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The Macroeconomy and Health in the United States

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ABSTRACT

The economy affects everyone as it expands and contracts. This paper will look at the effects that economic downturns have on the health of Americans. It will analyze the number of deaths per year caused by certain causes of death and determine the extent to which a downturn affects these numbers. This paper also looks at the cause and effect relationship between antidepressants and suicide. The empirical results indicate that the state of the economy affects the health of the nation.

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CHAPTER 1: INTRODUCTION

Often times, the economy is thought of as only relating to financial matters. However, the economy affects more than people's bank accounts and finances; it affects all aspects of their lives. It is important to know how your health may be affected by an economic downturn. If your health is not affected personally, there is a good chance that the health of a loved one is affected, which in turn affects you indirectly. Society at large is affected by the health of the workforce, which affects output, which affects economic growth. Societies are not self-contained; as the world becomes more and more globalized, the world is affected by the growth or stagnation of a particular economy. Brenner's (1984; interview with Bower) data support the notion that "economic decisions, whether they lead to recession or growth, always have health implications."

This paper will look at the United States economy's effects on people's health, specifically, the number of deaths from various causes for the years 1968 to 2004. I want to quantify the effects of economic downturns on the deaths due to heart disease, cirrhosis of the liver, lung cancer, and suicide. For comparison purposes, I will also look at the number of deaths from leukemia, breast cancer, and all cancers not otherwise specified. I hypothesize that economic downturns will cause the number of deaths from heart disease, cirrhosis of the liver, lung cancer, and suicide to increase. Conversely, I do not think the numbers of deaths from leukemia, breast cancer, and all cancers not otherwise specified will be affected by economic downturns. To further investigate suicide, I looked at sales data from antidepressants to see if the sales data corresponds to

the number of suicides in the United States. My hypothesis is that antidepressant drug sales will be negatively correlated with the number of deaths caused by suicide. As the number of suicides decreases, it is an indication that more people are taking antidepressants, and so the sales revenue would have increased.

CHAPTER 2: BACKGROUND

According to Brenner (1971), adverse changes in economic status restrict the degree to which individuals are able to acquire a great proportion of the goods and services that are valued in society. Periods of economic recession force a sizeable portion of the population either out of the economy, as in unemployment, or into a situation of decreased income. It should be noted that unemployment or underemployment means less income. In which case, people typically buy fewer of all goods, including health services. Less health maintenance leads to more health related deaths. Also, the increased stress caused by unemployment increases the likelihood of death. One determinant of the economy's health is the unemployment rate, and the general conclusion of practically all workers in the field is that unemployment tends to make people more emotionally unstable than they were prior to unemployment. Two authors in particular, Eisenberg and Lazarfield (1938), found that unemployment led to deteriorating senses of security, self-esteem, self-confidence, and to a decline in morale. These effects of unemployment can transform into serious health conditions for the people suffering from the loss of a job.

Studies by Campbell (1981), Scholzman and Verba (1978), and Veroff et al. (1981) used community surveys and found that unemployment is among the most stressful of life events. Persons who have experienced unemployment are far more likely to report feelings of unhappiness, dissatisfaction with life, and high levels of personal strain. In addition, Catalano and Dooley (1983) found that undergoing an undesirable job

or financial event nearly doubles the odds that an individual will become ill or injured. With the odds of increased illness being so high, it is important for individuals to be aware of possible outcomes. Sometimes awareness leads to prevention, and in this case, could save one's life as well as benefit the economy.

Healthier workers are physically more energetic and robust. They are more productive and earn higher wages, and are less likely to be absent from work due to illness. A study by Bloom et al. (2004) found that health has a positive and statistically significant effect on economic growth, and suggested that a one-year improvement in a population's life expectancy contributes to a four percent increase in output.

CHAPTER 3: BASIC ECONOMIC MODEL

A change in economic standing may cause the numbers of deaths caused by a particular disease to increase or decrease. There are two effects that measure the change of economic standing: the income effect and the substitution effect. The income effect is a result of the increase in the consumer's real income. It is observed through changes in purchasing power and relates to the change in the quantity demanded brought about by a change in real income. For normal goods, as income increases, the amount the consumer purchases increases as well; for inferior goods, as income increases, the amount the consumer purchases decreases.

The income effect is positive. As a person works more, and his income increases through higher wages, he is able to purchase more income elastic goods, such as health care. Health care has beneficial effects on one's health, such as preventative and routine physicals, prescription drug coverage, and managing illness. Other income-elastic goods like healthy foods and gym memberships cost more, but lead to healthier lifestyles.

The substitution effect, however, can be positive or negative. It is the effect of changes in relative price of goods due to substitution of a relatively less expensive good for a good that becomes relatively more expensive. As the economy expands, individuals are able to work more as the market becomes more valuable than leisure time. Working more can have positive and negative impacts on a person's health. Positively, working more could lead to greater self-esteem, less stress from worrying about personal financial matters, and/or better health habits. Positive health effects may be the result of these

outcomes. Negatively, increased work could cause one to experience more wear and tear on his body and relationships, as well as increased stress. These can lead to harmful health effects and may lead to death. On the contrary, increased leisure time may lower stress and improve personal relationships.

For the reasons stated above, it is important to realize that the effects of working more during economic expansion are not cut and dry. Therefore, empirical evidence is needed to determine whether the substitution effect is positive or negative for each specific situation, plus which effect dominates: income or substitution.

CHAPTER 4: LITERATURE REVIEW

This paper is not the first to explore the correlation between the state of the economy and the health of the constituents of that economy. Brenner predicted that heart attacks, cirrhosis of the liver, suicides and homicides will claim more lives three to five years after the height of unemployment. Increases in alcohol and cigarette consumption, fat consumption and the divorce rate aggravate recession-related health problems, as does the lack of medical insurance due to unemployment. Brenner's (1984; interview with Bower) study shows that the mortality rate is at its highest several years after a recession. The economy's affects on people's lives reaches much further and deeper than their purse or wallet.

Chen et al. (2002) documents that in economic historian Robert Fogel's 1993 Nobel Prize speech dramatic improvements in human health and lifespan over the last century have increased labor productivity and economic growth. These health improvements were largely ascribed to better nutrition and to an enhanced ability of consumers to transform nutrition information into desired health states.

However, per Amick et al. (1995), economic recession engenders damage to health by means of at least six mechanisms: (1) reduced financial access to health care, resulting in underutilization, (2) psychophysiological reactions to stress and loss, (3) damage to social relations and sources of social support, (4) maladaptive coping mechanisms involving high-risk consumption patterns, (5) less thorough and frequent maintenance of manufacturing plants and reduced investment in modernization, with a

consequent effect on health and safely, and (6) increased work stress during the economic recovery as firms that lost heavily during the recession take on more work but do not yet hire additional workers, due to a capital shortfall and uncertainty about the stability of the recovery. This paper will focus on issues related to (2), (3), (4), and (6) above.

Amick et al. (1995) goes on to say that psychophysiological coping reactions to stress and loss are highly varied. They include a compromised immune system, which is less able to resist infection and malignancy. It also affects the cardiovascular system, including hypertension, myocardial infarction, angina, and acute cholesterol response. Additional health issues may include peptic ulcers, asthma, disorders of the central nervous system such as migraines, anxiety, and psychotic and adjustment disorders, as well as emotional reactions, especially depression, aggression, and somatization.

Often times the ties of family, friends, and peer relations among coworkers have been found to moderate the impact of stress and loss. However, depressive or aggressive reactions to loss and stress can damage social networks by alienating close associates and discouraging them from providing social support. Indeed, the impact of depression, aggression, or general tension has brought about many broken relationships (Amick et al., 1995).

Many social scientists assume that maladaptive responses to chronic stress and adverse life events include adoption of unhealthy consumption patterns. Alcohol in particular has been cited as a maladaptive tool for management of stress and depression, as have tobacco and other addictive substances. Alterations in diet, especially increases in fat and sugar consumption, are also assumed to be coping devices (Amick et al., 1995).

Specific literature regarding the following diseases will be provided: heart disease, cirrhosis of the liver, lung cancer, and suicide. It is important to note that no specific literature was found regarding economic changes and leukemia, breast cancer, or cancers not elsewhere classified.

4.1 HEART DISEASE

Some 50 million Americans have high blood pressure, which increases risk of heart attack, stroke, and renal failure (Joint National Committee). Despite gains in human health over the last century, about one out of every six Americans still has high blood pressure. By treating as exogenous what is endogenous, many studies generate biased and inconsistent estimates of risk-overestimating the threat to some people, and underestimating it to others. A study by Chen et al. (2002) addressed this inconsistency by integrating behavior with an epidemiological model to establish consistent estimates of the response of blood pressure to changes in personal diet, exercise, and medication regimes. They assumed that people choose these health inputs, and that economic variables such as wages, food prices, and income influence these choices. The results suggest that prices, wages, and income matter in choosing nutrients and health activities; prices, wages and income can be effectively used as instruments in identifying endogenous inputs into the production of health and controlling for endogeneity makes a difference in estimated impacts of nutrient intake on blood pressure. When behavior is endogenous and measurement error is controlled, sodium intake is associated with lower blood pressure.

Chen et al.'s (2002) findings reinforce the idea that economic choice and health status are a two-way street: our choices affect our health and our health affects our choices. This seems obvious enough, and yet it has been commonly overlooked by both the man in the street and the scientist at work, who generally think of the social and medical disciplines as separate and assume that combining economics with health science would not alter the core of either. The major player in health policy in the United States, the National Institutes of Health (NIH), now acknowledges that choice and health are jointly determined.

Various types of stress in an economic downturn might lead to an increase in heart disease mortality. Brenner (1971) conducted a study looking at the relationship between economic change and heart disease mortality in New York State and the United States over the period 1960 to 1967. His data revealed a two-year lag in heart disease mortality after changes in employment. The study indicates economic downturns are associated with increased mortality from heart disease, and the mortality rate decreases during times of economic upturns. Only during the last six or seven years of his study (1960-1967) were times that had even moderately effective methods of treating coronary artery disease.

Rates of death due to stroke have also been examined. Though the following studies were conducted outside of the United States, it is implicit that the conclusions would be the same in the United States as in these developed nations. Franks et al. (1991) analyzed data provided by the Office of Population Censuses and Surveys (OPCS) on adults 45 to 74 years of age living in Greater London from 1971 to 1981. They found

a strong correlation between rates of death due to stroke and unemployment among men, imputing a "dose-response" relation of 5.4 excess deaths due to stroke per 100,000 men for every 1% increase in the jobless rate. However, no significant association was found among women. Brenner and Mooney (1983) also reported positive associations between unemployment rates and rates of mortality due to cerebrovascular causes in Canada, Sweden, France and Germany.

Early empirical research on heart-disease incidence and mortality clearly demonstrated that fluctuations in heart-disease mortality rates were inversely related to the employment rate in New York State from 1915 to 1967. Mortality from coronary-artery disease was related to fluctuations in the unemployment rate for the United States from 1930 to 1960. Both of these studies found that mortality peaked at least two to three years after economic recessions (Amick et al., 1995).

4.2 CIRRHOSIS OF THE LIVER

Amick et al. (1995) found that increases in mortality rates due to cirrhosis of the liver are positively related, over time, to consumption increases of distilled spirits (rather than wine or beer), and such consumption increases with cyclic declines in the national economy. Cirrhosis mortality itself increases substantially one to two years after national economic recession. Since it takes a long time to acquire chronic cirrhosis of the liver, it is clear that the short-term economic trauma had not initiated the cirrhotic condition, but that once morbidity was present, economic recession tended to hasten mortality.

Additionally, per Amick et al. (1995), admissions to mental hospitals for psychosis related to alcoholism and other alcohol-related mental disorders showed

substantial increases during economic recessions for the period 1921 to 1968. Similarly, arrests for drunkenness in Massachusetts increased with adverse changes in the national economy over the period 1915 to 1968. The arrests lagged two years behind fluctuations in the economy. Arrest rates for driving while intoxicated were also found to increase greatly during national economic recessions.

The studies that have been conducted regarding the effect of job loss on alcohol consumption typically support the hypothesis that those who have lost jobs or income consume more alcohol that those who have not. The findings are consistent with the National Institute of Alcohol Abuse and Alcoholism (1982) often-noted fact that a disproportionate fraction of those in treatment for alcohol disorder are unemployed. A rise in death from cirrhosis of the liver suggests that there is some relationship between growing unemployment and heavy drinking, even though the former is inversely related to overall alcohol consumption. It is interesting to note that Brenner (1975) found that wine and beer consumption in general reflects prosperous and stable periods, while consumption of distilled spirits reflects long-term wealth and short-term economic stress. Certain groups (the minority of the aggregate) in his study were more likely to turn to distilled spirits during times of major economic stress than others.

Persons who were employed and did not abuse alcohol at their first interview were more likely to report alcohol disorder at their second interview if they were laid off workers (i.e., not working and collecting unemployment insurance) at the second interview. The coefficient for laid off measures the effect of job loss statistically adjusted for the history of alcohol disorder. Catalano et al. (1993) also replicated the test (1) for

the subsample of respondents who had no history of alcohol disorder and (2) without the interaction of history of alcohol disorder and lay off, and found essentially the same effect. Among the control variables, being younger, male, and having had an earlier episode of alcohol disorder significantly increased the likelihood of alcohol disorder at the second interview. Though alcohol is only one cause of several, the more alcohol one consumes, the greater his chance of getting cirrhosis of the liver. The amount of alcohol that can injure the liver varies greatly from person to person. In women, as few as two to three drinks per day have been linked with cirrhosis and in men, as few as three to four drinks per day. Alcohol seems to injure the liver by blocking the normal metabolism of protein, fats, and carbohydrates (www.digestive).

A study by Brenner (1973) revealed that psychiatric hospitalization of people diagnosed as having psychosis with alcoholism increases sharply during economic downturns and decreases during upturns. One possible inference is that the incidence of alcoholic addiction similarly increases sharply during downturns and decreases during upturns in the economy. It is also possible that the incidence of addiction in general is inversely related to changes in the economy. One major implication of economic instability may be increases in many different types of social deviance as well as physical and psychological illness.

4.3 LUNG CANCER

Moore (1996) conducted a study that analyzed death and tobacco taxes. His paper argued that taxes are a proxy for general attitudes toward health, or perhaps resources devoted to health, which would differ across states over time. If this is the case, taxes

exert an effect on mortality given tobacco consumption, and therefore appear as significant predictors of mortality when added to his mortality-consumption regressions. Moore (1996) found that a ten percent increase in the tobacco tax rate is estimated to save about 6,000 lives per year, or, more accurately, to extend them. Taxes are more likely to be raised during times of economic growth, rather than economic downturns. Therefore during economic upturns, more lives may be saved from lung cancer due to additional cigarette taxes.

Among other health hazards, a group of British researchers Bartley et al. (1998) examined the relationship between unemployment and cigarette smoking (which can be partly considered as an outcome of various health behaviors) in men from a national longitudinal birth cohort study at age 33. At age 16, men who subsequently experienced more than three years of unemployment were already more likely to smoke (50.0%) than those who experienced no unemployment, of whom 31.6% were smokers. By age 33 this difference had grown to 51.2% of men who had accumulated over three years of unemployment compared with 25.8% smoking among those who had never been unemployed, reflecting the greater tendency for men who experience less unemployment to stop smoking. The recently unemployed were also more likely to smoke at age 33 years than those who had not been recently unemployed (53.9% and 28.6% respectively). After adjustment for confounding variables, including the number of cigarettes smoked per week at age 16, the relative odds of smoking at age 33 were 2.11 to 1.00 (95% confidence interval: 1.27-3.50) in the group with more than three years of unemployment.

Bartley et al. (1998) also found that smoking at age 33 was also associated with

recent unemployment (adjusted relative odds 2.06 to 1.00, 95% confidence interval: 1.41-3.03). Including both accumulated and recent unemployment in the same model suggested that both were independently associated with smoking at age 33. A univariate analysis (n=5,242) to assess the effect of excluding cases with missing data indicated that the relationship between unemployment and cigarette smoking at age 33 may have been somewhat underestimated: 55.6% of men who accumulated over three years of unemployment and 54.1% of recently unemployed men were smokers. Youth unemployment has been associated with a deterioration in health behaviors, including smoking, and the men in this study who had accumulated more unemployment were less likely to give up cigarette smoking and slightly more likely to have taken it up. As unemployment rises, so does the smoking rate, and the higher the smoking rate, the greater one is at risk for getting lung cancer.

4.4 SUICIDE

According to Amick et al. (1995) suicide was the first indicator of mental pathology found to increase consistently with adverse changes in the economy. A number of researchers have replicated these findings, attesting to the severe stress brought about by economic recession.

More than a century ago, Durkheim (1897) argued that the disparity between "needs" (socially conditioned expectations or aspirations) and the "means" to satisfy those needs may result in the extreme individual recourse to suicide. In times of economic stagnation, individuals' means are reduced, and they must "reduce their requirements, restrain their needs". Ahlburg and Schapiro (1982-1983) show that such

adjustments take time: society cannot instantaneously produce a new set of norms to meet the new set of economic conditions. The individual's "means and needs" are not in equilibrium, so anguish and frustration intensify and the contemplation of suicide increases.

When relative income is high, norms are more easily attained, thereby reducing psychological stress and leading to a decline in antisocial behavior such as homicides and suicides and to a greater adherence to traditional role models as reflected in increased marriage and fertility rates and lower divorce rates. When, instead, relative income is low, the disparity between means and needs leads to psychological stress and an opposite movement in socioeconomic behavior. Thus, for scholars like Durkheim, the relationship between goals and reality may explain changes in suicide rates over time. Among others, Henry and Short (1954), Breed (1963), Brenner (1973), and Ahlburg and Schapiro (1982-1983), have found that an increase in the suicide rate is positively correlated with an increase in the unemployment rate.

Grave economic maladjustments undoubtedly give rise to abnormal mental stresses and strains, which may be expected to react in a positive fashion to the number of suicides that occur. Hurlburt (1932) examined the rise and fall of business activity and suicide rates over a twenty-four year period. Notable declines in business activity were closely followed by substantial increases in the suicide rate; inversely, periods of prosperity were accompanied by declines in the suicide rate. Exceptions to this hypothesis are explained by outside factors, such as World War I prosperity or years with several months of prosperity followed by several months of economic downturn (or vice-

versa). Hurlburt's findings show signs that the suicide rate tends to increase during times of economic hardship and decrease during times of prosperity. However, during times of acute economic distress or abnormal prosperity, the suicide rate was more pronounced (either in presence or absence).

A time-series study of the economy and suicide in the United States by Yang (1992) found that, for the overall suicide rate, all of the independent variables were significant at the 5% level. The impact of economic growth on the overall suicide rate was as expected in the hypothesis as indicated by the sum of the coefficients associated with the current year and the one-year lagged per capita gross national product. That is, -.57 + .48 = -.11, meaning, that when the real income on a per capita basis increases by 1%, the suicide rate decreases by .11%. The economy tends to play a large role in the suicide rate.

Ahlburg and Schapiro (1982-1983) concluded that under high levels of employment the adverse effects of relative cohort size could be moderated for older males who are particularly sensitive to increased unemployment. If, however, the economy continues in recession, the impact of high needs and low means will be reinforced and will magnify the already high suicide rates for older males. Suicide must be added as the ultimate human price to the already heavy burden of high unemployment rates.

In the words of Brenner (1973), there is considerable evidence of an inverse relation between mortality from suicide and economic change. Suicide is another example of an act that is frequently thought to be fundamentally psychopathological or, at

least, to be a symptom of an underlying pathological condition. Moreover, in the case of suicide there are some studies that show very similar relations with economic change to ones found in studies of mental-hospital admissions.

4.4.1 ANTIDEPRESSANTS

The national suicide rate in the United States climbed 31% between 1957 and 1986 (except a small dip in the late 1970's). The reasons for this increase are unclear. However, in 1987 the suicide rate began to decline and that trend has continued. This time period closely followed the introduction of non-tricyclic antidepressants (such as Prozac). Psychological autopsies indicate that about 60% of suicides occur in the context of a depressive disorder and that most of those suicides were not being treated with antidepressant medication at the time of death. Nationally representative data for the period 1985 to 1999 indicate that annual antidepressant prescriptions increased four-fold in the US. This increase suggests more widespread treatment of depression and other illnesses for which antidepressants have been found efficacious, such as anxiety disorders and chronic pain. Ellis et al. (2004) ran multiple regressions that found an inverse association of the prescription rate for antidepressants with the suicide rate.

According to Bhaumik et al. (2005), more than 90% of suicides in the United States are associated with psychiatric illnesses. The most common psychiatric illness associated with suicide is mood disorder, and although most seek professional help within one month before death, most are untreated at the time of death. The group analyzed the relationship between antidepressant pharmacy prescription volumes and suicide rate overall at the county level. Their results agreed with studies in other

countries that reported that a decrease in suicide rate correlated with increased antidepressant use over a particular period. Suicidal behavior correlates with inadequate prescription of antidepressants, and from 1978 to 1997, the proportion of the outpatient US population with depression receiving at least one antidepressant prescription increased from 37.3% to 74.5%.

CHAPTER 5: METHOD & VARIABLES

In order to evaluate the effect of the economy on the health of Americans, the annual number of deaths caused by several diseases was studied. The Centers for Disease Control and Prevention (CDC) records the annual number of deaths for the most common deaths; this paper used those numbers for certain diseases for the years 1968 to 2004. The Unites States Census Bureau reports the total population of the United States, as well as population per age. I used this information to find the percentage of the US population between the ages of 21 and 65 for the years 1968 to 2004. This population was used because a larger population (such as the entire US population) would imply more deaths by each disease. To a first approximation, the population may be growing linear and the time trend would capture population growth. However, over this time period, the average age of the US citizen has risen.

I took this percentage and multiplied it by the number of deaths caused by each disease per year. Then I took the natural log of this number, which was used as the dependent variable in the linear regressions. The independent variables were chosen to reflect the current state of the economy for a particular year; they include the year, output gap, unemployment, inflation, and a two-year lag in output gap, unemployment, and inflation. Poisson regressions were also run to show the robustness of the linear regressions.

The variable HEART ATTACK represents the number of deaths caused by acute myocardial infarction (commonly referred to as a heart attack), STROKE represents the

number of deaths caused by cerebrovascular disease (results of cerebrovascular disease can include a stroke, or even sometimes a hemorrhagic stroke; this is used as the proxy for stroke), and the variable HYPERTENSION (commonly referred to as high blood pressure) was looked at to assess heart disease. These three diseases were also combined and are referred to as the variable HEART DISEASE.

Chronic liver disease and cirrhosis are used to represent those that have died from alcoholism. Along with hepatitis C, chronic alcoholism is the most common cause for chronic liver disease and cirrhosis; this variable is called CIRRHOSIS.

LUNG CANCER is the variable that represents deaths from malignant neoplasms of the respiratory system, which features the airways, lungs, and respiratory muscles.

Suicide numbers are recorded for those that take their own lives, and the variable is labeled SUICIDE.

In order to further investigate suicide, which is commonly a result of depression, I looked at sales data from some of the most popular antidepressants on the market today. The variable ELI LILLY represents the Eli Lilly neuroscience and/or central – nervous system drugs (used to treat depression and other neurological disorders) available from 1991 to 2004; these drugs include Prozac, Darvon, Permex, Zyprexa, Cymbalta, Strattera, Symbax, and Yentreve. ZOLOFT denotes the annual sales of Zoloft for the years 1996 to 2004. WELLBUTRIN represents the annual sales of Wellbutrin in the United States for the years 2000 to 2004. PAXIL represents the annual sales of Paxil in the United States for the years 2000 to 2004. TOTAL is the variable that corresponds to the combination of all of the previously mentioned antidepressants. It is important to note that Zoloft,

Wellbutrin, nor Paxil had a generic form available prior to or during the year 2004. Eli Lilly's neuroscience drugs may have had a generic drug available; however, at least one of the drugs in the category was available in non-generic form only. The sales data for Eli Lilly and Zoloft were available from the each of the drug company's annual 10-K's filed with the United States Securities and Exchange Commission (SEC). GlaxoSmithKline's Wellbutrin and Paxil sales data were available from the company's annual report.

The following variables are used to look at diseases that were hypothesized to not be affected by economic downturns. The variable LEUKEMIA represents all deaths brought about by leukemia. BREAST CANCER is the variable for deaths caused by malignant neoplasms of breast (commonly referred to as breast cancer). OTHER CANCER refers to malignant neoplasms of all other and unspecified sites. NON-ECON is the variable name for the combination of LEUKEMIA, BREAST CANCER, and OTHER CANCER combined.

The right-hand-side variables are measures of the economy. YEAR is the label for the years 1968 to 2004. OUTPUT GAP is formulated by the Congressional Budget Office (CBO) and measures the percentage difference between actual and potential output. A positive output gap indicates that the actual output is greater than potential output. Conversely, when potential output is greater than actual output, the output gap is negative. OUTPUT GAP is used in this paper as a measure of the economy's well being. Output generally falls below potential during recessions, remains below potential during

recoveries and early expansions, and rises above potential during late expansions. OUTPUT 2 YR. LAG is the two-year lag of the output gap.

UNEMPLOYMENT is the percent of unemployed workers in the civilian labor force in the United States, supplied by the Bureau of Labor Statistics (BLS). UNEMP. 2 YR. LAG is the two-year lag of unemployment.

INFLATION is the percent change in the Consumer Price Index (CPI), supplied by BLS. Taking the CPI of year 2 and subtracting the CPI of year 1, then dividing that by CPI of year 1, and then multiplying that by 100 calculates INFLATION. INFLATION 2 YR. LAG is the one-year lag of inflation. SUICIDE was used on the right-hand-side when regressions were run with antidepressant sales data on the left-hand-side.

I predicted that HEART ATTACK, STROKE, HYPERTENSION, HEART DISEASE, CIRRHOSIS, LUNG CANCER, and SUICIDE would be statistically significant and would be inversely correlated with the OUTPUT GAP and OUTPUT 2 YR. LAG. As the output gap increases, it represents economic downturn, and the numbers of deaths from these diseases should therefore increase. I also thought that the same dependent variables would be statistically significant, yet positively correlated with the UNEMPLOYMENT, UNEMP. 2 YR. LAG, INFLATION, and INFLATION 2 YR. LAG. Increasing unemployment and inflation represent economic hardship, so the numbers of deaths from these diseases should increase as unemployment and inflation continue to rise. I did not think that LEUKEMIA, BREAST CANCER, OTHER CANCER, or NON-ECON would be statistically significant. However, if they are

statistically significant, I hypothesize that they would also be negatively correlated with the output gap and lags, and positively related with unemployment, inflation, and related lags.

To further investigate suicide, I looked at sales data from antidepressants to see if the sales data correspond to the number of suicides in the United States. I hypothesized that ELI LILLY, ZOLOFT, WELLBUTRIN, PAXIL, and TOTAL would be negatively correlated with SUICIDE because as the number of suicides decreases, the more people there will be taking antidepressants and the sales revenue would increase. The same left hand side variables were hypothesized to be positively correlated with YEAR. As time goes on, the number of antidepressant prescriptions has increased and therefore the revenues should increase as well. I thought OUTPUT GAP and OUTPUT 2 YR. LAG would also be positively correlated because as the output gap increases, the number of suicides should decrease, meaning the number of people on antidepressants has increased. I predicted that UNEMPLOYMENT, UNEMP. 2 YR. LAG, INFLATION, and INFLAT. 2 YR. LAG would be inversely correlated with the antidepressant sales. As these indicators of economic downturns increase, the number of suicides should increase as well; therefore the antidepressant sales revenues should be negative.

CHAPTER 6: DATA & INTERPRETATION

Overall, my empirical findings were not as strong as I would have liked. However, that does not mean the results cannot give insight into this economic problem. Each cause of death was regressed in the linear distribution and were run with a 95% confidence interval. The following combinations of right-hand side variables were evaluated:

- YEAR, OUTPUT GAP, UNEMPLOYMENT
- YEAR, OUTPUT GAP, OUTPUT GAP 2 YR. LAG, UNEMPLOYMENT, UNEMP. 2 YR. LAG, INFLATION, INFLAT. 2 YR. LAG

The HEART ATTACK regressions were statistically significant and inversely correlated with YEAR. When statistically significant, and as predicted, UNEMPLOYMENT was positively related to the output gap. Therefore, a 1% increase in the unemployment rate leads to a 2.78% change in deaths. Unemployment is a significant variable in the regression; this means that in the year 2000, a 1% increase in unemployment rate would have led to 3,125 additional deaths caused by a heart attack, for people between the ages of 21 and 65. Please see Table 1 in the Appendix for results.

As can be seen in Table 2 in the Appendix, the STROKE regressions were always statistically significant and were negatively correlated with YEAR.

YEAR was always positively correlated with the HYPERTENSION regressions, thus the number of deaths caused by HYPTERTENSION continues to increase as time goes on. UNEMPLOYMENT and UNEMP. 2 YR. LAG were negatively correlated with

HYPERTENSTION when statistically significant at the 5% level. Thus, 1,170 or an 11.11% decrease in deaths of people between the ages of 21 and 65 would result from a 1% increase in the unemployment rate. This was not predicted; see Table 3 in the Appendix for more detailed results.

Yet, it is interesting to note that other studies, such as Jin et al. (1997), have found a positive correlation between unemployment and death due to heart disease, thus signifying that a poor economy does indeed have a negative effect on health.

Looking at a combination of heart diseases, the HEART DISEASE regressions can be seen in Table 4. YEAR was always statistically significant and positively correlated with HEART DISEASE. When significant, OUTPUT GAP was positively related. This was not hypothesized and says that a 1% increase in the output gap, would lead to a 1.04% increase in the number of deaths caused by a combination of heart attacks, stroke, and hypertension. This would be an additional 2,295 deaths of people between the ages of 21 and 65 in the United States in 2000.

When statistically significant, CIRRHOSIS was inversely correlated with YEAR. Unlike the hypothesis, CIRRHOSIS was positively correlated with OUTPUT GAP and OUTPUT 2 YR. LAG when significant at the 5% level. However, as hypothesized, UNEMPLOYEMENT was positively correlated and always statistically significant. Thus, a 1% increase in the unemployment rate leads to an increase in deaths of between 3.35% (first regression) and 4.35% (second regression). INFLATION was also positively correlated with CIRRHOSIS when statistically significant, as predicted. Therefore, a 1% rise in inflation will lead to a 0.74% increase in the number of deaths caused by cirrhosis

of the liver for people between the ages of 21 and 65. In the year 2000, this percentage would result in an additional 115 deaths. Please see Figure 1 in the Appendix. More detailed results can be found in Table 5 of the Appendix. Numbers of death caused by CIRRHOSIS seem to be greatly effected by changes in the economy.

As seen in Table 6 of the Appendix, YEAR was always significant at the 5% level and positively correlated with LUNG CANCER. When statistically significant, both UNEMPLOYMENT and UNEMP. 2 YR. LAG were positively correlated, as predicted. A 1% increase in the unemployment rate leads to a 6.55% increase deaths. This variable is highly substantial and means that for the year 2000, and additional 5,938 lives would be lost due to lung cancer. While a 1% increase in a two-year lag of the unemployment rate leads to a 2.99% increase in deaths caused by lung cancer. Both of these results indicate that economic downturns have negative impacts on one's health.

SUICIDE was positively and statistically significant with OUTPUT GAP. This was not predicted, and means that as the output gap increases, the number of suicides increases as well. Yet, as hypothesized, when significant, UNEMPLOYMENT and UNEMP. 2 YR. LAG were positively correlated. A 1% increase in the unemployment rate leads to a 5.90% increase in suicides. In the year 2000, this would have been another 1,009 suicides in people ages 21 to 65. Please see Figure 2 in the Appendix. A 1% increase in the two-year lag in the unemployment rate leads to a 2.45% increase in suicides. YEAR was always significant and positive. Please see Table 7 in the Appendix.

The following variables were hypothesized to have no effect from economic conditions. However, some of the right-hand-side variables were statistically significant. Please see Tables 8, 9, 10, and 11 of the Appendix for these results. LEUKEMIA was only statistically significant with YEAR at the 5 % level. Yet, as predicted, no economic measures were statistically significant with LEUKEMIA.

BREAST CANCER was always statistically significant and positively correlated with YEAR; when significant, UNEMPLOYMENT was also positively correlated. This was predicted if there was significance.

OTHER CANCER and NON-ECON were always positively correlated and statistically significant with YEAR. When significant, both of these dependent variables were positively related to UNEMPLOYMENT and UNEMP. 2 YR. LAG. If correlation were to exist, this was the predicted relation.

To further explore the effect that the economy has on suicide, each of the variables relating to antidepressant sales data were regressed in the Gaussian distribution, with the following combinations of right-hand side variables. The regressions were run with a 90% confidence interval:

- YEAR, SUICIDE
- YEAR, SUICIDE, OUTPUT GAP, OUTPUT 2 YR. LAG, UNEMPLOYMENT, UNEMP. 2 YR. LAG, INFLATION, INFLAT. 2 YR. LAG

ELI LILLY regressions were always statistically significant at the 10% level and were positively correlated with YEAR, which was to be expected. As the years go on, more revenue is generated from sales of antidepressants. As hypothesized, SUICIDE was

inversely related when statistically significant. A 1% increase in the number of suicides for people ages 21-65 leads to a -0.02% reduction in sales from drugs used to treat depression and other neurological disorders produced by Eli Lilly. For the year 2000, this would mean a decline in sales by over $1 million. OUTPUT GAP its lag were both hypothesized to be positive. However, OUTPUT 2 YR. LAG was inversely related. UNEMPLOYMENT and INFLATION were both negatively correlated with ELI LILLY when significant at the 10% level, as predicted. Please see Table 12 in the Appendix for specific findings.

As seen in Table 13 of the Appendix, regressions looking at Zoloft sales data also found that ZOLOFT was positively correlated, when statistically significant, with YEAR. SUICIDE was statistically significant and negatively correlated. A 1% increase in the number of suicides for people ages 21-65 leads to a -0.16% reduction in sales from Zoloft. This is a reduction of over $3.4 million.

As hypothesized, WELLBUTRIN was positively correlated with YEAR and OUTPUT GAP when significant. UNEMPLOYMENT and INFLATION were positively correlated with YEAR when statistically significant at the 10% level; this was not hypothesized. Results can be seen in Table 14 of the Appendix.

As hypothesized, PAXIL was positively correlated with YEAR, OUTPUT GAP, and OUTPUT 2 YR. LAG when significant. SUICIDE, UNEMPLOYMENT, and INFLATION were all hypothesized to be inversely related with PAXIL, yet were positively related when statistically significant at the 10% level.

As predicted, TOTAL regressions were always statistically significant at the 10% level and were positively correlated with YEAR. When statistically significant, SUICIDE was negatively correlated, as hypothesized. A 1% increase in the number of suicides for people ages 21-65 leads to a -0.02% reduction in sales for all of these antidepressants combined. Please see Figures 3 and 4, as well as Table 16 in the Appendix for detailed results. The summary statistics for all variables are available in Table 17 of the Appendix.

It should be noted that when evaluating the drug data, an endogeniety problem might exist between the sale of antidepressants and the number of deaths from suicide. Future research may need to correct for the endogeniety. One possible way to do so may include taking the following variables into account: the number of persons institutionalized for mental disorders, the number of antidepressant prescriptions, the number of counseling or psychiatric visits. However, all of these variables are related to mental health.

If at all possible, an instrumental variable (IV) that correlated with antidepressant sales, but not suicide rates, would be used. Two stage least squares regressions would be run to estimate this variable. Looking at the Food and Drug Administration (FDA) approval time may work for an IV. According to Dranove and Meltzer (1994) and Kaitin et al. (1991), the FDA tends to approve more important drugs faster. If an antidepressant is deemed important by the FDA and approved more quickly, there may be a lagged correlation between the drug's importance and the sales of that particular drug.

There is much more work to be done on this subject. It is my hope that future scholars will continue to investigate this problem and get more meticulous in their research. While some have investigated this on a small scale, I think it would be useful to look at specific regions of the country and world, as well as specific age groups and ethnicities to see how people react to economic changes. Looking at education levels, the number of available hospitals, the amount of government funding towards healthcare, and population specifics would perhaps give greater insight to those that are more at risk for disease. Times of economic downturns may magnify the causality between these variables and the number of deaths from the diseases evaluated in this paper.

It would also be intriguing to conduct an extensive case study on selected individuals, seeing how certain people react to changes in the economy over an extended time period. The goal of this research would be to help prevent future health tribulations, especially leading to death, in the event of hard economic times. It may be idealistic to think that lives could be saved or extended by informing people what actions may be especially harmful to their health during economic downturns. However, there is always the possibility that knowledge will lead to prevention, in which case lives may be enriched or saved.

CHAPTER 7: CONCLUSION

We do not know why different people develop different responses to economic distress – why some become distressed or commit suicide, while others develop physical illnesses or why some commit crimes, as others slip into apathy or revolt (Horwitz 1984). This paper has shown that we are able to see correlations between the economy and health conditions. My empirical evidence shows that economic downturns feature an increase in deaths from heart attacks, cirrhosis of the liver, lung cancer, and suicide.

As our current economy is in the midst of a recession and the national unemployment rate continues to rise, it will be interesting to see if the health of Americans responds according to my hypothesis (data.bls.gov). Will there be increased numbers of deaths caused by heart disease, cirrhosis of the liver, lung cancer, and suicides? I predict that there will be; yet only time will tell how this recession will affect America's health.

APPENDIX

Figure 1: CIRRHOSIS and INFLATION

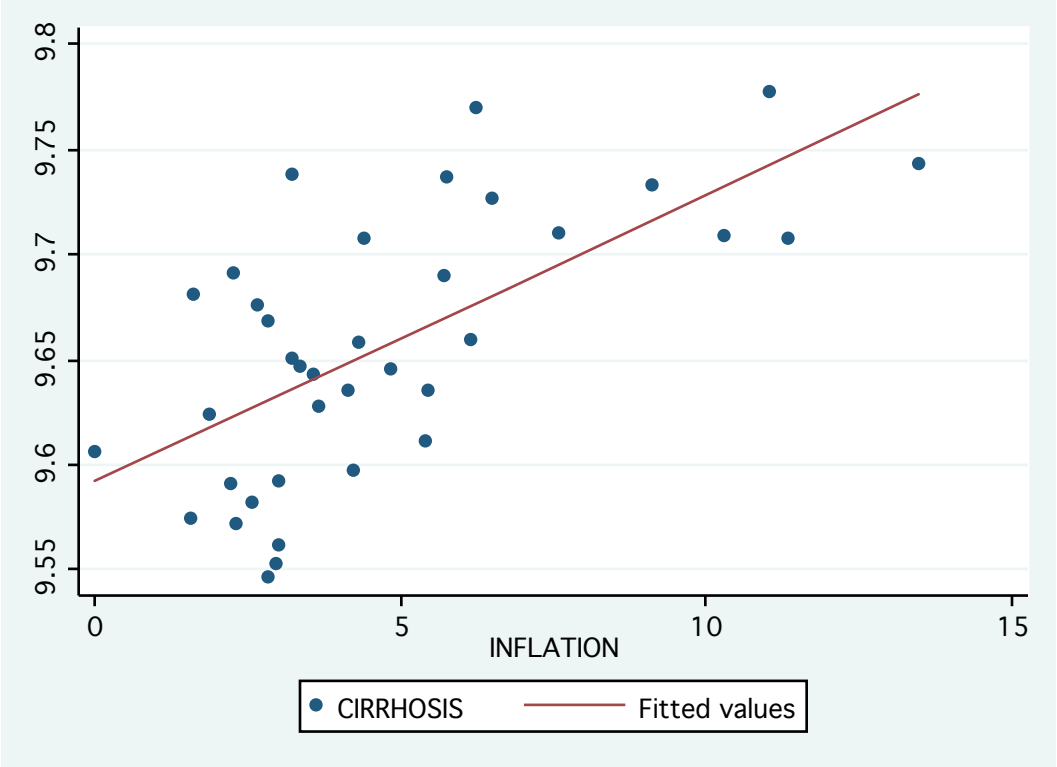

Figure 2: SUICIDE and UNEMPLOYMENT

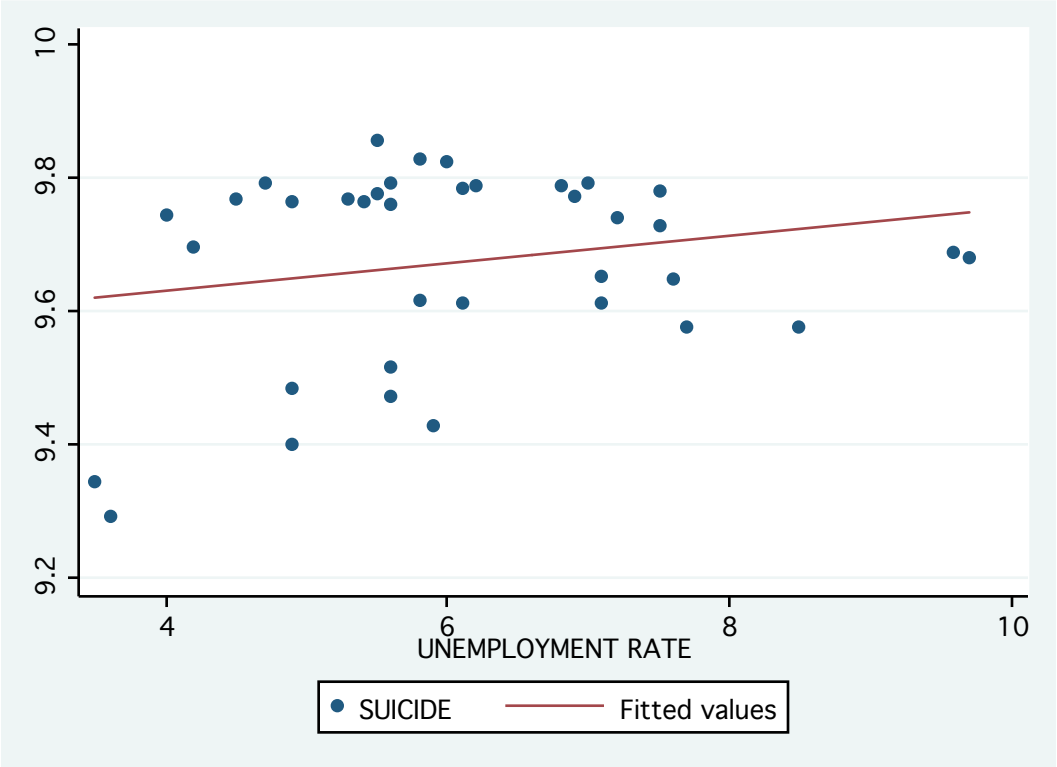

Figure 3: TOTAL and YEAR

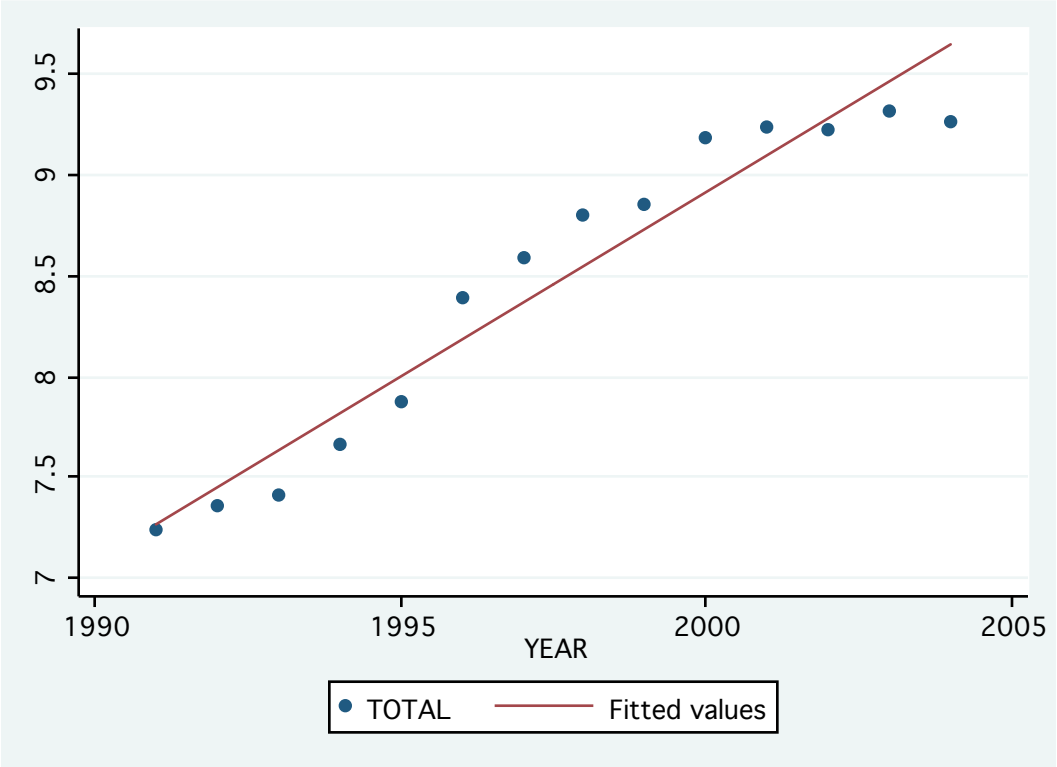

Figure 4: TOTAL and SUICIDE

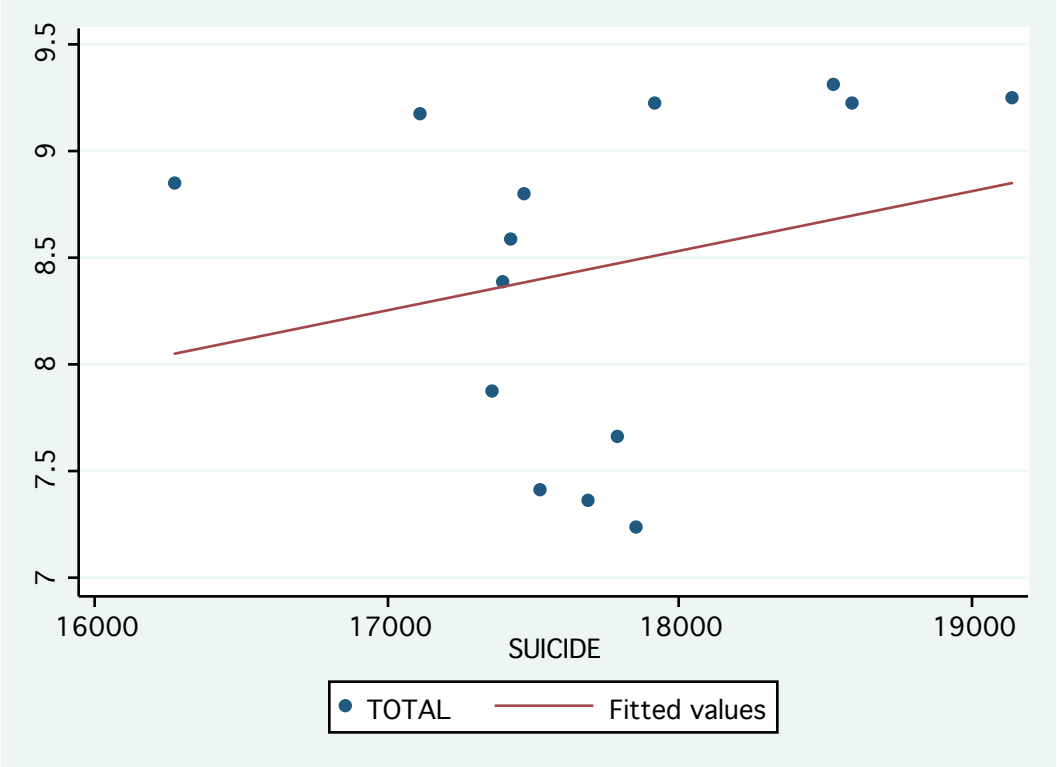

TABLE 1: HEART ATTACK Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9736	37
YEAR	-0.0177479 *	-31.30	0.000		
	(0.000567)				
OUTPUT GAP	0.0886851	1.39	0.174		
	(0.006244)				
UNEMPLOYMENT	0.0277942 *	2.91	0.006		
	(0.009549)				
Constant	46.96602 *	40.94	0.000		
	(1.147249)				
				0.9788	37
YEAR	-0.0185684 *	-24.36	0.000		
	(0.000762)				
OUTPUT GAP	0.0005355	0.08	0.939		
	(0.006882)				
OUTPUT 2 YR. LAG	0.0000454	0.01	0.991		
	(0.004201)				
UNEMPLOYMENT	0.0043554	0.30	0.765		
	(0.014404)				
UNEMP. 2 YR. LAG	0.0105521	1.83	0.078		
	(0.005776)				
INFLATION	-0.0009748	-0.35	0.730		
	(0.002798)				
INFLAT. 2 YR. LAG	0.0020571	0.58	0.565		
	(0.003536)				
Constant	48.66829 *	31.58	0.000		
	(1.541213)				
* dentotes statistical significance at the 5% level					

TABLE 2: STROKE Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.5897	37
YEAR	-.0058026 *	-5.84	0.000		
	(0.000994)				
OUTPUT GAP	0.0019684	0.18	0.858		
	(0.010949)				
UNEMPLOYMENT	-0.0222374	-1.33	0.193		
	(0.016743)				
Constant	23.11002 *	11.49	0.000		
	(2.011608)				
				0.6859	37
YEAR	-.0048372 *	-3.71	0.001		
	(0.001305)				
OUTPUT GAP	0.0136766	1.16	0.255		
	(0.011784)				
OUTPUT 2 YR. LAG	0.0113475	1.58	0.126		
	(0.007194)				
UNEMPLOYMENT	-0.0077781	-0.32	0.755		
	(0.024663)				
UNEMP. 2 YR. LAG	-0.0042333	-0.43	0.672		
	(0.009890)				
INFLATION	-0.0014132	-0.29	0.770		
	(0.004791)				
INFLAT. 2 YR. LAG	0.0064258	1.06	0.297		
	(0.006055)				
Constant	21.11837 *	8.00	0.000		
	(2.638977)				
* dentotes statistical significance at the 5% level					

TABLE 3: HYPERTENSION Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.8652	37
YEAR	.0317799 *	12.12	0.000		
	(0.002623)				
OUTPUT GAP	-0.0242516	-0.84	0.407		
	(0.028885)				
UNEMPLOYMENT	-.1111653 *	-2.52	0.017		
	(0.044172)				
Constant	-53.84756 *	-10.15	0.000		
	(5.306985)				
				0.9341	37
YEAR	.0365534 *	13.28	0.000		
	(0.002752)				
OUTPUT GAP	0.0299068	1.20	0.239		
	(0.024851)				
OUTPUT 2 YR. LAG	-0.0015691	-0.10	0.918		
	(0.015171)				
UNEMPLOYMENT	0.0501656	0.96	0.343		
	(0.052012)				
UNEMP. 2 YR. LAG	-.0761626 *	-3.65	0.001		
	(0.020856)				
INFLATION	-0.0014791	-0.15	0.885		
	(0.010103)				
INFLAT. 2 YR. LAG	-0.0120327	-0.94	0.354		
	(0.012769)				
Constant	-63.78063 *	-11.46	0.000		
	(5.565403)				
* dentotes statistical significance at the 5% level					

TABLE 4: HEART DISEASE Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9695	37
YEAR	-.0114964 *	-29.68	0.000		
	(0.000387)				
OUTPUT GAP	0.0071043	1.67	0.105		
	(0.004267)				
UNEMPLOYMENT	0.00686	1.05	0.301		
	(0.006525)				
Constant	35.20644 *	44.91	0.000		
	(0.782876)				
				0.9756	37
YEAR	-.0112403 *	-21.63	0.000		
	(0.005196)				
OUTPUT GAP	.0103781 *	2.21	0.035		
	(0.004691)				
OUTPUT 2 YR. LAG	0.004892	1.71	0.098		
	(0.002864)				
UNEMPLOYMENT	0.007881	0.80	0.429		
	(0.009819)				
UNEMP. 2 YR. LAG	0.0005588	0.14	0.888		
	(0.003937)				
INFLATION	-0.0006305	-0.33	0.743		
	(0.001907)				
INFLAT. 2 YR. LAG	0.0031835	1.32	0.197		
	(0.002411)				
Constant	34.68092 *	33.01	0.000		
	(1.050626)				
* dentotes statistical significance at the 5% level					

TABLE 5: CIRRHOSIS Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.4035	37
YEAR	-.0024945 *	-2.96	0.006		
	(0.000844)				
OUTPUT GAP	.0199705 *	2.15	0.039		
	(0.009293)				
UNEMPLOYMENT	.0334912 *	2.36	0.025		
	(0.014211)				
Constant	14.41684 *	8.44	0.000		
	(1.707298)				
				0.7547	37
YEAR	-0.0008767	-1.08	0.289		
	(0.000812)				
OUTPUT GAP	.0323409 *	4.41	0.000		
	(0.007330)				
OUTPUT 2 YR. LAG	.0148492 *	3.32	0.002		
	(0.004475)				
UNEMPLOYMENT	.043483 *	2.83	0.008		
	(0.015341)				
UNEMP. 2 YR. LAG	0.0048128	0.78	0.440		
	(0.006151)				
INFLATION	.007409 *	2.49	0.019		
	(0.002980)				
INFLAT. 2 YR. LAG	0.0035605	0.95	0.352		
	(0.003766)				
Constant	11.07807 *	6.75	0.000		
	(1.641487)				
* dentotes statistical significance at the 5% level					

TABLE 6: LUNG CANCER Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.935	37
YEAR	.0307887 *	20.66	0.000		
	(0.001490)				
OUTPUT GAP	0.013222	0.81	0.426		
	(0.016410)				
UNEMPLOYMENT	.0655018 *	2.61	0.014		
	(0.025095)				
Constant	-50.43729 *	-16.73	0.000		
	(3.015009)				
				0.9576	37
YEAR	.0286574 *	15.88	0.000		
	(0.001805)				
OUTPUT GAP	-0.0112172		0.497		
	(0.016297)				
OUTPUT 2 YR. LAG	-0.0051651		0.608		
	(0.009949)				
UNEMPLOYMENT	0.0052774		0.878		
	(0.034108)				
UNEMP. 2 YR. LAG	.0298839 *		0.037		
	(0.013677)				
INFLATION	0.0027164		0.685		
	(0.006625)				
INFLAT. 2 YR. LAG	-0.0016528		0.845		
	(0.008374)				
Constant	-46.03108		0.000		
	(3.649655)				
* dentotes statistical significance at the 5% level					

TABLE 7: SUICIDE Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9014	37
YEAR	.0130586 *	16.51	0.000		
	(0.000791)				
OUTPUT GAP	.0185093 *	2.13	0.041		
	(0.008709)				
UNEMPLOYMENT	.0589948 *	4.43	0.000		
	(0.013319)				
Constant	-16.60979 *	-10.38	0.000		
	(1.600133)				
				0.9455	37
YEAR	.0114848 *	13.02	0.000		
	(0.000882)				
OUTPUT GAP	0.0080148	1.01	0.323		
	(0.007964)				
OUTPUT 2 YR. LAG	0.0056859	1.17	0.252		
	(0.004862)				
UNEMPLOYMENT	0.0321907	1.93	0.063		
	(0.016669)				
UNEMP. 2 YR. LAG	.0244609 *	3.66	0.001		
	(0.006684)				
INFLATION	0.0002946	0.09	0.928		
	(0.003238)				
INFLAT. 2 YR. LAG	-0.0035437	-0.87	0.394		
	(0.004092)				
Constant	-13.44998 *	-7.54	0.000		
	(1.783577)				
* dentotes statistical significance at the 5% level					

TABLE 8: LEUKEMIA Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9835	37
YEAR	.016729 *	41.78	0.000		
	(0.000400)				
OUTPUT GAP	0.0013412	0.30	0.765		
	(0.004409)				
UNEMPLOYMENT	0.0085092	1.26	0.216		
	(0.006743)				
Constant	-24.08663 *	-29.73	0.000		
	(0.810126)				
				0.9854	37
YEAR	.0169783 *	29.95	0.000		
	(0.000567)				
OUTPUT GAP	0.0009776	0.19	0.850		
	(0.005119)				
OUTPUT 2 YR. LAG	-0.0053636	-1.72	0.097		
	(0.003125)				
UNEMPLOYMENT	0.0137499	1.28	0.210		
	(0.010714)				
UNEMP. 2 YR. LAG	-0.0048038	-1.12	0.273		
	(0.004296)				
INFLATION	0.0021412	1.03	0.312		
	(0.002081)				
INFLAT. 2 YR. LAG	-0.0029227	-1.11	0.276		
	(0.002630)				
Constant	-24.58568 *	-21.45	0.000		
	-1.146445				
* dentotes statistical significance at the 5% level					

TABLE 9: BREAST CANCER Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.8679	37
YEAR	.0516881 *	14.01	0.000		
	(0.001120)				
OUTPUT GAP	0.011578	0.94	0.355		
	(0.012332)				
UNEMPLOYMENT	.045102 *	2.39	0.023		
	(0.018858)				
Constant	-21.4596 *	-9.47	0.000		
	(2.265668)				
				0.9063	37
YEAR	.0137066 *	9.69	0.000		
	(0.001414)				
OUTPUT GAP	-0.0047433	-0.37	0.713		
	(0.012769)				
OUTPUT 2 YR. LAG	-0.003052	-0.39	0.698		
	(0.007795)				
UNEMPLOYMENT	0.124714	0.47	0.644		
	(0.026724)				
UNEMP. 2 YR. LAG	0.0208287	1.94	0.062		
	(0.010716)				
INFLATION	-0.0007635	-0.15	0.884		
	(0.005191)				
INFLAT. 2 YR. LAG	-0.0050421	-0.77	0.448		
	(0.006561)				
Constant	-17.42941 *	-6.10	0.000		
	-2.859565				
* dentotes statistical significance at the 5% level					

TABLE 10: OTHER CANCER Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9088	37
YEAR	.0202035 *	17.24	0.000		
	(0.001172)				
OUTPUT GAP	0.0106694	0.83	0.414		
	(0.012906)				
UNEMPLOYMENT	.0468907 *	2.38	0.023		
	(0.019737)				
Constant	-30.08294 *	-12.69	0.000		
	(2.371207)				
				0.9444	37
YEAR	.0177335 *	12.91	0.000		
	(0.001373)				
OUTPUT GAP	-0.0111508	-0.90	0.376		
	(0.012399)				
OUTPUT 2 YR. LAG	-0.0031089	-0.41	0.684		
	(0.007569)				
UNEMPLOYMENT	-0.0033038	-0.13	0.900		
	(0.025950)				
UNEMP. 2 YR. LAG	.0270839 *	2.60	0.014		
	(0.010406)				
INFLATION	-0.0017923	-0.36	0.725		
	(0.005041)				
INFLAT. 2 YR. LAG	-0.0021551	-0.34	0.738		
	(0.006371)				
Constant	-25.02289 *	-9.01	0.000		
	-2.776711				
* dentotes statistical significance at the 5% level					

TABLE 11: NON-ECON Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.917	37
YEAR	.0180708 *	18.17	0.000		
	(0.000995)				
OUTPUT GAP	0.0094335	0.86	0.395		
	(0.010955)				
UNEMPLOYMENT	.0398046 *	2.38	0.023		
	(0.016753)				
Constant	-25.09994 *	-12.47	0.000		
	(2.012754)				
				0.9446	37
YEAR	0.016202 *	13.29	0.000		
	(0.002119)				
OUTPUT GAP	-0.0070079	-0.64	0.529		
	(0.011005)				
OUTPUT 2 YR. LAG	-0.0034991	-0.52	0.606		
	(0.006718)				
UNEMPLOYMENT	0.0048419	0.21	0.835		
	(0.023032)				
UNEMP. 2 YR. LAG	.0196876 *	2.13	0.402		
	(0.009236)				
INFLATION	-0.0008595	-0.19	0.849		
	(0.004474)				
INFLAT. 2 YR. LAG	-0.0033402	-0.59	0.559		
	(0.005655)				
Constant	-21.28015 *	-8.63	0.000		
	-2.464483				
* dentotes statistical significance at the 5% level					

TABLE 12: ELI LILLY Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9588	14
YEAR	.1275261 *	15.86	0.000		
	(0.008039)				
SUICIDE	-.0002288 *	-4.76	0.001		
	(0.000048)				
Constant	-242.5803 *	-15.43	0.000		
	(15.720990)				
				0.9966	14
YEAR	0.0952373 *	7.97	0.001		
	(0.019508)				
SUICIDE	-0.0000111	-0.27	0.800		
	(0.000042)				
OUTPUT GAP	0.0160795	0.48	0.650		
	(0.033312)				
OUTPUT 2 YR. LAG	-0.0607983 *	-2.16	0.083		
	(0.028138)				
UNEMPLOYMENT	-0.1871345 *	-4.34	0.007		
	(0.043073)				
UNEMP. 2 YR. LAG	-0.0480261	-1.95	0.109		
	(0.024682)				
INFLATION	-0.0768719 *	-2.56	0.051		
	(0.030005)				
INFLAT. 2 YR. LAG	0.0048293	0.17	0.874		
	(0.028838)				
Constant	-180.4966	-7.72	0.001		
	(23.393040)				
* dentotes statistical significance at the 10% level					

TABLE 13: ZOLOFT Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.8048	14
YEAR	.8957312 *	6.68	0.000		
	(0.134163)				
SUICIDE	-.0016048 *	-2.00	0.071		
	(0.000815)				
Constant	-1755.852 *	-6.69	0.000		
	(262.362100)				
				0.8695	14
YEAR	0.662872	1.17	0.293		
	(0.564169)				
SUICIDE	0.0000616	0.03	0.976		
	(0.001960)				
OUTPUT GAP	-0.4110963	-0.26	0.804		
	(1.572589)				
OUTPUT 2 YR. LAG	-0.2777368	-0.21	0.843		
	(1.328320)				
UNEMPLOYMENT	-2.283217	-1.12	0.313		
	(2.033402)				
UNEMP. 2 YR. LAG	-0.7619961	-0.65	0.542		
	(1.164059)				
INFLATION	-0.5462211	-0.39	0.716		
	(1.416462)				
INFLAT. 2 YR. LAG	0.55145	0.41	0.702		
	(1.361357)				
Constant	-1304.034	-1.18	0.291		
	(1104.334000)				
* dentotes statistical significance at the 10% level					

TABLE 14: WELLBUTRIN Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.7895	14
YEAR	.5821728 *	4.62	0.001		
	(0.126009)				
SUICIDE	.0015932 *	2.12	0.058		
	(0.000753)				
Constant	-1188.634 *	-4.82	0.001		
	(246.416800)				
				0.9809	14
YEAR	0.2573229	1.32	0.245		
	(0.195393)				
SUICIDE	.0017737 *	2.61	0.048		
	(0.000679)				
OUTPUT GAP	1.67889 *	3.08	0.027		
	(0.544647)				
OUTPUT 2 YR. LAG	0.9224932	2.01	0.101		
	(0.460048)				
UNEMPLOYMENT	1.901354 *	2.70	0.043		
	(0.704244)				
UNEMP. 2 YR. LAG	0.1509512	0.37	0.723		
	(0.403158)				
INFLATION	2.452225 *	5.00	0.004		
	(0.490574)				
INFLAT. 2 YR. LAG	0.7762023	1.65	0.161		
	(0.471490)				
Constant	-561.4636	-1.47	0.202		
	(382.472800)				
* dentotes statistical significance at the 10% level					

TABLE 15: PAXIL Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.7428	14
YEAR	.61716 *	4.19	0.002		
	(0.147185)				
SUICIDE	0.0014638	1.66	0.124		
	(0.000879)				
Constant	-1256.088 *	-4.36	0.001		
	(287.826400)				
				0.9752	14
YEAR	0.154700	0.66	0.539		
	(0.234841)				
SUICIDE	.0019241 *	2.36	0.065		
	(0.000816)				
OUTPUT GAP	2.01613 *	3.08	0.027		
	(0.654607)				
OUTPUT 2 YR. LAG	1.152469 *	2.08	0.092		
	(0.552928)				
UNEMPLOYMENT	2.09208 *	2.47	0.056		
	(0.846425)				
UNEMP. 2 YR. LAG	0.1682992	0.35	0.742		
	(0.484552)				
INFLATION	2.787711 *	4.73	0.005		
	(0.589617)				
INFLAT. 2 YR. LAG	1.010871	1.78	0.135		
	(0.566680)				
Constant	-361.3364	-0.79	0.467		
	(459.691100)				
* dentotes statistical significance at the 10% level					

TABLE 16: TOTAL Regressions					
	Coefficint	t	P > |t|	R-squared	N
	(Standard Error)				
				0.9652	14
YEAR	.1976459 *	16.92	0.000		
	(0.011682)				
SUICIDE	-.0002177 *	-3.12	0.010		
	(0.000070)				
Constant	-382.4818 *	-16.74	0.000		
	(22.844190)				
				0.9896	14
YEAR	.1322596 *	4.03	0.010		
	(0.032844)				
SUICIDE	0.0000606	0.53	0.618		
	(0.000114)				
OUTPUT GAP	0.0507723	0.55	0.603		
	(0.091550)				
OUTPUT 2 YR. LAG	0.0164511	0.21	0.840		
	(0.077330)				
UNEMPLOYMENT	-0.2018198	-1.70	0.149		
	(0.118377)				
UNEMP. 2 YR. LAG	-0.0598837	-0.88	0.417		
	(0.067767)				
INFLATION	-0.0074739	-0.09	0.931		
	(0.082461)				
INFLAT. 2 YR. LAG	0.0828764	1.05	0.344		
	(0.079253)				
Constant	-255.5394 *	-3.97	0.011		
	(64.289970)				
* dentotes statistical significance at the 10% level					

TABLE 17: Summary Statistics					
Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
YEAR	37	1986	10.824360	1968	2004
OUTPUT GAP	37	-0.518919	2.229329	-6.6000	3.9000
OUTPUT 2 YR. LAG	37	-0.518919	2.229329	-6.6000	3.9000
UNEMPLOYMENT	37	6.091892	1.470143	3.5000	9.7000
UNEMP. 2 YR. LAG	37	5.781081	2.028250	0.0000	9.7000
INFLATION	37	4.720135	3.044722	0.0000	13.4986
INFLAT. 2 YR. LAG	37	4.586565	3.194791	0.0000	13.4986
HEART ATTACK *	37	11.883510	0.202244	11.4351	12.1451
STROKE *	37	11.449650	0.089871	11.3280	11.6304
HYPERTENSION *	37	8.602762	0.413666	8.0099	9.5188
HEART DISEASE *	37	12.412620	0.128460	12.1790	12.6160
CIRRHOSIS *	37	9.656512	0.063258	9.5465	9.7776
LUNG CANCER *	37	11.101260	0.338333	10.3834	11.4431
SUICIDE *	37	9.674357	0.145857	9.2947	9.8593
LEUKEMIA *	37	9.188238	0.181090	8.8981	9.4472
BREAST CANCER *	37	9.965675	0.178282	9.6027	10.1426
ALL OTHER CANCER *	37	10.321320	0.224720	9.8502	10.5336
NON-ECON *	37	11.026350	0.199895	10.6234	11.2152
ELI LILLY **	14	8.099405	0.498948	7.2461	8.6039
ZOLOFT **	14	4.939537	3.825527	0.0000	8.0156
WELLBUTRIN **	14	2.483018	3.460049	0.0000	7.2217
PAXIL **	14	2.622773	3.656701	0.0000	7.5681
TOTAL **	14	8.459181	0.789282	7.2461	9.3162
* denotes that the natural log of the raw data, multiplied by the percentage of the population between the ages of 21 and 65					
** denotes that the natural log was taken of the raw data					

DATA APPENDIX

TABLE A: Mortality Data

YEAR	HEART ATTACKS	STROKE	HYPERTENSION	HEART DISEASE	CIRRHOSIS
2004	156816	150074	23076	329966	27013
2003	170564	157689	21940	350193	27503
2002	179514	162672	20261	362447	27257
2001	184757	163538	19250	367545	27035
2000	192898	167661	18073	378632	26552
1999	192898	167366	16968	383788	26259
1998	192898	158448	14308	376307	25192
1997	192898	159791	13534	379537	25175
1996	192898	159942	12945	386419	25047
1995	192898	157991	12483	388703	25222
1994	192898	153306	11765	387470	25406
1993	192898	150108	11243	388807	25209
1992	192898	143769	10265	383417	25263
1991	192898	143481	9524	388260	25429
1990	192898	144088	9169	392265	25815
1989	192898	145551	8766	401267	26694
1988	192898	150517	8456	406923	26409
1987	192898	149835	8139	411516	26201
1986	192898	149643	7984	418629	26159
1985	192898	153050	7751	435000	26767
1984	192898	154327	7774	441223	27317
1983	192898	155598	7739	449637	27266
1982	192898	157710	7571	456312	27690
1981	192898	163504	7587	463595	29308
1980	192898	170225	7827	477636	30583
1979	192898	169488	7275	477225	29720
1978	192898	175629	5490	483783	30066
1977	192898	181934	5695	494027	30848
1976	192898	188623	6130	514230	31453
1975	192898	194038	6300	524990	31623
1974	192898	207424	6894	548514	33319
1973	192898	214313	7428	573403	33350
1972	192898	213344	7754	578942	32576
1971	192898	209092	7837	574643	31808
1970	192898	207166	8273	572680	31399
1969	192898	207179	8426	577188	29866
1968	192898	211390	9063	590063	29183

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TABLE A: Mortality Data (Continued)

Lung Cancer	SUICIDE	LEUKEMIA	BREAST CANCER	OTHER CANCER	NON-ECON
158091	32439	21395	41316	61911	124622
158086	31484	21535	42000	62639	126174
157713	31655	21498	41883	62969	126350
156058	30622	21451	41809	62708	125968
155521	29350	21339	42300	63060	126699
152156	29199	21014	41528	66251	128793
159736	30575	20324	42086	65389	127799
158465	30535	20313	42297	65627	128237
157271	30903	20340	43448	66451	130239
156378	31284	20148	44209	65678	130035
154714	31142	19669	44008	65754	129431
154183	31102	19530	43910	65315	128755
151269	30484	19272	43365	62887	125524
149119	30810	18945	43849	61916	124710
146386	30906	18574	43663	60221	122458
142281	30232	18246	43138	61030	122414
138253	30407	17577	42461	61130	121168
134983	30796	17284	41211	60500	118995
130450	30904	17365	40789	59446	117600
127311	29453	17319	40383	57905	115607
123699	29286	17080	39722	56236	113038
119962	28295	16820	38247	54852	109919
116359	28242	16704	37685	53191	107580
111296	27596	16273	36737	51701	104711
108504	26869	16533	35897	50679	103109
103178	27206	15988	34622	48591	99201
99898	27294	15391	34609	48943	98943
95182	28681	15329	34762	47276	97367
91131	26832	15056	33403	45975	94434
86675	27063	14754	32435	44585	91774
83475	25683	14575	32424	43620	90619
79335	25118	14478	32143	42693	89314
76998	25004	14402	31460	41724	87586
72898	24092	14469	30277	40685	85431
69517	23480	14492	29917	39068	83477
66038	22364	14450	29083	37825	81358
63485	21372	14375	29081	37247	80703

TABLE B: Economic Variable Data

YEAR	OUTPUT GAP *	OUTPUT 2 YR. LAG	UNEMPLOYMENT (%) **	UNEM. 2 YR LAG
2004	0.0000	0.0000	5.5000	5.8000
2003	0.0000	0.7000	6.0000	4.7000
2002	0.0000	2.6000	5.8000	4.0000
2001	0.7000	1.4000	4.7000	4.2000
2000	2.6000	1.0000	4.0000	4.5000
1999	1.4000	0.2000	4.2000	4.9000
1998	1.0000	-0.9000	4.5000	5.4000
1997	0.2000	-1.4000	4.9000	5.6000
1996	-0.9000	-1.2000	5.4000	6.1000
1995	-1.4000	-2.5000	5.6000	6.9000
1994	-1.2000	-2.7000	6.1000	7.5000
1993	-2.5000	-3.2000	6.9000	6.8000
1992	-2.7000	-0.1000	7.5000	5.6000
1991	-3.2000	1.0000	6.8000	5.3000
1990	-0.1000	0.6000	5.6000	5.5000
1989	1.0000	-0.4000	5.3000	6.2000
1988	0.6000	-0.5000	5.5000	7.0000
1987	-0.4000	-0.6000	6.2000	7.2000
1986	-0.5000	-1.2000	7.0000	7.5000
1985	-0.6000	-5.2000	7.2000	9.6000
1984	-1.2000	-6.6000	7.5000	9.7000
1983	-5.2000	-2.3000	9.6000	7.6000
1982	-6.6000	-2.2000	9.7000	7.1000
1981	-2.3000	0.8000	7.6000	5.8000
1980	-2.2000	0.9000	7.1000	6.1000
1979	0.8000	-1.0000	5.8000	7.1000
1978	0.9000	-2.3000	6.1000	7.7000
1977	-1.0000	-4.3000	7.1000	8.5000
1976	-2.3000	-0.6000	7.7000	5.6000
1975	-4.3000	3.6000	8.5000	4.9000
1974	-0.6000	1.4000	5.6000	5.6000
1973	3.6000	-0.6000	4.9000	5.9000
1972	1.4000	-0.5000	5.6000	4.9000
1971	-0.6000	3.0000	5.9000	3.5000
1970	-0.5000	3.9000	4.9000	3.6000
1969	3.0000	0.0000	3.5000	0.0000
1968	3.9000	0.0000	3.6000	0.0000

* www.cbo.gov; ** www.bls.gov

TABLE B: Economic Variable Data (Continued)

INFLATION	INFLAT. 2 YR. LAG	AVERAGE CPI ***
2.6630	1.5810	188.9000
2.2790	2.8455	184.0000
1.5810	3.3613	179.9000
2.8455	2.2086	177.1000
3.3613	1.5576	172.2000
2.2086	2.2945	166.6000
1.5576	2.9528	163.0000
2.2945	2.8340	160.5000
2.9528	2.5606	156.9000
2.8340	2.9936	152.4000
2.5606	3.0103	148.2000
2.9936	4.2081	144.5000
3.0103	5.4032	140.3000
4.2081	4.8183	136.2000
5.4032	4.1373	130.7000
4.8183	3.6496	124.0000
4.1373	1.8587	118.3000
3.6496	3.5611	113.6000
1.8587	4.3173	109.6000
3.5611	3.2124	107.6000
4.3173	6.1606	103.9000
3.2124	10.3155	99.6000
6.1606	13.4986	96.5000
10.3155	11.3497	90.9000
13.4986	7.5908	82.4000
11.3497	6.5026	72.6000
7.5908	5.7621	65.2000
6.5026	9.1278	60.6000
5.7621	11.0360	56.9000
9.1278	6.2201	53.8000
11.0360	3.2099	49.3000
6.2201	4.3814	44.4000
3.2099	5.7221	41.8000
4.3814	5.4598	40.5000
5.7221	0.0000	38.8000
5.4598	** ftp.bls.go	36.7000
0.0000	0.0000	34.8000

*** ftp.bls.gov

TABLE C: Antidepressant Sales Data

YEAR	ELI LILLY *	ZOLOFT **	WELLBUTRIN ***	PAXIL ***	TOTAL
2004	5452.702703	3027.927928	1185.402703	837.0394595	10503.07279
2003	5129.085873	2879.039705	1368.864266	1739.106648	11116.09649
2002	4424.92891	2599.052133	1180.735735	1935.475166	10140.19194
2001	5188.12074	2302.823759	915.8282376	1825.823174	10232.59591
2000	5157.6	2139	712.626	1719.739	9728.965
1999	4885.640496	2101.239669	0	0	6986.880165
1998	4738.965153	1938.75396	0	0	6677.719113
1997	3771.781116	1616.95279	0	0	5388.733906
1996	2919.20966	1467.618002	0	0	4386.827662
1995	2650.760234	0	0	0	2650.760234
1994	2131.939605	0	0	0	2131.939605
1993	1661.02503	0	0	0	1661.02503
1992	1582.822086	0	0	0	1582.822086
1991	1402.78129	0	0	0	1402.78129

In millions of 2000 dollars.

* Annual 10-K filings can be found at http://www.sec.gov/cgi-bin/browse-idea?action=getcompany&CIK=0000059478&type=10-k&dateb=&owner=exclude&count=40

** Annual 10-K filings can be found at http://www.sec.gov/cgi-bin/browse-idea?action=getcompany&CIK=0000078003&type=10-k&dateb=&owner=include&count=100

*** Annual 10-K filings can be found at http://www.gsk.com/investors/annual-reports-archive.htm

TABLE D: Population Data

YEAR	TOTAL US POP	POP 21-65	Percentage
2004	293,655,404.00	173,230,680.00	0.589911432
2003	290,788,976.00	171,126,055.00	0.588488798
2002	287,941,220.00	169,078,318.00	0.587197338
2001	285,102,075.00	166,807,499.00	0.585079919
2000	282,192,162.00	164,493,347.00	0.58291253
1999	272,690,813.00	151,961,496.00	0.557266651
1998	270,248,003.00	154,379,535.00	0.571251344
1997	267,783,607.00	152,760,179.00	0.570461279
1996	265,228,572.00	149,258,367.00	0.562753725
1995	262,803,276.00	145,825,980.00	0.554886462
1994	260,327,021.00	148,684,047.00	0.571143351
1993	257,782,608.00	145,270,531.00	0.563538914
1992	255,029,699.00	147,960,636.00	0.580170218
1991	252,153,092.00	146,074,614.00	0.579309232
1990	249,464,396.00	144,414,859.00	0.57889968
1989	246,819,230.00	142,978,290.00	0.579283429
1988	244,498,982.00	141,684,063.00	0.579487333
1987	242,288,918.00	140,373,957.00	0.579365982
1986	240,132,887.00	138,931,052.00	0.578559038
1985	237,923,795.00	137,113,712.00	0.576292556
1984	235,824,902.00	135,193,201.00	0.573277885
1983	233,791,994.00	133,218,590.00	0.569816732
1982	231,664,458.00	131,138,829.00	0.566072285
1981	229,465,714.00	128,896,028.00	0.561722384
1980	227,224,681.00	126,647,915.00	0.557368656
1979	225,055,487.00	124,506,415.00	0.553225414
1978	222,584,545.00	122,056,701.00	0.548361078
1977	220,239,425.00	119,607,770.00	0.54308065
1976	218,035,164.00	117,383,189.00	0.538368155
1975	215,973,199.00	115,270,501.00	0.533725951
1974	213,853,928.00	113,178,174.00	0.529231214
1973	211,908,788.00	111,205,956.00	0.524782181
1972	209,896,021.00	109,255,532.00	0.520522168
1971	207,660,677.00	107,365,543.00	0.517023948
1970	205,052,174.00	105,570,460.00	0.514846821
1969	202,676,946.00	103,826,711.00	0.512276867
1968	200,706,052.00	102,175,473.00	0.50908018

http://www.census.gov

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