POLICY BRIEF

GOVERNMENT PRICE CONTROLS ON OBESITY DRUGS

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Abstract

This policy brief discusses the implications of proposed US price controls on drugs for both public and private payers based on the manufacturing costs of producing the medications or foreign prices. We provide an in-depth discussion of the recent rationales offered for such price controls on diabetes and anti-obesity medications. We find that such rationales are misguided and that if such price controls were to be adopted, they would cause great harm to patients with obesity. We find that the overall benefits of these drugs far exceed their costs and, therefore, government price controls would greatly hurt US patients with obesity. We discuss that the large amount of therapeutic price competition the current obesity drug pipeline indicates would be a more productive force to control prices than through regulation.

Keywords: Obesity, Diabetes, Weight Loss Medication, Medicare, Therapeutic Competition, Price Controls, Obesity Drugs

Section 1: Introduction

Obesity has become one of the most serious and costly chronic diseases in the United States (US), affecting 42.4% of adults in 2018 (NIDDK, 2021). In response, various pharmaceutical companies have invested significant resources into the development of anti-obesity medications. Despite their potential value to a large patient population, the prices of these medications in the US market have sparked discussion among government officials.

In particular, some lawmakers have argued the prices of obesity drugs should be controlled by the government and have called for hearings with manufacturers. They present three main rationales to justify the need for government intervention in pricing. First, they contend that prices are disproportionately high compared to the manufacturing costs of the medicines. Second, they point out that the US consumers pay more for anti-obesity drugs than other countries. Third, they argue that Medicare spending on obesity treatments in the US could become excessive, given the high prevalence of the disease.

This policy brief discusses the evidence and the economic considerations of drug development as it relates to these three claims. We find that these rationales for government-imposed price controls are misguided and, if implemented, would ultimately harm patients. The cost of developing new pharmaceuticals is both burdensome and uncertain. Any cost-based price controls being implemented in the US would significantly limit the returns to pharmaceutical research and development (R&D) investments, reducing the number of new drugs entering the market. This is true in general for price controls but makes them especially damaging when the government would mandate prices based on the marginal cost of each successful drug that enters the market. In particular, we argue that government price controls based on manufacturing costs or foreign pricing of the estimated 12% of drugs that make it through the FDA development process will lead to negative overall profits of development as developers must fund the 88% of drugs that fail to reach the market (Congressional Budget Office, 2021).

We find that the overall value of obesity medications far exceeds their costs when considering the total benefits associated with anti-obesity medications by examining various economic factors, including excess healthcare costs, productivity losses, tax revenue implications, increased life expectancy, and social benefits. It is important to note that the actual cost of these medications for obesity and diabetes is not the commonly cited list price of an average of $1,186 per month; instead, it is approximately 48-78% lower due to manufacturer discounts on GLP-1s (Ippolito & Levy, 2023). Our findings indicate substantial cost savings from coverage, with a conservative estimate of annual savings of around $1.99 trillion, while the more optimistic estimate could reach up to $2.21 trillion in annual savings.

Furthermore, adopting government-controlled pricing in the US would harm American patients far more than similar policies impact patients in other countries. Many foreign countries do not have an innovation access tradeoff in setting price controls, as innovation is driven by global sales which a small country does not affect much. In contrast, the US, as a large and wealthy country, contributes 64-78% of global earnings from drug development, despite being about 25% of world GDP (Goldman & Lakdawalla, 2018; Kose et al., 2017). Currently, the US benefits from high demand for pharmaceuticals, which enables quicker access to new treatments as well as a wider variety of options for patients. A reduction in US earnings, such as when adopting foreign price controls, would have significant consequences including a decline in total pharmaceutical innovation. This could ultimately result in dramatically diminished benefit for US patients, who would face limited access to cutting-edge treatments and fewer options overall.

In light of these findings, we argue that enhanced therapeutic competition – not government price control regulations – is the best way to protect patients from high drug prices. The substantial FDA pipeline for obesity drugs is poised to introduce such competition soon, similar to past drug classes where innovation has led to lower prices, such as treatments for Hepatitis C and HIV.

The rest of this policy brief is structured as follows: Section 2 addresses the proposed rationales for cost-based pricing of obesity drugs. Section 3 evaluates the evidence base and economics of drug development that negates these rationales. Section 4 discusses the potential future impact of market competition in lowering prices for obesity drugs. Section 5 further discuses the limitations of price controls and marginal cost-based pricing. Finally, section 6 summarizes our concluding remarks.

Section 2: Background

This section briefly outlines the rationales presented in favor of cost-based pricing of obesity drugs.

Section 2.1: Summary of Arguments that Prices Should Better Align with Manufacturing Costs of Marketed Drugs

Proponents of cost-based pricing often argue that drug prices should more closely align with their manufacturing costs. This section briefly outlines the main rationale for the implementation of pricing controls to align drug prices closer to manufacturing costs.

In April 2024, Senator Bernie Sanders, on behalf of the US Senate Committee on Health, Education, Labor, and Pensions, sent a letter to the CEO of Novo Nordisk. In the letter, Sanders (2024b) announced an investigation into the high prices of the company's anti-obesity drugs, Ozempic and Wegovy. The Senate investigation was launched in response to a Yale University study that found these medications could be manufactured for less than $5 a month, while their list prices were $969 and $1,349 per month for Ozempic and Wegovy, respectively.

The authors of this Yale University study indicated that the study was simply limited to documenting manufacturing costs, not advocating in favor of price controls tied to production costs (Melissa Barber, 2024). Nevertheless, the Sanders letter asks Novo Nordisk to reduce prices for these drugs, and to disclose information on profits, R&D spending, and the methodology used to determine drug prices (Sanders, 2024b).

This investigation has fueled broader discussions around whether pharmaceutical pricing should be regulated based on tangible costs, which often preclude the complexities involved in the economics of an individual drug's development. Proponents of cost-based pricing often cite the potential for increased accessibility, arguing that aligning prices more closely with production costs could make essential medications more affordable for a broader population. Additionally, they highlight the strain high drug prices place on healthcare systems and household budgets, noting that excessive pricing can limit access to life-saving treatments. Supporters also contend that transparency around manufacturing costs can encourage fairer pricing practices by illuminating the disparity between production costs and market prices, fostering greater accountability from pharmaceutical companies.

Section 2.2: The Cost of Obesity

Obesity is a growing public health crisis in the US, with its total economic and societal impact soaring to $1.4 trillion in 2018, up from $976 billion in 2014 (Bendix, 2020). This substantial increase is largely driven by the growing population of individuals with obesity, escalating medical costs, and significant losses in productivity, among other social factors. As of 2018, the prevalence of obesity among adults in the US was estimated to be 42.4% (NIDDK, 2021). Among Medicaid beneficiaries, 48% have obesity, while 38% of those enrolled in Medicaid and Children's Health Insurance Program (CHIP) have obesity (JEC, 2024).

In May 2024, the Committee on Health, Education, Labor, and Pensions released its report highlighting the financial implications of addressing obesity through pharmaceutical interventions. The report found that if half of all adults with obesity utilized FDA-approved weight loss drugs, the total cost would reach $411 billion, with Medicare and Medicaid expenditures alone amounting to $166 billion (Sanders, 2024a). Bernie Sanders' estimates emphasize the potential strain on federal healthcare budgets if such measures are widely adopted. However, a recent Congressional Budget Office (2024) report estimated use of obesity drugs in Medicare would only be utilized by 2-3% of eligible populations in early years of the budget window and 12-14% at the ending years of a 10-year window, resulting in a $38 billion spending effect.

Furthermore, covering specific medications like Wegovy presents additional financial challenges. Cubanski et al. (2024) estimated that including Wegovy in insurance coverage would increase Medicare Part D spending by $2.8 billion annually. The demand for these drugs is already substantial; for instance, Medicare spent $4.6 billion on the diabetes drug Ozempic in 2022, a

dramatic rise from $56.8 million in 2018. This surge made Ozempic the sixth highest-selling Part D drug, accounting for 2% of total Part D spending (Cubanski & Neuman, 2024).

The Joint Economic Committee (JEC) estimates further underscore the immense financial burden obesity imposes on the US healthcare system. Together, these projections from Bernie Sanders and the JEC highlight the urgent need for comprehensive strategies to mitigate the economic and health impacts of obesity in the US.

Section 2.3: International Pricing Discrepancy

Comparing prices between the US and other countries presents significant challenges, as the comparisons are not apples-to-apples. In the US, manufacturers incur substantial costs for distribution and formulary placement through price concessions, discounts, and rebates to wholesalers, pharmacy benefits managers (PBMs), and payers. Additionally, income and foreign exchange adjustments need to be considered. This situation raises the question of whether price differences for non-drug healthcare services in the US are disproportionately higher than those for pharmaceuticals compared to other countries. In many other nations, drug prices are determined by inefficient pricing mechanisms that take into account factors such as local budgets, access needs, and the value of improving health outcomes—factors that should not apply to the US healthcare system.

The costs of Mounjaro and Ozempic for diabetes and Wegovy and Zepbound for obesity are higher in the US than in other developed nations. According to a report by the Committee on Health, Education, Labor, and Pensions, if Novo Nordisk were to establish price parity between the US and Denmark, the pharmaceutical company would dramatically reduce yet still have a profit margin of $181 per prescription (Sanders, 2024a).

Section 3: Impact of Price Control Proposals on Health and Innovation

This section explores the limitations of marginal cost-based pricing by examining key aspects such as pharmaceutical pricing due to R&D costs, the potential impact of Medicare covering obesity medication, and a brief analysis of international price controls.

Developing new pharmaceuticals is both burdensome and fraught with uncertainty. Implementing price controls in the US could effectively constrain the returns on pharmaceutical R&D investments, reducing the number of new drugs entering the market. While price controls generally pose challenges, mandating prices based solely on the marginal cost of each successful drug that enters the market is particularly problematic. Such an approach disregards the substantial R&D expenditures required to develop those drugs, including the costs associated with numerous failed attempts. Under the current system, the high prices of successful drugs help pharmaceutical

companies to recoup these broader R&D costs, enabling pharmaceutical companies to take on the risks necessary for innovation.

Section 3.1: Problems with Marginal Cost-Based Pricing

Marginal cost-based prices are susceptible to flaws and shortcomings. For instance, the Yale University study by Barber et al. (2024), which serves as the basis for Senator Sanders' proposal, neglects critical factors such as R&D expenditures, return on investment (ROI), and other associated costs, which are further evaluated in Section 5. A detailed cost breakdown of the ingredients analyzed by Barber et al. (2024), along with the sources of their data, is provided in Appendix B. Compounding these challenges, the success rates of clinical trials have dropped, and legislative changes, such as the Inflation Reduction Act, have reduced the net effectiveness of patent protections for drugs, further increasing revenue uncertainty for pharmaceutical companies. Currently, only 12% of drugs make it through the FDA development process, meaning that these few successful drugs must fund the roughly 88% of developed drugs that fail to reach the market (Congressional Budget Office, 2021).

If marginal cost-based pricing were implemented, innovation in the pharmaceutical industry would likely suffer, as firms depend on revenues from successful products to support long-term growth and R&D investment. This issue is exacerbated by the lengthy and uncertain development process, decreasing return of development, and lower approval rates for new drugs. For example, Knedsen and Lau (2019) highlight the development timelines for GLP-1 drugs; the molecule was first published in 1987, yet it took 18 years for exenatide, the first GLP-1-approved drug, to reach the market in 2005, followed by dulaglutide in 2014. Moreover, novel drug approvals have declined since 1995, despite R&D expenditures rising from $11.9 billion in 1995 to $102 billion in 2021 (PhRMA, 2022). Rennane et al. (2021) found the R&D cost for a new molecular entity (NME) range from $318 million to $2.8 billion.

Large pharmaceutical companies often address these challenges by acquiring smaller firms or their drugs to expedite development, producing the smaller company's drug faster than would be possible without their additional resources. Over the past three decades, approximately 20% of new drugs or their parent companies have been acquired by larger firms (Austin & Hayford, 2021). Incremental innovation also plays an important role; for instance, while both Wegovy and Ozempic use semaglutide as their active ingredient, they differ in dosage, target populations, and prescribed conditions (Rajeswaran, n.d.).

Implementing lower prices through marginal cost-based pricing could significantly diminish future revenues, ROI, and innovation. Deloitte (2018) found that the cost of bringing a drug to market increased to record levels in 2017; projected peak sales halved in the same period, leading to a 68.3% decline in R&D returns. According to Danzon and Ketcham (2004), if therapeutic reference pricing for pharmaceuticals were applied in the US, it would not only affect

R&D, but also negatively impact the prices of on-patent products by influencing the competitive generic market, ultimately reducing the future supply of new drugs. Ciarametaro and Buelt (2022) suggest that lowered pharmaceutical prices will decrease the market size and expected returns, which would in turn decrease investments in clinical trials and subsequently lead to a reduction in newly approved drugs. They estimate that a 1% reduction in market size could result in 0.2% to 6.0% fewer new drugs (Ciarametaro & Buelt, 2022). Furthermore, Philipson and Durie (2021) found that price regulations would lead to a 29-60% reduction in R&D spending over fifteen years, potentially resulting in 167-342 fewer new drugs.

Section 3.2: The Value of Obesity Drugs Compared to their Transaction Prices

Over the last decade, multiple new treatments have been approved for weight loss management. Popular GLP-1 weight loss drugs Wegovy and Zepbound have an average list price of $1,186 per month and a post-insurance price of $187 with manufacturer coupons – the net prices received by drugmakers for GLP-1s for both diabetes and obesity are estimated to be 48–78% less than the list price, ranging from $233 to $551 (Ippolito & Levy, 2023). Medicare predicts the cost they will secure per user is roughly $5,600 in 2026, decreasing to $4,300 in 2034 (Congressional Budget Office, 2021). This aligns with the cost of GLP-1s approved for the treatment of type 2 diabetes (T2D), where manufacturer discounts range from 54-59%, resulting in net prices of $312 to $469 per month (Hernandez & Sullivan, 2024). This adjustment shifts the cost benchmark from $1,186 per month to a range of $233 to $551 per month. These significant manufacturer discounts suggest that the relevant benchmark for cost-benefit analyses of weight loss medications should be the net transaction, rather than the list prices, which do not reflect transaction prices.

The costs of such medications are orders of magnitudes smaller than the total set of benefits they generate. In May 2024, the Joint Economic Committee Republicans (JEC-R) published a response to the Economic Report of the President, focusing on the financial burden of obesity (Schwikert, 2024). Building on a prior report, the JEC-R estimated that obesity leads to average excess medical costs of $5,155 per individual with obesity annually, amounting to $8.2-$9.1 trillion in total excess healthcare costs over the next decade. Furthermore, the JEC-R estimated the cost of Medicare and Medicaid spending on obesity to be $4.1 trillion over the next decade (Joint Economic Committee, 2023). In 2023 alone, productivity losses due to obesity were estimated to be $565 billion, equivalent to a 6% loss of total productivity (Joint Economic Committee, 2023). Additionally, they found that obesity-related labor market and productivity losses are projected to be between $13.5 and $14.7 trillion over a decade, resulting in $2.4-$2.6 trillion in lost tax revenue over that same period (Schwikert, 2024). Even the overall economic impact of being overweight (BMI $\geq$ 25) was found to have a 3.5% effect on GDP in 2020, projected to rise to 4% by 2035 (World Obesity Atlas, 2023).

Beyond its economic costs, obesity significantly impacts individual health and longevity. Obesity reduces life expectancy by an estimated 4.7 years (Schwikert, 2024). Using a Value of

Statistical Life Year (VSLY) of $495,000 per life year, as applied by the US Department of Health and Human Services, this reduction translates to a loss of $2.3 million per person, which with an adult population 2022 of 260,837,000, and obesity rate of 42.2%, amounts to a total loss of $253.2 billion (Kearsley, 2024; US Census Bureau, 2023; NIDDK, 2021). The burden of obesity is expected to continue to grow, with the share of individuals with obesity in the US projected to increase by 2.1 percentage points from 2020 to 2035, to an estimated total of 58% of the adult population. Simultaneously, the Medicare-eligible population is expected to grow by 4.3% during this period (*World Obesity Atlas 2023*, 2023; US Census Bureau, 2023).

The economic burden of obesity is highly driven by its increased risk of various chronic diseases, including T2D, cardiovascular disease (CVD), metabolic-associated fatty liver disease, and cancer. These disease-specific effects are accounted for in estimates of overall healthcare costs of obesity. These conditions in themselves contribute significantly to overall healthcare costs, diminish life expectancy, and reduce quality of life. Among these, T2D and CVD are among the top contributors to healthcare spending, making reductions in these diseases crucial for controlling medical expenditures (Dieleman et al., 2020). Obesity is a leading cause of T2D, with 89.8% of individuals affected by T2D being either overweight or obese (CDC, 2024). The percentage of those classified as obese alone accounts for nearly half of the total, at 47.1%. Weight loss has been shown to have a significant but not full impact on T2D outcomes; Lean et al., (2018) reported remission rates of 34%, 57%, and 86% for a weight loss of 4.95-9.90%, 9.90-14.85%, and more than 14.85%, respectively. Similarly, over 45% of all CVD cases in the US are linked to obesity (Daviglus et al., 2004). Research shows that reducing weight by 5-10% significantly decreases the risk of CVD (Cercato & Fonseca, 2019). Furthermore, the SELECT trial showed that GLP-1 agonists reduce the risk of composite cardiovascular events by 20% over three years in non-diabetic individuals, with the effect being non-dose-dependent (Kaplan et al., 2024).

A microsimulation module conducted by the University of Southern California (USC) Schaeffer Center projected that if Medicare and private insurance provided coverage for weight loss medications it could generate $1.27 trillion in social benefits over the next decade (Sexton Ward et al., 2023). Using an average excess medical cost of obesity of $2,505, they estimated that Medicare would have $175 billion of cost offsets in the next ten years. Notably, 60% of these savings would stem from reduced demand for hospital inpatient care under Medicare Part A and decreased skilled nursing care needs. Additionally, significant cost reductions are anticipated due to decreases in obesity-related comorbidities.

Using the estimates from Schwikert (2024) and Sexton Ward et al. (2023), we calculate the total annual net benefits associated with anti-obesity medication coverage by examining various economic factors, including excess healthcare costs, productivity losses, tax revenue implications, and social benefits. These calculations take into account the expenses incurred by providing coverage of anti-obesity medication for all eligible adults. To determine the adult obese population

in the US, we reference the 2022 adult population of approximately 261 million with an obesity rate of 42%, which equates to around 110 million individuals (US Census Bureau, 2023; NIDDK, 2021). For the transaction prices (rebated) of obesity medications, we utilize CBO (2024), where annual costs are projected to range from $5,600 in 2026 to $4,300 in 2034, averaging an annual expense of $4,950. Assuming a 100% uptake among adults, this leads to total estimated costs of approximately $544.86 billion. The findings reveal a lower bound estimate of annual savings at approximately $1.99 trillion, with the upper bound estimate reaching $2.21 trillion in annual savings. The enormous value of health generated from lower morbidity and mortality simply adds order of magnitudes to these large net benefits by orders of magnitude. Detailed cost estimates are presented below in Table 1.

Table 1: Breakdown of Value of Obesity Drugs

	Lower Bound	Upper Bound
Adult Population with Obesity (US Census Bureau, 2023; NIDDK, 2021)	110,073,214	
Excess Healthcare Costs (Schwikert, 2024)	$820 billion	$900 billion
Cost of Productivity Losses (Schwikert, 2024)	$1,350 billion	$1,470 billion
Cost of lost Tax Revenue (Schwikert, 2024)	$240 billion	$260 billion
Added Social Benefits (Sexton Ward et al., 2023)	$127 billion	
Cost of Prescriptions Annually (Ippolito & Levy, 2023)	$544.86 billion	
Annual Savings	**$1.99 trillion**	**$2.21 trillion**

To evaluate the reduced burden of obesity in the US, we included the excess healthcare costs associated with the disease, the economic impact of lost life years, the effects on labor productivity and supply, and the implications for lost tax revenue over the next decade, as outlined in Table 2. This analysis accounts for the potential uptake of weight loss medications by the entire US obese population, estimated at 110 million individuals, which could result in reduced total burden of $24.35 to $26.65 trillion over the next ten years. If 40% of that population, or approximately 44 million people, were to take these medications, the reduced total burden could

amount to between $9.74 and $10.66 trillion in the same timeframe. An uptake for anti-obesity medicines at 20% or approximately 22 million individuals would still account for a significantly reduced total burden of $4.87 to $5.33 trillion over the next decade. Even a 10% uptake of the adult obese population would save $2.44 to $2.67 trillion in that same period.

Table 2: Total Reduced Burden of US Obesity in Trillions of US Dollar in a Decade

% Increase in Demand uptake for Anti-Obesity Drugs	**10%**	**20%**	**40%**	**100%**
Adult Population with Obesity (US Census Bureau, 2023; NIDDK, 2021)	11 million	22 million	44 million	110 million
Excess Healthcare Cost (Schwikert, 2024)	$0.82 - $0.91	$1.64 - $1.82	$3.28 - $3.64	$8.2 - $9.1
Cost of Lost Life Years (Kearsley, 2024; Schwikert, 2024)	$0.03	$0.05	$0.10	$0.25
Cost on Labor Productivity & Labor Supply (Schwikert, 2024)	$3.35 - $1.47	$2.7 - $2.94	$5.4 - $5.88	$13.5 - $14.7
Cost of Lost Tax Revenue (Schwikert, 2024)	$0.24 - $0.26	$0.48 - $0.52	$0.96 - $1.04	$2.4 - $2.6
Reduced Total Burden of Obesity	**$2.44 - $2.67**	**$4.87 - $5.33**	**$9.74 - $10.66**	**$24.35 - $26.65**

Section 3.3: International Pricing and Problems with US Adopting Foreign Price Controls

Stringent price controls in the European Union (EU) have resulted in decreased R&D investment compared to the less-regulated US market, underscoring the significant role that the US market plays in fostering pharmaceutical innovation (Golec & Vernon, 2010). Between 1991 and 2010, these controls are estimated to have resulted in 46 fewer new medications and the loss of 1,680 research jobs in the EU. Ekelund and Persson (2003) found price regulations discourage competition between brand-name drugs, while Danzon and Chao (2000) identified similar effects in generic markets when investigating price regulation's effect on competition in pharmaceutical markets across seven countries. Their findings reveal that stringent regulations, for instance, in France, Italy, and Japan, including on manufacturer prices and retail pharmacy margins, significantly reduce price competition among generic drugs. These controls effectively eliminate natural decreases in price due to both generic drugs and brand name drugs market forces.

Price regulations in the EU and Canada, such as reference pricing or fixed price-setting, have also discouraged generic entry and increased generic prices over time (Y. et al., 2016). Furthermore, price controls have been shown to deter the entry of innovative brand-name products, particularly in smaller markets where revenue potential is limited. This suggests that price

regulation not only stifles competition but also impedes the availability of new, cutting-edge treatments.

In addition to using price controls, international pricing practices differ in their evaluation of cost-effectiveness. The trend of the US paying significantly more for prescription drugs compared to nine other high-income countries began in the 1990s, coinciding with the advent of many blockbuster drugs, according to Sarnak et al. (2017). This discrepancy is partly due to an absence of price controls in the US, as well as other countries adopting new drugs more gradually and only when the benefits clearly outweigh the existing therapies on the market. While this approach can reduce costs, it effectively limits consumer choice and influences the types of pharmaceutical innovation each country prioritizes.

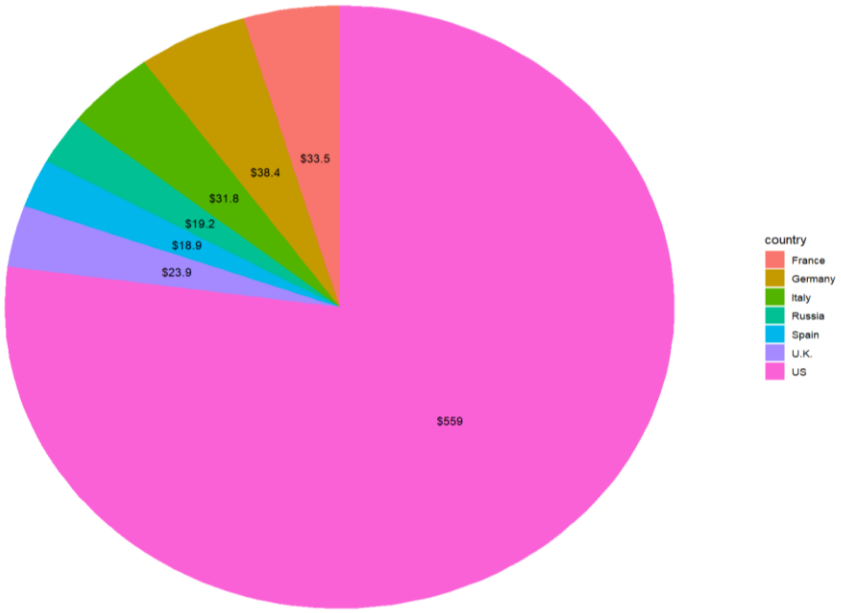
Countries like the United Kingdom (UK) employ lower spending thresholds for the cost-effectiveness of treatments, often using much lower figures than the limit in the US. For instance, the UK's Quality-Adjusted Life Year (QALY) threshold is approximately £20,000 to £30,000 per QALY ($25,062.00 - $37,593.00 USD)[1], compared to the US, which is around $50,000 per QALY (Walker et al., 2024; Neumann et al., 2014). These differences in cost-effectiveness thresholds and pricing strategies give foreign governments significant influence over the perceived value of medicines, including those developed and marketed in the US.

While smaller countries may implement price controls without severely impacting global innovation—due to their relatively minor contribution to the pharmaceutical revenue pool—a similar approach in a major market like the US could have a detrimental impact and far-reaching consequences. As a major driver of pharmaceutical sales, the US sustains innovation globally, especially for conditions like obesity, where the demand for innovative treatments is high.

The extent of the spending disparity is stark. In 2018, Europe was the second-largest market and contributed approximately 23% of pharmaceutical market value in terms of sales (EFPIA, 2019; Exchange-Rates.org, n.d.). While the US-branded and generic drug revenue were about $559 billion, making is so the US, depending on the allowance of profit margin, accounts for 64-78% of worldwide pharmaceutical profits (Goldman & Lakdawalla, 2018). Figure 1 highlights this disparity by comparing the total pharmaceutical market value of US with that of the six highest-spending European countries. For smaller countries, the cost of price controls often manifests as delays in innovation. On average, across 16 developed nations, new drugs take 17 months longer to reach patients compared to the US, where approved treatments become available almost immediately (Roy, 2019).

[1]Price conversion based on the exchange rate of 1 GBP = 1.25 USD as of November 22, 2024.

Figure 1: Pharmaceutical Market Value in Billions of US Dollars - 2018



Applying EU-like price controls in the US could potentially lead to a substantial reduction in the development of new treatments, especially given the high costs and risks associated with pharmaceutical R&D. A study by Golec & Vernon (2010) estimates such price controls from 1991 to 2010 would have resulted in 117 fewer new medicines. This underscores the direct link between market-driven pricing and the resources available for advancing medical research. While price controls might appeal as a short-term mechanism to reduce drug prices, they do not account for the long-term economic and societal impacts on pharmaceutical innovation, which is crucial for addressing complex health issues prevalent in the US. This analysis highlights the need to carefully weigh both economic and health policy implications when considering price control measures in the pharmaceutical industry. A balanced approach is necessary to ensure affordability without compromising the pipeline of innovative treatments that improve public health outcomes.

Section 4: The Role of Market Competition Rather than Regulation in Disciplining Pricing

Net spending on brand-name drugs in Medicare Part D increased 62% from 2011 to 2015, despite a decrease in the number of prescriptions for these drugs in the same period (Rosen Vance et al., 2018). This surge has been attributed primarily to high launch prices for new medications. For example, in 2017, the median annual list price of a new cancer medication was $160,000 – a 58.4% increase compared to 2013 (Sarpatwari et al., 2019). Therapeutic competition is often seen as a way to mitigate escalating drug prices. Ekelund and Persson (2003) found that in the US market, the availability of therapeutic substitutes impacts both launch prices and price dynamics, as prices are often set strategically in response to market competition.

Lee (2004) explained this phenomenon in new drug markets, noting that the first product in a new class typically establishes the pricing benchmark; the second and third-in-class products will either have to innovate or lower prices, while the third or fourth-in-class drugs offer real price advantages. For example, Lee (2004) found that for the Class of ACE inhibitors, the third-in-class drug had a launch price 72.2% lower than the first-in-class drug. Supporting this, Lu and Comanor (1998) found a 38% decrease in the ratio of a new drug's launch price when substitutes increased from one to two, with a further 19% decrease when the number of substitutes increased from two to three. They also found that the more branded the substitutes, the higher the downward price pressure. Additionally, Cockburn et al. (1999) conclude that 70% of new follow-on entrant drugs were priced at or below the market-leading drug, likely because these drugs entered the market within two years of the initial drug. More recently, Dickson et al. (2023) found that the introduction of competition in a therapeutic area led to a 4.2% reduction in annual net price growth and an 18.5% fall in commercial spending on existing therapies. However, the timing of subsequent releases also has an effect on price discounts. Régnier (2013) found that delayed entry of substitutes by five years resulted in smaller price discounts of about 23%.

While many studies affirm the price-reducing effects, there is also evidence contradicting the decrease in prices. Darrow and Kesselheim (2018) found cases of therapeutic competition can reduce prices, but they also found that imperfect market conditions due to information asymmetry, and regulatory constraints limit effective competition in the pharmaceutical sector. They argue that despite competition between brands, there is imperfect information due to the lack of direct comparison data. Additionally, the structure of Medicaid and Medicare, with non-exclusion and the inability to negotiate prices, affects inter-brand competition. Furthermore, Ellyson and Basu (2021) found in the insulin market, in expectation of a new brand-name drug's entry, the leading brand-name drug increased prices by 10.5%, suggesting that expected competition can sometimes drive prices upward.

Section 4.1: The FDA Pipeline of Obesity Drugs and Future Price Competition

Between 1999 and 2018, obesity rates in the US increased from 30.5% to 42.4%, while severe obesity nearly doubled from 4.7% to 9.2% in the same period (NIDDK, 2021). JP Morgan (2023) estimates that the US anti-obesity medication market will grow from $0.5 billion in 2020 to $44 billion in 2030. By 2030, an estimated 15 million adults in the US alone are expected to be using anti-obesity medications. This anticipated surge in demand is being matched by a robust and competitive drug development pipeline, which is expected to drive price competition and improve affordability.

In the US, as of June 26, 2024, there were 92 anti-obesity drugs in Phase 3 trials, 96 in Phase 2, 16 in Phase 1, and one in the preclinical stage. This data was compiled from Melson et al. (2024) for trials up to February 2024 and supplemented by information from the US National Library of Medicine (NLM) (NLM, n.d.). We filtered the NLM for clinical trials with the condition "Obesity", focusing on weight loss as the primary outcome, and sponsored by a pharmaceutical

company. The drugs and their treatment effect for those in either Phase 2 or Phase 3 of clinical trials in participants with obesity either with diabetes or without-diabetes are highlighted in Table 3 below. We limit the table to published Phase 2 or Phase 3 results. Of the 96 drugs in Phase 2 trials, four target specialized populations – for example, participants with Prader-Willi Syndrome – while 78 either haven't completed their Phase 2 trial or have not yet posted the results (see Appendix A for full list).

Table 3: Pipeline Drugs and their Treatment Effect

Name of Drug (Manufacturer)	**Latest Phase**	**Treatment Effect from Phase 2 or 3**
NNC0174-0833 (Novo Nordisk)	2	Across 5 dosages for the treatment group the mean percent reduction from baseline weight ranged from 6.1% to 10.8% compared to 3% for the placebo.
Liraglutide & Orlistat (Novo Nordisk)	2	In participants without diabetes, across four Liraglutide treatment groups, the mean reduction in body weight ranged from -5.1 kg to -7.6 kg (-5.29% to -7.79%). This is compared to the Orlistat treatment group -4.4 kg (-4.58%), and the Lira placebo group with a reduction of -3.00 kg (-3.08%).
Canagliflozin (Johnson & Johnson)	2	In patients without diabetes, across three dosage groups the mean percent reduction in body weight ranged from -2% to -2.8%, compared to -1.1% for the placebo.
JNJ-64565111 (Janssen)	2	Across three dosages for the treatment group the mean percent reduction from baseline ranges from -11.8% to -8.51%, compared to -1.76% for placebo.
Pramlintide and Metreleptin (Amylin Pharmaceuticals)	2	Across three groups of varying dosage of Pramlintide and Metreleptin the percent reduction in body weight ranged from -8.20% to -9.92%, compared to -2.68% for placebo.
Leucine and Sildenafil & Leucine, Sildenafil and Metformin (NuSirt Biopharma)	2	Across two treatment groups the mean percentage body weight change ranged from an increase of 0.67% to a decrease of -0.49% for Leu Sil, a decrease of -0.552% to -0.929% for Leu Mil Sil, compared to the placebo with an increase of 1.121%.
Exenatide (AstraZeneca)	2	In non-diabetic subjects, the reduction in body weight was -4.62% compared to -1.5% for the placebo.
Setmelanotide (Rhythm Pharmaceuticals)	2	The mean percent change for the treated group was -2.0%, compared to a change of -0.3% in the placebo group.
Pramlintide Acetate and Metreleptin (AstraZeneca)	2	The mean percent reduction in body weight for the groups using both drugs ranges from -6.39 to -7.02%, compared to 2.01% for the placebo.
BI 456906 (Boehringer Ingelheim)	2	The mean percent reduction in body weight for the treatment groups ranged from -6.19% to -14.94% compared to the placebo group with a reduction of -2.82%
Danuglipron (Pfizer)	2	The mean reductions ranged from -6.9% to -11.7%, compared to a gain of 1.4% for placebo (Pfizer, 2023).

ALT-801 (Altimmune)	2	The mean weight loss for Pemvidutide was -10.3% (1.2mg) -11.2% (1.8mg), 15.6% (2.4mg) compared to -2.2% with placebo (Altimmune, 2024).
Dapiglutide (Zealand)	2	The mean weight loss was -2.9% (4mg) and -4.3% (6mg) compared to -2.2% with placebo (Zealand Pharma, 2024).
Retatrutide (Eli Lilly and Company)	2	In 48 weeks, Across 6 dosages, the mean percentage reduction in weight for those treated was- 8.67% to -24.22% compared to 2.1% in the placebo group.
Tirzepatide (Eli Lilly and Company)	3	After a lifestyle weight loss program, after 72 weeks, the treatment resulted in a mean percent body weight reduction of -21.1%, whereas the placebo resulted in a mean percent body weight change of 3.3%.
Naltrexone/Bupropion (Orexigen Therapeutics, Inc)	3	Those treated had a reduction in body weight ranging from -5% (16 mg) to -6.14% (32mg) and 1.33% for placebo.
Liraglutide (Novo Nordisk)	3	Analyzing for weight loss maintenance, the mean percentage reduction in body weight was -6.11% compared to the placebo -.05%.
Liraglutide (Novo Nordisk)	3	In non-diabetic subjects with co-morbidities, the mean percent reduction for treatment groups ranged from -8.44% to -6.77% compared to placebo -3.11%.
Tirzepatide (Eli Lilly and Company)	3 *Active not recruiting with results	The mean percent reduction from baseline body weight ranged from -16% to -22.5% compared to -2.4% for placebo.
VI-0521 (Vivus, Inc)	3	The mean percent weight loss was between -5.1% to -10.9% for those treated compared to -1.55% for the placebo.
Naltrexone/Bupropion (Orexigen Therapeutics, Inc)	3	The mean weight loss is -9.46% of baseline body weight for those treated, compared to gain of 0.94% in the placebo.
Lorcaserin (Esai)	3	The mean weight loss of treatment is -5.87% of baseline body weight for those treated and 2.2% for the placebo group.
IBI362 (Innovent Biologics)	3 *Completed	In phase 2: Across two dosages, the mean percentage reduction in body weight ranged from -12.05% to -14.05% for treated individuals compared to -0.47% for placebo. (Innovent Biologics, 2024)
CagriSema (Novo Nordisk)	3 *Active not recruiting	In phase 2: On co-administering, the mean reduction in body weight is -15.6% compared to individually administering either semaglutide (-5.1%) or cagrillntide (-8.1%) (Apovian & McDonnell, 2023).
Orforglipron (Eli Lilly and Company)	3 *Active not recruiting	In phase 2: In adult participants with weight-related comorbidities, at week 36, the mean weight loss was -9.4% to −14.7% for those treated and 2.3% with placebo. 46-75% of patients experienced a weight loss ≥10% (Wharton et al., 2023).
Semaglutide 50 mg (Novo Nordisk)	3 *Completed	In phase 2: After 68 weeks, the mean body weight reduction was 15.1% from baseline for those treated, compared to 2.4% with placebo. 85% of patients experience a weight loss ≥ 5% of baseline weight, 69% of patients experience a weight loss ≥ 10%, 54% of patients experience a weight loss ≥15%, and

		34% of patients experience a weight loss ≥ 20% (Knop et al., 2023).

In Figures 2 and 3, we graphically represent the average weight change for treated individuals, compared to their baseline weight for Phase 2 and Phase 3 trials. The most encouraging effect is seen for Retatrutide from Eli Lilly and Company with a mean reduction in body weight from baseline of -24.22%.

Figure 2: Results from Completed Phase 2 Pipeline Drugs

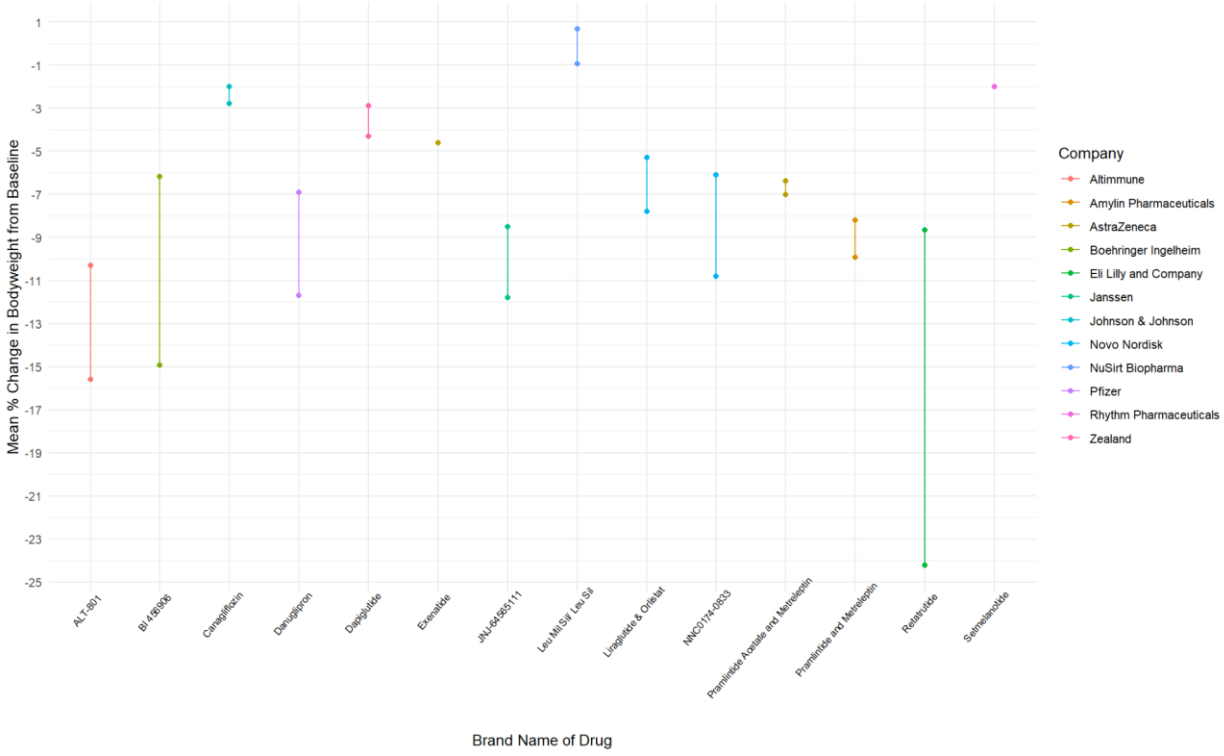
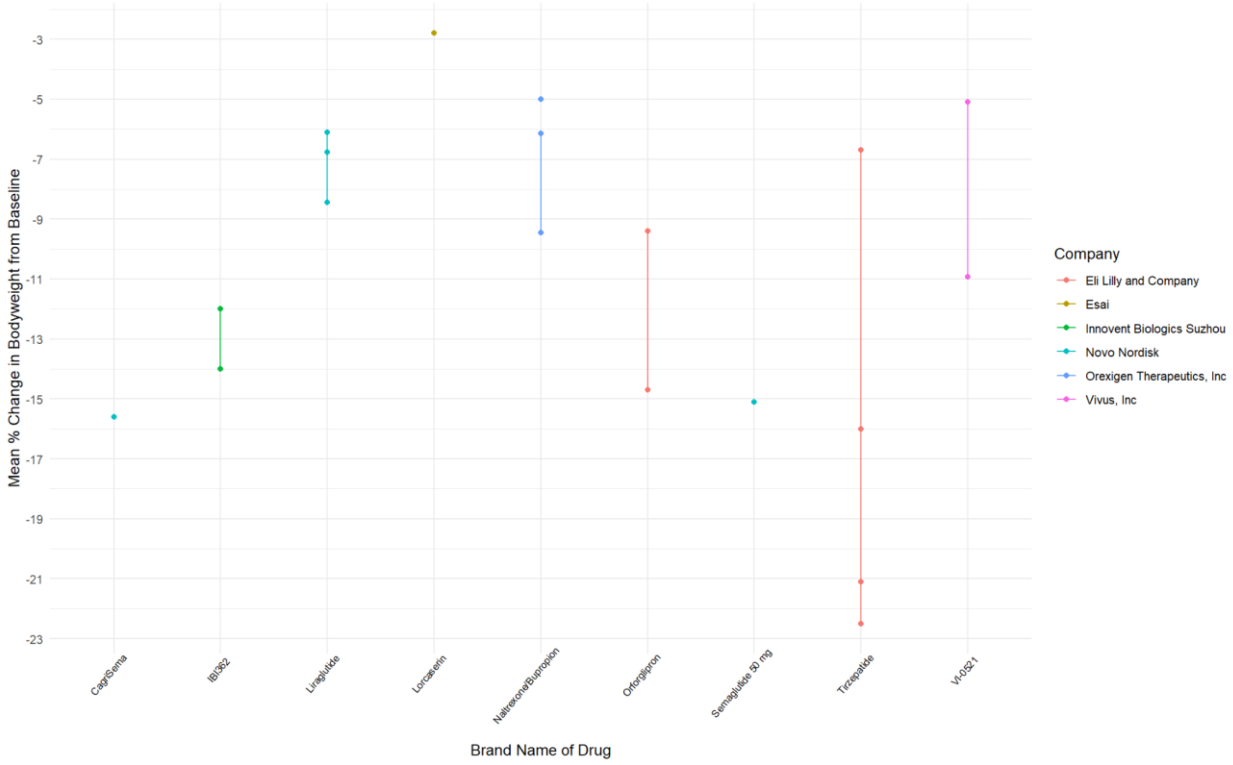


Figure 3: Results from Completed Phase 3 Pipeline Drugs



4.2: Therapeutic Price Competition for Historically Innovative Drug Classes

Antidepressants Case Study

Prozac, developed by Eli Lilly, is a selective serotonin reuptake inhibitor (SSRI) indicated for acute and maintenance treatment of major depressive disorder, obsessive-compulsive disorder, acute depressive episodes in bipolar I disorder, panic disorder, bulimia nervosa, and premenstrual dysphoric disorder (Wenthur et al., 2013). Approved by the FDA in 1987, Prozac was the first SSRI on the market and retained patent protections until 2001. The next few SSRIs entered the market in quick succession, Zoloft (Pfizer) in 1991, followed by Paxil (GlaxoSmithKline) in 1992, Celexa (AbbVie) in 1998, and Lexapro (Forest Laboratories) in 2002 (MentalHealthDaily, n.d.). As these drugs became more widely available, the rate of patients reported to have depression and prescribed antidepressants steadily rose from 70% in 1987 to 89% in 2001; SSRI usage prescription rose from 9.7% in 1987, rising in one year to 21%, to 69% in 2001 (Stafford et al., 2001). During this period, spending on mental health medications grew faster than spending on all other medications.

Prozac was launched at a price of $1.18 a day, almost double the leading brand-name antidepressant in the market (Berndt et al., 1996). When Zoloft was launched in 1992, its daily price was set 25% lower than Prozac (Berndt et al., 1996). Similarly, Paxil followed a similar strategy, launching at a discounted price, lower than Prozac and Zoloft (Pink Sheet, 1993). These lower prices were in an attempt to gain market share. In response, Pfizer's chairman indicated

Zoloft's prices may be reduced. Despite the competition, Prozac's sales soared, peaking at over $2.8 billion, up from $1 billion just six years earlier (Wenthur et al., 2013). This quick success inspired the development of SSRIs, making it so the class achieved sales in excess of $10 billion, with multiple becoming blockbuster drugs, and hundreds of millions of prescriptions. Prozac maintained its position as the market leader until 1996, with a market share of 48%, despite being less frequently prescribed by non-psychiatrists (Berndt et al., 1996). Even after its market share began to decline, Prozac remained the most prescribed drug by dollar sales in 2000, even without being the leader in antidepressant prescriptions (Prescription Drug Trends a Chartbook Update, 2001).

Hepatitis C Case Study

Sovaldi, developed by Gilead Sciences, is a Hepatitis C virus (HCV) nucleotide analog indicated for the treatment of adult patients with genotype 1, 2, 3, or 4 chronic HCV infection without cirrhosis and pediatric patients above the age of 3 with genotype 2 or 3 chronic HCV infection without cirrhosis (Gilead Sciences, 2013). The drug received its initial FDA approval in 2013 and was the first HCV drug approved as a virologic cure for HCV infection. However, soon after Sovaldi's approval, five additional drugs were approved facing competition from Abbvie's Viekira and Technivie, Bristol-Myers' Daklinza and Epclusa, and Merck's Zepatier (Gari et al., 2023).

When Sovaldi launched, a 12-week cycle of the drug cost $84,000 and a single pill cost $1,000 (Lowe, 2014). The drug's patent will expire in 2028 (Gari et al., 2023). In 2014, a year after it launched, Sovaldi captured 48.2% of the Medicare market share for direct-acting agents for HCV. That same year, the Medicaid reimbursement for Sovaldi reached its peak at around $1.4 billion. In 2014, Gilead Sciences released Harvoni, a stand-alone pill in contrast to Sovaldi, which requires co-administration. By 2015, a year after it launched, Harvoni captured 33.51% of the Medicare market share for direct-acting agents for HCV, and together with Sovaldi, Gilead's products held a commanding market share at 59.45%. Harvoni received the highest total Medicaid reimbursement for a total of three years. Over the years, Gilead's drugs have remained the most expensive in the market, with Sovaldi seeing an uptick in prices after 2018 (Gari et al., 2023).

Sovaldi consistently maintained a higher average price than its competitors, many of which show a downward trend in price as they compete with Gilead's drugs for market share. In 2014, Abbvie cut prices to win an exclusive deal with Express Scripts, the largest manager of drug prescription benefits (Hirst, 2014). While exact numbers are unavailable, it is estimated that the price reduction exceeded $30,000, prompting the manager to stop offering Gilead's drugs. In 2018, Merck cut the price for Zepatier by 60% after being in the market for two years (Weintraub, 2018). It did so in an attempt to win greater market share as it struggled to compete with Gilead and Abbvie. Mavyret, developed by AbbVie, entered the market at the lowest price point, with a launch price of $26,400, just 31.4% of the initial price of Sovaldi (Liu, 2019). To bolster revenue and

maintain its presence in Medicaid, Gilead introduced generics for Sovaldi and Harvoni before their patents expired. By Q2 2019, a quarter of Gilead's Hepatitis C revenue was from these generics, illustrating the effectiveness of this strategy in preserving market dominance.

4.3: Price Reductions of Obesity Drugs Implied by Therapeutic Competition

The current momentum of FDA-approved drugs for weight loss medications reflects a growing emphasis on innovation in this therapeutic area. Early weight loss medications including Xenical (CHELAPHARM) in 1999 and Alli (GlaxoSmithKline) in 2007, both utilize Orlistat to inhibit fat absorption. Subsequent advancements introduced medications including Victoza (Novo Nordisk) in 2010, a GLP-1 receptor agonist, and combination therapies such as Qsymia (Vivus) in 2012, which combines Phentermine and Topiramate, and Contrave (Orexigen) in 2014, comprising Naltrexone and Bupropion (FDA, n.d.). Current drug innovation is focused on dual compounds, which have been found to have added benefits and increased weight loss, as well as triple agonists, as seen in the promising Eli Lilly pipeline drug Retatrutide, which uses GLP-1, GIP, and glucagon (Melson et al., 2024). Phase 2 clinical trials have demonstrated promising results, with participants achieving up to 24.2% mean weight reduction at 48 weeks (Lilly, 2023). This approach represents a significant advancement in obesity treatment, offering potential benefits beyond those of earlier single or dual-agent therapies.

According to Lee (2004), the initial product in a new therapeutic class typically sets the benchmark price, while subsequent products may either differentiate themselves through innovative features or engage in price competition. Presently, the market for anti-obesity medications is seeing a considerable focus on pioneering approaches for weight loss, although there are instances of price reduction. For example, Eli Lilly launched Zepbound at a price 21% lower than Wegovy (Gumbrecht, 2023). Drawing insights from case studies in the antidepressant and Hepatitis C markets, it is predicted that launch prices for new weight-loss drugs will be reduced, ranging from 25% to 31.4%, as already demonstrated by Zepbound. According to these case studies, we may soon see launch prices closer to $925. However, some literature indicates more significant declines in prices as the pipeline increases. If the anti-obesity medication market emulates the coronary stent market, then according to Lee (2004) we may see these third-in-class drugs at a discount of 72.2%, potentially bringing prices as low as $375.

Section 5: The Misguided Science Underlying Proposals for Price Controls of Obesity Drugs

Barber et al. (2024) have limitations in their marginal cost-based pricing analysis due to their lack of consideration for key factors such as capital investments, quality assurance and control, regulatory and legal costs, or reimbursement rates. The analysis assumes equitable production and cost efficiency across different manufacturers without considering changes based on manufacturer size. Smaller manufacturers, or those in certain countries, often face higher production costs, leading to higher prices. This implies that the authors believe supply chain

resilience is the same for all firms, which is not always the case. In reality, labs are not always efficient, acquisition is not always possible, and the value of products might be low. According to Díaz and Sanchez-Robles (2020), efficiency is higher for firms that engage in manufacturing and distribution, compared to those engaging in R&D. The relationship between efficiency and employee costs exhibits a negative correlation, indicating that both very large and very small firms outperform those of medium and small sizes.

In their comparison of marginal cost-based pricing to list price, Barber et al. (2024) also overlook the impact of the US insurance system on real marginal cost borne by consumers. According to Hernandez et al. (2020), between 2007 and 2018, drug list prices rose by 159%, but discounts for Medicaid increased from 40% to 76%, and for other payers from 23% to 51%. The increased discounts offset almost two-thirds of the increased list price. Garness (2019) found that less than half of Americans pay the list price for a drug not covered by their insurance program. However, if anti-obesity medications were to be covered under Part D, one would expect this proportion to decrease.

To assess these concerns quantitatively, we conducted straightforward back-of-the-envelope calculations. We identified the number of units sold by Novo Nordisk and Eli Lilly in the US for their GLP-1 medications for both weight loss and T2D by dividing the US annual sales revenue of each drug by its US list price. We used the list price as provided by KFF analysis (2024). This calculation provided us with the annual US sales volume for each drug. We then multiplied this sales volume by the annual per-unit costs estimated by Barber et al (2024) by matching it with its generic name. The annual total costs ranged from $0.22 million for Ozempic (in 2018) to $119.92 million for Rybelsus (in 2022) for their US sales. However, these costs are lower than the industry averages for R&D expenditure alone, which range from $0.8 billion to $2.3 billion (Austin & Hayford, 2023). Our calculations for Ozempic, Wegovy, Rybelsus, and Trulicity are presented in Table 4 below.

Table 4: Cost Calculations Using US Sales Volume and Cost Estimates

Manufacturer	Brand Name	Year	Annual US Sales in USD (Mil)	List Price	Annual Qty Sold in US (Mil)	Barber LC in USD	Barber HC in USD	Annual TC (US + Low) in Mil	Annual TC (US + High) in Mil
Novo Nordisk	Ozempic	2018	228.76	936	0.24	0.89	4.73	0.22	1.16
Novo Nordisk	Ozempic	2019	1,343.86	936	1.44	0.89	4.73	1.28	6.79
Novo Nordisk	Ozempic	2020	2,331.00	936	2.49	0.89	4.73	2.22	11.78

Novo Nordisk	Ozempic	2021	3,243.52	936	3.47	0.89	4.73	3.08	16.39
Novo Nordisk	Ozempic	2022	5,425.00	936	5.80	0.89	4.73	5.16	27.41
Novo Nordisk	Ozempic	2023	8,821.40	936	9.42	0.89	4.73	8.39	44.58
Novo Nordisk	Wegovy	2021	194.04	1349	0.14	0.89	4.73	0.13	0.68
Novo Nordisk	Wegovy	2022	858.76	1349	0.64	0.89	4.73	0.57	3.01
Novo Nordisk	Wegovy	2023	4,120.20	1349	3.05	0.89	4.73	2.72	14.45
Novo Nordisk	Rybelsus	2019	7.00	936	0.01	38.62	72.49	0.29	0.54
Novo Nordisk	Rybelsus	2020	255.64	936	0.27	38.62	72.49	10.55	19.80
Novo Nordisk	Rybelsus	2021	594.02	936	0.63	38.62	72.49	24.51	46.00
Novo Nordisk	Rybelsus	2022	1,121.54	936	1.20	38.62	72.49	46.28	86.86
Novo Nordisk	Rybelsus	2023	1,548.40	936	1.65	38.62	72.49	63.89	119.92
Eli Lilly	Trulicity	2018	2,515.80	977.42	2.57	7.05	17.4	18.15	44.79
Eli Lilly	Trulicity	2019	3,155.20	977.42	3.23	7.05	17.4	22.76	56.17
Eli Lilly	Trulicity	2020	3,835.90	977.42	3.92	7.05	17.4	27.67	68.29
Eli Lilly	Trulicity	2021	4,914.40	977.42	5.03	7.05	17.4	35.45	87.49
Eli Lilly	Trulicity	2022	5,688.80	977.42	5.82	7.05	17.4	41.03	101.27
Eli Lilly	Trulicity	2023	5,433.30	977.42	5.56	7.05	17.4	39.19	96.72

Section 6: Concluding Remarks

This policy brief discussed the implications of proposed US government price controls on drugs based on the production costs or foreign prices. We discussed the recent rationales offered for such government price controls on diabetes and anti-obesity medications. We find that such rationales, although well-intended, would cause great harm to patients with obesity. The overall benefits of these drugs far exceed their costs and, therefore, government price controls would

greatly hurt US patients with obesity by reducing future improvements of them to come to market. We discuss that the large amount of therapeutic price competition that the current obesity drug pipeline indicates would be a more productive force to control prices than through regulation.

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Appendix A. Phase 2 Pipeline Drugs

Without Results

1. Nct00622765, R256918 (Johnson & Johnson)
2. Nct05532020, Dccr (Soleno Therapeutics, Inc.)
3. Nct04969939, Semaglutide 2.4 Mg, Nnc0165-1875 (Novo Nordisk)
4. Nct02313220, Dapagliflozin, Exenatide (Astrazeneca)
5. Nct05284617, Hu6 (Rivus Pharmaceuticals, Inc.)
6. Nct05891834, Inv-202 (Inversago Pharma Inc.)
7. Nct06326060, Nnc0519-0130, Tirzepatide (Novo Nordisk)
8. Nct04963231, Setmelanotide (Rhythm Pharmaceuticals, Inc.)
9. Nct00239174, Sr147778 (Sanofi)
10. Nct04799327, Shr20004 (Jiangsu Hengrui Medicine Co., Ltd.)
11. Nct00537420, Pyy3-36, Sibutramine (Nastech Pharmaceutical Company, Inc.)
12. Nct06256562, Gzr18 (Gan And Lee Pharmaceuticals, Usa)
13. Nct01195792, Gsk1521498 (Glaxosmithkline)
14. Nct00297180, Gw869682 (Glaxosmithkline)
15. Nct01666691, Beloranib (Zafgen, Inc.)
16. Nct05616013, Bimagrumab, Semaglutide (Versanis Bio, Inc.)
17. Nct00349635, Metformin, Fenofibrate (Solvay Pharmaceuticals)
18. Nct05121441, Ard-101 (Aardvark Therapeutics, Inc.)
19. Nct06041841, Lb54640 (Lg Chem)
20. Nct00236613, Topiramate (Johnson & Johnson)
21. Nct00748436, Betahistine Dihydrochloride (Obecure Ltd. Antiviral Therapy Evaluation Center)
22. Nct01508949, Liraglutide (Novo Nordisk)
23. Nct01126970, Velneperit 400 Mg, Orlistat 120 Mg (Shionogi)
24. Nct00116740, Apd356 (Eisai Inc.)
25. Nct00394667, Tesofensine (Neurosearch A/S)
26. Nct05111912, Xw003, Liraglutide (Sciwind Biosciences Apac Co Pty. Ltd.)
27. Nct00459004, Rimonabant (Sanofi)
28. Nct05925114, S-309309 (Shionogi)
29. Nct00479492, Cp-866,087 (Pfizer)
30. Nct06019559, K-757, K-833 (Kallyope Inc.)
31. Nct06445075, Apitegromab, Tirzepatide, Semaglutide (Scholar Rock, Inc.)
32. Nct04904913, Ibi362 (Innovent Biologics (Suzhou) Co. Ltd.)
33. Nct05669599, Amg 133 (Amgen)
34. Nct06037252, Tirzepatide (Eli Lilly and Company)
35. Nct06250946, Hrs-7535 (Shandong Suncadia Medicine Co., Ltd.)
36. Nct02063295, Zgn-440 (Zafgen, Inc.)
37. Nct06373146, Tirzepatide and Mibavademab (Eli Lilly And Company)
38. Nct05934110, Emp16-120/40, Orlistat (Empros Pharma Ab)

39. Nct00094146, Sandostatin Lar Depot (Novartis)
40. Nct00189514, Pramlintide Acetate (Astrazeneca)
41. Nct00339014, Zonisamide Cr and Bupropion Sr (Orexigen Therapeutics, Inc)
42. Nct05197556, Hsg4112 (Glaceum)
43. Nct03818256, Miricorilant (Corcept Therapeutics)
44. Nct05881837, Hrs9531 (Fujian Shengdi Pharmaceutical Co., Ltd.)
45. Nct00785408, Ac2307 (Astrazeneca)
46. Nct06230523, Ly3841136 (Eli Lilly and Company)
47. Nct06391710, Hrs9531 (Fujian Shengdi Pharmaceutical Co., Ltd.)
48. Nct00345410, Ave1625 B (Sanofi)
49. Nct06259981, Gly-200 (Glyscend, Inc.)
50. Nct00104507, Apd356 (Eisai Inc.)
51. Nct00364871, Naltrexone and Bupropion Sr (Orexigen Therapeutics, Inc)
52. Nct00709371, Zonisamide Sr / Bupropion Sr (Orexigen Therapeutics, Inc)
53. Nct05385978, Aphd-012, Aphd-012p (Aphaia Pharma Us Llc)
54. Nct06124807, Ly3305677 (Eli Lilly and Company)
55. Nct00542009, Ce-326,597 (Pfizer)
56. Nct02063802, Metformin (Laboratorios Silanes S.A. De C.V.)
57. Nct06118021, Hs-20094 (Jiangsu Hansoh Pharmaceutical Co., Ltd.)
58. Nct00112021, Pramlintide Acetate (Astrazeneca)
59. Nct06226090, Tg103 (Cspc Baike (Shandong) Biopharmaceutical Co., Ltd.)
60. Nct01818921, Zgn-440 (Zafgen, Inc.)
61. Nct06046443, Lb54640 (Rhythm Pharmaceuticals, Inc.)
62. Nct00482638, Mk0493 (Merck Sharp & Dohme Llc)
63. Nct06254261, Ray1225 (Guangdong Raynovent Biotech Co., Ltd)
64. Nct06299098, Trevogrumab, Garetosmab, Semaglutide (Regeneron Pharmaceuticals)
65. Nct00788528, S-2367 (Shionogi)
66. Nct02069197, Orlistat (Mid-Atlantic Epilepsy and Sleep Center, Llc)
67. Nct00409305, Betahistine (Obecure Ltd.)
68. Nct00156897, Atl-962/ Orlistat (Alizyme)
69. Nct00748605, S-2367 (Shionogi)
70. Nct05299697, Tg103 (Cspc Baike (Shandong) Biopharmaceutical Co., Ltd.)
71. Nct01003483, Orlistat (Yazd Research & Clinical Center For Infertility)
72. Nct00444561, Pramlintide Acetate (Astrazeneca)
73. Nct05215847, Ard-101 (Aardvark Therapeutics, Inc.)
74. Nct01511198, Liraglutide/ Metformin (Novo Nordisk)
75. Nct06054698, Hrs9531 (Fujian Shengdi Pharmaceutical Co., Ltd.)
76. Nct00231647, Topiramate (Johnson & Johnson)
77. Nct01271777, Gft505 (Genfit)

With Results But Specialized Populations

1. Nct04725240, Setmelanotide (Rhythm Pharmaceuticals)
2. Nct03149445, Tesofensine/Metoprolol (Saniona)
3. Nct04524403, Miricorilant (Corcept Therapeutics)
4. Nct03013543, Setmelanotide (Rhythm Pharmaceuticals)

Appendix B. Cost Breakdown

Table 5: Cost Components from Barber et al (2024)

Component	Cost per Month (US$)	Source
API cost	See Table 4	
Vial (10mL)	0.155 - 0.21	Clendinen (2016), CEPI 2020
Cartridge (3mL)	0.10 - 0.33	Jiangsu Delfu medical device Co. interviewees
Disposable Pen	0.30 - 2.50	Interviewees, Jiangsu Delfu Medical device Co.,
Reusable Pen	5 - 10	Interviewees, GensuPen, Delfu Medical
Fill-and-Finish: Injectable Formulations	0.1	Based on cost of water for injection and sodium chloride
Fill-and-Finish: Oral Formulations	0.01	Hill et al (2018)
Secondary Packaging	0.1	Clendinen (2016)
Profit Margin	10 - 50%	Assumed ranges based on industry standards
Allowance for Tax	25%	Enache (2022)
Needle for Pen	0.03g	Jiangsu Delfu medical device Co., Alibaba
Insulin Syringe with Needle	0.07 - 0.32	Medecins Sans Frontieres 2022, Klatman EL, Ogle GD
Biosimilar Development Costs	11 - 53 million	Chinese biosimilar insulin manufacturer
Excipient Costs	Varies	Bulk commercial suppliers

Table 6: API Costs from Barber et al (2024)

Medicine	Cost of API (US$/kg)	Source
GLP1 Agonists		
Dulaglutide	1,500,000	Manufacturer quote
Exenatide	542,500	Export-import data
Liraglutide	573,521	Export-import data
	500,000	Manufacturer quote
Lixisenatide	No data	
Semaglutide	70,569	Export-import data
Tirzepatide	No data	