Global Healthcare: The Obesity Evolution: Framing global AOM peptide manufacturing capacity and implications for the branded/generic markets

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As a Global Healthcare team, we have been publishing our expectations for the global obesity medication market size and estimating patient numbers. While the market's attention appears to be concentrated on the demand outlook for obesity medication over the medium term, there has been less focus on the global capacity for production of these medications.

For Novo Nordisk, a key area of investor concern lies in the longer-term outlook for the company upon the majority of semaglutide patents expiring in 2031/32. In our view, the speed of genericisation and potential broader impact on GLP-1/AOM pricing depend on the availability of semaglutide API supply. China leads in API supply, ahead of generic entry in 2027, and will likely be the key source of API for global generic players launching semaglutide.

In this report, we leveraged insights from CDMO / API supplier conversations and a recent report by our Asia research team (see here) to investigate potential API supply for peptide-based AOMs and how this could impact the global obesity market dynamics. A key caveat is a lack of visibility, and an inability to perform due diligence around company commentary on manufacturing capacity, yields, demand and output, given a lack of available industry data available. As such, the analysis largely highlights directional relationships that we intend to update as data becomes increasingly obtainable.

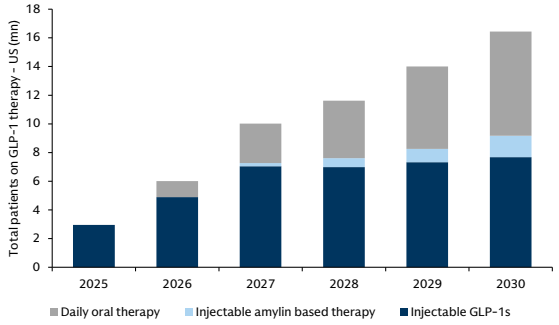
Key conclusions from our analysis include:

- Novo Nordisk's fermentation based approaches likely set the company up to remain the lowest cost manufacturer;
- Global peptide CDMO players appear to be focused on branded products, building long-term strategic partnerships, although this could represent a risk if part of the capacity additions were to be used for generic supply;
- Significant peptide API capacity via SPPS (synthetic manufacturing) exists in China – however questions remain, and if oral semaglutide demand remains high and price elasticity continues to drive increased volumes, the implied capacity utilisation could significantly increase;
- Brand loyalty, price elasticity and the 'consumerised' nature of the Obesity market are all factors that add uncertainty to the speed of genericisation of semaglutide – while upcoming generic launches in

Canada, Brazil, India, Mexico and China will offer some interesting insights, we caution on how broadly applicable these insights will be to the global AOM market.

Executive Summary - Six key charts

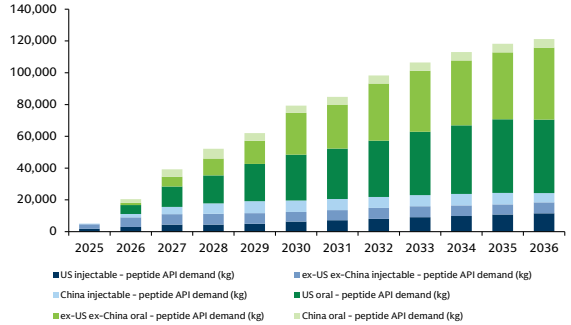
Exhibit 1: We model >16mn US obese patients taking AOMs by 2030
Total patients on GLP-1 therapy - US (mn)



NB/ patients = annualised equivalent patients

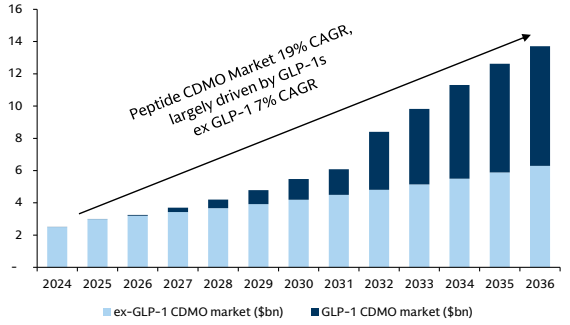
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 2: Our base case is that c.79,000 kg of peptide API will be required by 2030 and c.118,000 kg by 2035 to serve the obesity market
Global peptide API required (kg) - GLP-1 injectables and orals



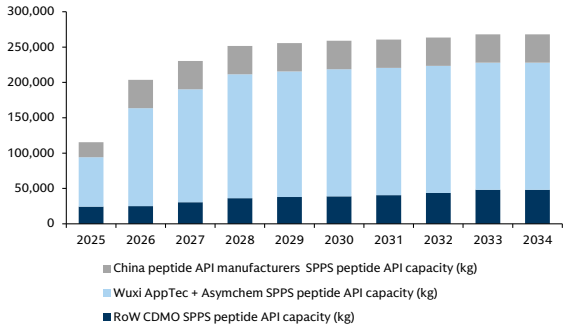
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 3: The global peptide CDMO market is expected to grow at a c.19% CAGR 2025-2036, driven by GLP-1s
Global Peptide CDMO Market ($bn)



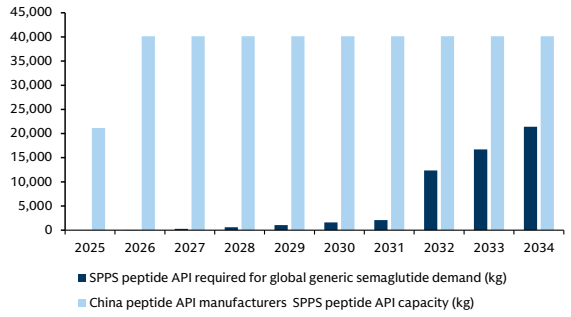
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 4: We expect Wuxi & Asymchem to drive API SPPS capacity growth
Peptide API manufacturing capacity (kg) - Wuxi & Asymchem vs China peptide API manufacturers vs RoW CDMO



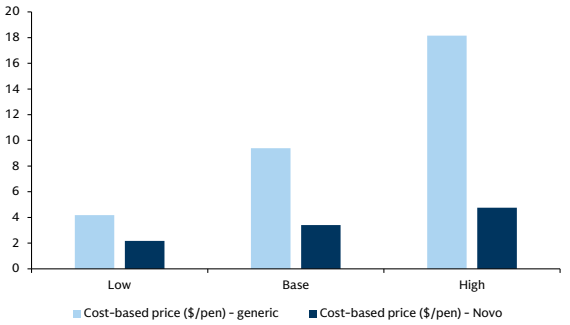
Source: Company data, Goldman Sachs Global Investment Research

Exhibit 5: Chinese API suppliers (non-CDMO) appear to have increased capacity well in advance of the semaglutide patent expiry
SPPS peptide API required for global generic semaglutide demand (kg) vs China peptide API manufacturers SPPS peptide API capacity (kg)



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 6: We believe that Novo's substantial investment in fermentation capacity expansion will drive lower unit cost production vs generics' SPPS
Cost-based price ($/pen) - generic vs Novo



Source: JAMA, Company data, Goldman Sachs Global Investment Research

Company level considerations

Novo Nordisk – Neutral, 12m PT DKK 305/US$47

As discussed, we find our SPPS API production capacity analysis to be generally supportive of our modelling of generic uptake over the longer term, with Novo likely to remain the lowest cost supplier, although risk remains as to potential additional capacity increases and if the Chinese CDMO players also branch into generics, there is still potential for a race to the bottom on semaglutide price beyond patent expiry. Therefore, semaglutide API supply remains a key factor we are watching going forward, as well as the impact of the generic launches in Canada and Brazil in the coming months, with China in 2027 being key to assessing how the volume increase could manifest with the launch of a generic version.

Our work implies that Novo could produce semaglutide via fermentation at a c.25% lower cost per unit for the pens, and c.75% lower cost for the pill, vs generic producers using SPPS. This implies Novo will have a manufacturing/economies of scale advantage vs generic competition upon the semaglutide patent expiries in 2032, with the advantage increasing if Wegovy pill penetration were to increase faster.

Over the next 12 months, we continue to see the uptake of Wegovy Pill and the broader oral GLP-1 class as being the key driver of Novo's shares (more detail in our recent report "Pill positioning enhances Wegovy competitiveness, but uncertainties remain"). However, we would highlight that the oral uptake could have more significant positive implications for Novo over the medium/long term too, given the greater API requirement and Novo's production cost advantages.

In terms of key factors to watch, we would highlight i) capacity announcements by CDMOs for GLP-1s beyond that already announced, ii) updates regarding peptide CDMOs' ability to produce GMP compliant GLP-1, and iii) oral vs injectable GLP-1 uptake by patients, as being the key determinants of to what extent Novo's economies of scale in API manufacturing comes into fruition.

Eli Lilly – Buy, 12m PT $1,283

On the manufacturing side, recall that capacity constraint was a notable issue in 2024, where the company entered 2025 with capacity execution as a key goal for the year. With continued investment and solid execution, the company did not experience notable capacity constraint in 2025, and has framed it as a past issue entering 2026. With continued volume ramp and pipeline development, the company continues to heavily invest in manufacturing capacity, with a series of recent manufacturing expansion announcements related to incretins (here, here, here and here) in both US and OUS.

On generic competition on the horizon (tirzepatide composition of matter patent expiry in 2036), the API capacity analysis makes us incrementally more positive on the erosion trajectory post 2036 – where the tilt towards semaglutide in the

compounded GLP-1 market suggests additional manufacturing barriers for entry (consistent with our KOL diligence that suggests tirzepatide to be less financially attractive to compound), in addition to semaglutide's earlier entry and installed base. More importantly, LLY is focused on developing next-gen obesity medications - most notably including eloralintide and retatrutide that could launch before the end of this decade, and a number of earlier stage candidates - that would allow meaningful potential traction/switching before the 2036 Zepbound LOE.

On orals, the small molecule nature of Foundayo provides a scale advantage, which the company sees as being critical to addressing the large unmet need/low penetration across the globe, although it would eventually also allow easier generic production. Here, our focus continues to be on the launch trajectory, with multiple potential accelerants into 2H26 (including full commercial channel unlock starting June 1, Medicare unlock July 1st, and full promotion starting 3Q).

How much peptide API is needed to serve the Global AOM market?

Summary

- We model $66bn in US GLP-1 sales by 2030, split 50/50 between orals and injectables
- We expect c.35,000 kg of peptide API will be required to serve the US GLP-1 market by 2030 and c.57,000 kg by 2035
- We model $43bn in ex-US ex-China AOM sales by 2030, split 50/50 between orals and injectables
- We expect c.32,000 kg of peptide API will be required to serve the ex-US ex-China GLP-1 market by 2030 and c.48,000 kg by 2035
- We model $4.5bn in China AOM sales by 2030, split c.15%/85% between orals and injectables
- We expect c.12,000 kg of peptide API will be required to serve the China GLP-1 market by 2030 and c.13,000 kg by 2035, largely driven by generic semaglutide injectable API

Overview of peptide manufacturing: API for peptides/GLP-1s are manufactured using fermentation/ genetic engineering or synthetically by SPPS.

There are two methods commonly used for peptide API manufacturing. The first is fermentation, which Novo Nordisk uses to produce semaglutide and liraglutide, and plans to use to produce zenagamatide. The second process is synthetic production, used to produce products such as tirzepatide, retatrutide and survodutide. Synthetic production is most commonly done via SPPS (solid phase peptide synthesis), but can also be done by LPPS (liquid phase peptide synthesis).

We expect the vast majority of generic manufacturers will produce GLP-1s by SPPS rather than by fermentation, given SPPS usually has a much lower upfront capex requirement. However, we note that SPPS processes can be more difficult to scale up vs fermentation processes. **Therefore, to estimate the kg of API required for the global obesity market, we assume that all peptide based products that are not produced by Novo Nordisk will be produced via SPPS.**

Exhibit 7: API production – fermentation vs. SPPS

	Fermentation	Solid phase peptide synthesis (SPPS)
Upfront capex required	High upfront capex requirement	Low upfront capex requirement
Scalability	Less difficult	More difficult
Can incorporate synthetic amino acids?	No	Yes
Peptide examples	Semaglutide (from Novo Nordisk)	Tirzepatide Survodutide Generic semaglutide
3D protein formation	Can produce 3D folded proteins within one synthesis process	Synthesising longer peptides can be difficult and result in lower product yields
Ease of purification	Complex given proteins are synthesised within host cells	Easier to purify given a more controlled manufacturing process
Risk of contamination	Higher risk of biological contamination given production in host cells	Lower risk as synthetic manufacturing incorporates a high degree of control of the production process
Ease of incorporating modifications to protein synthesised	Difficult as takes a long time to ramp up fermentation manufacturing	Easier to incorporate post-translational modifications, and simple to scale up

Source: Company reports, Goldman Sachs Global Investment Research

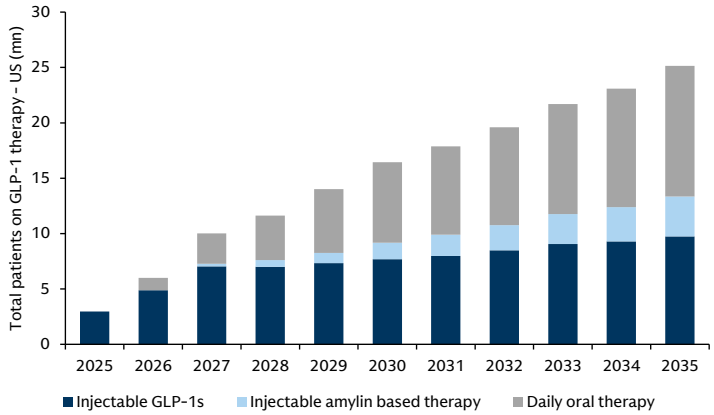
We model >16mn US obese patients taking AOM medications by 2030, split 45%/55% between oral and injectable therapies

We model the number of US patients taking anti-obesity medication rising from c.2.5mn in 2025 to >16mn by 2030 (NB/ annualised equivalent patients). Within this, we expect injectable GLP-1s' patient share to decrease from 100% in 2025 to c.45% in 2030, with oral medications reaching c.45% share in 2030 and c.47% share in 2035 vs 0% in 2025. We expect injectable amylins to be used by c.10% of patients by 2030 and c.14% of patients by 2035.

As such, we expect the US market to reach c.$66bn in 2030 and remain at this level in 2035. Within this, we assume c.7% pricing declines on average per year.

Exhibit 8: We model >16mn US obese patients taking AOMs by 2030 and >25mn by 2035

Total patients on GLP-1 therapy - US (mn)



NB/ patients = annualised equivalent patients

Source: Company data, Goldman Sachs Global Investment Research

Our base case is that c.35,000 kg of peptide API will be required per year by 2030 to serve the US obesity market

We estimate the kg of peptide required through multiplying the number of patients by the average peptide mg per dose, and the number of doses per patient per year. By 2030, we assume that LLY's Zepbound and NOVO's Wegovy are still the dominant anti-obesity medications in the market.

We then account for only 70% of product being recovered during the SPPS purification process (average SPPS recovery is 60-80%), as well as an additional 10% of peptide required for injectable overfill.

Exhibit 9: We estimate total API required based on average dose and patient share for each peptide-based AOM
US API assumptions - % share, mg per dose and number of doses

Key assumptions	2030		
	Patient share (% of segment)	Peptide mg per dose	Doses per patient per year
Injectable GLP-1s			
Wegovy	16%	1.7	52
Generic semaglutide	0%	1.7	52
Wegovy high dose	3%	7.2	52
CagriSema	2%	4.8	52
Zenagamtide subQ	4%	30	52
Zepbound	54%	10	52
Generic tirzepatide	0%	10	52
Retatrutide	6%	10	52
Injectable amylins			
Cagrilintide	15%	2.4	52
Eloralintide	30%	6	52
Daily orals			
Wegovy pill	45%	15	365
Generic oral semaglutide	0%	15	365
Zenagamtide oral	3%	30	365

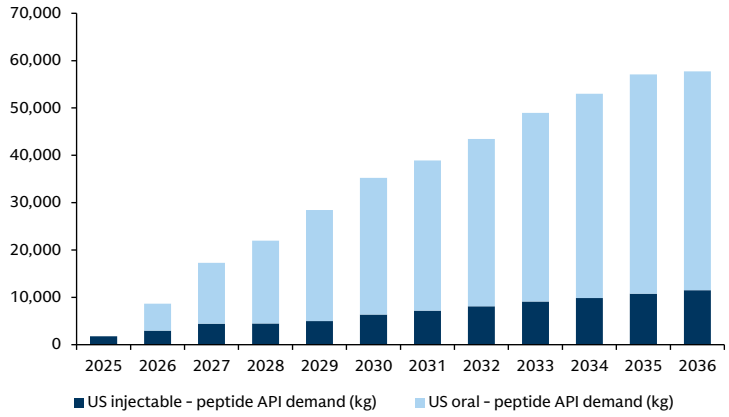
NB/ patient shares do not sum to 100% as non-peptide AOMs are excluded

Source: Company data, NIH, Goldman Sachs Global Investment Research

As such, we model the US anti-obesity medication market requiring c.35,000 kg of peptide produced per year by 2030 and c.57,000 kg by 2035, vs c.1,800 kg in 2025. Per our estimates, the majority of this growth is driven by increased uptake of oral peptide therapies. With oral medications requiring significantly more peptide per dose vs injectables (e.g. c.1.7 mg semaglutide per week on average of Wegovy injectable, vs c.105 mg per week of Wegovy pill), oral medications therefore most significantly drive the peptide uptake we model. These calculations only include patients taking these drugs for obesity/overweight, and does not include those taking them as diabetes treatments.

Exhibit 10: We expect the majority of peptide API demand growth to be driven by oral GLP-1 medications

US peptide API required (kg) - GLP-1 injectables and orals



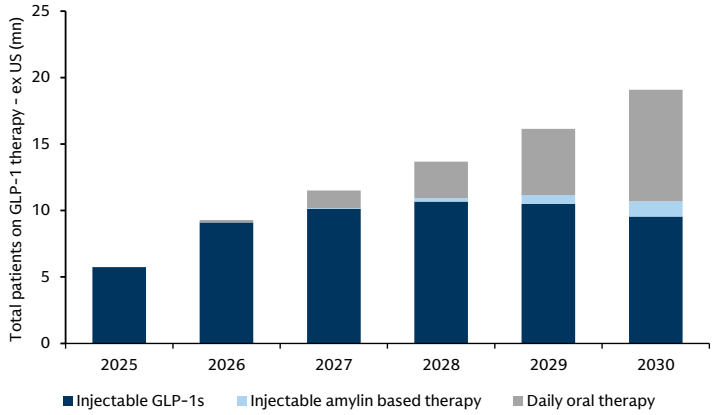
Source: Company data, Goldman Sachs Global Investment Research

We model >19mn ex-US ex-China obese patients taking AOM medications by 2030, split 45%/55% between oral and injectable therapies

We model the number of ex-US patients taking anti-obesity medication to rise from c.5.75mn in 2025 to >19mn by 2030 and >25mn by 2035 (NB/annualised equivalent patients). Within this, we expect injectable GLP-1s' patient share to decrease from 100% in 2025 to c.50% in 2030, with oral medications reaching c.45% share in 2030 and 50% by 2035 vs 0% in 2025. We expect injectable amylins to be used by c.5% of patients by 2030 and c.10% by 2035.

As such, we expect the ex-US market to reach c.$43bn in 2030 and c.$58bn in 2035. Within this, we assume an average price per dose of c.$275 in 2026, decreasing by a mid-single-digit percentage each year to 2030, and low-single-digit % to 2035.

Exhibit 11: We model >19mn ex-US ex-China obese patients taking AOMs by 2030 and >25mn by 2035
Total patients on GLP-1 therapy - ex-US ex-China (mn)

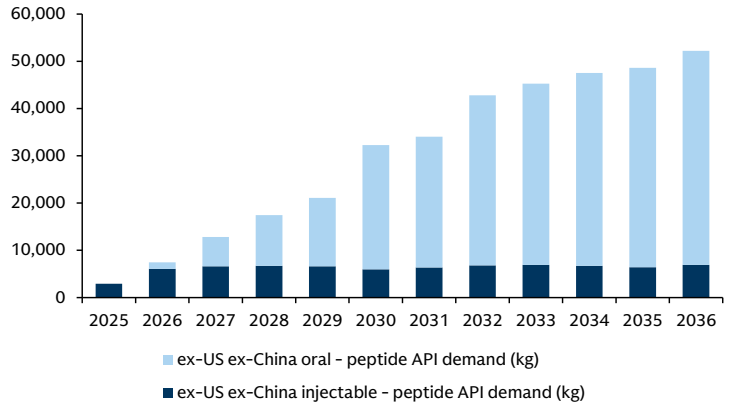


Source: Company data, Goldman Sachs Global Investment Research

Our base case is that c.32,000 kg of peptide will be required per year by 2030 to serve the ex-US ex-China obesity market

Using the same method as for the US market, we model the ex-US ex-China anti-obesity medication market requiring c.32,000 kg of peptide produced per year by 2030 and c.48,000 kg by 2035, vs c.2,900 kg in 2025. Per our estimates, the majority of this growth is driven by increased uptake of oral therapies. With oral medications requiring significantly more peptide per dose vs injectables, oral peptide medications most significantly drive the peptide uptake we model to 2030.

Exhibit 12: Our base case is that c.32,000 kg of peptide will be required per year by 2030 and c.48,000 kg by 2035 to serve the ex-US ex-China obesity market
Ex-US ex-China peptide API required (kg) - GLP-1 injectables and orals

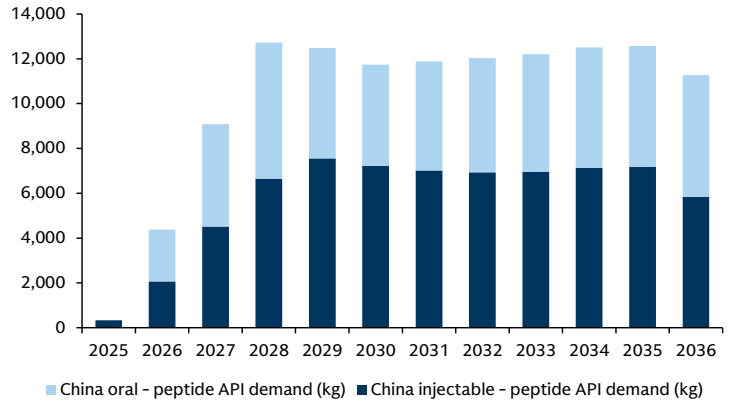


Source: Company data, Goldman Sachs Global Investment Research

Our base case is that c.12,000 kg of peptide will be required per year by 2030 to serve China's obesity market

Based on our China team's forecasts, we estimate that the Chinese anti-obesity medication market will require c.12,000 kg of peptide produced per year by 2030 and c.13,000 kg by 2035, vs <1,000 kg in 2025. Per our China team's forecasts, this is based on 3% penetration of GLP-1s in the obese/overweight population in China, and 14% of patients being on oral vs 86% on injectable therapy. However, if we assume a 45%/55% oral/injectable split as we expect in the ex-US region, this could lead to an increase in 90,000 kg of API required. Key determinants here will be price and the validity of the SNAC patents in China. If the patents hold, then there could be a generic market for only injectable semaglutide in China from 2027, although longer-term capacity requirements could significantly increase if the oral launches in a similar way to what we have seen in the US.

Exhibit 13: Our base case is that c.12,000 kg of peptide API will be required per year by 2030 and c.13,000 kg by 2035 to serve China's obesity market
China peptide API required (kg) - GLP-1 injectables and orals

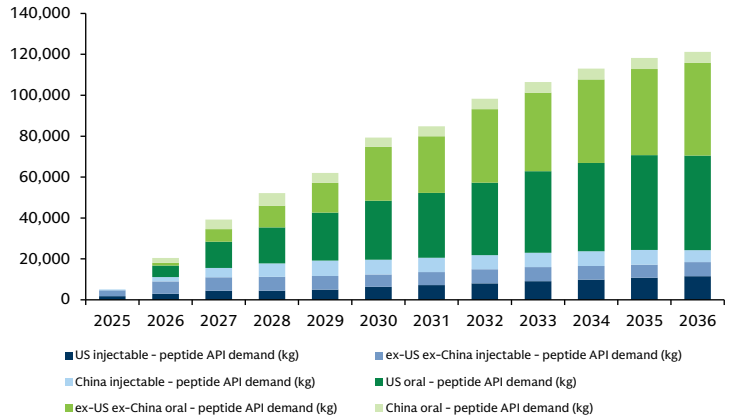


Source: Company data, Goldman Sachs Global Investment Research

Overall, our base case is that c.79,000 kg of peptide will be required per year by 2030 to serve the global obesity market

We expect c.79,000 kg of peptide API will be required per year by 2030 and c.118,000 kg by 2035, compared to c.5,000 kg in 2025. We expect the US to be the largest driver by region, requiring c.34,000 kg of peptide API in 2030. Across all regions, we expect an increased uptake of oral AOMs to drive growth in kg of API required to serve the global AOM market.

Exhibit 14: Overall, our base case is that c.79,000 kg of peptide will be required per year by 2030 and c.118,000 kg by 2035 to serve the global obesity market
Global peptide API required (kg) - GLP-1 injectables and orals



Source: Company data, Goldman Sachs Global Investment Research

For diabetes patients, we estimate that c.13,300 kg of peptide API would be required to serve the global diabetes market by 2030

For context, we estimate the kg of peptide API that could be required to treat the GLP-1 diabetes market.

We estimate there are c.6mn T2D patients treated with GLP-1s in the US as of 2025. This is based on 75% of T2D patients being treated, and 21% of those being treated with GLP-1s. Out to 2036, we assume a 2%yoy growth in the number of T2D patients, and a 1% increase in GLP-1 penetration. To estimate the kg of peptide API required, we assume an average dose of 1.5 mg per week for Ozempic, and 9.5 mg per week for Mounjaro, and assume a 40%/60% share split between ozempic/mounjaro, based on press reports. Accounting for 70% SPPS recovery rate and 10% overfill implies c.1,200 kg of peptide API would be required to serve the GLP-1 T2D patients in 2030 and c.1,600 kg in 2035 (Exhibit 15, Exhibit 16).

Exhibit 15: Accounting for 70% SPPS recovery rate and 10% overfill implies c.1,200 kg of peptide API would be required to serve the GLP-1 T2D patients in 2030 and c.1,600 kg in 2035

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Number of T2D patients	36	37	37	38	39	40	41	41	42	43	44	45
%yoy		2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
% of patients who are treated	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
GLP-1 market penetration	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%	31%	32%
T2D patients treated with GLP-1s	**6**	**6**	**6**	**7**	**7**	**8**	**8**	**9**	**9**	**10**	**10**	**11**
Number of TRx per year (mn)	68	73	78	83	88	93	99	104	110	116	122	129
Ozempic												
Number of TRx per year (mn)	27	29	31	33	35	37	39	42	44	46	49	52
% treated with Ozempic	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Average dose of Ozempic (mg/TRx)	6	6	6	6	6	6	6	6	6	6	6	6
70% SPPS recovery	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
10% overfill	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
mg API required per TRx	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
kg semaglutide API required per year - US T2D	**257**	**274**	**292**	**311**	**331**	**351**	**372**	**393**	**415**	**438**	**462**	**486**
Mounjaro												
Number of TRx per year (mn)	41	44	47	50	53	56	59	63	66	70	73	77
% treated with Mounjaro	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Average dose of Mounjaro (mg/TRx)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
70% SPPS recovery	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
10% overfill	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
mg API required per TRx	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
kg zepbound API required per year - US T2D	**609**	**651**	**694**	**739**	**785**	**833**	**882**	**933**	**986**	**1,040**	**1,097**	**1,155**
Total												
kg API required per year - US T2D	**866**	**925**	**987**	**1,050**	**1,116**	**1,184**	**1,254**	**1,326**	**1,401**	**1,479**	**1,558**	**1,641**

Source: Company data, International Diabetes Foundation, CDC, Goldman Sachs Global Investment Research

Exhibit 16: Accountingor 70% SPPS recovery rate and 10% over fill implies c.1,200 kg of peptide API would be required to serve the GLP-1 T2D patients in 2030 and c.1,600 kg in 2035

kg peptide API required per yearor GLP-1 patients - US T2D

We then apply the same assumptions to the global T2D market. Taking the same assumption that 75% of T2D patients are being treated (although we note that this is likely lower in many countries), we assume 8% GLP-1 penetration in line with Novo's commentary. Out to 2036, we assume 2%yoy growth in the number of T2D patients, and a 1% increase in GLP-1 penetration. To estimate the kg of peptide API required, we assume an average dose of 1.5 mg per weekor Ozempic, and 9.5 mg per weekor Mounjaro, and assume a 40%/60% share split between ozempic/mounjaro, based on press reports. Accountingor 70% SPPS recovery rate and 10% over fill implies c.13,300 kg of peptide API would be required to serve the GLP-1 T2D patients in 2030 and c.20,400 kg in 2035 (Exhibit 15, Exhibit 16).

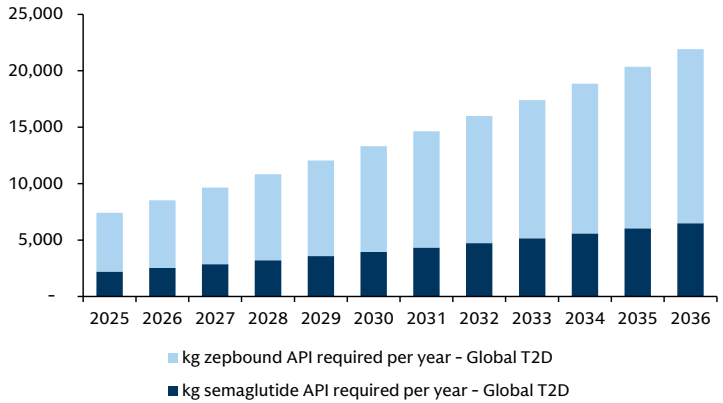
Exhibit 17: Accounting for 70% SPPS recovery rate and 10% overfill implies c.13,300 kg of peptide API would be required to serve the GLP-1 T2D patients in 2030 and c.20,400 kg in 2035

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Number of T2D patients	810	826	843	860	877	894	912	930	949	968	987	1007
%yoy		2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
% of patients who are treated	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
GLP-1 market penetration	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%
T2D patients treated with GLP-1s	**49**	**56**	**63**	**71**	**79**	**87**	**96**	**105**	**114**	**123**	**133**	**144**
Number of TRx per year (mn)	583	669	758	851	947	1,046	1,149	1,256	1,367	1,481	1,600	1,722
Ozempic												
Number of TRx per year (mn)	192	221	250	281	312	345	379	415	451	489	528	568
% treated with Ozempic	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%
Average dose of Ozempic (mg/TRx)	6	6	6	6	6	6	6	6	6	6	6	6
70% SPPS recovery	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
10% overfill	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
mg API required per TRx	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
kg semaglutide API required per year - Global T2D	**1,815**	**2,082**	**2,360**	**2,648**	**2,946**	**3,256**	**3,576**	**3,908**	**4,252**	**4,608**	**4,977**	**5,358**
Mounjaro												
Number of TRx per year (mn)	391	448	508	570	634	701	770	842	916	992	1,072	1,154
% treated with Mounjaro	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
Average dose of Mounjaro (mg/TRx)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
70% SPPS recovery	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
10% overfill	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
mg API required per TRx	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
kg zepbound API required per year - Global T2D	**5,833**	**6,694**	**7,586**	**8,512**	**9,471**	**10,466**	**11,496**	**12,564**	**13,669**	**14,814**	**15,999**	**17,226**
Total												
kg API required per year - Global T2D	**7,648**	**8,776**	**9,946**	**11,159**	**12,417**	**13,721**	**15,072**	**16,472**	**17,921**	**19,422**	**20,976**	**22,584**

Source: Company data, International Diabetes Foundation, CDC, Goldman Sachs Global Investment Research

Exhibit 18: Accounting for 70% SPPS recovery rate and 10% overfill implies c.13,300 kg of peptide API would be required to serve the GLP-1 T2D patients in 2030 and c.20,400 kg in 2035

kg peptide API required per year for GLP-1 patients - Global T2D



Source: Company data, International Diabetes Foundation, CDC, Goldman Sachs Global Investment Research

How much SPPS capacity is available for GLP-1 API production?

Summary

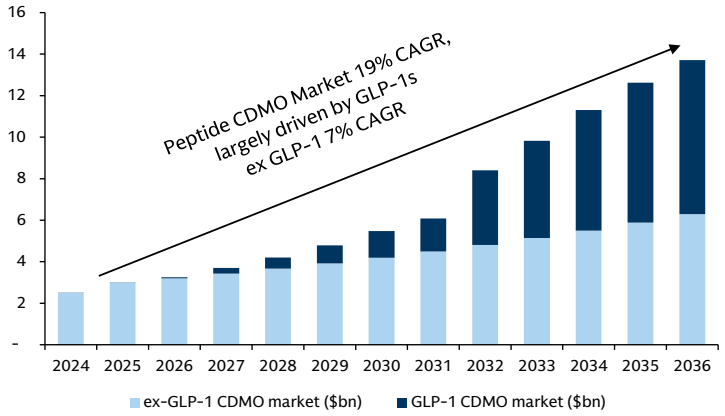
- We estimate the global peptide CDMO market will grow at a c.19% CAGR 2025-2036, driven by GLP-1s, with the underlying market growing at 7% CAGR
- Wuxi, AsymChem and other Chinese players comprise the majority of CDMO peptide manufacturing capacity
- We estimate that global SPPS API manufacturing capacity could increase to c.230,000 kg by 2030 – which will serve all peptides, not just AOMs

We expect the global peptide CDMO market to grow at a c.19% CAGR 2025-2036, driven by GLP-1s

Based on our API calculations laid out earlier in this note, we estimate that the global GLP-1 peptide CDMO market was <$1bn in 2025. However, we expect the GLP-1 CDMO market to grow to c.$3bn by 2030, driven by increased uptake of AOMs by obese patients over time. From 2030 to 2036, we expect this market to grow at a 32% CAGR, largely driven by the uptake of generic semaglutide injectable. Our market sizing calculations are based on our API calculations discussed earlier, while assuming c.2% inflation in rev/kg of GLP-1 API.

Assuming the underlying peptide market grows at a c.7% CAGR, this implies the global peptide CDMO market growing at a c.19% CAGR 2025-2036.

Exhibit 19: We expect the global peptide CDMO market to grow at a c.19% CAGR 2025-2036, driven by GLP-1s
Global Peptide CDMO Market ($bn)



Source: Company data, Goldman Sachs Global Investment Research

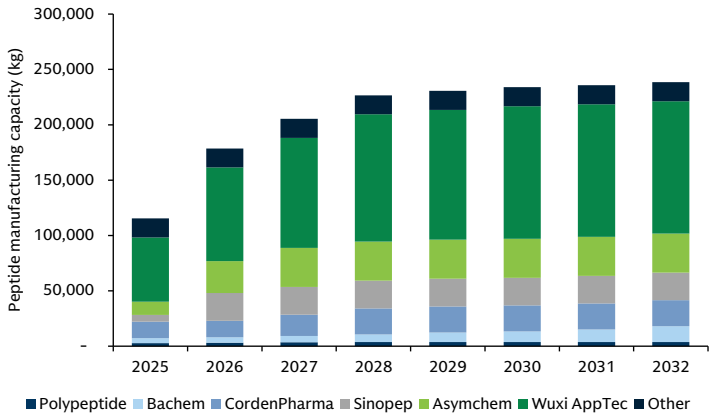
Wuxi AppTec, Asymchem and other Chinese players comprise the majority of peptide API manufacturing

Currently, the majority of peptide API volume comes from Eli Lilly and Novo Nordisk branded products. While Novo Nordisk produces all its API in-house, Eli Lilly has a combination of in-house API production and outsourcing to synthetic peptide API manufacturers/CDMOs, such as Wuxi AppTec's TIDES business.

In addition, compounded semaglutide has been produced by the Chinese peptide manufacturers such as Sinopep. Following recent capacity expansions (also discussed by our Asia research team here), some specifically for AOM peptide API, Wuxi AppTec, AsymChem and other Chinese players dominate the peptide API capacity, with Wuxi AppTec representing nearly 50% of global API SPPS capacity on our estimates.

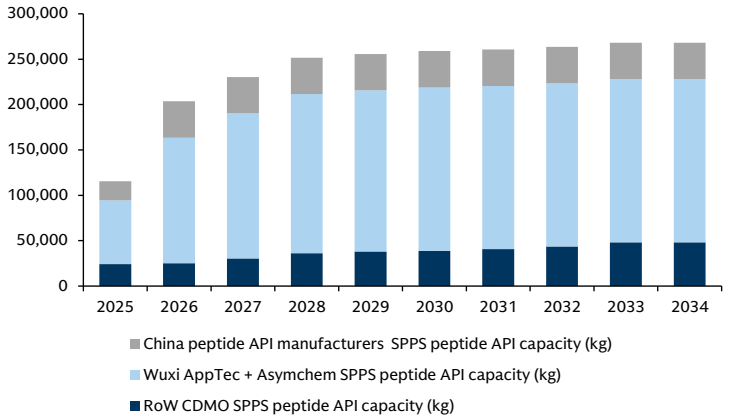
Overall, we estimate c.115,000 kg of global SPPS API manufacturing capacity in 2025 (Exhibit 20). We think that the majority of this capacity comes from Chinese players such as Asymchem and Wuxi AppTec. Similarly, based on announced company capacity plans, we expect these companies will drive 2026 market capacity increases yoy, and capacity additions out to 2030. While the companies have not shared the proportion of this capacity expected to be used for GLP-1 production, we expect the majority of this capacity expansion is driven by the anticipation of additional GLP-1 SPPS rather than the underlying SPPS market (Exhibit 21).

Exhibit 20: Wuxi AppTec, Asymchem and other Chinese players comprise the majority of CDMO peptide manufacturing
Global peptide API SPPS manufacturing capacity (kg)



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 21: We expect most of the growth in the peptide API market to be driven by Wuxi & Asymchem
Peptide API manufacturing capacity (kg) - Wuxi & Asymchem vs China peptide API manufacturers vs RoW CDMO



Source: Company data, Goldman Sachs Global Investment Research

We estimate that global SPPS API manufacturing capacity could increase to c.230,000 kg by 2030

Our bottom-up analysis of API manufacturing companies' capacity expansion plans implies that global SPPS API manufacturing capacity could increase to c.230,000 kg by 2030.

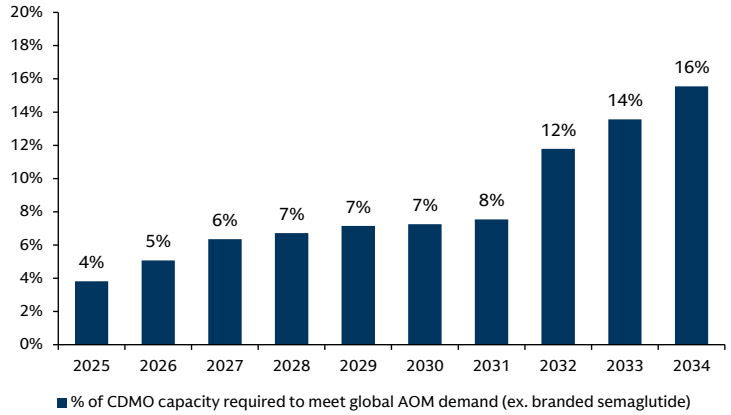
For the purpose of our analysis, we assume capacity remains broadly flat after 2030, given no expansion plans have yet been announced, and based on our discussions with API manufacturers – in addition, our calculations suggests that, as it stands, there should be sufficient capacity. Our analysis implies that the kg of API required to serve the global obesity market demand (ex branded semaglutide) would be equivalent to c.7% of SPPS API manufacturing capacity at CDMOs (global and China) in 2030, rising to c.16% by 2034. As highlighted above, we expect this to be mostly driven by China CDMO manufacturing capacity, vs RoW (Exhibit 21). We caveat that while we include tirzepatide in this analysis, we do not yet know how much in-house SPPS peptide API production capacity LLY has.

In addition, our estimate just relates to AOM therapies and does not include other peptide products in the market. However, for Polypeptide, 57% of revenues relate to metabolic markets (not disclosed by Bachem), which we believe is largely GLP-1s. For the capacity increases, our view is that the key drivers are WuXi AppTec and Asymchem that are positioning for AOM therapies in the future. This suggests low capacity utilisation across the global market, and that (i) the capacity levels are theoretical and are not yet online or can be mothballed fairly quickly; otherwise, this could significantly pressure margins, (ii) we are overestimating the recovery rate (i.e. it is lower than 70%), suggesting greater API production is required to satisfy current estimates of utilisation, (iii) the CDMOs expect greater demand or (iv) there is a risk of overcapacity. On the overcapacity point, we note that as Novo will have the lowest production cost, it could be difficult for the CDMOs / API producers to cut prices too much relative to the profitability.

However, we would highlight that this output is highly sensitive to our oral vs injectable market share estimate, given the significantly higher amount of API required per dose of oral AOM vs injectable. As a reminder, we model a c.45%/55% share of oral/injectables in the GLP-1 market by 2030. Furthermore, we would also caveat that the price/volume dynamic upon semaglutide's genericisation is still largely unknown (i.e. whether generic semaglutide comes into the market at a large discount, and drives significantly higher volumes, or not). As discussed below, we also think there are several additional factors which may constrain the amount of global SPPS capacity actually available for GLP-1 production.

Exhibit 22: Our analysis implies that the kg of API required to serve the global obesity market demand (ex branded semaglutide) would be equivalent to c.7% of SPPS API manufacturing capacity in 2030, rising to c.16% by 2034.

% of global CDMO SPPS peptide API manufacturing capacity required to meet global AOM demand (ex. branded semaglutide)



* does not include LLY's in house capacity

Source: Company data, Goldman Sachs Global Investment Research

Exhibit 23: We estimate peptide SPPS manufacturing capacity to grow to c.235,000kg in 2030

Peptide manufacturing capacity by company (kg) - 2025 and 2030

Estimated peptide SPPS manufacturing capacity (kg)	2025	2030
Polypeptide	2,862	3,650
Bachem	4,393	9,665
CordenPharma	15,000	25,000
Divi's Lab	2,069	23,500
Sinopep	6,000	119,609
Wuxi AppTec	58,000	35,284
Asymchem	12,000	2,069
Hybio Pharma	5,000	5,000
Duo Rui Pharma	3,000	3,000
Shenzhen JYMed	2,000	2,000
BrightGene Bio-Med	1,400	1,400
Snbiopharm	1,250	1,250
Chinese Peptide	500	500
Fengrun Pharma	500	500
Mingtai Biotech	485	485
Genor BioPharma	476	476
Changzhou Pharma	380	380
Peptides Biotech	150	150
Total peptide SPPS manufacturing capacity (kg)	**115,465**	**233,918**

Blue = China, Grey = RoW

Source: Company data, Goldman Sachs Global Investment Research (2030)

What are the key additional constraints to global SPPS API capacity?

Summary

- We expect the majority of CDMOs to focus on branded AOM production
- We expect GLP-1s to drive a 1pp/3pp uplift in growth of the multi-dose pen/autoinjector market
- Will the API produced be GMP compliant?
- How could the supply/demand balance outlook change with oral/injectable market share evolution?
- How will the increasingly consumer-focused aspect of the obesity market impact its evolution?

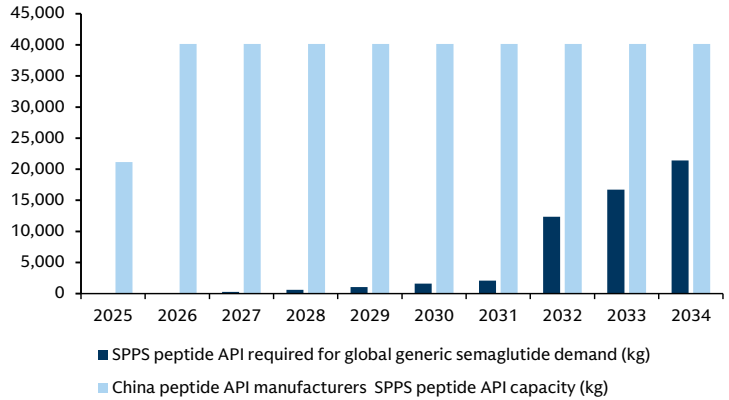
We expect the majority of CDMOs to focus on branded AOM production

We expect the majority of CDMOs to focus on producing branded AOMs over generic versions.

We expect CDMOs will be more focused on having a diverse portfolio of production contracts, and extending their relationships with large pharmaceutical companies to sustain multi-year, multi-asset, diverse revenue streams.

As such, just taking the SPPS production capacity available from Chinese API manufacturers (not strategic CDMO partners) that we expect to produce the majority of the generic semaglutide globally vs. our modelled estimates for total generic semaglutide API (across both injectable and oral semaglutide generics) implies that upon semaglutide patent expiry by 2032, the peptide API required for generic semaglutide is likely to represent around 50% capacity utilisation at the Chinese API suppliers. However, we would highlight that this representation does not include i) Chinese CDMO players branching into the generic space and ii) CDMO / generic peptide API manufacturing in regions other than China.

Exhibit 24: Chinese API suppliers (non-CDMO) appear to have increased capacity well in advance of the semaglutide patent expiry and could be approaching c.50% capacity utilisation by 2034 - although this will likely be lower once Indian/ Brazilian generic manufacturing capacity is factored in



Source: Company data, Goldman Sachs Global Investment Research

However, if the China-based CDMOs that have significant plans to increase capacity were to produce generic GLP-1 product, there could be significant capacity available, depending on how the underlying demand had progressed and to what extent these suppliers were already utilised.

However, while we expect the Chinese API manufacturers to be the bulk of generic semaglutide production, **we would expect a large portion of that capacity will also be in preparation for tirzepatide's patent expiry in 2036**. We note that per dose, tirzepatide requires >4-6x as much API on average as injectable semaglutide (15 mg vs. 2.4 mg at the highest doses). Therefore, over the long term, we would expect the actual amount of available API capacity to be restricted by some producers preparing capacity for generic tirzepatide production, given the popularity of and extra API requirement of tirzepatide vs semaglutide. However, we note that oral semaglutide will likely still drive the majority of peptide API required, assuming a 50/50 oral/injectable share in the AOM market.

We expect GLP-1s to drive a 1pp/3pp uplift in growth of the multi-dose pen/autoinjector market

Another key consideration in the expanding AOM market is the delivery devices. Some generics in India have launched in vial format, as did the compounded semaglutide imported into the US and Zepbound vial option. However, we believe as the market continues to develop, pen based delivery will remain key (autoinjectors or multi-use pens).

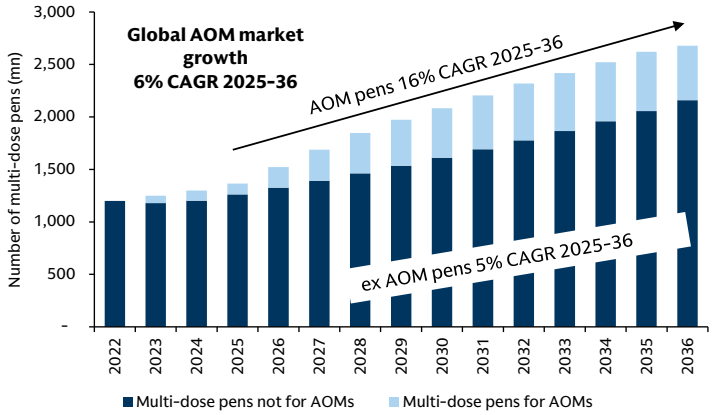
For our analysis, we assume that

1. all ex-US injectable AOMs are delivered in multi-dose pens (4 doses/pen)
2. 75% of US injectable AOMs are delivered in autoinjectors (1 dose/pen), and 25% are stored in multi-dose pens.

Per Ypsomed, in 2024 the global market stood at c.1,300 multi-dose pens and c.600mn autoinjectors. Applying these assumptions to our obesity market patient estimates implies the global market will grow at a 16% CAGR for multi-dose pens (Exhibit 25) and a 14% CAGR for autoinjectors (Exhibit 26) for 2025-2036. Assuming pens for other non AOM medications grow in line with the broader pharma market at c.5% per annum, this implies that GLP-1s will give a 1pp uplift to the multi-dose pen market growth CAGR, and a 3pp uplift to the autoinjector market growth CAGR 2025-36.

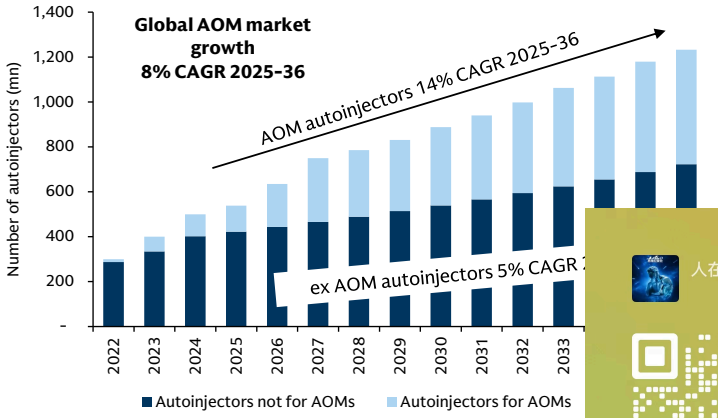
While we do not have visibility on the future manufacturing capacity of multi-dose pens/injectors by company, we expect this excess demand to be absorbed by the market.

Exhibit 25: We expect the global multi-dose pen market to grow at c.6% CAGR 2025-36, driven by GLP-1s
Global multi-dose pen market (mn)



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 26: We expect the global autoinjector market to grow at c.8% CAGR 2025-36, driven by GLP-1s
Global autoinjector market (mn)



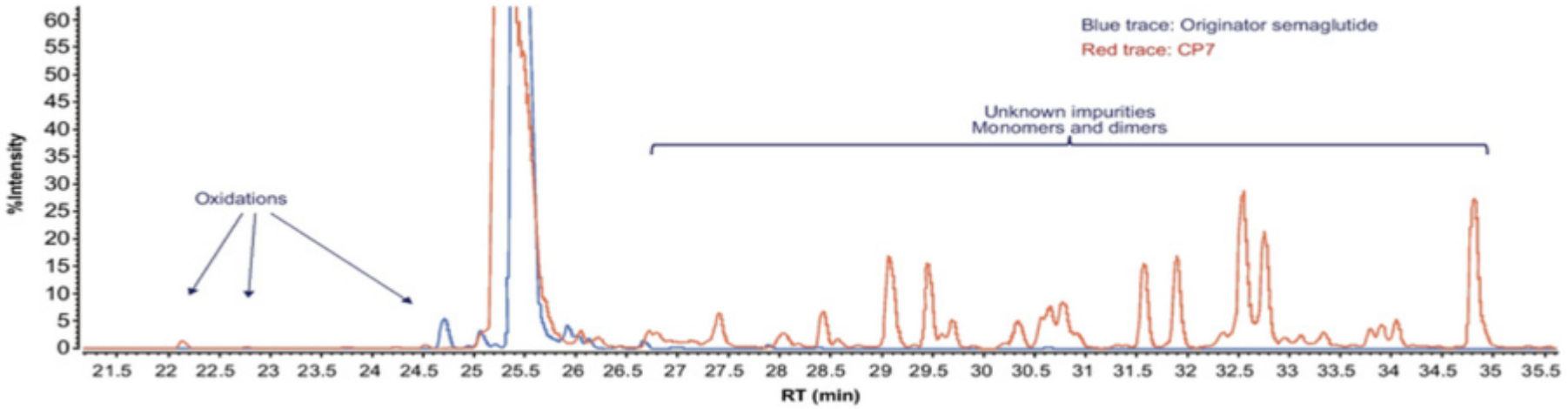
Source: Company data, Goldman Sachs Global Investment Research

Will the API produced be GMP compliant?

As of 2026, the GMP compliance status of the majority of SPPS API production capacity expected to come online over the medium term is not clear. During the period of compounded semaglutide in the US in 2024/25, Novo Nordisk highlighted the greater purity of its fermentation-produced semaglutide in comparison to compounded semaglutide produced by SPPS, as shown in Exhibit 27. However, we note that per an analysis of compounded vs. branded AOMs published in Nature (see here), there appear to be only limited differences in the adverse profile shown between branded Wegovy and compounded semaglutide (Exhibit 28). We suspect that this varies between producers and concerns still sit among those in the industry, as demonstrated at ADA last year (our note here), where the main concerns expressed by KOLs regarding compounded GLP-1s were: i) issues with quality and presence of impurities, and ii) inconsistent dosing, such that if a patient switched from unbranded to branded product, this could require a re-titration of risk potential adverse events if the compounded doses were inconsistent.

Despite this, our view is that even if it were the case that a manufacturer's GLP-1 production capacity was not initially GMP compliant, we note that generic semaglutide producers have several years until the majority of semaglutide patent expires to refine their manufacturing processes to ensure GMP compliance. Therefore, while questions remain on GMP compliance of the capacity coming online, and visibility is inherently low, this may not constrain SPPS API capacity over the medium/long term.

Exhibit 27: LC-MS analysis - compounded vs branded semaglutide
Compounded vs branded semaglutide



Source: Nature

Exhibit 28: A recent nature study implies limited differences in the AE profile between branded and compounded semaglutide (although the sample size is relatively small)

Demographics and treatment response characteristics of study population

	All study participants	Ozempic	Wegovy	Compounded semaglutide	Mounjaro	Zepbound	Compounded tirzepatide
Sample size, n	27,885	11,971	3,821	3,777	4,650	2,321	1,345
Percent of total	100%	42.90%	13.70%	13.50%	16.70%	8.30%	4.80%
Median age (s.d.)	52 (13.4)	53 (13.9)	49 (12.8)	49 (12.8)	54 (13.0)	50 (12.8)	50 (12.4)
Female, n (%)	22,977 (82.4%)	9,664 (80.7%)	3,221 (84.3%)	3,302 (87.4%)	3,710 (79.8%)	1,903 (82.0%)	1,177 (87.5%)
Ancestry							
European, n (%)	21,822 (78.3%)	9,102 (76.0%)	2,980 (78.0%)	3,038 (80.4%)	3,738 (80.4%)	1,869 (80.5%)	1,095 (81.4%)
Latino, n (%)	3,604 (12.9%)	1,741 (14.5%)	457 (12.0%)	464 (12.3%)	537 (11.5%)	240 (10.3%)	165 (12.3%)
African American, n (%)	1,174 (4.2%)	526 (4.4%)	208 (5.4%)	119 (3.2%)	188 (4.0%)	102 (4.4%)	31 (2.3%)
Other, n (%)	1,285 (4.6%)	602 (5.0%)	176 (4.6%)	156 (4.1%)	187 (4.0%)	110 (4.7%)	54 (4.0%)
Efficacy							
Median pre-treatment BMI, kg/m^2 (s.d.)	35.1 (7.6)	35.3 (7.8)	36.0 (7.0)	33.1 (7.0)	36.2 (7.9)	35.6 (7.1)	32.4 (7.2)
Median pre-treatment weight, kg (s.d.)	98.4 (23.7)	99.8 (24.2)	99.8 (22.6)	91.6 (21.4)	101.6 (24.7)	99.8 (22.3)	89.8 (22.3)
Median months on treatment (s.d.)	8.3 (10.2)	10.0 (12.7)	7.6 (8.2)	6.3 (6.1)	10.6 (7.9)	5.6 (4.3)	7.3 (5.9)
Mean dose, mg (s.d.)	N/A (N/A)	1.1 (0.7)	1.5 (0.8)	0.9 (0.6)	8.4 (4.1)	7.4 (3.8)	7.5 (4.0)
Median post-treatment BMI, kg/m^2 (s.d.)	30.2 (7.4)	30.8 (7.6)	31.0 (7.0)	29.1 (6.8)	29.8 (7.6)	30.3 (6.9)	27.6 (6.7)
Median post-treatment weight, kg (s.d.)	84.4 (22.8)	86.2 (23.5)	86.2 (22.2)	81.2 (20.6)	84.4 (23.5)	84.4 (21.6)	77.1 (20.6)
Median BMI change, kg/m^2 (s.d.)	-4.1 (3.7)	-3.7 (3.6)	-4.3 (3.8)	-3.5 (3.1)	-5.3 (4.3)	-4.6 (3.6)	-4.1 (3.3)
Median % change BMI (s.d.)	-11.7% (9.5)	-10.7% (9.2)	-11.9% (9.6)	-10.5% (8.4)	-15.1% (10.5)	-13.1% (9.1)	-12.8% (8.9)
Reason for treatment							
To improve blood sugar, n (%)	10,689 (23.1%)	5,315 (28.9%)	684 (12.1%)	667 (12.6%)	2,497 (32.2%)	409 (11.4%)	273 (13.4%)
To reduce cardiovascular risk, n (%)	7,180 (15.5%)	2,628 (14.3%)	1,041 (18.4%)	789 (14.9%)	1,189 (15.3%)	692 (19.3%)	367 (18.0%)
For weight loss, n (%)	26,799 (57.8%)	9,892 (53.8%)	3,712 (65.5%)	3,661 (69.0%)	3,794 (49.0%)	2,281 (63.5%)	1,310 (64.1%)
Other, n (%)	1,671 (3.6%)	544 (3.0%)	230 (4.1%)	190 (3.6%)	269 (3.5%)	210 (5.8%)	94 (4.6%)
Moderate / severe side effects							
Constipation, n (%)	7,612 (27.3%)	3,189 (26.6%)	1,150 (30.1%)	1,069 (28.3%)	1,167 (25.1%)	553 (23.8%)	300 (22.3%)
Diarrhea, n (%)	3,461 (12.4%)	1,636 (13.7%)	458 (12.0%)	423 (11.2%)	515 (11.1%)	208 (9.0%)	102 (7.6%)
Nausea, n (%)	7,006 (25.1%)	3,165 (26.4%)	1,110 (29.0%)	991 (26.2%)	897 (19.3%)	456 (19.6%)	193 (14.3%)
Vomiting, n (%)	2,353 (8.4%)	1,187 (9.9%)	405 (10.6%)	284 (7.5%)	253 (5.4%)	109 (4.7%)	34 (2.5%)
Loss of appetite, n (%)	16,417 (58.9%)	5,918 (49.4%)	2,352 (61.6%)	2,344 (62.1%)	2,980 (64.1%)	1,627 (70.1%)	912 (67.8%)
Unpleasant taste sensation, n (%)	2,132 (7.6%)	981 (8.2%)	302 (7.9%)	253 (6.7%)	316 (6.8%)	143 (6.2%)	75 (5.6%)
Stomach pain, n (%)	3,492 (12.5%)	1,702 (14.2%)	454 (11.9%)	445 (11.8%)	484 (10.4%)	189 (8.1%)	105 (7.8%)
Loss of pleasure from eating, n (%)	7,180 (25.7%)	2,723 (22.7%)	1,032 (27.0%)	957 (25.3%)	1,303 (28.0%)	641 (27.6%)	375 (27.9%)
Muscle Weakness, n (%)	2,277 (8.2%)	1,027 (8.6%)	294 (7.7%)	296 (7.8%)	348 (7.5%)	159 (6.9%)	94 (7.0%)
Facial skin sagging ('Ozempic face'), n (%)	1,204 (4.3%)	554 (4.6%)	144 (3.8%)	109 (2.9%)	240 (5.2%)	70 (3.0%)	58 (4.3%)
Sagging skin around buttocks ('Ozempic butt'), n (%)	2,202 (7.9%)	852 (7.1%)	291 (7.6%)	233 (6.2%)	479 (10.3%)	181 (7.8%)	132 (9.8%)

Source: Nature

How could the supply/demand balance outlook change with oral/injectable market share evolution?

In April, our China team estimated (see here) that per y/e 2025 China's API peptide capacity could serve 400mn patients taking semaglutide for 6 months per year. This calculation was based on the assumption of 25,000 kg available peptide API capacity, all weekly semaglutide doses being 2.4 mg, and no account for SPPS recovery rate (%) or overfill requirements.

Below, we build on that analysis to show our expectation for the number of patients that could be served in 2033, when semaglutide's patent would have expired (Exhibit 29). Once accounting for SPPS recovery rate (%) and overfill requirements, our analysis implies that c.900mn patients taking 2.4 mg semaglutide could be served by available China peptide API manufacturers' capacity in 2033.

However, c.90mn Wegovy pill patients could be served by the same capacity, assuming an average dose of 6 mg (doses available are 1.5 mg-25 mg). Assuming a 50% wegovy pill/50% wegovy injectable share implies c.164mn patients could be served by China peptide API manufacturers' capacity in 2033, which equates to around 10% of the total Obesity global addressable population.

Exhibit 29: We present below scenarios for the number of patients who could be served by the China peptide API manufacturers' capacity in 2033
Scenario analysis based on global peptide API capacity - number of semaglutide patients per year

2025 - per our China team							
	Pharma and biotech global API SPPS manufacturing capacity (kg) - 2025	Average semaglutide dose (mg per week)	Average time on therapy (years)	Average semaglutide per patient per year (mg per year)	70% SPPS recovery	10% overfill	Implied number of semaglutide patients per year (mn)
China API peptide capacity (kg)	25,000	2.4	0.5	62			401

2033 - Calculations							
China peptide API manufacturers' capacity	China peptide API manufacturers' caapcity (kg) - GSe 2033	Average semaglutide dose (mg per week)	Average time on therapy (years)	Average semaglutide per patient per year (mg per year)	70% SPPS recovery	10% overfill	Implied number of semaglutide patients per year (mn)
Wegovy injectable 2.4mg	88,251	2.4	0.5	62	89	98	900
Wegovy injectable high dose 7.2mg	88,251	7.2	0.5	187	267	294	300
Wegovy pill - 6mg average dose	88,251	24	0.5	624	891	981	90
Assuming 50% Wegovy pill, 50% 2.4mg injectable	**88,251**	**13.2**	**0.5**	**343.2**	**490**	**539**	**164**

Source: Company data, Goldman Sachs Global Investment Research

How will the increasingly consumer-focused aspect of the obesity market impact its evolution?

As previously discussed, we expect DTC growth in the US market to be driven largely by oral AOMs given i) the lower price point and ii) the "easier" formulation for patients to take. However, we think the key unknown regarding the consumer obesity market remains to what extent there is price elasticity of demand for obesity products.

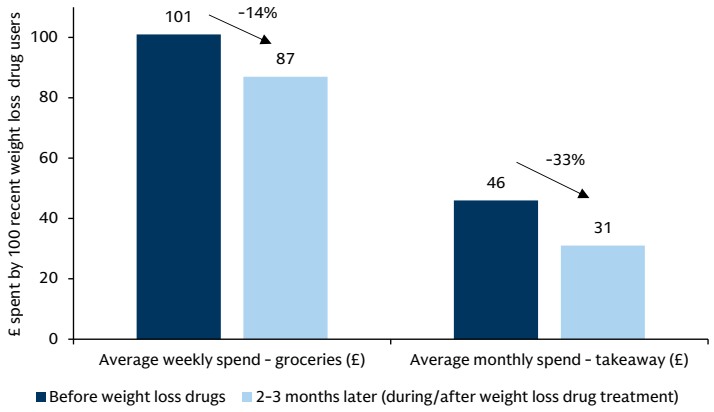
As we noted in our recent prescription data analysis, Wegovy pill has been taking a large share of NBRx, and we expect this to slowly be reflected in TRx over the course of the year. However, it is yet unknown which of i) lower price point (in 1Q26, Wegovy pill was at a c.65% net price/TRx discount to the injectable - Exhibit 33), ii) ease of formulation and iii) lower but still satisfactory weight loss in the consumers' eyes, are the key drivers of the rapid uptake of Wegovy pill. In addition, it is estimated that c.25% of adults experience needlephobia. While we do not know to what extent this has driven volume uplift of Wegovy pill, 25% of Wegovy injectable prescriptions equates to c.50% of weekly Wegovy pill TRx in May (Exhibit 32). Applying a 60% IQVIA capture rate to the remainder implies that c.440,000 patients, who are incremental to the injectable TAM, are taking Wegovy pill, as a result of a 65% net price decline.

Given these unknowns, going forward, we will be particularly looking out for any data on:

- Cash savings for consumers from taking GLP-1s e.g. lower grocery spending, but more likely savings on other discretionary expenditure (restaurant spending, alcohol etc). Per a YouGov survey published in March 2026 (Exhibit 30), the average weekly grocery spend by patients on weight loss drugs decreases to £87 per week from £101 per week after 2-3 months of GLP-1 use. Similarly, the average monthly spend on takeaways decreases from £46 per month to £31 per month - suggesting a 'break-even point' of around £69 per month for Obesity medication based purely on food savings (ignoring benefits of better physical health, mental health, well being etc). However, we note that this survey only included 100 participants, who had been on medication for 2-3 months, and was only conducted in the UK.
- Stay time on therapy (which appears to be around 7-8 months currently), and cycling on/off therapies,
- Microdosing, in order to get a better understanding of how the average consumer intends to use these AOM products,
- Brand loyalty, i.e. whether consumers are drawn to purchasing Wegovy or products in the Wegovy family vs generic companies' brand names due to reputation of/attachment to the brand Novo has built.

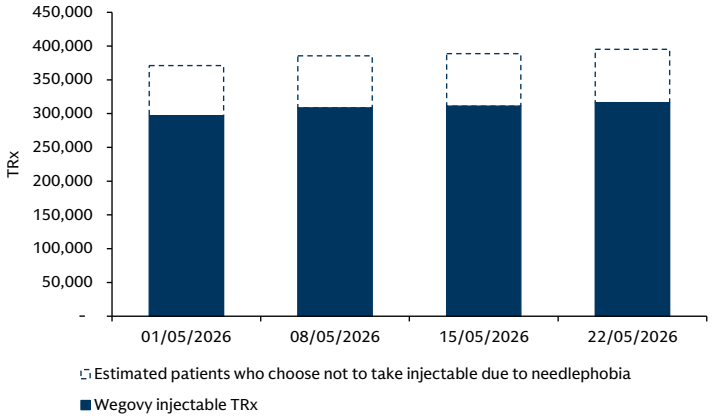
With limited data so far, we think any incremental information/data points will be key to tracking the evolution of the market going forward.

Exhibit 30: Based on a recent YouGov survey, patients spend significantly less on grocery shopping and takeaways when taking GLP-1s
£ spent by 100 recent weight loss drug users - before and 2-3 months after starting weight loss drug treatment



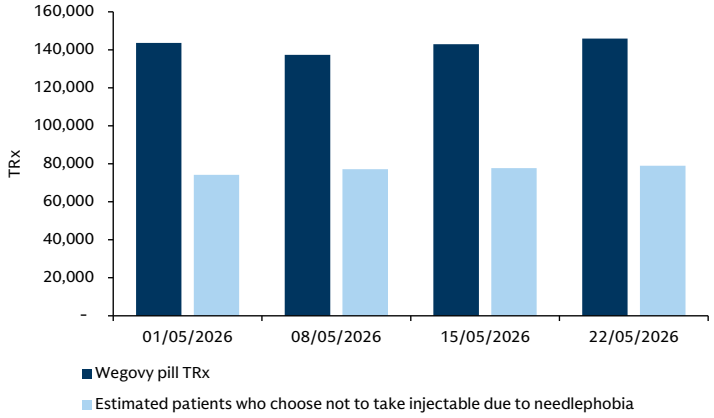
Source: YouGov.com

Exhibit 31: c.25% of adults have needlephobia
Estimated patients who choose not to take injectable due to needlephobia vs Wegovy pill TRx



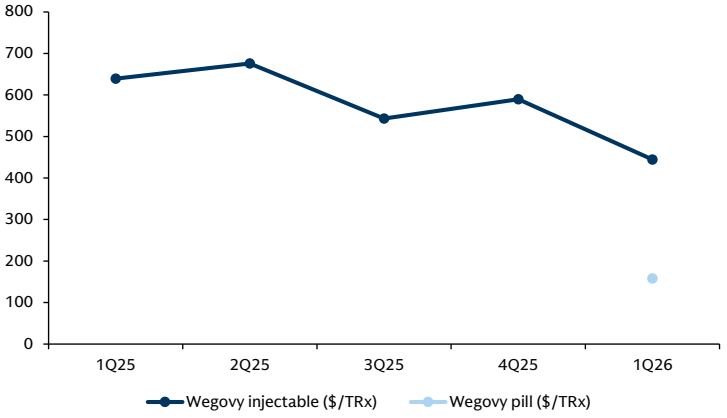
Source: IQVIA, Goldman Sachs Global Investment Research

Exhibit 32: It is not yet clear to what extent these patients are driving Wegovy pill TRx growth, assuming full uptake of this group would imply they are c.50% of weekly Wegovy pill TRx
Estimated patients who choose not to take injectable due to needlephobia vs Wegovy pill TRx



Source: IQVIA, Goldman Sachs Global Investment Research

Exhibit 33: In the first quarter of launch, Wegovy pill was at a c.65% net price/TRx discount to the injectable
Wegovy injectable ($/TRx) vs Wegovy pill ($/TRx)



Source: Company data, IQVIA, Goldman Sachs Global Investment Research

There are several additional factors that could limit SPPS API capacity that we are tracking

We highlight several additional considerations we are tracking for the global GLP-1 API production market in the table below.

Exhibit 34: There are several additional factors that could limit SPPS API capacity that we are tracking

Question	Comment
What proportion of peptide production is secured for medication in therapeutic areas ex obesity?	Based on our conversations, Western CDMOs intend to hedge their exposure to GLP-1s through maintaining contracts for medications i) for other therapeutic areas and ii) from large pharmaceutical companies not involved in GLP-1s.
Is there sufficient fill and finish capacity to support GLP-1 API expansion?	While we do not have an estimate for existing GLP-1 fill-and-finish capacity, we expect the ramp for fill-and-finish capacity to take time. For example, Gland Pharma (covered by Shyam Srinivasan) say that while they expect the company's fill-and-finish capacity to reach c.140mn by units by y/e 2027, they only expect to actually complete c.15-20mn units, with the production ramp up taking several years.
How long will it take to ramp capacity?	Per our CDMO coverage, we note that it typically takes c.3-4 years to build a CDMO facility, and c.3-4 years to fill it.
Where is this capacity based?	Per our conversations, some CDMOs suspect Western CDMOs may be preferred over CDMOs in other regions by Western companies. We also note geopolitical tensions rising/loosening could impact preferred production locations.

Source: Goldman Sachs Global Investment Research

What will the cost per unit be for SPPS API production vs Novo Nordisk's fermentation process?

We believe that Novo's substantial investment in fermentation capacity expansion will drive lower unit cost production vs generics' SPPS

We believe generic manufacturers will only manufacture GLP-1s via synthetic methods given the upfront investment required and lower volumes, relative to Novo. CDMO and API suppliers have already started to invest in SPPS infrastructure ahead of the semaglutide patent expiration and with an eye on the tirzepatide patent expiration in the mid-long term. While SPPS is the more expensive manufacturing methodology vs. fermentation at scale, the volume opportunity could still be vast.

Given this, and based on our conversations with peptide manufacturers, we believe that Novo will have a significant cost advantage vs competition through its fermentation manufacturing network. Novo has spent $28bn in CapEx over the last decade, and since 2021, the company has announced c.$21bn in further CapEx to support their GLP-1 franchise. We see this as advantageous for Novo given that i) volume of capex, we believe, will be difficult for other companies to replicate (and per Novo, an API facility typically takes >5 years to construct, while fill-and-finish facility typically takes >3 years), ii) the scale of Novo's network results in significant economies of scale so cost per unit is low, and iii) Novo's manufacturing expertise is superior to other players'.

Exhibit 35: Novo has spent $28bn on capex over the last decade, and since 2021, the company has announced c.$21bn in further CapEx to support their GLP-1 franchise.
GLP-1 related capacity announcements from Novo Nordisk (2021-2026)

Date announced	Location	Function	Investment (DKK bn)	Investment (USD bn)
API				
Dec-21	Kalundborg, Denmark	Mainly API	17	3
Nov-22	Bagsvaerd, Denmark	Clinically API	5	1
Jun-23	Hillerod, Denmark	Mainly API	16	2
Nov-23	Kalundborg, Denmark	Mainly API	42	6
Oral Portfolio				
Dec-23	Athlone, Ireland	Oral Portfolio	1	0
Mar-26	Athlone, Ireland	Oral Portfolio	3	0
Fill Finish/Finished Production				
Nov-23	Chartres, France	Fill Finish	16	2
Jun-24	Clayton, US	Fill Finish	27	4
Dec-24	Odense, Denmark	Finished Production	9	1
Total			136	21

Source: Company reports, Goldman Sachs Global Investment Research

Cost of production for injectable semaglutide

We present scenarios for the cost of injectable semaglutide production for i) generic SPPS, and ii) fermentation, laying out our assumptions by line item. Our conversations with suppliers suggest that at scale, the cost of production of semaglutide by SPPS has fallen from around $500/gram to around $150/gram. We believe Novo is lower than this, in the region of $75-100/gram. In addition, at the 2024 CMD, Novo highlighted that it typically achieves 10% productivity improvements each year.

In our base case, we estimate that the cost per pen of generic semaglutide would be c.$9 per pen. In our low-cost case, we think the cost could reach as low as $4 per pen (assuming unlimited capacity), while in our high-cost case, we think the cost could be c.$18/pen. On a COGS basis, our base case is for the cost per pen of generic semaglutide to be c.$5.

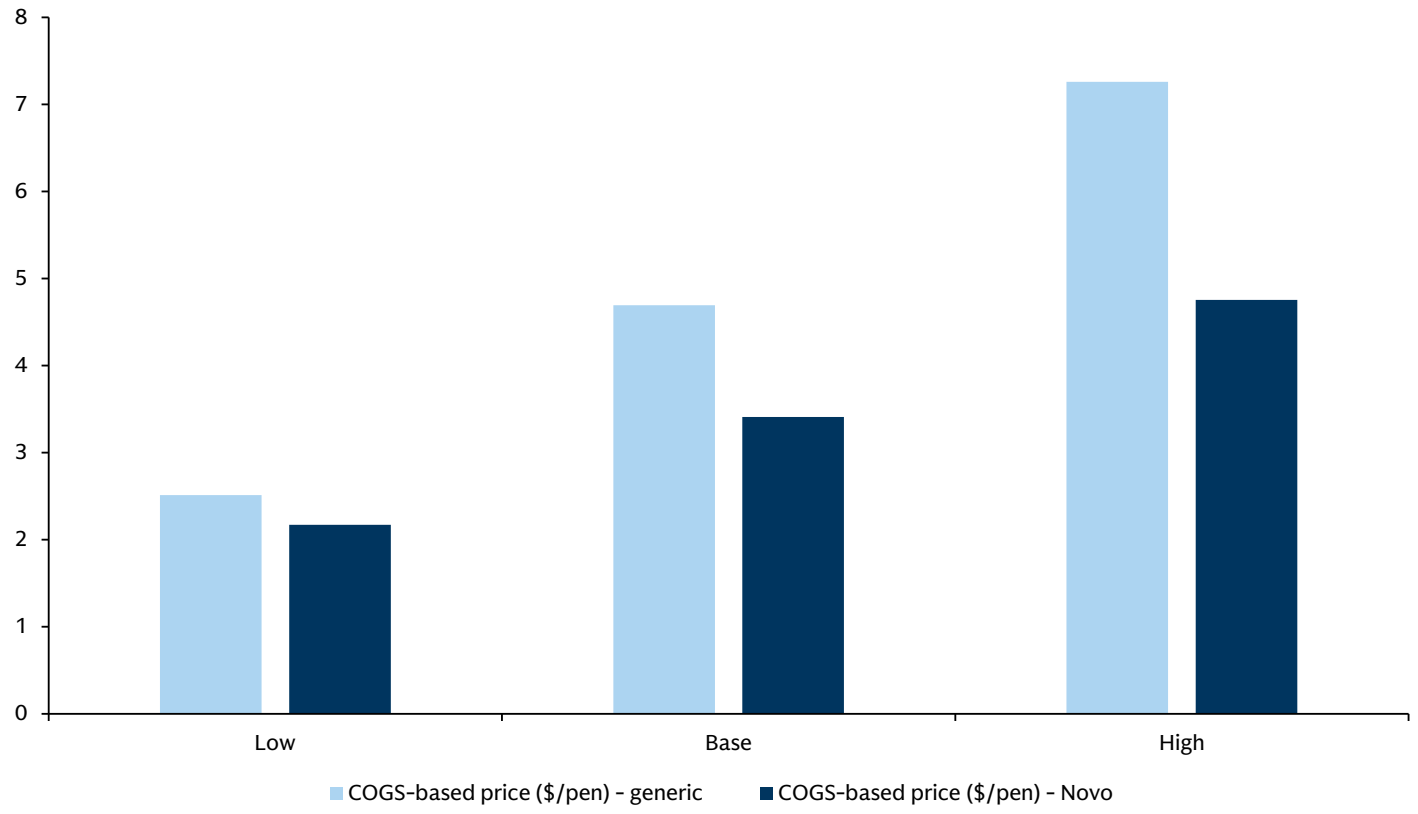
Meanwhile, we expect the cost per pen for Novo could be at c.$3.5/pen, given that Novo benefits from i) economies of scale in the production of API via fermentation, and ii) not having to pay additional margin to a third party (we expect most generic manufacturers will need to outsource API production). In our low-cost case, we think the cost could reach as low as $2 per pen (assuming unlimited capacity), while in our high-cost case, we think the cost could be c.$5/pen.

Exhibit 36: In our base case, we estimate that the cost per pen of injectable wegovy could be as low as $3.5...
Semaglutide ($/pen)

Cost-based price - semaglutide ($/pen)	SPPS - pen			Novo Fermentation - Pen		
	Low	Base	High	Low	Base	High
Cost semaglutide API ($/g)	75	150	250	37.5	75	125
Over fill ($/g)	7.5	15	25	3.75	7.5	12.5
Average generic semaglutide dose (mg)	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*	*1.7*
API ($/pen)	0.6	1.1	1.9	0.3	0.6	0.9
API manufacturer margin (assuming outsourced)	0.6	1.1	1.9	0.0	0.0	0.0
Cost of the actual pen ($/pen)	1.0	1.5	2.0	1.5	2.0	2.5
Fill and finish ($/pen)	0.2	0.6	1.0	0.2	0.5	0.8
D&A	0.2	0.4	0.5	0.2	0.4	0.5
COGS ($/pen)	**2.5**	**4.7**	**7.3**	**2.2**	**3.4**	**4.8**
Gross margin for pharma company (%)	40%	50%	60%			
Cost-based price ($/pen)	**4.2**	**9.4**	**18.2**			

Source: JAMA, Company data, Goldman Sachs Global Investment Research

Exhibit 37: ...vs $5/pen for generic semaglutide
COGS-based price - semaglutide ($/pen)



Source: JAMA, Company data, Goldman Sachs Global Investment Research

Cost of production for oral semaglutide

We present scenarios for the cost of oral semaglutide production for i) generic SPPS, and ii) fermentation, laying out our assumptions by line item. Industry data suggests that tableting cost can range from $0.01-0.05; however, we have assumed that this could be closer to $0.05-0.25 per pill to account for the SNAC absorption enhancer.

In our base case, we estimate that the cost of generic semaglutide would be c.$225 per 30 pills. In our low-cost case, we think the cost could reach as low as $72 per 30 pills (assuming unlimited capacity), while in our high-cost case, we think the cost could be c.$523/30 pills. This is driven largely by the higher API cost, which could make it difficult for generic companies to make as strong a margin from generic oral semaglutide, unless the API cost comes down in the future. On a COGS basis, our base case is for the cost per 30 pills of generic semaglutide to be c.$113.

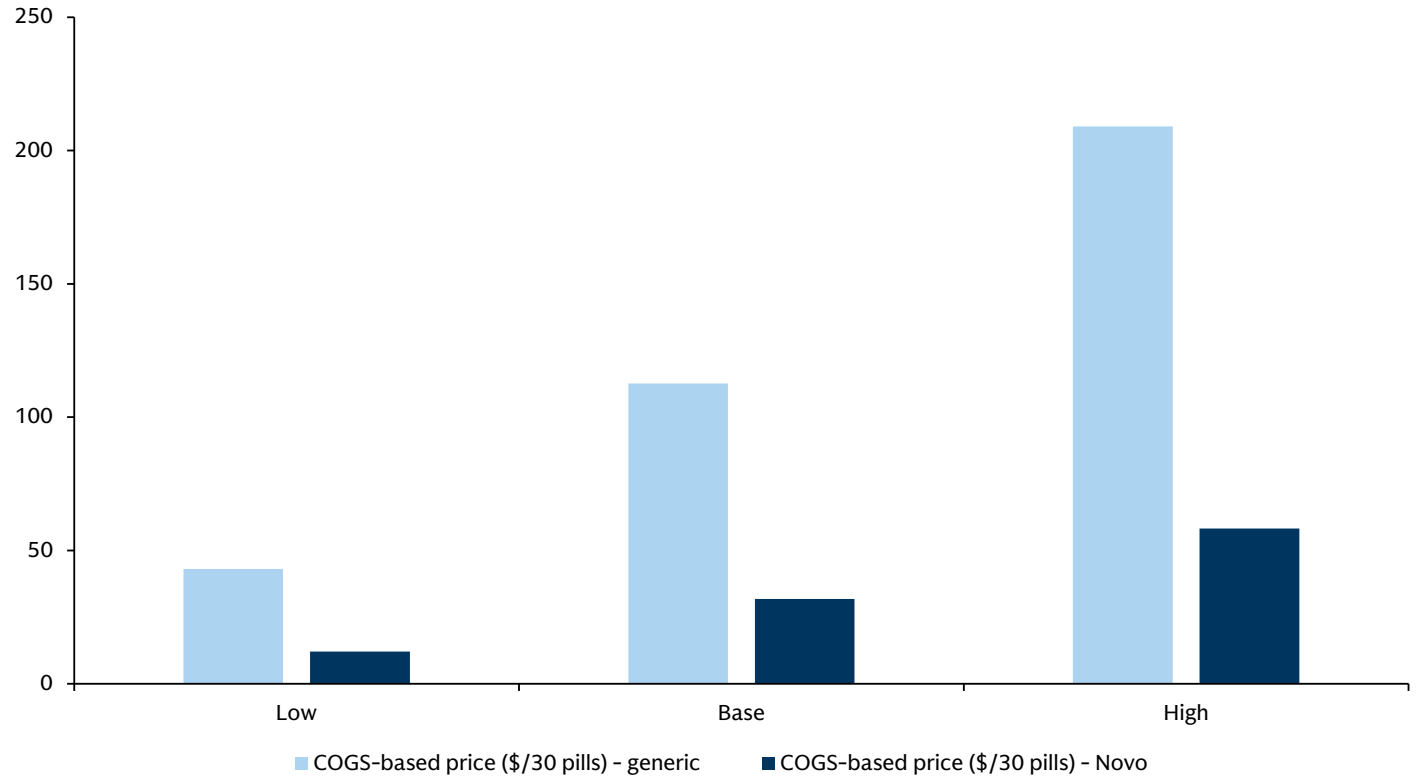
Meanwhile, we expect the cost for Novo could be at c.$32/30 pills, with Novo's lower cost of API production being a key factor in the differential vs. generic players. In our low-cost case, we think the cost could reach as low as $12 per 30 pills (assuming unlimited capacity), while in our high-cost case, we think the cost could be c.$58/30 pills.

Exhibit 38: In our base case, we estimate that the cost per 30 pills of Wegovy pill could be $32
Semaglutide ($/30 pills)

Cost-based price - semaglutide ($/30 pills)	SPPS - oral			Novo Fermentation - oral		
	Low	Base	High	Low	Base	High
Cost semaglutide API ($/g)	75	150	250	37.5	75	125
Over fill ($/g)	-	-	-	-	-	-
Average generic semaglutide dose (mg)	*9.2*	*12.0*	*13.4*	*9.2*	*12.0*	*13.4*
API ($/30 pills)	20.7	53.9	100.5	10.4	26.9	50.3
API manufacturer margin (assuming outsourced)	20.7	53.9	100.5	0.0	0.0	0.0
Cost of the actual pen ($/30 pills)	-	-	-	-	-	-
Fill and finish ($/30 pills)	1.5	4.5	7.5	1.5	4.5	7.5
D&A	0.2	0.4	0.5	0.2	0.4	0.5
COGS ($/30 pills)	**43.1**	**112.6**	**209.0**	**12.0**	**31.8**	**58.3**
Gross margin for pharma company (%)	40%	50%	60%			
Cost-based price ($/30 pills)	**71.8**	**225.3**	**522.6**			

Source: JAMA, Company data, Goldman Sachs Global Investment Research

Exhibit 39: ...vs $113/30 pills for generic semaglutide
COGS-based price - semaglutide ($/30 pills)



Source: JAMA, Company data, Goldman Sachs Global Investment Research

Gross margin impact

We show in Exhibit 40 our analysis on the gross margin impact for Novo vs the generic players. We take $450 as the average price per month for injectable Wegovy price today and $160 as the average price per month for Wegovy pill (based on estimated dose and channel weightings). This implies that Novo could currently make a gross margin of >99% on the injectable, and 64-92% on the oral wegovy products. Turning to the generic players, assuming a typical gross margin range of 40-60% implies that generic companies would have to charge $6-12 per month for injectable semaglutide and $108-$349 per month for oral semaglutide. If we apply the 40-60% gross margin range to Novo's cost base, this implies that Novo can significantly undercut generic players in terms of manufacturing cost for both the pen and the oral; we estimate that Novo could charge c.$5.5-8 per month for injectable Wegovy and $30-97 for Wegovy pill, and still receive a 40-60% gross margin on their products.

Exhibit 40: Our analysis implies that Novo has a significantly lower cost manufacturing capability compared to generic producers

Novo - based on current price	Novo Fermentation - Pen			Novo Fermentation - oral		
	Low	Base	High	Low	Base	High
Novo price ($/month (i.e. 1 pen, 4 doses), $/30 pills)	450	450	450	160	160	160
COGS ($/month (i.e. 1 pen, 4 doses), $/30 pills)	2.2	3.4	4.8	12.0	31.8	58.3
Gross margin (%)	99.5%	99%	99%	92%	80%	64%

Generics - based on typical GM	SPPS - pen			SPPS - oral		
	Low	Base	High	Low	Base	High
Generic price ($/month (i.e. 1 pen, 4 doses), $/30 pills)	6.3	9.4	12.1	107.7	225.3	348.4
COGS ($/month (i.e. 1 pen, 4 doses), $/30 pills)	2.5	4.7	7.3	43.1	112.6	209.0
Gross margin (%)	40%	50%	60%	40%	50%	60%

Novo - based on typical generic GM	Novo Fermentation - Pen			Novo Fermentation - oral		
	Low	Base	High	Low	Base	High
Novo price ($/month (i.e. 1 pen, 4 doses), $/30 pills)	5.4	6.8	7.9	30.1	63.6	97.1
COGS ($/month (i.e. 1 pen, 4 doses), $/30 pills)	2.2	3.4	4.8	12.0	31.8	58.3
Gross margin (%)	40%	50%	60%	40%	50%	60%

Source: Company data, Goldman Sachs Global Investment Research

Valuation and Risks

Novo Nordisk

We are Neutral rated on Novo Nordisk. We derive our price target from a 50:50 blend of DCF and P/E approaches. Our bottom-up DCF analysis suggests a valuation of DKK306 per share. We use a WACC of 7.1% and a TGR of -2%. On a multiples basis, we believe Novo Nordisk should trade on 14.5x P/E on our 2027 EPS estimate, implying DKK304 per share. As a result, our 12-month price target is DKK305. Our ADR PT is set with reference to the Danish line, translated at the current FX rate, leading to an ADR 12-month PT of $47.

Key risks to our view and price target include: Upside risks - (1) faster-than-expected Wegovy pill sales ramp post launch; and (2) higher-than-expected peak CagriSema sales. Downside risks - (1) clinical risks if CagriSema and/or amycretin development were to be unsuccessful; (2) slower-than-expected scale-up in manufacturing for Wegovy/Ozempic; (3) stronger-than-anticipated competitor obesity data, particularly oral small molecule GLP-1 based assets; and (4) deeper and sustained price pressure.

Eli Lilly

We are Buy rated on Eli Lilly. We apply a 28.0x P/E multiple on our Q5-Q8 EPS estimates to arrive at our 12-month price target of $1,283.

Downside risks: A greater-than-expected annual pricing decline in the obesity market. Lower-than-expected market share due to either external competition or internal lack of execution on its current and pipeline assets could present downside to our estimates. Worse-than-expected data pipeline assets could result in significant downside to our medium-to-long-term estimates and lead to multiple compression of the stock.

Disclosure Appendix

Reg AC

We, James Quigley, Theodora Rowe Beadle, Asad Haider, CFA, Nick Jennings and Jeff Su, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

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Unless otherwise stated, the individuals listed in the Contributing Authors disclosure of this report are analysts in Goldman Sachs' Global Investment Research division.

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Growth is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

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Quantum

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Disclosures

Rating and pricing information

Eli Lilly & Co. (Buy, $1,078.78), Novo Nordisk (Neutral, Dkr271.80) and Novo Nordisk (ADR) (Neutral, $42.00)

The rating(s) for Eli Lilly & Co. is/are relative to the other companies in its/their coverage universe: AbbVie Inc., BioNTech, Bristol-Myers Squibb Co., Eli Lilly & Co., Innoviva Inc., Johnson & Johnson, Merck & Co., NewAmsterdam Pharma, Pfizer Inc., Royalty Pharma Plc, Vaxcyte Inc.

The rating(s) for Novo Nordisk and Novo Nordisk (ADR) is/are relative to the other companies in its/their coverage universe: AstraZeneca, Bayer AG, GSK Plc, GSK Plc (ADR), Galderma, Lonza Group, Merck KGaA, Novartis, Novartis (ADR), Novo Nordisk, Novo Nordisk (ADR), Roche, Sandoz Group AG, Sanofi, Sanofi (ADR), Sartorius AG, Sartorius Stedim Biotech

Company-specific regulatory disclosures

The following disclosures relate to relationships between The Goldman Sachs Group, Inc. (with its affiliates, "Goldman Sachs") and companies covered by Goldman Sachs Global Investment Research and referred to in this research.

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Goldman Sachs expects to receive or intends to seek compensation for investment banking services in the next 3 months: Eli Lilly & Co. ($1,125.27), Novo Nordisk (Dkr283.85) and Novo Nordisk (ADR) ($43.75)

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Goldman Sachs had a non-investment banking securities-related services client relationship during the past 12 months with: Eli Lilly & Co. ($1,125.27)

Goldman Sachs had a non-securities services client relationship during the past 12 months with: Eli Lilly & Co. ($1,125.27)

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Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
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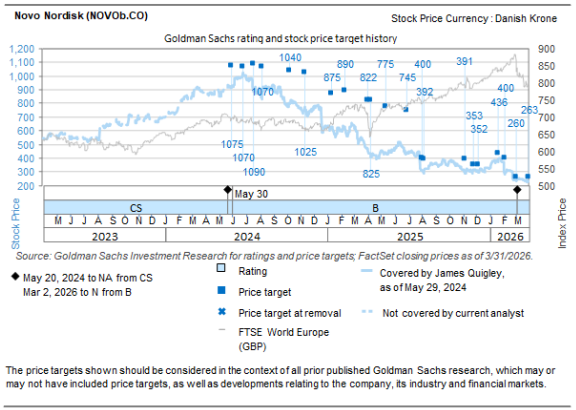
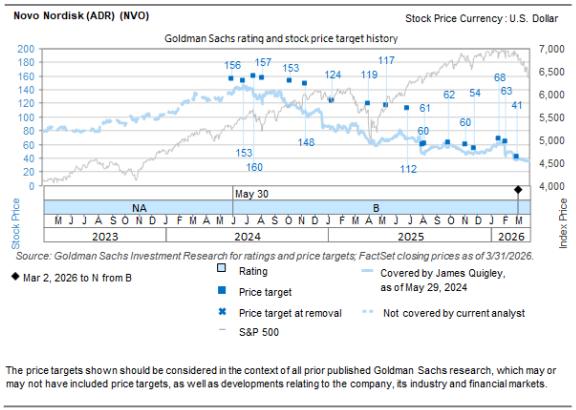
Price target and rating history chart(s)



The price targets shown should be considered in the context of all prior published Goldman Sachs research, which may or may not have included price targets, as well as developments relating to the company, its industry and financial markets.



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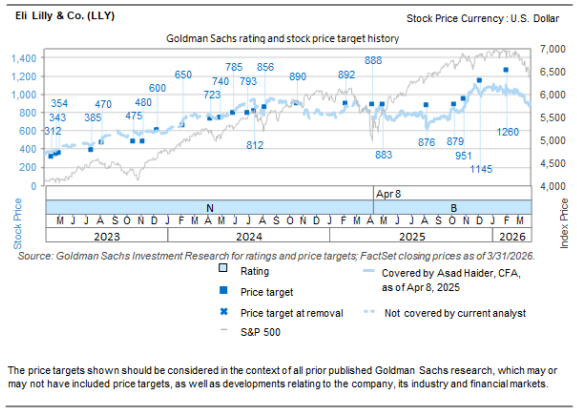

The price targets shown should be considered in the context of all prior published Goldman Sachs research, which may or may not have included price targets, as well as developments relating to the company, its industry and financial markets.

Target price history table(s)

Novo Nordisk (NOVOb.CO)

Date of report	Target price (Dkr)	Closing price (Dkr)
03-Jun-26	305.00	271.80
31-Mar-26	263.00	230.90
02-Mar-26	260.00	237.35
05-Feb-26	400.00	280.65

Novo Nordisk (ADR) (NVO)

Date of report	Target price ($)	Closing price ($)
03-Jun-26	47.00	42.00
02-Mar-26	41.00	37.76
05-Feb-26	63.00	43.34
22-Jan-26	68.00	62.23

Novo Nordisk (NOVOb.CO)

Date of report	Target price (Dkr)	Closing price (Dkr)
22-Jan-26	436.00	396.70
08-Dec-25	352.00	299.00
26-Nov-25	353.00	314.20
06-Nov-25	391.00	306.95
07-Aug-25	392.00	308.85
04-Aug-25	400.00	313.00
30-Jun-25	745.00	439.60
12-May-25	775.00	441.40
08-Apr-25	825.00	434.05
02-Apr-25	822.00	466.60
10-Feb-25	890.00	615.40
10-Jan-25	875.00	632.30
11-Nov-24	1,025.00	773.90
08-Oct-24	1,040.00	797.10
08-Aug-24	1,070.00	864.00
19-Jul-24	1,090.00	906.10
26-Jun-24	1,070.00	1,007.00
30-May-24	1,075.00	916.90

Novo Nordisk (ADR) (NVO)

Date of report	Target price ($)	Closing price ($)
26-Nov-25	54.00	48.71
06-Nov-25	60.00	46.51
30-Sep-25	62.00	55.49
07-Aug-25	61.00	48.76
04-Aug-25	60.00	48.81
30-Jun-25	112.00	69.02
12-May-25	117.00	67.74
02-Apr-25	119.00	68.24
10-Jan-25	124.00	86.26
11-Nov-24	148.00	109.09
08-Oct-24	153.00	117.20
08-Aug-24	157.00	128.17
19-Jul-24	160.00	131.54
26-Jun-24	153.00	143.67
30-May-24	156.00	132.80

Eli Lilly & Co. (LLY)

Date of report	Target price ($)	Closing price ($)
01-May-26	1,283.00	963.33
05-Feb-26	1,260.00	1,020.84
08-Dec-25	1,145.00	997.59
31-Oct-25	951.00	862.86
10-Oct-25	879.00	833.49
08-Aug-25	876.00	625.65
02-May-25	883.00	823.62
08-Apr-25	888.00	726.24
07-Feb-25	892.00	878.31
21-Oct-24	890.00	906.13
09-Aug-24	856.00	891.68
16-Jul-24	812.00	941.60
02-Jul-24	793.00	906.71
30-May-24	785.00	815.06
01-May-24	740.00	776.75
11-Apr-24	723.00	759.59
07-Feb-24	650.00	725.38
11-Dec-23	600.00	584.04
08-Nov-23	480.00	619.13
18-Oct-23	475.00	607.24
09-Aug-23	470.00	526.23

Date of report	Target price ($)	Closing price ($)
18-Jul-23	385.00	451.20

Price targets shown in table(s) are unadjusted for corporate actions.

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