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An economic analysis of cancer drug pricing: Market failures, policy challenges, and equity implications

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Abstract

The global cost of cancer treatment has escalated, with drug prices becoming a major barrier to access and sustainability in healthcare systems. This paper examines the economic drivers behind these high prices, including patent protections, market monopolies, inelastic demand, information asymmetry, and opaque R&D costs. Drawing on economic theory and recent literature, it finds that cancer drugs are often priced well above their clinical value. Pharmaceutical firms typically recover R&D costs rapidly but maintain high prices, generating profit margins disproportionate to therapeutic outcomes. Cross-country comparisons reveal stark disparities in affordability. In some middle-income countries, patients must work over two weeks on minimum wage to afford a single dose. These pricing practices place significant strain on individuals and healthcare budgets, especially where negotiating power is limited. The paper argues that current pricing models are economically inefficient and socially unjust. It recommends key reforms: reducing market exclusivity periods, implementing value-based pricing aligned with clinical outcomes, and enforcing transparency in R&D spending and pricing structures. These steps are critical to improving drug affordability, advancing equity, and supporting responsible innovation in cancer care.

Keywords: Cancer drug pricing, health policy reform, market failure, pharmaceutical economics, value-based pricing.

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1. Introduction

In recent years, global spending on medicines has grown significantly and is projected to reach US$2.3 trillion by 2028, at a compound annual growth rate of 5-8%. The heavy financial burden poses a serious challenge to global health systems. Even though increased expenditure due to the growing demand for medicines cannot be ignored, rising drug prices remain a major concern for health policymakers [1]. Since 1995, the price of new drugs against cancer has risen dramatically with the use of biologics in cancer treatment, most anticancer drugs marketed between 2009 and 2014 cost more than $100,000 per year [2] (see Figure 1).

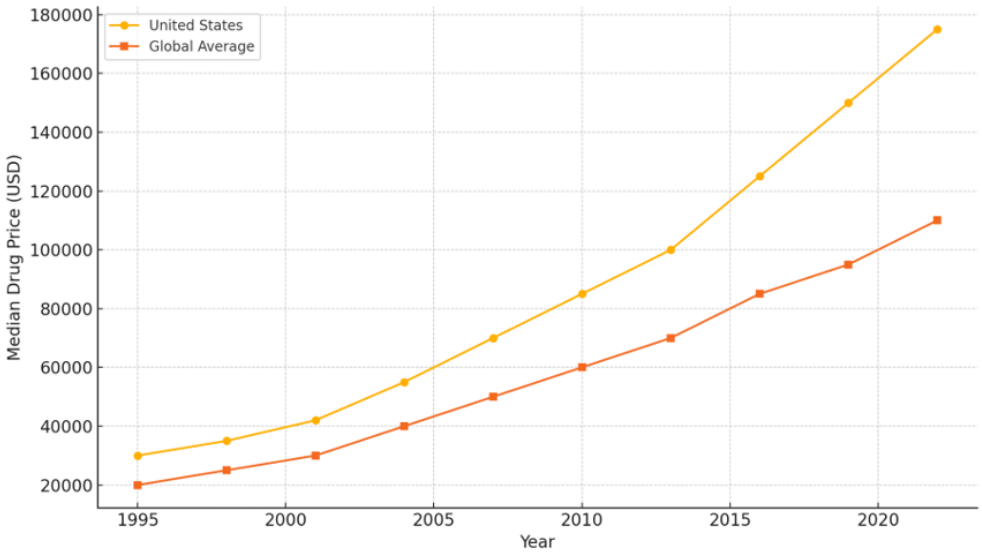

Figure 1.
Trends in Median Launch Prices of New Cancer Drugs, 1995–2023 (US dollars, adjusted for inflation).
Source: Adapted from Leighl, et al. [2]; Hernandez, et al. [3], and Serra-Burriel, et al. [4].

These prices are far beyond the affordability of many patients and healthcare systems, and cancer treatments have led to severe economic toxicity. In 2023, Serra-Burriel 's cross-sectional study again examined the price of cancer medicines to be three times higher than the price of other medicines adjusted for the same epidemiological endpoints [4]. This difference exists in both the US and European countries, with the former being free to set drug prices and the latter having the power to negotiate prices. Access to affordable medicines is an integral part of the right to health. However, many cancer medicines are priced beyond affordability and value, and their prices appear to be 'unfair'. These high prices are often not justified by transparent research and development (R&D) costs [5]. This problem is further exacerbated by policies designed to protect intellectual property rights over medicines and promote innovation, hindering universal health coverage and access to essential medicines.

This article reviews recent research on the pricing and policy landscape of cancer drugs, focusing on key contributors to market failure such as monopolistic practices, demand inelasticity, willingness to pay, and information asymmetry. While patent protection policies were originally designed to incentivize innovation, they have also contributed to long-term issues of unsustainability and limited access. According to the World Health Organization, cancer is the second leading cause of death globally, responsible for nearly 10 million deaths in 2020. The burden is increasingly shifting to low- and middle-income countries (LMICs), where more than 70% of cancer deaths now occur. Yet, these regions face the greatest affordability barriers. For example, WHO has reported that essential cancer medicines are unavailable in 47% of LMIC public hospitals, primarily due to price-related procurement challenges. These global disparities underscore the need for urgent reform in drug pricing policies that reflect both equity and economic sustainability. In this context, balanced health policy regulation is essential, not only to foster competition and continued pharmaceutical innovation but also to safeguard the public's right to affordable healthcare. Building on these concerns, this paper aims to investigate the economic mechanisms underlying the persistent disconnect between cancer drug prices and their clinical value, and to identify policy solutions that can improve affordability and promote equity across diverse healthcare systems.

2. Literature Review

The issue of high cancer drug prices has generated extensive academic discussion and policy concern. Existing literature has explored a range of contributing factors, including the disconnect between drug price and clinical value, the cost of research and development (R&D), regulatory frameworks, and global disparities in access. This section systematically reviews recent influential studies to understand how the field has evolved, where gaps remain, and how the present study contributes to addressing those gaps.

2.1. Drug Prices and Clinical Benefit Misalignment

One of the core debates in current research concerns whether the prices of cancer drugs are justified by their clinical outcomes. Vokinger et al. [6] conducted a comparative analysis of cancer drug prices and their corresponding therapeutic benefits in both the United States and Europe [6]. Their findings showed that there was no consistent relationship between the cost of a drug and the degree of improvement it offered in overall survival or quality of life. In particular, many drugs that achieved regulatory approval based on surrogate endpoints, rather than hard clinical outcomes, were priced at similar levels to drugs with demonstrated survival benefits. This mismatch has raised serious concerns regarding pricing fairness and the criteria used to assess value in pharmaceutical markets. The authors emphasized the importance of post-market value assessments and called for the implementation of pricing models that better reflect therapeutic outcomes.

2.2. R&D Costs and Pricing Justification

Another important theme in the literature relates to whether high drug prices can be justified by the cost of bringing new medicines to market. Wouters et al. [7] analyzed the R&D expenditures for a large sample of new drugs approved between 2009 and 2018 [7]. Their study estimated that the median cost to develop a new drug was below one billion US dollars, a figure substantially lower than the estimates frequently cited by industry sources. Furthermore, their results suggested that revenues generated from many new drugs far exceeded their development costs within a relatively short time period.

Supporting this view, Prasad and Mailankody [8] investigated the development cost of individual oncology drugs and compared these figures with the revenue generated post-approval [8]. They found that pharmaceutical companies often recovered their R&D expenses quickly and went on to earn substantial profits. These findings challenge the widely accepted narrative that high prices are necessary to incentivize innovation and instead point toward structural inefficiencies in pricing mechanisms. The lack of transparency in R&D expenditure reporting further complicates the ability of regulators and payers to assess the fairness of pricing decisions.

2.3. Regulation, Innovation, and Market Behavior

The role of pharmaceutical regulation in shaping innovation incentives and pricing strategies has also been a focus of inquiry. Eger and Mahlich [9] explored the impact of European regulatory policies on corporate investment in pharmaceutical R&D [9]. Their study found that while pricing regulations might slightly influence company profitability, they do not significantly discourage innovation, especially in fields like oncology where profit margins are high. These findings imply that well-designed regulatory frameworks can help control drug prices without compromising scientific progress. The authors argue for balanced regulation that safeguards public health budgets while maintaining sufficient incentives for drug development.

2.4. International Disparities in Pricing and Access

Several studies have highlighted the stark disparities in cancer drug affordability across countries. Moye-Holz and Vogler [10] examined the affordability of cancer medications in 16 countries across Europe and Latin America [10]. Their research revealed wide variations in the number of workdays required to purchase standard cancer treatments, with patients in some middle-income countries needing to work several weeks to afford a single dose. These disparities were attributed to differences in procurement policies, pricing negotiation capacity, and market transparency. The authors concluded that a lack of international coordination and inconsistent application of pricing strategies contributes to unequal access to essential cancer medicines.

Godman et al. [11] reached similar conclusions in their study of oral generic cancer medicines in 25 European countries [11]. They found substantial price variability, even within regions that share similar regulatory infrastructures. This suggests that effective procurement strategies and market competition can significantly influence affordability, but such benefits are not uniformly realized across countries. These findings underscore the importance of aligning national policies with broader international efforts to improve equity in drug pricing.

2.5. The Role of Price Confidentiality and Rebates

Confidential rebates and negotiated discounts have become increasingly common in pharmaceutical pricing, particularly in high-income countries. Bonetti and Giuliani [12] examined how these practices affect pricing transparency and fairness [12]. Their research found that although confidential discounts may reduce drug costs for individual health systems, they create significant information asymmetries across countries. This lack of transparency limits the ability of lower-income nations to negotiate fair prices and may undermine efforts to establish equitable pricing standards globally. The authors argue that greater price transparency is necessary to ensure more balanced and accountable drug pricing policies.

2.6. The Cancer Premium and Behavioral Influences

Adding a new perspective to the economic discussion, Serra-Burriel et al. [4] introduced the concept of the “cancer premium” [4]. Their study demonstrated that cancer drugs are consistently priced higher than non-cancer medications, even when adjusted for similar epidemiological and clinical criteria. This premium, according to the authors, cannot be fully explained by R&D costs or therapeutic benefits. Instead, it may reflect behavioral factors such as the fear associated with cancer and the political sensitivity surrounding oncology care. These psychological dimensions may distort willingness to pay and influence policy decisions, contributing to persistent overvaluation in this drug category.

2.7. Research Gap and Study Contribution

Although the reviewed literature provides substantial insight into cancer drug pricing from various disciplinary angles, it remains fragmented across isolated domains such as R&D costs, regulation, and international comparison. Few studies offer an integrated economic analysis that connects these elements through the lens of market failure. Moreover, current literature tends to focus on high-income countries or singular case studies, leaving a gap in comparative frameworks that evaluate the interplay between market structure, pricing behavior, and access across different economic contexts.

This study addresses this gap by combining economic theory with recent empirical evidence to provide a structured analysis of cancer drug pricing. It emphasizes the systemic nature of the problem, shaped by monopolistic market behavior, weak price elasticity, regulatory asymmetries, and information imbalances. By synthesizing these themes, this research aims to support the development of policy mechanisms that improve affordability and equity without undermining pharmaceutical innovation. While significant research has addressed pricing issues in high-income countries, there remains a scarcity of

systematic analyses involving low-income regions such as Sub-Saharan Africa or Southeast Asia. These settings often face the most extreme trade-offs between cost and access, yet receive minimal academic or policy attention. Addressing this gap would enable a more globally inclusive understanding of the equity implications of cancer drug pricing.

3. Issues and Economic Analyses

3.1. Patent Policies and Monopoly Power

The patent system provides temporary market dominance to stimulate innovation by allowing pharmaceutical companies exclusive rights to manufacture and market a new drug for a typical period of 20 years. This exclusivity results in a monopoly, enabling the company to set prices without facing competition. In such a monopoly, the company aims to maximize profits by equating its marginal revenue (MR) to its marginal cost (MC). However, because the demand for life-saving medications is relatively inelastic, companies in a monopoly position can charge prices far above their marginal costs, yielding significant economic profits [3]. In contrast, in a perfectly competitive market, the price of a generic drug is equal to the marginal cost (P = MC) and therefore is not economically profitable in the long run.

Collectively, monopoly-driven pharmaceutical prices have significant impacts on healthcare systems across different countries. For example, in the United States, where private health insurance is funded by voluntary advance contributions and out-of-pocket payments, the high cost of treatment or the insurance premiums may put a direct financial strain on the patient. This is evidenced by Hussaini's study in 2022, suggesting that about half of all cancer patients face personal financial burdens related to their treatment pharmaceuticals. Unlike the United States, the prices of medicines in some European countries are set through negotiation [11]. Germany has a social health insurance system. Most of it (86%) is provided by competing, non-profit, non-governmental health insurance funds in the statutory health insurance (SHI). Lower out-of-pocket costs for patients reduce the potential for direct financially damaging effects on cancer patients. Nevertheless, the high prices can impact the health care system. As there are limited resources for health care, the high cost of cancer drugs leads to fewer resources being available for other diseases.

One policy response to excessive monopoly pricing is the issuance of compulsory licenses, which allow governments to authorize the production of generic versions of patented drugs without the consent of the patent holder. A prominent example is South Africa's use of compulsory licensing during the HIV/AIDS crisis, which dramatically reduced drug prices and improved treatment access. Applying similar mechanisms to cancer treatments could counterbalance patent-induced price inflation while preserving incentives for genuine innovation.

3.2. Demand Elasticity and Willingness to Pay

The pharmaceutical market is different from other goods because of its own uniqueness. Information asymmetries between drug providers and consumers hinder the interaction of supply and demand, leading to market failures. Elasticity of demand measures the response of the quantity demanded to a change in price. For cancer drugs, demand elasticity is lower (demand inelasticity), suggesting that a price increase will result in only a very minor decrease in the quantity demanded. This inelasticity allows pharmaceutical companies to increase prices with little loss of sales. Hernandez et al. [3] proved that in the US, from 2007-2018, the price of tumour necrosis factor inhibitors increased by 166% and the price of antineoplastic drugs increased by 59%, with increased sales [3].

Meanwhile, previous research considered the patients' willingness to pay for cancer higher than for other non-communicable diseases due to higher lethality than for other non-communicable diseases [2, 13]. However, Serra-Burriel et al. [4] demonstrated that instantly after controlling for lethality, cancer drug price expenditures were still much higher than for other drugs, termed as 'the cancer premium' [4]. The reason for this may be that the fear of cancer drives people to be willing to put more resources into paying for cancer than for other diseases. Behavioral economics suggests that patients and policymakers may overvalue marginally effective cancer drugs due to framing effects, where life-extending treatments are framed as essential regardless of cost-effectiveness. This emotional framing skews willingness to pay and encourages policies that prioritize cancer drugs over potentially more cost-effective interventions in other health domains. Although the health risks associated with cancer are overestimated by the public, there is no necessity to be so fearful of the effects of cancer [14]. Moreover, many high-priced cancer drugs only marginally improve survival or quality of life for cancer patients compared to existing therapies. The evidence available is insufficient to justify the high prices measured by the cost per year of increased life expectancy or improved quality of life.

The fear of cancer is also reflected at the level of health policy. For example, some countries have created individual cancer drug funding mechanisms to support anticancer drugs [14]. There is not another health condition that has a fund dedicated to improving access to pharmaceuticals. For example, in England, hospitals may advise patients to prolong end-of-life treatment, even if this treatment is less cost-effective than would normally be considered acceptable by the healthcare system. Although this suggestion is not specific to cancer patients, in fact, only anti-cancer drugs in clinical practice fit the criteria for consideration as set out in the policy [14, 15].

3.3. Pricing Strategies

It is argued that concerns about high list prices for cancer drugs are somewhat overblown, as pharmaceutical companies often offer significant discounts to organizations that purchase medicines. These confidential discounts have become commonplace in wealthier countries and vary widely across therapeutic categories and countries [10]. However, a study noted that the average price of medicines in the United States, after discounts and inflation were removed, increased by a net 60% over the period 2007-2018, with an annual growth rate of 4.5 percent. Cancer drug prices increased by a net 41% [3]. This has raised widespread concerns about the transparency and equity of drug pricing in global health systems. While these discounts have helped to reduce the final price paid by health systems, their widespread use remains problematic. The

confidentiality of these discounts may prevent the adoption of consistent and equitable pricing strategies in different regions, which may disadvantage countries in low- and middle-income countries that are in dire need of affordable medicines.

A potential solution is the adoption of differential pricing strategies coordinated at a global level. Under this model, countries would pay for medicines in proportion to their income levels, supported by a centralized international pricing database to improve transparency and coordination. However, without a binding international framework, current implementations remain voluntary and fragmented, which undermines the intended equity goals.

Pharmaceutical companies have market power by virtue of owning drugs protected by patent policies and can set prices above the level of competing markets. In the absence of competition, companies can maximize profits through price discrimination strategies by pricing according to the ability to pay in different markets. Price discrimination allows firms producing cancer medicines to capture consumer surplus and turn it into additional profits. By segmenting the market, firms can charge higher prices to countries with less elastic demand and lower prices to countries with more elastic demand. Studies have noted that public procurement and ex-factory prices of originator cancer drugs vary considerably between countries of different income levels. Even in lower-income European countries and countries in Latin America and the Caribbean, a worker would need more than 15 days of minimum wage to purchase one of the several anticancer drugs studied [10].

As illustrated in Figure 2, the number of minimum wage workdays required to purchase a standard dose of cancer medicine varies significantly across countries. While patients in high-income countries like the United States and Germany may spend only 3–4 days' wages, those in middle- and lower-income countries such as Argentina, India, or Ukraine may need to work more than two weeks. This stark disparity underscores the inequitable burden of cancer drug pricing globally and raises critical concerns regarding affordability and access.

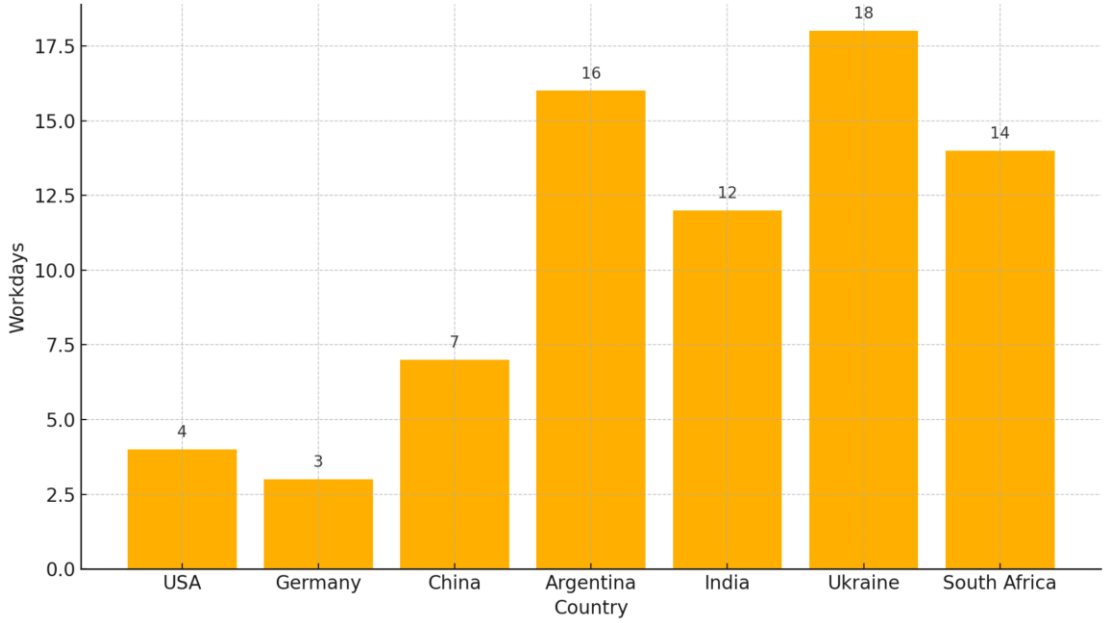

Figure 2.
Minimum Wage Workdays Required to Afford a Standard Can.

A research study examining 31 European countries found that discounts and rebates were commonly used in inpatient and outpatient departments in 25 countries [12]. Methods of managing these discounts and rebates vary considerably worldwide. They are often part of confidentiality agreements, which can affect price transparency and lead to distortions in the pricing of medicines. For example, while the official list price is public, the actual transaction price after discounts and rebates remains confidential, making it difficult for public payers to assess the true cost. The secrecy around pricing enhances information asymmetry, where buyers (healthcare systems or countries) do not have knowledge of the prices paid by others. This lack of transparency weakens their bargaining power and allows pharmaceutical companies to maintain higher control over prices.

3.4. Innovation and R&D Costs

It is estimated that the cost of research and development (R&D) of cancer drugs is the highest of all areas of drug development [8]. It has been argued that pharmaceutical companies should increase the prices of anti-cancer drugs to recover the huge R&D costs. This should be used as an innovation incentive to continue developing new anticancer drugs. However, a study has shown that there is no direct correlation between R&D costs and treatment prices. In fact, revenues from anticancer drugs greatly exceed projected R&D costs. Prasad and Mailankody [8] found the R&D expenditures of pharmaceutical companies that succeeded in getting their first cancer drug approved at an estimated cost of $648 million [8]. However, within a short period of time, the R&D costs were recouped, with some companies making more than 10 times more profit than the R&D expenditure - a higher return on investment for pharmaceuticals compared to other industries. Such excess profits may lead to inefficiencies in the anticancer drug development process and impede truly innovative and clinically meaningful advances.

A significant side issue is also the economics of R&D costs. A large proportion of R&D costs are sunk costs, which have already been incurred and cannot be recovered. Economically, sunk costs should not be considered in drug pricing decisions. However, pharmaceutical companies use these sunk costs to justify high prices to ensure an adequate return on investment. At the same time, pharmaceutical companies rarely disclose detailed research and development costs, instead failing to represent the average company cost for individual drugs. This opacity makes it difficult to assess whether prices are fair or inflated.

Meanwhile, the R&D cost figures disclosed by pharmaceutical companies are in doubt. The development of new drugs often has characteristics of a public good. Governments invest large amounts of public funds and financial subsidies in new medicines to increase the availability of pharmaceutical products. Studies have found that upwards of half of new drug research in the United States uses technologies available in the public service, and that public funding supports 50-75 percent of basic science and applied science research for new drug development. However, no pharmaceutical company's annual financial report reflects the government subsidies and tax incentives it receives. This has led to further overestimation of the cost of innovation and development of cancer drugs by pharmaceutical companies.

Moreover, the reported inflation in R&D costs is often influenced by accounting practices that include substantial "opportunity costs" or capitalized returns on investment. While these practices are acceptable in financial disclosures, they distort the economic rationale for high pricing. In reality, the development of innovative drugs is frequently supported by significant public funding, particularly during the early research stages. For instance, data from the United States shows that the National Institutes of Health (NIH) has contributed to the discovery of over 75% of new drug molecular targets approved in recent years. Similar public support structures exist in countries like the UK, Germany, and France. This highlights that pharmaceutical innovation is not solely a private sector achievement but rather the outcome of collective, publicly subsidized efforts. As such, drug pricing should incorporate a "public return" principle, adjusting prices downward in accordance with the level of public investment involved. Such transparency would foster fairer cost-sharing models and reduce the financial burden placed solely on patients and health systems.

4. Policy Recommendations and Economic Solutions

4.1. Promoting Competition

The essential economics that leads to unfair cancer prices is that patent protection policies give monopoly power to pharmaceutical companies. Direct price controls on cancer drugs may reduce the willingness of drug companies to innovate [9]. Even if a country imposes price controls on medicines, drug companies may simply withdraw from that market. Between 2011 and 2018, nearly 90% of new pharmaceuticals will be available in the United States, whereas in other developed countries with price-control mechanisms, the rate of availability of new medicines will be only half that of the United States [5]. One way to alleviate this problem without stifling innovation in cancer drugs is to shorten the period during which drugs are sold exclusively by one company. This would shorten the duration of the monopoly and promote competition. It would encourage companies to recoup their research and development costs more efficiently and allow generic producers to enter the market more quickly, thereby lowering prices and increasing access. Furthermore, as an increasing number of competitors in the cancer drug market can lead to more competitive pricing, drug companies need to compete for market share by improving product quality or reducing costs.

4.2. Delinking R&D Costs from Pricing

The financial burden that many cancer drugs impose on healthcare payers is often disproportionate to their clinical value. Numerous studies have shown that there is no consistent correlation between the cost of a cancer drug and its actual therapeutic benefit [6]. While a few high-priced drugs may offer meaningful improvements in survival, the majority deliver only marginal gains despite substantial costs. This disconnects between price and clinical effectiveness raises fundamental concerns about the efficiency, transparency, and fairness of current oncology drug pricing strategies.

To address these challenges, value-based pricing models have been proposed as a means of aligning drug costs with their actual health benefits. These models aim to enhance both resource allocation efficiency and equitable access to essential treatments. Some countries have already begun experimenting with such frameworks. For instance, in Germany, manufacturers are allowed to freely set prices during the first year of market entry, after which prices are renegotiated based on the drug's assessed therapeutic value. Similarly, China's National Volume-Based Purchasing (NVBP) initiative has significantly lowered drug prices, increasing affordability: the proportion of affordable medicines rose from 33% to 67%, and the average number of workdays required to purchase a treatment decreased from 8.2 to 2.8 days. While further research is needed to evaluate the long-term impact of such policies on innovation and access, these early examples indicate promising directions for reforming cancer drug pricing.

4.3. Enhancing Transparency and Global Coordination

One of the critical barriers to equitable drug pricing is the widespread lack of transparency in how prices are determined and negotiated. Confidential pricing agreements, common in high-income countries, obscure the actual transaction prices of cancer medications and hinder cross-national price comparisons. This opacity weakens the bargaining power of lower- and middle-income countries and enables firms to maintain excessive control over pricing. A potential solution is the creation of a global pharmaceutical price observatory, coordinated by the World Health Organization or a multilateral body. This platform would collect and publish real-world drug purchase prices, discounts, and relevant R&D cost data, allowing countries to benchmark their negotiations and improve procurement strategies. Furthermore, regional joint procurement mechanisms such as the Pan American Health Organization's Strategic Fund or the African Medicines Regulatory

Harmonization initiative can enhance purchasing leverage and reduce duplication of efforts. Strengthening international coordination in this way not only supports transparency but also reinforces shared responsibility in ensuring affordable access to essential cancer drugs across diverse economic contexts.

5. Conclusion

The pricing challenges of cancer drugs arise from a multifaceted combination of factors, including monopolistic market structures, price discrimination strategies, and high yet often non-transparent research and development (R&D) costs. This study contributes to the existing literature by offering a comprehensive economic analysis of these structural inefficiencies, supported by empirical comparisons and theoretical insights.

The findings demonstrate that current pricing mechanisms frequently fail to align with the actual clinical value of cancer therapies, resulting in considerable economic inefficiencies and inequities in access. By analyzing international pricing practices and disparities in affordability, this paper emphasizes the need for coherent health policy interventions that enhance market transparency, foster competition, and ensure equitable access to essential medicines.

Furthermore, this research underscores the critical role of governments and regulatory institutions in designing and implementing pharmaceutical pricing frameworks that balance the objectives of innovation, sustainability, and public health. Policy instruments such as value-based pricing, enhanced international negotiation mechanisms, and reduced exclusivity periods are identified as promising pathways toward more effective pricing governance.

In conclusion, while further research is warranted to refine these policy approaches and assess their long-term impact, the present study establishes a foundational understanding of the economic distortions underlying cancer drug pricing. It provides both a diagnostic and a prescriptive contribution, offering concrete directions for future health policy reform aimed at improving affordability, efficiency, and fairness in oncology drug markets.

Looking forward, the reform of cancer drug pricing must extend beyond national-level policy interventions and embrace global governance mechanisms. Governments should advocate for internationally harmonized frameworks for health technology assessment (HTA) and value-based pricing standards, which would provide a stronger institutional foundation for transnational pricing negotiations. At the same time, greater investment in publicly funded research platforms or shared intellectual property pools could reduce dependence on private patent monopolies. Policymakers must also be mindful of the risk of creating a “reverse innovation trap,” where excessive price controls disincentivize small and medium-sized biotech firms from engaging in breakthrough development. Future research should thus explore sustainable models that balance fairness in pricing with adequate returns on investment. By developing more transparent and ethically grounded pricing structures, the international community can better align innovation incentives with the universal right to access effective cancer treatment.

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