

**Prescription Drug Prices and the United States' Health Care Market, a Cross-Sectional  
Analysis**

by

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## Abstract

This thesis is an analysis of the United States health care market and what factors most significantly influence spending habits. The data obtained for this study is from 2004 and was collected for each state through various institutions and publications. Various statistical models are used in this thesis in order to find the most influential variables in regards to health care spending. After this analysis, two-stage least squares is used to compensate for any simultaneity issues and improve the quality of the results, if possible. This study concludes that prescription drug prices have a significant impact on health care expenditures.

## Acknowledgments

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## **CHAPTER I**

### **INTRODUCTION**

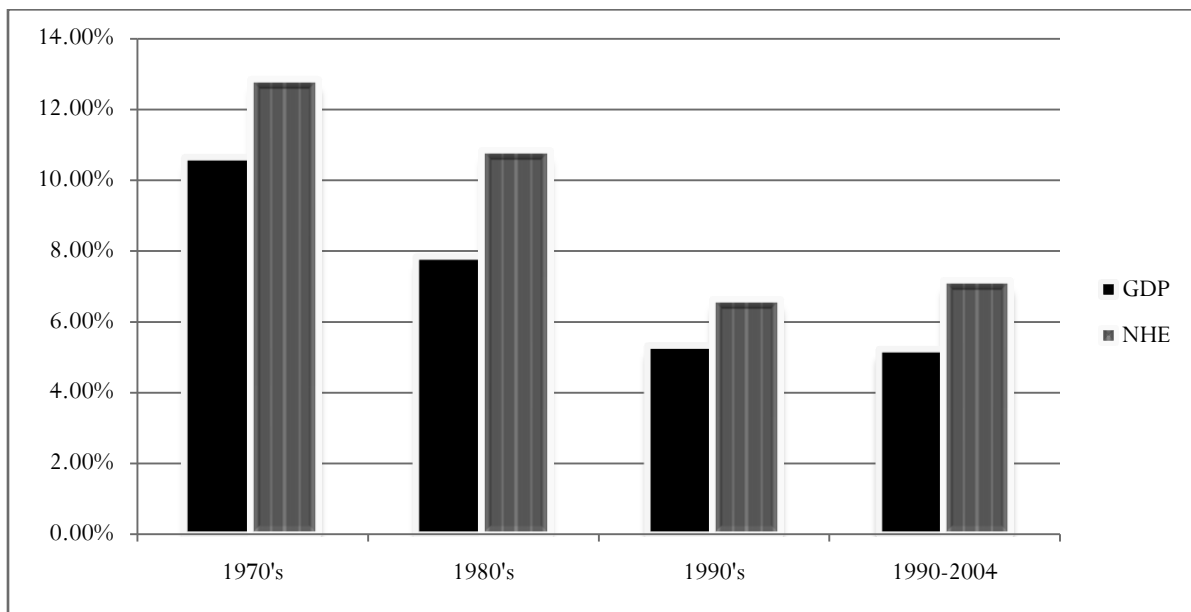
The state of the health care system in the United States has been a highly debatable topic for many years, and is becoming an even more critical topic due the current recession that is affecting the U.S. economy. According to the U.S. Census Bureau (2008), through coverage provided by employers, parents, individual insurance or government insurance policies, 84.7% of American citizens have health insurance coverage. However, that 15.3 % of the population that remains uninsured in actually means that around 45.7 million American citizens are uninsured. This is perplexing because of the fact that even though the United States spends twice as much on health care per capita than any industrialized nation, the number of uninsured Americans is continuing to grow. In fact, it has been shown that the current growth in health care spending is outstripping the economic growth rate (GDP) and for decades, health insurance costs are rising faster than wages or inflation.

According to Himmelstein, Warren, Throne and Woolhandler (2005), medical causes were cited by about half of bankruptcy filers in the United States in 2001. The Commonwealth Fund (2006) stated that more than one-quarter of families in which one or more members were uninsured had to alter their lifestyle significantly in order to pay medical bill expenses. It is interesting to note that, in relation to national income, the rapid rate at which health care spending is growing is a major cause of concern, begging the vital question: can the health care system of the United States remain financially sustainable in the long run?

The current condition of the United States' economy plays a vital role in the allocations entailed to the health care system and the spending involved in seeking medical services. Even though United States still has the largest national economy of the world, with gross domestic product around \$14.3 trillion, potential problems stemming from international debt, falling house prices, low savings rate, as well as other contributing factors have led to an economic downturn. According to the United States Department of the Treasury (2008), gross US external debt was over \$13.6 trillion as of June 2008, thus the public debts amount to approximately 73 % of GDP.

Even though the public debt is that large, the annual growth rate of national health care expenditures has exceeded the GNP growth rate, ever since 1965. The following figure from the Centers for Medicare and Medicaid Services (CMS) shows the side-by-side comparison of GDP and National Health Care Expenditures (NHE):

**Figure One: Comparison Between GDP And NHE Expenditures**





Even though the unemployment rate is rising and the economic forecast for the United States is not encouraging, current estimates show that approximately 15.2% of GDP is currently spent on to be used for health care, data from the Office of the Actuary in the Centers for Medicare and Medicaid Services (2008) showed that in 2007, \$2.26 trillion was spent on health care in the United States, increasing from \$2.1 trillion spent in the previous year. Spending in 2006 represented 16% of GDP, an increase of 6.7 % over 2004 spending. Estimates show that growth in spending is projected to average 6.7 % annually from 2007 through 2017. In fact, the share of GDP spent on health care costs is also predicted to keep growing at an increasing rate; with experts expecting it to reach about 19.5 % of GDP by 2017 (Office of the Actuary in the Centers for Medicare and Medicaid Services, 2008).

The United States' health care system is a more privatized system than those found in other advanced countries; however, almost half of US total health care spending still comes from the government through the Medicare and Medicaid programs. In 2004, Paul Krugman and Robin Wells (2006) showed that the breakdown of personal health expenditures were as follows: 36 % of expenses were paid for by private insurance, 34 % by federal government, 15 % by private out-of pocket expenses, 11 % by state and local governments, and 4 % by other private funds.

Another fact shows that, according to the Institute of Medicine of the National Academy of Sciences, the United States is the only wealthy and industrialized nation that does not ensure universal coverage in comparison to other industrialized nations and yet spends the most money on medical care. Even though the United States spends more on health care than other industrialized nations, that does not automatically mean that the United States is the healthiest nation in this group, quite the contrary exists in actuality. For example, a study by Mark Wilson

(1999) showed that in comparison to France and Norway, the United States had the higher infant mortality rate and a lower expected lifespan. However, it should be noted that the study also showed that the U.S. population is considered healthy relative to most of the rest of the world.

In a study performed by PricewaterhouseCoopers (PwC, 2006), the recent increases in the amount of health care insurance coverage have been influenced by increased consumer demand for the product. This has resulted due to the fact that there are more intensive diagnostic tests performed on sick patients, more tests performed in routine check-ups for the prevention of diseases, new, yet expensive, medical technology available which appeals to patients, newer treatments, as well as higher usage of prescription drugs and drugs used in operational procedures, such as anesthetics. Also, an increase in unhealthy lifestyles and the aging of the baby-boomer generation have also caused there to be an increase in health care coverage.

In more recent developments, one of the main contributors to the increased costs of health care has been the rising costs of prescription drug prices, which naturally increases the overall expenditures in the drug-related market sector of the health care industry. The Center for Medicare and Medicaid Services (CMS) estimated that the 2004 expenditures for pharmaceutical drugs was already around \$207 billion, but future projections show that the amount spent will rise to over \$500 billion by 2013 (Baker 2004). A potential consequence of such factors leading to increased costs of providing and buying health care insurance is a change in the number of insured people in the United States, especially now with the downturn in the United States economy.

Prescription drugs are the fastest growing component of health insurance premiums, as about 10 % of health care costs are incurred due to prescription drugs. The trend is continuing,

however, for the fact remains that for those adults who have drug coverage in their insurance plans, the use of prescription drugs continues to increase at a dramatic rate.

According to the Kaiser Family Foundation (2006), “health care is the type of good that we want more of as the nation prospers and becomes wealthier and health care suppliers, providers and institutions have been successful in providing an increasing variety of new products and services to meet the societal demand.” A positive result of this trait is that because the demand is higher and more medical treatments are sought after, more research is performed in these sectors that could potentially lead to innovations in health care issues and conditions that previously had not been further looked into due to monetary constraints, such as new cancer treatments as well as further research conducted regarding AIDS. However, although these advances in medical technology produce costs savings in medical services, the additional spending incurred by these new technological advances currently outstrips the savings.

Even though this is the case, the question must be asked, how does one put a monetary value on human life? Many ethical issues come into play in this argument because many medical procedures are very costly, however, who determines which person is “allowed” to get these treatments and who isn’t. Areas of concern pertain to AIDS, the factors and causes behind it, abortion, treatment for the elderly, and many other areas. This question will remain to be debated, and infringes on many touchy subjects that will not be addressed in this study.

An enormous drawback to the increasing costs of health care is that it transfers many costs to other sectors of the economy being affected. For example, currently the costs associated with health care spending are the single largest state expenditures, even exceeding education expenses by most states. Because the costs for government-funded health care programs have increased faster than tax receipts, drastic measures have to be taken in order to resolve the health

program financing by means of cutting the funds entitled to educational services, as well as other services. A direct consequence, according to Ezekiel J. Emanuel and Victor R. Fuchs (2008), is that there has been a significant increase in tuition prices for state-funded colleges, which means that if the prices continue to increase some students face the possibility of not being able to afford going to college or will have even more debt accumulated as a result of attending school.

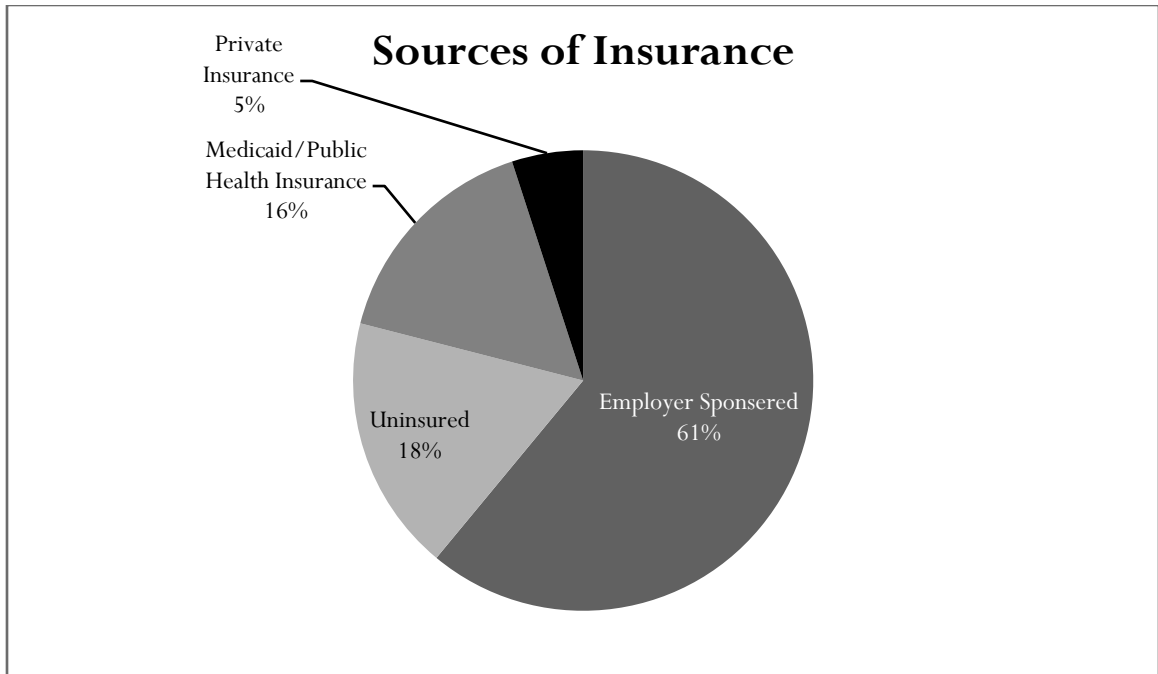
An important question to ask is who actually pays for these increasing health care costs? Historical trends show that the pattern of spending costs has shifted in the following ways: In 1960, patients directly financed the majority of personal health-care expenditures from out-of-pocket payments, representing about 56 % of expenditures but by 1988, out-of-pocket expenses for patients had fallen to 23.7 percent. Private health insurers, primarily sponsored by employers, have increased their shares of the expenditure burden from 21 to 32.4 percent, from 1960 to 1988. Increases in spending on health care can also be seen in the federal government, which increased their shares from 8.9 to 29.9 percent (Vandegrift and Anusua, 2006).

Employers still are the main providers for health insurance for the United States, providing coverage to 59 % of Americans in 2007, even though employers are not required to provide health insurance coverage. This, however, does not mean that employers solely bear the cost of the insurance plans, and the benefits provided to their workers, and want to be philanthropists. Fringe benefits, such as those incurred from health insurance benefits, as well as employees' wages are components of overall worker compensation and have already been taken into account when deciding on their employee's health insurance packages as well as their salaries (Emanuel and Fuchs, 2008).

Due to rising insurance costs, an increasing trend is developing in that fewer employers are offering health insurance plans in the workplace. In fact, statistics indicated that in 2000, 69

percent of firms offered health benefits, however recently the percentage of firms offering health benefits has reduced to 61 percent. The following pie-chart shows the approximate break-down of who provides the majority of insurance coverage in the United States:

**Figure Two: Percentage Allocations of Insurance Coverage**



This thesis will investigate the causes for the significant increases in the prices of prescription drugs and will analyze some of the reasons why prescription drugs are the fastest growing component of health care expenditures. Further empirical work will be performed to support the results of previous work, general economic theory, as well as previous statistics analyzed. The purpose of this study is to examine the factors explaining the increased health care costs, such as those derived from the rising prices for prescription drugs and the demographic and physical characteristic of the American citizens. Once these have been analyzed, further research will be conducted to see how significant these increased costs and changes in lifestyle,

such as eating habits and educational attainment, have on the health care market. There have been a number of studies related to this topic that have explored the effects of economic and socioeconomic variables on health care spending. Therefore, the study will apply these previous theories pertaining to the health care industry to demographic and physical trends as explanatory variables in the regression.

This study is divided up into five chapters: Introduction, Background and Literature Review, Data and Methodology, Estimation and Results, and the Conclusion. The Background chapter will give the reader a more detailed look at each of the factors causing the costs of health care to increase. The Literature Review examines the historic and empirical theories behind health care spending and increases in prescription drug prices. The Data and Methodology chapter develops a model based on those theories and studies, defines all the explanatory variables, provides the data sources for these variables, and discusses with much detail the anticipated theoretical behavior of each of these variables. In the Estimations and Results chapter, the structural equations are presented, followed by a section using two-stage least squares estimation and the results incurred from doing so. The results are then analyzed in terms of the sign and significance of each variable's coefficient in the Discussion of Regression Results chapter. The Conclusion chapter summarizes the study's findings and the present ideas for further research in the area.

**CHAPTER II**  
**BACKGROUND ON THE PRESCRIPTION DRUG MARKET AND LITERATURE**  
**REVIEW**

As the main emphasis of this study is on the prescription drug market and the effect it has on health care spending, an in-depth look at the causes of the increased demand and prices for prescription drugs will be analyzed in this chapter. Although prescription drugs are incredibly vital for the prevention and treatment of severe and fatal illnesses, the amount spent on these products is a growing cause of concern. Prescription drug costs are continuing to rise as the demand for these drugs is increasing at a substantial rate, which has caused prescription drug spending to account for a large part of GDP spending.

One of the main reasons for the increased spending on prescription drugs is due to the increasing prevalence of various chronic conditions, such as asthma, diabetes, high cholesterol levels, which can lead to a greater variety of medical complications. Two of the main reasons why these chronic conditions have increased in occurrence is due to the aging population of the baby-boomers and because Americans, in general, are becoming less healthy due to rises in the obesity, higher stress levels and many other factors. Therefore, in order to be able to treat these conditions, doctors have to prescribe a wider variety of drugs as well as increase the number of prescriptions they write. The Center for Medicare and Medicaid Services (2008) has projected that prescription drug spending will constitute around 2.8 % of real GDP by 2013.

Data shows that spending on prescription drugs for the U.S. was estimated to be around \$216.7 billion in 2006, which has increased significantly from the \$40.3 billion spent in 1990. Experts, in a report by the National Institute for Health Care Management Research and Educational Foundation (2002), estimate that prescription drug expenditures will rise approximately 10.3 % a year between 2008 and 2011, and would then account for approximately 15 % of total national health care spending by 2011.

From 1999 to 2005, there had been a decline in prescription drug spending due to the fact that there was an increase in the usage of generic drugs, a decrease in the number of new drugs introduced into the market, and an increase in the tiered co-payment benefit plans (The Henry J. Kaiser Family Foundation 2004). However, due to several reasons, since 2006 the spending on prescription drugs has risen once again. Such reasons are lower rebates from drug manufacturers, increased use of specialty drugs, increased use of prescription drugs, and changes in the optimal amount of therapeutic mix of drugs.<sup>1</sup>

Analyzing the factors that increased prescription drug prices is crucial in discussing the topic of health care issues, for one can only solve a problem if one knows the underlying causes. There are many causes as to why prescription drug prices have increased, the main ones being: newly-approved medicines, advertising costs, research and development costs, patents, increase in prescriptions written by doctors, and moral hazard. The next paragraphs each deal with these associated costs and the pros and cons of using these techniques.

Heavily marketing newly-approved medicines to both doctors and consumers increases the costs of prescription drugs. Newly-approved medicines are almost always more expensive than the older drugs available, mainly due to the fact that pharmaceutical companies want to recoup their drug-development costs, and nearly always are more costly than generic drugs.

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<sup>1</sup>Prescription Drug Trends. Baldwin Wallace College. <http://www.bw.edu/academics/bus/programs/hcmba/nl/costs/>



Many people are of the mentality that the newer a product, the better it must be. Because most doctors prefer to prescribe newer medicines, also consumers prefer newer, brand-name medicines, there has been a shift in the type of drug spending done, which has caused there to be a 36 percent rise in retail prescription drug spending. Newer drugs can be highly beneficial if they treat illnesses that, prior to the invention of the newer drug, remained untreated. However, it can be the case that the newly-approved medicines are not as effective or even at times have the same effect as prior drugs, thus causing the increased costs to be redundant.

A topic of debate is the advertising aspect of the pharmaceutical industry. In 2001, it was estimated that pharmaceutical manufacturers spent approximately \$2.7 billion in advertising, according to the U.S. General Accounting Office. In the Public Citizen's report (Luke Warren, Ben Peck, Frank Clemente 2003) address the issue of such advertising costs faced by the top pharmaceutical companies in 2002. The authors address a previous study performed by Harvard and MIT (2003) which determined that "direct-to-consumer advertising by the drug industry increased from \$800 million in 1996 to \$2.7 billion in 2001. Measured purely by profits, it is easy to see why pharmaceuticals are sold on advertising: The Harvard-MIT study found that for every dollar spent on direct-to-consumer ads, the companies achieved \$4.20 in sales."

The Public Citizen's report also mentioned the fact that drug companies hardly mention the "me-too" drugs, which are drugs that have already been invented but are refined in later years, when talking about R&D investments. "Me-too" drugs do not require nearly as much investment due to the fact that there is no need to discover new chemical compounds or chemical formulas. Therefore, the report concludes that pharmaceutical companies spend most of the R&D costs on copying the newest blockbuster drugs and making improvements on it versus developing actual breakthrough medicines. Aravind Adiga (2003) described the "me-too" drugs

in situation in the following sense: “It was an addictive formula: Offer a simple variation on an existing medicine, turn it over to the marketing machine and watch the money roll in. Indeed, marketing, as much as science, was responsible for creating the blockbuster phenomenon.”

In fact, the Public Citizen’s report (2003) showed that in a span of twelve years, the FDA approved 1,035 new drugs but only 238 of these new drugs were given priority review by the FDA. The FDA giving priority review to these new drugs means that these specific drugs “represented a significant improvement in treating or preventing disease.” These numbers indicated that only 24 percent of the drug approvals were considered to be significant improvement over already existing drug-remedies.

Advertising can be beneficial to the extent that it provides useful information to consumers, which increases the level of overall health by encouraging the population to talk to their health care professionals about their current health and any issues they might have, or previously did not know they had. An example of this is that for many years depression was rarely diagnosed and thought of as a serious illness for it had such a stigma attached it to. However, nowadays, depression no longer has that negative stigma attached it to, and many more people get the treatment needed to overcome it because it has been openly talked about and it is no longer looked upon the way it used to.

However, some argue that advertisements can lead many people to think they have more severe problems than they actually do, and this thus leads to an increase in the number of physician visits. However, a survey conducted by the United States Food and Drug Administration (FDA 2003) showed that those patients who visited their doctors and asked about prescription drugs by brand name, due to the advertisement they had heard shows that 88 percent of those patients actually had the condition that the drug treats. This is beneficial to society

because if people go to the doctor and get tested, earlier detection of serious diseases is less costly, and would make people healthier in the long run.

Pharmaceutical companies are defending their high prices, believing that they are necessary in order to fund the research and development costs that go into producing innovative drugs. However, data indicates that these research and development costs for new drugs are only a small part of expenditures on new drugs for the majority of costs are incurred by marketing and administration. A study conducted by Francine Brewer, entitled *Why Are Drug Prices So High?*, showed that prescription drug sales are around \$200 billion yearly, for which only \$5-6 billion was spent on creating new drugs. This value of money spent on creating new prescription drug amounts to roughly 2.5 to 3 % of overall costs.

Many health insurance plans have changed their coverage policies to cover more of the costs for prescription drugs, which in turn has lowered many of the barriers for patients to receive certain drug treatments. Because of the fact that such a large proportion of the American population has medical coverage, the majority of the cost of prescription drugs is borne by another party. These outside parties are namely private insurance companies, the government, and public insurance companies. Due to the fact that the insured consumer's out-of-pocket expenses on prescription drugs are actually quite low, there isn't much of an incentive on the consumer's behalf to shy away from what the doctor has prescribed to them, in regards to the cost aspect. The outcome of this is that it causes there to be a higher demand for prescription drugs. Nowadays, patients and doctors tend to rarely consider the prices of prescription drugs before buying them, and for good reason to them; for why should they when a third party payer will pay for the expenses?

The use of patent law is another reason for the increase of prescription drug prices, for patents prevent other companies from producing a less expensive version of the drug for a certain number of years. Naturally, pharmaceutical companies continuously try to extend their patent protection in order to maximize their profits for the longest period of time possible. Patents cause there to be large gaps between the actual cost of producing a certain drug and the price charged for the drug, which often makes certain drugs unaffordable, especially to those who remain uninsured or whose insurance policies still require them to have large out-of-pocket expenses for prescription drugs. Research shows that drug patents increase prices by 300-400 % above the competitive market price (Dean Baker 2004).

Granting pharmaceutical companies the right to protect their drugs through patents causes there to be excessive marketing expenses which in turn makes the patent system an inefficient process; however, as will be discussed in the following paragraphs, in some ways patents are a necessity. Although drug patents provide the majority of the revenue for financing prescription drug research, the deadweight efficiency losses incurred from patent protection according to Dean Baker (2004) were around \$25 billion in 2004, and projections show that the deadweight losses will exceed \$100 billion by 2013.

However, because of the competitive nature of the pharmaceutical industry, there is no longer a large incentive to pursue research into new drugs unless that research can be patentable, which makes the drug profitable. If findings were not protected under law, competitors would be able to access all the information needed to manufacture the drug at a lower price to consumers, due to the fact that would be able to avoid research and development costs. Therefore, in a way, it is necessary for pharmaceutical companies to have the protection of patent law or else they would only be making losses by having to pay for the research and development costs, which

would result in those companies to lose their incentive to invent new medicines. Naturally, this would be harmful to society's well-being and health.

In the health insurance industry, moral hazard occurs for, oftentimes, the insured party's behavior is altered due to the fact that they do not bear the full costs of medical services, for their insurance covers most of the costs. For this reason, individuals will tend to receive medical services more often than they would if they actually had to pay for these services out of their own pocket. The moral hazard problem of the health insurance industry gives the insured party more incentive to ask for pricier and more elaborate medical services, which are sometimes not even necessary. For this reason, the more demand increases with small amounts of copayments or sometimes even no co-payments for those who are fully insured, the more costs increase for insurance companies. Insurance companies must find a way to somehow cover these increasing costs, and they do so by increasing the cost of health insurance policies to the consumer.

According to Aaron, Schwartz and Cox in their book *Can We Say No? The Challenge of Rationing Health Care* (2005), if people had to pay for medical care the way they pay for other products, his example being groceries, they would have to forego most of what modern medicine has to offer, because they would quickly run out of funds in the face of medical emergencies. Aaron et al. state that those individuals who have extensive insurance coverage have economic incentives to want and receive any service that yield greater benefits than the cost that they would incur from it. The problem with that is that, for those who have well-conceived insurance plans, the "costs borne by receiving these additional medical services is either zero if one has full coverage, or close to zero, as many co-payments do not require much out-of-pocket expenses" (Aaron et al. 2005).

In order to put things more into a perspective for one to see just how profitable the pharmaceutical market is, the following statistics show some key facts about the industry. Pharmaceutical manufacturers were the nation's most profitable industry from 1995 to 2002, and since then they have continued to be included in the top-ranking industries.

According to *Fortune* (2003) magazine's analysis of America's 500 largest companies, the drug companies had \$35.9 billion in profits in 2002. That year, the drug companies managed to channel 17 percent of their revenues into profits. The Public Citizen's report (2003) showed that from 2001 to 2002, all companies in the Fortune 500 suffered a combined loss of 66.3 percent in profits from 2001 to 2002. However, the top-ten drug companies' profits were "equal to more than half of the \$69.6 billion in profits netted by the entire list of *Fortune* 500 companies – when all losses are subtracted from all gains." Also, that year the drug industry ranked second among all business sectors in return on shareholder equity. The following chart, from *Fortune* 500, shows the breakdown of the top-ten drug companies profits and revenues in 2002:

Abbreviations are as follows:

PSE = Profits as a % of Stockholders' Equity

PR = Profits as a % of Revenues

PC = Profits as a % Change From 2001

RC = Revenues as a % Change from 2001

And both Revenues and Profits are in millions of dollars.

**Table One: Drug Companies' Profit and Revenue Increases**

<b>RANK</b>	<b>COMPANY</b>	<b>REVENUES</b>	<b>RC</b>	<b>PROFITS</b>	<b>PC</b>	<b>PR</b>	<b>PSE</b>
1	Merck	\$ 51,790	9%	\$ 7,150	-2%	14%	39%
2	Johnson & Johnson	\$ 36,298	10%	\$ 6,597	16%	18%	29%
3	Pfizer	\$ 35,281	9%	\$ 9,126	17%	26%	46%
4	Bristol-Myers Squibb	\$ 18,119	-11%	\$ 1,895	-61%	10%	21%
5	Abbott Laboratories	\$ 17,685	9%	\$ 2,794	80%	16%	26%
6	Pharmacia	\$ 16,929	-12%	\$ 597	-60%	4%	7%
7	Wyeth*	\$ 14,584	3%	\$ 4,447	95%	30%	55%
8	Eli Lilly	\$ 11,078	-4%	\$ 2,708	-3%	24%	33%
9	Schering-Plough	\$ 10,180	4%	\$ 1,974	2%	19%	24%
10	Amgen	\$ 5,523	38%	\$ -1,392	-224%	-25%	-8%
Total		\$217,467	3.70%	\$35,896	-3.40%		
Median		\$17,307	6.50%	\$2,708	0%	17.00%	27.60%

Because of the increasing prescription drug prices, many Americans have found alternatives by asking their doctors to prescribe cheaper or generic drugs, using available data and research sources to make price comparisons on certain drugs, shifting their spending preference to over-the-counter drugs, buying pharmaceutical products from foreign countries in order to take advantage of lower prices, and buying prescription drugs off the internet. It is currently estimated that approximately \$1 billion of pharmaceutical drug sales in Canada alone are for US customers because Canadian retail prices for brand-name prescription drugs are significantly lower than those in the United States. The incentive behind shopping from foreign pharmacies is that, buyers can save between 50 and 80 % in comparison to the costs of U.S. pharmaceutical prices.

Americans buying their prescription drugs from Canada and other foreign countries creates several problems for the American drug companies as well as for those taking these foreign-produced drugs. Most of the opposition to buying pharmaceuticals from Canada, and other countries, is said to be because of concern with public safety; however, the underlying objections to these new purchases are clearly rooted in protecting the pharmaceutical industry's profitability.

However, according to Steve Morgan and Jeremiah Hurley (2002), the real reason these out-of-the country purchases constitute as a problem is because "it undermines a profitable pricing strategy, which divides the drug market in a way that different prices can be charged to different purchases, of branded pharmaceutical manufacturers." Therefore, the blatant use of price discrimination has naturally provided the greatest maximum profits possible to the pharmaceutical companies (Barlett, Steele, Karmatz and Kiviat 2004). Another dangerous consequence of such high prices is that there is a large divergence between the price and marginal cost in the pharmaceutical industry, which brings about the incentive to produce counterfeit drugs, which have the potential of being severely harmful to those who take the drug.

A report by the Wall Street Journal in September of 2008 stated that due to the current economic situation, consumers starting to reduce health care spending as the number of doctor's office visits and the number of prescriptions filled both dropped between 2007 and 2008. However, due to the nature of the data that is currently available, the data for the recent decreases in spending is not available for use in the regression that is to follow. National expenditures on pharmaceuticals have declined in recent years, a report by the Organization for Economic Co-operation and Development (OECD 2007) showed that the 12.9% of total health



care costs is currently spent on pharmaceutical whereas in 2003, 17.7% of total health care costs were spent on pharmaceuticals.

Although many believe that the United States is over-insured, through evidence supporting that idea that many Americans seek medical services for issues that might not need the medical attention, the fact still remains that millions of people remain without insurance coverage. Many consequences come about due to so many Americans being uninsured, and employers bear significant costs associated with the uninsured. Uninsured employees cause lost employee productivity, less turnover as well as an increased amount of absenteeism.

Another problem that arises from increased health care costs is that workers who know that they have health issues will actively seek out jobs at companies that have generous health benefits, which undermines the institution of employer-based coverage. Because employers are no longer able to take on the full responsibility of rising health care costs, they have had to resort to increasing the share of costs by placing them on their employees through increased premium payments, deductibles and co-insurance plans. Therefore, many workers have experienced that their out-of-pocket costs for medical care have increased at higher rates than their wages actually have.

A recent study by the Kaiser Family Foundation (2006) found that due to the economic downturn in recent years, a significant strain has been placed on state Medicaid and State Children's Health Insurance Program (SCHIP). Current estimates suggest that a 1 % increase in the unemployment rate would increase Medicaid and SCHIP enrollment by 1 million, and increase the number uninsured by 1.1 million. According to Dorn, Garret, Holahan, and Williams (2008), state spending on Medicaid and SCHIP would increase by \$1.4 billion (total spending on these programs would increase by \$3.4 billion).

The current economic instability and increases in the unemployment rate are also causing shifts in the health insurance market. As of January 2008, the employment rate was 7.6 % and data from the Labor Department indicates that around 11.6 million Americans are currently unemployed, for the recession has severely affected the factory and construction market sectors (Neil Irwin and Annys Shin 2009). In fact, a report by Cogan, Hubbard and Kessler (2004), showed that upon completed calculations, that each percentage-point rise in health insurance costs increases the number of uninsured people by 300,000 people.

Thus far, a major component of rising health care costs, that being the increasing costs of prescription drugs and the causes of these effects, has been discussed in detail. The next section of this chapter will focus on analyzing previous researching on how this, and other factors, actually impact overall health care costs.

## LITERATURE REVIEW

This part of the thesis analyzes previous work by economists, doctors, and health care advocates on factors that have an effect on health care costs, thereby directly affecting health care spending. Some of the studies discuss what the Background Section of Chapter Two focuses on, as various others of these previous studies focus on different aspects of the cost increases. One area of focus in this chapter is the underlying factors causing more people to seek medical treatment and the reasons why the demand for health care services and insurance has increased. Some of the studies focus on the rising cost of prescription drugs as well as the potential reasons why these prescriptions have been filed by doctors.

There have been a number of prominent studies on how much the elderly contribute to overall medical costs, one of which was performed by Lubitz, Beebe and Baker (1995) in their work *Longevity and Medicare Expenditures*. Because the elderly account for over one-third of health care spending in the United States, the authors analyzed the impacts of an increased lifespan on Medicare expenditures. Of that number of elderly people, two-thirds of their health care costs are paid for by Medicare and Medicaid. The focus of the study was on current patterns of Medicare expenditures in accordance to age at death, for the most considerable proportion of costs incurred by the elderly are in the last year of their life, as well as future effects that demographic changes might have on Medicare spending.

Because life expectancy is rising, there is enormous amount of concern about health care spending. According to the authors of that study, estimates of the average human life expectancy range from 65 to 100 years in the coming years. The authors therefore wanted to quantify the cost of the increased longevity of a person's life. Data used for the study were Medicare data in

order to compare the payments made for those patients who died at a later age versus those who died at a younger age.

Data for this analysis was obtained through the Medicare program in order to estimate lifetime Medicare expenses obtained by the Continuous Medicare History Sample, which contains longitudinal information on a 5 % random sample of Medicare beneficiaries. The Medicare administrative data provided information of claims submitted by hospitals, doctors and other providers. A sample of 129,166 beneficiaries who were 65 or older and who died in 1989 and 1990 were used. Nursing home expenditures that were not covered by Medicare and charges for medications provided outside the hospital were not included in the study.

The regression model used in predicting Medicare payments had the average payment for a particular cohort in a particular year before death as the dependent variable and used the age at death, the age at which payments were incurred, and the product of the first two variables as the independent variables.

The results from the study indicated that estimated lifetime Medicare payment were around was around \$13,044 for those who died at 65 years of age, \$56,094 for those who died at 80, and \$65,633 for those who died at 101 or older. The authors concluded that there will be a 7.9 % increase in life expectancy beyond the age of 65 between the years 1990 and 2020, which would cause there to be a 2.0 % increase in lifetime Medicare payments. After running the regression, the authors concluded that the effect on Medicare spending of increased longevity beyond the age of 65 may not be significant, due to the fact that their study concluded that “the increase in lifetime Medicare payments associated with an additional year of life decreased as the age at death rose.” Therefore, the authors believe that Medicare payments will most likely be more affected by the expected increase in the number of elderly people.

Data shows that although the elderly in the United States spend around 20 % of their total health care costs on nursing home care, Medicare, in 1990, only paid for 4.5 % of nursing home care. Therefore, one significant limitation of this study was the exclusion of most nursing home costs for lifetime nursing home use increases according to the age at death. According to the authors, only 17 % of those who died between the ages of 65 and 74 had lived in a nursing home at some point in their life. However, research shows that around 60 % of those who died between the ages of 85 and 94 had lived in a nursing home at one point in their life. The study concludes that demographic changes in the population of Medicare enrollees should affect the program's expenditures principally through the increased number of elderly persons, not through increased longevity among the elderly.

According to the authors, the effect of increased longevity on Medicare expenditures is mitigated by two factors "as the age of the beneficiary increases and the fact that the additional period of any one enrollee's life that is covered consists of relatively low-cost years before the terminal illness." Their study showed that "average Medicare payments per person for the third and earlier years preceding death show little relation to an enrollee's age at death, which suggests that any limitation of care related to age takes place mainly in the time near death, when severe illnesses often develop, rather than in earlier years."

A study by Chernew, Cutler, and Keenan (2003) titled *Increased Spending on Health Care: How Much Can the United States Afford* focuses on the question of health care affordability as it is becoming a mounting problem due of the fact that resources are far scarcer than the demands for their use. The subject matter is particularly interesting to the authors because of the fact that even though the United States' economy is in a current recession, health care spending is continuing to increase significantly.

It has been shown that between 1945 and 1998, spending on health care grew at a faster rate than the income growth rate (for every ten-year period). The authors stated that even though some increases in health care spending is expected as an outcome of the aging U.S. population, other historical evidence shows that changing demographic characteristics, such as aging, have accounted for a small fraction of the gap between the growth of real health care spending and GDP.

Previous studies on health care costs and growth of the costs have primarily been discussed using cross-sectional comparisons to other countries, at a particular point in time, or through comparisons of the percentage change in health care spending relative to that of real national income. Chernew, Cutler and Keenan (2003) do not believe that that method is “well-suited to yielding insights about how much we, as a nation, can afford to spend on health care and how much we are willing to spend.” For that reason, the authors presented a framework for thinking about affordability.

Chernew et al. (2003) suggest that “within a reasonable range of projected health care spending growth, we can afford to spend more for health care if we place sufficient value on those services relative to forgone non–health care consumption.” The authors want to identify what specifies costs are “bearable” for people. This can, simply, be defined as health care services are unaffordable services is if the price of such services would exceed one’s economic resources. Although health care services prices can possible exceed one’s economic resources, this does not imply that insurance policies are not affordable. This is the case because costs of insurance premiums are proportional to the probability of certain illnesses. In fact, the authors observed that:

“Absolute amount of money the United States could afford to spend on health care (or health insurance) would obviously rise with income (and wealth). Moreover, the percentage of income that could be devoted to health care, without reducing spending on other products, would also rise with income because the increase in income allows spending on all products to rise even if most of the increase is devoted to health care. This implies that as our society gets richer, we can spend a greater absolute amount, and a greater share of income, on health care.”

The outcome of this empirical study showed that since health care spending is on an upward trajectory, an important topic to address is the sustainability of the health care system. The authors of this study believe that the “economy could sustain a differential of one percentage point between growth of real per capita health care costs and growth of GDP well into the future.” The study states that even though, as a whole, our society may not want to spend more on health care than we already do, we can afford to do this without reducing overall spending, spending that is not related to health care spending.

The results show that the value of care and distributional issues are more important than our ability to pay for care, as a whole. This is the case because the value of care directly determines the willingness to pay. The study showed that medical services and new medical technologies do create value that people desire and that these products will be purchased. However, the authors note that even though society as a whole can afford to pay more for such medical services that does not automatically imply that “we should reduce efforts to reduce wasteful practices in the health care sector.”

Even though society can spend more on new medical services, information technologies as well as management strategies will continue to be an important role in cost allocations and

promoting cost-efficiency, according to this study. Using the current Centers for Medicare and Medicaid Services (CMS) assumption about long-term health care cost growth; the study concluded that health care costs will be affordable through 2075, whereas a two-percentage-point gap would only be affordable through 2039.

Chernew et al. (2003) showed that health care spending can be financially stable for a certain period until new reform policies must be put in place in order for the health care system to remain financially stable. In order to understand their projections better, it is helpful to analyze the underlying factors that have caused the rising costs of health care costs and how current premium dollars are being spent in greater detail than Chernew's study. Such a study was performed by PricewaterhouseCoopers (PwC 2006) in their work *The Factors Fueling Rising Healthcare Costs 2006* which takes a new look at the issues analyzed in PwC's 2002 report commissioned by America's Health Insurance Plans, entitled *The Factors Fueling Rising Healthcare Costs*.

For this study, data were obtained through various sources, such as review of government and private surveys that tracked employers' costs in providing health care coverage to their employees, interviews conducted with health insurance plan actuaries, and the Center for Medicare and Medicaid Services (CMS) forecast for 2005. Estimates showed that there was an 8.8 % increase in insurance premiums between 2004 and 2005. This 8.8 % premium increases were divided into three reasons of rising costs: general inflation, health care price increases in excess of inflation and increase in utilization. General inflation accounted for 2.4% of the premium increases, health care price increases accounted for 2.6% of the increase, and increased utilization for 3.8 % of the actual increase, thus making it the most important of these factors. PricewaterhouseCoopers's analysis showed that the factors increasing the utilization of health



care were attributed to increased consumer demand, new treatment, more intensive diagnostic testing, the aging population, and lifestyle changes.

The PwC study showed that the overall cost of health care services is the primary source of the cost of health insurance premiums. The overwhelming share of health insurance premiums pay for the cost of health benefits, as obtained through various services, such as hospital, doctors, drugs and many other such services. The layout of the costs of health insurance premiums are primarily spent on physician services (24 percent), outpatient costs (22 percent), inpatient hospital costs (18 percent), prescription drugs (16 percent), medical services (6%), consumer services/provider support/marketing (5%), government payments/compliance/claims processing (6%), and health plan profits (3%).

After analyzing the factors directly affecting the costs, the report concluded that current health plan trends to provide consumer engagement, healthier lifestyles, and promoting provider pay-for-performance have the potential to reduce future cost increases, and have the abilities to address the reasons as to what drives costs up. The PwC report also concluded that the growth in health care insurance premiums slowed down since the previous 2002 report, due to various factors. One such factor is that government mandates provided direct contribution to rising health insurance premiums in 2002, and although they still continue to contribute to the cost of health benefits, recent data show that the number of new state mandates has declined. This change in policies shows that there is particular emphasis being devoted to the cost of certain state mandates.

Gathering data and research on particular factors that contribute to the rise in health care costs is extremely important in this analysis, as it will later be used in the regressions. Therefore, a more in-depth look will be taken at the increased prevalence in diabetic patients, through a

research study conducted by Rathmann, Haastert, Roseman, Gries and Giani (1998) entitled *Prescription Drug Use and Costs among Diabetic Patients in Primary Health Care Practices in Germany*.

Their work focused on evaluating the number of prescription drugs prescribed as well as the costs of these drugs solely among diabetic patients in Germany, specifying their study on those in primary care practices. Diabetes is an important topic to address in regards to prescription drug use because of the fact that diabetes is a leading cause of disability and death as a result of cardiovascular disease, which thereby increased health care costs. The increased number of prescriptions for cardiovascular drugs is a direct result of the high rate of death due to diabetes and the high number of people who are diagnosed with diabetes.

The authors of the study believe that the economic impact of diabetes may have been underestimated in a previous study as their focus was too narrow. Due to the fact that diabetes is closely related to other cost-intensive chronic conditions, it is difficult to distinguish between the costs incurred from solely the diabetes disease and the costs incurred from the relationship the disease has to other medical conditions, in most cases. The authors of that paper sought to determine the effects that this relationship has on prescription drug usage and costs.

Data for the regression analysis were obtained through the MediPlus database and from the Institute for Medical Statistics in Frankfurt, Germany. MediPlus gathered data on all prescriptions, diagnoses, and demographic data among all primary care patients throughout Germany. Data on prescriptions filled and prescription drug costs, calculated from drug company sales prices, were analyzed in 30,604 diabetic and 17,713 non-diabetic patients from 362 primary care practices during 1994.

Ratios for drug groups were obtained from logistic regressions models controlling for age, sex and other covariates. Relative costs for prescription drugs were estimated by direct age and sex standardization. According to the authors of this study, they believe that diabetes impacts the health care markets severely, due to the close relationship it has to other cost-intensive chronic conditions, such as cardiovascular disease, hypertension, and lipid disorders.

After the regressions were run, the data showed that diabetic patients had an increased prescription use for most drugs, with a significant increase in use of cardiovascular drugs, fibrates, laxatives, gout medication, and wound care products. Those who were diabetic accounted for 21% of total annual prescription costs and total costs, in U.S. dollars, per patient-year were three times higher for diabetic patients than the non-diabetic patients, averaging spending of \$384 versus \$123. The most important cost factor pertaining to prescription drugs were cardiovascular drugs, which amounted to 39% of the costs. Other factors influencing the increased costs are a result of an increased number of days spent in hospitals, more expensive outpatient treatments, higher costs for nursing home care, and increased drug consumption.

Through the empirical work performed, the study showed that the total prescription costs in diabetic patients were threefold higher than in non-diabetic control subjects where the greatest contributing factor in regards to the excess costs was cardiovascular drug prescriptions in primary health care practices. Insulin was the major cost factor for those that required diabetes treatments, which accounted for about a quarter of total prescription costs in the diabetic population.

The authors of the study concluded that prescription drug use among diabetic patients in primary health care practices increased primarily due to increased use of cardiovascular drugs and for treatment of diabetic-associated disorders. Also, they showed that in Germany, diabetic

patients accounted for over one-fifth of the total pharmacy costs in primary practices. Therefore, because diabetic patients had such an enormous impact on prescription drug usage, it can be inferred that diabetes is a major economic factor in drug use.

To further analyze the prescription drug market, a report coauthored by Findlay, Sherman, Chockley and Watkins (2002) for the National Institute for Health Care Management Research and Education Foundation, titled *Prescription Drug Expenditures in 2001*, studied prescription drug costs and the reasons for the recent price increases.

Data from this study is based on data compiled by IMS Health, Inc. and Scott Levin through specialization in gathering pharmaceutical marketplace data. Scott Levin's Source Prescription Audit (SPA) presents sales at the retail level, which were purchased by the consumer. Scott Levin sampled around 40,000 retail outlets on their nationwide outpatient prescriptions dispensed by retail pharmacies. Outlets include chain and independent pharmacies, pharmacies at food stores, discount stores and mass merchandisers. The SPA does not include sales of prescription drugs by mail order or through health facilities such as hospitals and nursing homes or HMOs. The IMS Health's Retail and Provider Perspective data and its National Prescription Audit also projected nationwide prescriptions and prescription drug sales, based on a sample of over 150,000 retail outlets and health facilities.

The data analyzed in the report showed that the primary reason for the rise in pharmaceutical spending was caused by the increase in the volume of prescriptions prescribed by professionals. Some of the reasons for the increase in prescriptions being written are due to for an increase number of current users taking medicines for a longer period of time, an increase in first time users of prescription users, and more consumers using more than one medicine at a

time. The latter reason is especially prevalent in the elderly generation, whose regimen for prescription drugs can often amount to as high as taking three to five pills daily.

The report does not discount how crucially important and life-saving prescription drugs are. The authors recognize how necessary for the treatment of illnesses, improvement of many medical conditions and diseases, provide strong relief from pain, and treat and cure many life-threatening diseases. Even though prescription drugs are so vital, there are a lot of issues arising due to the increasing costs. According to *Prescription Drug Expenditures in 2001* (Findlay et al. 2002), the most important from “health care financing perspective is whether the growing use of prescription drugs will, over time, add to overall health care costs or yield savings as they supplant and reduce the need for other, more costly medical treatments.”

What is interesting to observe is that the rise in prescription drug spending in recent years can be largely attributed to a relatively small number of drugs, most of which were approved after 1993. Expenditures for prescription drugs in the U.S. continue to be the fastest growing component of health care. As measured by various research groups and by the federal government, prescription drug spending has risen 15% or more per year over the past several years. Amador and Fitzpatrick (2003) reported that “while spending on prescription drugs accounts for around 10 percent of total of total spending on health care in the U.S., in recent years, drug costs have in contributed disproportionately to a sharp upturn in overall health costs.”

The report concluded that that more people take more expensive and elaborate medicines due to the emergence of a wider array of conditions and diseases than there were before. According to Findlay et al. (2002), the rise in pharmaceutical spending has primarily been caused by an increase in the volume of prescriptions due to there being more new first time users of prescription medicines, more current users taking medicines for longer periods, and more people

taking two, three, four or more medicines at one time. The report could not conclude if the rise in prescription drug expenditures would permanently change the health care system in the U.S., but has shown that the increase in spending has caused there to be many shifts already. The shifts in spending behavior include consumers having less out-of-pocket costs and influencing government policies to include prescription drug benefits, such as the Part D program of Medicare.

Prescription drug spending in the U.S. continues to rise at a brisk pace, highly influenced by increases in the sales of a relatively small number of top-selling drugs each year. Impacts from this new trend are already having an impact in some aspects. Such examples are “accelerating the shift of health care costs to consumers after years in which they paid a fairly small share of the point-of-service costs and by fueling pressure to add a prescription drug benefit to the Medicare program.”

In *Increasing Health Insurance Costs and the Decline in Insurance Coverage*, a study by Chernew, Cutler, and Keenan (2005) explores the relationship between health care premiums and coverage rates. The paper focuses on geographic variations that effect insurance premiums and coverage rate, which makes the study broader than some of the earlier studies, which make the study less likely to be confounded with other secular trends. This study uses instrumental variable techniques to address the potential for reverse causality between rising costs and coverage rates, as well for adjusting for any potential measurement errors in the data. A probit regression was also used to estimate the association between rising local health insurance costs and the falling propensity for individuals to have any health insurance coverage, controlling for a rich array of economic, demographic, and policy covariates.

The authors examined the changes in insurance coverage from 1988-90 to 1997-99 focusing only on the non-elderly population because they believed that essentially all of the elderly have coverage through Medicare and divided people into health insurance units (HIUs) reflecting coverage under typical health insurance policies (Cutler and Gruber, 1996).

The Current Population Survey (Mills, 2002) is the primary data source for insurance coverage and individual level demographic variables is because the survey has information about insurance coverage from the previous year. According to this study, “the effect of technological progress on the utility of being uninsured vs. insured depends on the availability of charity care, norms of practice, and the marginal utility of the incremental cost of insurance to cover new services.”

Over half of the decline in coverage rates experienced over the 1990s is attributable to the increase in health insurance premiums. This study projected that the number of uninsured people would increase by 1.9 million to 6.3 million in the next decade if real per capita medical costs increase at a rate of 1 to 3 percentage points. Therefore, in order to reduce the number of uninsured people, initiatives to do so must first confront and analyze the reasons for the rising costs. However, this places pressure on the health insurance coverage rates.

The outcome of this study shows that a 1 % premium increase results in a net increase in uninsured of 164,000 people and that increases in medical costs could have a significant impact on changes in insurance coverage in the future. The results indicated that if medical costs increase by 1% per year above GDP, this would indicate that the number of uninsured will increase by 1.9 million over a ten year period.

In the conclusion of that paper, the authors believe that rising health insurance costs are the dominant explanation for falling insurance coverage over time, which suggest that the

uninsured population is likely to increase further if health care cost growth continue to exceed income growth. Therefore, initiatives aimed at reducing the number of uninsured must first of all confront the growing pressure on coverage rates generated by the rising costs. However, since the rising costs are a reflection of the medical advances which increase the quality of care provided to people, it remains to be seen whether this involves limiting the cost of care.

Himmelstein, Warren, Thorne and Woolhandler (2005) in their work *Illness and Injury as Contributors to Bankruptcy*, focused on the number of bankruptcies filed in the United States due to medical costs. The authors surveyed 1,771 personal bankruptcy filed in five federal courts, filling out a questionnaire form, obtaining financial data from public court records and conducted interviews with 931 of these candidates. In 2001, almost 1.5 million American families or individuals filed bankruptcy petitions, and due to the fact many legal cases have shown that medical bills are a large contributor to personal bankruptcies, the authors were keen on collecting detailed information on medical expenses, access to medical care, and work loss statistics for a more in-depth look at this situation.

After analyzing the questionnaires and interviews that asked about the person's employment status, housing, demographic, specific reasons for filing for bankruptcy, if medical bills exceeded \$1,000 and health insurance coverage information, the results showed that medical causes was a large contributor to personal bankruptcies filed. Their research showed that around 1.9 to 2.2 million American experienced medical-related bankruptcies in 2001. The study showed that for those whose illnesses led to these bankruptcies, "out-of-pocket costs averaged \$11,854 since the start of the illness...and 75.7 percent had insurance at the onset of the illness."

Illnesses caused there to be many financial problems for these families due to the high medical costs and also through lost income due to being absent from work. In fact, according to



Himmelstein et al. (2005), “59.9 percent of these families bankrupted by medical problems indicated that medical bills (from medical care providers) contributed to bankruptcy 47.6 percent cited drug costs; 35.3 percent had curtailed employment because of illness...often to care for someone else.”

The types of medical problems cited as being the biggest contributors to personal bankruptcies varied from cardiovascular disorders, trauma, back problems, cancer, mental disorders, diabetes, childbirth-related and congenital disorders, as well as medical problems involved with ongoing chronic illnesses. The authors cite many contributing factors to these bankruptcies on brief lapses in insurance coverage, the fact that many health insurance policies do not cover enough of the necessary costs when it comes to serious illnesses, the fact that many employment-based coverage plans sometimes do not protect families, and through loss of income.

Himmelstein et al. (2005) believe that “even universal coverage could leave many Americans vulnerable to bankruptcy unless such coverage was much more comprehensive than many current policies...and that health insurance should be divorced from employment to avoid coverage disruptions at the time of illness. Insurance policies should incorporate comprehensive stop-loss provisions, closing coverage loopholes that expose insured families to unaffordable out-of-pocket costs. Additionally, improved programs are needed to replace breadwinners’ incomes when they are disabled or must care for a loved one.”

In order to fully understand the reasons behind the increased spending in health care, it is important to develop a model that includes possible contributing factors. Therefore, by utilizing the previous discussed literature reviews, a model for further analysis can be developed by using

some of the variables these authors have used in their studies. Important aspects of the previous literature discussed in this chapter, such as diabetes, prescription drug costs, the costs incurred by the elderly and others will be used as independent variables in the stud. However, other variables will be added to the model, those that the author of this thesis believes are significant in the analysis of health care costs.

## **CHAPTER III**

### **DATA AND METHODOLOGY**

The Literature Reviews as well as the background information on the health care industry, and mainly the prescription drug costs, have all discussed certain variables that contribute to health care expenditures. As some of the studies have mentioned contributing factors such as chronic illnesses (cancer, diabetes, cardiovascular diseases), these will be used in order to form the statistical model to be used. Also, some of the factors leading to these chronic illnesses, such as obesity, will be observed. Due to Himmelstein's et al. (2005) discussion of how medical costs have such a significant effect on personal bankruptcies, that variable will also be used in the upcoming regression analysis. As most of the Literature Reviews have looked at one or two of these variables, this thesis will focus on the most important variables contributing to health care costs of each of the Literature Reviews.

The specification of an appropriate statistical model for this study is crucial in order to achieve relevant statistical inferences. The model must incorporate the crux of existing theories, some of which were already addressed through the studies discussed in the Literature Review section, and also try not to omit any important variables. This chapter will identify the model to be used in this study, state the statistical model to be used, discuss the conceptual model to be used, as well as list where the data sources for each variable came from. A priori expectations concerning the expected sign of the estimated coefficients are developed through knowledge

from prior works as well as economic inferences. Also, each explanatory variable is examined thoroughly in order to justify its use in the statistical model through supporting justifications from previously conducted studies.

After analyzing previous works conducted in this area, the model to be used in this thesis can conceptually be defined as:

National personal health care expenditures= *Function of* (Income; Age; Health Status; Health Care Expenditures; Health Care Services; Insurance Coverage; Employment; Education)

The hypothesis to be tested is whether or not retail prescription drug sales have a significant impact on overall national health care expenditures. Expectations, from previously conducted research, show that prescription drug prices have a significant impact on health care expenditures, and therefore have adverse affects such as increasing the number of uninsured people. The null hypothesis for this study is whether  $H_0: \beta_{\text{retail prescription drug sales}} = 0$ .

From the explanatory variables introduced in the paragraphs above as well as the conceptual model, the structural equation to be estimated in this study is given by:

$$\begin{aligned} \text{National Personal Health Care Expenditures} = & \beta_0 + \beta_1(\text{PINC}) + \beta_2(\text{OB}) + \beta_3(\text{PNC}) + \\ & \beta_4(\text{UNIN}) + \beta_5(\text{UR}) + \beta_6(\text{BA}) + \beta_7(\text{INFD}) + \beta_8(\text{PBRUP}) + \beta_9(\text{CDR}) + \beta_{10}(\text{DR}) + \\ & \beta_{11}(\text{RPDS}) + u \end{aligned}$$

The model will be estimated using ordinary least squares with the LIMDEP statistical package.

The intent of this study is to examine how influential prescription drug prices are in regards to health care expenditures, therefore contributing to health insurance premium prices

and influencing many other related topics. Therefore, an obvious candidate for the dependent variable in the model is national personal health care expenditures (NPHCE). This variable includes total statewide medical expenditures on dental services, professional health care, other personal health care, home health care, durable medical product, drugs and other medical nondurables, hospital care, physician and clinical services, other types of personal and professional health care, and nursing home care.

Since the total national personal health care expenditures included their data on prescription drugs, the amount of prescription drug expenditures was subtracted from the total health care expenditures for each state in order to avoid an overlap due to the retail prescription drug sales variable that will be used in the model.

Durable medical product expenditures cover retail sales of items, which include such items as eyeglasses, contact lenses, surgical and orthopedic products, hearing aids, medical equipment rental, wheelchairs, and many others. It is assumed that the more one spends on personal health care, the more one spends on medical products because that more one seeks medical services, the more one is apt to get eyeglasses, contacts, hearing aids or other products prescribed. Because of this, it is a large portion of what is spent on health care expenditures and is thereby included in the dependent variable.

Nursing home expenditures cover services provided in both private and public freestanding nursing home facilities. This variable is relevant to analyze because the elderly account for over one third of health care spending in the United States. New treatments, innovative drugs, and changes in lifestyles have all contributed to an increase in the life expectancy rate, which of course is the reason that the total population over the age of 65 is projected to increase. Due to this increase in lifespan, costs to cover elderly people for a longer

period of time will have to be incurred. This will especially be costly in the United States as the baby-boomer generation has now approached that age.

When introducing the explanatory variables into the system, they must relate, in some way, to factors influencing national health care expenditures. Some of the classifications of variables have been made by mimicking prior studies performed. Following the theories and including other influencing factors, the explanatory variables for the regressions are discussed in further detail in the following paragraphs. Table One summarizes all the predicted coefficients on the variables:

**Table Two: Expected Signs of the Variables**

<b>THE PREDICTED SIGNS FOR THE REGRESSION VARIABLES</b>					
<b>VARIABLE</b>	<b>SIGN</b>	<b>VARIABLE</b>	<b>SIGN</b>	<b>VARIABLE</b>	<b>SIGN</b>
<b>BA</b>	<b>+</b>	<b>PINC</b>	<b>+</b>	<b>PBRUP</b>	<b>-</b>
<b>CDR</b>	<b>+</b>	<b>PNC</b>	<b>+</b>	<b>UR</b>	<b>-</b>
<b>DR</b>	<b>+</b>	<b>RPDS</b>	<b>+</b>	<b>OB</b>	<b>+</b>
<b>INFD</b>	<b>+</b>	<b>UNIN</b>	<b>-</b>		

The variable PINC, personal income per capita, is an important variable to include in the regression as one assumes that the more disposable income one has, the more people would seek health care services. Health care is considered to be a normal good, thus the coefficient is predicted to have a positive coefficient. Seeking preventive care is very beneficial, not only for one's own personal health but also in terms of productivity.

The number of college graduates variable that have a bachelor's degree or higher (BA) is predicted to have a ceteris paribus relation to health care expenditures. The reason for this is that the more education one receives, the more knowledge one has regarding certain types of sicknesses, diseases, and in general, one knows more when serious complications have arisen or are arising and thus know when it is time to seek medical attention. Therefore, having higher educational levels usually leads to an increased amount spent on health care.

The OB variable, which stands for obesity rate, is also predicted to have a positive sign, for if one is obese then it is more likely that the patient has more problems than someone with a normal bodyweight. Obesity is one of the main causes of cardiovascular diseases, diabetes, certain types of cancer, and many other diseases. Therefore, if one is obese, the more likely one is to incur serious health issues which therefore would increase health care expenditures. For the overall population, the same would apply, for the higher the rate of obesity is in a certain state, it will cause more health care expenditures in that state.

The variable UNIN, the number of uninsured people in America, is predicted to have a negative relationship in regards to health care spending. The sign is predicted to be negative because if one is uninsured, that person is not likely to seek medical care as they would prefer not to incur the costs of paying for the service, and will do so only if it is absolutely necessary. The number of uninsured people in the United States was calculated by dividing the total number of uninsured people by the total population of the state. The reason why this variable is significant to analyze is that the number of uninsured people in America is increasing as currently around 45.7 million people (which amounts to 15.3% of the total population) are lacking insurance coverage.

The variable PBRUP, number of personal bankruptcies, is relevant to include in the analysis because research has shown that over fifty percent of personal bankruptcies filed in the United States have been a direct result of medical expenses (Himmelstein et al. 2006). The coefficient expected on this variable is negative because one would expect that as the number of personal bankruptcies filed increases, national health care expenditures would decrease for people would not be able to pay those bills. PBRUP was calculated by dividing the total number non-business filings by the total number of filings by state.

The same negative relationship is predicted to be found in the UR (unemployment rate) variable. As the unemployment rate rises, keeping in mind that in this analysis the *ceteris paribus* would hold and income would be held constant, employer-sponsored health care insurance would be lost with job loss, which would therefore mean that the unemployed would seek less medical care. In extreme emergencies, those who are unemployed and are in need of medical attention tend to go to the emergency room and pay the cost upfront, but this occurs mostly in severe situations, for having insurance coverage is not worth it to them.

The number infant death rates variable is predicted to have a negative coefficient, though this sign is debatable and depends on individual beliefs on this subject matter (this will be discussed in further detail in Chapter Four). A negative relationship can be expected because as the number of infant mortalities increase, even though more will be spent on health care in order to try to save the infant, future expenses on those children is less because there are no longer any future expenses. On the other hand, many parents will do and pay whatever they can in order to save their child, which usually requires an extended hospital stay, prescription drugs, costly medical procedures and medical tests –which could mean that the number of infant deaths has a positive relationship with national health care expenditures.



CDR (cancer death rate) is predicted to have positive coefficients because it is assumed that there will be more medical expenditures as a direct consequence of the disease. The treatment of cancer usually last from a couple of months to a few years, thus increasing the expenditures on health care. DR, the diabetes rate per state, is predicted to have a positive coefficient in regards to per capita health care expenditures. This variable is relevant, for research has shown, diabetes patients account for large part of prescription drug usage and other medical costs, such as durable medical products such as insulin-level tests.

The number of mothers who need prenatal care is another variable used in the regression. PNC is important to analyze because the more births there are in the United States, the more likely it is that mother's will need some type of care during the pregnancy. Many factors affect pregnancies, such as unhealthy lifestyles, stress, genetic problems, and therefore the more doctors are involved in the pregnancy process; the more likely it is that the child will survive. The coefficient of PNC is predicted to be positive for the more the mother is in need of care during the pregnancy, the higher the medical costs will there, and therefore, more will be spent on health care.

The RPDS variable, retail prescription drug sales, is the main emphasis of this regression analysis. The variable is predicted to have a positive relationship in accordance with national health care expenditures because as national health care expenditures increase, visits to physician offices increase and this leads to more prescriptions being written and filled.

Total population of each is state is not used as a variable in the regression; however, it was implicitly used in calculating some of the explanatory variables in order to obtain the per capita data. In order to calculate the percentage of people who obtained a bachelor's degree or

higher, the BA total was divided by the total number of people who received some type of education in the state.

To calculate UNIN, the number of uninsured people was divided by the total population of each state in order to receive the percentage of uninsured people. Retail prescription drug sales were given as total, thus in order to be able to run a regression and get the variable to fit in with the other variables, retail prescription drug sales were divided by total population of each state to get retail prescription drug sales per capita.

Age was another variable which was “included” in the conceptual model, however, as the cancer death rate and infant death rate variables were both age-adjusted, age was an implicit variable used in the regression.

In the statistical model to be used for the regression, cross-sectional data were used for the most recent data available for all variables, which was from the year 2004. Data were collected for all the states in the United States, including the District of Columbia. Sources for the explanatory variables used came from the following:

Data for national health care expenditures come from the Office of the Actuary through the Centers of Medicare and Medicaid Services (CMS) published in 2007. The data obtained from the CMS included expenditures on: nursing home care, hospital care, prescription drugs, physician and clinical services, durable medical products, other types of personal health care, other types of professional services, and home health care expenditures. Observations were measured by state and by year.

Retail prescription drug sales were obtained through the Kaiser Foundation and measured the number of prescriptions filled at pharmacies by state, which included new and old prescriptions filled and refilled for both brand names and generic drugs. The data collected are

based on Vector One™: National by Verispan, L.L.C. Such retail pharmacies include independent and chain pharmacies, food stores, and mass merchandisers but exclude prescriptions filled by mail order. Data collection was based upon 814 defined regional zones. As the Retail Prescription Sales were not per capita, each state's retail prescription sales were divided by the total population of the state in order to get per capita terms.

State median per capita personal income, age statistics, the number of uninsured Americans, and educational attainment by state were obtained through the Census Bureau. United States per capital personal income was measured in dollars and computed using Census Bureau midyear population estimates.

Data on obesity rates and diabetes rates were obtained from the national Center for Chronic Disease Prevention and Health Promotion. Obesity rates were measured by weight classification through body mass index. 2004 data was available for every state but Hawaii; therefore, the average value for Hawaii's obesity rate in 2003 and 2005 was used to get the closest estimate for 2004 possible.

Data for the number of personal bankruptcies were obtained through the American Bankruptcy Institute's 2004 data accumulation for annual business and non-business filings by state. In order to get a percentage of the number of consumer bankruptcies and not business bankruptcies, the number of personal filings was divided by total number of filings. Seasonally adjusted unemployment rate data were obtained through the United States Department of Labor. Data were given by state and on a monthly basis, thus in order to use it with the other annual data, the year-end values (December 2004) were used.

The number of infant deaths for 2004 data was obtained through the Kaiser Family Foundation in the National Statistics Report, Volume 55 Number 19, published on August 21,

2007. The number of mothers receiving prenatal care was provided through the same source, in the Volume 57 Number 2 edition. Infants were defined as being children under the age of one year.

Cancer death rate data was obtained through the National Vital Statistics and used the deaths incurred in 2005 due to the fact that those who died in that year would have sought treatment for the cancer in earlier years, naturally one cannot be certain that they were treated in 2004 but it is highly possible. Therefore, those who died in 2005 had the expenses in earlier years, which is the point of the study. Death rates for the cancer patients were age-adjusted per 100,000 U.S. standard population, where the population samples used for computing the death rates are post-census estimates based on the 2000 census estimated as of July 1, 2004. Data obtained from the Census Bureau were compiled in the Current Population Survey's annual and social and economic supplement report. This report is an annual survey of approximately 78,000 households nationwide.

## **CHAPTER IV**

### **ESTIMATION AND RESULTS**

In this chapter, the structural equations of a more in-depth model and the results are presented. This chapter addresses the problems that were encountered in running the preliminary regressions, addressing why certain variables were included or dropped from the statistical model, the outcome of the regression and the statistical inferences made from these outcomes. Then, a new structural system is estimated by two-staged least squares in order to correct the problems encountered by a few of the signs on the variables. After presenting and discussing the results of the two-staged least squares estimation, the reasoning behind the outcomes will be discussed in further detail.

Due to the exploratory nature of this research investigation, several different regressions were run in order to ascertain the effects that various variables have on national health care expenditures. The nature of this cross-sectional data means that for this particular year of investigation, that being 2004, there are a total of 51 observations, one for each state and the District of Columbia. Because of this, not too many variables should be used in the statistical model. A general requirement of statistical estimation is that the number of total explanatory variables used in the regression should be less than the total number of observations. Using a rule of thumb of five observations per explanatory variable, in the case of this regression, the maximum of explanatory variables that should be used in the regression is ten.

Panel data would have been preferred to use rather than cross-sectional data for using a wider-array of data for multiple years would have showed the comparisons of national health care spending better; however, not enough data was available in order to conduct a panel-data analysis. Therefore, the author had to focus on a cross-sectional study for the most recent year of data available. In order to verify if another form of the model should be used, another model was tested using the natural logs of each of the variables and running an ordinary least squares regression on it. However, the results using the log model showed that many variables that had been statistically significant in the original model were now insignificant. Looking at the unemployment rate variable, it still did not have the correct sign. Running a Box-Cox test, the double log form also showed inconclusive results. For these reasons, it was concluded that the log-form of the model should not be used since the results on the variables are highly insignificant.

Data were gathered on twelve variables that seemed theoretically important to the analysis and were believed to be factors in health care expenditures. Therefore, each explanatory variable was run in at least one of the regressions in the preliminary model, as discussed in the previous chapter. After running different statistical models, the results showed that a few variables came out to be statistically insignificant, regardless of model specification. The following table shows the three variables that were shown to be statistically insignificant:

**Table Three: Insignificant Variables in the Statistical Model**

<b>Variable</b>	<b>T-ratio</b>
<b>Obesity Rate (OB)</b>	0.090
<b>Diabetes Rate (DR)</b>	0.621
<b>Bachelor's Degree (BA)</b>	0.610

Due to this fact that these three variables were all statistically insignificant in the preliminary models run, these variables were removed from the suggested statistically model.

Therefore, the complete model used in this thesis was reduced to:

$$\text{National Personal Health Care Expenditures} = \beta_0 + \beta_1(\text{PBRUP}) + \beta_2(\text{CDR}) + \beta_3(\text{UNIN}) + \beta_4(\text{PINC}) + \beta_5(\text{PNC}) + \beta_6(\text{UR}) + \beta_7(\text{RPDS}) + \beta_8(\text{INFD}) + \varepsilon$$

The most important question addressed by the regression is whether or not the t-ratio of retail prescription drug sales is statistically significant and if the sign on the variable is positive and robust, which would correlate to what is expected through economic theory. However, before this can be determined, it is important to further analyze the results obtained through the regression analysis. The regression results are reported in tables five and six:

**Table Four: Ordinary Least Squares Regression Results**

Variable	Coefficient	Standard Error	t-ratio	P[ T >t]	Mean of X
<b>Constant</b>	7239.20499	3538.80313	2.046	0.0471	
<b>PBRUP</b>	-8171.7576	3754.42058	-2.177	0.0352	0.97426275
<b>CDR</b>	910672.134	591752.897	1.539	0.1313	0.00187261
<b>UNIN</b>	-4055.2103	2173.08577	-1.866	0.069	0.13660757
<b>PINC</b>	0.0792542	0.01236758	6.408	0	32336.4314
<b>PNC</b>	0.0038598	0.003242	1.191	0.2405	80628.4706
<b>RPDS</b>	1.79455754	0.87675442	2.047	0.047	585.034524
<b>INFD</b>	-0.8998545	0.54417988	-1.654	0.1057	547.764706
<b>UR</b>	15871.3063	6435.40952	2.466	0.0178	0.05015686

**Table Five: Ordinary Least Squares Regression Results Continued:**

<b>Residuals</b>	
<b>Sum of Squares</b>	7118487
<b>Standard error of e</b>	411.6889
<b>Fit</b>	
<b>R-squared</b>	0.7223776
<b>Adjusted R-squared</b>	0.6694971
<b>Model test</b>	F[8.42] (prob) =13.66
<b>Diagnostic</b>	
<b>Log likelihood</b>	-374.4486
<b>Restricted(b=0)</b>	-407.1266
<b>Chi-sq [8] (prob)</b>	65.36
<b>Info Criter.</b>	
<b>LogAmemiya</b>	12.20306
<b>Akaike Info. Criteri.</b>	12.19932
<b>Autocorrelation</b>	
<b>Durbin-Watson Stat.</b>	2.0210014
<b>Rho</b>	cor[e,e(-1)] = -.0105



**Table Six: Descriptive Statistics of OLS Regression**

<b>Variable</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
NHCE	4656.16	716.113	3313.3774	7694.8276
PBRUP	0.97426	1.78E-02	0.9235	0.9923
CDR	1.87E-03	1.66E-04	1.41E-03	2.17E-03
UNIN	0.13661	3.39E-02	8.33E-02	0.2420402
PINC	32336.4	5203.169	24144	50383
PNC	80628.5	96718.68	6599	544843
RPDS	585.035	102.6322	395.38667	810.67078
INFD	547.765	580.2692	30	2811
UR	5.02E-02	1.05E-02	3.00E-02	7.30E-02

In order to test for the possibility of multicollinearity in the statistical model, the correlation matrix was analyzed for each of the variables used in the regression:

**Table Seven: Correlation Matrix of OLS Regression**

	<b>NHCE</b>	<b>PBRUP</b>	<b>CDR</b>	<b>UNIN</b>	<b>PINC</b>	<b>PNC</b>	<b>RPDS</b>	<b>INFD</b>	<b>UR</b>
<b>NHCE</b>	1.00000	-.07923	.26160	-.4324	.6344	-.207	.380	-.24302	.1555
<b>PBRUP</b>	-.07923	1.00000	.40015	-.0016	-.0012	.0587	.281	.14634	.1858
<b>CDR</b>	.26160	.40015	1.000	.09182	-.0851	-.067	.6908	.04032	.3689
<b>UNIN</b>	-.43246	-.00169	.09182	1.0000	-.2837	.3881	-.214	.41678	.2569
<b>PINC</b>	.63440	-.00129	-.08515	-.2837	1.000	.1079	.0137	.04788	-.013
<b>PNC</b>	-.20784	.05878	-.06786	.38815	.10798	1.000	-.1451	.97383	.2441
<b>RPDS</b>	.38072	.28138	.69081	-.2140	.01374	-.145	1.000	-.05729	.0858
<b>INFD</b>	-.24302	.14634	.04032	.41678	.04788	.9738	-.0572	1.0000	.2871
<b>UR</b>	.15552	.18585	.36893	.25693	-.0134	.2441	.0858	.28712	1.000

After analyzing the correlation matrix, there could potentially be some variables that seem to be correlated with one another. Retail prescription drugs and cancer death rate had a correlation coefficient of 0.69081, national health care expenditures and personal per capita income for the correlation coefficient equaled 0.6344. The correlation matrix definitely showed that multicollinearity existed between the number of infant deaths and prenatal care for the correlation coefficient between these two variables equaled 0.97383. Due to this high level of correlation, further action was taken in order to analyze the potential problems stemming from this.

These results show that since all the t-ratios were statistically significant, the variables are not perfectly collinear with one another, that is to say the correlation between the two is not equal to 1. Therefore, one knows that perfect multicollinearity is not present; however, whether or not near-perfect collinearity exists in the model cannot be specified.

In order to correct this problem, a few more regressions were run in order to analyze the effects that the number of infant deaths variables (INFD) and number of women seeking prenatal care during a pregnancy (PNC) had on the overall model. Due to the high correlation, PNC was removed from the model in an attempt to get rid of the multicollinearity problem; however, this caused the RPDS variable to become statistically insignificant. Keeping PNC but removing INFD from the model had the same result, as well as the addition of another problem, the sign of the PNC coefficient was the opposite of what is expected from economic theory.

Therefore, by removing both PNC and INFD from the statistical model due to their high correlation caused the RPDS variable to be statistically insignificant. Therefore, if either variable were to be dropped, specification error would result due to how highly influential it is in regards

to prescription drug sales. For these reasons, INFD and PNC both remain in the model for further analysis even though they are highly correlated.

The number of infant deaths and the number of women seeking prenatal can be highly correlated due to numerous reasons, such as those women seeking medical care during the pregnancy are experiencing difficulties in their pregnancy, which therefore could indicate that there are more deaths. After initially removing the variables from the model, it clearly showed that the variables, though they are correlated, are very important to the overall statistical model, highly influencing the statistical significance of retail prescription drug sales.

After running the statistical models with the White standard errors, the Breusch-Pagan robust statistics showed a few variations in the outcomes of the variables. All the explanatory variables but CDR, UNIN, and PINC had increases in their t-ratios. Although PINC decreased in its t-ratio, it did not decrease enough for it to become statistically insignificant. The remaining explanatory variables had slight increases in t-ratios, however, INFD had a drastic increase in t-ratio, from 1.654 to 2.355. Therefore, under the Breusch-Pagan robust model, the number of infant deaths is statistically significant.

**Table Eight: Heteroskedasticity Test Results**

Residuals	
Sum of Squares	7118487
Standard error of e	411.6889
R-squared	0.7223776
Adjusted R-squared	0.6694971
Model test	F[8.42] (prob) =13.66
Autocorrelation	
Durbin-Watson Stat.	2.0210014
Rho	-0.0105007
White heteroscedasticity	
Breusch/Pagan LM Chi-sq [8](prob)	7.04(.5328)

**Table Nine: Comparison of White-Standard Error Results and Ordinary Least Squares:**

<b>WHITE-STANDARD ERROR RESULTS</b>				<b>OLS RESULTS</b>		
<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>T-Ratio</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>T-Ratio</b>
<b>Constant</b>	7239.20499	3371.303	2.147	7239.20499	3538.80313	2.04
<b>PBRUP</b>	-8171.757	3214.413	-2.542	-8171.7576	3754.42058	-2.177
<b>CDR</b>	910672.134	614178.5	1.483	910672.134	591752.897	1.539
<b>UNIN</b>	-4055.2103	2253.999	-1.799	-4055.2103	2173.08577	-1.866
<b>PINC</b>	0.0792542	0.015901	4.984	0.0792542	0.01236758	6.408
<b>PNC</b>	0.0038598	0.002058	1.876	0.0038598	0.003242	1.191
<b>RPDS</b>	1.79455754	0.854835	2.099	1.79455754	0.87675442	2.047
<b>INFD</b>	-0.899854	0.382084	-2.355	-0.8998545	0.54417988	-1.654
<b>UR</b>	15871.3063	7480.557	2.122	15871.3063	6435.40952	2.466

In order to test for the presence of heteroscedasticity, the Breusch-Pagan LM chi-square statistic was analyzed. For, according to Damodar N. Gujarati (2002), if the chi-square value obtained using the White Test exceeds the critical chi-square value at the chosen level of significance of the model, there is heteroscedasticity in the model. The Breusch-Pagan chi-square value equaled 7.04 and the critical chi-square value equals 58.12. Therefore, the Breusch-Pagan statistic does not exceed the critical chi-square value which thereby means that there is no heteroscedasticity in this model (see Table Seven for Chi-square value).

In order to determine whether the statistical model had misspecification, a Ramsey RESET test was performed (Ramsey, 1969). The Ramsey RESET test uses the estimated

dependent variable as a regressor, which is called the restricted model. After doing so, the standard error from the original regression is then compared to the standard error from the unrestricted regression with the estimated dependent variable as a regressor (the restricted model) by using an F-test. If the F-statistic is below the F-critical value then this suggests that there may be no misspecification.

The F-test used in the Ramsey RESET test compares both regressions, the original one (which is the restricted model) and the auxiliary one (which is the unrestricted model). In order to calculate the F-test, one subtracts the sum of squares from the restricted model from the sum of squares of the unrestricted model; then, this number is divided by the number of restrictions in the model. In this case, the number of restrictions equaled three as  $\hat{y}^2$ ,  $\hat{y}^3$ , and  $\hat{y}^4$  were created in order to run the test, this results in the following:

$$\frac{(SSE_r - SSE_{ur})}{\text{number of restrictions}} = \frac{(6987250 - 5855960)}{3} = 377097$$

This numerator is then divided by the outcome of dividing the sum of squares of the unrestricted model by the degrees of freedom, which equals:  $(SSE_{ur}/df) = (5855960/38) = 154104$ . Dividing the number by the denominator shows that the F-test statistic for the RESET test is 2.447 ( $= 377097/154104$ ). Because the F-critical value at the five percent level and 39 degrees of freedom is 2.92, due to the fact that the F-statistic does not exceed the F-critical value, the statistical model passes RESET at the 5% level (F-test RESET < F-critical).

Even though autocorrelation is not expected to be a problem with this statistical model as it uses cross-sectional data and not time series data, the Durbin-Watson statistics were analyzed in order to make sure of this. The reported Durbin-Watson statistic for the regression was 2.0021,

and since the Durbin-Watson statistic lies between 2 and 4 -  $d_u$ , it can be clearly inferred that there is no autocorrelation in the model.

Chernew, Cutler and Keenan (2003) suggest that estimation problems could arise due to joint determination of several explanatory variables that could affect health care expenditures, as they discussed reverse causality in their paper. After running the ordinary least squares regressions, some anomalous results suggested that certain variables might be endogenous, which could result in there being a causality problem. Two of these variables that could cause such problems that are relevant to this study are the number of uninsured people and prescription drug sales.

Retail prescription drugs could be an endogenous variable in relation to national health care expenditures due to the fact that even though drug expenditures were subtracted out from national health care expenditures in this analysis, retail prescription drug sales still can affect national health care expenditures through other means. Such examples are that sometimes taking prescription medicine can cause there to be side effects, and this could result in a person needing emergency medical care, more hospitalization, more diagnostic tests to be performed, etc.

The number of uninsured people could be endogenous to national health care expenditures because the data does not specifically show what part of national health care expenditures came from out-of-pocket expenses or through pay-off plans from the hospitals or doctors. Therefore, the number of uninsured people could be endogenous to national health care expenditures by influencing these expenditures more significantly because of the lack of coverage and therefore having higher costs.

The remainder of this chapter examines the impact of the estimated coefficients of the health care expenditures model of allowing for the simultaneous determination of health care

expenditures, retail prescription drug sales, and the number of uninsured people. The two-staged least squares method was implemented to existing simultaneity. In addition, economic theory suggests that as the unemployment rate increases, health care expenditures would decrease because of the fact that many people would lose their insurance coverage. The sign from the regression showed that there was a positive correlation, and for this reason it was further analyzed.

To control for these problems, the brute force two-staged least squares methodology was applied to the implied system. In the first stage of this process, two new structural equations were specified and estimated. An additional variable was added in the first stage to both new structural equations; these were variables that affected the possible endogenous variables but not the dependent variable used, as shown in equations two (2) and three (3) in the upcoming pages.

The variables believed to possess the possibility of being endogenous in the statistical model were retail prescription drug sales (RPDS) and the percentage of people who were uninsured (UNIN). In order to be able to specify two additional structural equations, additional data were researched that affected RPDS and UNIN respectively but neither that would affect national health care expenditures directly. It was theorized that the median age, new variable MEDAGE, would highly affect UNIN. This was theorized because of the fact that many people of young age believe that nothing bad will happen to them directly and therefore, many young adults do not have insurance policies. Further proof of this can be shown by analyzing the car insurance industry. Car insurance for young adults is much higher than for those who are older because insurance companies have seen through their own cases that young adults cause more accidents.



Also, median age is important to analyze due to the fact that in the United States, the elderly account for over one third of health care spending. One problem being faced is that due to new treatments, innovative drugs, and changes in lifestyles have all contributed to an increase in the life expectancy rate, which of course, in the ethical aspect of the argument is great, for naturally most want to live for the longest possible time they can. However, due to more advanced treatments, the total population over the age of 65 is projected to increase, and thus costs to cover these elderly people longer will have to be incurred. This will especially be costly in the United States as the baby-boomer generation has now approached that age.

Retail prescription drug sales are highly dependent on how many pharmacies there are, as well as the number of pharmacists there are. Data on the number of pharmacies was not attainable, however, data on the number of pharmacists, pharmacy technicians and pharmacy aides was available for 2004 through the Bureau of Labor Statistics; the variable was labeled PHARMA. These two new variables were included in the following additional structural equations:

Structural Equation for Two-Stage Least Squares Model:

$$UNIN = \alpha_0 + \alpha_1UR + \alpha_2MEDAGE + \mu \quad (2)$$

$$RPDS = \delta_0 + \delta_1PBRUP + \delta_2UNIN + \delta_3PINC + \delta_4PHARMA + \lambda \quad (3)$$

**Table Ten: Regression Results of (2)**

VARIABLE	COEFFICIENT	STANDARD ERROR	T-RATIO	P[ T >t	MEAN OF X
Constant	0.27208273	0.08771027	3.102	0.0032	
UR	0.57336159	0.44853002	1.278	0.2073	0.05015686
MEDAGE	-0.0044743	0.00214455	-2.086	0.0423	36.7058824

**Table Eleven: Regression Results of (3)**

VARIABLE	COEFFICIENT	STANDARD ERROR	T-RATIO	P[ T >t	MEAN OF X
Constant	-882.749565	801.412568	-1.101	0.2764	
PBRUP	1634.11805	806.967054	2.025	0.0487	0.97426275
UNIN	-676.842272	468.803215	-1.444	0.1556	0.13660757
PINC	-0.00094759	0.00290532	-0.326	0.7458	32336.4314
PHARMA	-0.00011147	0.00142335	-0.078	0.9379	10519.6078

Using these structural equations, the second stage of the two-staged least squares regression was implemented by regressing the following equations:

$$\begin{aligned} \text{UNIN} = & \gamma_0 + \gamma_1 \text{PBRUP} + \gamma_2 \text{CDR} + \gamma_3 \text{PINC} + \gamma_4 \text{PNC} + \gamma_5 \text{INFD} + \gamma_6 \text{UR} + \gamma_7 \\ & \text{MEDAGE} + \gamma_8 \text{PHARMA} + \mu \end{aligned} \quad (4)$$

$$\begin{aligned} \text{RPDS} = & \gamma_0 + \gamma_1 \text{PBRUP} + \gamma_2 \text{CDR} + \gamma_3 \text{PINC} + \gamma_4 \text{PNC} + \gamma_5 \text{INFD} + \gamma_6 \text{UR} + \gamma_7 \\ & \text{MEDAGE} + \gamma_8 \text{PHARMA} + \mu \end{aligned} \quad (5)$$

After regression equations four and five, the estimated values of these endogenous variables, UNINHAT and RPDSHAT, were placed into the original statistical model, equation 1, and regressed with the remaining exogenous variables. The following statistical equation represents the model used in the two-staged least squares regression:

$$\begin{aligned} \text{National Personal Health Care Expenditures} = & \beta_0 + \beta_1(\text{PBRUP}) + \beta_2(\text{CDR}) + \\ & \beta_3(\text{UNINHAT}) + \beta_4(\text{PINC}) + \beta_5(\text{PNC}) + \beta_6(\text{UR}) + \beta_7(\text{RPDSHAT}) + \beta_8(\text{INFD}) + \varepsilon \end{aligned}$$

The following tables present the results from the two-staged least squares regression:

**Table Twelve: Two-Staged Least Squares Results**

<b>Residuals</b>	
Sum of Squares	7496272
Standard error of e	422.4721
<b>Fit</b>	
R-squared	.7076439
Adjusted R-squared	.6519570
Model test	F[8.42] (prob) =12.71
<b>Diagnostic</b>	
Log likelihood	-375.7672
Restricted(b=0)	-407.1266
Chi-sq [8] (prob)	62.72
<b>Info Criter.</b>	
LogAmemiya	12.25477
Akaike Info. Criteri.	12.25103
<b>Autocorrelation</b>	
Durbin-Watson Stat.	1.8947734
Rho	cor[e,e(-1)] = .0526133

**Table Thirteen: Two-Staged Least Squares Results Continued**

Variable	Coefficient	Standard Error	t-ratio	P[ T >t]	Mean of X
Constant	5851.27307	4274.22235	1.369	0.1783	
PBRUP	-5575.82731	4388.03184	-1.271	0.2108	0.97426275
CDR	-.443120D+07	.296914D+07	-1.492	0.1431	0.00187261
PINC	0.07492501	0.01589206	4.715	0	32336.4314
PNC	0.01008498	0.00470924	2.142	0.0381	80628.4706
INFD	-2.07591625	0.89350227	-2.323	0.0251	547.764706
UR	32311.1246	10386.2923	3.111	0.0033	0.05015686
UNINHAT	6284.89201	9644.28499	0.652	0.5182	0.13660757
RPDSHAT	13.601065	6.43829485	2.113	0.0406	585.034524

The main reason for using these structural equations is to determine if national health care expenditures is possible jointly determined with either retail prescription drugs sales or the percentage of uninsured people. Also, the two-staged least squares approach was used in hope that it would correct the problem of the sign of the coefficient on the UR variable. The results, however, do not conform with theoretical expectations. In relation to the ordinary least squares regression, using two-staged least squares did not change the sign on UR, however it did change a few of the t-ratios and signs of coefficients on some of the variables. The following tables show side-by-side comparisons of the two methods:

**Table Fourteen: Side-by-Side Comparison of OLS and 2SLS**

OLS	Coefficient	T-Ratio	Significant	2SLS	Coefficient	T-Ratio	Significant
Variable				Variable			
Constant	7239.20499	2.046	YES	Constant	5851.27307	1.369	NO
PBRUP	8171.75764	2.177	YES	PBRUP	-5575.82731	1.271	NO
CDR	910672.134	1.539	NO	CDR	.443120D+07	1.492	NO
UNIN	4055.21034	1.866	NO	UNINHAT	6284.89201	0.652	NO
PINC	0.0792542	6.408	YES	PINC	0.07492501	4.715	YES
PNC	0.0038598	1.191	NO	PNC	0.01008498	2.142	YES
RPDS	1.79455754	2.047	YES	RPDSHAT	13.601065	2.113	YES
INFD	0.89985451	1.654	NO	INFD	-2.07591625	2.323	YES
UR	15871.3063	2.466	YES	UR	32311.1246	3.111	YES

Using the two-staged least squares method resulted in PBRUP to become statistically insignificant and both PNC and INFD to become statistically significant. However, one negative aspect of using 2SLS is that the coefficient on the cancer death rate coefficient diverged from the expected sign and had a negative coefficient, which clearly does against economic theory. The coefficient on prescription drug sales increased from 1.79 to 13.60 and the coefficient on personal bankruptcies filed increased from -8171.75 to -5575.82. The sign of UR was not corrected by using the two-stage least squares regression, therefore potential simultaneity bias could not be corrected for by using 2SLS for this variable.

Now that the 2SLS has been run, a comparison must be made between its outcomes and those that were attained through running the OLS method. One of the main negative consequences of using the 2SLS method is that the sign of the CDR variable had the wrong sign. Most of the t-ratios obtained through using 2SLS were close to the same value, thus showing signs of collinearity. Due to the main fact that there are not notably many differences between using OLS and 2SLS but because 2SLS did not pass RESET at any level, the focus of the results will use those found through running ordinary least squares, as those results are strong, robust and passed RESET.

However, it must be noted that, as the focus of this thesis is that of retail prescription drugs (RPDS), the coefficient may actually be higher than what OLS suggests for by using the 2SLS method, the coefficient on RPDS was 13.60 versus the 1.79 obtained through OLS. Therefore, caution should be used when analyzing the results as the effect of retail prescription drugs may actually be higher than what OLS suggests.

Due to the fact that the main changes were that two variables became statistically insignificant and one variable became statistically significant and one variable's sign came out

wrong, the author has decided that the best statistical model for this thesis is using ordinary least squares. The results from the statistical model from using OLS, for the most part, are very encouraging. Those variables for which a sign could be unambiguously given, meaning those variables whose t-ratios were statistically significant, had the sign that was expected except for one, except for one of the variables. Further analysis on the meaning of the unexpected sign will be discussed in detail in this section.

The variables shown to be statistically significant in the model were: the constant, personal bankruptcies, personal per capita income, retail prescription drug sales per capita, and the unemployment rate for the t-ratios on all of those explanatory variables was above the critical value. Contrary to this, results from the regression indicated that the variables that are insignificant in the model are: cancer death rate, the number of people that are uninsured, prenatal care, and the number of infant deaths. It should be noted that even though these variables turned out to be statistically insignificant, it does not mean that they do not contribute to overall health care expenditures per capita, it merely indicates that in this model, it has been shown that they are not significant. Possible reasons that these variables were statistically insignificant could be because of the type of data used, the data that were available or how the data were measured.

Predicted signs, in regards to what economic theory and intuition were previously given in Table Two and have been discussed in previous chapters. The actual signs of the regression outcomes are given in table sixteen upon which the reader can see that the sign for the unemployment rate came out opposite as one would have expected.

**Table Fifteen: Expected Versus Actual Signs of OLS**

<b>Variable</b>	<b>Expected Sign</b>	<b>Variable</b>	<b>Actual Sign</b>	<b>As Expected?</b>
<b>BA</b>	+	<b>BA</b>	+	<b>YES</b>
<b>CDR</b>	+	<b>CDR</b>	+	<b>YES</b>
<b>DR</b>	+	<b>DR</b>	+	<b>YES</b>
<b>INFD</b>	+	<b>INFD</b>	(-)	<b>NO</b>
<b>OB</b>	+	<b>OB</b>	+	<b>YES</b>
<b>UR</b>	(-)	<b>UR</b>	+	<b>NO</b>
<b>PBRUP</b>	(-)	<b>PBRUP</b>	(-)	<b>YES</b>
<b>PINC</b>	+	<b>PINC</b>	+	<b>YES</b>
<b>PNC</b>	+	<b>PNC</b>	+	<b>YES</b>
<b>RPDS</b>	+	<b>RPDS</b>	+	<b>YES</b>
<b>UNIN</b>	(-)	<b>UNIN</b>	(-)	<b>YES</b>

One would have expected that as the unemployment rate rises, national health care expenditures per capita decrease due to the fact that employers provide a large percentage of the insurance benefits to their employees. Therefore, if the unemployment rate goes up, more people will lose those insurance benefits, not only for themselves but often for their family, and for this reason, one would think that people would make necessary changes and not go to the doctors' offices for routine checkups anymore or go to the doctors without there being a substantial reasoning for them going there.

However, the results of this regression analysis showed, either using the ordinary least squares or the two-staged least squares method, that as the unemployment rate increases,

expenditures on national health care per capita increase as well. However, it should be noted that there is the *ceteris paribus* requirement in regards to income and the unemployment rate, stating that in regards to analyzing the unemployment rate, income should be held constant. Therefore, with income held constant and unemployment rate rising, the amount spent on national health care should still decrease according to a priori expectations. The outcome of this regression goes against a priori reasoning, however perhaps this sign is not as unexpected as the author expected.

First, in most cases, becoming unemployed is a stressful position for anyone who needs to provide for either oneself or one's family, for a lot of pressure is exerted on one when one becomes unemployed for now new solutions must be made in order to support payments on houses or rent payments, groceries and living subsidies must be maintained and, depending on the amount of savings one has, being unemployed before retirement cannot last for an indefinite period of time. This increased pressure and the stress incurred from it can be very harmful to one's body as research has shown that stress can cause serious complications.

According to Smith, Jaffe-Gill and Segal (2008), stress can actually lead to heart disease, digestive and sleep problems, depression, obesity, autoimmune diseases and many other problems. Therefore, increased stress increases the chances of becoming sick. These illnesses cause the person to seek medical services and often require prescription drugs to be taken in order to cure these problems. For this reason, it can be shown that an increase in the unemployment rate causes there to be increased stress which leads to more chronic illnesses, which naturally leads to higher expenditures on health care.

Second, individual per capita health care expenses will increase due to the fact that employers provide a lot of their employee's insurance coverage, and therefore, if the person loses that insurance coverage through the loss of their job and needs to seek medical attention, then



these expenses would often need to be paid out-of-pocket by the unemployed person. Naturally, this would significantly increase the amount spent on health care, per capita by the individual. For without insurance policies, those seeking medical attention no longer have to pay the co-pay fees, but often must pay the full cost of the procedure, which tend to be far higher than what most people believe them to be.

It should also be noted that because year-end data was used for the unemployment rates, there could be a discrepancy in the outcome due to the fact that historically, unemployment rates are lower in December than the rest of the year. This is the case since many will seek extra employment opportunities due to the holidays and the increased expenditures those bring. Therefore, by using the year-end data for unemployment rate, these values are potentially much lower than the normal average, which may have been the reason the sign was the opposite of what it should have been.

This result actually brings up an interesting solution to the rising health care costs that in recent years has been gaining more attention from politicians and those interested in health care reform –that being the consumer direct health care approach (CDHA). CDHA applies, according to the Woo, Ranji, Salganicoff, and Claxton (2006), to “a broad range of health plan designs such as Health Savings Accounts (HSAs) or Health Reimbursement Accounts (HRAs), but is most commonly used to describe the combination of a high-deductible health insurance plan with a tax-preferred savings account used to pay for routine health care expenses.”

The CDHA model requires that the individuals with Health Savings Accounts pay for routine health care expenses out of these savings accounts. Then, after the accounts are depleted, “individuals pay directly out-of-pocket until they have reached the relatively high deductible amount in their health plan.” (Woo et al. 2006) The incentives created by using this approach,

according to the proponents, is that consumers can keep any of the unspent dollars in their accounts which thereby would often be an incentive to be cost-conscious in regards to health care services purchases.

This approach came about as a result of the problems that arise from moral hazard in the health care industry. The consumer directed health care approach as well as significant increases in out-of-pocket liability have the potential to significantly lower the health care costs, as it is a combination of a high-deductible health insurance plan with a tax-preferred savings account used to pay for routine health care expenses.

Many make the arguments that CDHAs will reduce the number of uninsured people due to the lower premium costs associated with high deductible health plans which in the end would make health insurance more affordable. Proponents of CDHAs believe that this approach will offer a lot of benefits in reforming the current health care system by teaching insured individuals of the true cost of medical services. By paying for medical expenses from their own funds, proponents of the CDHA believe that not only will they become more cost-conscious, but they would also do more research and more informed and necessary choices on what they really need before going to the doctor. Such choices made by the consumer would therefore reduce unnecessary health care spending, and this in turn would reduce costs (Kaiser 2006).

Even though the consumer-directed approach to health care seems like a logical solution, there are many disadvantages with it. One such disadvantage is that, according to the Woo et al. (2006), “health savings accounts...are yet another tax break for the wealthy.” Another disadvantage of this system, as said by Krugman and Wells (2006), is that health savings accounts “tend to undermine employment-based health care, because they encourage adverse

selection: health savings accounts are attractive to healthier individuals, who will be tempted to opt out of company plans, leaving less healthy individuals behind.”

The opponents argue that higher out-of-pocket liabilities could deter lower income patients as well as chronically ill patients from getting the treatments that they need. And even though the proponents of the approach believe that consumers will be able to obtain all the information they need to about the price and quality of their health care to make informed decisions, this cannot be guaranteed to help consumers in times when they need to make such crucial decisions.

The sign of the number of infant deaths, INFD, can be interpreted as either having a positive relationship to health care expenditures or having a negative relationship in regards to it. Though not statistically significant, the sign of the variable is still interesting to discuss. The regression results showed that INFD had a negative coefficient, meaning that as the number of infant deaths decrease, spending on national health care expenditures increase. This could potentially very well be the case since the higher number of infant deaths would mean that there would be lower future costs for those children, if they had survived the birth. Therefore, the higher the number is of children not surviving, the lower overall costs it has on health care.

However, a point should also be made on the fact that as the number of infant deaths increase, this could potentially involve other costs in trying to save these children before they die. Also, data were not available to show whether or not the mothers of these children who died survived the birth or not, for this would also have significant effects on health care expenditures. The number of women who sought out prenatal care during their pregnancy had a positive coefficient, as expected, due to the fact that the more one seeks extra attention, the higher the expenditures are.

Another variable that was statistically insignificant in the model was the cancer death rate (CDR). The sign of this variable came out as predicted, having a positive effect on national health care expenditures. Even though the cancer death rate seems logical to have a significant effect on national health care expenditures, it is perhaps due to lack of data availability that the results came out as they are. One logical explanation of this fact is that perhaps the cancer death rate per say is not statistically significant on health care expenditures. More so, it would seem that cancer treatments have a significant effect on health care expenditures for medical innovations and newer cancer treatments have reduced the number of people dying from cancer and thus this fact should be taken into account.

The positive and significant coefficient on the RPDS variable implies that as the sales for prescription drugs, per capita, increases then national health care expenditures increase as well. This is exactly what was predicted from economic theory. Therefore, the more prescription drugs are prescribed, the more will be spent on national health care expenditures which in turn means health insurance companies will have to increase their premiums. For that reason, more people will not be able to afford health care for someone must cover these increased costs of prescription drugs. The coefficient of the RPDS variable is 1.7945 which indicates that for every 10% increase in retail prescription drug sales, there will be 17.95 dollar increase in national health care expenditures. This shows the reader just how much of an effect prescription drug prices and sales of these drug have on overall national health care expenditures per capita.

The coefficient on the PINC variable is positive as well as statistically significant. This result shows that, as predicted, the more income (per capita) one has, the more will be spent on health care in order to take preventive measures in aid to increasing your health. Also, for those with more disposable income, they are better able to pay the co-payment amounts than those

whose income is lower. The coefficient on the personal per capita income is .079 which means that a \$10 increase in income will cause there to be a \$0.79 in national health care expenditures.

The variable PBRUP is statistically significant to the model, and as predicted has a negative coefficient. The interpretation of this is that the more personal bankruptcies that are filed, the less one is able to spend on national health care, per capita. The coefficient is also extremely high on this variable, due to the scaling factor, and equaled -8171.75. As this regression was run with the most recent data available, that being from the year 2004, the reader should note that even for that year personal bankruptcies played a part in national health care expenditures. However, it should be noted that reverse causality could exist with this variable in relationship to national health care expenditures as national health care expenditures affect personal bankruptcies but personal bankruptcies do not necessarily affect national health care expenditures. Therefore, perhaps a lag variable should have been used for that variable.

If data had been available for more recent years, perhaps last year in order to analyze the effect of the recession currently hitting the American economy, it surely would have an even more significant effect because of the fact that more people, and definitely businesses, are declaring bankruptcies due to the job losses and the overall economic downturn. Evidence from a study by the Commonwealth Fund supports this find. In fact, the study showed that one-fifth of working-age adults currently have medical debt that they are having to pay off, for both those adults who are insured and those who are uninsured. Also, the research showed that two-fifths of these adults with medical debts said that they were unable to pay for necessities, such as food, rent and heat, because of incurred medical bills.

Lastly, the variable regarding the number of uninsured people (UNIN) will be discussed in detail; although results from the regression showed that the variable was statistically

insignificant, using the ordinary least squares regression. The sign of the variable came out as expected, having a negative effect on national health care expenditures for the more people become uninsured, either through job losses or other factors, the less they will be able to go to the doctor, thereby reducing the health care expenditures. However, the rising amount of uninsured people has other significant effects on the health care market, as discussed in the following paragraph.

According to studies previously conducted, uninsured employees have significant effects on their work environment for they often cause lost productivity, lost turnover as well as an increased amount of absenteeism. This can be ascertained on the fact that employees lacking insurance coverage often do not seek preventive measures, through check-ups and other ways, and therefore have more problems than those who do seek preventative measures. In fact, research has shown that common ailments such as headaches, back pains, muscle and joint pains cost the nation's employers \$61.2 billion annually in lost workplace productivity and absenteeism.<sup>2</sup>

According to a study by the National Bureau of Economic Research, healthy workers are generally more productive and are less likely to be absent from work. This is the case because people who have insurance tend to be healthier because they can invest in preventive care, by using their health insurance coverage to do routine check-ups and thereby benefit from early detection. Early detection of an illness enables doctors to treat the illnesses at earlier stages, often when the disease is not as wide-spread or even when simple medication will cause the disease to be cured, which results in that person needing less time to recover or be in the hospital, leading to less time away from the job. In fact, the Commonwealth Fund study concluded that 59 % of

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<sup>2</sup> Gaps in Health Insurance: An All-American Problem. Collins, Davis, Doty, et al. The Commonwealth Fund, April 26, 2006. [http://www.commonwealthfund.org/publications/publications\\_show.htm?doc\\_id=367876](http://www.commonwealthfund.org/publications/publications_show.htm?doc_id=367876)

uninsured adults who had chronic illnesses did not fill their needed prescriptions or did not take their medications as often as they needed to because they could not afford to do so.

As this project aimed to show, results reported above from the regression indicate that retail prescription drug sales do have a significant impact on national health care expenditures. Additionally, virtually all of the variables used to explain what affects national per capita health care expenditures were seen to be highly significant. All but one of the variable's coefficients, that being the unemployment variable, were of the expected sign. For this reason, it seems that the core statistical model does a very good job of explaining the process.

## **CHAPTER V**

### **CONCLUSION**

From the empirical analysis performed in this report, it has been shown that retail prescription drug sales do impact national health care expenditures, as predicted from prior research on the health care industry. Extremely high profits in the pharmaceutical companies clearly show that prices do not need to be as high as they are, for most of the costs the pharmaceutical companies are incurring are due to marketing and advertising for the drugs they produce. Generic drugs have slightly impacted the pharmaceutical companies' market shares, for now the top-name pharmaceutical companies have to compete with other companies. However, this is only for those certain drugs, mainly over-the-counter drugs, and therefore it is not a severe impact for the brand-name pharmaceutical companies.

The state of the health care system in the United States is a highly debated topic currently due to the fact that the amount of people who are not able to afford the high costs of health insurance is rising. Also, since the unemployment rate is rising, many are losing their health insurance plans they received through their jobs and cannot afford to pay for their own insurance. In order to find a solution to the ongoing problem of health care insurance, one must first address the reasons why health insurance premiums have increased so significantly. The United States, unlike most industrialized nations, has not set price controls on pharmaceutical sales.



Thus, by addressing the issue of increasing prescription drug sales and analyzing the reasons for the increasing costs of these drugs, maybe by setting limitations on these high-profitting companies can a solution to the health care crisis come about.

It has been clearly shown through various studies that the ongoing debate of health care policies and insurance coverage needs to be resolved in upcoming years, and action must be taken as soon as possible in order to stabilize the situation. The current economic recession has led to an increased number of people becoming uninsured due to various reasons, such as losing their coverage previously provided by their employment positions, or losing their the amount of expendable income needed to pay for insurance coverage.

With the economy falling into a recession and thousands of people losing their jobs, how will people be able to keep incurring these high costs when such a large portion of Americans have already had to file for bankruptcy? Health insurance coverage is currently a hot topic in politics, and President Obama as well as all presidents to come will have to make a decision as to whether it would be wise to nationalize the United States health care system, and if that were to come about, how to do so.

Even though many factors, as shown through the regression analysis, contribute to health care expenditures, prescription drug sales are highly significant in regards to the spending allocations. Government policies have severely helped out the American citizens in relief of health insurance costs through the Medicare and Medicaid programs. These programs have been very successful, as between 2000 and 2004, the number of Americans covered by Medicaid rose by eight million but during this time period, the number of uninsured also rose by six million. Before 2006, Medicare had not been providing coverage for outpatient prescription drugs, which

caused 27% of seniors, 34% of poor and 33% near-poor seniors to not have any type of drug coverage.

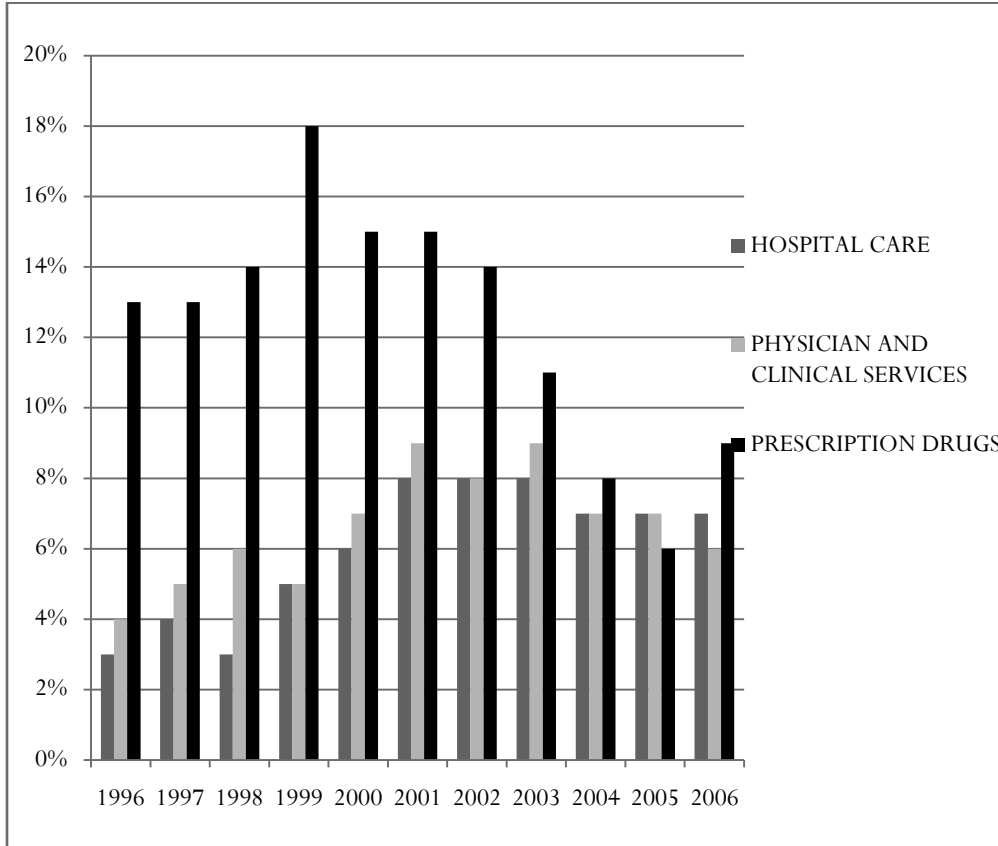
The implementation of the Part D Prescription drug coverage program has enabled over 90% of Medicare beneficiaries to have drug coverage as of 2008. However, in order to finance the costs incurred by this new program, the government's share of expenses rose on prescription drugs fell from 48% to 44% and the consumer's out-of-pocket share declined from 24% to 22%.<sup>3</sup> As President Obama has said, "the explosion in health care costs has put our federal budget on a disastrous path. This is largely due to what we're spending on Medicare and Medicaid" (Gawande 2009). A new forecast showed that Medicare would run out of funds by 2017, if the current trends continued.

As it is predicted that drug spending as a percent of overall health spending will increase from 10% to 12%. Thus, what needs to be done to offset these increased costs will be important for health insurance companies, employers, and governmental insurance programs to analyze. This percentage is forecasted to only increase due to the fact that the presence of serious illnesses is increased, partially accelerated by the unhealthy lifestyles that many Americans have that are a results of smoking, obesity rates, and many other. The following figure, provided by the Kaiser Family Foundation (2004), shows that shifting in the major types of spending on health care:

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<sup>3</sup>Prescription Drug Trends; The Henry J. Kaiser Family Foundation; October 2004

**Figure Three: Shifts in Types of Health Care Spending**



Would it be appropriate to follow the European models of nationalized health care or obligatory health care, and could the United States afford to implement this plan? What can be done to reduce prescription drug prices that doesn't hurt the pharmaceutical companies, no matter how profitable they are, in such a way that they do not leave the industry thereby hurting the people. Should more educational incentives be made in educating the American public on living a healthier lifestyle by emphasizing how obesity and smoking lead to various types of illnesses?

As President Barack Obama (2009) stated in a speech as the White House: "the greatest threat to America's fiscal health is not Social Security...It's not the investments that we've made

to rescue our economy during this crisis. By a wide margin, the biggest threat to our nation's balance sheet is the skyrocketing cost of health care. It's not even close." (Gawande, 2009)

These are the main questions that are being faced in politics today and need to be taken into account in order for the United States health care system to be financially sustainable for future generations because the financial burden of the United States health care system has damaged the global competitiveness of American businesses (Gawande 2009).

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**APPENDIX A: DATA SOURCES**

<b>VARIABLE</b>	<b>SOURCE</b>
<b>Diabetes Rate</b>	<a href="http://apps.nccd.cdc.gov/brfss/list.asp?cat=DB&amp;yr=2004&amp;qkey=1363&amp;state=All">http://apps.nccd.cdc.gov/brfss/list.asp?cat=DB&amp;yr=2004&amp;qkey=1363&amp;state=All</a>
<b>Infant Death Rate</b>	<a href="http://statehealthfacts.org/comparemaptable.jsp?ind=67&amp;cat=2">http://statehealthfacts.org/comparemaptable.jsp?ind=67&amp;cat=2</a>
<b>Cancer Death Rate</b>	<a href="http://www.cdc.gov/nchs/vitalstats.htm">http://www.cdc.gov/nchs/vitalstats.htm</a>
<b>National Health Care Expenditures:</b>	<a href="http://www.cms.hhs.gov/NationalHealthExpendData/">http://www.cms.hhs.gov/NationalHealthExpendData/</a>
<b>Number of uninsured Americans</b>	<a href="http://www.census.gov/">http://www.census.gov/</a>
<b>Bachelor's degree</b>	<a href="http://www.census.gov/">http://www.census.gov/</a>
<b>Total Population</b>	<a href="http://www.census.gov/">http://www.census.gov/</a>
<b>Obesity Rate:</b>	<a href="http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&amp;yr=2004&amp;qkey=4409&amp;state=All">http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&amp;yr=2004&amp;qkey=4409&amp;state=All</a>
<b>Per Capita Personal Income:</b>	<a href="http://www.bea.gov/regional/reis/drill.cfm">http://www.bea.gov/regional/reis/drill.cfm</a>
<b>Personal Bankruptcies Filed:</b>	<a href="http://www.abiworld.org/AM/AMTemplate.cfm?Section=Home&amp;TEMPLATE=/CM/ContentDisplay.cfm&amp;CONTENTID=50962">http://www.abiworld.org/AM/AMTemplate.cfm?Section=Home&amp;TEMPLATE=/CM/ContentDisplay.cfm&amp;CONTENTID=50962</a>
<b>Prenatal Care</b>	<a href="http://205.207.175.93/VitalStats/TableViewer/tableView.aspx?ReportId=1707">http://205.207.175.93/VitalStats/TableViewer/tableView.aspx?ReportId=1707</a>
<b>Retail Prescription Drug Sales:</b>	<a href="http://www.kff.org/insurance/7031/ti2004-1-1.cfm">http://www.kff.org/insurance/7031/ti2004-1-1.cfm</a>
<b>Unemployment Rate:</b>	<a href="http://www.bls.gov/cps/#data">http://www.bls.gov/cps/#data</a>