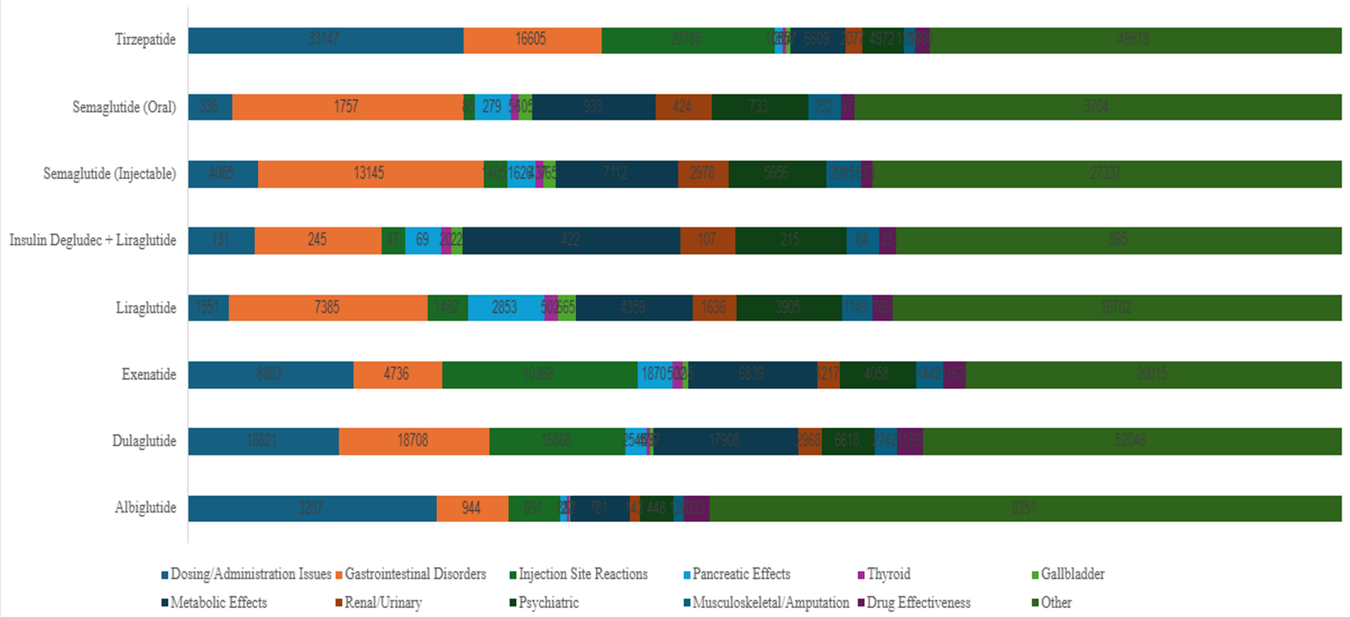


Figure 2. Adverse Event Categories by GLP-1 Receptor Agonists



DISCUSSION

- Tirzepatide demonstrated the most rapid rise, increasing from negligible levels pre-2021 to 38,000 reports in 2024, before declining in 2025. Injectable semaglutide also showed sustained growth, peaking at **~11,000 reports**, reflecting expanded clinical use.
- Injectable semaglutide demonstrates strong growth post 2020, increasing from 2,500 to 11,500 in 2024 before dropping to 2,200 in 2025.
- Oral semaglutide shows gradual uptake, reaching 1,200 cases around 2023 to 2024, followed by a slight decline.
- Tirzepatide shows a broad adverse event profile, with very high counts in gallbladder, injection site reactions, and gastrointestinal disorders, alongside notable dosing and administration issues.
- A clear shift in reporting patterns is observed, with earlier years dominated by legacy GLP 1 agents and recent years driven by newer therapies.
- Exenatide is characterized by high injection site reactions and notable metabolic and dosing related events, with gallbladder events also contributing significantly.
- Liraglutide shows strong representation of gastrointestinal disorders and gallbladder events.
- Dosing and administration issues are particularly notable in newer agents, especially tirzepatide, suggesting potential real world use challenges.
- Overall reporting peaks in 2024, largely influenced by high case volumes from tirzepatide and injectable semaglutide.

Limitations

- FAERS is a passive surveillance system, so adverse events are voluntarily reported, leading to underreporting and selective reporting.
- FAERS lacks a denominator (total exposed patients), so findings reflect reporting frequency, not true incidence or risk, and causal relationships cannot be established.
- FAERS lacks detailed clinical data such as disease severity, comorbidities, and concomitant medications.

CONCLUSION

GLP-1 agents show increasing real-world AE reporting in the United States, particularly for semaglutide and tirzepatide. Most reports originated from consumers, occurred among adults, and were more frequent in women. Gastrointestinal reactions were most common, while administration-related errors were prominent for tirzepatide. Continued monitoring and improved patient support may help reduce safety concerns as GLP-1 use expands.

Presented at ISPOR North America Conference, Pennsylvania, Philadelphia May 18, 2026