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GLP-1 medications for weight-loss: a triumph of marketing over patient care

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ABSTRACT

GLP-1 weight loss drugs are receiving an avalanche of positive press. From major media outlets to trade publications, clinical, policy, and lay audiences have been inundated with articles declaring them to be "miracle drugs." This messaging has largely been constructed by the drugs' manufacturers, often supported with quotes from doctors and researchers holding significant, undeclared financial entanglements with the manufacturers. The peer-reviewed research underpinning the efficacy and safety of these drugs also uses misleading reporting practices to obscure less positive findings. As such, this information may not be seen by reviewers, policy makers, clinicians, or the public. This paper will examine and critique the literature on GLP-1 medications for weight loss. We begin by briefly describing the mechanism of action and their evolution from diabetes medications to "weight management." We then provide a narrative review of the efficacy and safety data from the Phase 3, double-blind, randomized controlled trials of the two most popular GLP-1-based drugs currently available for weight loss – semaglutide and tirzepatide, highlighting misleading reporting practices. We also describe conflicts of interest among research authors, media proponents, and "patient advocacy" groups, as well as documented regulatory misconduct in the marketing of these drugs. This analysis will provide readers with more clear, comprehensive, and accurate information than is currently easily accessible, allowing for improved public and healthcare discourse and informed consent around these drugs.

KEYWORDS

GLP-1 receptor agonists; adverse events; conflicts of interest; pharmaceuticalization; Novo Nordisk

Sola dosis facit venenum. [The dose makes the poison.] (Paracelsus)

Glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic peptide (GIP) are incretin hormones that stimulate insulin release from the pancreas, reducing blood glucose. As GLP-1 and GIP function is impaired in individuals with type 2 diabetes, pharmacological agents were developed to mimic their effects (Nauck and Meier 2018). Unlike the short-lived endogenous hormones, these medications provide prolonged receptor activation (Sharma et al. 2018).

GLP-1 also contributes to satiety by interrupting normal hunger signals and slowing gastric emptying (Nauck and Meier 2018), and weight loss is a side effect of GLP-1 receptor agonists (GLP-1RAs; Novo Nordisk 2025) leading to exploration of this class of medications as weight-loss drugs. Although weight loss is observed at all doses of these medications, higher doses produce more weight loss. While the diabetes applications seek to optimize glycemic control at the minimum dosage to minimize side effects, the dosages used in the weight-loss formulations are intended to be as high as possible to *magnify* the *side effect* of weight loss.

Over the past decade, awareness has grown that "diets don't work," contributing to significant revenue losses in the diet industry (Chen 2016). However, with the release of GLP-1RAs for weight loss, accompanied by mass advertising, media hype, and celebrity and influencer promotion (Alibilli et al. 2025; Berning et al. 2025; Han et al. 2024; Jayanthi 2025; Raubenheimer, Myburg, and Bhagavathula 2024), the thin body is once again framed as attainable. In one study, over 60% of people who had heard of GLP-1RAs

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cited the news as a source of information, over 50% cited social media, more than a quarter cited friends or family, and fewer than 10% first heard about them from healthcare providers (Auerbach et al. 2025).

These media discourses have been underpinned by, and served to reinforce, weight stigma, positioning fatness as a burden to both the individual and to society as a whole (Fahs and Swank 2025). Further, the ubiquitous coverage has all but drowned out recent shifts toward body positivity and size acceptance (Bombak, Meadows, and Billette 2019; Harjunen and Puhakka 2025), replacing them with an eliminationist narrative that again reinforces fat shame and individual obligation and responsibility for weight loss (Fox 2024; Oswald 2024). In the "Age of Ozempic," remaining fat can seem even more unforgiveable than ever.

Whether in response to internalized weight stigma, omnipresent anti-fatness, and/or pressure from friends, family, and healthcare providers, many higher-weight people are considering these medications for weight loss (Auerbach et al. 2025; Chapin 2024). However, there remains significant confusion and misunderstanding of the nature of these medications or the importance of the dosing schedule used in the weight-loss formulations of the drugs.

To our knowledge, the academic literature on the clinical risks and benefits of GLP-1RAs largely comprises work written by scholars and practitioners embedded in the weight-centric paradigm, with little analysis of the environment in which these drugs are being promoted, or the practices involved in their marketing. Separately, scholars have explored the marketing practices, conflicts of interest, and corporate misconduct involved (Bombak, Adams, and Thille 2022; Mulinari, Pashley, and Ozieranski 2024; Ozieranski and Mulinari 2024), without integrating this information into an evaluation of the clinical findings. However, we argue that evaluation of the clinical evidence cannot be divorced from the broader climate in which the research was conducted and published. The present paper aims to address this gap in the literature.

Others have written about this shifting narrative, and the tensions between fat liberationist perspectives and anti-fat discourse in the age of Ozempic (Harjunen and Puhakka 2025; Oswald 2024). However, what is missing is a critical analysis of the weight of the evidence on the use of GLP-1RAs for weight loss that can facilitate transparency, informed evaluation, and decision making regarding the prescription and consumption of these products.

Here we present a narrative review of the evolution of these drugs for use in weight management, their efficacy and side effects, and the relentless marketing strategies employed by the pharmaceutical companies. We will focus on semaglutide (a GLP-1RA) and tirzepatide (a GLP-1/GIP co-agonist) (Lilly 2025a; Novo Nordisk 2023), currently the most well-known and widely used GLP-1RAs (Berning et al. 2025). However, much of the information provided is applicable to other GLP-1RAs.

While the authors reject weight loss as a valid goal for individual or population-level health promotion (Calogero et al. 2019; Hunger, Smith, and Tomiyama 2020), this critique is intended to be of use to healthcare professionals and individuals in both the weight-neutral and weight-centric paradigms in critically evaluating the use of GLP-1RAs for weight loss on evidentiary grounds.

Methodology

Completed Phase 3, double-blind, randomized controlled trials of semaglutide and tirzepatide for weight loss were identified from the ClinicalTrials.gov trial registration database, using the search terms "semaglutide" and "tirzepatide." Studies were included if they were in an "overweight" or "obese" adult population, with or without comorbidities, had a primary outcome of weight loss or cardiovascular disease risk, and compared the efficacy of the drug with a placebo. Studies with an active control only were excluded. Additionally, trials of the oral formulation of semaglutide were excluded because these had not yet received FDA approval at the time. Original searches were carried out in March 2025 and were updated in July 2025. Sixteen studies of semaglutide (17 papers) and six of tirzepatide (7 papers) were identified; however, findings had not yet been published for four of the semaglutide trials. Therefore, the final sample comprised 18 studies (20 papers, including two reports of trial extensions with relevant primary outcomes). Specifically, this comprised the publications of the "Semaglutide Treatment Effect in People with obesity" STEP series of trials 1–10, plus the STEP-HFpEF study in patients with heart failure with preserved ejection fraction; the "Semaglutide Effects on Cardiovascular Outcomes in People with Overweight or Obesity" (SELECT) trial, the "Efficacy and Safety of Tirzepatide Once Weekly in Participants without Type 2

Diabetes Who Have Obesity or are Overweight with Weight-Related Comorbidities" (SURMOUNT) trials 1–4, plus SURMOUNT-CN (China) and SURMOUNT-J (Japan), and the "Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity (SUMMIT) trial.[1]

Data regarding the efficacy for weight-loss and cardiovascular outcomes as well as the incidence of adverse events were extracted from the papers and/or the supplementary materials where available by the first and second author. Detailed breakdown of findings from the semaglutide and tirzepatide adult weight loss trials are shown in Supplementary Tables S1 and S2, respectively.[2]

Additional information on adverse drug interactions was drawn from the US Federal Drug Administration (FDA) Adverse Event Reporting System (FAERS) using the search terms "semaglutide" and "tirzepatide" in May 2025, and updated August 2025. The system collects data from mandatory drug manufacturer notifications as well as reports from healthcare providers and consumers that are provided on a voluntary basis. Efficacy and safety data are reported descriptively. Findings were not synthesized across studies.

Information on the marketing practices involved in the promotion of GLP-1RAs for weight loss was drawn from a range of available sources by all three authors. Cases were selected using a convenience sample of Google search results with combinations of the search terms "Novo Nordisk," "Eli Lilly," "Obesity," "Ethics," "Marketing," "Promotion," and "Shareholders." from January 2015 through June 2025 in the United States, United Kingdom, and Australia, as well as the previous analyses undertaken by the three authors on their various public forums. Sources included primary pharmaceutical company and industry documents, UK governmental records, databases related to financial disclosures, "obesity" organization websites, and published investigative journalism from national news sources. A systematic review of information available worldwide is beyond the scope of this paper; cases were selected to present examples of tactics reported consistently across international markets.

How effective Are GLP-1 receptor agonists?

Efficacy for Weight Loss

Significant weight loss is typically observed upon initiation of GLP-1RAs. Because of tolerability concerns, these drugs are titrated upward from subtherapeutic levels. In type 2 diabetes, titration is guided by HbA1c levels and patient tolerance; for weight loss, it continues to the highest tolerated dose (e.g., 1.7–2.4 mg semaglutide; 10–15 mg tirzepatide). Weight loss typically slows and then plateaus by about one year (Aronne et al. 2024; Bliddal et al. 2024; Davies et al. 2021; Garvey et al. 2023; Jastreboff et al. 2022; Kadowaki et al. 2022, 2025; Kosiborod et al. 2023; McGowan et al. 2024; Mu et al. 2024; Packer et al. 2025; Rubino et al. 2021, 2022; Ryan et al. 2024; Wadden et al. 2021, 2023; Wilding et al. 2021; Zhao et al. 2024). In studies with treatment extending beyond one year at maximum dose, body weight continued to plateau (Jastreboff et al. 2025) or rebound slightly (Garvey et al. 2022) over time.

The study abstracts generally report average weight loss among trial completers (see below). Trial lengths ranged from 44 weeks to 4 years, and average losses while on medication ranged between 7.9% and 20.9%. However, individual outcomes varied widely. The primary trial endpoints were usually percent change in body weight and/or proportion of sample losing at least 5% body weight, with secondary outcomes exploring attainment of higher thresholds.

Interestingly, the oft-reported 5% weight-loss goal to achieve clinically significant health improvements is not based on scientific evidence, and has been revised downwards over the years based on what studies have shown to be typical weight loss from intentional weight-loss attempts. A review of weight-loss studies found no consistent link between weight loss and improvements in metabolic markers; instead, any observed health benefits appeared largely driven by increased health behaviors rather than weight loss *per se* (Tomiyama, Ahlstrom, and Mann 2013), making the concept of "clinically significant" weight loss somewhat moot. This question notwithstanding, in some trials, up to one-third of participants failed to reach even this minimal weight-loss target (e.g., Davies et al. 2021; Ryan et al. 2024), though most studies reported average rates between 10% and 20%; 25–50% failed to lose 10% of their body weight in a majority of trials, and nearly half, on average, failed to achieve 15% weight loss, although over 70% fell short of this

target in some trials (Davies et al. 2021; Ryan et al. 2024). Longer trials tended to be associated with *less* weight loss on average and fewer participants meeting preset targets.

In the 2-year STEP 5 trial, weight plateaued after one year and began to rise slightly (Garvey et al. 2022). In the 4-year SELECT trial, weight loss stabilized around week 65 and, authors claimed, was maintained thereafter (Ryan et al. 2024). However, of the 8803 participants in the treatment arm, only 921 (10.5%) remained at follow-up, suggesting results may overestimate long-term maintenance. This interpretation is supported by evidence of increased attrition following modest gains in average body weight within the study population, suggesting participants with less favorable outcomes likely withdrew disproportionately. Notably, the proportion of participants achieving ≥ 5% weight loss was not reported at the four-year mark, but only at two years. At that time, 67.8% had lost ≥ 5%, 44.2% ≥10%, and only 11% ≥ 20%. It is plausible that a substantial proportion of the more than 1300 individuals who discontinued participation by the two-year point had either failed to lose weight or had begun regaining it. Given attrition rates were similar between the semaglutide and placebo arms, poor weight-loss outcomes rather than adverse events are likely to have been the primary driver of participant withdrawal. Due to the complex series of neurophysiological mechanisms that resist sustained caloric restriction, weight loss plateaus, reverses, or becomes difficult to maintain (Sumithran and Proietto 2013), and weight-management trial participants frequently discontinue participation rather than attend follow-up assessments (Mann et al. 2007).

In the SURMOUNT-4 trial, 36-week maximum tolerated dose was followed by either continued tirzepatide or placebo for 52 weeks (Aronne et al. 2024). Authors defined weight maintenance as regaining < 20% of the initial 36-week weight loss during the 52-week follow-up. Among participants who completed the trial, 10.5% of participants still on tirzepatide had already regained ≥ 20% of their initial loss by week 88 (information found on page 19 of 27 of the supplementary materials); however, even among the "maintainers," many may have been actively regaining but had not yet crossed the 20% threshold, and a continued trajectory of weight regain is highly probable.

Efficacy for Cardiovascular Health

Data from diabetes trials indicate GLP-1RAs also offer modest cardiovascular benefits even at very low doses (Marso et al. 2016). The cardiovascular effects of semaglutide in higher-weight patients without diabetes were tested in the 4-year SELECT trial (Lincoff et al. 2023). In an unusual move, Novo Nordisk put out a heavily publicized press release of the trial findings four months before they were published in a peer-reviewed academic journal. The press release claimed Wegovy reduced the risk of major adverse cardiovascular events by 20% in "overweight" and "obese" adults. Their stock jumped 16% to an all-time high (Kuchler and Smyth 2023). On study publication, it became apparent that this 20% represented a *relative* risk reduction; 8% of participants receiving placebo had one of three cardiovascular events compared with 6.5% in the Wegovy group – an *absolute* difference of 1.5% (Lincoff et al. 2023). Further, the sample was just under three-quarters male and 84% white, and while statistically significant findings were observed for cardiovascular outcomes in the sample as a whole, subgroup analysis indicated that the results were not significant for women, Black people, Hispanic people, those under 55 or over 75, or those with a BMI above 35 kg/m^2. These subgroup analyses were not included in the paper itself but on page 35 of 47 of the supplementary materials. The 20% figure continues to feature prominently in scientific and lay reports of the efficacy of Wegovy in reducing cardiovascular risk in higher-weight patients.

No cardiovascular trials have yet been published for tirzepatide in the general population. However, the SUMMIT trial of tirzepatide in patients "with obesity" and heart failure with preserved ejection fraction reported that "treatment led to lower risk of composite death from cardiovascular causes or worsening heart failure than placebo . . . " (Packer et al. 2025, 427). Indeed, there was a 48% reduced risk of this primary endpoint in the tirzepatide group. Tirzepatide did appear to improve exacerbations of heart failure (8.0% occurrences in treatment group versus 14.2% for placebo). However, deaths from cardiovascular events were more common with tirzepatide (2.2%) than placebo (1.4%), a 58% increased (relative) risk. While neither of these alone represent the reported composite end point, the published composite endpoint was not the one registered at the start of the trial. The initial primary endpoint was a composite of all-cause mortality, cardiovascular events, six-minute walking distance, and scores on a quality-of-life measure related to heart failure. The endpoint reported in the published paper was not introduced into the study

records on clinicaltrials.gov until version 55 of the study documents was filed, three years after the start of the trial.

Withdrawal effects

The STEP 1 extension study examined semaglutide withdrawal in 228 participants after one year of use (Wilding et al. 2022). Rapid weight regain began immediately upon cessation and continued to increase at one-year follow-up, particularly among those with greatest initial weight loss; after 1 year, the majority of weight lost had been regained. Cardiovascular benefits had already begun to decline prior to withdrawal and worsened thereafter.

The SURMOUNT-1 extension study examined a 17-week tirzepatide withdrawal period in 1032 participants with pre-diabetes at baseline after 176 weeks on-treatment. Rapid increases in weight and losses of previous cardiovascular benefits were observed immediately on cessation of the drug (Jastreboff et al. 2025). The SURMOUNT-4 trial involved 783 participants who received tirzepatide for 36 weeks before being randomized to continue the drug or switch to placebo for 52 weeks (Aronne et al. 2024). Again, rapid weight regain and reversal of cardiovascular improvements were observed following cessation.

While the drug manufacturers suggest these effects are proof the drugs should be taken indefinitely, no research exists to support the potential efficacy or harms of this approach. However, while long-term post-withdrawal data are lacking, extensive evidence from prior weight-loss research indicates that up to two-thirds of individuals ultimately regain more weight than they lost through dieting (Mann et al. 2007; Rothblum 2018), often with a worsened metabolic profile (Sumithran and Proietto 2013).

The Impact of Dosing for Weight-Loss

Semaglutide is marketed by Novo Nordisk under the name Ozempic for diabetes. Patients initially receive a sub-therapeutic dose (0.25 mg) and are titrated up to 0.5 mg after four weeks. If glycemic control is achieved, this dose is continued; if not, the dose can be escalated every four weeks until desired control or maximum dose is reached. Until 2022, the approved maximum safe dose was 1 mg. This was increased to 2 mg in the US in March 2022 (Reuters 2022). In Europe, the maximum dose currently remains 1 mg (European Medicines Agency 2025). For weight-loss, semaglutide is marketed under the name Wegovy, at a recommended dose of 2.4 mg, above the maximum recommended dose of Ozempic. Similarly, tirzepatide is marketed by Eli Lilly as Mounjaro for diabetes in five standard dosages between 2.5 mg and 15 mg (Lilly 2025a). Again, the goal is to achieve optimal glycemic control at the lowest possible dose. Early trials of tirzepatide for weight loss tested doses of 5 mg, 10 mg, and 15 mg (Jastreboff et al. 2022). The 5 mg dose produced similar cardiovascular benefits but less weight loss than the higher doses (Jastreboff et al. 2022, supplementary materials). Subsequent trials only included doses of 10 mg and 15 mg (Garvey et al. 2023; Wadden et al. 2023).

Tolerance

Medication tolerance can be low, with many patients requiring dose reduction or discontinuation. In the 4-year SELECT trial, approximately 5% of participants could not tolerate doses above the sub-therapeutic 0.25 mg, and around 25% were unable to maintain the full 2.4 mg dose for most of the study (Ryan et al. 2024; Lincoff et al. 2023, supplementary materials). Comparable rates of dose reduction and dropout due to adverse events were observed in other trials (see Tables S1 and S2). Thus, even if longer-term usage resulted in continued or even stable weight-loss outcomes, neither of which is supported by current data, the feasibility of life-long usage is questionable.

Side effects

Common side effects of GLP-1RA medications include nausea, diarrhea, vomiting, constipation, dizziness, abdominal pain, dyspepsia, and gastroesophageal reflux (Lilly 2025b; Novo Nordisk 2024). These tend to be worse on starting the drug and dose up-titration but do not necessarily abate fully (Aronne et al. 2024,

supplementary material; Wilding et al. 2021). Despite this, many participants consider these side effects an acceptable price to pay for weight loss (Jensen et al. 2025). Willingness to tolerate side effects has been linked empirically with higher BMI, previous dieting, anti-fat attitudes, and poor body image (Markey et al. 2025).

Untreated, gastrointestinal side effects can lead to severe dehydration requiring hospitalization (MHRA 2024). An additional risk related to loss of appetite over a prolonged period is malnutrition, with potentially serious health consequences, as well as increased risk of restrictive eating disorders (Kałas et al. 2025). Anorexia nervosa has the highest mortality rate of any psychiatric illness and is just as dangerous in high-weight as in low-weight individuals (Moskowitz and Weiselberg 2017).

Severe side effects of GLP-1RAs include acute pancreatitis, gallbladder disease, kidney injury, diabetic retinopathy complications, suicidal ideation and behavior, and ileus – complete paralysis of the intestinal tract (Lilly 2025b; Novo Nordisk 2024). In the UK, hundreds using GLP-1RAs have reported pancreatic issues. In response, the Medicines and Healthcare Regulatory Agency (MHRA) launched a trial involving patients hospitalized with acute pancreatitis (Burns 2025; MHRA 2025). As of 13 May 2025, ten patients using weight-loss drugs had died from pancreatitis, five of whom were taking tirzepatide.[3] While causality cannot be proven, pancreatitis is a known risk, and a surge in related hospitalizations coinciding with increased GLP-1RA use prompted the MHRA to initiate further investigation.

GLP-1RAs can disrupt the absorption of other medications, especially those requiring stable blood concentrations, such as seizure drugs, psychotropics, blood pressure medications, ADHD treatments, and oral contraceptives; GLP-1RAs may harm a fetus. They can also affect drugs with narrow therapeutic windows, including warfarin, lithium, SSRIs, antipsychotics, and digoxin, risking reduced efficacy or toxicity. Both drugs also carry Federal Drug Administration (FDA) boxed warnings for thyroid cancer risk (Lilly 2025b; Novo Nordisk 2024).

Thus, complications of taking GLP-1RA weight-loss medications may be life-limiting or even life-threatening. More serious side effects may not disappear on cessation of the medicine and long-term complications may have severe impact on health, quality of life, and healthcare costs.

As of August 2025, tirzepatide had been linked with over 93,000 adverse events, including 13,660 serious events and 423 deaths and semaglutide with over 58,000 adverse events, including 27,892 serious events and 760 deaths in the US alone (FDA, 2025).[4] GLP-1RAs already exceed the death toll of earlier weight-loss drugs withdrawn for safety reasons (Rodgers, Tschöp, and Wilding 2012).

Marketing "obesity"

Authors on GLP-1RA trial publications overwhelmingly work for the drug manufacturers or, as researchers and clinicians, have received millions of dollars in payments from them. Some also hold stock in the pharmaceutical companies whose products they are testing (Chastain 2024a, 2024b, 2025) Beyond clinical trials, Novo Nordisk, in particular, has spent hundreds of millions of dollars worldwide to influence the narrative around "obesity" prior to the release of their GLP-1RA weight-loss portfolio. Their 2015 Annual Report outlined a 10-year strategy for creating a market for their new and emerging weight loss drugs in a section entitled, "Obesity care: building the market from scratch" (Novo Nordisk 2015). Their three-pronged strategy was outlined by Novo Nordisk Australasia managing director: to "create legitimacy and urgency for the medical management of obesity" by promoting a narrative that "obesity" is a disease requiring long-term medical management and facilitate publication of research that furthers this narrative; to evolve the pharmaceuticalization of "obesity" by influencing professional guidelines and targeting healthcare professionals through "education" campaigns; and to promote government and insurance funding of medications for "obesity" (Soelberg 2015). This strategy follows an established pattern by which the pharmaceutical industry "are now marketing diseases, not just drugs" (Conrad, 2007, cited in Williams, Martin, and Gabe 2011) by using research funds to manipulate research and policy agendas (Bombak, Adams, and Thille 2022; Fabbri et al. 2018).

In the last decade, Novo Nordisk has invested heavily in creating networks of academic researchers and authors, forming professional organizations, lobbying bodies, and "patient groups" to deliver their key messaging around "obesity" (Das and Ungoed-Thomas 2023). Novo Nordisk sponsors hundreds of "obesity" patient advocacy groups worldwide (PatientView 2024) including funding media training for members to ensure that lived experience stories are accompanied by industry messaging. At the 2018

European Congress on Obesity, Obesity Canada representatives described training patient advocates to speak to the press, stating proudly that "every patient who is being interviewed in Canada right now will say obesity is a chronic disease. In every single interview. Twenty times." (European Coalition for People Living with Obesity 2023).

Obesity Canada oversaw the development of new "clinical obesity guidelines" (Wharton et al. 2020) when Novo Nordisk were a primary financial sponsor; however, the prominent guideline funding statement served to obscure the relationship between the guidelines' creation and Novo. In contrast, the mandated conflict of interest statement was nearly 1300 words; almost half of the 62 coauthors disclosed multiple financial links to the pharmaceutical and weight loss industry. All six executive committee members had multiple financial relationships with industry, particularly with Novo Nordisk, contravening the US Institute of Medicine's recommended standards for conflicts of interest in clinical practice guideline development (Institute of Medicine 2011; Schünemann et al. 2015), as well as the then newly introduced policy of the target journal itself (Kelsall 2019). The key message in the guidelines was that "obesity" is a chronic disease requiring life-long medical treatment. These guidelines have now been rolled out in a franchise model to Chile and Ireland, in a pilot programme funded by an unrestricted grant from Novo Nordisk to Obesity Canada and the European Association for the Study of Obesity (Ramos Salas et al. 2023).

Despite this massive investment, few governments have agreed to subsidize the medications because of high cost and lack of evidence of health improvements (Reuters 2024). One exception has been the UK. In 2023, the National Institute of Health and Clinical Excellence (NICE) approved National Health Service (NHS) funding of Wegovy for the treatment of "obesity" for people with a BMI above 35 kg/m^2 (NICE 2023). NICE's decision was based on submissions from Novo Nordisk and evidence from individuals nominated by the company or by Obesity UK (NICE 2023), a charity receiving funding from Novo Nordisk. Clinicians put forward by Novo Nordisk had received undisclosed payments from the company (Disclosure UK 2023/2024), also seen in tirzepatide hearings (NICE 2024). In the three years prior to the submission, Novo Nordisk reported nearly £22 million for donations, sponsorships, and fees to "obesity" charities, NHS trusts, royal colleges, healthcare education providers, and universities in the UK (Das and Ungoed-Thomas 2023). An additional £4 million in consulting and lecture fees went to health professionals and "obesity experts" – nearly matching the £28 million they reported for UK research and development. The company also sponsored the parliamentary group advising the government on obesity policy (Das and Ungoed-Thomas 2023; Disclosure UK 2023/2024).

These figures likely understate the extent of patronage; researchers identified widespread under-reporting and non-disclosure of payments to "obesity" charities, advocacy groups, media, and professionals between 2015 and 2022 (PMCPA 2025). In the three years before Wegovy's release, Novo Nordisk failed to disclose around 500 payments worth £8 million to over 150 individuals and organizations promoting drug approval (Ozieranski and Mulinari 2024). The company also funded major UK pharmacy chains in exchange for marketing data and supported online pharmacies that then illegally advertised prescription-only drugs directly to the public (Das 2025). Many countries prohibit direct-to-consumer advertising of prescription drugs; however, "disease-awareness" advertising campaigns by Novo Nordisk and Eli Lilly, have tested these limits (Bowler 2025; Galvin 2025).

The UK approvals of Wegovy and Zepbound were accompanied by extensive media coverage featuring prominent "obesity" researchers and clinicians. Many of these spokespeople had received tens of thousands of pounds from drug manufacturers and held leadership roles in professional organizations funded by Novo Nordisk, and to a lesser extent Eli Lilly – amounting to indirect financial ties worth millions (Das and Ungoed-Thomas 2023; Disclosure UK 2023/2024). These conflicts of interest were not disclosed in media reports.

The corporate misconduct involved in the marketing of GLP-1RAs extends beyond undisclosed conflicts of interest. Between 2019 and 2023, the UK Prescription Medicines Code of Practice Authority (PMCPA) found Novo Nordisk guilty of ten violations for inappropriately and dangerously marketing weight-loss drug Saxenda (liraglutide, another GLP-1) to healthcare professionals. Increasingly serious violations led to a two-year suspension from the Association of the British Pharmaceutical Industry (ABPI) – its most severe penalty to date (Mulinari, Pashley, and Ozieranski 2024). In the US, Novo Nordisk was fined $58.65 million in 2010 for deliberately downplaying the thyroid cancer risks of Victoza (liraglutide; diabetes formulation)

to healthcare professionals despite FDA warnings; the company denied any wrongdoing and Victoza sales exceeded $1 billion dollars that year (Mercedes 2021).

The campaign to expand the market and intensify pressures on government and private insurers to fund the drug continues. A recent international consensus paper proposed a new definition of "obesity" that extended the diagnostic boundaries for which pharmaceutical and/or surgical intervention is, the paper claims, warranted (Rubino et al. 2025). Of the 56 authors, 46 declared extensive entanglements with the pharmaceutical industry, including 40 who had received research grants, consulting fees, speaker fees, and other income from Novo Nordisk. The guideline has already been endorsed by over 70 professional organizations, indicating a significant future shift in the classification and treatment recommendations for "obesity" (Fourman et al. 2025). Assessing the impact of this expanded definition of "obesity" in a cohort of over 300,000 US adults, the new criteria classified 68.6% of the cohort as "obese," compared with 42.9% using the standard BMI cutoffs only, a 60% increase. Further, 36.1% of the cohort met the criteria for the newly defined "clinical obesity," a figure that increased with age, to over half of those aged 70 or over (Fourman et al. 2025).

Discussion

We have highlighted some concerning details regarding the true efficacy of GLP-1RAs for both weight-loss and cardiovascular health that are not readily apparent from reading the peer-reviewed reports of trial outcomes. We have also noted that a majority of authors on these reports have received large amounts of money from the drugs' manufacturers, either directly or indirectly.

Industry funding of new drug trials is common, and researchers having financial ties to pharma does not necessarily indicate malfeasance. However, substantial evidence suggests that industry funding may influence outcomes (Bekelman, Li, and Gross 2003), trial reporting (Lexchin 2005; Sismondo 2008), and the research agenda itself (Fabbri et al. 2018). Certainly, across most of the GLP-1RA weight loss studies, less-flattering findings are often reported only in the supplementary material, which may not be subject to peer review. Further, given the extent to which Novo Nordisk is embroiled within the "obesity" field, many peer reviewers likely also have direct or indirect connections to Novo Nordisk, creating a scholarly echo chamber. It would increase transparency if reviewers also had to declare any financial entanglements with trial sponsors, and perhaps a cutoff could be used to ensure peer review is conducted by reviewers without significant ties to industry. Journals should also consider mandating that the contents of any supplementary material (e.g., list of tables, figures, etc.) are included in the manuscript itself, so the full scope of available data is readily apparent, and readers can make an informed decision about how deeply they want to delve into the findings. On a more systematic level, we do not need more studies to demonstrate that industry funding and financial relationships with trial paper authors is strongly linked with findings favoring the drug under investigation, and attempts to rectify this situation through disclosure statements have failed to have much impact (Sismondo 2008); researchers and clinicians have long called for increased public funding of clinic trials, perhaps subsidized by the pharmaceutical industry at arms' length (Baker 2004).

We have also detailed the range and extent of currently known side effects, although it should be noted that adverse event occurring in a person taking a drug is not proof of causal effects. Nevertheless, the rate of reported adverse events surged following increased promotion, availability, and popularity (Figure 1) – around 2% of the UK and US populations currently use GLP-1RAs for weight loss, projected to increase five-fold by 2035 (Morgan Stanley 2024; Robertson 2025). Google Trends analysis shows exponential growth in searches for "Ozempic" and related terms between 2018 and 2023, with a steep rise in early 2023 driven by social media and celebrity endorsements (Han et al. 2024).

While serious adverse events are less common than more minor side effects, the sheer number of people now taking these drugs presages an emerging public health problem. It is not unusual for side effects of medications to become more apparent after a drug has gone to market, sometimes resulting in post-marketing withdrawal of the product (Onakpoya et al. 2016). Again, the number of adverse events and deaths associated with these drugs significantly exceeds those of other weight-management medications at the time they were withdrawn from market for safety reasons (Rodgers, Tschöp, and Wilding 2012). Further, available statistics likely underestimate the true prevalence of adverse events as side effect

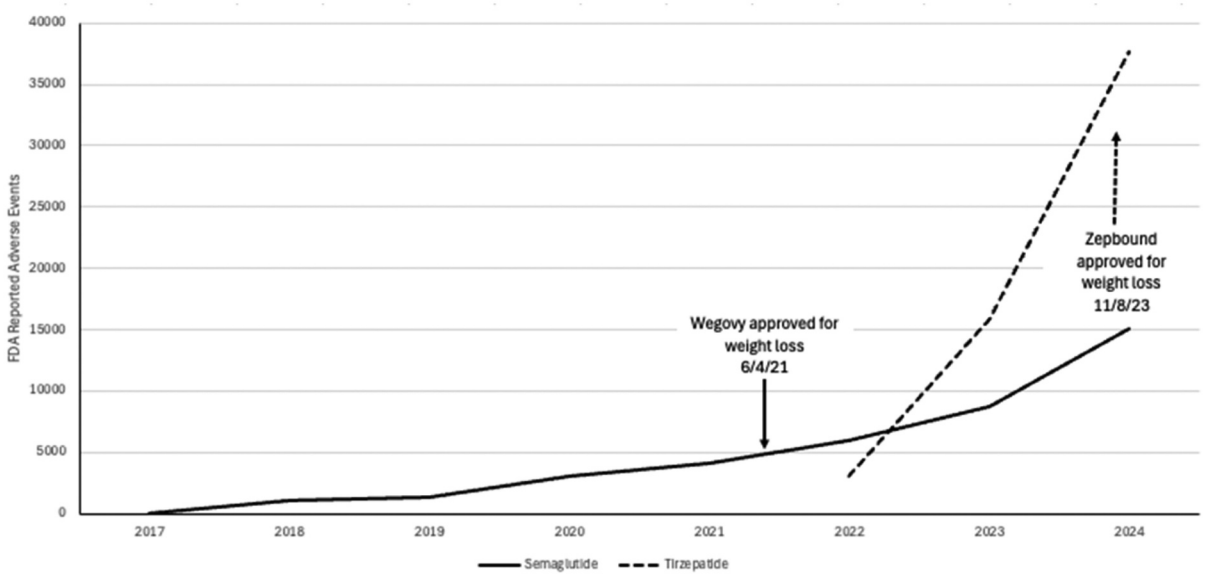

Figure 1. US adverse events reporting for semaglutide (solid line) and tirzepatide (dashed line).

reporting, while compulsory for product manufactures, is voluntary for clinicians and consumers and may be influenced by factors including lack of awareness, complacency, uncertainty, or the burden of reporting procedures (García-Abeijon et al. 2023). Clinicians also vary in the extent that they inquire about side effects (Steinman 2013). Importantly, people acquiring the drugs through channels other than their healthcare provider – an estimated 80% in the UK (Robertson 2025), for example – are less likely to use official reporting systems (MHRA 2024).

Additionally, people who are taking GLP-1RAs under medical supervision may withhold information about side effects to avoid being taken off the drugs (clinician pers. comm.). To date, only anecdotal evidence is available on this phenomenon, and this is an issue that would benefit from future research. Similar patient reluctance to report side-effects has been observed for anti-psychotic medication (Nourishad 2025), but this important clinical issue remains under-researched in general. Evidence from other conditions suggests that patients are more likely to report side effects when providers specifically ask (Aspinall et al. 2002); however, it is unknown if prompting will be effective in the case of GLP-1RAs for weight loss, given the broader fatphobic environment, immense pressures to lose weight, and lack of alternative effective "treatments."

Previous studies show that people are willing to sacrifice significant health for the promise of thinness. In one study of bariatric surgery candidates, over a quarter would accept a > 10% risk of death to achieve their ideal weight (Wee et al. 2013), and post-surgery, patients often said they would prefer severe health or life-limiting conditions, including deafness, blindness, heart disease, or limb loss, rather than regain the weight (Rand and Macgregor 1991). In a non-clinical sample, nearly half of 4000 participants said they would trade at least one year of life to avoid being "obese," with 15% willing to give up over ten years; a quarter would sacrifice the ability to have children, and over one in eight would rather be alcoholic or blind rather than fat (Schwartz et al., 2006). In a climate of anti-fat rhetoric, moral panic, and individual blame (Fahs and Swank 2025; Harjunen and Puhakka 2025), both societal- and self-stigma force fat individuals to choose between health and quality of life.

Finally, we described Novo Nordisk's intensive campaign to expand the market for weight-management medications by shaping the cultural narrative. While the "obesity as disease" discourse did not originate with pharmaceutical companies, lobbying and financial sponsorship of professional organizations, health-care professionals, and researchers have intensified in the past decade. This has been amplified by U.S. campaigns to reduce insulin prices (Schaffer 2019; Tsaplina 2019) threatening a key revenue source, and the pursuit of replacement blockbuster drugs (Fischer 2024; Jacobsen and Gronholt-Pedersen 2017). Pharmaceutical companies' fiduciary duty is to their shareholders; most of the practices described above, while concerning, are not illegal but represent an extremely effective campaign to further develop and

entrench the disease narrative to maximize profit. They do, however, sometimes contravene industry standards intended to improve the transparency and integrity of clinical science, for example recommendations regarding the extent of industry ties with developers of clinical guidelines (Institute of Medicine 2011; Schünemann et al. 2015). All journals should implement these best-practice policies to increase transparency and reduce bias in clinical guidelines, and these should be strictly enforced.

Other potential strategies to limit the dominance of marketing over clinical care could include banning direct-to-consumer advertising of prescription medications by the USA and New Zealand, the only industrialized countries not to do so (Feldman 2022) and tightening up the regulatory powers of oversight agencies to address "disease awareness" marketing campaigns designed to subvert these rules. Direct and indirect industry funding should be displayed *prominently* in all promotional and marketing materials, media coverage including for sources interviewed, and social media content. Promotion of prescription drugs by non-healthcare professionals should also be banned or strictly regulated. In 2024, TikTok started removing content related to GLP-1RAs and suspending accounts of some influencers, although many still remain; other platforms have yet to follow suit (Muller 2024). Perhaps a more powerful deterrent may be to hold influencers to the same standards of care as healthcare professionals, who may be liable for any harms caused by failure to disclose side effects, promotion of off-label prescription, especially when the patient does not meet the approved medical criteria for the drug, and undisclosed conflicts of interest. While non-healthcare professionals do not have a legal duty of care, they may still be guilty of making misleading health claims – for example minimizing risks or declaring a product "miraculous," negligent misrepresentation, and deceptive advertising practices (Kiaei 2025). The law is evolving in this area, however more clarity and stronger enforcement is needed (BEUC (2023); Munevar, Hayashi, and Martizen 2025).

Following the massive investment in shaping the "obesity" narrative, an increasing number of medical bodies worldwide have now officially classed "obesity" as a disease (Jastreboff et al. 2019), placing responsibility for its "solution" beyond the simple remit of individual behavior change, and shifting the dialogue, at least as targeted to public health professionals and policy makers, from one predominantly underpinned by a neoliberal healthist philosophy, where high-weight status represents a moral failing to be addressed by individuals making "more responsible" choices (Germov and Williams 1996; Hoverd and Sibley 2007; Townend 2009), to one demanding a pharmaceutical solution. This shift has been accompanied by a concerted lobbying campaign demanding that governments and insurance companies absorb or subsidize the cost of the medications. Interestingly, clinicians and bioethicists have questioned the scientific validity of declaring "obesity" a disease (e.g., American Medical Association Council on Science and Public Health 2013; Charrow and Yerramilli 2018; Hofmann 2016; Vallgårda et al. 2017), yet utilitarian arguments emphasizing access to third-party funding have helped sway decisions (ABC News 2013; Allison et al. 2008, Vallgårda et al. 2017).

Another key argument was that a disease classification would de-stigmatize "obesity" by countering the misconception that higher-weight status is a result of lifestyle choices (Allison et al. 2008). This argument has been taken up by the manufacturers of GLP-1RAs and is a foundation of much of their current advertising campaigns (Bowler 2025; Galvin 2025; Thoem 2025). It is ironic, then, that remaining fat is viewed as a failure to make the responsible choice to undergo "treatment" (Oswald 2024; Thoem 2025), and fat shaming has once again usurped body positivity in the cultural mores (Pick 2023). However, it is not surprising. Regardless of the efficacy (or lack thereof) of these medications, the foundation upon which all of their marketing rests is the belief that fat people should risk our lives and quality of life to become thin (Warin, Bombak, and George 2024). De-stigmatization and pathologization cannot co-exist (Fox 2024; Fox et al. 2023). In the words of Charlotte Cooper (2016), "You cannot promote the disappearance of a group of people and expect their social position to improve." If only a fraction of the money spent on weight loss research and treatment were directed toward weight-neutral or weight-inclusive healthcare, how different would this picture look?

Limitations

This paper has a number of limitations. Most critically, the lack of transparency in the marketing practices for GLP-1RA weight-loss medications has necessitated relying on non-peer-reviewed resources to gather relevant information. These have included internal documents, reports by

investigative journalists, and scrutiny of publicly available databases for safety information and financial disclosures. Internal reports, by definition, are not necessarily available to the public and much information may have been missed. Reports by investigative journalists have been selected by the authors for inclusion and are thus neither random nor comprehensive. Similarly, databases searched are limited both by the choices of search terms and lack of disclosure from the originators of the data, and thus may be incomplete.

The analysis of the shortcomings of the published clinical trials is limited by not having full access to the choices in methodology, statistical analysis, and/or reporting that were made by the drugs' manufacturers and/or research authors, most of whom have significant financial entanglements and/or incentives. However, the authors feel that the clinical and corporate practices included in the present paper are both consistent and representative, and expose a pattern of intentional choices by the manufacturers of these medications, designed to overstate the benefits and obfuscate the limitations and risks of GLP-1RAs for weight loss, impairing true evidence-based decision making from healthcare professionals and policy makers, and precluding genuine informed consent from patients.

Additionally, our analysis of the marketing of "obesity" has focused on Novo Nordisk's targeting of researchers and healthcare professionals. An in-depth analysis of other forms of cultural outreach is beyond the scope of this paper, but includes investment of hundreds of millions of dollars in public-directed advertising (Constantino and Capoot 2024; Joy, Bessey, and Mann 2025; Klein, Zenone, and Kesselheim 2025), sponsorship of entertainment media (Physicians Committee for Responsible Medicine 2023), paid celebrity and influencer endorsements (Hawkinson 2024; PR Newswire 2025; Thoem 2025), including targeting plus-size influencers (O'Neill 2024), and contributions to US political candidates (e.g., Open Secrets 2020), including the sponsors of a 2021 bill requiring federal funding of weight-loss medications (Treat and Reduce Obesity Act, 2021). As such, our findings are far from exhaustive.

Conclusion

While the practices described in this paper are not unique to the marketing of these particular medications (Moynihan, Henry, and Heath 2002; Williams, Martin, and Gabe 2011), the scale of this campaign is undoubtedly massive, with the potential market for a supposedly effective weight-loss medication unlikely to be matched by many other product types (Fourman et al. 2025). In 2024, Ozempic was the third top-selling prescription drug worldwide (Philippidis 2025). Regardless, the strategies involved in the reporting and marketing of these drugs precludes true informed consent from potential users, continuing a history of harming higher-weight people in the name of profits (Rodgers, Tschöp, and Wilding 2012).

For many consumers, GLP-1RAs produce short-term weight loss, especially at higher doses. However, typical weight-loss outcomes have been overstated, and early evidence suggests that the trajectory of weight regain observed with other weight loss methods will be replicated here, even with continued use. Cardiovascular benefits are modest and may not be experienced by all demographic groups. Cessation of the medications results in rapid weight regain and loss of any health benefits accrued. Healthcare systems worldwide are already being faced with potentially life-threatening and life-limiting complications of GLP-1RA medications. While GLP-1RAs are a useful tool for certain metabolic conditions, as with all drugs, they come with risks, especially at higher doses. The weight-loss formulations magnify these risks.

Morgan Stanley estimated the global weight-loss drug market will be worth up to $105 billion by 2030 (Morgan Stanley 2024). However, the burden of long-term health and economic costs will be borne by governments and populations for decades to come. Despite being up against the "avalanche of money" (Adams 2025) used by the pharmaceutical industry to construct this highly profitable narrative, whistle-blowers, activists, researchers, healthcare providers, and investigative journalists worldwide are speaking up, pushing back, and demanding that the truth be told.

Given the cultural obsession with thinness, including its common conflation with health, the interest in GLP-1s for weight loss is not surprising. That said, ethics demand that the patients who are the intended targets for these drugs and the providers who are the intended prescribers have access to robust, unbiased research to allow for true informed consent. The current research falls far short of this standard and need.

Notes

1. SELECT, SURMOUNT, and SUMMIT are not acronyms.
2. Note, the Supplementary Materials for this paper were subject to peer review.
3. pers. comm. to J Burns from MHRA, provided to authors.
4. Searches were initially carried out in May 2025 and updated in August 2025. Over that 3-month period, the number of reported adverse events for tirzepatide and semaglutide had increased 38% and 36%, respectively. The rate of serious adverse events had increased 61% and 30%, respectively, and the number of deaths by 42% and 17%, respectively.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Ragen Chastain, MEd, BCPA is a US-based speaker, writer, researcher, Board Certified Patient Advocate, multi-certified health and fitness professional, and thought leader in weight science, weight stigma, health, and healthcare. Author of the Weight and Healthcare newsletter, co-author of the Health at Every Size Health Sheets, and editor of the anthology The Politics of Size, Ragen is frequently featured as an expert in national and international print, radio, television, podcasts, and documentary film. She has provided Grand Rounds, Continuing Medical Education, keynotes, and consulting to diverse organizations including Massachusetts General Hospital, Memorial Sloan Kettering, Kaiser Permanente, Nationwide Children's Hospital, Amazon, Google, Dartmouth, Cal Tech, and the Yale School of Medicine. Ragen has been following and analyzing the emergence of evidence around weight-loss medications in her Weight and Healthcare newsletter, written with an audience of healthcare providers and educated lay readers in mind, and has created and delivered Continuing Education on the topic of GLP-1 receptor agonists for weight loss and secondary uses. In 2024, she co-authored with Angela Meadows evidence to the Welsh government Health and Social Care inquiry into prevention of ill health – "obesity" on the topic of GLP-1 receptor agonists for weight loss.

Dr Angela Meadows is a Lecturer (Assistant Professor) in Psychology at the University of Essex in Colchester, UK. Her research specialism is weight-related stigma and its impact on health and wellbeing, which she considers at both the individual level (attitudes and behaviors) and society level (sociocultural and policy environment). She has been working in the field of weight stigma for 15 years and is recognized internationally as a leader in the field. In 2013, she founded the interdisciplinary Weight Stigma Conference, now an annual 2-day event drawing international scholars and practitioners from the fields of public health, medicine, psychology, sport and exercise science, education, business, law, social sciences, and others to consider research, policy, and practice around the issue of weight stigma. In 2022, she presented oral and written evidence to the UK government Department of Health and Social Care inquiry into body image and mental and physical health and in 2024, she presented evidence on weight stigma and critical weight science to the Welsh government Health and Social Care inquiry into prevention of ill health – "obesity" and co-authored with Ragen Chastain evidence to this enquiry on the topic of GLP-1 receptor agonists for weight loss.

Louise Adams is a clinical psychologist in private practice and an advocate for weight-inclusive health. A founding member and past President of Size Inclusive Health Australia (SIHA), Louise is an activist, educator, author, blogger, speaker, and host of the All Fired Up podcast. She founded Flourish Kirribilli, a multidisciplinary clinic in Sydney offering weight inclusive health care. Through multiple channels, including her newsletter, blog, podcast, academic publications, public speaking, and media, Louise challenges weight-centric frameworks that perpetuate harmful research, weight stigma and damage psychological and physical well-being. Her advocacy work included a high-profile campaign against the Fast Track Trial—a semi-starvation study on Australian teenagers—which galvanized public support and led to changes in the trial protocol. Louise has authored two books. The Non-Diet Approach Guidebook for Psychologists and Counsellors (2014), co-written with Dr Fiona Willer, AAPD, offers a framework for applying non-diet principles in therapeutic settings. Her second book, Mindful Moments (2016), provides practical guidance on self-compassion and mindfulness for everyday life. Currently, Louise's advocacy work is focused on countering the growing influence of pharmaceutical companies in obesity research, policy and practices, which has reached epidemic levels since the introduction of Novo Nordisk's weight loss drugs.

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Generative AI statement

ChatGPT (v GPT-4-turbo) was used to assist with editing to reduce word count to article limits. The GPT was asked to make written content more succinct while maintaining academic style and keeping key details. All responses were checked carefully and edited/corrected as appropriate.

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