Greed: A Helping and Hurting Force for Oncological Drugs

Cancer, a prevalent force in society that stands alongside the common cold, and the flu as a household name disease. However, it is much more frightening do to its uncertain and unnatural characteristics. It is a contradiction to the security we find in the knowledge that our body will fight for us. It originates within, it feeds off, and eventually will destroy the body. With the terminal nature of the disease and its high acquisition rate it has become a major focus of the medical industry. With patients and doctors seeking the best treatment methods, much pressure has been placed on the pharmaceutical industry. These companies have been and continue to be successful in developing drugs that prolong the life of cancer patients. However, because of the benefits provided by the drugs a large price tag has been placed on them. Currently, an intense debate surrounds whether the pricing is unreasonable, even if many may claim that a price cannot be set on life. This paper will list the prices of the most commonly used cancer drugs, and pharmaceutical companies' justification for current and rising prices, and ultimately why prices are too high. Most individuals have a general grasp of the risks and costs of cancer physically. However, a majority are unaware of the full gamut of costs they will incur. This project is not meant to make those with cancer feel worse, or worry. Instead by providing them with a better understanding of their situation it aims to enlighten in hopes of making those affected by cancer both directly and indirectly more comfortable.

In a Youtube video by Mayo Clinic on a paper written about the rising cost of cancer drugs. The doctor being interviewed mentioned that the average yearly cost of a cancer drug is $100,000 [25]. For example, Gleevec. It is approved to treat a rare cancer called Chronic Myeloid Leukemia (CML). The FDA defines leukemia as, a type of cancer in which the bone marrow produces an excessive number of abnormal (leukemic) white blood cells. These abnormal cells suppress the production of normal white blood cells, which act to protect the body against infection. According to Drug.com, which pulled its data from the Drugs.com discount card which is a card used when making purchases at pharmacies, Gleevec currently costs $8,806.25 for ninety 100mg tablets and $10,575.82 for thirty 400mg tablets [19]. On the official Gleevec website it states that a patient who is prescribed Gleevec should take 400mg a day, and if the desired reduction in tumor size is not achieved the prescribing doctor will most likely up the dosage to 800mg [23]. For a year of treatment, based on these numbers, it costs at least $126,000. Another commonly prescribed oncological drug is Herceptin. Herceptin is prescribed to treat Breast Cancer. According to Drug.com, a single dose of Herceptin costs $4,375.49 [20]. The normal course of treatment using Herceptin, according to the FDA, constitutes an initial dose of 4 mg/kg as an intravenous infusion over 90 minutes then at 2 mg/kg as an intravenous infusion over 30 minutes weekly during chemotherapy for the first 12 weeks or 18 weeks. One week following the last weekly dose of Herceptin, administer Herceptin at 6 mg/kg as an intravenous infusion over 30–90 minutes every three weeks [22]. According to an article written by Market Watch, a course of treatment costs approximately $64,000 [16].

The video proceeded to state that cost of cancer drugs in the U.S. are 50-100% more expensive than cancer drugs of similar caliber in other developed countries even though they are funded for the most part through tax revenue [25]. For example, in a report done by CNN they found that Gleevec (a cancer treatment) costed $6,214 (per month/per customer) in the United States, compared to $1,141 in Canada and $2,697 in England [11]. The cost of Gleevec in this report is less than the $10,572.82 that Drug.com recorded. This is most likely because CNN conducted its report in 2015 and may have used data from prior to 2015. In contrast, Drug.com

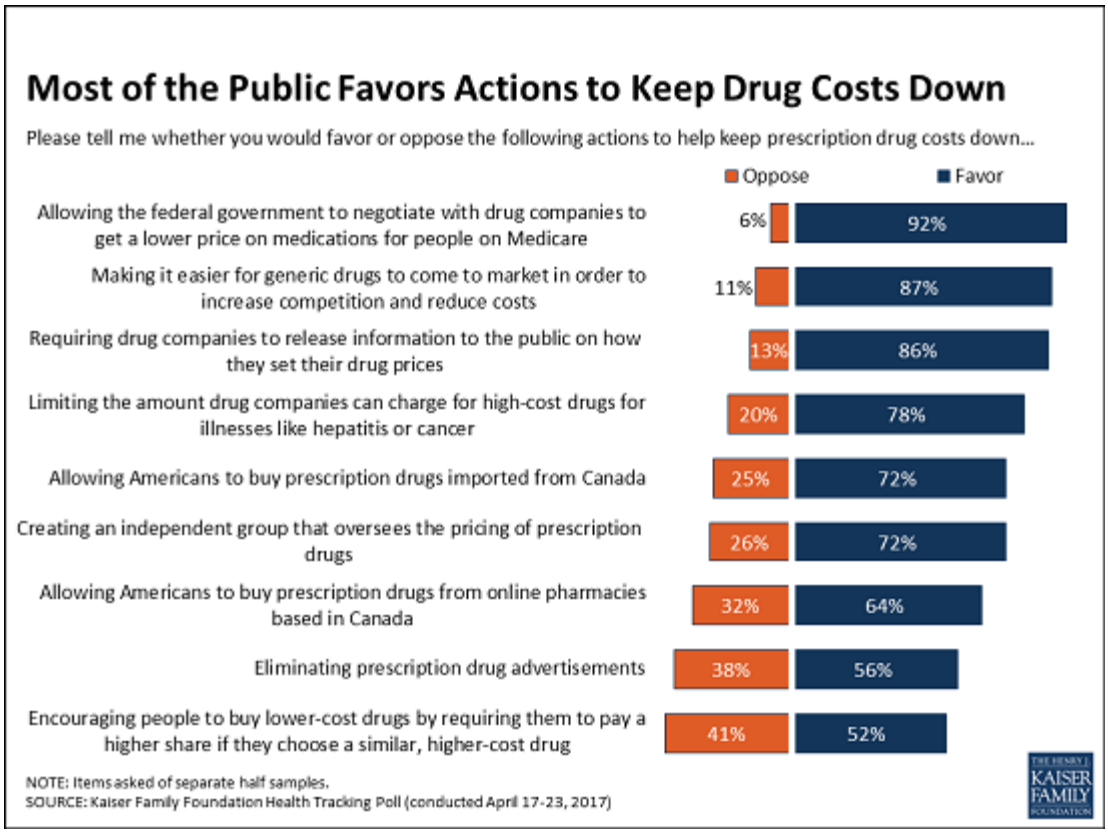
continually updates their numbers by keeping track of the costs charged on their discount card. Further examples include Humira (for rheumatoid arthritis) which costs $2,246 in the United States, compared to $881 in Switzerland and $1,102 in England [11]. Cymbalta (for depression) costs $194 in the United States, compared to $46 in England and $52 in the Netherlands [11]. These disparities in cost can be explained by the differences between the structure of the U.S. health care system and the structure of most European countries health care systems.

In the U.S., the number of groups buying drugs is much greater, for example hospitals, private insurance groups, Medicare, and plans for individuals, compared to European countries [11]. As result, these organizations can individually negotiate pricing with pharmaceutical companies leading to unregulated pricing. In contrast, in Europe there are fewer groups with which pharmaceutical companies can do business with. As result, the companies must be more sensitive to the amount their customers are willing to pay. In addition, most government healthcare systems in Europe have mutable forumlaries, a list of drugs that are covered by a health care plan, and drugs for the entire country are bought through this formulary [11]. Furthermore, the federal law agencies in charge of the formulary can negotiate pricing with drug companies putting downward pressure on prices. However, when Medicare underwent a major overhaul in 2003, the legislation forbids Part D from negotiating drug-pricing with suppliers [11]. If Medicare could negotiate with pharmaceuticals it would be able to significantly drive drug pricing down. Evidence for this can be found in the same CNN article mentioned earlier. The author, Nadia Kounang, spoke with Joshua Cohen who is an associate professor at Tufts Center for the Study of Drug Development. He said to '"look to the Veterans Administration(VA) to see how collective buying power can work. The VA negotiates significantly lower prices for drugs across almost all therapeutic classes, he wrote in an email. As a closed health care system, it is able to extract higher discounts. Generally, prices of drugs within the VA system -- both branded and generic -- are 10% to 20% cheaper than elsewhere in the U.S. system"' [11]. In addition, there is no agency, government or non-government, that runs comparative studies on drugs to guarantee their efficacies and validate their pricing. For example, Health Canada, Canada's health bureau, has a drug review board that tests new drugs and determines if they provide greater benefits then other similar drugs already on the market. Organizations that purchase drugs then use this data to determine how much they are willing to pay [11]. An example of the benefits of a system like this can be seen in the actions of Memorial Sloan Kettering, one of the leading cancer treatment and research facilities in the U.S, concerning the cancer drug Zaltrap. In the article *The Cost of Living* by New York Magazine, written on October 20th, 2013, the story of Zaltrap, which was approved by the Food and Drug Administration on August 3, 2012, is discussed. The drug, when combined with three other previously approved drugs, extends a patient's life by forty-two days. At the time of the drugs approval its price was still unknown. However, Leonard Saltz, who heads the gastrointestinal oncology group at Memorial Sloan-Kettering Cancer Center believed he could estimate the cost of Zaltrap. Avastin, a "second line" treatment, extends a patient's life by forty-two days and costs around five thousand dollars per month. However, when Zaltrap was officially placed on the market it was priced at unexpected eleven thousand dollars. With such an astronomical cost Saltz suggested to his committee to not provide Zaltrap at the Memorial Sloan-Kettering Cancer Center. Such a decision was a shock because it has been the tradition that physicians to not use price as a reason to deny supplying a drug that could improve quality of life. Memorial Sloan-Kettering did decide to not carry Zaltrap at its current price and reported its decision and reasoning to the *Times*. Several weeks later, Sanofi, the creator of Zaltrap, reduced Zaltrap's

price by 50%. Sloan-Kettering still does not provide Zaltrap [7]. This demonstrates the power of resistance in the healthcare system to influence drug pricing, and shows the benefits of increasing regulation in the drug market.

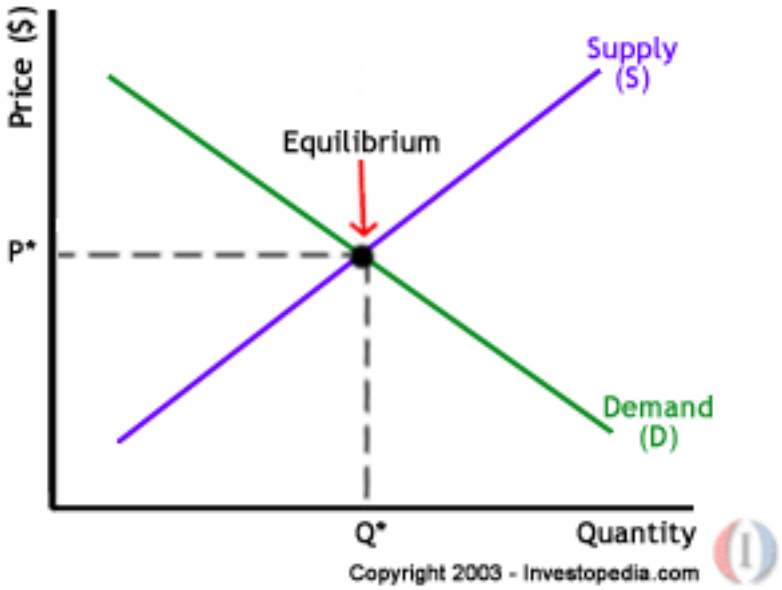
This conflict surrounding drug-pricing has become a major focus of society. In a poll of 1,171 adults conducted by the Kaiser Family Foundation, a non-profit organization that focuses on national health issues from a non-partisan point of view, in April of 2017 found that 92% of the population wants to allow the federal government to negotiate with drug companies to get a lower price on medication for people on Medicare [26].

With treatments for most types cancer averaging $100,000 as mentioned before, regulation through Medicare could be vital to helping lower costs. The Kaiser Family Foundation discuses some possible approaches that would allow Medicare to regulate drug pricing. First, and probably the simplest would be striking the non-interference clause from Medicare legislation allowing the Secretary of Health and Human Services to negotiate with drug suppliers [3]. A separate approach would be establishing a public Part D alongside private Part D that would be regulated by the Department of Human and Health Services (HHS) under the oversight of the HHS Secretary. The secretary would create a formulary for public Part D allowing him or her to negotiate the prices of drugs included in the formulary [3]. A middle ground option is to allow the HHS secretary to negotiate prices only over high-priced drugs like Gleevac ($126,00) [3]. However, the Congressional Budget Office has suggested these three options most likely would negatively affect government spending and a more robust combination of the three would need to be implemented [3]. For example, the Secretary would need to establish a formulary and regulate prices or take regulatory action against companies that do not provide large enough discounts if the government wishes to receive the large discounts that risk-bearing private plans can acquire.

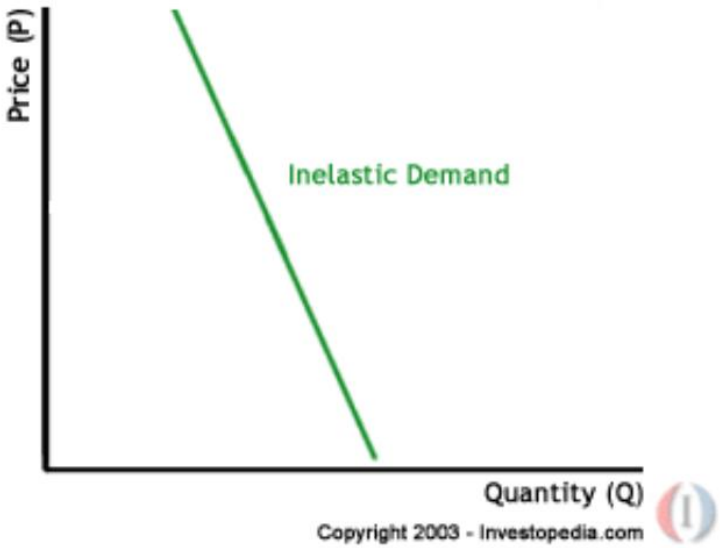


Drug companies provide four main arguments to justify their pricing of new oncological drugs. This paper will focus on three. The first being the cost of development is high, over a billion dollars, for each new drug [25]. In a study conducted in 2016, it was estimated that on average it costs $2.6 billion dollars to produce one new pharmaceutical compound [5]. However, other researchers find that it costs 20% more to develop new oncological compounds, which translates to $3.12 billion dollars [1]. Either way, the current price tag on research and development is massive. As such, pharmaceutical companies may be justified in their defense against high drug pricing. "The total costs for developing a new drug consist of approximately 20–25% spent on discovery, 15–20% spent on safety and toxicology, 30–35% spent on product development (including clinical supplies), and 35–40% spent on clinical trials"[16]. The cost per patient to be included in a clinical trial has risen 70% from 2008 to 2011 [24]. Per-patient costs increased on average 46% in the first phase of research, 72% in second phase of research, 88% in the first part of phase three, 86% in the second part of the third phase, and 31% in final phase [24]. "Furthermore, oncology is ranked as the third most expensive for overall clinical trial costs ($78.6 million) by therapeutic area. For oncology studies, the average total per-study costs include the following: $4.5 million for phase 1, $11.2 million for phase 2, and $22.1 million for phase 3; $2 million for the NDA/BLA (biologic license application) review phase; and $38.9 million for phase 4" [15]. The total cost of the four phase equals almost $80 million dollars by the time the drug is approved for sale to the public. However, it is important to remember that most companies test multiple versions of a drug before one version make it successfully through all four phases. The same study that was conducted in 2016 that determined the average cost of research and development for a drug is $2.6 billion dollars, was also conducted in 2007 and concluded from 1993 to 2002, of 175 oncological drugs, 1 in 4 drugs made it to market [4]. It is also key to note that oncology drug clinical trials are more expensive because they take comparatively longer to complete than trials for other medications. Based on data from 2015, it takes on average approximately 9.5 years for FDA patent filing for oncological drugs [2]. With such high price tags, it appears that these drugs need to be priced highly otherwise the members of the pharmaceutical industry will be incapable of having the funding to support new drug development. This being true, there is a caveat that will be revealed through the second and third tenets companies use to support their pricing habits.

The second argument made is that the free market will address the problem. In a free market economy, the price of goods is determined by the supply and demand for the product. In this case, the product is represented by the oncological drug. It is considered a free market because there is no regulation from the government, monopolies, or any other authority. The price that the public would receive the drug at is the point at which the upward sloping supply curve intersects the downward sloping demand curve [6]. This is called the equilibrium point [9].



However, this model also assumes that the price of cancer drugs is relatively flexible, and there are not substitutes (goods that provide similar services). Cancer drugs are highly inelastic [6]. This means that the good is needed at a certain amount no matter the cost. In this case, the dose of a cancer drug required to treat a dying patient does not change with the price of the drug. Resulting in an almost vertical demand curve: [8]



This results from and shows that dying patients are willing to pay extravagant costs for treatment. This leads to a scenario where the price of a drug can skyrocket, but demand for the drug will remain relatively static. Thus, the market for oncological drugs does not follow the normal supply and demand tenets of a free market. As result, the claim that the free market will resolve the pricing conflict is false and the pricing in the market is more dependent on the desires of the drug suppliers.

Third, drug companies argue that because their oncological drugs provide the large benefit of prolonging the survival of patients, the pricing is justified. When a new drug enters the

market the FDA provides the manufacture a monopoly of 5-7 years or 12 years if it is a biological agent [10]. In addition, if this new drug was invented, not just an improved version of an older drug, the patent can be extended to 20 years or more [6]. In majority of cases generic drugs are cheaper than brand name drugs. However, big pharmaceutical companies often pay off producers of generic drugs to prevent generics from entering the market or produce their own generic [6].

In many cases, the cost of a new drugs is unreasonable and unproportioned to the benefits received by the drug. However, the FDA does not consider whether a new drug extends life for a few days or a few years when determining whether to approve it for sale to the public [6]. As result drug companies can pump out new drugs with minimal changes claiming that addition of a few extra days of survival justifies large price hikes. This also creates more unnecessary research and development costs which can then be used again to justify new pricing. Research on the current value of a quality-adjusted life year (QALY) has revealed that on average patients will pay $110,000 to $160,00 for another year of life on an average per-capita income of $54,000 [10]. "Taking vascular endothelial growth factor inhibitors used to treat metastatic colon cancer as an example. This drug prolongs survival for a median of 1.4 months over standard of care treatment. A patient's treatment course for second-line therapy may have a median duration of 12–14 months. With cetuximab priced at $5000 to $11,000/month, this amounts to $40,000 to $80,000 per patient per additional month of life gained for their total treatment duration with the addition of cetuximab. Using cetuximab as an example, it was calculated to cost $800,000 to prolong the life of one patient by 1 year" [6]. This almost eight times the cost individuals are willing to pay, on average, for another year of life. In the article *Cancer, bankruptcy and death: study finds a link,* Fred Hutch found that about three percent of cancer patients go bankrupt. In addition, cancer patients are 2.5 times more likely to declare bankruptcy and cancer patients who go bankrupt are eighty percent more likely to die [13]. With such prices for many drugs well above the acceptable QALY amount, it is no surprise that many patients can not financially support the treatments they may need to survive. Also, many cancers do come back. This means most likely another round of treatment. With such high costs, it will be difficult to have sufficient time to reestablish a base that can support such a financially taxing situation again. However, it should be mentioned that the cost-benefit relationship is not always lopsided. In a study conducted by Claudio Lucarelli and Sean Nicholson at the National Bureau of Economic Research, they found that treatment for colorectal cancer when using a hedonic price index, one that accounts for price and benefit changes, over the last 13 years has remained constant with occasional increases and decreases [12]. Such findings are key because they remind society that although, like any company, pharmaceuticals are greatly driven by profit, but they are still primarily committed to improving the health of the ill.

It is apparent that the cancer drug pricing trends are unsustainable and unreasonable. With average prices for these oncological drugs pushing more than a tenth of million dollars for one round of treatment and no reigns being placed to control further increases in price the costs of care is becoming a frightening prospect. It should be mentioned that this paper does not even address the variety of costs incurred from the many different treatments used in conjunction with cancer drugs and hidden costs like travel and loss in productivity. With such costs included it is no surprise a percentage of patients go bankrupt. It is apparent that many of the conflicts that arise with pricing for cancer drugs stem from the structure of the U.S. health care system. As was mentioned drugs in general are 50-100% cheaper outside the U.S., resulting from almost a complete lack of price regulation in the U.S. There are a variety of suggestions that have been

proposed for how to alter the health care system, but just one will not be sufficent. It is vital that they are paired with alterations to the research and development process. The costs of research and development pharmaceutical companies claim is a forerunner in causing the high pricing of their drugs. Much of the process is inefficient and needs to be streamlined. For example, just limiting the number of drugs that need to be tested before one is approved by the FDA would greatly reduce research and development costs. It is apparent to the government, the medical system, and the public that an overhaul is necessary and it boils down to whether action will be taken in a timely manner. Cancer treatment is approaching a point where the cost of vital pharmaceutical drugs is great enough that even patients that earn enough to live a comfortable lifestyle may be placed in the position where they must decide what must take precedence, the financial burden of their treatment or their own life. An unacceptable position that no individual show be required to face.

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