Historical Analysis of Insulin Pricing and the Implications for Low-Access States such as Kentucky

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Protein therapeutics encompass a large portion of pharmaceutical drugs, and yet they are relatively new in healthcare. Protein medications include recombinant proteins, vaccines, and monoclonal antibodies, and they primarily treat diseases in oncology, hematology, endocrinology, and diabetes (Leader et al., 2008). These medications began with the introduction of human insulin—the first recombinant protein therapeutic—in 1982, and new therapeutics have since developed at a rapid rate (Leader et al., 2008). Protein therapeutics cannot be synthetically produced and are therefore grown in cell cultures (Lagassé et al., 2017).

Although insulin is chemically simpler compared to recently developed protein therapeutics, it is still regarded as one of the most revolutionary medical innovations. The discovery of insulin in 1921 transformed the prognosis of diabetes—a disease that prevents the body from naturally controlling blood-glucose levels (Vecchio et al., 2018). While insulin suppresses many of the symptoms, it does not prevent the disease from occurring. Even after the discovery of insulin, the prevalence of diabetes increased from 12.1 million in 2000 to 30.3 million in 2019 (CDC, 2019). Diabetic cases in the U.S. are projected to increase by 54% between 2015 and 2030 due to a variety of contributing factors such as low access to education, healthcare, or quality food (Rowley et al., 2017). There is no argument that developments in the field of diabetic research have both saved lives and transformed a previously life-ending prognosis. Before the development of insulin, patients certainly felt the physical burden of the disease. Fortunately, patients that are appropriately medicated today experience few symptoms. Instead, they are now faced with the challenge of managing the swelling financial burden that accompanies a lifetime as a diabetic.

Diabetes costs the U.S. $116 billion and $176 billion in 2007 and 2012, respectively (Riddle & Herman, 2018). However, as of 2017, the disease cost the U.S. population approximately $327 billion per year (Cefalu et al., 2018). For a single diabetic individual, the annual cost of managing this disease was approximated at $16,752 (Riddle & Herman, 2018) whereas the median household income was $61,937 (Guzman, 2019). Many families simply cannot afford to live comfortably with such a significant portion of their annual income being devoted to a single disease.

While this disease affects many people in the U.S., low-income states in the southeast U.S. exhibit significantly higher rates of diabetes (Barker et al., 2011). The dual burden of higher incidences of diabetes and a lower-than-average income make this region particularly vulnerable to the price increases observed in recent years. Insulin prices have significantly grown, and future increases could have substantial impacts on low-access states. I will, therefore, study the rise in insulin prices and the contextual impact of relevant stakeholders.

Case Context

Insulin is a peptide hormone that controls blood-glucose levels by facilitating glucose uptake (Wilcox, 2005). Diabetes is classified with either insulin receptor impairment (type 2, accounts for 90%) or loss of insulin-producing cells (type 1, accounts for 10%) (Institute for Quality and Efficiency in Health Care, 2018, p. 2; Simmons & Michels, 2015; Wilcox, 2005). Both type 1 and type 2 diabetes can be managed with insulin therapeutics. The National Institute of Health indicates that one in five people died within 20 years after a diagnosis with type 1 diabetes in 1950, and today, this mortality rate has decreased to approximately 3.5 percent within 20 years of diagnosis (NIH, 2010). This is primarily due to the commercialization of recombinant human insulin which was first manufactured by Genentech and Eli Lilly and Co. in 1982 (Vecchio et al.,

2018). The Center for Disease Control (CDC) estimates that 30.3 million people in the U.S. have diabetes (2019). A wide variety of medications are available to meet the needs of a given patient. Recombinant DNA technology led to the development of a variety of insulin analogs such as insulin aspart, lispro, glulisine, glargine, detemir, degludec during the last few decades (Donner & Sarkar, 2000). These are shown in Table 1, and clearly, only a few manufacturers exist. Eli Lilly, Novo Nordisk, and Sanofi are the three primary producers of insulin and account for 90% of the world's insulin market (Ewen et al., 2019).

Table 1. Different insulin types and the respective brand names and commercial manufacturers. Table adapted from Donner & Sarkar, 2000.

	Category of Insulin	**Brand Name**	**Manufacturer**
Rapid-Acting	Lispro	Humalog	Eli Lilly
	Aspart	NovoLog	Novo Nordisk
	Glulisine	Apidra	Sanofi
Short-Acting	Human	Humulin R	Eli Lilly
	Human	Novolin R	Novo Nordisk
Intermediate-Acting	NPH Human	Humulin N	Eli Lilly
	NPH Human	Novolin R	Novo Nordisk
Rapid-Acting	Detemir	Levemir	Novo Nordisk
	Glargine	Lantus	Sanofi
	Glargine	Basaglar	Eli Lilly
	Glargine	Toujeo	Sanofi
	Degludec	Tresiba	Novo Nordisk

Closely connected to these insulin manufacturers are the health insurance providers throughout the U.S. The largest private healthcare providers are UnitedHealth Group and Anthem Inc. Likewise, many individuals receive their health insurance through Medicare and Medicaid. Medicare is a federal program that provides healthcare to individuals with disabilities or individuals older than 65 years of age. Medicaid is a state and federal program that provides health coverage to low-income individuals (Hoffman et al., 2000). These specific groups play a unique role in the insulin market due to their patient involvement. In the U.S., physicians rarely understand the financial situation of their patients. Instead, this information is held by the insurance companies who then assess medication benefits and generate portfolios of drugs available to the patient (National Academies of Sciences et al., 2017). Because of the close relationship between insurance companies and manufacturers, certain drugs may be more commonly covered by a provider than others. Although these insurance companies make a significant annual revenue, the top eight private providers together cover less than half of the U.S. population. In other industries, this would be considered a relatively low market share, and even the largest providers should have a relatively weak bargaining power (National Academies of Sciences et al., 2017). It is believed that this break-up of purchasing power led to the development of pharmacy benefit managers (PBMs). PBMs manage the formularies covered by insurance providers. They act as intermediates between the payer and the manufacturer, and they are financed by retaining a portion of the discount they receive from the manufacturers (National Academies of Sciences et al., 2017).

The final major players in the insulin market are the U.S. Food and Drug Administration (FDA) and the U.S. Patent and Trademark Office (USPTO) who work through regulatory intervention. If a manufacturer continues to research a drug and discovers further indications, the FDA must then approve this discovery before the company can market for this purpose. The

company may then file a patent to ensure that other companies may not produce the product until patent expiration. The process of drug approval can take anywhere from 1 year to a decade depending on the drug and the manufacturer's relationship with the FDA (National Academies of Sciences et al., 2017).

While diabetes is clearly an issue throughout the U.S., Barker et al. (2011) implemented health surveys to characterize counties with noticeably high diabetic incidence rates. The 644 counties identified were localized to 15 southern states with Kentucky being one of the most prevalent (see Figure 1). Therefore, this study focuses on the implications of insulin pricing for individuals in low-access states, specifically investigating the Commonwealth of Kentucky.

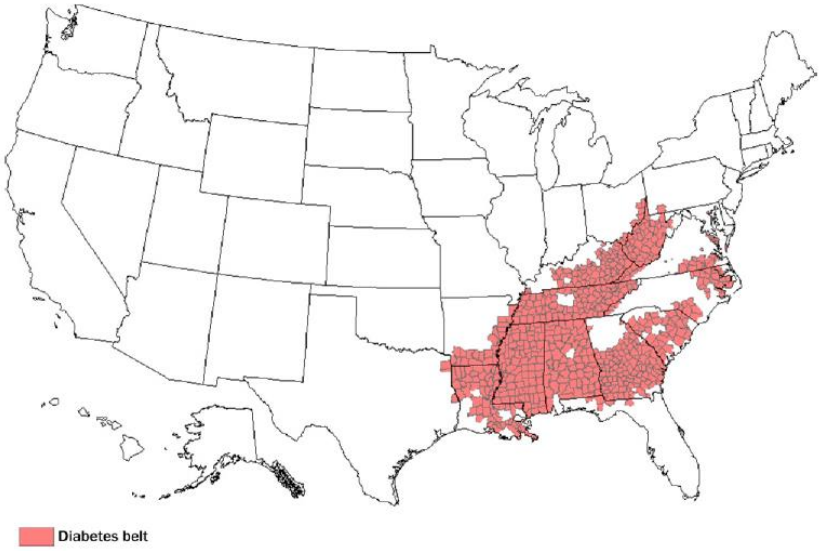

Figure 1. Depiction of the "diabetes belt". Adapted from 'Geographic Distribution of Diagnosed Diabetes in the U.S. (Barker et al., 2011).

Sociotechnical Analysis of Insulin Price Inflations

As a technology, insulin therapeutics as a collective have continued to contradict the common trends of pharmaceutical innovation. A study by Greene and Riggs coined the term "incremental innovation" when referring to the consistent development of new insulin

technologies since the hormone's discovery in 1923 (Greene & Riggs, 2015). This incremental innovation has allowed insulin manufacturers to introduce new patents and justify their price increases. From a socio-technical perspective and through the lens of justice-based ethics, it is necessary to consider the impact that further price increases may have on the patient. The price of insulin has continued to rise since its introduction, and nearly a century after its initial development as a therapeutic, diabetic patients throughout the Western hemisphere are paying the steep price for these incremental and arguably lackluster developments to an already effective drug (Greene & Riggs, 2015).

This study utilizes the actor-network theory (ANT) to analyze insulin as a socio-technical system. Latour introduces ANT by arguing that technology is built by and adapts through the interactions of various networks. These networks are comprised of people, organizations and technologies which are collectively referred to as actors. ANT argues that society must consider nonhumans or technologies when analyzing the structure of society (Latour, 1992). From this perspective, society should be understood as a system of relationships that link humans to nonhumans. By considering these diverse connections, Latour demonstrates how certain technologies can be discriminatory and exclude or discount certain stakeholders (Latour, 1992). This is particularly pertinent when considering the lack of generic insulins that exists today. The inability to purchase a life-saving medication due to discontinuation of former insulin therapeutics in place of incrementally improved medications will certainly affect low-income patients. ANT serves as a lens to view technology in society because it requires the viewer to analyze societal implications of a technology in its many contexts.

When insulin is viewed through this framework, an understanding of involved networks—namely pharmacy benefit managers (PBMs), insurance companies, and the government—can first

be analyzed, and the role that insulin plays in its own pricing through the pushback of a complex manufacturing process can be accounted for when considering the improvements in manufacturing techniques. Additionally, environmental factors and networks may surround insulin pricing without affecting the final market price. These nonhuman factors must also be considered.

Additionally, ANT suggests that many new interactions may be discovered through an analysis of how social actors shift and evolve through time (Bilodeau & Potvin, 2018). By understanding the evolution of a "social actor", we can better understand the specific context of a connection, and therefore determine stronger connections between relevant stakeholders. This historical component of ANT allows for the contextualization of social actors and, subsequently, makes it possible to reconstruct the connections between relevant networks and technologies (Bilodeau & Potvin, 2018). In the context of insulin pricing, this could help a researcher to better document the events that lead to an observed price increase. The use of ANT, therefore, provides a context-dependent analysis of insulin prices, both temporally and geographically.

This historical analysis additionally employs a justice-based ethical framework to assist the analysis of the patient as a stakeholder without a voice. Justice ethics deals with morals by measuring the rights of the individuals involved and chooses a solution that provides the least damage to those involved. Justice is also concerned with overriding established principles that are deemed unjust. Throughout this study, the currently established principles that enable insulin pricing or prevent price-reduction interventions were analyzed through the lens of justice-ethics.

Research Question and Methods

The research question for this paper is: How has insulin pricing changed from 1996 to 2019, and how is this related to the interactions of different stakeholders? Additionally, what do future insulin price increases imply for high-risk states such as Kentucky? Kentucky was chosen

as the location of particular interest due to personal connections and as a representative sample of a location within the "diabetes belt" (see Figure 1). The specific time period was constrained due to the availably of pricing information.

Data provided by Truven Analytics was used to approximate the price of four insulin therapeutics (Ramsey, 2016). This report provided pricing for Lantus and Levemir from 2001 to 2015, and Humalog and NovoLog from 1996 to 2016. I visually approximated the plots and used this data to calculate the annual percent change in drug pricing. I approached these questions by implementing ANT to assess the involvement of the groups and non-human factors that affect insulin pricing. Justice ethics was subsequently used to determine the implications for states with low-access to healthcare. These two frameworks allowed me to analyze insulin therapeutics as a collective technology that has changed over the years due to its development and the influence of external stakeholders.

The percent changes in insulin prices were compared with stock prices for the three manufacturers of the drugs listed above. The stock values were obtained from Yahoo Finance (Yahoo Finance, 2020). Price changes were also compared with national changes in the United States GDP. This data was obtained from the World Bank Group (The World Bank Group, 2020). Patent records were obtained from the U.S. Patent and Trademark Office's online database. Historical accounts of company involvements were obtained from sources such as the U.S. Department of Justice's online database for public affairs (U.S. Department of Justice, 2012). A similar approach was taken for the largest health insurance providers, namely UnitedHealthcare Group and Anthem (Rudden, 2019). Finally, I then studied the implications of price inflations for Kentucky with a geographical analysis of healthcare statistics surrounding the health and socioeconomic status of Kentuckians. I utilized data sources such as those provided by Barker et

al. (2011) to identify the predominately affected region within the United States, and I utilized legislation from Kentucky to deduce the implications of price inflations for the affected states as a whole.

Results

Although insulin prices have consistently increased between 1996 and 2016, the results loosely suggest that larger price increases may occur during times of decreasing stock growth (see Figure 2 and Figure 3). An increase in insulin pricing may have served to increase the three companies' revenues and projected stock values. Additionally, the results suggest that the magnitude of the increase may correspond with the current state of the U.S. economy as approximated by the GDP (see Figure 4 with corresponding maxima and minima). Nevertheless, many factors affect drug pricing including the influence of governmental agencies such as the FDA and the European Medicines Agency (EMA). The pharmaceutical industry is highly regulated by the FDA and EMA to ensure the quality and efficacy of all drugs (Handoo et al., 2012). In the U.S., the FDA subsequently fines pharmaceutical companies for false claims or off-label promotion of therapeutics. This research, therefore, suggests that insulin prices rise significantly after large monetary settlements due to governmental intervention. These price increases may, therefore, serve to maintain a constant level of annual growth while combatting the financial burden of a settlement. The prices of these insulin products also seem to rise (a) prior to patent expiration and (b) in conjunction with other similar insulin therapeutics produced by competitors. This seems to occur even if the two are different forms of analogs (see Table 1 for analog listing). The best example of this coordinated price changing is demonstrated by NovoLog (insulin aspart) and Humalog (insulin lispro), both of which are rapid-acting insulin therapeutics (see Figure 3). Finally, the results indicate that governmental legislation plays a role in these price increases. This

is due to the existence of federal and state legislation that directly prevents the intervention of government agencies in the pricing of therapeutics. A significant portion of this legislation originated at the start of the century.

In the context of price increases in low-access states, this research implies that further price inflations would only contribute to the increasing prevalence of diabetes. Even with new insulin technologies, there has been a consistent growth in diabetes incidences in the area coined the "diabetes belt". The possible increase in diabetes prevalence could be a result of exacerbated social determinants of health (SDOH).

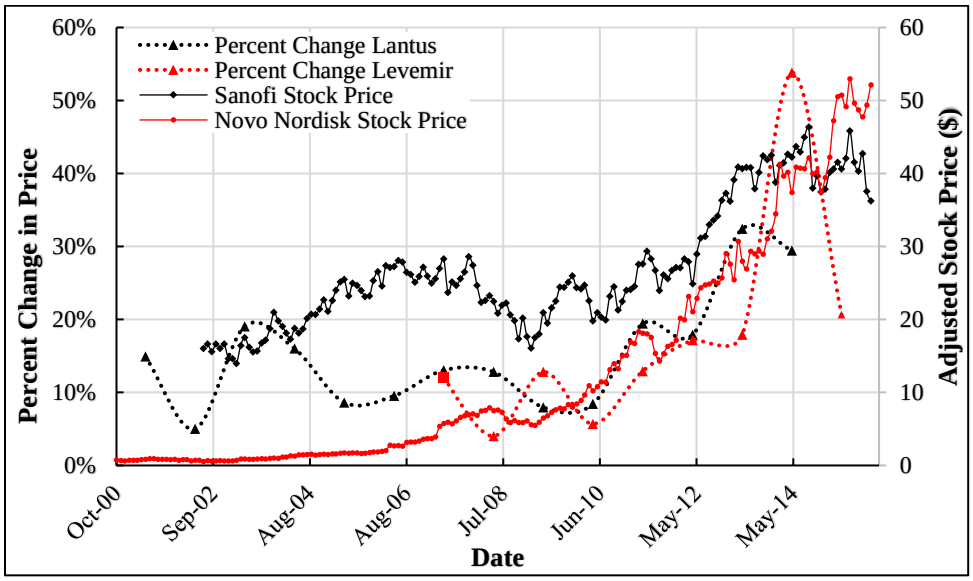

Figure 2. Percent change of insulin prices for Lantus (produced by Sanofi) and Levemir (produced by Novo Nordisk) with corresponding stock prices for Sanofi and Novo Nordisk.

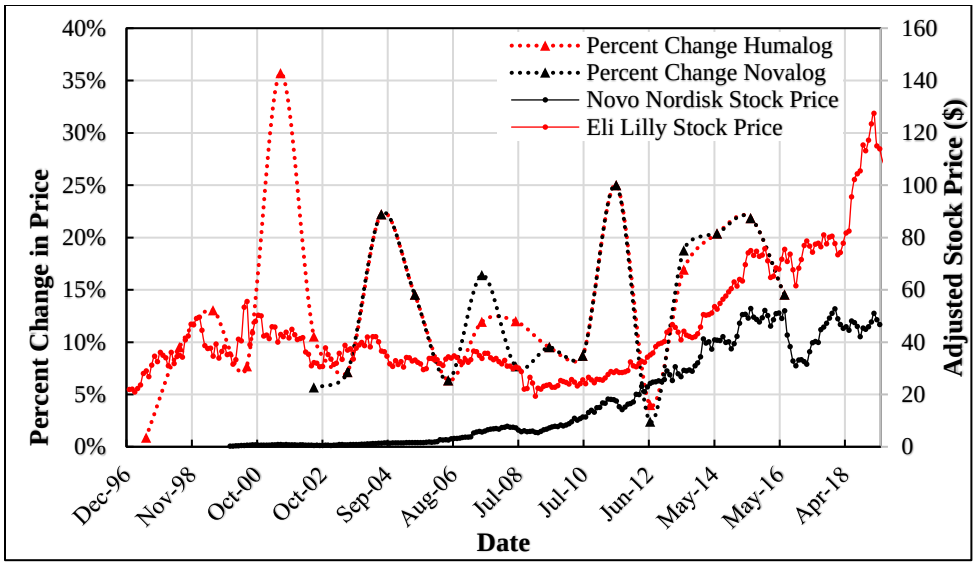

Figure 3. Percent change of insulin prices for Humalog (produced by Eli Lilly) and NovoLog (produced by Novo Nordisk) with corresponding stock prices for Eli Lilly and Novo Nordisk.

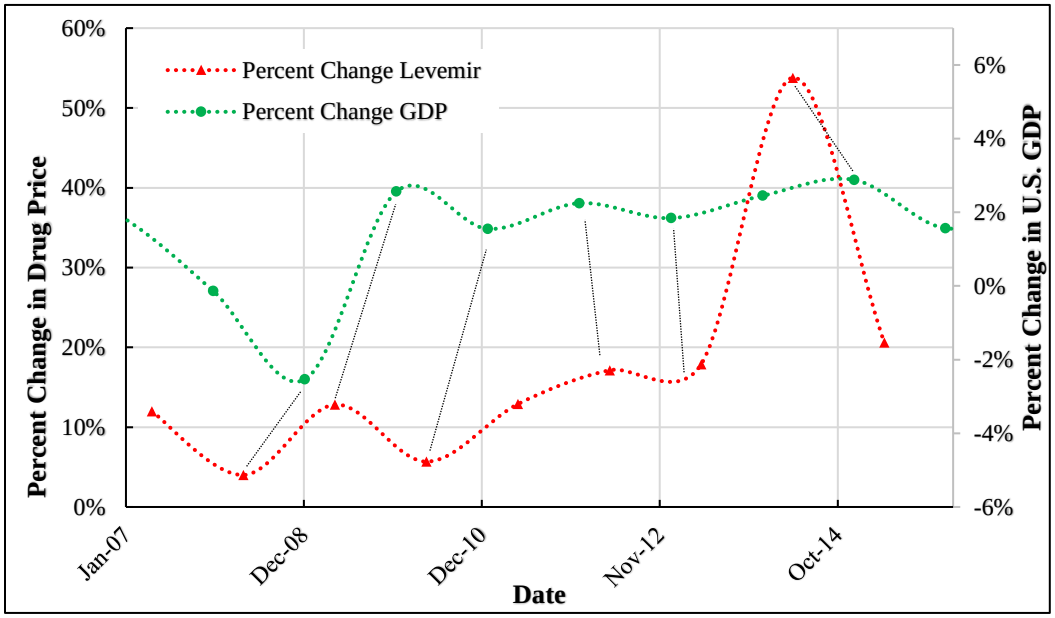

Figure 4. Percent change in Levemir (produced by Novo Nordisk) price and percent change in U.S. GDP.

The possibility that insulin prices may increase during periods of stock depreciation arises primarily because diabetic therapeutics are the heart of the drug platforms of these three companies. In 2019, five of Eli Lilly's top ten selling therapeutics were diabetic treatments (Statista, 2020). While these companies focus their research and development attention in other

fields, their reliance on diabetic-product revenue is undeniable. As seen in Figure 3, Eli Lilly's stock price began to drop in 2001, and Humalog saw its largest percent increase that year. However, this was the exact year that Lilly's "blockbuster" drug Prozac went off-patent and generic products entered the market (Huskamp et al., 2008). With Prozac pulling in a revenue of $2.6 billion during its last year on patent (a quarter of the company's revenue), there is no doubt that Eli Lilly would instead turn to another top-selling drug, Humalog, for continued revenue (Langreth, 2001). Likewise, this trend is also demonstrated by Eli Lilly in 2011 when the patent for Zyprexa expired. In 2004, Zyprexa alone brought in $4.4 billion (Eli Lilly, 2004). Sanofi also followed this trend in 2007 when the patent and forecasted sales for Plavix were threatened by its competitor, Apotex (Plavix brought in $3.8 billion in 2005) (PharmaTimes, 2006). Finally, Novo Nordisk follows this trend in 2012 when the patents for NovoLog and Prandin in Europe, China, and Japan had all expired (see Figure 2) (Novo Nordisk, 2012). The complexity of drug pricing will undoubtedly introduce exceptions to this trend. Some exceptions could arise due to governmental intervention through the FDA.

In 2003 and 2007, the FDA fined Sanofi $80 million and $190 million, respectively. The 2003 fine was due to conspiracies to keep a generic competitor for Cardizem CD off the market, and the 2007 fine was a result of fraudulent marketing/pricing (Department of Justice, 2007; State of California Department of Justice, 2003). During both of these years, Sanofi stock prices dropped, and Lantus prices increased. Similarly, Eli Lilly was fined $1.4 billion in 2009 for off-brand promotion of Zyprexa, and in subsequent years, Humalog prices rose 15 and 25%, respectively (Kmietowicz, 2009). Lilly was also fined in 2004 and 2011, and Novo was fined $25 million in 2011. In each of these years, we observe a larger increase in insulin prices as depicted by a maxima on the plot of percent change in drug prices (Department of Justice, 2011). Insulin

prices clearly increased during the years containing or superseding major fines by the FDA, most likely in an attempt to maintain projected company growth while combatting the financial burden brought on by these penalties.

Although drug prices often decrease following patent expiration, insulin products are often an exception (Greene & Riggs, 2015). A drug product will typically stay protected by the patent for 20 years, and yet Eli Lilly has sold insulin since Iletin manufacturing began in 1923 (Eli Lilly & Company, 1923). Nevertheless, the prices of Humalog, NovoLog, and Lantus seem to rise in the years preceding patent expiration in 2014, 2017, and 2015, respectively (Dunn, 2018; Eli Lilly, 2020; Norup et al., 1999). However, when analyzing the price increases of Humalog and NovoLog—both of which are different, yet rapid-acting forms of insulin—the plots are almost identical with the exception of a deviation in 2007 (see Figure 3). This discrepancy is attributed to NovoLog being a more recently approved, and therefore marketable, therapeutic (Vecchio et al., 2018). Patent expirations or the introduction of new drugs also affect insulin pricing.

For example, in 2002, Novo Nordisk introduced NovoLog Mix in FlexPen, an injectable of insulin aspart (Novo Nordisk, 2004). In the 2003 report, the board of directors stated that the FlexPen was "underpinning this growth (of NovoLog)" and that they would introduce 150 new U.S. sales representatives to maintain sales of the insulin aspart vials (Novo Nordisk, 2004). This increase in marketing costs could merit an increase in NovoLog cost. The large price increase is, indeed, observed the following year in 2004.

Governmental price regulation could also be implemented through legislation. However, the U.S.'s current policies place barriers on legislative regulation. In 2003, the landmark Medicare Prescription Drug, Improvement, and Modernization Act explicitly forbade the federal government from directly negotiating prices with pharmaceutical companies (Gellad et al., 2008).

Since this year, insulin prices have rapidly escalated. This legislation also led to the expansion of pharmacy benefit managers (PBMs), which negotiate drug prices with companies on behalf of insurance companies. PBMs were initially created by UnitedHealth Group in 1988—currently the 6th company on the Fortune 500 list (UnitedHealth Group, 2020). Members of Congress attempted to repeal this legislation with the Medicare Prescription Drug Price Negotiation Act(s) of 2007, 2017, and 2019, none of which have yet to pass the Senate (Dingell, 2007; Welch, 2017, 2019). The 2003 legislation clearly introduces roadblocks to federal interventions that could have occurred in other countries (Keyhani et al., 2010). While pharmaceutical companies also consider health insurance portfolios when pricing their products, this information was unattainable for this research. Nevertheless, a connection can be seen between U.S. pharmaceutical companies and the largest insurance providers—UnitedHealth Group and Anthem—through similar trends in stock prices (see Figure 5). In comparison, non-insulin manufacturers such as Pfizer and European insulin manufacturers such as Novo Nordisk do not seem to follow the trends as concretely. Perhaps this indicates a coordination of drug options that align with the current success of a given pharmaceutical company and its products.

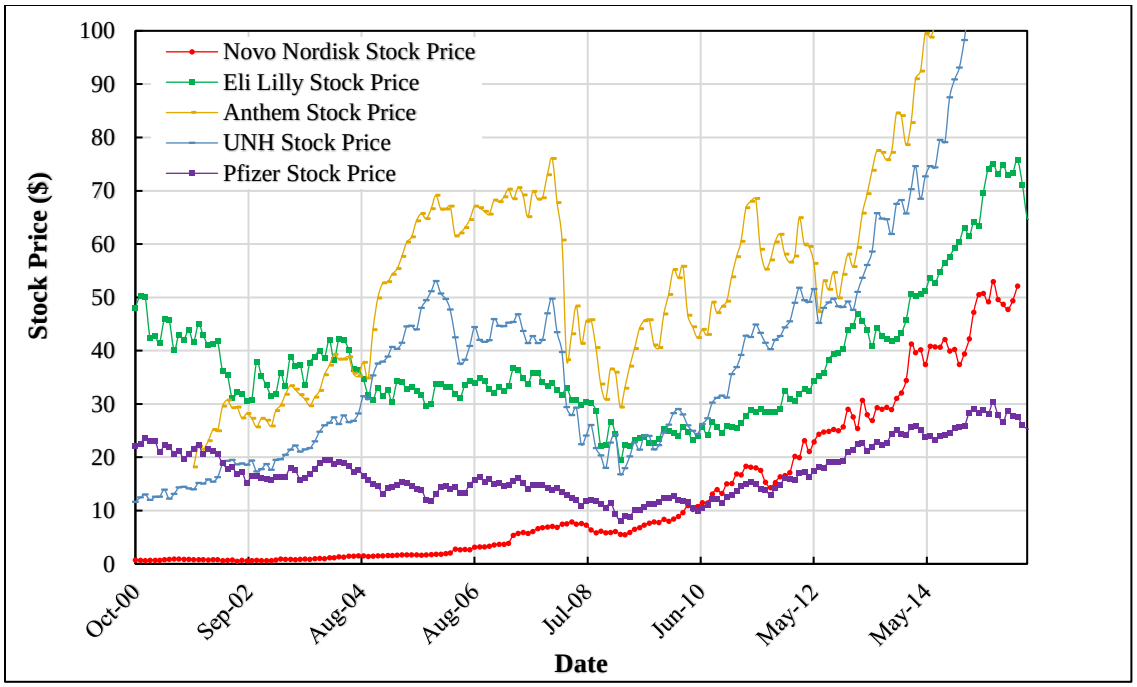

Figure 5. Stock prices for U.S. insulin manufacturers (Eli Lilly), European insulin manufacturers (Novo Nordisk), U.S. non-insulin pharmaceutical company (Pfizer), and two U.S. health insurance providers (Anthem and UnitedHealth Group (UNH)).

With respect to the southeast U.S., there is no denying that multiple factors contribute to diabetes prevalence. Kentucky is the 5th poorest state with the 7th highest prevalence of diabetes in the U.S. (State Health Improvement Plan Committee, 2017; State of Childhood Obesity, 2020). The implications are undeniable. Southeast states have the highest prevalence of negative social determinants of health (SDOH) with nine of these states having the highest percentages for all five SHOD's, namely economic stability, education, community, healthcare, and neighborhood environment (Lòpez-DeFede, 2019). However, obesity is not always linked to diabetes. Iowa, Nebraska, and North Dakota all exhibit high rates of obesity with low diabetes prevalence. Economic factors clearly contribute to this crippling disease, and high medical costs will only exacerbate this burden.

Discussion

Actor-network theory (ANT) asserts that everything in the world exists as a network of shifting relationships, and drug pricing is no exception (Latour, 1992). Human networks such as the company board of directors set the wholesale price. However, they also base the wholesale price depending on the discounts offered to PBMs. This research demonstrates the shifting human networks involved by showing the coordination of costs between similar medications from different manufacturers. Additionally, the results suggest a co-occurrence of FDA penalties with insulin price increases. This co-occurrence arises because insulin consistently sustains a significant portion of the annual revenue and drug portfolio for all three companies, and price increases have historically not resulted in major reductions in sales due to the insulin monopoly of the three companies. Nevertheless, the FDA is a governmental agency, and federal legislation prevents congress from regulating any increases in drug pricing. The introduction of new legislation or regulatory requirements results in subsequent shifts in the active network that defines pharmaceutical norms and pricing. Likewise, ANT establishes the effect of non-human actors, and my results concur that non-human actors such as the expiration of Prozac's patent or the introduction of NovoLog Mix FlexPen contribute to price increases. The complexity of the manufacturing process combined with the research and development that goes into the approval of new insulin analogs and delivery techniques is another non-human factor that may contribute to the rising cost of insulin therapeutics.

Additionally, Latour develops the idea that technology can be discriminatory (Latour, 1992). The studies of Dzau and Balatbat concur that technological advances in healthcare may exacerbate the discrepancy between "winners and losers" in healthcare by "widening social inequality" (2018), and Winner presents this argument by asking, "What about groups that have

no voice but that, nevertheless, will be affected by the results of technological change?" (1993, p. 46). Unfortunately, the patient is often this actor without a voice and with no choice but to purchase insulin. Justice-based ethics can appropriately be applied to this research in the context of the patient. The typical diabetic pays approximately $8000 a year for treatment, and roughly 9% of diabetics make less than $30k a year (American Diabetes Association, 2013; Bird et al., 2015). By increasing the cost of insulin, the gap between winners and losers in healthcare will broaden. Concerning healthcare, justice ethics mandates that there must be an equal distribution of resources and treatments, and yet this research demonstrates the polarization of diabetes prevalence and poverty in the U.S. (Saint Joseph's University, 2017). If an ethical basis exists concerning the uniform distribution of healthcare resources in the U.S., the southeast states including Kentucky clearly provide evidence for a justice-based ethical flaw in the healthcare system.

The limitations of this research primarily arose due to the unavailability of insulin pricing information. Truven Analytics is the only known source that offers the information at a cost of $2,600/year. Additionally, the University of Virginia does not have access to this software, and my rudimentary estimations of the data could have affected the reliability of the data. The time span of the available data was also relatively limited. With respect to an analysis of patents, I only observed the filing and expiration of the formulation patents. However, many of these drugs have over 25 patents filed during their lifetime. Finally, the complex nature of the pharmaceutical industry and involved parties made it incredibly difficult to discern the involvement of major health insurance providers. I could not specifically find the prices and price changes offered by the major companies on their various portfolios.

Future studies should focus on newer insulin price data. If legislation such as the Medicare Prescription Drug Price Negotiation Act of 2019 passes the House and Senate, it could result in decreases in insulin pricing. Additionally, Eli Lilly has released a generic Humalog at 50% of the cost which could affect Humalog pricing. In 2019, the Congressional Diabetes Caucus also introduced the Insulin Price Reduction Act (Shaheen, 2019). This would give the makers of insulin an incentive to lower the price of insulin to the 2006 price. The legislation would protect the manufacturers from having to offer additional rebates, and it would also prohibit health insurers from refusing to cover any product that had its price reduced under the terms of the bill. Finally, an insulin price cap for Kentucky was recently introduced, and this could decrease Kentucky's mortality due to diabetes (Austin, 2020).

As a physician, it will be imperative that I consider the economic status of my patients when prescribing a medication. According to the physicians I have spoken with, many doctors prescribe the most appropriate medication based on the status-quo of the given disease. However, medications can cripple a patient financially. A part of the Hippocratic oath states that physicians must heal the patient, not a cancerous tumor or fever. In the same way, I must make sure I am recommending medicine that is best for the patient's health and wellbeing, not simply the disease. This research will help me remember the financial burden that medicine can have.

Conclusion

The evidence provided in this research paper can be extrapolated to help understand the current climate of the healthcare industry. Although insulin therapeutics provide a clear point of aggravation for patients due to its long lifetime as a medication, the prices of new medications are also costly, sometimes orders of magnitude higher than prior insulin prices (Andrews, 2015). This

research suggests that, while the increasing costs of medications are undeniable, there is certainly more to the process of pricing a drug than a decision made by executives. Seeing as healthcare reform is a major topic of debate in the current political climate, future research must analyze new healthcare policies or legislation that arise in the ensuing years. Additionally, future work must serve to determine the largest causes of price increases as well as mechanisms to decrease costs. In conclusion, many factors—both human and non-human—affect the overall pricing of insulin therapeutics. Through policy reform that addresses access to healthcare and the equitable distribution of therapeutics, the gap between low-access states and other regions may begin to diminish.

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