# Obesity Drugs: The Next Wave of GLP-1 Competition

## New drugs from public and private companies will challenge Novo and Lilly's dominance.

**Morningstar Equity Research**
September 2024

**Contents**



Karen Andersen, CFA
Strategist, Biotechnology
karen.andersen@morningstar.com

Kazi Helal, Ph.D.
Senior Analyst, Biotech, PitchBook
kazi.helal@pitchbook.com

Damien Conover, CFA
Director, Pharmaceuticals
damien.conover@morningstar.com



### First Wave of Obesity Drugs Led by Novo and Lilly

New public and private entrants are emerging to challenge the leading positions of Novo Nordisk and Eli Lilly in a potential $200 billion total GLP-1 market, which we expect will see 68% of sales from weight loss indications by 2031. Given first-mover advantages and innovation with next-generation products, we expect Novo and Lilly to retain two thirds of the total market by 2031, reinforcing their wide moats.

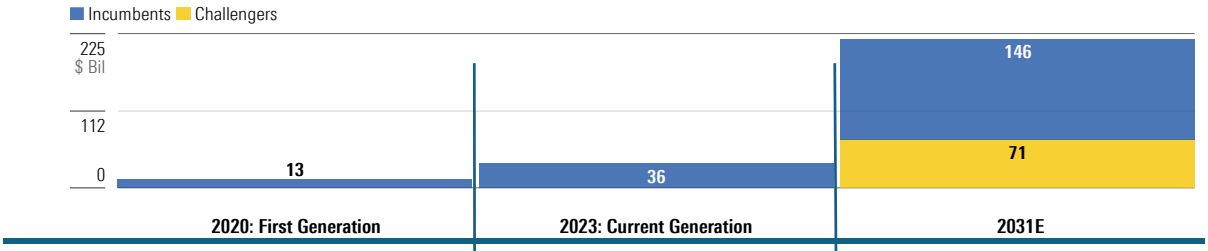
### Next Wave of Obesity Drugs

Midstage cardiometabolic pipelines are filling up across public and private biopharma as Novo and Lilly's success revitalizes drug development. We expect 16 new obesity drugs could launch by 2029, with roughly $70 billion of the GLP-1 market coming from these new challengers by 2031.

### Key Takeaways

- Novo Nordisk and Eli Lilly are launching leading obesity drugs that will support a $200 billion total GLP-1 market. While we assume they will retain nearly 70% of the market, we view the stocks as overvalued.
- Over the next three to four years, next-generation obesity drugs from Roche (FVE: $55), Amgen (FVE: $317), Pfizer (FVE: $42), AstraZeneca (FVE: $78), private firm Boehringer, and acquisition targets including Viking and Structure will likely take market share and pressure drug pricing.
- Led by Metsera and Hercules (both acquisition targets), venture capital/private obesity drug development will layer in new drugs. On pages 19-20, we rank the most likely acquirers and targets.

**Exhibit 1** GLP-1 Evolution: Key Private and Public Companies Challenge Incumbents Novo and Lilly in a $200 Billion Potential Market




| | 2020: First Generation | 2023: Current Generation | 2031E |
|---|---|---|---|
| **Key Firms** | Novo Nordisk, AstraZeneca | Novo Nordisk, Eli Lilly | Several Key Firms (see list at right) |
| **Weight Loss** | 5% | 14-18% | >18% |
| **Nausea** | Heavy Nausea | Moderate Nausea | Mild Nausea |
| **Dosing** | Daily Injection | Weekly Injection | Monthly/Weekly Inject. or Daily Oral |

Weight loss includes obesity and overweight. First-gen GLP-1 weight loss refers to Novo's Saxenda. Current-gen GLP-1 weight loss refers to Novo's Wegovy and Lilly's Zepbound.

Source: Morningstar. Star ratings as of Aug. 30, 2024.

## GLP-1 Drugs Represent Paradigm Shift for Obesity Treatment, but Valuations Look Steep

GLP-1 drugs act similarly to the hormone glucagon-like peptide 1 (GLP-1), which helps the body produce insulin to help treat diabetes and slows the movement of food from the stomach to help treat obesity.[1] While initially approved for diabetes, GLP-1 drugs are gaining new indications, including the large opportunity in obesity following decades of failed attempts to create an effective and safe drug.

Novo Nordisk's semaglutide (Ozempic and Rybelsus for diabetes and Wegovy for obesity) and Eli Lilly's tirzepatide (Mounjaro for diabetes and Zepbound for obesity) are the clear leaders in the GLP-1 class. Novo Nordisk and Eli Lilly hold a significant first-mover advantage, as most other firms largely reduced cardiometabolic research a decade ago due to a lack of innovation, side effects, and lower pricing power.

However, new entrants are emerging, enticed by an expected $200 billion market. We expect significant market share penetration in obesity but also pricing pressure, multiple new drug launches, and several potential acquisitions to make the market more competitive than what investors are currently assuming (Exhibit 2).

**Exhibit 2** PitchBook/Morningstar Analysis Offers a Different Take on a Rapidly Growing Obesity Market

| Market Perspective | PitchBook/Morningstar Take | Reference Pages |
|---|---|---|
| Novo Nordisk's and Eli Lilly's obesity drugs face limited competitive risks. | Competitive obesity drugs will likely begin to launch in 2026. | Page: 3<br>Exhibit: 3 |
| The obesity driven GLP-1 market is very large, but complex to quantify. | We quantify key assumptions to support a $200 billion annual market. | Page: 4<br>Exhibit: 4 |
| Obesity drug penetration will be high. | Relative to other blockbuster markets like atopic dermatitis, asthma and psoriasis, we expect obesity drugs to post higher market penetration. | Page: 5<br>Exhibit: 5 |
| Obesity drug pricing will remain fairly strong. | Pricing will likely fall in the near term to gain expanded payor access, and price declines will accelerate to over 10% annually by 2027 as more competition enters the market. | Page: 5<br>Exhibit: 6 |
| Secondary indications beyond obesity will drive significant sales. | The high overlap between obesity and other cardiovascular disease will largely just help market penetration into obesity. | Page: 6<br>Exhibit: 7 |
| Eli Lilly and Novo Nordisk look undervalued. | Eli Lilly and Novo Nordisk look overvalued, with high market share retention and stable pricing needed to support current price and undervalued calls. | Page: 7<br>Exhibit: 8 |
| The next wave of obesity drugs is building, but too far away to value. | The next wave of drugs is poised to launch in the 2026-2029 timeframe and could improve on current mechanisms of action and bring novel targets. | Page: 7<br>Exhibit: 9 |
| The efficacy of Eli Lilly and Novo Nordisk obesity drugs sets a high bar. | The next wave of obesity drugs is surpassing Eli Lilly and Novo Nordisk drugs, likely on efficacy, convenience, and tolerability. | Pages: 8-10<br>Exhibit: 10-11 |
| The market recognizes new strategies are emerging to treat obesity. | We highlight the major evolutions of obesity drug treatment strategies. | Page: 11<br>Exhibit: 12 |
| Investments are increasing into earlier stage obesity drugs. | We highlight the key buyers and sellers in the public and private markets. | Pages: 14-20<br>Exhibits: 21-23 |

Source: Morningstar.

One the most dynamic parts of this market is the next wave of obesity drugs in the pipeline, with potential launches from new challengers potentially starting in 2026 with Boehringer Ingelheim and

1 Mayo clinic.

Zealand's survodutide. Several launches in 2027 (Amgen, Altimmune), 2028 (Pfizer, Roche, Viking, and Structure), and 2029 (Roche, Viking, AstraZeneca, and Zealand) stand out to us as potentially competitive with Novo Nordisk and Eli Lilly. That said, Novo and Lilly are also advancing their next-generation pipelines, beginning with Novo's cagrisema and Lilly's orforglipron in 2026.

**Exhibit 3** Potential Launch Timeline for New GLP-1 Therapies and Combinations: Competition to Novo and Lilly Begins in 2026

| | | Approved | 2025E | 2026E | 2027E | 2028E | 2029E+ |
|---|---|---|---|---|---|---|---|
| GLP-1 | injectables | Wegovy (2021) | | | | | |
| | orals | | Rybelsus | orforglipron | | danuglipron<br>GSBR-1290 | CT-996<br>AZD5004 |
| +GIP | injectables | Zepbound (2023) | | | maritide | CT-388<br>VK2735 | |
| | orals | | | | | | VK2735 |
| +amylin | injectables | | | cagrisema | | | petrelintide<br>amycretin |
| | orals | | | | | | amycretin |
| +glucagon (injectable) | | | | survodutide | pemvidutide<br>retatrutide* | | |
| +CB1 (oral) | | | | | | | monlunabant |
| +activin/myostatin (injectable) | | | | | | bimagrumab | |

Source: Morningstar, company reports. *triple GLP-1/GIP/glucagon.

### $200 Billion GLP-1 Market Size to Attract New Entrants

We estimate the GLP-1 drug market to reach annual sales of more than $200 billion and highlight the key assumptions behind the $200 billion annual market (Exhibit 4).

**Exhibit 4** GLP-1 Drug Market Projections With Key Assumptions

| | 2023 | 2028E | 2031E | 2031 Market Assumptions<br>Patients Treated with GLP-1 |
|---|---|---|---|---|
| US Diabetes Patients (mil) | 5.2 | 13 | 16.7 | 41% |
| US Obesity Patients* (mil) | 0.9 | 11.2 | 21.1 | 23% |
| US Overweight Patients** (mil) | 0.2 | 3 | 4.8 | 13% |
| **US Total GLP-1 Patients (mil)** | **6.3** | **27.2** | **42.6** | |
| **Percentage of US Adults** | **2%** | **10%** | **16%** | |
| International Diabetes Patients (mil) | 12.2 | 41.6 | 57.6 | 19% |
| International Obesity Patients* (mil) | 0.4 | 8.3 | 23.9 | 7% |
| International Overweight Patients** (mil) | 0.1 | 4.3 | 10.6 | 1% |
| **International Total GLP-1 Patients** | **12.7** | **54.2** | **92.1** | |
| **Percentage of Intl Adults** | **0%** | **1%** | **2%** | |

| Price (USD) | 2023 | 2028E | 2031E | Insured Versus Out-of-Pocket Pricing |
|---|---|---|---|---|
| US Diabetes | 3,739 | 2,817 | 2,415 | Primarily net insured price |
| US Obesity | 7,107 | 4,253 | 2,921 | Weighted average of insured/out-of-pocket price |
| International Diabetes | 749 | 579 | 497 | Primarily net insured price |
| International Obesity | 3,300 | 2,553 | 2,189 | Mostly out-of-pocket |

| | 2023 | 2028E | 2031E | Novo Nordisk/Eli Lilly Combined Market Share |
|---|---|---|---|---|
| **Total Market (USD Bil)** | **36** | **150** | **217** | **67% (2031E)** |

Source: Morningstar, company reports. *Non-diabetic. **Includes overweight patients treated for cardiovascular risk and kidney disease.

### Solid Market Penetration and Strong, but Weakening, Pricing Support the Large Obesity Market

Two key assumptions drive our outlook: 1) market penetration rates, and 2) obesity drug pricing. On US market penetration, we project 41% of diabetics and close to one quarter of nondiabetic obesity patients will be on a GLP-1 drug by 2031 based on the strong efficacy of the drugs and likely robust insurance coverage. As shown in Exhibit 5, our assumed 2031 GLP-1 penetration rates are ahead of advanced drug penetration in psoriasis and atopic dermatitis, but the high media coverage of the GLP-1 class likely means higher market share gains. Internationally, we project much lower market penetration rates in obesity (especially outside of developed markets) due to lack of robust insurance coverage causing pricing to remain too high for most patients to utilize the drugs.

**Exhibit 5** Market Penetration by Major Diseases Relative to Projected GLP-1 Market Penetration

| | 2022 Market Data (US/EU5) | | | | 2031E (US) | |
|---|---|---|---|---|---|---|
| | Atopic Dermatitis | Asthma | Psoriasis | Rheumatoid Arthritis | GLP-1 Obesity | GLP-1 Diabetes |
| Treated with advanced therapy | 9% | 17% | 23% | 41% | 23% | 41% |
| Years with advanced therapy on the market | 7 | 21 | 17 | 26 | 10 | 21 |

Source: Morningstar, Sanofi, CDC, company reports.
Note: Markets are US, EU5 (France, Germany, UK, Spain, Italy) except GLP-1 obesity and diabetes, which are US.
Note: Wegovy's 2021 approval is used for the 10-year marker for obesity and Victoza's 2010 approval is used for diabetes.

### Obesity Drug Pricing in the US Will Likely Fall Faster Over the Next Decade

Over the next two years, we expect Novo and Lilly to concede price declines to expand insurance coverage over larger patient groups. By 2027 and beyond, we expect new entrants to cause the annual pricing declines to accelerate toward 10%-15% as competitors work to gain insurance coverage. While the current GLP-1s haven't faced as steep pricing declines as other diabetes medicines such as DPP-4s and SGLT-2s, recent pricing declines have accelerated, as we believe Novo and Lilly increased pricing competition when both firms launched a weekly GLP-1 drug. We expect the pricing pressure to accelerate as new GLP-1s reach the market with similar efficacy, as seen with the cardiometabolic drug class of DPP-4s and SGLT-2s (Exhibit 6). Additionally, we expect forced Medicare price negotiations for Wegovy (as part of the Inflation Reduction Act) to also pressure GLP-1 pricing starting in 2027.

**Exhibit 6** Historical and Projected Pricing Dynamics in Cardiometabolic Drugs

| Cardiometabolic Drug Class | DPP-4s | SGLT-2s | GLP-1s: 2010-2026E | GLP-1s: 2027E-2031E |
|---|---|---|---|---|
| Variable Response Rate/Dosing | No: largely similar | No: largely similar | Yes: Novo and Lilly GLP-1 drugs offered better cardiovascular outcomes and easier weekly dosing. | No: Likely interchangeability in Obesity |
| More than two companies | Yes: 4 key competitors | Yes: More than 5 key competitors | No: Largely only Novo and Lilly | Yes: Likely to have more than 5 key competitors |
| Estimated peak annual price declines | >10% | >10% | Slight pricing gains initially, followed by moderate pricing declines | **>10% in US Obesity Market** |

Source: Morningstar, Health Affairs, and company reports.
Note: DPP-4s (Dipeptidyl peptidase-4 ) include Januvia, Onglyza, Tradjenta and others. SGLT-2s (sodium glucose cotransporter 2) include Farxiga, Jardiance, Invokana, and others.

### New GLP-1 Indications Should Primarily Support Market Penetration Into Obesity

The most important market for GLP-1 drugs is obesity due the large prevalence rate and limited prescription options. However, additional indications in obesity-related diseases should help with obesity market penetration and insurance coverage. As shown in Exhibit 7, obese patients significantly outnumber other obesity-related indications. Further, the overlap is very high in obesity-related indications and obesity. As a result, we expect new obesity-related indications to largely help with market penetration within the obesity market and to a lesser extent into the overweight market.

**Exhibit 7** Overlap of Obesity Patients and Obesity-Related Indications

| Disease | Sales Opportunity | US Patients (millions) | Also Have Obesity | Other Prescription Options | GLP-1 Status |
|---|---|---|---|---|---|
| Obesity | **Major** | 115 | 100% | Few | Approvals for Novo's Saxenda (2014) and Wegovy (2021) and Eli Lilly's Zepbound (2023). |
| Type 2 Diabetes | **Major** | 35 | 60% | Many | Many GLP-1 approvals, first was exenatide in 2005. |
| MASH | Minor | 13 | 85% | Few | Boehringer's survodutide and Lilly's Zepbound posted positive Phase 2 data in MASH in 2024. |
| Heart Failure | Minor | 7 | 50% | Several | Novo's semaglutide saw a 41% reduced risk of worsening HF in post-hoc analysis (2026E approval), while Lilly's trial showed a 38% reduction in HF outcomes (2025E approval). |
| Atherosclerotic Disease | Minor | 21 | 48% | Many | Novo's Ozempic and Lilly's Trulicity have shown 26% and 12% reduction in cardiovascular events for diabetics, respectively. Novo's Wegovy showed 20% reduction in similar events in obesity. |
| Chronic Kidney Disease | Moderate | 17 | 41% | Several | Novo's Wegovy reduced adverse kidney disease events by 22%, likely approval in early 2025. |

Source: Morningstar, Novo Nordisk Capital Markets Day 2024.

### Valuation Outlook for Obesity Drug Leaders Novo and Eli Lilly

We view Novo Nordisk and Eli Lilly as overvalued with the market likely projecting too much market penetration for obesity drugs or expecting obesity drug pricing to remain stable. In Exhibit 8, we highlight the unlikely scenarios needed to support the current valuations of Novo and Lilly as well as the very unlikely outcome that the stocks are currently undervalued. While Novo and Lilly have many drugs currently marketed and in the pipeline, we have isolated the scenarios to the obesity market as we believe that is the largest factor that can influence the firms' valuations.

To support the current valuations of Eli Lilly and Novo Nordisk, US GLP-1 market penetration into obesity would need to reach close to 75% with international obesity market penetration reaching close to 25% with only low-single-digit pricing declines. These high penetration rates with more moderate pricing declines seem very unlikely. Further, for the scenario to support the stocks as undervalued, Lilly and Novo would also have to retain close to 95% of the market by 2031, which seems highly unlikely given the increasing competitive pressures.

**Exhibit 8** 2031 Valuation Scenarios for Eli Lilly and Novo Nordisk

| Scenario | Most Likely Outcome<br>Base Case | Potential Bullish Outcome<br>Increased Market Penetration<br>Less Pricing Pressure | Unlikely Bullish Outcome<br>Increased Market Penetration<br>Stable Pricing<br>Increased Market Share |
|---|---|---|---|
| U.S. GLP-1 Obesity Market Penetration | 25% | 60% | 60% |
| International GLP-1 Obesity Market Penetration | 7% | 25% | 25% |
| Obesity Drug Annual Pricing Change 2024-2031 | Low-Double Digit Declines | Mid-Single Digit Declines | Stable |
| Novo Nordisk and Lilly Combined Market Share | Close to 70% | Close to 70% | 85% |
| **Valuation of Novo Nordisk and Lilly** | **Overvalued** | **Fairly Valued** | **Undervalued** |

Source: Morningstar, company reports. Note: Assumes largely successful transitions to next-generation obesity drugs for Novo and Lilly as well as some moderate mix shift to Lilly from Novo by 2031.

## New Drugs to Challenge Novo Nordisk's and Eli Lilly's Obesity Drug Leadership

Novo Nordisk and Eli Lilly have set the bar for efficacy and side effect profiles with obesity drugs Wegovy and Zepbound, but we expect the next generation of drugs will likely reach or exceed these drug profiles and potentially increase the convenience of dosing through oral dosing or monthly injection dosing. In Exhibit 9, we highlight the most important obesity drugs and drug candidates.

**Exhibit 9** Comparing Obesity Incumbents to Challengers: Key Potential Differentiators

| | | Mechanism of Action | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Firm | Drug | GLP-1 | GIP | Glucagon | Amylin | CB1 | Completed Phase | Oral? | Small Molecule? | Efficacy | Tolerability |
| **Incumbents: Approved** | | | | | | | | | | | |
| Novo Nordisk | Wegovy | ✓ | | | | | 3 | No | No | Lagging | Solid |
| Eli Lilly | Zepbound | ✓ | ✓ | | | | 3 | No | No | Solid | Solid |
| **Incumbents: Next Generation** | | | | | | | | | | | |
| Novo Nordisk | Rybelsus 50 mg | ✓ | | | | | 3 | Yes | No | Lagging | Solid |
| Novo Nordisk | cagrisema | ✓ | | | ✓ | | 1b | No | No | Leading | Solid |
| Novo Nordisk | oral amycretin | ✓ | | | ✓ | | 1 | Yes | No | Leading^ | Solid^ |
| Novo Nordisk | monlunabant | | | | | ✓ | 1 | Yes | Yes | Leading^ | Leading^ |
| Eli Lilly | retatrutide | ✓ | ✓ | ✓ | | | 2 | No | No | Leading | Lagging |
| Eli Lilly | orforglipron | ✓ | | | | | 2 | Yes | Yes | Lagging | Lagging |
| Eli Lilly | mazdutide | ✓ | | ✓ | | | 3 | No | No | Lagging | Solid |
| **Challengers** | | | | | | | | | | | |
| Viking | VK2735 | ✓ | ✓ | | | | 2 | Both* | No | Leading | Lagging |
| Boehringer Ingelheim/Zealand | survodutide | ✓ | | ✓ | | | 2 | No | No | Lagging | Lagging |
| Structure Therapeutics | GSBR-1290 | ✓ | | | | | 2 | Yes | Yes | Solid | Solid |
| Altimmune | pemvidutide | ✓ | | ✓ | | | 2 | No | No | Lagging | Lagging |
| Pfizer | danuglipron^^ | ✓ | | | | | 2b | Yes | Yes | Lagging | Lagging |
| Roche (Carmot) | CT-388 | ✓ | ✓ | | | | 1 | No | No | Leading | Solid^ |
| Roche (Carmot) | CT-996 | ✓ | | | | | 1 | Yes | Yes | Leading | Solid^ |
| Amgen | maritide** | ✓ | ✓ | | | | 1 | No | No | Leading | Lagging |
| Zealand | petrelintide | | | | ✓ | | 1 | No | No | Solid | Leading |

Source: Morningstar, company reports. Phase 3 data from Step 1 (Wegovy), Surmount 1 (Zepbound), and Oasis 1 (Rybelsus). *Data for VK2735 is for injectable version (oral data only available for four weeks in phase 1). **maritide is a GIP antagonist, other GIP-targeting drugs are agonists. ^Minimal published data to support drug's potential profile. ^^ Danuglipron data is for twice-daily dosing; new program is once-daily dosing.

## Obesity Drug Candidates Can Differentiate on Efficacy, Convenience, Supply, and Tolerability

We see several ways that new firms can differentiate from incumbents Novo Nordisk and Eli Lilly. We expect efficacy (speed, duration, and quality of weight loss), gastrointestinal tolerability, injectable versus oral dosing, and availability of supply will all be key determinants of differentiation. There is no head-to-head data available for these drugs, although Lilly will have Zepbound and Wegovy head-to-head data later this year. Obesity trials enroll different populations and have different rules for how patients are introduced to effective dose levels, which affects both speed of efficacy and tolerability. This limits our ability to compare trial data, although we think there is sufficient data to sort drugs based on available data.

### Some Drug Candidates Could Have Convenience and Supply Advantages

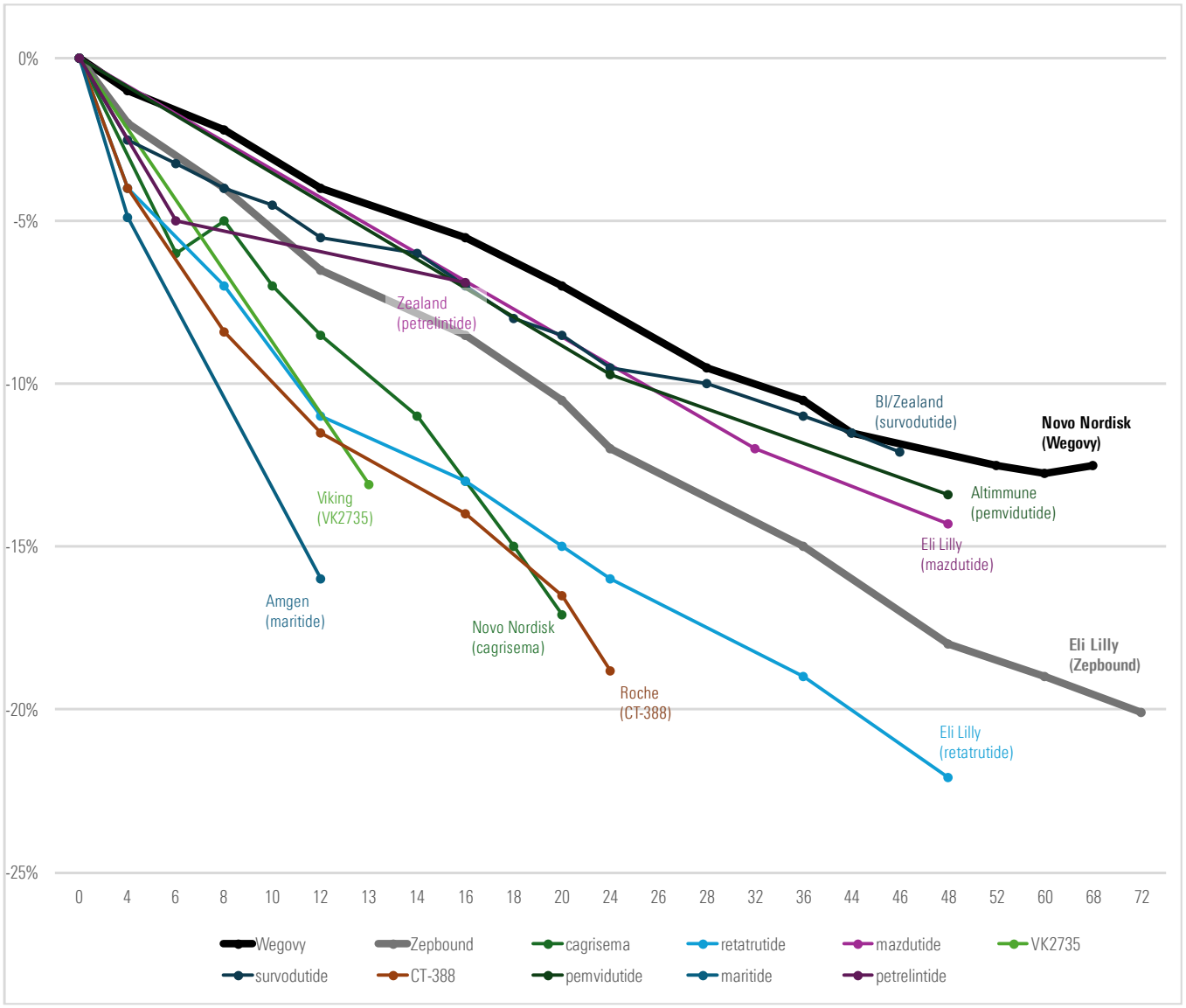
Novo Nordisk and Eli Lilly are struggling to provide enough supply of their peptide-based drugs, which require complex manufacturing and face limitations in global infrastructure for such drugs. We think oral versions of peptides, including high-dose Rybelsus and Viking's VK2735, could be even harder to supply, as dosages need to be even higher to reach therapeutic levels when digested (although the fill/finish process would be simplified). We think Amgen's injectable maritide could be slightly easier to scale, particularly if dosing can be extended to monthly or even quarterly (instead of weekly Wegovy and Zepbound injections). By far the easiest to scale would be oral small molecule drugs, such as Lilly's orforglipron, Novo Nordisk's monlunabant, Pfizer's danuglipron, Roche's CT-996, and Structure's GSBR-1290. For example, Structure management noted in a June 2024 presentation that its current manufacturing capacity could supply more than 120 million patients, far surpassing what we estimate as the roughly 20 million patients (diabetes and obesity) who drove the $36 billion in GLP-1 global sales in 2023.

### Injectable Efficacy: Amgen, Viking, and Roche Could Challenge Incumbents on Efficacy

Several controlled trials and real-world data point to the conclusion that Lilly's Zepbound has stronger efficacy than Novo's Wegovy. That said, we think Wegovy's longer time on the market, head start with label expansions, and Novo's solid pipeline will continue to keep the playing field relatively level between these firms.

Looking beyond Wegovy and Zepbound at injectable drug candidates, we see a split in efficacy between those that look more similar to Wegovy and those that could even surpass Zepbound's efficacy. For example, GLP-1 and glucagon-targeting drug candidates survodutide (Boehringer Ingelheim/Zealand), pemvidutide (Altimmune), and mazdutide (Lilly and Innovent) all appear to have efficacy closer to Wegovy than Zepbound. With launches unlikely prior to 2026, we don't have high expectations for sales of these therapies, as entrenchment of Novo and Lilly will only increase over this time. Zealand's amylin drug petrelintide has shown encouraging early data and still has a chance at differentiation, particularly if tolerability stays strong. We see stronger potential for Novo's GLP-1/amylin cagrisema, Roche's GLP-1/GIP CT-388, and Lilly's triple agonist retatrutide, although tolerability issues and potential cardiovascular side effects could hold back retatrutide. Other GLP-1/GIP targeting drug candidates from Viking and Amgen have also generated promising data, although data released so far is shorter term.

**Exhibit 10** Placebo-Adjusted Percentage Weight Loss Over Time: Wegovy and Zepbound Versus Injectable Obesity Drug Candidates (weeks)

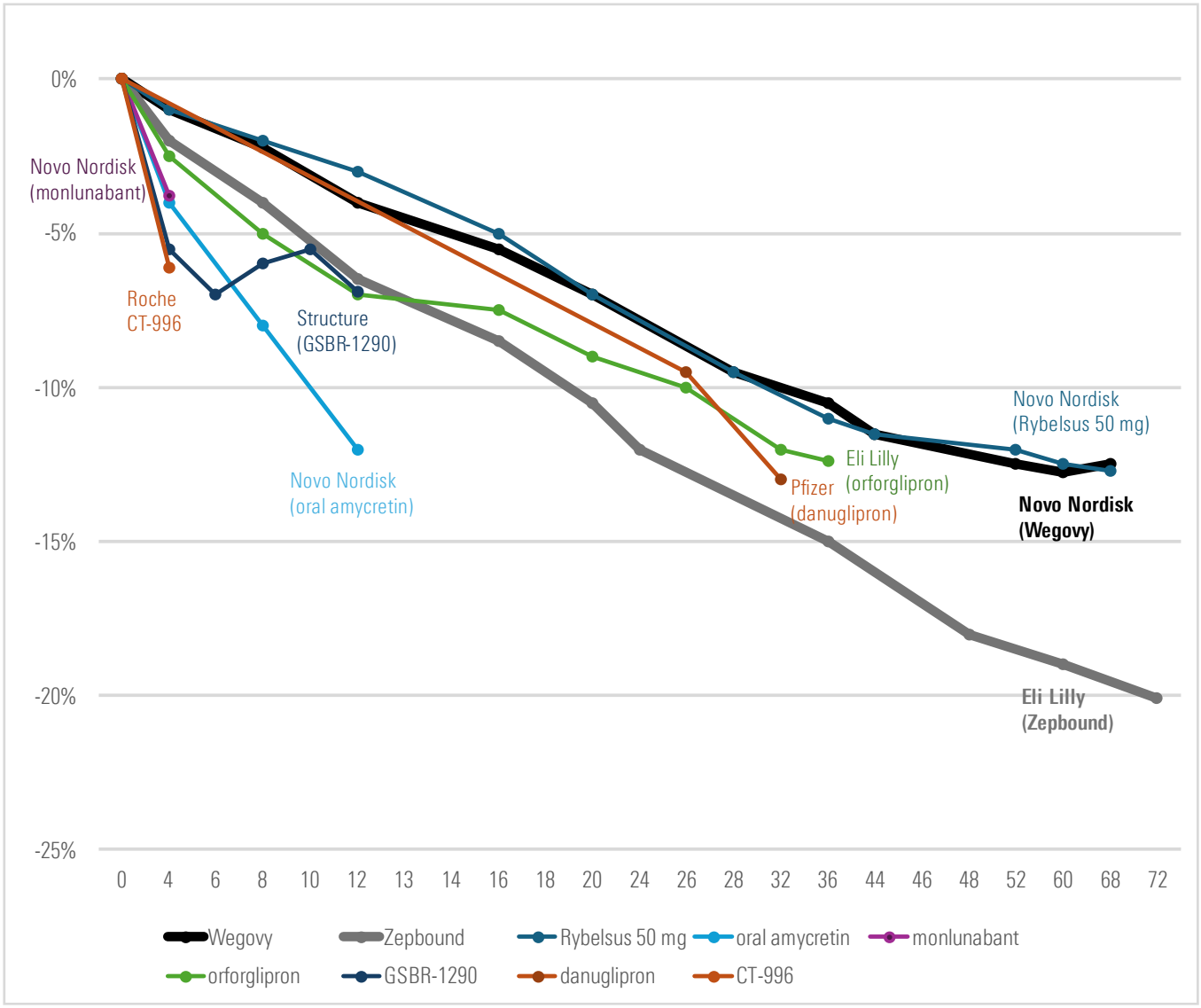



Source: Morningstar, company reports, Lancet, New England Journal of Medicine. Data varies slightly depending on whether data is reported based on intent to treat (treatment regimen estimand all randomized patients in trial) or per protocol (efficacy estimand, only those following treatment schedule). Novo Nordisk (Wegovy, cagrisema) and Viking (VK2735) efficacy data is intent to treat, so appears slightly less effective. Exact reporting methods vary and not all trials are published with disclosed protocols.

**Oral Efficacy: Structure Could Compete With Novo's Next-Generation Drug Candidates**

Among oral drug candidates, we think high-dose Rybelsus could be the first to launch, but supply issues could end up delaying the launch further. We think orforglipron stands a better chance at generating stronger efficacy than injectable Wegovy, given the long-term data generated in phase 2. In addition, if Pfizer's once-daily danuglipron can generate similar efficacy as the twice-daily program, its prospects look similar to orforglipron's. That said, Novo's CB1 monlunabant and a next-generation GLP-1/amylin drug (amycretin) as well as Structure's GSBR-1290 all have the potential to generate data that surpasses Zepbound, although data so far is relatively short term.

**Exhibit 11** Placebo-Adjusted Percentage Weight Loss Over Time: Wegovy and Zepbound Versus Oral Obesity Drug Candidates (weeks)




Source: Morningstar, company reports, Lancet, New England Journal of Medicine. Data varies slightly depending on whether data is reported based on intent to treat (treatment regimen estimand, all randomized patients in trial) or per protocol (efficacy estimand, only those following treatment schedule). Novo Nordisk (Wegovy, Rybelsus) efficacy data is intent to treat, so appears slightly less effective. Exact reporting methods vary and not all trials are published with disclosed protocols. Danuglipron data is phase 2b study of discontinued twice-daily dose (ongoing as once-daily program).

### Quality of Weight Loss: Fat Mass Loss Is Better Than Lean Mass Loss

Quality of weight loss is increasingly in focus, as 40% of weight loss for Wegovy patients in Step 1 was lean mass, and roughly 25% of weight loss for Zepbound patients in Surmount-1 was lean mass. Natural weight loss (with diet and exercise alone) is typically roughly 20% lean mass (when total weight loss is roughly 10%),[2] and we expect new targets and combinations could help reduce the loss of lean mass.

In fact, among the several strategies in obesity clinical development, a combination strategy with myostatin/activin-targeting therapies is being pursued by multiple firms (Exhibit 12).

**Exhibit 12** Strategies to Build Differentiation Beyond Wegovy

| Strategy | Rationale | Example Firms (Drug Candidate) |
|---|---|---|
| GLP-1 small molecule | Me-too efficacy but much simpler manufacturing, convenience of oral | Lilly (orforglipron), Structure (GSBR-1290)<br>AstraZeneca (ECC5004), Terns (TERN-601)<br>Pfizer (danuglipron), Roche (CT-996) |
| GIP combos | Incretin that adds to GLP-1 efficacy without increasing tolerability issues | Lilly (Zepbound), Viking (VK2735), Roche (CT-388),<br>Amgen (maritide) |
| Lean Mass Preservation (myostatin/activin) | Could combine with GLP-1 therapies to reduce weight loss from muscle | Public:<br>Lilly (bimagrumab), Roche (RO7204239), Regeneron (trevogrumab, garetosmab), Keros Therapeutics (KER-065), Scholar Rock (apitegromab), Biohaven (taldefgrobep)<br>Private:<br>SixPeaks<br>35Pharma (HS-235) |
| Gene Therapy | Could remove need for chronic therapy | Fractyl Health<br>(to clinical trial in 2025) |
| Me-Too GLP-1 | Expand supply in various geographies | Public:<br>Hanmi (Korea, efpeglenatide)<br>Jiangsu HengRui (China, noiiglutide)<br>Private:<br>Sciwind (China, ecnoglutide) |
| Amylin Targeting | Another mechanism to increase satiety, either with GLP-1 or as monotherapy | Novo (cagrisema, amycretin)<br>Zealand (petrelintide)<br>Lilly (eloralintide)<br>Structure (entering phase 1) |
| CB1 | Peripheral CB1 targeting drugs aim to avoid depression side effect of Sanofi's rimonabant | Novo (monlunabant)<br>Skye (nimacimab)<br>Corbus (CRB-913-CB1)<br>Agenix (AGTX-2004) |
| NLRP3 | Blocking "inflammasome" activation in obese patients could lead to weight loss | Public:<br>Ventyx (VT3232)<br>Private:<br>Nodthera (NT-0249,0976)<br>Ventus (VENT-02) |
| Glucagon | Another incretin that could be used in combo, this time increasing energy expenditure | Lilly (retatrutide, mazdutide)<br>Altimmune (pemvidutide)<br>BI/Zealand (survodutide) |

Source: Morningstar, company reports. Maritide is a GIP antagonist, while other GIP-target drugs are agonists.

2 Turicchi, Jake et al. Associations between the rate, amount, and composition of weight loss as predictors of spontaneous weight regain in adults achieving clinically significant weight loss: A systematic review and meta-regression. Obesity Reviews, 20 (7). pp. 935-946. ISSN 1467-7881.

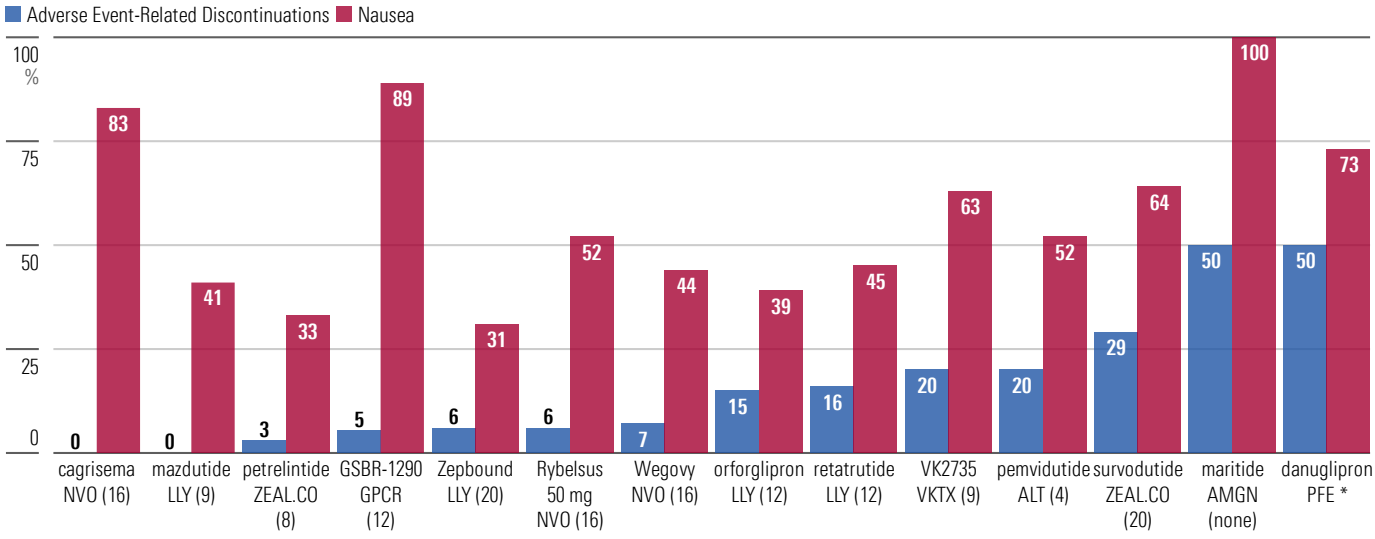
In addition, Altimmune's GLP-1/glucagon-targeting therapy pemvidutide yielded 22% lean mass loss in phase 2, showing a potential slight improvement to standard of care. Pipeline candidates that avoid GLP-1 altogether, such as Zealand's amylin drug petrelintide, could also see less lean mass loss, although this lean mass data is preclinical and the drug is just entering phase 2.

**Tolerability Looks Promising for Several New Drugs; Better Dosing Could Improve Data**

Aside from efficacy, convenience, and supply, we think tolerability remains a key potential differentiator for new obesity medicines. Exhibit 13 sorts data on one measure of tolerability: discontinuations due to adverse events. A longer dose escalation period (in weeks in parentheses) should result in better tolerability. We think phase 1 data from Zealand's amylin targeting petrelintide, phase 2 data for Structure's oral GLP-1 GSBR-1290, and phase 1b data for Novo Nordisk's GLP-1/amylin injectable cagrisema bode well for solid or perhaps leading tolerability, if phase 3 data also supports this profile. We also think there is room for improved tolerability for several pipeline candidates, particularly Lilly's oral GLP-1 orforglipron and Amgen's maritide, with slower dose escalation to avoid nausea (maritide patients at the highest dose in the phase 1 study were not titrated at all). We have excluded Roche's CT-388 and Novo's monlunabant and oral amycretin from this analysis, as we don't have sufficient details to compare their tolerability.

**Exhibit 13** Obesity Drugs Sorted by Adverse Event-Related Discontinuation Rates at Key Efficacy Dose

Dose escalation in weeks in parentheses




Source: Morningstar, company reports, Lancet, New England Journal of Medicine. NVO: Novo Nordisk. LLY: Eli Lilly. GPCR: Structure Therapeutics. VKTX: Viking Therapeutics. ALT: Altimmune. ZEAL.CO: Zealand Pharma. AMGN: Amgen. PFE: Pfizer. *weekly, biweekly, and monthly titration at various doses, discontinuation rate at least 50% in all arms.

**Upcoming Catalysts Will Mean a Dynamic Market for Obesity Firms**

Aiming to differentiate on all these measures, several firms will be reporting key data in the near term that could position them to compete with incumbents Lilly and Novo, as shown in Exhibit 14. Novo and Lilly also expect next-generation data for their obesity pipelines.

**Exhibit 14** Upcoming Catalysts for Incumbents and Potential New, Differentiated Obesity Drugs

| Firm | Drug | Status | Next Data | Notes |
|---|---|---|---|---|
| **Incumbents: Approved** | | | | |
| Eli Lilly | Zepbound | Approved | H2H v Wegovy (2024) | Zepbound has strong data in sleep apnea and is likely to prove more effective than Wegovy in the head-to-head study. |
| Novo Nordisk | Wegovy | Approved | High Dose (Q4 2024)<br>MASH (2024)<br>Alzheimer's (2025) | Higher dose could improve Wegovy's efficacy, but at risk of more tolerability issues. |
| **Incumbents: Next Generation** | | | | |
| Eli Lilly | retatrutide | Phase 3 | 2026 | Lilly is aiming for leading efficacy and includes patients with sleep apnea and knee osteoarthritis. |
| Eli Lilly | orforglipron | Phase 3 | 2025 | Lilly is aiming for similar efficacy to Zepbound, oral convenience. |
| Eli Lilly | bimagrumab | Phase 2 | H2 2024 | Data for this activin type II blocker (activin/myostatin) with semaglutide could lead to Zepbound combo to reduce muscle loss. |
| Eli Lilly | eloralintide | Phase 2 | 2025 | Lilly has moved its own amylin targeting molecule to phase 2, perhaps as an option to defend against cagrisema competition. |
| Eli Lilly/Innovent | mazdutide | Phase 3 | Higher 9mg dose (2025) | Innovent's phase 3 has a high bar to surpass Zepbound and advance in Lilly pipeline. |
| Novo Nordisk | Rybelsus 50 mg | Filing | EU Launch (2025) | Oral semaglutide requires more manufacturing capacity, could lead to further delays. |
| Novo Nordisk | cagrisema | Phase 3 | First Ph 3 studies (Q4 2024)<br>H2H v Zepbound (2025) | Aiming for leading efficacy with potential for better tolerability and less lean mass loss than Wegovy. |
| Novo Nordisk | oral amycretin | Phase 1 | Subcu (2025) | Despite solid early oral data, Novo could move forward with subcu to conserve supply. |
| Novo Nordisk | monlunabant | Phase 2 | Q3 2024 | Could have better tolerability and less muscle loss than GLP-1, and perhipheral action could prevent psychiatric side effects. |
| **Challengers** | | | | |
| Altimmune | pemvidutide | Phase 3 | Trial start (2024) | Encouraging phase 2 muscle loss and CV data could differentiate, and better titration in phase 3 could improve tolerability. |
| Amgen | maritide | Phase 3 | Phase 2 data (2024) | Amgen is entering phase 3 after an encouraging look at phase 2 data, although details are still coming. |
| AstraZeneca | AZD5004 | Phase 2b | Trial start (H2 2024) | Phase 1 data should be revealed as this oral GLP-1 moves to mid-stage development. Could focus on lower BMI (overweight). |
| AstraZeneca | AZD9550<br>AZD6234 | Phase 1 | Phase 1 data (2024) | GLP-1/glucagon and amylin programs round out Astra's obesity pipeline and add potential for combination regimens. |
| Boehringer Ingelheim/Zealand | survodutide | Phase 3 | Phase 3 data (Late 2025) | Late 2025 Phase 3 data at higher dose with longer dose titration to minimize side effects |
| Pfizer | danuglipron | Phase 1 | Dose optimization data (Q1 2025) | Once daily optimization is taking place ahead of pivotal trials for this GLP-1, which saw tolerability setbacks at twice daily dose. |
| Roche | CT-388 | Phase 2 | T2D Phase 1b data (2024) | Roche is testing multiple doses/titration in a new phase 2 study to differentiate from Zepbound, hoping to start phase 3 in 2025. |
| Roche | CT-996 | Phase 2 | Phase 2 start (2025) | After positive 4-week data in phase 1, additional phase 1 arms are starting this year and phase 2 likely next year. |
| Structure Therapeutics | GSBR-1290 | Phase 2b | Tablet data (late 2025) | Structure is aiming for differentiated tolerability, oral convenience. |
| Terns | TERN-601 | Phase 1 | 2H 2024 | Inspired by the structure of Pfizer's danuglipron, Terns is developing a once-daily oral. |
| Viking | VK2735 | Phase 2 | Higher dose oral data and phase 2 start (Q4 2024)<br>Phase 3 injectable start (2025) | Viking is moving its injectable to phase 3 next year, possibly including a monthly dose option, but peptide structure is a manufacturing challenge, especially for oral version. |
| Zealand | petrelintide | Phase 2b | Trial start (2024) | Phase 1 data showed encouraging tolerability data and early efficacy data similar to Wegovy and Zepbound. |
| Zealand | dapiglutide | Phase 2b | Higher dose data (2024/2025)<br>Trial start (H1 2025) | Higher doses, longer-term data could support this GLP-1/GLP-2. |

Source: Morningstar, company reports.

### Public Markets: Large Biopharma Firms Interested in Buying Into Obesity Market

While cardiometabolic drug development was a key area of focus for the biopharma industry up until the early 2010s, most biopharma firms (except Novo and Eli Lilly) significantly reduced research and development efforts in the therapeutic area as pricing power declined and innovation stalled. The industry heavily pivoted more toward oncology, immunology, and rare disease drugs, where pricing power remained strong and innovative scientific advancements were striving.

Given the huge obesity market opportunity combined with an increased understanding of treatment, we expect large biopharma firms to accelerate development efforts into obesity drugs through acquisitions. On the public side, close to $5 billion in upfront payments for obesity drug-related acquisitions have occurred since 2023 (Exhibit 15). This is a relatively small investment into acquisitions for one of the most innovative therapeutic areas, as the industry's largest (>$20 billion) annual acquisitions alone typically total over $50 billion.[3] In addition, obesity-based collaborations in 2023 between large public firms and smaller private innovators, like AstraZeneca/Eccogene (focused on oral GLP-1 ECC5004) and Novo Nordisk/EraCal (focused on Era-379), show strong appetite among big biopharma firms for access to novel obesity drug candidates.

**Exhibit 15** Top Obesity Drug-Related VC Exits, by Exit Size, 2020-24

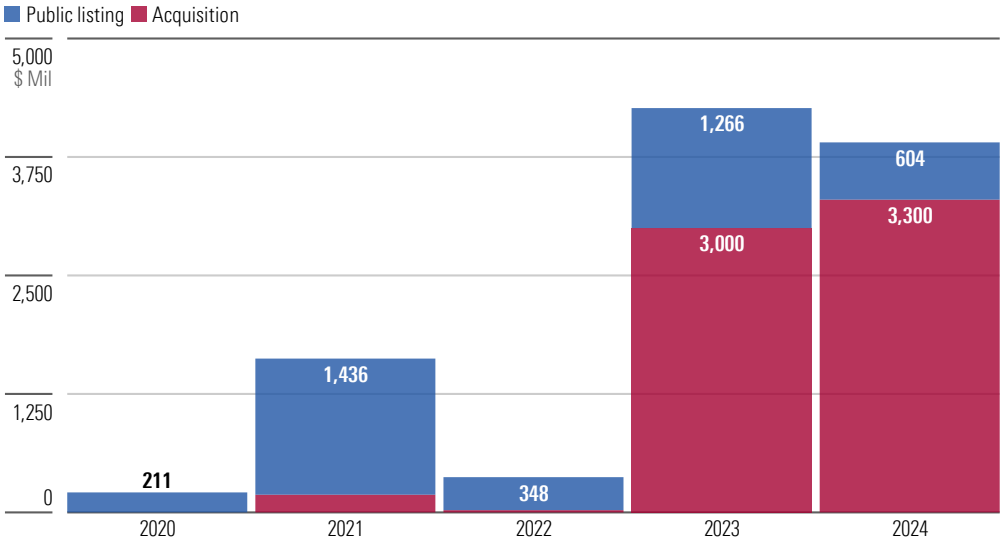
| Company name | Exit type | Acquiring Firm | Close date | Exit size ($M) |
|---|---|---|---|---|
| Carmot Therapeutics | Merger/Acquisition | Roche | January 26, 2024 | $3,300 |
| Versanis Bio | Merger/Acquisition | Eli Lilly | August 14, 2023 | $1,925 |
| Inversago Pharma | Merger/Acquisition | Novo Nordisk | September 8, 2023 | $1,075 |
| Cutia Therapeutics | IPO | N/A | June 9, 2023 | $789 |
| Epitomee Medical | IPO | N/A | December 15, 2021 | $632 |
| Fractyl Health | IPO | N/A | February 2, 2024 | $604 |
| VectivBio | IPO | N/A | April 9, 2021 | $451 |
| Structure Therapeutics | IPO | N/A | February 4, 2023 | $414 |
| Terns Pharmaceuticals | IPO | N/A | February 5, 2021 | $280 |
| Keros Therapeutics | IPO | N/A | April 8, 2020 | $211 |
| Lobesity | Merger/Acquisition | 9 Meters | July 19, 2021 | $113 |
| Doer Biologics | Merger/Acquisition | Huadong Medicine | April 27, 2021 | $75 |

Source: Morningstar, PitchBook. Data as of July 17, 2024.

On the private side, exits are increasingly focused on acquisitions, rather than IPOs (Exhibit 16), although BioAge Labs filed for an IPO in early September.

3 Morningstar Biopharma Industry Landscape, April 2024, slide 20.

**Exhibit 16** Obesity Drug Development VC Exit Value (in $ millions) by Exit Type

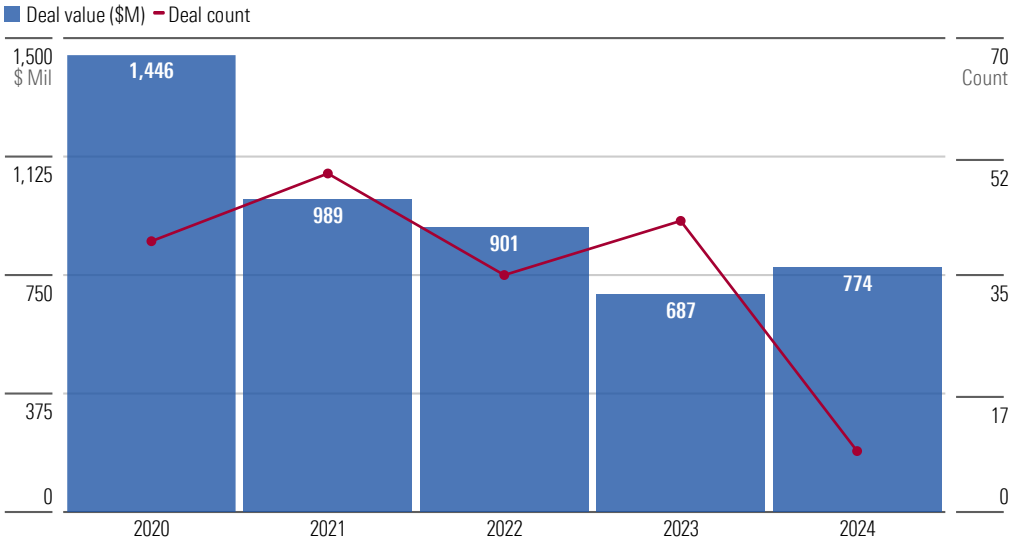



Source: PitchBook, Data as of July 17, 2024.

## Private Data Trends: Emerging Startups in the Obesity Treatment Landscape

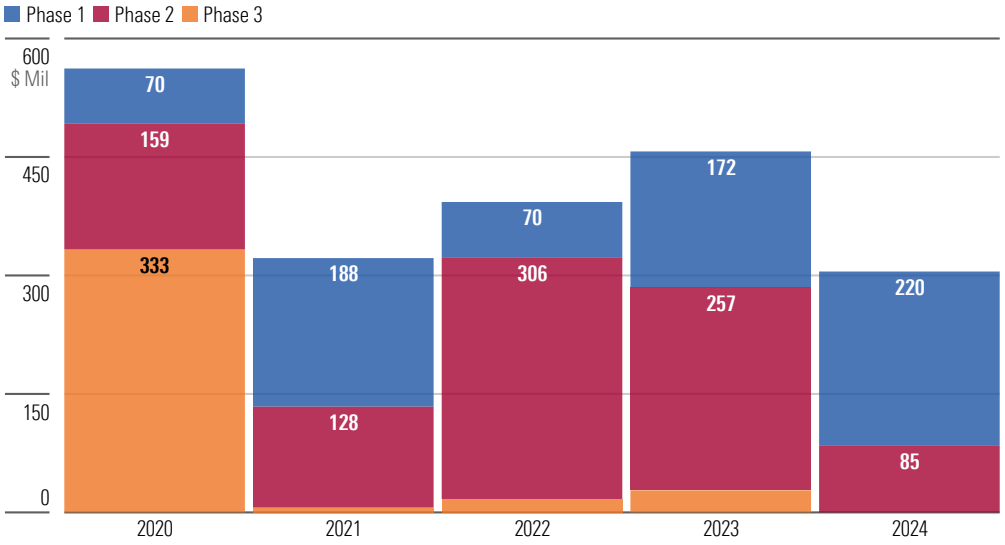
The obesity treatment sector is experiencing a surge of innovative startups, each bringing unique approaches to tackle this global health crisis. These emerging companies are attracting significant investment and exploring novel mechanisms to compete with established players like Novo Nordisk and Eli Lilly.

**Exhibit 17** Obesity Drug Development: VC Deal Activity, 2020-24



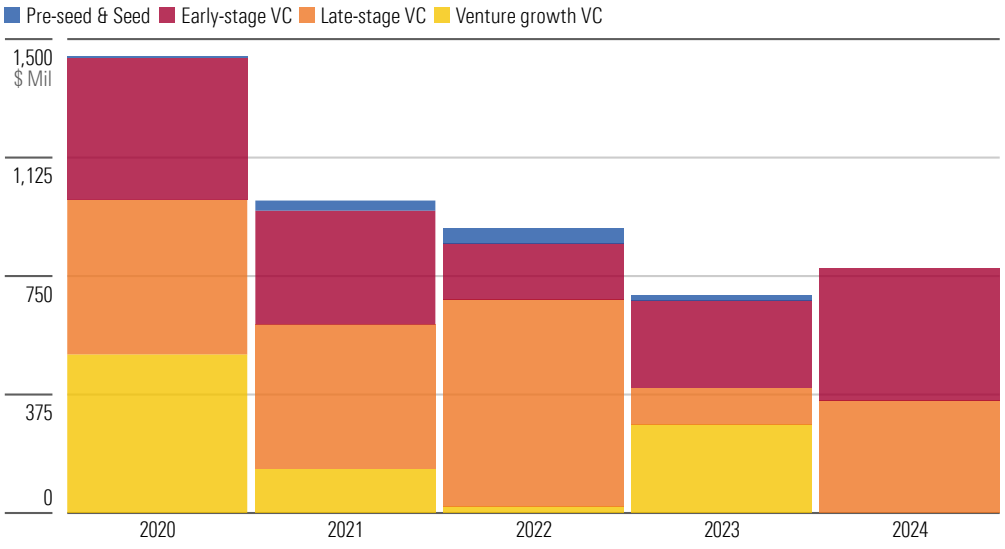

Source: PitchBook, Data as of July 17, 2024.

**Exhibit 18** Obesity Drug Development VC Deal Size (in $ millions) by Highest Phase




Source: PitchBook, Data as of July 17, 2024. * Determined as the highest phase of a trial that started prior to the round closing. * Combines in-between phases with the highest phase.

**Exhibit 19** Obesity Drug Development VC Deal Value (in $ millions) by stage




Source: PitchBook, Data as of July 17, 2024.

Metsera, backed by $290 million from Arch Venture Partners and Population Health Partners, is developing a portfolio of oral and injectable weight loss drugs targeting multiple gut hormones. Similarly, Hercules CM NewCo, a $400 million venture supported by Bain Capital, RTW Investments, and Atlas Venture, has licensed a portfolio of incretin drugs from Chinese pharmaceutical company Jiangsu Hengrui. SixPeaks Bio, incubated by Versant Ventures with $30 million in Series A funding, is partnering with AstraZeneca to develop new approaches to obesity treatment. Additionally, Deep Apple Therapeutics focuses on small-molecule drugs for metabolic disorders, leveraging structural and computational biology to target G-protein coupled receptors (GPCRs) involved in metabolism.

OrsoBio, with a total of $97 million in funding, is advancing a diverse portfolio including mitochondrial protonophores, ACC2 inhibitors, and LXR inverse agonists for treating obesity and associated metabolic disorders.

CinRx Pharma has raised $73 million to support obesity drug development through a hub-and-spoke model. One of its ventures, CinFina, is developing four obesity drugs licensed from Johnson & Johnson, emphasizing muscle preservation alongside weight loss. CinRx continues to explore new obesity therapies and create additional biotech ventures. ProFound, in partnership with Pfizer, is exploring next-generation obesity assets using proteomics to identify new drug targets. This collaboration is part of a $50 million initiative with Flagship Pioneering, aiming to expand Pfizer's obesity drug pipeline with innovative treatments.

Many other private investments in the space are internationally based, focusing on "me-too" drugs primarily in China, Korea, and Japan. These companies are potential merger and acquisition targets for Big Pharma or startups attempting to license them in a roll-up strategy similar to Metsera or Hercules CM. Notable examples include Sciwind Biosciences, Gmax Bio, Regor Therapeutics, and Sohia Pharma, all of which are based on GLP-1 biology.

Emerging trends in the field include a focus on muscle preservation, oral alternatives to injectables, and innovative drug delivery systems. Companies like CinFina and BioAge Labs are developing molecules to help patients maintain muscle mass. Syntis Bio is developing SYNT-101, an oral daily pill that mimics the effects of gastric bypass, while Rivus Pharmaceuticals works on controlled metabolic accelerators as once-daily oral doses. i2o Therapeutics, with $46 million in Series A funding, is developing a drug-device combination licensed from Intarcia, including an implantable device called "Medici" that can deliver GLP-1 medication for up to one year. Companies are also exploring multimodal approaches to address not only weight loss but also related complications such as diabetes and cardiovascular diseases, with Rivus Pharmaceuticals aiming to treat cardiovascular conditions rather than targeting the weight loss market directly.

Lastly, the IPO market is heating up for obesity-related startups. BioAge Labs is raising $100 million, potentially serving as a bellwether for the sector and catalyzing further investment. Meanwhile, MBX Biosciences has filed for a $100 million IPO. While its lead asset targets hypoparathyroidism, MBX also has a preclinical long-acting GLP-1/GIP receptor co-agonist peptide, MBX 4291, aimed at improving obesity treatment dosage and user-friendliness. These IPOs highlight continued investor interest in metabolic disease therapies and could pave the way for more startups to access public markets.

**Exhibit 20** Top VC Deals in Obesity Since 2020 (>$75 Million)

| Company | Close date | Deal size ($M) | Deal type | Stage | Lead investor(s) |
|---|---|---|---|---|---|
| Hercules CM | May 16, 2024 | $400 | Early Stage VC | | |
| Metsera | April 3, 2024 | $350 | Early Stage VC | Series A | ARCH Venture Partners, Population Health Partners |
| Kallyope | January 27, 2022 | $236 | Later Stage VC | Series D | Mubadala Investment Company, The Column Group |
| BioAge Labs | February 1, 2024 | $194 | Later Stage VC | Series D | Sofinnova Investments |
| Ventus Therapeutics | February 9, 2022 | $140 | Later Stage VC | Series C | RA Capital Management, SoftBank Investment Advisers |
| Rivus Pharmaceuticals | August 19, 2022 | $132 | Early Stage VC | Series B | RA Capital Management |
| Kallyope | March 25, 2020 | $112 | Later Stage VC | Series C | |
| Ventus Therapeutics | April 8, 2021 | $100 | Early Stage VC | Series B | RA Capital Management |
| BioAge Labs | December 3, 2020 | $90 | Later Stage VC | Series C | Andreessen Horowitz, Elad Gil |
| Regor Therapeutics | February 18, 2021 | $90 | Early Stage VC | Series B | Lilly Asia Ventures |
| Aardvark Therapeutics | May 9, 2024 | $85 | Later Stage VC | Series C | Decheng Capital |
| OrsoBio | November 7, 2023 | $85 | Early Stage VC | Series A | Enavate Sciences, Longitude Capital |
| Neurogastrx | July 12, 2021 | $80 | Later Stage VC | Series B | |
| SixPeaks Bio | August 23, 2024 | $80 | Early Stage VC | Series A | Versant Ventures |
| GMAX Bio | March 5, 2021 | $78 | Later Stage VC | Series C | China Merchants Group |
| ProFound Therapeutics | May 26, 2022 | $75 | Early Stage VC | | |

Source: PitchBook, Data as of Sept. 1, 2024.

## Most Likely to Acquire: Incumbents Novo and Lilly, Also New Obesity Players J&J and Merck

To catch up to the underinvestment in obesity drug development, we expect several big biopharma firms to make acquisitions over the next 18 months, targeting smaller focused obesity drug development firms. In Exhibit 21, we rank the most likely large cap buyers of obesity drug development firms. We rank the companies on strategic fit and balance sheet strength to enable acquisitions.

**Exhibit 21** Ranking of Big Biopharma Firms Most Likely to Make Obesity Drug Acquisitions

| Ranking | Company | Strategic Fit | Balance Sheet Strength |
|---|---|---|---|
| 1 | Merck | **High:** Solid entrenchment in cardiometabolic but largely missed the GLP-1 innovation, which could drive acquisitions, especially with the approaching Keytruda 2028 patent loss. | **High:** With only limited recent acquisitions, Merck is poised to make a major deal. |
| 2 | Novo | **High:** A top leader in cardiometabolic and likely always looking to augment internal efforts. | **High:** Recent Catalent deal will reduce cash but major windfalls from obesity drug sales will replenish cash quickly. |
| 3 | Johnson & Johnson | **Medium/High:** Recent cardiometabolic setbacks (Xarelto, Invokana, aprocitentan) could trigger the need for external innovation. | **High:** Very strong balance sheet (even after the Shockwave acquisition) enable solid potential acquisitions. |
| 4 | Eli Lilly | **High:** Potentially the best positioned firm in cardiometabolic and willingness to buy additional related assets (such as Versanis) sets up future deals. | **Medium/High:** Very robust cashflows from obesity drugs and limited patent losses could enable major acquisitions. |
| 5 | AstraZeneca | **Medium/High:** Licensing of ECC5004 (GLP-1) and strong position of cardiometabolic drug Farxiga with future combinations shows increasing interest. | **Medium/High:** Despite Alexion acquisition, the robust cashflows set up solid potential. |
| 6 | Boehringer Inge | **High:** With a major focus in cardiometabolic drugs and with a lead drug (suvodutide) that could have side effect issues, the appetite for acquisitions is likely high. | **Medium:** Limited recent deals leaves the firm optionality |
| 7 | Roche | **Medium/High:** Recent acquisition of Carmot shows interest in GLP-1 drugs and limited pipeline suggests potential for more deals. | **Medium/High:** Limited recent deals leaves the firm optionality. |
| 8 | Daiichi Sankyo | **Medium:** While historically a area of focus for the company, cardiometabolic drugs seem less important than cancer drugs. | **High:** Recent antibody drug conjugate deals have increased cashflows opening the potential for more acquisitions. |
| 9 | Sanofi | **Medium:** The firm has pivoted to immunology, but the historical entrenchment in cardiometabolic disease could entice the firm to make an acquisition. | **High:** Limited recent deals leaves the firm optionality. |
| 10 | Novartis | **Medium:** While holding a solid portfolio of cardiometabolic drugs, the focus on cancer, immunology and rare disease makes future obesity deals less likely. | **High:** Only moderate recent deal flow opens the potential for more acquisitions. |
| 11 | Chugai | **Medium:** Royalty on Lilly's orforglipron could entice the firm to gain greater exposure to cardiometabolic drugs. | **Medium/High:** Could likely finance a mid-sized acquisition, but aversion to debt may limit larger deals. |
| 12 | Regeneron | **Low/Medium:** PCSK9 drug Praluent has been disappointing in cardiometabolic and focus is more on eye-care, immunology and cancer. | **Medium/High:** Potential to make acquisitions. |
| 13 | Amgen | **Medium/High:** The recent clinical advancement of MariTide in obesity opens a newer therapeutic area that could use more follow up drugs. | **Low:** The major acquisition of Horizon leaves the cash account more depleted. |
| 14 | GSK | **Low:** Largely moved away from cardiometabolic over the last decade. | **Medium/High:** Cash from Haleon divestment, lower dividend and only moderate sized recent acquisition allow for more deal flow. |
| 15 | Pfizer | **Medium/High:** GLP-1 drug daniglupron's delay likely elevates external deal options. | **Low:** Major acquisition of Seagen likely limits ability to make major deals. |
| 16 | Bayer | **Medium/High:** A solid entrenchment in cardiometabolic disease would be a natural fit for obesity drug development. | **Low:** Glyphosate litigation hampers ability to make large acquisitions. |
| 17 | Gilead | **Low/Medium:** Focused largely on virology and cancer, although liver disease research did bring a GLP-1 to preclinical development. | **Medium:** The large acquisition of Immunomedics and recent tuck in acquisitions make large near-term deals less likely. |
| 18 | Bristol Myers | **Low/Medium:** While Eliquis is a leader in atrial fibrillation, the firm has largely exited the cardiometabolic landscape. | **Low/Medium:** Despite the major acquisition of Celgene and recent mid-sized deals for Karuna and RayzeBio, the strong cashflows would enable acquisitions. |
| 19 | AbbVie | **Low/Medium:** While not a major competitor in cardiometabolic drugs, the strong entrenchment in the aesthetics industry could make an obesity drug a good match. | **Low/Medium:** Cash availability is lower following the large acquisition of Allergan and recent mid-sized acquisitions of ImmunoGen and Cerevel. |
| 20 | Takeda | **Low/Medium:** With a heavy immunology focus, obesity drug interest seems low. | **Low:** The major acquisition of Shire likely limits big deals. |
| 21 | Biogen | **Low:** Focused on neurology, oncology and rare diseases, not cardiometabolic. | **Low:** Recent Reata acquisitions limits major deal potential. |

Source: Morningstar, company reports.

## Acquisition Targets for Obesity Drugs Span Public and Private Markets

On the public side, we have seen several firms with strong early-stage obesity drug data. We expect these firms are ready to sell to a larger firm as late-stage development, manufacturing, and marketing will likely be too costly for smaller firms to manage independently. In Exhibit 22, we rank the most likely acquisition targets for obesity drugs.

**Exhibit 22** Potential Acquisition Targets in Obesity: The Public Market

| Rank | Target | Key Drug/Product(s) | Current Valuation ($B) | Rationale | Challenge |
|---|---|---|---|---|---|
| 1 | Structure | GSBR-1290 (Daily Oral GLP-1) Phase 2 data reported | 2.1 | Phase 2 efficacy data looks similar to Lilly's oral orforglipron with potentially a lower discontinuation rate. Non-peptide structure could make manufacturing much easier than Rybelsus. | Likely at least a year behind orforglipron. |
| 2 | Viking | VK2735 (Weekly Injection GLP-1/GIP) Phase 3 ready<br>VK2735 (Daily Oral Version GLP-1/GIP) Phase 2 data reported | 5.8 | Phase 2 injectable data looks competitive with Zepbound/Wegovy. An oral formulation is testing higher doses to see if efficacy can also be improved. | 20% discontinuation rate is concerning. The oral version also looks less effective and is peptide based, making manufacturing more challenging. |
| 3 | Altimmune | Pemvidutide (Weekly Injection GLP-1/Glucagon) Phase 3 Ready | 0.4 | Long-term weight loss data look slightly better than Wegovy's. | 20% discontinuation rate could be a limitation, but allowing for dose declines as patients ramp in phase 3 should help. |
| 4 | Zealand | Survodutide (Weekly Injection GLP-1/Glucagon) Phase 3 with partner Boehringer<br>Dapiglutide (GLP-1/GLP-2) and Petrelintide (amylin) in phase 2 | 8.5 | High-single digit/low-double digit percentage royalty on global sales of survodutide, among first challengers in obesity market.<br>Unique mechanism of action for mid-stage pipeline with GLP-1/GLP-2 and amylin targeting drugs. | Only get royalties on survodutide, which had a high dropout rate of 29%.<br>Dapiglutide dosage still being raised to achieve competitive efficacy. |
| 5 | Fractyl Health | Revita and Rejuva | 0.1 | Offers the potential for long-term maintenance. | Unique treatment could have side effects. |

Source: Morningstar, company reports. Valuation data as of Aug. 5, 2024.

On the private side, names like NodThera, Corteria, and Diasome stand out as having a greater than 50% probability of being acquired, according to PitchBook data (Exhibit 23).

**Exhibit 23** Top VC- Backed Obesity Companies, by Total VC Raised to Date (in $ millions)

| Company Name | VC ($M) raised to date | IPO probability | M&A probability | No Exit probability |
|---|---|---|---|---|
| Human Longevity | $1,087.8 | 93% | 5% | 2% |
| Kallyope | $479.0 | 95% | 3% | 2% |
| Hercules CM | $400.0 | N/A | N/A | N/A |
| Metsera | $350.0 | N/A | N/A | N/A |
| BioAge Labs | $318.2 | 95% | 3% | 2% |
| Ventus Therapeutics | $300.0 | 95% | 3% | 2% |
| CinRx Pharma | $176.0 | 32% | 18% | 50% |
| Rivus Pharmaceuticals | $167.0 | 93% | 3% | 4% |
| OrsoBio | $139.6 | 76% | 13% | 11% |
| Sciwind Biosciences | $138.2 | N/A | N/A | N/A |
| Aardvark Therapeutics | $129.0 | 69% | 22% | 9% |
| Neurogastrx | $127.8 | 3% | 21% | 76% |
| Raynovent Biotech | $115.7 | N/A | N/A | N/A |
| NodThera | $102.2 | 26% | 60% | 14% |
| GMAX Bio | $94.3 | N/A | N/A | N/A |
| Regor Therapeutics | $90.0 | N/A | N/A | N/A |
| Diasome | $89.7 | 15% | 78% | 7% |
| Corteria Pharmaceuticals | $88.4 | 42% | 51% | 7% |
| ProFound Therapeutics | $87.7 | 15% | 57% | 28% |
| SixPeaks Bio | $80.0 | N/A | N/A | N/A |

Source: PitchBook, Data as of Sept. 1, 2024.

# Appendix

**Exhibit 24** Obesity Development Pipeline—Private Firms

| Firm | Drug | Mechanism | Administration | Small Molecule? | Phase |
|---|---|---|---|---|---|
| 35Pharma | HS235 | Activin/GDF ligand trap | injectable | no | preclinical |
| Aardvark Therapeutics | ARD-101 | bitter taste receptor agonist | oral | yes | 2 |
| Antag therapeutics | - | GIP antagonist | injectable | no | preclinical |
| Aphaia Pharma | APH-012 | nutrient sensing cell stimulator | oral | yes | 2 |
| Beijing QL Biopharmaceutical | ZT002 | GLP-1 agonist | injectable | no | 1c |
| BioAge | BGE-100 | NLRP3 inhibitor | oral | yes | preclinical |
| BioAge | BGE-105 (azelaprag) | G-protein coupled apelin receptor agonist | oral | yes | 2 |
| Biorestorative Therapies | ThermoStem | brown fat derived stem cells | injectable | no | preclinical |
| Boehringer Ingelheim | BI1820237 | NPY2R | injectable | no | 1 |
| Boehringer Ingelheim/Gubra | BI3034701 | undefined "triple agonist" | injectable | no | 1 |
| Boehringer Ingelheim/Zealand | survodutide/BI456906 | GLP-1/glucagon agonist | injectable | no | 3 |
| CinFina | CIN-109 | GDF15 analog | injectable | no | 1 |
| CinFina | CIN-110 | PYY analog | injectable | no | 1 |
| CinFina | CIN-209 | GLP-1/GDF15 | injectable | no | preclinical |
| CinFina | CIN-210 | GLP-1/PYY | injectable | no | preclinical |
| Corteria | COR-1389 | CRF2 agonist | injectable | no | 1 |
| Cyta | CYTA-001 | thyroid hormone receptor beta agonist | undisclosed | no | preclinical |
| Cytoki | CK-0045 | IL-22 analog | injectable | no | 1 |
| Diasome | HDV incretins | hepatocyte-directed vesicles | injectable | no | preclinical |
| Enterin | ENT-03 | PTP1B inhibitor | injectable | no | 1 |
| ERX Pharmaceuticals | ERX-1000 | leptin sensitizer | oral | yes | 1 |
| Gila Therapeutics | GT-001 | PYY analog | oral | no | 1 |
| Glaceum | HSG4112 | glabridin analog | oral | yes | 2 |
| Glyscend Therapeutics | GLY-200 | polymer GI coating | oral | no | 2 |
| Gmax | GMA102 | GLP-1 agonist | injectable | no | 3 |
| Gmax | GMA105 (glutazumab) | GLP-1 agonist | injectable | no | 2 |
| Gmax | GMA106 | GLP-1/GIP agonist | injectable | no | 1 |
| Hercules (via Jiangsu HengRui) | HRS-7535 | GLP-1 agonist | oral | yes | 1/2 |
| Hercules (via Jiangsu HengRui) | HRS-4729 | next-gen incretin agonist | not disclosed | undisclosed | preclinical |
| Hercules (via Jiangsu HengRui) | HRS-9531 | GLP-1/GIP agonist | injectable | no | 2 |
| Kallyope | K-757 | nutrient receptor agonist | oral | yes | 2 |
| Kallyope | K-833 | nutrient receptor agonist | oral | yes | 2 |
| Metsera (via D&D) | - | GLP-1 | injectable | no | 1 |
| Metsera (via D&D) | DD03 | GLP-1/GIP/GCGR | oral | no | preclinical |
| Metsera (via D&D) | DD07 | amylin agonist | oral | no | preclinical |
| Metsera (via D&D) | DD02S | GLP-1 agonist | oral | no | preclinical |
| Metsera (via D&D) | DD14 | GLP-1/GIP agonist | oral | no | preclinical |
| Metsera (via D&D) | DD15 | GLP-1/GIP/glucagon | injectable | no | preclinical |
| MBX Biosciences | MBX 4291 | GLP-1/GIP | injectable | no | preclinical |
| Mindrank AI | MDR-001 | GLP-1 agonist | oral | yes | 1 |
| NodThera | NT-0249, NT-0976 | NLRP3 inhibitor | oral | yes | 2 |
| Olatec | OLT1177 | NLRP3 inhibitor | oral | yes | 2 |
| OrsoBio | TLC-1235 | liver targeted protonophore | oral | yes | preclinical |
| OrsoBio | TLC-6740 | liver targeted protonophore | oral | yes | 1 |
| Pep2Tango | PTT-A | GLP-1/GIP/amylin/calcitonin | injectable | no | preclinical |
| QL Biopharmaceutical | ZT003 | GLP-1/FGF21 agonist | injectable | no | preclinical |

Source: Morningstar, PitchBook, company reports.

**Exhibit 24 (continued)** Obesity Development Pipeline—Private Firms

| Firm | Drug | Mechanism | Administration | Small Molecule? | Phase |
|---|---|---|---|---|---|
| Regor Therapeutics | RGT-075 | GLP-1 agonist | oral | yes | 2 |
| Regor Therapeutics | RGT-028 | GLP-1 agonist | oral | yes | preclinical |
| Regor Therapeutics | RGT-274 | GLP-1 agonist | oral | yes | preclinical |
| Resalis | RES-010 | miR-22 inhibitor | injectable | no | 1 |
| Resalis | RES-020 | miR-22 inhibitor | injectable | no | preclinical |
| Rivus | HU6 | controlled metabolic accelerator | oral | yes | 2 |
| Sciwind | XW003 (ecnoglutide) | GLP-1 agonist | injectable | no | 3 |
| Sciwind | XW014 | GLP-1 agonist | oral | yes | 1 |
| Sciwind | XW004 | GLP-1 agonist | oral | no | 1 |
| Sciwind | XW017 | GIP agonist | injectable | no | preclinical |
| Scohia Pharma | SCO-267 | GPR40 | oral | yes | 1 |
| Scohia Pharma | SCO-094 | GLP-1/GIP agonist | undisclosed | undisclosed | 1 |
| SixPeaks | dual specific antibody | activin type IIA/IIB receptors | injectable | no | preclinical |
| SixPeaks | dual specific antibody | GLP-1 with activin | injectable | no | preclinical |
| Supercede | undisclosed | ACTR2 | oral | yes | preclinical |
| Syntis Bio | SYNT-101 | polydopamine coating | oral | no | 1 |
| Ventus | VENT-02 | NLRP3 inhibitor | oral | yes | 1 |
| Zhejiang Doer (Doer Biologics) | DR10624 | GLP-1/glucagon/FGF21R | injectable | no | 1 |

Source: Morningstar, PitchBook, company reports.

**Exhibit 25** Obesity Development Pipeline—Public Firms

**Public Firms**

| Firm | Drug | Mechanism | Administration | Small Molecule? | Phase |
|---|---|---|---|---|---|
| Agentix | AGTX-2004 | CB1R antagonist | oral | yes | preclinical |
| Alnylam | ALN-INHBE | INHBE inhibitor | injectable | no | preclinical |
| Alnylam | ALN-Gene C | undisclosed | injectable | no | preclinical |
| Alnylam | ALN-Gene D | undisclosed | injectable | no | preclinical |
| Altimmune | pemvidutide/ALT-801 | GLP-1/glucagon agonist | injectable | no | 3 |
| Amgen | AMG133/MariTide | GLP-1 agonist/GIP inhibitor | injectable | no | 2 |
| Arrowhead | ARO-INHBE | INHBE inhibitor | injectable | no | preclinical |
| Arrowhead | ARO-ALK7 | ALK7 inhibitor | injectable | no | preclinical |
| AstraZeneca | AZD9550 | GLP-1/glucagon agonist | injectable | no | 1 |
| AstraZeneca | AZD6234 | amylin analog | injectable | no | 1 |
| AstraZeneca/Eccogene | ECC5004/AZD5004 | GLP-1 | oral | yes | 1 |
| Biohaven | taldefgrobep | myostatin/activin A inhibitor | injectable | no | 2 |
| Corbus | CRB-913 | CB1 inverse agonist | oral | yes | preclinical |
| D&D Pharmatech | DD01 | GLP-1/glucagon agonist | injectable | no | 1 |
| D&D Pharmatech | NLY12 | GLP-1 agonist | injectable | no | preclinical |
| D&D Pharmatech | DD13 | amylin agonist | injectable | no | preclinical |
| Elevai Labs | EL-22 | myostatin probiotic | oral | no | preclinical |
| Elevai Labs | EL-32 | myostatin/activin A probiotic | oral | no | preclinical |
| Eli Lilly | retatrutide | GLP-1/GIP/glucagon | injectable | no | 3 |
| Eli Lilly | orforglipron | GLP-1 | oral | yes | 3 |
| Eli Lilly | mazdutide/LY3305677* | GLP-1/glucagon agonist | injectable | no | 3 |
| Eli Lilly | dacra QW II (LY3541105) | amylin/calcitonin agonist | injectable | no | 1 |
| Eli Lilly | GLP-1 NPA1 | GLP-1 | injectable | yes | 2 |
| Eli Lilly | GIP/GLP coagonist 3 | GLP-1/GIP | injectable | no | 1 |
| Eli Lilly | LY3841136/eloralintide | amylin receptor agonist | injectable | no | 2 |
| Eli Lilly | bimagrumab | activin receptor type IIA/IIB | injectable | no | 2 |
| Fractyl Health | GLP-1 agonist gene therapy | GLP-1 | injectable | no | preclinical |
| Gan & Lee | GZR18 | GLP-1 agonist | injectable | | 1/2 |
| Gilead | GS-4571 | GLP-1 | oral | yes | preclinical |
| Glyscend | GLY-200 | mucin-complexing polymer | oral | yes | 2 |
| Gubra | GUB014295 (GUBamy) | amylin agonist | injectable | no | 1 |
| Gubra | UCN2 | CRHR2 agonist | injectable | no | preclinical |
| Hanmi | efpeglenatide | GLP-1 | injectable | no | 3 |
| Hanmi | HM15275 | GLP-1/GIP/GCGR | injectable | no | 1 |
| Hanmi | efpegerglucagon | glucagon | injectable | no | 2 |
| Jiangsu HengRui | Noiiglutide | GLP-1 agonist | injectable | no | 3 |
| Keros Therapeutics | KER-065 | TGF-beta (myostatin/Activin A) | injectable | no | 1 |
| Laekna (China) | LAE102 | ActRIIA (activin receptor) | injectable | no | 1 |
| Lipocine | LPCN 2401 | androgen receptor agonist | oral | yes | 2 |
| Merck | efinopegdutide | GLP-1/glucagon agonist | injectable | no | 2a |
| Novo Nordisk | | GLP-1/GIP | injectable | no | 1 |
| Novo Nordisk | cagrisema | GLP-1/amylin | injectable | no | 3 |
| Novo Nordisk | amycretin | GLP-1/amylin | oral or subcu | 1 oral, 1 subcu | 1 |
| Novo Nordisk | tri-agonist | undisclosed | undisclosed | no | preclinical |
| Novo Nordisk | amylin monotherapy | amylin | undisclosed | no | preclinical |
| Novo Nordisk | INV-202/monlunabant) | CB1 receptor blocker | oral | yes | 2 |
| Novo Nordisk | INV-347 (next-gen) | CB1 receptor blocker | oral | yes | 1 |
| Novo Nordisk | EMB1 (peptide) | EMB1 agonist | injectable | no | preclinical |
| Novo Nordisk | EMB2 (small molecule) | EMB2 agonist | oral | yes | preclinical |
| Novo Nordisk | EraCal pipeline | EraCal Therapeutics | oral | yes | preclinical |

Source: Morningstar, PitchBook, company reports.

**Exhibit 25 (continued)** Obesity Development Pipeline—Public Firms

| Firm | Drug | Mechanism | Administration | Small Molecule? | Phase |
|---|---|---|---|---|---|
| Palatin | bremelanotide | MC4R | injectable | no | 2 |
| Pfizer | danuglipron | GLP-1 | oral | yes | 1 |
| Pfizer | PF-07976016 | undisclosed | oral | yes | 1 |
| Pfizer/Nxera | PF-06954522 | GLP-1 | oral | yes | 1 |
| Rani/ProGen | PG-102 | GLP-1/GLP2 | oral | no | 1 |
| Regeneron | trevogrumab | myostatin Ab | injectable | no | 2 |
| Regeneron | garetosmab | activin A Ab | injectable | no | 2 |
| Regeneron | GPR75 | GPR75 inhibitor | undisclosed | undisclosed | preclinical |
| Regeneron | mibavademab | LEPR (leptin) | injectable | no | 2 |
| Roche | RO7204239 | myostatin Ab | injectable | no | preclinical |
| Roche/Carmot | CT-388 | GLP-1/GIP agonist | injectable | no | 1/2 |
| Roche/Carmot | CT-996 | GLP-1 | oral | yes | 1 |
| Scholar Rock | apitegromab | myostatin | injectable | no | 2 |
| Scholar Rock | SRK-439 | myostatin | injectable | no | preclinical |
| Shionogi | S-309309 | MGAT2 inhibitor | oral | yes | 2 |
| Skye Bioscience | nimacimab | CB1 antibody | injectable | no | 2 |
| Structure Therapeutics | GSBR-1290 | GLP-1 | oral | yes | 2 |
| Structure Therapeutics | TBD | amylin analog | oral | yes | preclinical |
| Structure Therapeutics | TBD | GIP agonist | oral | yes | preclinical |
| Structure Therapeutics | TBD | glucagon agonist | oral | yes | preclinical |
| Structure Therapeutics | ANPA-0073 | apelin (APJR) | oral | yes | 1 |
| Sun Pharma | GL0034 | GLP-1 agonist | injectable | no | 1 |
| Terns Pharmaceuticals | TERN-601 | GLP-1 | oral | yes | 1 |
| Terns Pharmaceuticals | TERN-501 combo | THR-beta agonist | undisclosed | undisclosed | preclinical |
| Ventyx | VT3232 | NLRP3 inhibitor | oral | yes | 2 |
| Veru | enobosarm | selective androgen receptor modulator | oral | yes | 2 |
| Viking | VK2735 | GLP-1/GIP agonist | injectable | no | 2 |
| Viking | VK2735 | GLP-1/GIP agonist | oral | no | 1 |
| Viking | DACRA (dual amylin/calcitonin receptor agonists) | | injectable | no | preclinical |
| Vivani | NPM-115 | high-dose GLP-1 (exenatide) | implant | no | preclinical |
| Vivani | NPM-139 | GLP-1 (semaglutide) | implant | no | preclinical |
| Wave Life Sciences | RNAi INHBE | INHBE inhibitor | injectable | no | preclinical |
| Yunovia (spin off of public Ildong) | | GLP-1 agonist | oral | yes | 1 |
| Zealand | dapiglutide | GLP-1/GLP-2 agonist | injectable | no | 2 |
| Zealand | petrelintide/ZP8396 | amylin analog | injectable | no | 2 |
| Zealand | ZP 6590 | GIPR agonist | injectable | no | preclinical |

Source: Morningstar, PitchBook, company reports.

## Research Methodology for Valuing Companies

**Overview**

At the heart of our valuation system is a detailed projection of a company's future cash flows, resulting from our analysts' research. Analysts create custom industry and company assumptions to feed income statement, balance sheet, and capital investment assumptions into our globally standardized, proprietary discounted cash flow, or DCF, modeling templates. We use scenario analysis, in-depth competitive advantage analysis, and a variety of other analytical tools to augment this process. We think analyzing valuation through discounted cash flows presents a better lens for viewing cyclical companies, high-growth firms, businesses with finite lives (mines, for example), or companies expected to generate negative earnings over the next few years. That said, we don't dismiss multiples altogether but rather use them as supporting cross-checks for our DCF-based fair value estimates. We also acknowledge that DCF models offer their own challenges (including a potential proliferation of estimated inputs and the possibility that the method may miss short-term market-price movements), but we believe these negatives are mitigated by deep analysis and our long-term approach.

Morningstar's Equity Research Group ("we," "our") believes that a company's intrinsic worth results from the future cash flows it can generate. The Morningstar Rating for stocks identifies stocks trading at a discount or premium to their intrinsic worth—or fair value estimate in Morningstar terminology. Five-star stocks sell for the biggest risk-adjusted discount to their fair values, whereas 1-star stocks trade at premiums to their intrinsic worth.

Four key components drive the Morningstar rating:

- our assessment of the firm's economic moat.
- our estimate of the stock's fair value.
- our uncertainty around that fair value estimate.
- the current market price.

This process ultimately culminates in our single-point star rating.

**Economic Moat**

The Morningstar Economic Moat Rating is a structural feature that Morningstar believes positions a firm to earn durable excess profits over a long period of time, with excess profits defined as returns on invested capital above our estimate of a firm's cost of capital. The economic moat rating is not an indicator of the investment performance of the investment highlighted in this report. Narrow-moat companies are those that Morningstar believes are more likely than not to achieve normalized excess returns for at least the next 10 years. Wide-moat companies are those that Morningstar believes will earn excess returns for 10 years, with excess returns more likely than not to remain for at least 20 years. Firms without a moat, including those that have a substantial threat of value destruction-related risks related to environmental, social, and governance; industry disruption; financial health; or other idiosyncratic issues, are more susceptible to competition. Morningstar has identified five sources of economic moats: intangible assets, switching costs, network effect, cost advantage, and efficient scale.

**Fair Value Estimate**

Each stock's fair value is estimated by using a proprietary discounted cash flow model, which assumes that the stock's value is equal to the total of the free cash flows of the company is expected to generate in the future, discounted back to the present at the rate commensurate with the riskiness of the cash flows. As with any DCF model, the ending value is highly sensitive to Morningstar's projections of future growth.

**Fair Value Uncertainty**

The Morningstar Uncertainty Rating represents the analysts' ability to bound the estimated value of the shares in a company around the fair value estimate, based on the characteristics of the business underlying the stock, including operating and financial leverage, sales sensitivity to the overall economy, product concentration, pricing power, exposure to material ESG risks, and other company-specific factors. Based on these factors, analysts classify the stock into one of several uncertainty levels: Low, Medium, High, Very High, or Extreme. Our recommended margin of safety—the discount to fair value demanded before we'd recommend buying or selling the stock—widens as our uncertainty of the estimated value of the equity increases.

**Market Price**

The market prices used in this analysis and noted in the report come from exchanges on which the stock is listed, which we believe is a reliable source.

**Morningstar Rating for Stocks**

The Morningstar Rating for Stocks is a forward-looking, analyst-driven measure of a stock's current price relative to the analyst's estimate of what the shares are worth. Stock star ratings indicate whether a stock, in the equity analyst's educated opinion, is cheap, expensive, or fairly priced. To rate a stock, analysts estimate what they think it is worth (its "fair value"), using a detailed, long-term cash flow forecast for the company. A stock's star rating depends on whether its current market price is above or below the fair value estimate. Those stocks trading at large discounts to their fair values receive the highest ratings (4 or 5 stars). Stocks trading at large premiums to their fair values receive lower ratings (1 or 2 stars). A 3-star rating means the current stock price is close to the analyst's fair value estimate.

**Risk Warning**

Please note that investments in securities are subject to market and other risks, and there is no assurance or guarantee that the intended investment objectives will be achieved. Past performance of a security may or may not continue in the future and is no indication of future performance. A security investment’s return and an investor's principal value will fluctuate so that, when redeemed, an investor's shares may be worth more or less than their original cost.

A security's current investment performance may be lower or higher than the investment performance noted within the report. Morningstar's Uncertainty Rating is a useful data point with respect to sensitivity analysis of the assumptions used in our determining a fair value price.

## General Disclosure

“Morningstar” is used throughout this section to refer to Morningstar, Inc., and/or its affiliates, as applicable. Unless otherwise provided in a separate agreement, recipients of this report may only use it in the country in which the Morningstar distributor is based. Unless stated otherwise, the original distributor of the report is Morningstar Research Services LLC, a USA-domiciled financial institution.

This report is for informational purposes only, should not be the sole piece of information used in making an investment decision, and has no regard to the specific investment objectives, financial situation, or particular needs of any specific recipient. This publication is intended to provide information to assist investors in making their own investment decisions, not to provide investment advice to any specific investor. Therefore, investments discussed and recommendations made herein may not be suitable for all investors; recipients must exercise their own independent judgment as to the suitability of such investments and recommendations in the light of their own investment objectives, experience, taxation status, and financial position.

The information, data, analyses, and opinions presented herein are not warranted to be accurate, correct, complete, or timely. Unless otherwise provided in a separate agreement, neither Morningstar, Inc., nor the Equity Research Group represents that the report contents meet all of the presentation and/or disclosure standards applicable in the jurisdiction the recipient is located.

Except as otherwise required by law or provided for in a separate agreement, the analyst, Morningstar, Inc., and the Equity Research Group and their officers, directors, and employees shall not be responsible or liable for any trading decisions, damages, or other losses resulting from, or related to, the information, data, analyses, or opinions within the report. The Equity Research Group encourages recipients of this report to read all relevant issue documents—a prospectus, for example) pertaining to the security concerned, including without limitation, information relevant to its investment objectives, risks, and costs before making an investment decision and when deemed necessary, to seek the advice of a legal, tax, and/or accounting professional.

The report and its contents are not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country, or other jurisdiction where such distribution, publication, availability, or use would be contrary to law or regulation or that would subject Morningstar, Inc., or its affiliates to any registration or licensing requirements in such jurisdiction.

Where this report is made available in a language other than English and in the case of inconsistencies between the English and translated versions of the report, the English version will control and supersede any ambiguities associated with any part or section of a report that has been issued in a foreign language. Neither the analyst, Morningstar, Inc., nor the Equity Research Group guarantees the accuracy of the translations.

This report may be distributed in certain localities, countries, and/or jurisdictions ("territories") by independent third parties or independent intermediaries and/or distributors ("distributors"). Such distributors are not acting as agents or representatives of the analyst, Morningstar, Inc., or the Equity Research Group. In territories where a distributor distributes our report, the distributor is

solely responsible for complying with all applicable regulations, laws, rules, circulars, codes, and guidelines established by local and/or regional regulatory bodies, including laws in connection with the distribution of third-party research reports.

**Conflicts of Interest**

- No interests are held by the analyst with respect to the securities subject of this investment research report.
- Morningstar, Inc., may hold a long position in the securities subject of this investment research report that exceeds 0.5% of the total issued share capital of the security. To determine if such is the case, please click https://www.morningstar.com/company/disclosures/holdings.
- Analysts' compensation is derived from Morningstar, Inc.'s overall earnings and consists of salary, bonus, and in some cases restricted stock.
- Morningstar's overall earnings are generated in part by the activities of the Investment Management and Research groups, and other affiliates, that provide services to product issuers.
- Neither Morningstar, Inc., nor the Equity Research Group receives commissions, compensation, or other material benefits in connection with providing research, nor do they charge companies to be rated.
- Morningstar employees may not pursue business or employment opportunities outside Morningstar within the investment industry (including, but not limited to, working as a financial planner, an investment professional or investment professional representative, a broker/dealer or broker/dealer agent, a financial writer, reporter, or analyst) without the approval of Morningstar's Legal and if applicable, Compliance teams.
- Neither Morningstar, Inc., nor the Equity Research Group is a market maker or a liquidity provider of the securities noted within this report.
- Neither Morningstar, Inc., nor the Equity Research Group has been a lead manager or co-lead manager over the previous 12 months of any publicly disclosed offer of financial instruments of the issuer.
- Morningstar, Inc.'s Investment Management group has arrangements with financial institutions to provide portfolio management/investment advice, some of which an analyst may issue investment research reports on. In addition, the Investment Management group creates and maintains model portfolios whose underlying holdings can include financial products, including securities that may be the subject of this report. However, analysts do not have authority over Morningstar's Investment Management group's business arrangements or allow employees from the Investment Management group to participate or influence the analysis or opinion prepared by them.
- Morningstar, Inc., is a publicly traded company (ticker: MORN) and thus a financial institution the security of which is the subject of this report may own more than 5% of Morningstar, Inc.'s total outstanding shares. Please access Morningstar, Inc.'s proxy statement, "Security Ownership of Certain Beneficial Owners and Management" section at https://shareholders.morningstar.com/investor-relations/financials/sec-filings/default.aspx.

Morningstar may provide the product issuer or its related entities with services or products for a fee and on an arm's-length basis, including software products and licenses, research and consulting services, data services, licenses to republish our ratings and research in their promotional material, event sponsorship, and website advertising.

Further information on Morningstar's conflict-of-interest policies is available at http://global.morningstar.com/equitydisclosures.

For a list of securities the Equity Research Group currently covers and provides written analysis on, or for historical analysis of covered securities, including fair value estimates, please contact your local Morningstar office.

**For recipients in Australia**: This report has been issued and distributed in Australia by Morningstar Australasia Pty. Ltd. (ABN: 95 090 665 544; ASFL: 240892). Morningstar Australasia Pty. Ltd. is the provider of the general advice ("the service") and takes responsibility for the production of this report. The service is provided through the research of investment products. To the extent the report contains general advice, it has been prepared without reference to an investor's objectives, financial situation, or needs. Investors should consider the advice in light of these matters and, if applicable, the relevant Product Disclosure Statement before making any decision to invest. Refer to our Financial Services Guide, or FSG, for more information at http://www.morningstar.com.au/s/fsg.pdf.

**For Recipients in New Zealand:** This report has been issued and distributed by Morningstar Australasia Pty Ltd and/or Morningstar Research Ltd (together 'Morningstar'). This report has been prepared and is intended for distribution in New Zealand to wholesale clients only and has not been prepared for use by New Zealand retail clients (as those terms are defined in the Financial Markets Conduct Act 2013).

The information, views and any recommendations in this material are provided for general information purposes only, and solely relate to the companies and investment opportunities specified within. Our reports do not take into account any particular

investor's financial situation, objectives or appetite for risk, meaning no representation may be implied as to the suitability of any financial product mentioned for any particular investor. We recommend seeking financial advice before making any investment decision.

**For recipients in Canada**: This research is not prepared subject to Canadian disclosure requirements.

**For recipients in Hong Kong**: The report is distributed by Morningstar Investment Management Asia Limited, which is regulated by the Hong Kong Securities and Futures Commission to provide investment research and investment advisory services to professional investors only. Neither Morningstar Investment Management Asia Limited nor its representatives are acting or will be deemed to be acting as an investment advisor to any recipients of this information unless expressly agreed to by Morningstar Investment Management Asia Limited.

**For recipients in India:** This investment research is issued by Morningstar Investment Research India Private Limited (formerly known as Morningstar Investment Adviser India Private Limited). Morningstar Investment Research India Private Limited is registered with SEBI as a Research Entity (registration number INH000008686). Morningstar Investment Research India Private Limited has not been the subject of any disciplinary action by SEBI or any other legal/regulatory body. Morningstar Investment Research India Private Limited is a wholly owned subsidiary of Morningstar Investment Management LLC. In India, Morningstar Investment Research India Private Limited has one associate, Morningstar India Private Limited, which provides data-related services, financial data analysis, and software development. The research analyst has not served as an officer, director, or employee of the fund company within the last 12 months, nor have they or their associates engaged in market-making activity for the fund company.

**For recipients in Japan**: The report is distributed by Morningstar Japan, Inc. for informational purposes only. Neither Morningstar Japan, Inc. nor its representatives are acting or will be deemed to be acting as an investment advisor to any recipients of this information.

**For recipients in Korea**: This report is distributed by Morningstar Korea Ltd., which has filed to the Financial Services Committee, for informational purposes only. Neither Morningstar Korea Ltd. nor its representatives are acting or will be deemed to be acting as an investment advisor to any recipients of this information.

**For recipients in Singapore**: This report is distributed by Morningstar Investment Adviser Singapore Pte Limited, which is licensed and regulated by the Monetary Authority of Singapore to provide financial advisory services in Singapore. Recipients of this report should contact their financial advisor in Singapore in relation to this report. Morningstar, Inc. and its affiliates rely on certain exemptions (Financial Advisers Regulations, Section 28(1)(e), Section 32B and 32C) to provide its investment research to recipients in Singapore.

**About Morningstar® Equity Research™**

Morningstar Equity Research provides independent, fundamental equity research differentiated by a consistent focus on durable competitive advantages, or economic moats.

**For More Information**

+1 312 696-6869
equitysupport@morningstar.com

22 West Washington Street
Chicago, IL 60602 USA