Unum Long Term Disability Insurance Study

A Major Qualifying Project Report
Submitted to the faculty
of the
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the Degree of Bachelor of Science
in Actuarial Mathematics
by

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Abstract

This project aimed to find an explanation as to why Social Security's Long Term Disability (LTD) incidence rates have increased in the past few years while Unum has not experienced the same results. We worked with Unum's complete LTD data and publicly available Social Security and Census data in attempts to identify a solution. We developed a method to accurately compare Social Security and Unum incidence rates and explored several promising theories that could not be confirmed without more data.

1. Background

1.1   Introduction

In the past, the private and public sectors of insurance have shown similar patterns in the number of long term disability (LTD) claims filed each year. LTD Insurance is available to individuals incapable of working for a long period of time. LTD insurance is provided in two major forms, Social Security Disability Income (SSDI) and privately insured disability insurance. Both insurance programs provide the disabled with a source of income. Social Security, the public form of insurance, is a federally managed mandatory program (some states and municipal workers are exempt) which provides United States employees with a wide range of benefits. The private insurance companies provide individual and group disability insurance to employees or companies.

In the past several years, Social Security has reported a significant increase in the number of claims that the private sector has not experienced.[1] The world's largest disability insurance company, Unum, is one of the private companies that has not experienced this increase. Unum would like to understand why this deviation has occurred. This knowledge could potentially help Unum in future predictions.

Previous studies have shown that many factors influence the claim rates of long term disability insurance. The range of these includes economic components and socio-demographic aspects. These influences include unemployment, age, gender, occupational groups, health, and location of residency. Unemployment is the economic factor with the strongest influence on disability claim rates. As unemployment rates increase, so do disability claim rates.[2] Over the past two years, unemployment has been rising which could explain the large increase in overall claim rates. In terms of socio-demographic factors, occupational groups have the most influence on disability claim rates. Unskilled workers have significantly higher claim rates for disability than semiskilled or skilled workers.[3] Recently there has been an increase in the

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[1] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)
[2] (Doudna, 1977)
[3] (Salkever, Shinogle, & Purushothaman, 2001)

number of unskilled workers who are unemployed.[4] The combination of these two factors and others could increase the claim rate for long term disability insurance.

Despite this previous research concerning which factors influence the number of claims, there is still no explanation as to why the private sector is not currently experiencing the same increase in the number of claims that the public sector has reported. In previous recessions, both Unum and Social Security have experienced an increase in the number of claims filed for LTD insurance.[5] During the current recession, however, Unum has not seen nearly as many claims as expected.

This project aims to analyze Social Security's data for the last five years and compare it to Unum's data and that of the rest of the private sector in an attempt to understand why there is a sudden difference in the claim incidence rate. We will organize the claim data by state, gender, salary band/ industry, and age. Using this information as well as data on concurrent unemployment rates will provide us with insight into determining why the current difference in claim pattern has occurred.

1.2   Long Term Disability Insurance

There are many differences between long term disability insurance provided by Social Security and that provided by Unum. One of these differences is the definition used to describe a disabled individual. According to Social Security, an individual is considered disabled if (i) he/she cannot do work that he/she did before, (ii) Social Security decides that he/she cannot adjust to other work because of his/her medical condition(s), and (iii) his/her disability has lasted or is expected to last for at least one year or to result in death.[6]According to Unum, an individual is considered disabled if (i) he/she is limited from performing the material and substantial duties of his/her regular occupation due to sickness or injury, and (ii) he/she has had a 20% or more loss in his/her indexed monthly earning due to the same sickness or injury. The most significant difference between these two definitions is the work one is able to do after becoming disabled. Social Security has a much narrower definition of work ability, specifying

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[4] Ibid
[5] (Poirier, 2010)
[6] (Social Security Online, 2010)

that an individual must be unable to adjust to *any* type of work in the next year or longer. This difference limits who qualifies for LTD insurance from Social Security.

Social Security and Unum provide their disability insurance in very different ways. Most workers in the U.S. pay a percentage of each paycheck to Social Security (and their employer is required to contribute a matching percentage, as well). If one of these workers paying Social Security becomes disabled, he/she is able to file a claim to receive benefits paid by the Social Security Disability Insurance (SSDI) Program. In order to qualify for these benefits, one must be approved by Social Security. The average lifetime earnings covered by Social Security determines the payments an individual will claim if approved for LTD insurance. Benefit amount also depends on income, resources, and living situation. Unum typically provides group disability insurance to companies that purchase insurance for their employees. One can individually purchase disability insurance from Unum, but it is more common for Unum to provide group long term disability insurance through an employer (and all of the data we worked with was from Unum's group coverage). If a worker is provided with long term disability insurance by Unum becomes disabled, he/she must be approved by Unum to start receiving payments. These payments could be part or all of one's previous income.

1.2.1   History of Public vs. Private

Social Security and Unum were both founded over 50 years ago. In 1939, Unum became the first insurer to offer disability benefits to its customers. It was not until 15 years later, in 1954, that Social Security first began paying benefits for disability. The SSDI program is currently run by the Social Security Administration and is a payroll tax funded, federal insurance program.

1.2.2   Coverage

Social Security and Unum provide their insurance in two very different ways. The coverage supplied varies for each provider. As soon as an individual becomes disabled, he/she is able to file a claim with Social Security or Unum.

If a claim is filed with Social Security, it must then be approved. This process of approving or declining an application could take three to five months. If the claim is not approved, the individual may appeal it if he/she disagrees with the decision. If the claim is approved, the

individual will typically start receiving payments six months after becoming disabled. SSDI insurance payments will continue as long as the individual's condition has not improved and he/she is still unable to work.

Figure 1

Similarly, if an individual decides to file a claim with Unum, the application must then be approved. This process could take several months. If the claim is not approved, the individual will have 180 days from the notice of a claim denial to file an appeal. If the claim is approved, the individual will start receiving payments as soon as the elimination period is over. The elimination period, as described by Unum, is the later of: 90 days or the date when short term disability payments end, if applicable. The LTD insurance payments received depend on monthly earnings. In order to calculate monthly payments for an individual, Unum uses the following process:

1. Multiply monthly earnings by 60%.
2. Compare the answer from Item 1 with the maximum monthly benefit of $5,000. The lesser of the amounts is the gross disability payment.
3. Subtract from the gross disability payment any deductible sources of income. This is the monthly payment.

Assuming conditions remain the same as the date an individual started receiving payments, he/she will continue receiving payments until the maximum period of payment. This period is based on age. The older someone is, the shorter their maximum period of payment will be.

1.2.3 Changes in Disability Insurance claim rate

In the past few years, the number of Social Security long term disability insurance claims has been changing drastically. From 2008 to 2009, Social Security had a 21% increase in the number
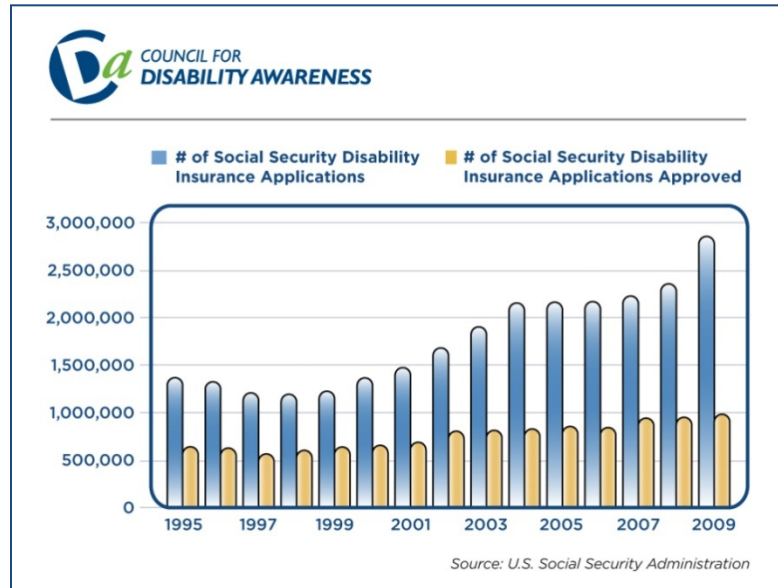
of SSDI claims filed.[7] In 2009, the number of applications for SSDI increased to 2.8 million, more than at any other time in history.[8] As the number of claims filed per year has increased drastically, the percentage of claims approved has decreased. Over the past ten years, the number of applications has increased by 135%, while the percentage of applications approved decreased from 52% to 35%.[9] The number of SSDI applications and the number of SSDI approved applications per year from 1995 to 2009 is shown in Figure 1. The number of SSDI claims filed is expected to rise even higher in 2010.[10]

The Council for Disability Awareness (CDA) is a non-profit organization dedicated to informing the American public about disability. The CDA consists of private sector long term disability insurance companies, including Unum. Annually, the CDA conducts a report that analyzes any new or continuing trends in long term disability insurance claims within Social Security and CDA companies. Typically, CDA companies represent over 75% of the entire commercial disability insurance marketplace. The companies participating in the survey vary from year to year, but most have participated for several consecutive years. It is commonly assumed that the CDA companies are representative of the entire private sector disability insurance companies for the survey taken each year.

One section of the CDA review focuses on past years' disability claim trends as well as observations and predictions for the future. In the 2010 survey, the majority of CDA companies reported no change in the number of claims in 2008, two reported a slight decrease, and three reported a slight increase.[11] Since 2004, the CDA companies have reported an increase in the number of people receiving disability payments, but in more recent years this increase has leveled off to nearly zero.[12] This change is shown in Figure 2.

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[7] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)
[8] Ibid
[9] Ibid
[10] Ibid
[11] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)
[12] Ibid

The number of disabled individuals receiving disability insurance payments from CDA Member Companies has increased in each of the years since CDA began keeping records in 2004.

Number Receiving Disability Payments

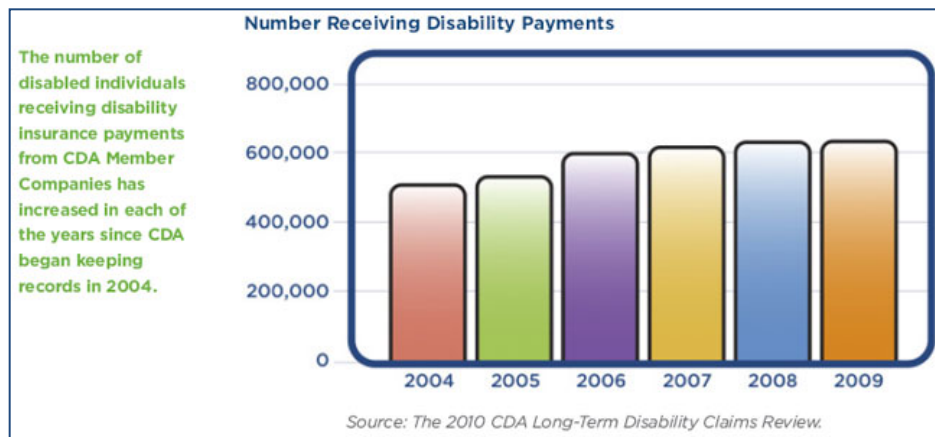Source: The 2010 CDA Long-Term Disability Claims Review.

Figure 2

A large focus of the CDA survey is to gather predictions about the future. For the next 12 months, 50% of CDA companies are expecting no change in incidence and 44% are predicting some minor increase in the near future.[13] Out of all the companies surveyed, none of them are expecting a substantial jump in incidence rates.[14]

From 2008 to 2009, Social Security experienced an increase of 21% in the number of long term disability claims filed, while the private companies surveyed by the CDA barely experienced an increase.[15] In the next year, Social Security is expecting its claim rate to rise even higher, while 94% of companies surveyed by the CDA are expecting little or no change in claim rate.[16] This unexplained gap is of concern to Unum and Social Security.

1.3   Economic Factors Influencing Disability Insurance

Several economic factors influence the number of disability claims in a given time period. Typically, over the course of a recession, both private LTD and public SSDI experience an increase in the number of disability claims. Two factors that change drastically during a recession are unemployment and the consumption-to-wealth ratio. A change in either of these factors appears to relate to a change in disability incidence rates.

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[13] Ibid
[14] Ibid
[15] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)
[16] Ibid

1.3.1 Connection between Unemployment and Disability Insurance

During a recession, unemployment rises and the claim rate for long term disability insurance follows. Figure 3 shows the percent change in unemployment rate as well as the percent change in incidence rate over the past ten years for Social Security Disability Insurance.
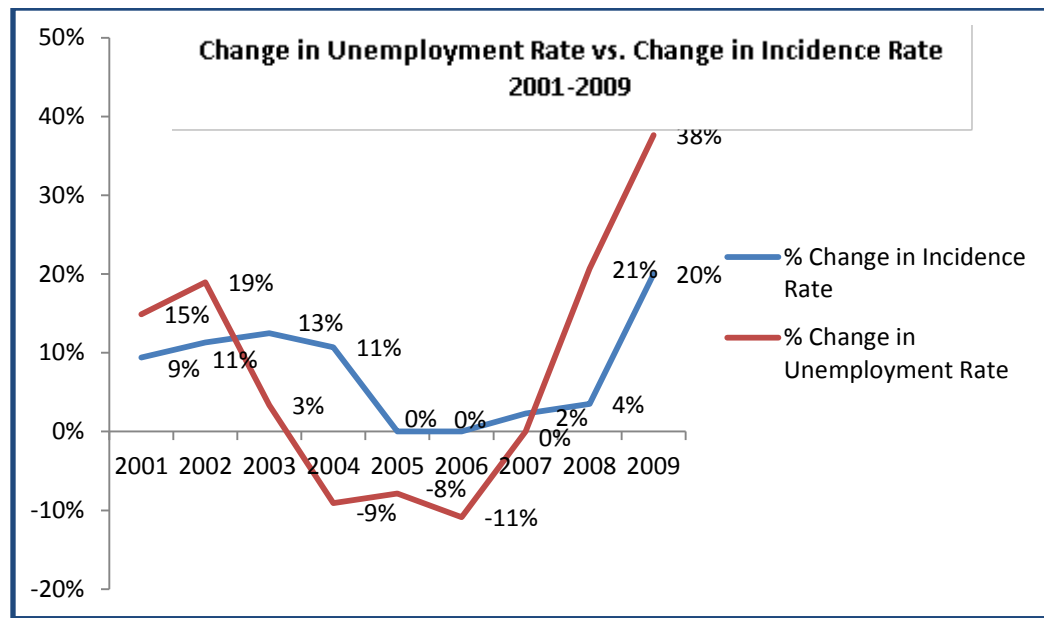
Figure 3

When there is an increase or decrease in the percentage change in unemployment, there is also an increase or decrease in the percent change in disability incidence rates. From the fourth quarter of 2007 to early 2010, the unemployment rate doubled from 4.8% to 9.7%.[17] This large increase in the unemployment rate could be responsible for the recent increase in Social Security's claim rate, but it does not explain the lack of change in the private sector's claim rate.

One possible explanation as to why the private sector's claim rate has not changed would be the varying unemployment rates throughout the United States. Figure 4 illustrates the level of unemployment by state for 2000, 2005, and 2009. The darker the color in each state, relates to higher unemployment.

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[17] (Katz, 2010)

Figure 4

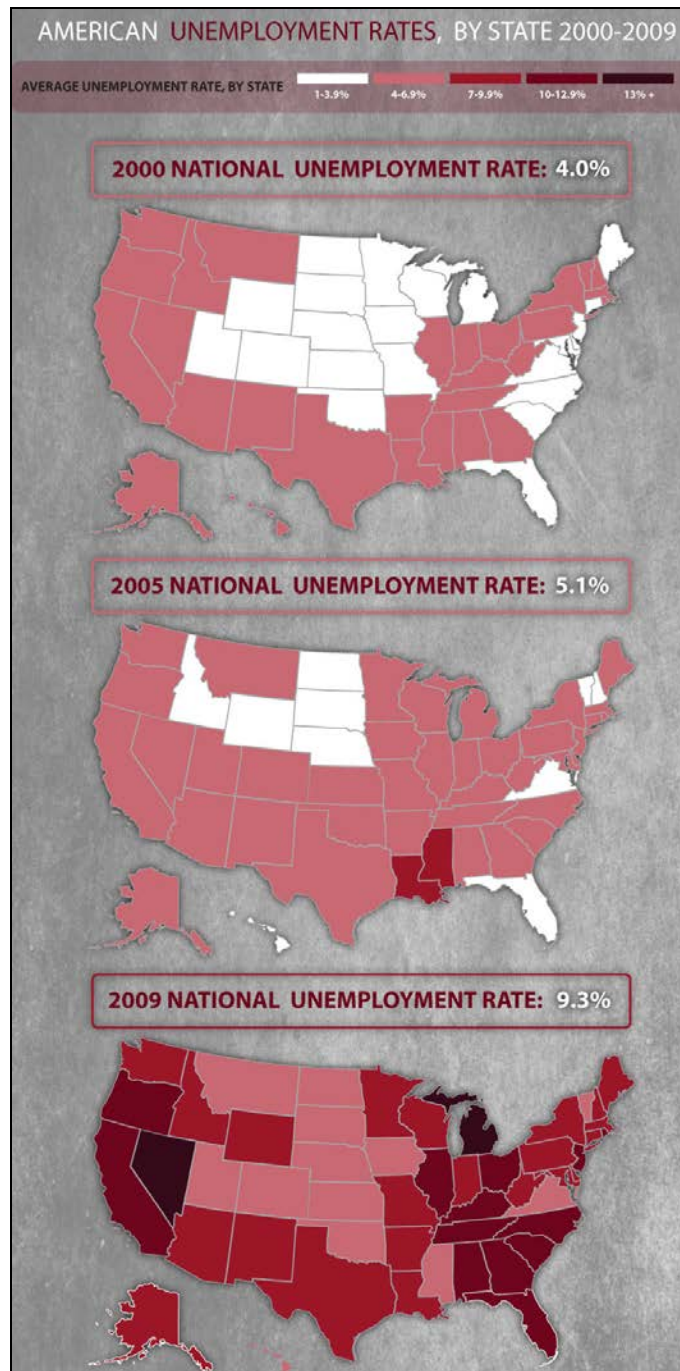In certain states, the unemployment rate has increased significantly while other states only changed slightly. For example, from 2000 to 2009, Michigan experienced a 12.1% increase in unemployment rate, while Vermont only experienced a 4.2% increase. A large swell in unemployment will cause LTD incidence rates to increase. If Unum is underrepresented in

states where unemployment is increasing, then the company may not experience any change in incidence rates. Social Security, on the other hand, is well represented in all states – including those with rapidly growing unemployment rates. Therefore, Social Security would experience a significant growth in incidence rates that Unum does not.

The 2010 census report shows that, in the United States, individuals aged 18-34 have recently seen a large increase in unemployment.[18] According to the census data, this is due to companies not hiring as many unskilled workers. An unskilled worker is defined as someone who doesn't have technical training, which includes a college degree. Overall, unskilled workers have higher unemployment rates and lower earnings. Workers with higher average earnings have a lower rate of unemployment and therefore a lower claim rate for long term disability insurance. If Unum does not insure a significant number of unskilled workers, this be another possible reason why only Social Security experienced the increase in disability claim rates.

The U.S. population can be broken up by state unemployment rate as well as the skill level of each individual. If either of these groups is underrepresented by Unum, compared to Social Security, those differences could help explain the recent divergence in incidence rates between Unum and Social Security.

1.3.2 Consumption-to-Wealth Ratio

The consumption-to-wealth ratio, an indicator of how risk-averse the population is behaving, is another economic factor proven to relate to the claim rates of long term disability insurance. The consumption to wealth ratio, first calculated in 1989 by Campbell and Mankiw, is the current level of consumption by income and asset returns.[19] A low consumption to wealth ratio indicates that individuals are avoiding risk and more concerned with their future economic well- being and therefore saving more than they are spending. When this is the case, disability incidence rates tend to increase, as more people seek the security of disability income.[20]

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[18] (Yen, 2010)
[19] (Xu, 2005)
[20] (Smoluk, 2009)

The consumption-to-wealth ratio tends to increase during a recession since this is a time when the population is more risk averse. This ratio is mostly a nation-wide statistic so we were unable to determine if it has contributed to the recent difference between Unum and Social Security's claim rates. To do that, we would want to see consumption-to-wealth ratios broken down to align with Unum's mix of business.

1.4 Socio-demographic Factors that influence LTD

Recent research indicates that many factors that influence long term disability incidence rates pertain to sociological and demographical characteristics of a population. The population in this case is the entire work force of the United States, approximately 152 million people.[21] In 2009, most of this population was covered for disability under the SSDI program, but only 50 million of those workers were covered by private insurers.[22] There are countless socio-demographic characteristics that may influence the likelihood of filing a disability claim, as well as whether or not an individual is privately insured. Based on our review, the most relevant ones for this study are: gender, occupational groups, age, health, and the influence of existing benefits.

1.4.1 Gender

In 2009, the workforce was composed of approximately 46.8% females and 53.2% males. Nearly a decade ago, the workforce was made up of only 127 million people where 50.2% were female.[23] Although there has a decrease in the percentage of women in the workforce, the overall rate of disability among women workers has been growing much more rapidly than among men. The percentage of females receiving SSDI payments in 2009 was 55% higher than 11
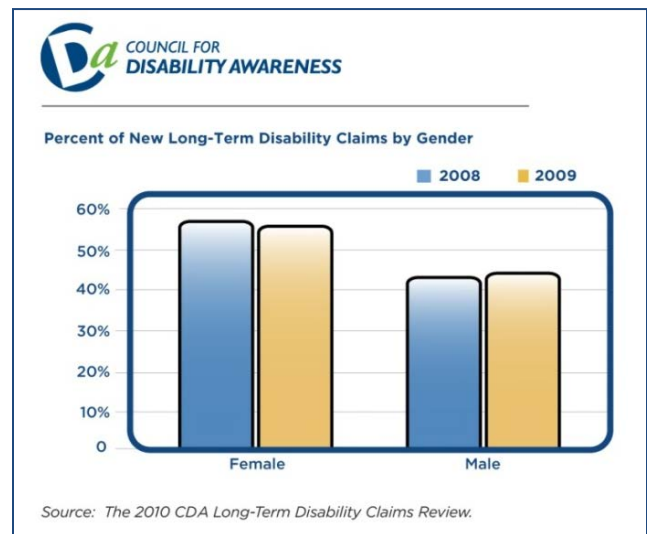
Figure 5

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[21] (United States Department of Labor: Bureau of Labor ~~~~~~~~,

[22] Ibid

[23] Ibid

years earlier, (increasing from 3.3% to 5.1%), while the percentage of males receiving SSDI grew by only 37% during the same period (from 3.8% to 5.2%). Looking from another perspective, the number of disabled female workers grew by 78% over the past decade, whereas the number of disabled males increased by only 46%. In 2009, females accounted for approximately 56% of all disability claims.[24] The numbers seem to show that the female worker population is decreasing, but their disability rates are increasing. Are females becoming more susceptible to disability? Some possible explanations were introduced by medical studies performed on populations of both genders. One study explains how "Globally, women have more chronic pain than men, more recurrent pain, they are more likely to have multiple sources of pain, and they are definitely neglected as it relates to treatment."[25] Another study indicates that women have a lower pain tolerance then men do, and in turn may file for disability for reasons that men would generally ignore.[26] The Council for Disability Awareness used the fact that women are more suseptible to disability to show that the average long term disability incidence rate for females, in the private insurance sector, is approximately 1.22 times greater than that for males.[27] However, for Social Security, the incidence rate for females is 1.7 times greater than that of males.

1.4.2   Occupational Groups

The U.S. Office of Personnel Management has established occupational groups that are used to classify the work of different jobs. This classification is made in terms of the kind or subject matter of the work, the level of difficulty and responsibility, and the
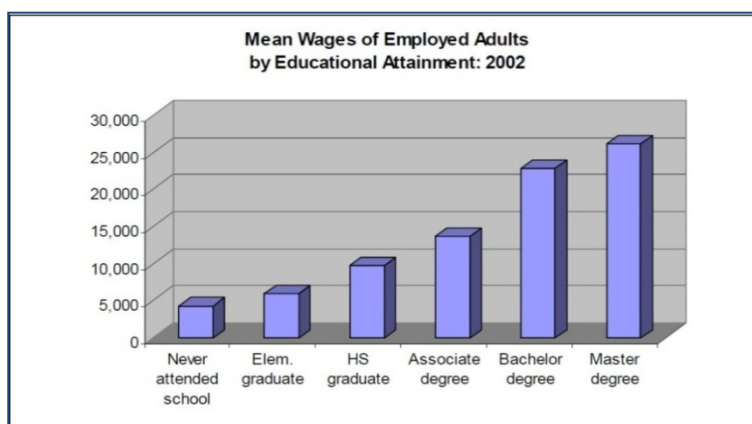

Figure 6

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[24] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)
[25] (Calandra, 2001)
[26] (Sohn, 2010)
[27] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)

qualification requirements of the work. The classification is made to ensure similar treatment for positions within a class in personnel and pay administration. Occupational groups have been established for both white collar and blue collar positions. White collar workers are generally salaried professionals and are usually college educated, whereas blue collar workers typically perform manual labor and earn an hourly wage.[28]

The occupational group that is held by each worker (either white collar or blue collar) strongly depends on the worker's skill and education. In general, "better-educated persons have more options in the job market because they possess a larger stock of general and specific human capital", hence most jobs require some sort of college education.[29] Unskilled workers most commonly fall into the blue collar positions, and are nearly 5.6 times more likely to file for disability than the average semi-skilled workers, who fall under both blue collar and white collar positions.

Uneducated workers also tend to fall under the blue collar positions, and earn salaries that are anywhere from 1/2 to nearly 1/7 as much of educated workers, who tend to fall under white collar positions.[30] A 10% increase in average earnings would decrease long term disability payments by approximately 3.5%. Therefore, the higher an individual's education or skill level is, the less likely he or she is to file for disability. A recent study performed by the Millman Inc. showed that white collar workers are at less risk to fall victim of long term disability.[31]

Traditional carriers often times limit the amount of disability insurance that blue collar workers can receive. As a result, only 28% of blue collar employees are covered by long term disability insurance by the
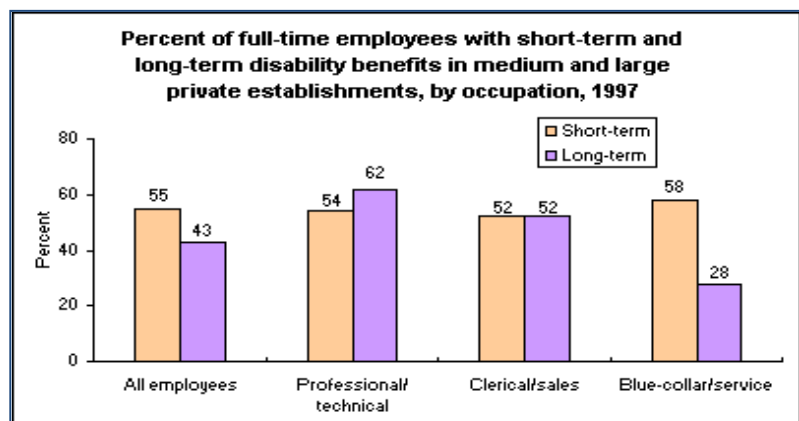
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[28] (USA Jobs, 2010)
[29] (Levy, 1980)
[30] (Graham & Paul)
[31] (Fletcher, 2007)

private sector.[32] Most claims filed by blue collar workers tend to be through Social Security instead of through private companies. Figure 7 illustrates the percentages of each occupational group that is covered by private long term disability insurance. It is clear that blue collar workers had the lowest percentage of full-time employees receiving long term disability benefits in 2007. From these results blue collar workers are less likely to be insured by private companies such as Unum, but they are also more likely to incur a long term disability than a white collar worker. Since this is the case Unum has a low representation in a part of the working population with high incidence rates which could be a factor in why their incidence rates have not increased.

1.4.3   Age

Age has a major impact on disability, mainly due to the fact that an individual has an increased probability of becoming injured as he/she gets older. "The prevalence of longstanding illness and disabilities increases with age. Older people are more likely to experience

Figure 8

Figure 9

multiple impairments such as both failing sight and hearing, and chronic conditions such as osteoarthritis."[33] Workers over the age of 60, though, are significantly less likely to file for disability than younger workers. Social Security mandates a minimal retirement age of 62 to receive full retirement benefits. The reason many workers over the age of 60 do not file for disability is simply because they are receiving retirement benefits. In the United States, the average age of retirement is also the minimum mandated age. A 15% decrease in disability

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[32] (Bureau of Labor Statisitcs: TED: The Editor's Desk, 1999)
[33] (Barrett, 2005)

incidence rates is witnessed after the age of 60 among workers covered by Social Security. On the other hand, older workers under the age of 60, generally between the age of 50 and 59, have a huge impact on long term disability incidence rates.[34] The reasoning is directly tied in with the health factors which will be discussed in section 4.4.

1.4.4 Health

An individual's health-related history has an enormous impact on his/her risk of becoming disabled, and in turn, influences his/her probability of filing for long term disability insurance. A previous study performed on Unum customers listed the top causes of disability amongst the individuals who have claimed with them. From this list we found that disability incidence rates are most predominant in intervertebral disc injuries and other back related injuries. Nearly 60% of all claims filed were associated with back related problems.[35] Therefore, an individual with a history of back problems is much more likely to file for disability. Social Security, on the other hand noticed that musculoskeletal diagnoses, such as arthritis, are most predominant, and made up 28.5% of all their existing long term disability claims.[36] The variation in injuries witnessed by both sectors may be a result of how each defines disability. The conditions an individual needs to be diagnosed with in order to be considered disabled were previously noted in chapter 2.

Obesity is also an important health factor that could influence disability incidence rates. In the United States, the population of obese individuals has been steadily increasing over the past two decades. Nearly a decade ago, obesity was the greatest contributor to disability witnessed in individuals between the

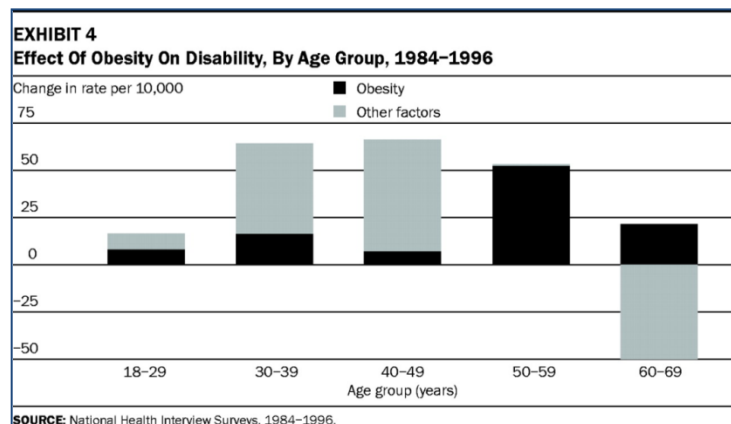**Figure 10**

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[34] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)
[35] (Salkever, Shinogle, & Purushothaman, 2001)
[36] (The 2010 Council for Disability Awareness Long-Term Disability Claims Review, 2010)

ages of 50 and 59. With respect to all age groups, the rise of obesity has consistently increased the number of disabled individuals by at least 7% yearly.[37] Obesity translates into higher health care costs and contributes to long and short term disability at all ages. In our research however we did not find any data to suggest whether or not SSDI or Unum have varying levels of obesity amongst their populations.

1.4.5   Other Benefits/Compensation

When an individual becomes disabled, he/she is looking for some form of compensation to replace lost wages. In states that have generous workers' compensation benefits, long term disability claim rates are much lower. The absence of benefit duration limits deters many employees from transferring to long term disability insurance providers. Since in most cases only one form of compensation is allowed, the employees choose the type that offers a faster flow of income. States that offer more Social Security Disability Insurance (SSDI) packages have incidence rates that are up to 6.38 times greater than those
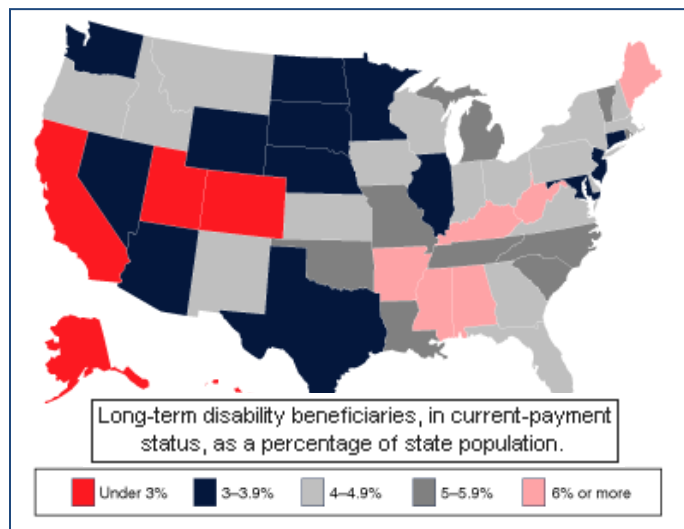
Long-term disability beneficiaries, in current-payment status, as a percentage of state population.

Under 3%   3–3.9%   4–4.9%   5–5.9%   6% or more

Figure 11

that.[38] For 2010, the average SSDI package offered in the United States was $1,070.20 per month.[39] Figure 11 illustrates the difference in each states' percentage of long term disability insurance beneficiaries, aged 18-64, in current-payment status.

In 2001, a study performed on Unum discovered that "firms that provide employees with group long term disability medical coverage noticed a 42.6% higher incidence rate than those

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[37] (Lakawalla, Bhattacharya, & Goldman, 2004)
[38] (Salkever, Shinogle, & Purushothaman, 2001)
[39] (Social Security Online, 2010)

firms that do not offer any group medical coverage."[40] This drastic increase in incidence rate demonstrates the impact of the additional benefits an employee may be provided with.

1.5 Relationship between Social Security and all forms of Private Insurance

When an individual needs to file a health care claim, he/she will choose between public and private care. Each option has different benefits, and there are a variety of reasons why a person would choose one instead of the other. Public care is free, but defines disability more strictly than private plans, as mentioned in Section 2. On the other hand, private insurance does not always cover 100% of an individual's needs. Most of the research performed on the private sector is from employer based health care plans.

1.5.1 "The Interaction of Public and Private Insurance: Medicaid and the Long-Term Care Insurance Market"

Both Social Security and private companies are able to provide someone with more than just disability insurance. When an individual requires assistance while performing daily tasks, he/she may be subscribing to a long-term health care plan. Long-term care (LTC) is offered privately and publicly, as the Medicaid program.

Medicaid is offered by Social Security and will support working individuals in need of care. This person must be able to prove that they do not own a certain amount of assets, or have assets "hidden" with family or friends. To check this, Social Security will look back 3-5 years at this individuals' financial background, to ensure he/she actually requires the help that he/she is claiming.[41] Private insurance companies do not perform these types of checks on their clients, because the insured individuals are not receiving free care, as they would be under Medicaid. Individuals paying for private LTC, on average, are charged 18 cents more on the dollar for their plan than their expected future claim amount. This difference in price is largely due to imperfect competition and transaction costs among private companies.

When an individual is supported with a Medicaid plan, there is no limit to how much compensation he/she is able to receive. How much is owed to the individual is determined at

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[40] (Salkever, Shinogle, & Purushothaman, 2001)
[41] (Brown & Finkelstein, 2008)

the time he/she starts requiring care. Private companies, however, impose caps on their maximum daily payout. In 2000, the national average for this daily payout was $100.[42] On average, the payouts from private companies cover only one-third of the total compensation an individual is going to need. The rest is covered by Medicaid.[43]

These differences between Medicaid and private LTC influence how an individual chooses which programs he/she applies for. Private plans are built for an individual's specific needs, while Medicaid offers 70% of these benefits, only for free.[44] Eventually, the differences between the two care providers are going to lead people away from private insurance, causing "crowding out", discussed more in the next section.

1.5.2 "Does Public Insurance Crowd out Private Insurance?"

Throughout the 1980's, there was a significant increase in the number of people eligible for public health care. The number of pregnant women and children, especially, saw an increase in free health care. Unlike public health care, the private sector experienced a decrease in the percent of people who were insured privately from approximately 75% to 70%. When this shift between the number of public claims and the number of private claims occurs, it is referred to as "crowding out". It is important to understand why an insured person would choose private coverage over public, and vice versa.

To learn about the "crowding out" phenomena, a study was performed from 1987 to 1992 to learn which factors influence someone's decision of whether to apply for public or private health care. The study concluded that when employers react to changes in the market by altering their health plans, the take-up rate is greatly affected. The take-up rate is the rate at which employees choose to use the coverage offered to them. "Crowding out" occurs when there is a drop in the take-up rate.

When public health care eligibility rises, employers often reduce the generosity of their current health plan. Employers do this by reducing coverage of the plan, raising the premiums

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[42] (Brown & Finkelstein, 2008)
[43] Ibid
[44] Ibid

paid by the employees, or dropping the plan entirely.[45] When coverage of a private health care plan is reduced, or when premiums are raised, people have more incentive use the free public care available to them. When coverage for a plan is dropped entirely, the employee has no choice other than to claim Social Security. The decisions of the employers have a huge impact on the take-up rate for private health care.

The dependents of an employee can also be factors in "crowding out". For example, an employee may not be eligible for public health care, but he/she may have dependents that are. An individual with a dependent may choose to refuse private coverage for his/her dependent, but keep the coverage for himself/herself. As women and children, who are often covered as dependents, see more leniencies when it comes to how much public health care they have access to, the private companies experience a decrease in the number of claims filed.

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[45] (Cutler & Gruber, 1996)

2. Methodology

The overall goal of this project was to identify possible explanations as to why Social Security has experienced a drastic increase in long term disability claim rates, while Unum has not experienced this sudden increase. To achieve this goal our project team completed the following steps:

- Organize Unum data and add available Social Security data
- Develop a method for converting Social Security's payment based data into compatible claim date data to accurately align the data by year
- Investigate and add any additional useful data
- Compare Unum, Social Security, and supplementary data to identify any relationships that could be the cause of the difference in incidence rates

2.1 Organize Unum Data and Add Available Social Security Data

This project was proposed to us by Unum Group, a private insurance company. Unum was interested in why Social Security recently experienced a large increase in disability incidence rates, but Unum did not. After researching several factors that influence disability incidence rates, we were ready to begin analyzing data to determine if any of these potential factors caused the recent difference in incidence rates. In order to assist our investigation, Unum provided us with LTD insurance claim data from 2000 to 2008. Before we began analyzing this data, we organized the data and added Social Security data available to us.

2.1.1 Unum's Data

With our liaison at Unum, we decided that it would be most useful to have the Unum data broken down by four major categories: gender, age, state, and working industry of each claimant. The data we received contained several pieces of useful information, such as the number of claims (claim count), the number of individuals insured (exposure count), and the number of people who are also receiving benefits from Social Security (SS paid claim count). The data we received contained over 500,000 rows. It was not realistic to analyze the data in the format of a spreadsheet, so we used a pivot table to organize and analyze the data.

2.1.2 Social Security Data

Once we had all of the Unum data organized, we added available Social Security data to the same Excel file. This allowed for an easy comparison to Unum's data. We were able to locate some useful data on the Social Security Administration website. Most of the data on the website was accurate through 2008, but the incidence rates were only accurate through 2004. So, for the incidence rate, we assumed the predicted values after 2004 were the actual incidence rates. We contacted the Social Security Administration in the hopes of obtaining further detail regarding age, gender, occupation, geographic location of their claimants. Unfortunately, they were unable to provide us with any new data.

2.2 Relating Social Security claim data to Unum claim data using a Disability Date Distribution Method

During our investigation of Unum and Social Security data, our project group noticed that both sectors record their data using different "claim dates". The incidence rates attributed

to Unum are derived from claim data that is documented at the actual date of disability, whereas incidence rates attributed to Social Security are derived from data that is documented at the date of the first claim payment. In order to accurately compare the incidence rates, we devised a method for dating back given Social Security data to an estimated date of disability.

2.2.1 The Disability Date Distribution Method

Social Security focuses on the date payments begin rather than the actual date of disability. To directly compare Unum and Social Security incidence rates, our project group had to formulate a distribution that best represented the assumed dispersal of Social Security dates of disability. The Disability Date Distribution Method (DDDM) was designed to provide us with estimated dates of disability that we could compare with Unum's dates of disability. Prior to the explanation of our distribution method, several key terms must be introduced. When an individual becomes disabled and he/she files a claim for long term Disability, he/she must wait for the claim to be approved. When, and if, the claim is approved, the claimant will start receiving payments. For simplicity, we will refer to the entire time period between when the individual becomes disabled and then starts receiving payments as the **lag time**. Before claims are even considered, an individual must be disabled for a fixed period of time before filing for disability. This time period is to insure that the injury is actually serious and calls for long term disability coverage. This time period between the date of disability and the date of the claim will be referred to as the **elimination period**, and can be thought of as so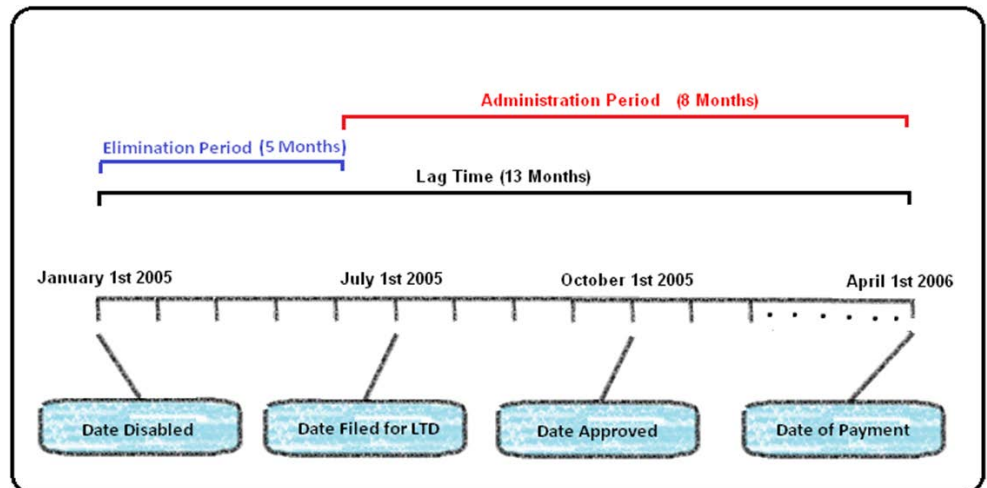mewhat of a deductible. Throughout the entire disability process, there are many obstacles and delays a claimant may encounter including, but not

Figure 12

limited to, tardiness in filing, the processing period, possible delays in approval of the claim, and delay in payments after approval. We will lump all these possibilities together and call that entire time the **administration period.** Figure 12 illustrates an example in which an individual becomes disabled on January 1st 2005. On July 1st 2005, exactly 6 months later, this individual decides to file a claim for long term disability insurance. Five of these six months will be the elimination period, while one month will be considered part of the administration lag (tardiness in filing). On October 1st 2005, the Social Security Administration approves the claim, and consequently payments begin on April 1st of the following year. These additional 8 months will also be considered part of the administration period.

Upon formulation of the DDDM, several key assumptions were made based off of extensive background research and provided data. The following is a list of the assumptions associated with the DDDM:

1. The elimination period is fixed at 5 months.
2. The administration period is constantly increasing at about 2% per month.
3. The distribution of lag times can be modeled by a Beta or Pert distribution.
4. The model for the administration period incorporates a minimum, maximum, and a mode. The minimum administration time is 6 months, the mode is constantly increasing at 2.78% per month (1/36th of a year per month), and the maximum administration time increases based off of the mode.
5. 20% of all claims started receiving payments before the mode of all claims
6. As the lag times increases, the distribution shifts to the right with time.
7. The maximum lag time will not exceed 5 years.

Our next step was to take these assumptions and create 5 inputs to accurately depict these assumptions as well as the lag time. The two main inputs are the elimination period and the administration period. Since the elimination period is fixed, no further breakdown was necessary. The administration period was broken down into two components: the minimum and the mode. Since the maximum is based off of the mode, no maximum input was necessary. Another input determined the area to the right side of the mode. Our assumption was that 20%

of the distributions area was towards the most recent date of the distribution. This means that only 20% of all claims started receiving payments before the mode of all claims. Our final input was the Social Security claim count at the time of payment.

The following step in our process was to create parameters that would ultimately form our distribution. We used the skeletal structure of the beta and Pert distributions to determine the necessary parameters, and concluded that our four parameters will be Alpha, Beta, minimum, and the maximum. These parameters were calculated using four of our inputs (excluding the Social Security Claim count), as well as the change in time. First, we needed to calculate the minimum and the maximum administration periods, which, when added to the elimination period, will act as the range of our distribution. The range, in our case, consists of the number of months in which a disability can occur. The following equations were used for the minimum and maximum calculations:

$$Calculated\ Minimum = Minimum$$

$$Calculated\ Maximum = Mode + \frac{(mode - minimum)(1 - area\ to\ the\ right\ of\ the\ mode)}{(area\ to\ the\ right\ of\ the\ mode)}$$

To obtain the parameters needed for our distribution we will add the calculated minimum and maximum to the elimination period. Consequently, we will call these parameters the min and max.

Next, to portray our scenario and form the most accurate distribution, we transformed the estimated mode to an adjusted mode. This adjusted mode will be used in the formulation of the rest of our parameters. The following equation was used for this calculation:

$$Adjusted\ Mode = (Calculated\ Maximum) * \frac{(Mode - Minimum)}{(Calculated\ Maximum - Minimum)}$$

Using the previous three calculations, the parameters Alpha and Beta were then generated. Alpha and Beta are shape parameters that will determine the profile the distribution will take. The following equations were used to calculate these two parameters:

$$\alpha = Mode + \frac{(4 * Adjusted\ Mode + Calculated\ Maximum - Calculated\ Minimum)}{(Calculated\ Maximum - Calculated\ Minimum)}$$

$$\beta = \frac{(5 * Calculated\ Maximum - Calculated\ Minimum - 4 * Adjusted\ Mode)}{(Calculated\ Maximum - Calculated\ Minimum)}$$

Next, we had to develop a random value denoted as X. This random variable represents the estimated month that a disability occurred. The range of this value will be the entire set of months in which a given individual could have been disabled, and these values will be bounded by the minimum and maximum previously described. Due to the behavior of our distribution, X may take on 2 values. The x_1 variable will be representing the beginning of the month, while the x_2 variable will be representing the end of the month. To calculate the actual value of X, we first established how far back we assumed a person may need to be placed from the date of his/her payment. We assumed 60 months would be an ideal period of time since, in our research, no claim cases extended that far back from the date of payment. The given Social Security claim payment data began on January 2000; we will denote this date as month 60. After applying our 60 month maximum, the assumed maximum date of disability will be January 1995, or month 0 in our case. Consequently we established a formula to determine the X value:

$$X_1 = Min(\ (Maximum + Elimination\ Period), Max((min), 0.5$$
$$+ (Month\ of\ SS\ claim\ payment - Estimated\ month\ of\ disability)))$$

$$X_2 = Max(\ (Minimum + Elimination\ Period), Min((max), 0.5$$
$$+ (Month\ of\ SS\ claim\ payment - Estimated\ month\ of\ disability)))$$

(Recall: The elimination period is fixed at 5 months)

The distribution that is ultimately created from these parameters is then used to determine the probability that a given individual becomes disabled in an estimated month. The formula used to determine the probability of a claim occurring at each month is the integral of the disability date distribution from the maximum lag time to X_1. This is then subtracted from the integral of the disability date distribution from the maximum to X_2. Any probability outside the range is 0. We determined the number of individuals who became disabled at each estimated month by

multiplying this probability by the given number of Social Security claim payments at each estimated month. The following equation provides us with Social Security data compatible to Unum's data:

$$
\begin{aligned}
DDDM = (Claim\ Count) \\
* (If((Month\ os\ SS\ claim\ payment \\
- Estimated\ month\ of\ disability) \\
< (max \\
+ 1), If((Month\ of\ SS\ claim\ payment \\
- Estimated\ month\ of\ disability) \\
\geq (min - 1), BetaDist(X_2, \alpha, \beta, min, max) \\
- BetaDist(X_1, \alpha, \beta, min, max), 0, 0))
\end{aligned}
$$

Note this formula incorporates excel functions for simplicity.

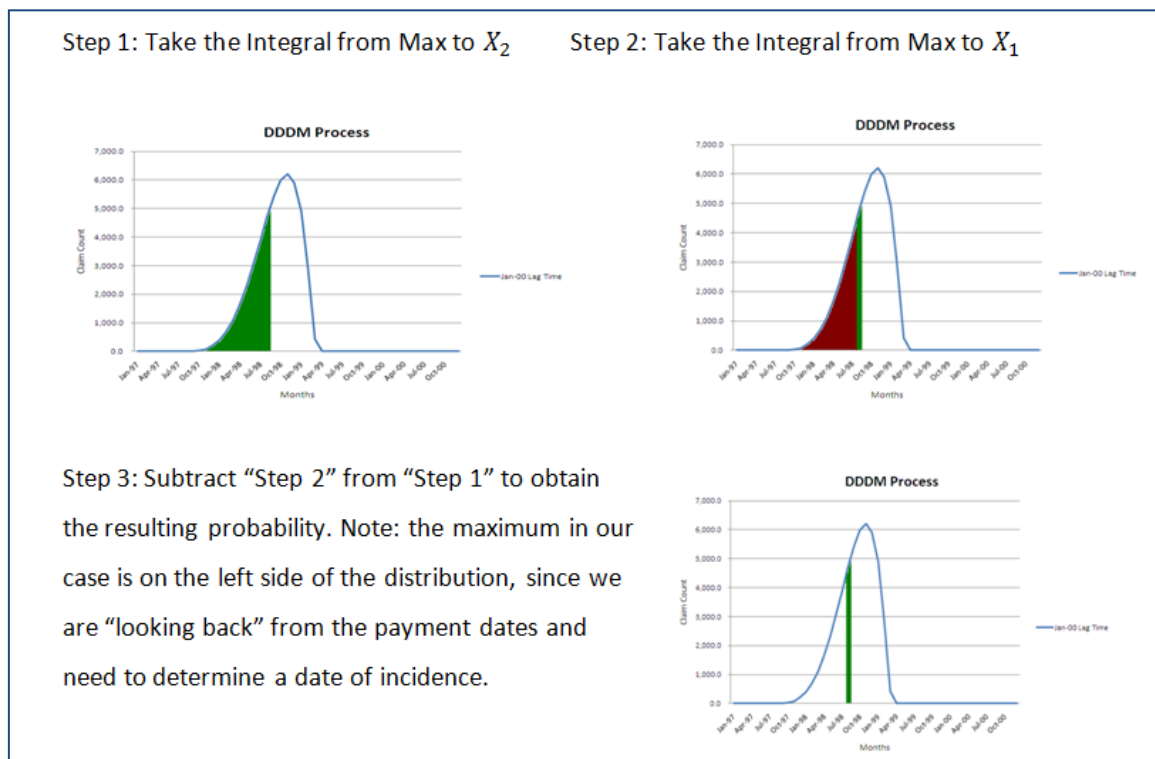Another way to visualize this process is illustrated in **Figure 13**, below:

Figure 13

The resulting probability is then multiplied by the given Social Security Claim count. The final result is an estimated number of disability claims dated back to the date of disability rather than the current date of payment. By repeating this process for every individual month, then summing up all the dates of disability that fall into each month we get an estimated total number of disability claims by month. The following section will go into more detail on the results of the DDDM.

2.2.2 Disability Date Distribution Method (DDDM) Results

The final product of our calculations and the input of our parameters results in what we call the Disability Date Distribution Method. This distribution is a combination of the Beta and Pert distributions, and most accurately depicts our overall "picture." We use this distribution to date back the given Social Security claim dates to estimated dates of disability. This allowed us to compare Social Security and Unum incidence rates.

To illustrate the steps the distribution makes over time, let's assume that Social Security's claim payment counts are 50,000 each month. Figure 14 shows how the distribution spreads these 50,000 claims over a period of time. It also illustrates how the distribution shifts over a 12 month time period. Figure 15 incorporates the months in between the 12 month span. Note that the mode of the distribution (the height) decreases as time goes on. This is due to the assumed increase in lag time. As time passes, the distribution of probabilities is spread over a longer period of time. Thus the height of the distribution seems to decrease given that the data
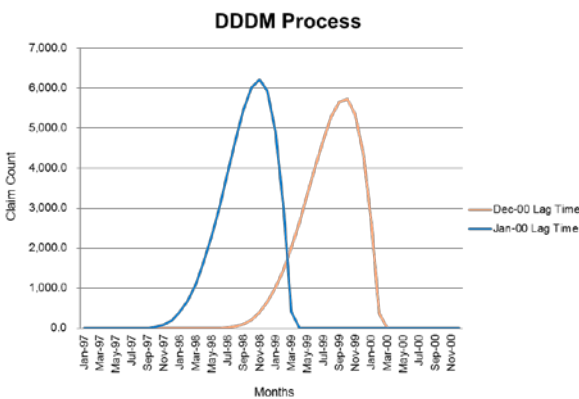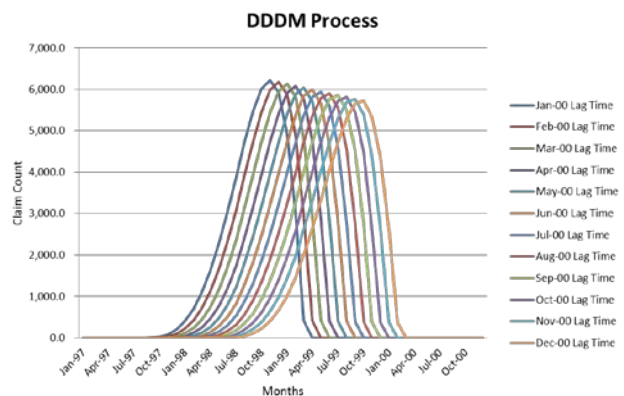

Figure 14

Figure 15

is fixed.

To illustrate a more realistic scenario, we will use the actual claim counts given by Social Security over the same period of time. This is shown in Figure 16, below. The height fluctuates in this case due to the natural change in claim counts. Although it is difficult to see in Figure 16, the lag time is constantly increasing. This is evidenced by the lower height of successive months' distributions, which would necessitate a wider base to maintain the same area below the curve.
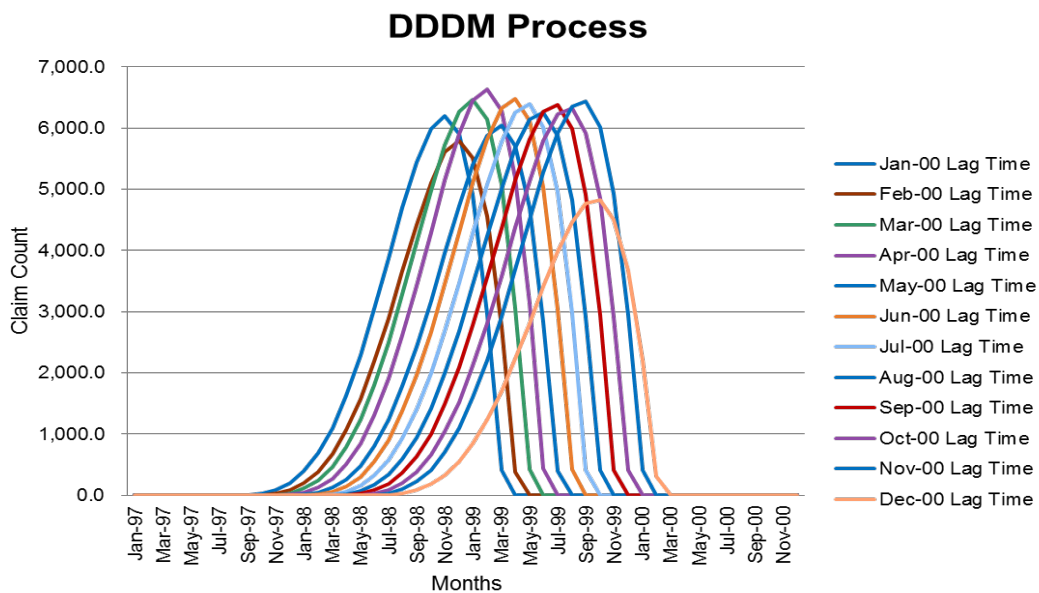
Figure 16

The final step in our process is to get the aggregate count of disability claims by month. Since many of the distributions overlap over any given month, we had to "stack" the distributions to get the total count that each distribution contributes towards that given month. Figure 18 illustrates a "stacked" version of our distributions. By summing up each months column individually, we get an estimated total count of disabilities for each month.
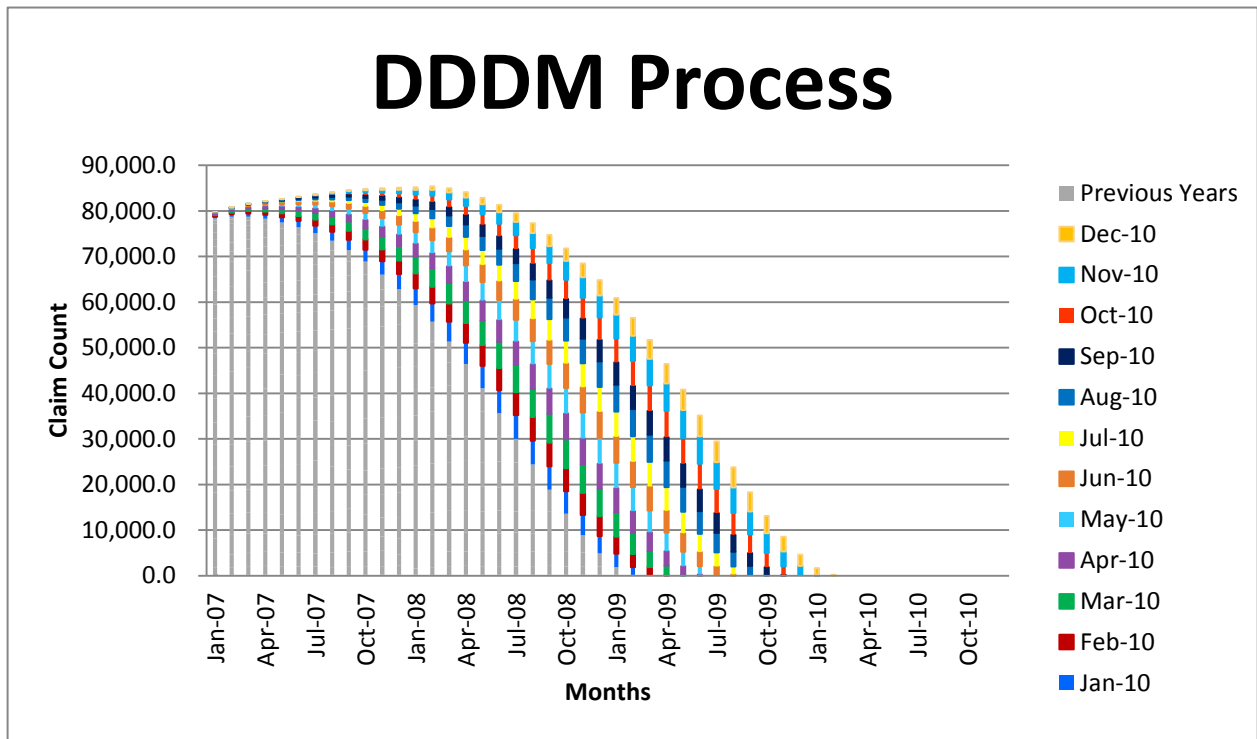
Figure 18

As previously mentioned, Social Security and Unum record their disability claims using two different claim dates. The Disability Date Distribution Method allowed us to estimate the date of disability for Social Security's claimants. With these dates, we calculated Social
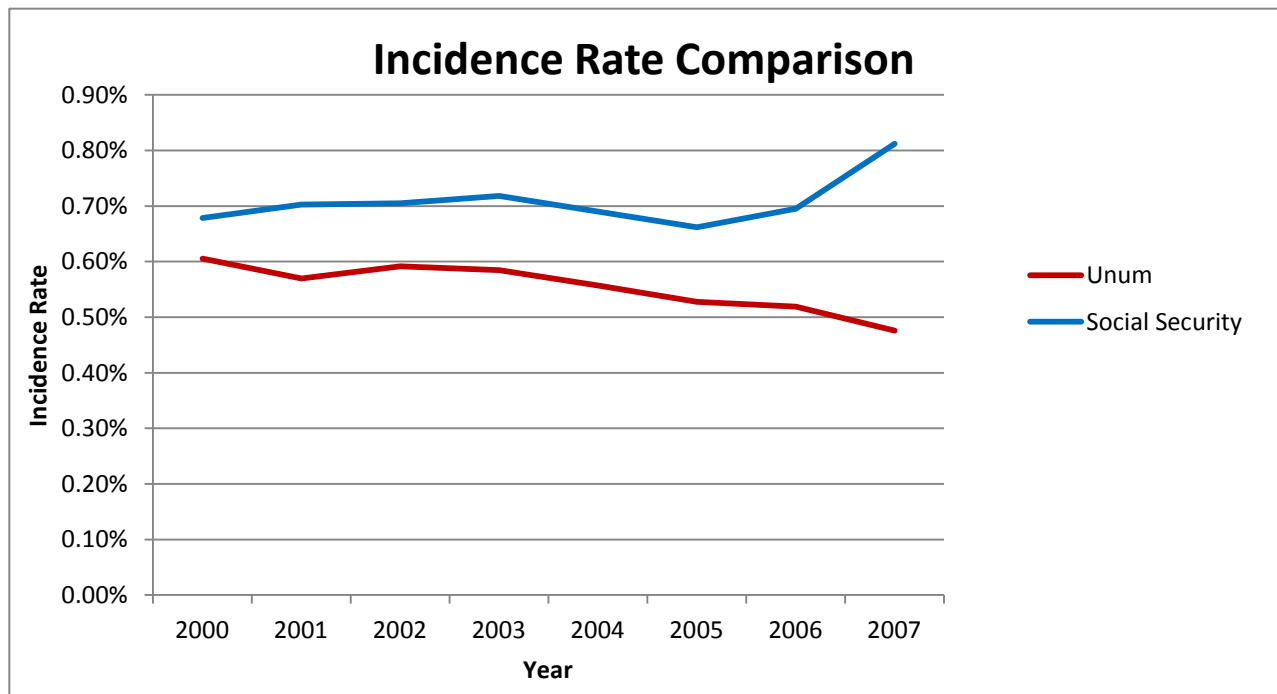

Figure 17

Security's annual incidence rates and compared them to those of Unum. We were then able to see when the deviation between Social Security's and Unum's incidence rates began. This is shown in Figure 17. Unum and Social Security follow a similar trend until the end of 2005, when the two start deviating.

From previous years' trends we can see that Social Security has experienced an increase in incidence rates over the period 2000 to 2007. Unum, on the other hand, has been following a decreasing trend. The cause of the abnormality in Social Security's incidence rate is difficult to isolate, but will be discussed further in the next chapter.

2.3 Investigate and Add any Additional Useful Data

After transforming Social Security's development of incidence rates to match Unum's, we decided it would be useful to include information about the U.S. population, U.S. unemployment rates, and industry groupings. This data allowed for a more in depth analysis of the Unum data.

2.1.2 U.S. Population Data

One piece of data we decided would be useful, but was not included in the Unum data was the percentage of the U.S. population insured by Unum. The U.S. population organized by year and state allowed us to compare the percentage of each state that Unum insures each year. With this data, we were able to determine whether Unum is underrepresented in certain areas of the U.S.

2.1.3 Unemployment Data

Some studies have shown that unemployment is linked with an increase in incidence rates. In order to determine whether unemployment had an influence on the recent incidence rates, we included yearly U.S. unemployment rates, as well as yearly U.S unemployment rates per state. With this data, we were able to compare unemployment rates with Social Security's incidence rates. Unfortunately, we were unable to directly compare unemployment rates with Unum's incidence rates because in order to file a disability claim with Unum, an individual must be employed. This could be a potential factor in why Unum's incidence rates haven't been increasing. If unemployment rates increasing is causing Social Security incidence rates to

increase because individuals are claiming disability as a way to attain a salary then it would not affect Unum the same way since to claim with Unum you must be employed. Another interesting trend associated with unemployment was present during late 2006 and early 2007. During this time period, incidence rates began to drastically rise and, shortly afterwards the stock markets took a plunge, and unemployment rates began to drastically rise. This rise in Social Security claim rates may possibly have been a leading indicator to the rise in unemployment. Typically, when an individual fears of becoming unemployed he/she may be inclined to find an alternate source of income. Long term disability insurance may be one of those possible sources. Though, this conclusion is very difficult to prove due to the nature of human behavior, but our group is confident that the change in unemployment does play a major role in Social Security Incidence rates.

2.1.4 Industry Groupings

The data we received from Unum was organized by the first two digits of the Standard Industrial Classification (SIC) codes. These codes provide us with some major industry groupings. Unfortunately, there were approximately 80 different SIC codes included in the data. This many codes made it difficult for us to analyze, so we broke the SIC codes into 11 broad categories:

- Agriculture, Forestry, Fishing
- Construction
- Finance, Insurance, Real Estate
- Manufacturing
- Mining
- Public Administration
- Retail Trade
- Services
- Transportation, Communications, Electric, Gas, Sanitary Services
- Wholesale Trade
- Other

These groupings allowed us to more easily analyze the data.

2.2 Compare Unum, Social Security, and supplementary data to identify any relationships that could be the cause of the difference in incidence rates

After including Social Security's data and adding supplementary data, there was still some information we were lacking. We were able to calculate these missing pieces with the information we previously inputted. The main calculations were incidence rates. With these incidence rates, we were able to compare several important factors.

2.1.1 Calculating Incidence Rates

In order to compare incidence rates for Unum and Social Security, we first needed to calculate these. Incidence rate is the percentage of new cases per total population in a given period of time. So, LTD insurance claim rate is the percentage of new claims per total number of people exposed in a given year. With the data given and data we gathered, we were able to calculate LTD insurance incidence rates for Unum and Social Security for each year.

2.1.2 Unum Incidence Rates

The Unum data that we received contained Unum claim counts (the number of people who became disabled) and exposure counts (the number of people who could have become disabled). In order to calculate incidence rate, we divided the exposure count by the claim count. We used pivot tables to calculate the yearly incidence rate for gender, age, state, and industry.

2.1.3 Social Security Incidence Rates

The Social Security data we were able to gather contained yearly incidence rates and yearly claim counts. This is exactly what we were looking for, but the data was recorded differently than Unum's, as previously mentioned. Once Social Security's claim count was converted to be comparable to Unum's data, we calculated the transformed incidence rate. We did this by dividing the transformed claim count by the total yearly working population, which for Social Security's case is the exposure count.

Social Security's incidence rates were only organized by age and gender, so we were not able to directly compare incidence rates by state or industry. We were, however, able to find some trends in each of the categories we aimed to focus on. Some of these trends will be discussed in more detail in the following sections.

2.1.4   Comparison of State Coverage and Incidence Rate

One possible explanation for Social Security's dramatic increase in Incidence rates, but not Unum's may possibly due to the population that Unum is insuring. If Unum has been insuring a certain populations that differed from that of Social Security, then minor changes or disturbances in these populations may have influenced Unum's incidence rates, but not Social Security's, or vice versa.

We calculated the percentage of the population insured by Unum for every state in the U.S. We then compared these percentages to the incidence rates in each state for 2008. This showed us how represented Unum is across the U.S. Some states stood out to us. Mainly, those with low percentages of the state population insured, but very high incidence rates. These results are displayed in Figure 19, below.
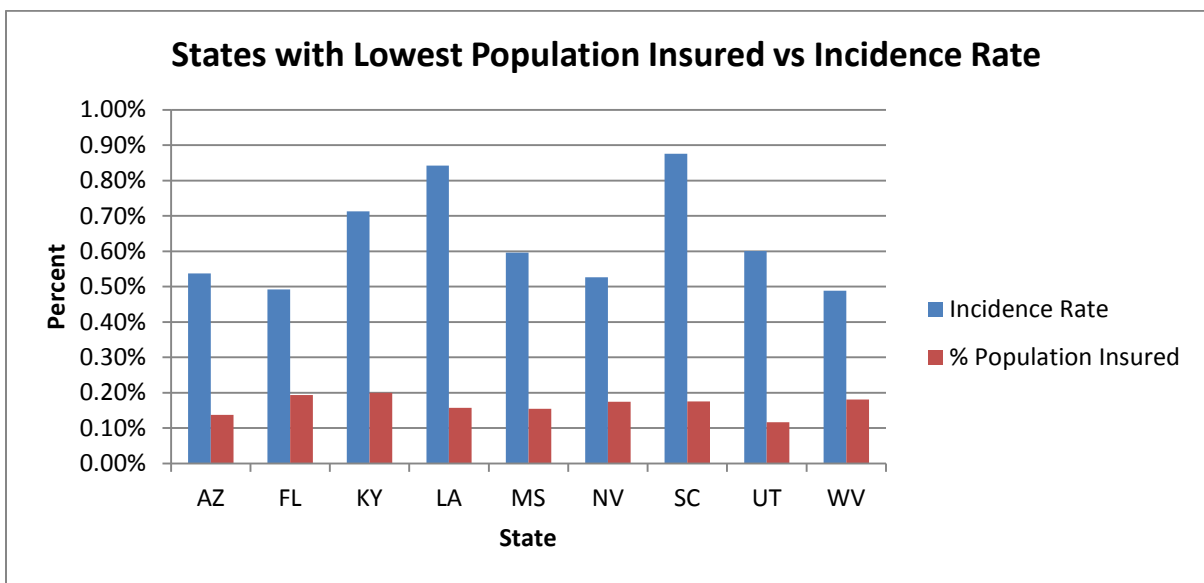
Figure 19

Overall, the average percentage of the population insured by Unum in each state is 0.44 percent and the average incidence rate is 0.47 percent. The states in figure Figure 19 have incidence rates much higher than the average incidence rate, yet the percentage of the population insured is well below the average percentage insured. The group found this very interesting since it seems that Unum does less business in states with high incidence rates.

We also examined the states with the highest percentages of the population insured by Unum. The incidence rates and percentage insured for each of these states are displayed in Figure 20, below.

States with Lowest Incidence Rates vs Population Insured
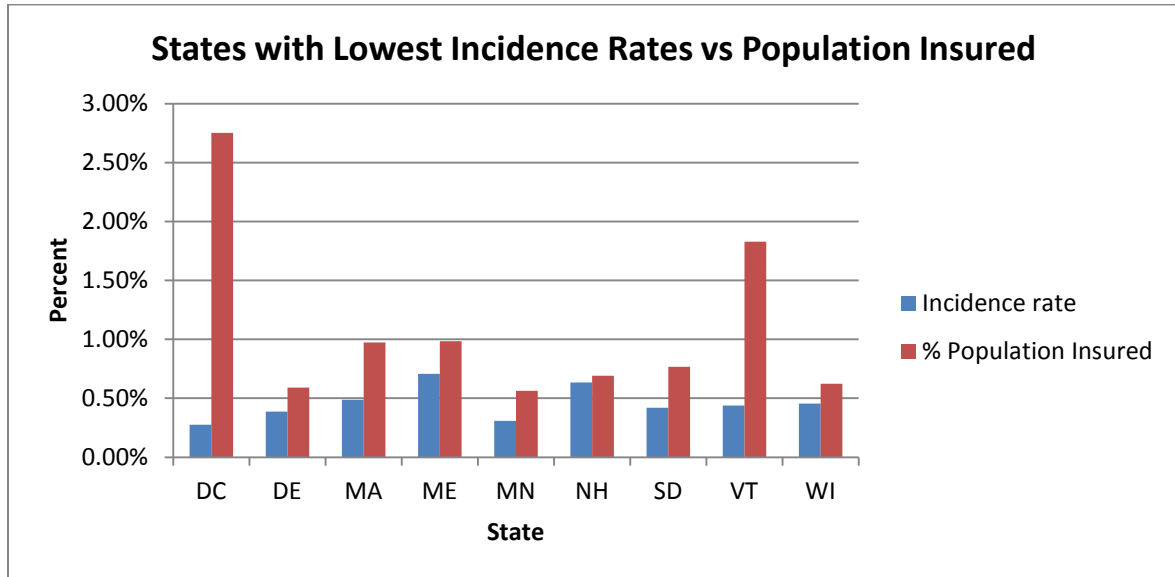
Figure 20

Figure 20 shows that in the states with the percentage of the population insured above the average of 0.47 percent have incidence rates mostly around the average of 0.44 percent. It appears that Unum is focusing on insuring states with incidence rates around the average, but not states with high incidence rates.

We were unable to compare this information to Social Security incidence rates at the state level, but we are confident that the Unum results explain that Unum is mainly insuring a population with low incidence rates. We cannot, however, conclude that this is the reason why Unum's incidence rates did not increase in a similar way to Social Security's incidence rates.

2.1.5   Summary of State Coverage and Incidence Rate

The most interesting trend that we found between Unum incidence rates throughout the states were when the incidence rate was above the state average but had a very small part of the population insured. The two states that stood out the most were South Carolina and Louisiana along with several other states across the south. For some of these states, the coverage is so small that the incidence rates may be insignificant. However, if these states that

are underrepresented by Unum, and they are witnessing the largest increase in Social Security disability rates then this could be an explanation as to why Unum hasn't experienced the same results.

For example West Virginia is one of the states with the highest Unum incidence rates and lowest percent of the population insured. According to recent Social Security Administration Statistics West Virginia has the highest percentage of people (8.7%) receiving Social Security Disability benefits (Barlow 2010). The other states in the top five in order are Arkansas, Kentucky, Alabama, and Mississippi. Kentucky and Mississippi are both on our list of lowest percent of population covered and highest incidence rates. We were unable to find information about every state but if could we could know for sure if there was a correlation.

Another interesting aspect of the state analysis was that there were certain states with above average percentages of the population covered and below average incidence rates. The most significant in this category was DC and Vermont. This doesn't give us a large insight into the Social Security Increase but the Unum coverage in both of these states are effective since they are paying out less money compared to the amount of coverage they are providing

2.1.6   Industry

Industry is another possible explanation for the major increase in only Social Security's incidence rates. If Unum insures industries that don't have increasing incidence rates, this could explain why Unum's incidence rates did not increase like Social Security's did. After breaking the SIC codes into broader categories, as explained previously, we decided to compare industries throughout years we had data. Figure 21, below, displays the incidence rates for each industry for 2000 to 2008.

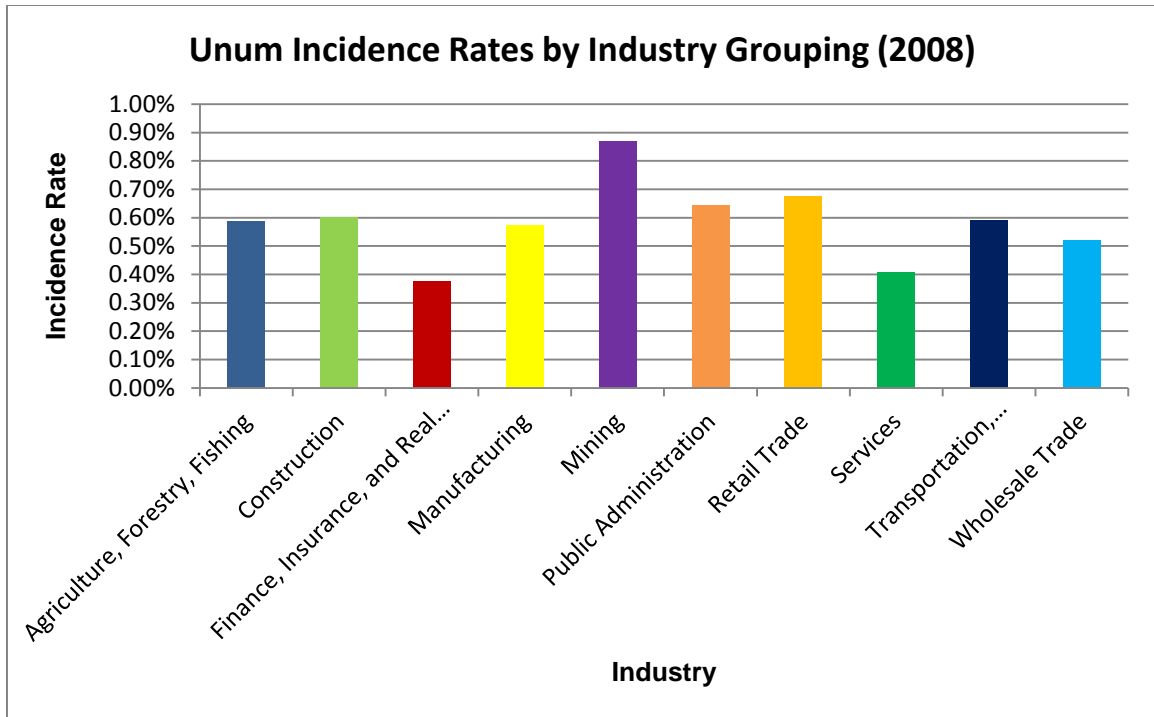**Unum Incidence Rates by Industry Grouping (2008)**

Figure 21

In order to compare the incidence rate for each industry to the percentage of the population insured by Unum, we found it important to look at the percentage of the population insured for each industry. The percentage of the population insured for each industry is displayed in Figure 22, below.
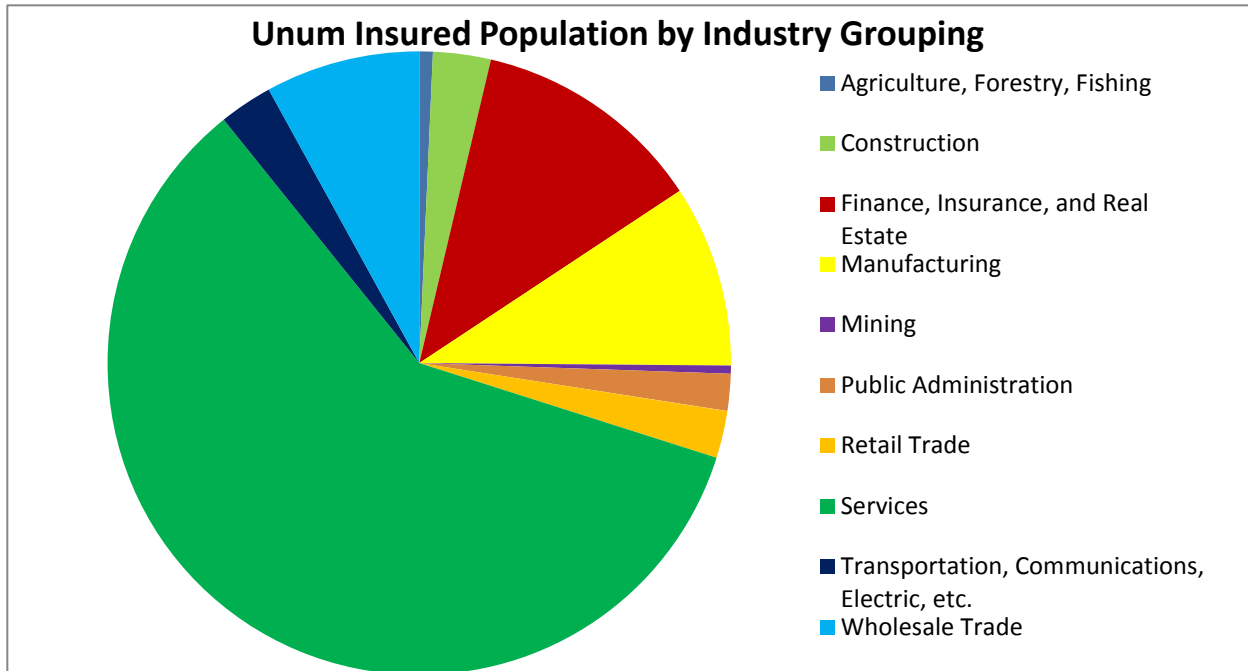
Unum Insured Population by Industry Grouping

Legend:
- Agriculture, Forestry, Fishing
- Construction
- Finance, Insurance, and Real Estate
- Manufacturing
- Mining
- Public Administration
- Retail Trade
- Services
- Transportation, Communications, Electric, etc.
- Wholesale Trade

Figure 22

We can see that Unum insures a large number of people in the Services, Finance, Insurance, and Real Estate Industries. These four industries have the lowest incidence rates. The opposite of this is also true. Unum insures the least number of people in the Mining, Construction, and Agriculture Industries, yet these industries have the highest incidence rates. It seems that Unum does more business in industries with low incidence rates and not insuring many people in the industries with the high incidence rates.

Unfortunately, we were unable to compare Unum's incidence rates by industry to those of Social Security. We know that Social Security has complete coverage in every industry, so for example they do insure more people in the mining industries than Unum, but we do not have their specific incidence rates for each industry. If we had this data, we could compare the industries with the highest or lowest incidence rates to those of Unum and determine whether there is a similar pattern and made an exact conclusion. We are confident however in saying that Unum does not insure a lot of people in industries with high incidence rates while Social

Security does therefore this could play a factor in why Unum hasn't experienced the same increase.

2.1.7 Gender Comparison of Social Security and Unum

One category that we did have some complete data for both Social Security and Unum was incidence rates by gender. In order to determine whether gender had an influence on these rates, we compared the data we had from 2000-2008 for both males and females.

First, we looked at the Unum and Social Security incidence rates separately, to

determine whether males or females had higher incidence rates. Figure 24 and Figure 23 show these graphs. What we can see, is that Unum's incidence rates for females are generally higher than for males, and the exact opposite is true
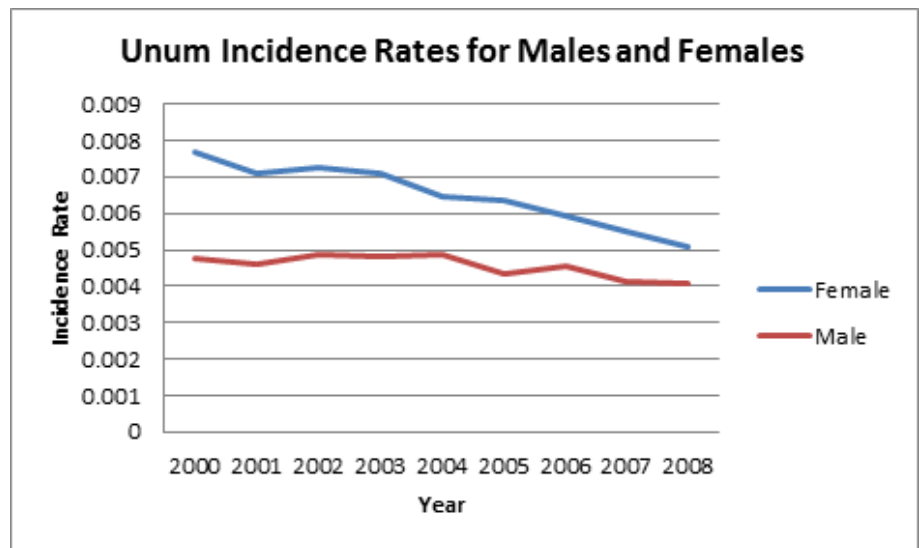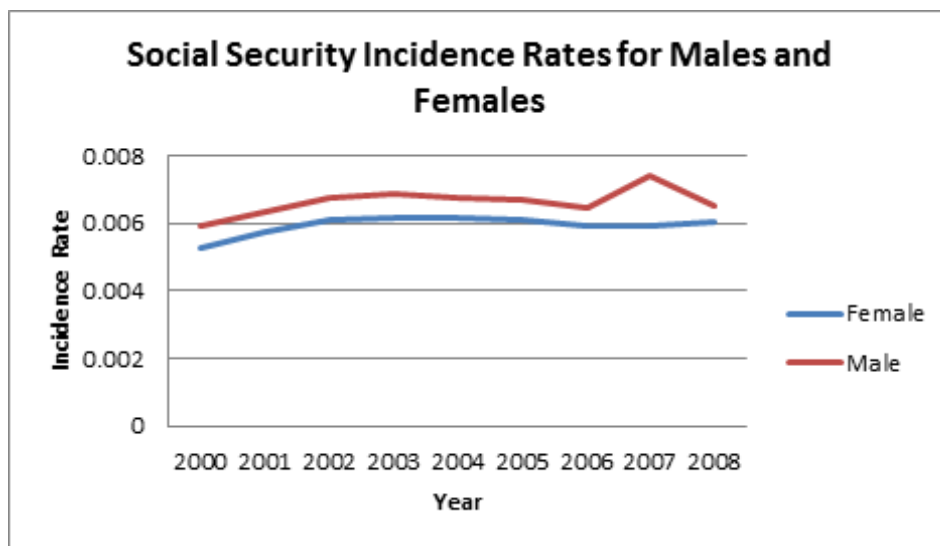

Figure 24

for Social Security. Besides that, there is little pattern in the rates that help explain why Unum has recently seen a decrease in incidence rates. This pattern is especially present in Unum

Figure 23

covered females, where a distinct downward trend is present. Social Security, on the other hand, has experienced a slight spike in the males' incidence rates shortly after 2007. This may have caused the overall increase in incidence rates. Besides the spike however, both genders follow the exact trend since the first year of our recorded data.

We decided to investigate each gender separately, and compare the two incidence rates for each. By doing this we hoped to see trends that explain why Unum has a lower incidence rate than Social Security.

For each gender, we saw an increase in the Social Security incidence rate, along with a decrease in the Unum incidence rate. This trend was much more extreme for women, as illustrated in Figure 26. We see, as the graph starts in year 2000, the Unum incidence rate is much larger than the Social Security rate. As years progress, the graph slowly shifts the other way, ending in 2008 with a higher Social Security than Unum rate. This was an interesting find,
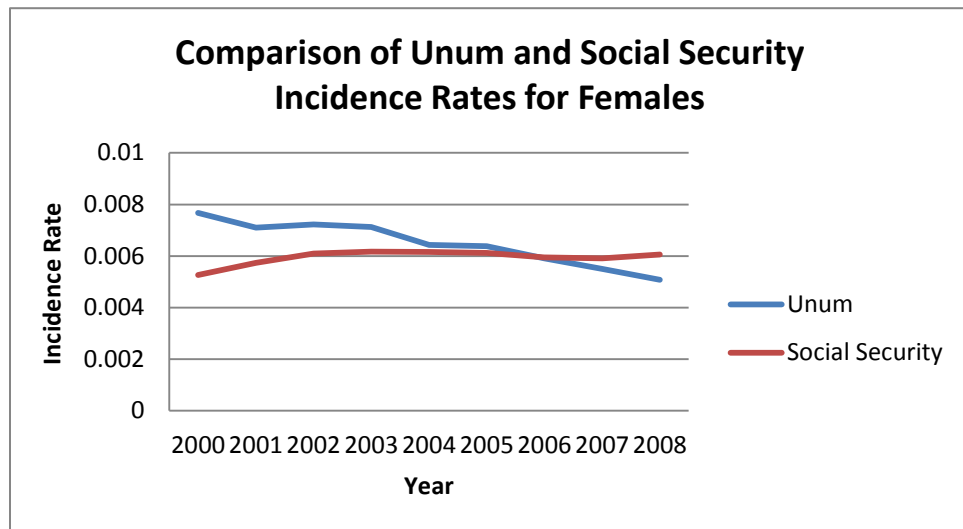
Comparison of Unum and Social Security Incidence Rates for Females

Figure 26

Comparison of Unum and Social Security Incidence Rates for Males
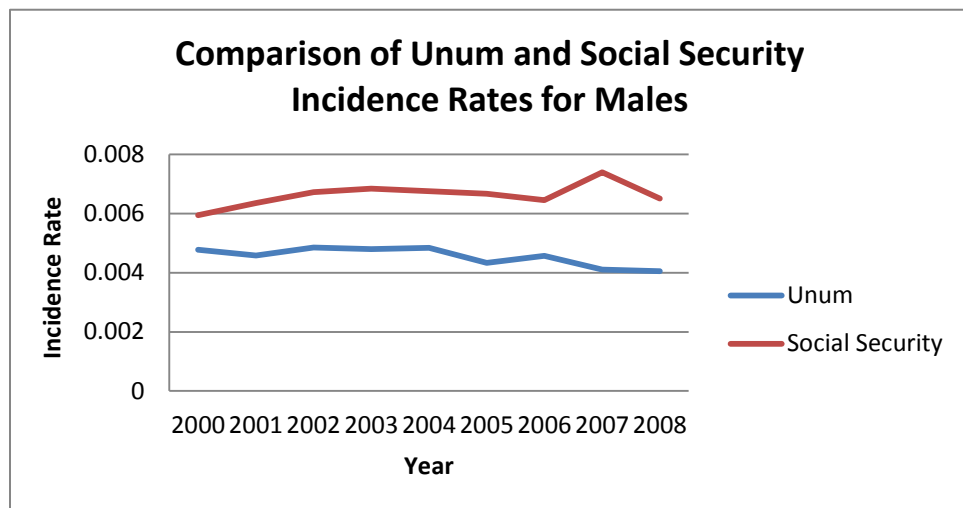
Figure 25

which begins to give us an explanation for the recent change in Unum and Social Security incidence rates.

We made a similar comparison for men shown in Figure 25. This gave us less of an explanation than the graph for women did, but we still saw an increase in the gap between the Social Security and Unum rates. In 2007, especially there was quite an extreme gap in the two incidence rates. This was lessened by 2008, but does not hide the fact that over the period, the trend showed an increasing gap between the two rates.

The biggest thing we learned by making the above comparisons was that the Unum incidence rates for women have been on the decline for the 8 years of which we have data, while the Social Security incidence rates for women have been on the rise. This is one category in which the recent shift in incidence rates is greatly exemplified in our data. It is important to note that we do see the same trend when making the same comparisons for males. This could be potentially useful knowledge for Unum when making decisions on which gender to more heavily insure.

2.1.8 Comparison of Social Security Incidence rates and Percentage of U.S. Population insured by Unum for each age group

Age was another important category we decided to look at to find a potential cause for the recent difference in Social Security and Unum incidence rates. We believed comparing Social Security's incidence rates for each age group to Unum's overall coverage of each group, we might see a range of age in which we could draw conclusions about the difference in rates.

To investigate the effect of age on incidence rates, we compared Social Security's incidence rate for each age group (five year intervals), with the percent of US population insured by Unum for each age group. We determined the latter by dividing the exposure count for each age group, (given by Unum), by the US population in each age group. Data concerning US population in each age group was found on the US Census website. With all of this data, we were able to make a nice comparison between the two rates, and saw an interesting trend. We use 2008, the most recent year of which we have data, to make the comparison.

As shown in Figure 27, neither statistic is uniform across all age groups by any means. Already we know this worth investigating, as Unum could make efforts to insure more of other age groups if it proves beneficial. In the younger age groups, Social Security has a relatively low incidence rate, while Unum insures a high percentage of those people. This shows that not a lot of Unum's clients claim Social Security in that age group. In the older age groups, the
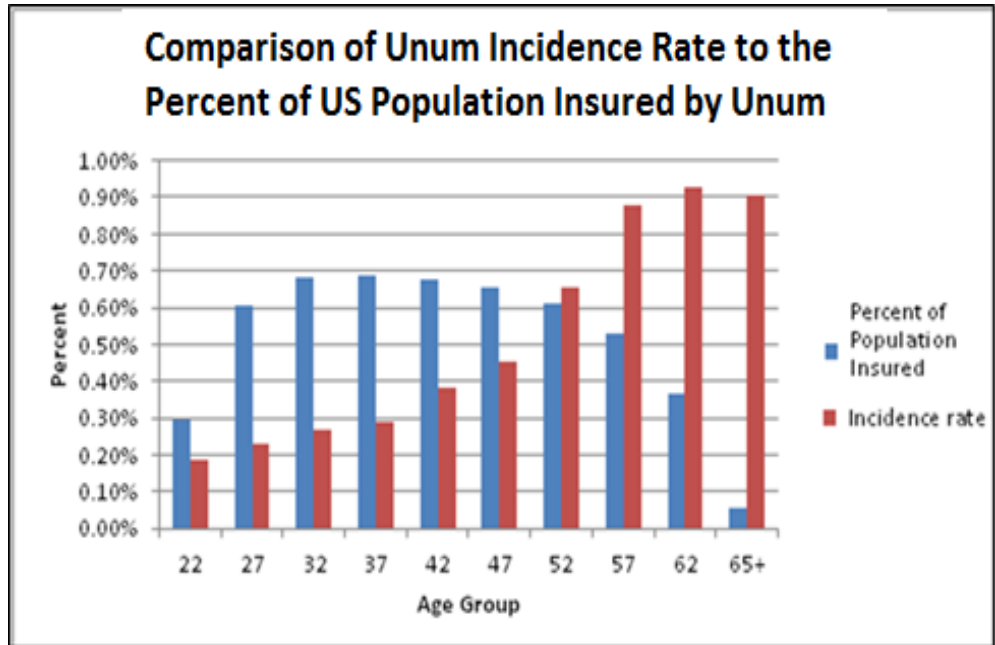

Figure 27

Social Security incidence rate becomes large, while Unum is insuring less of the population. This is likely due to the working population reaching retirement and no longer using the Unum insurance plan provided to them by their work. Those retirees still might make a Social Security claim though, increasing the incidence rate.

Looking at this information, it would seem as if attempting to insure a younger population would be beneficial for Unum. Perhaps the younger age groups are generally healthier, or maybe Unum already insures companies with statistically healthier people. Further investigation into this topic could lead to better conclusions about why Unum's incidence rate has become increasingly lower than Social Security's.

3. Conclusions

After analyzing Unum's data, it appears that Unum is insuring a different population than Social Security. Social Security insures the majority of the U.S. working population, while it

seems that Unum is focusing on insuring certain populations. Most of Unum's insured population is in the New England area, where incidence rates are low. The largest Unum insured industry is the services industry, also where incidence rates are low. It also appears that Unum is insuring younger age groups the most, where incidence rates are low. Along with focusing on insuring populations with low incidence rates, it appears that Unum is not insuring as many people in populations with high incidence rates. Private insurance companies have entire departments whose purpose is to investigate any company that is seeking to be insured. Insurance companies typically do not insure a company that is at a high risk for claiming disability because they don't want to have to make large pay outs. Therefore it makes sense that through our research into Unum's data that they are underrepresented in areas with high incidence rates.

After completing this investigation, we are able to say that Unum and Social Security have been insuring two very different populations. Unemployment appears to be another major factor, though it is very difficult to justify. Human behavior may cause individuals to seek disability benefits to compensate for any lost wages incurred by unemployment. Those who fear becoming unemployed may also apply for disability income on things they generally wouldn't claim. Overall, there are many factors that may play a part in the deviation of incidence rates between Unum and Social Security including age, gender, geographic location, working industry, and unemployment.

4. Recommendations

Our project group learned a lot through the information given to us by Unum, as well as through the Social Security Statistics available to us on the internet. However, there were certainly areas of our project where we could have drawn better conclusions. Had we had a more complete library of supplemental data, we could have gained a better understanding of incidence rates, giving us a more meaningful conclusion.

Our biggest obstacle was acquiring data from Social Security that compared well with the data we had for Unum. We knew this was not going to be easy, as our Unum data was in

months, and there was no such Social Security data on the internet that was broken down into months. Getting this information proved impossible, and were stuck with making approximations, making our numbers less reliable. Future investigators of this topic should strive to find Social Security data that compares perfectly to the group it is being compared to.

Projecting Social Security's data for years we did not have actual numbers, was not a preferable way to get comparable numbers. Ideally, the numbers we had would have been factual, as we could have been surer about our findings. Instead we relied on projecting our data into the future, and accepting those numbers as fact. Using actual numbers for studies of this nature is necessary for coming to a meaningful conclusion.

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5. Appendix

5.1 Pivot Table

A pivot table summarizes large groups of data in lists and tables and allows an easy analysis. Pivot tables make it easy to quickly organize data into specific categories of interest. Some functions pivot tables can perform quickly are sum, count, give an average of or sort data. Charts and graphs are also easy to create from a pivot table.

Below is an example of a pivot table. Figure 29 is the field that contains all of the options for creating the pivot table. Included in the field are all of the categories the data is sorted by. We are able to select any of these we wish to analyze. Figure 28 is the pivot table created by the field list. In the example below, it shows the claim count for each year and then we can easily break this count down into age groups by clicking the plus sign to the left of the year. From this table, a graph can quickly be created and manipulated by changing the selections in the pivot table.
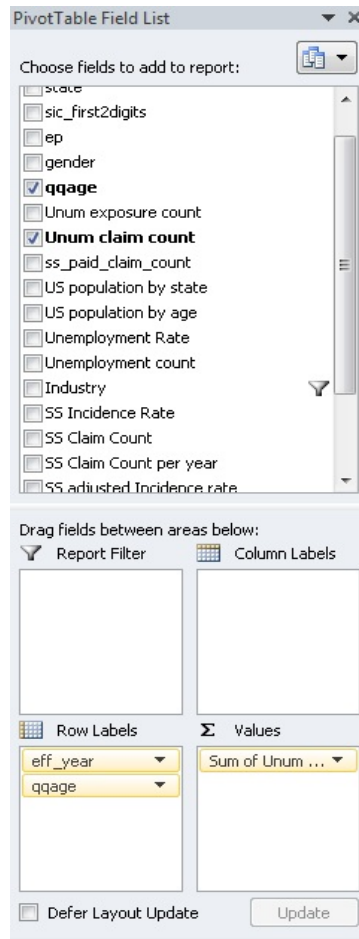

Figure 29

Figure 28

5.2 List of 2 Digit SIC Codes

AGRICULTURE, FORESTRY, AND FISHING
01 - - AGRICULTURAL PRODUCTION - CROPS
02 - - AGRICULTURAL PRODUCTION - LIVESTOCK
07 - - AGRICULTURAL SERVICES
08 - - FORESTRY
09 - - FISHING, HUNTING, AND TRAPPING

MINING
10 - - METAL MINING
12 - - COAL MINING
13 - - OIL AND GAS EXTRACTION
14 - - NONMETALLIC MINERALS, EXCEPT FUELS

CONSTRUCTION
15 - - GENERAL BUILDLING CONTRACTORS
16 - - HEAVY CONSTRUCTION, EXCEPT BUILDING
17 - - SPECIAL TRADE CONTRACTORS

MANUFACTURING
20 - - FOOD AND KINDRED PRODUCTS
21 - - TOBACCO PRODUCTS
22 - - TEXTILE MILL PRODUCTS
23 - - APPAREL AND OTHER TEXTILE PRODUCTS
24 - - LUMBER AND WOOD PRODUCTS
25 - - FURNITURE AND FIXTURES
26 - - PAPER AND ALLIED PRODUCTS
27 - - PRINTING AND PUBLISHING
28 - - CHEMICALS AND ALLIED PRODUCTS
29 - - PETROLEUM AND COAL PRODUCTS
30 - - RUBBER AND MISC. PLASTICS PRODUCTS
31 - - LEATHER AND LEATHER PRODUCTS
32 - - STONE, CLAY, AND GLASS PRODUCTS
33 - - PRIMARY METAL INDUSTRIES
34 - - FABRICATED METAL PRODUCTS
35 - - INDUSTRIAL MACHINERY AND EQUIPMENT
36 - - ELECTRONIC & OTHER ELECTRIC EQUIPMENT
37 - - TRANSPORTATION EQUIPMENT
38 - - INSTRUMENTS AND RELATED PRODUCTS
39 - - MISC. MANUFACTURING INDUSTRIES

TRANSPORTATION, COMMUNICATIONS, ELECTRIC, GAS, AND SANITARY SERVICES
40 - - RAILROAD TRANSPORTATION
41 - - LOCAL AND INTERURBAN PASSENGER TRANSIT
42 - - TRUCKING AND WAREHOUSING
43 - - U.S. POSTAL SERVICE
44 - - WATER TRANSPORTATION
45 - - TRANSPORTATION BY AIR
46 - - PIPELINES, EXCEPT NATURAL GAS
47 - - TRANSPORTATION SERVICES
48 - - COMMUNICATION
49 - - ELECTRIC, GAS, AND SANITARY SERVICES

WHOLESALE TRADE
50 - - WHOLESALE TRADE - DURABLE GOODS
51 - - WHOLESALE TRADE - NONDURABLE GOODS

RETAIL TRADE
52 - - EATING AND DRINKING PLACES
53 - - GENERAL MERCHANDISE STORES
54 - - FOOD STORES
55 - - AUTOMOTIVE DEALERS & SERVICE STATIONS
56 - - APPAREL AND ACCESSORY STORES
57 - - FURNITURE AND HOMEFURNISHINGS STORES
58 - - EATING AND DRINKING PLACES
59 - - MISCELLANEOUS RETAIL

FINANCE, INSURANCE, AND REAL ESTATE
60 - - DEPOSITORY INSTITUTIONS
61 - - NONDEPOSITORY INSTITUTIONS
62 - - SECURITY AND COMMODITY BROKERS
63 - - INSURANCE CARRIERS
64 - - INSURANCE AGENTS, BROKERS, & SERVICE
65 - - REAL ESTATE
67 - - HOLDING AND OTHER INVESTMENT OFFICES

SERVICES
70 - - HOTELS AND OTHER LODGING PLACES
72 - - PERSONAL SERVICES
73 - - BUSINESS SERVICES
75 - - AUTO REPAIR, SERVICES, AND PARKING
76 - - MISCELLANEOUS REPAIR SERVICES
78 - - MOTION PICTURES
79 - - AMUSEMENT & RECREATION SERVICES
80 - - HEALTH SERVICES
81 - - LEGAL SERVICES
82 - - EDUCATIONAL SERVICES
83 - - SOCIAL SERVICES
84 - - MUSEUMS, BOTANICAL, ZOOLOGICAL GARDENS
86 - - MEMBERSHIP ORGANIZATIONS
87 - - ENGINEERING & MANAGEMENT SERVICES
88 - - PRIVATE HOUSEHOLDS
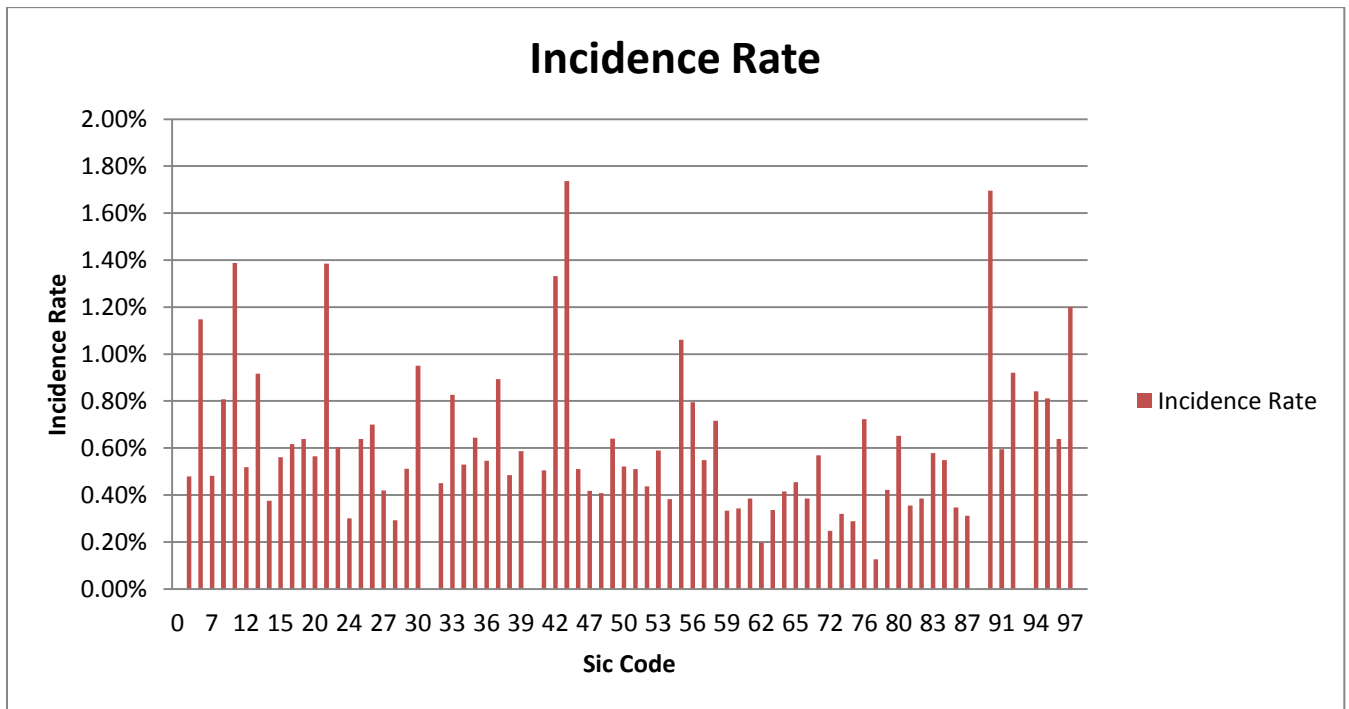89 - - SERVICES, (NOT ELSEWHERE CLASSIFIED)

PUBLIC ADMINISTRATION
91 - - EXECUTIVE, LEGISLATIVE, AND GENERAL
92 - - JUSTICE, PUBLIC ORDER, AND SAFETY
93 - - FINANCE, TAXATION, & MONETARY POLICY
94 - - ADMINISTRATION OF HUMAN RESOURCES
95 - - ENVIRONMENTAL QUALITY AND HOUSING
96 - - ADMINISTRATION OF ECONOMIC PROGRAMS
97 - - NAT'L SECURITY AND INTERNATIONAL AFFAIRS

NONCLASSIFIABLE ESTABLISHMENTS
99 - - NONCLASSIFIABLE ESTABLISHMENTS

5.3 Graph of Incidence Rates by Industry

5.4 Graph of Incidence Rates by State