

# **The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**

The Honors Program  
Senior Capstone Project  
Student's Name: Andrea J. Bergeron  
Faculty Sponsor: Laurie J. Bates, Ph.D.  
April 2014

## **Table of Contents**

Abstract .....	1
Introduction .....	2
Literature Review .....	3
Table 1: Breakdown of Expected Costs and Benefits .....	10
Empirical Model, Sample, and Data .....	11
Empirical Results .....	14
Summary and Conclusions .....	15
Appendices .....	19
Table 2: Independent Variables .....	19
Table 3: Descriptive Statistics .....	20
Table 4: Empirical Results .....	21
References .....	22

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

**ABSTRACT**

This study uses economic theory to investigate the impact of socioeconomic factors on the suicide rate in the United States. Using a utility maximization framework based on Hamermesh and Soss' 1974 model, a panel data set from 2000-2010 is constructed for the 50 states and District of Columbia. This research adds to the literature in the field by focusing on the more recent past and providing additional variables consistent with today's challenges. The results from the multiple regression analysis can be used to advocate policies that may reduce the suicide rate in the future.

## **INTRODUCTION**

*"We made a death pact, and I have to accomplish my part of the deal. Please bury me next to my baby. Please bury me with my leather jacket, jeans and motorcycle boots. Goodbye."*  
– Sid Vicious, 1979

Individual motivations for suicide encompass a wide variety of social and economic issues. According to the Center for Disease Control (CDC), suicide was the 10<sup>th</sup> leading cause of death in 2010, and for the riskier age bracket, ranks in at second. For those ages 35-54, suicide is the 4<sup>th</sup> leading cause of death just shy of cancer, heart disease, and unintentional injury. The number of yearly suicides has risen 31% from 1999 to 2010, with national statistics of 28,181 and 38,364 respectively. This is higher than the number of motor vehicle deaths in the same year. Approximately one American commits suicide every 13.7 minutes, and this figure represents only the fatal attempts.

Given the considerable increase in the suicide rate in recent years, the topic has garnered heavy media attention from many major news networks. In 2013, the Wall Street Journal released an article titled *Suicides Soar in the Past Decade*, which states that downturns in the economy have been heavily correlated with the rise in suicides. Facing the worst recession in decades, individuals have been burdened with wiped-out stock market wealth, home equity, college savings, retirement funds, and significant job layoffs. Individual well-being and self-esteem have been placed on the line, especially for American men who are typically expected to serve as breadwinners for the household. With suicide rates four times higher for men than women, these factors could place a significant threat on the adult male population into the future.

While it may appear irrational to end one's life, the argument can be provided that individuals evaluate the benefits and costs associated with staying alive and opt for death. This occurs when the derived benefit of living into future periods falls below the expected costs of committing suicide. Therefore, the rational decision making framework can be applied to the suicide decision in order to derive some of the underlying reasons why individuals choose to

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
***Senior Capstone Project for Andrea J. Bergeron***

---

commit suicide. Suicide is a multi-faceted problem that cannot be adequately analyzed using one dimension. Social, economic, and physiological factors all contribute to the suicide decision and help provide deeper insight into the rationale used by individuals who have been faced with such a choice. Bringing this issue to the forefront will educate policymakers by assessing the viability of current suicide prevention techniques and suggesting new approaches to deal with the suicide phenomenon.

**LITERATURE REVIEW**

Emile Durkheim was well renowned for his definition of suicide as a two-dimensional phenomenon. This definition explains the social implications of suicide through two main facets; the need for social integration, and the imbalance of means and needs. Durkheim outlined four definitions of suicide as follows; anomic suicide (resulting from dramatic changes in society or an individual's personal situation), fatalistic suicide (occurring due to strong regulation and the feeling that the future is blocked), egotistical suicide (stemming from insufficient integration into society and not belonging), and altruistic suicide (resulting from too much integration and the willingness to sacrifice the self for others). Among his discoveries, Durkheim found that suicide rates were higher for males, those not married, and those without children. Durkheim's case study also focused heavily on the impact of religion on suicide rates. This work was instrumental in opening the floor for further discussion among sociologists regarding individual motives for suicide (Durkheim, 1897).

Soon after Durkheim's study was published, other fields began to take interest in applying alternative theories to better understand the suicide decision. Most of these theories encompassed a sociological framework, but soon there emerged a focus built on economic factors. According to Samuel Cameron (2005), there are three main reasons why economics should be applied to suicide; 1) microeconomic theory is founded upon rational choice models, 2) suicide statistics could benefit from analysis through economic techniques, and 3) the tools in economic theory may help determine policy actions to combat increasing suicide

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

rates. This integration of sociological and economic perspectives on the suicide rate has been a point of interest for decades.

Daniel Hamermesh and Neal Soss advance the literature by integrating economic theory into the framework for understanding suicide (1974). Based on a utility maximization model, their study incorporated economic reasoning into understanding some of the variations in suicides, most specifically by age and income. This study sets up the economic model using a utility function that assumes individuals kill themselves when the perceived total discounted lifetime utility is equal to zero. At zero, the individual derives no benefit from continuing life.

Hamermesh and Soss' study is broken down into three main sections: 1) an international breakdown of suicide across different age groups, 2) a time series analysis of male suicides in the United States from 1947-1967, and 3) an explanation of suicide by occupation and age group. Hamermesh and Soss find that suicide increases with unemployment and age, and decreases with income.

In 2009, Yong-Hwan Noh added to this unemployment finding using cross-country panel fixed effects and controlling for the interaction between unemployment and income to prove that the unemployment rate only affects suicide positively in countries with high per-capita GDP levels. In other words, unemployment rates are not universally linked to an increasing suicide rate. Instead, the countries with higher income face a higher degree of suicide with a rising unemployment rate, whereas lower-income countries actually showed a negative relationship between unemployment and suicide. The intuition behind this is that if one loses his or her job when most of the people surrounding them are employed, this will have a much more detrimental effect than if the individual loses his or her job in an environment where seemingly everyone else is also jobless.

Since Hamermesh and Soss, others have drawn heavily upon this model, notably David Marcotte (2003). Marcotte carried out his study using individual-level data from a national probability sample of Americans aged 18-54 from 1991-1992. The main development of this study was the use of attempted suicides as the dependent variable, as opposed to only looking

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

at fatal suicide attempts. Each day, approximately 17 suicides are attempted for every one completed suicide. Because so many suicide attempts are non-fatal, this information could play a crucial role in one's decision. Marcotte argues that individuals who attempt suicide are not choosing between life and death, but simply between attempting suicide or not. Marcotte explores the ways in which a suicide attempt in one period can impact utility in future periods, and finds that individuals who attempt suicide but survive will recognize higher income in the periods following the attempt than those who simply consider suicide but never make an attempt. This has been attributed to the fact that following the shock of the attempt, loved ones are scared into offering help in the form of income transfers, care, or treatment.

The idea of using individual-level data has been supported by other economists, and is encouraged by the Mitch Kunce and April Anderson in their 2001 study on suicide rates. This paper uses a balanced panel of time-series, cross-sectional data from 1985-1995 over all 50 states and the District of Columbia. In concluding their paper, Kunce and Anderson claim that suicide occurrence varies based on individual specific reasons regardless of social class, race, gender, or age. However, due to the availability of data, measuring these statistics at the individual level is nearly impossible and poses a threat to the development of their study.

Suzuki Tomoya (2008) also manipulates the Hamermesh and Soss model and bases his study around expected income of individuals in Australia. This approach uses a similar utility maximization model and incorporates income uncertainty in order to account for speculation by individuals on what their future financial prospects would be. This allows for the income variable to be dynamic instead of the typical use of static permanent income. This study found that since individuals are typically risk-averse and opt to maximize utility, the suicide rate is likely to decrease when future income is expected to rise, and increase when wages are expected to lower in future periods. The major policy recommendation that arose from Tomoya's work is the idea of using wage stabilization legislation to prevent some of the uncertainty surrounding future income expectations that leads to increased suicidal behaviors.

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

Other researchers focus on physiological aspects of the suicide decision by looking at the implications of mental health on suicide rates. Frank and McGuire (2000), Ludwig and Marcotte (2004), and the National Alliance on Mental Illness (NAMI) (2009) are among some of these studies. Marcotte and Ludwig find that the use of Selective Serotonin Reuptake Inhibitors (SSRIs) used to control depression has a negative effect on suicides. Results reported included the statistic that for every 300,000 SSRI pills sold, one suicide was averted *ceteris paribus*, suggesting that antidepressants could be helpful in preventing suicides. NAMI (2009) analyzed mental health programs in all fifty states and looked at the possibilities of improved conditions in the mental health sector. In light of current budget cuts for most states, the NAMI report helped illustrate areas in which funding is necessary and those in which funding could likely be cut. Ross, Yakovlev, and Carson (2010) looked at state data from 1997-2005 and found a statistically insignificant relationship between state mental health expenditures and suicide rates. The government must allocate budgets to their highest valued use and this finding suggests that perhaps the money that is being poured into mental health programs could be better used in other potentially life-saving programs.

In a perfect society, does some level of suicide persist, or is the suicide rate stable at zero? Yang and Lester (1991) sought to explain the possibility of a natural rate of suicide similar to the natural rate of unemployment present in an idealized society. Regression analysis was implemented for the year 1980 by setting 27 social variables related to suicide equal to zero in order to analyze the suicide rate in a utopian society. Variables found to have the most significant association with suicide include divorce, interstate travel, and non-attendance to church. Yang and Lester found that even in this society based around perceived social perfection, the suicide rate was 6.01 per 100,000 of the population per year. This suggests that a suicide rate exists at a positive and non-zero interval, similar to the concept of a natural rate of unemployment. Due to this finding, it is possible to analyze the suicide rate using a cost benefit analysis that helps further prove the importance of econometric modeling in assessing social issues.



**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
**Senior Capstone Project for Andrea J. Bergeron**

---

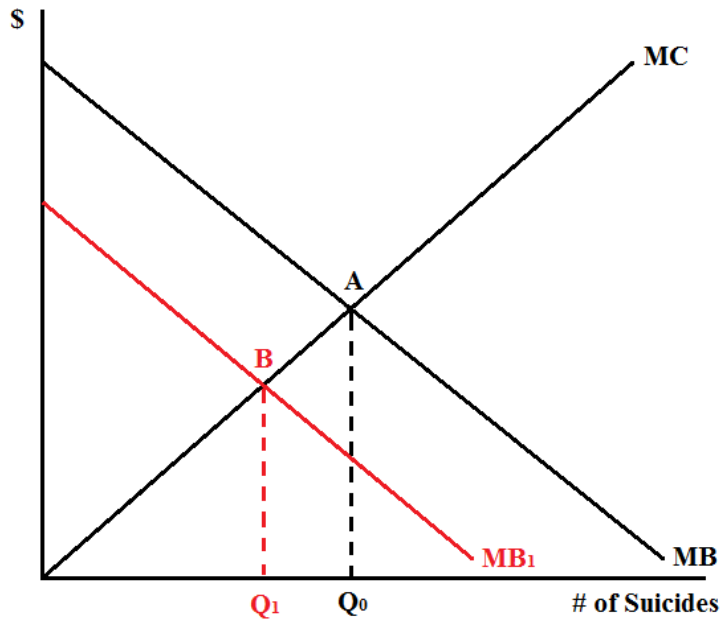
Suicide is a permanent solution to a temporary problem, and as with any problem, a decision must be made regarding which action to take. The individual facing the decision must weigh the costs and benefits of taking a certain action. According to *The Economy and Suicide: An Economic Perspective on Suicide* by Yang and Lester (1997), many factors contribute to this decision. Potential benefits that arise from the act of suicide include escape from pain, either mentally or physically; the idea that following the suicide, survivors will feel a sense of guilt, regret, or deep sadness; or that the act will somehow reinstate a more favorable reputation. In some cases, those who commit suicide feel a sort of adrenaline rush from self-inflicted pain, so the thought of ending it all by their own hand is appealing. There are also rare cases where suicide is committed in the format of a death pact, and therefore individuals commit suicide in order to hold up their end of the "bargain."

Costs associated with committing suicide include but are not limited to the time and money necessary to obtain the knowledge and equipment to commit the act itself; the difficult process of mentally preparing to kill oneself; the anticipated punishment in the afterlife associated with ending one's own life on earth as predicted by almost all major religions; and the opportunity cost of no longer being alive, which includes anything that may happen in the many years foregone by cutting life short (Yang and Lester, 1997). Another potential cost includes the possibility of failing to completely eradicate one's own life, and the social and physical repercussions that could be faced as a result.

A person will follow through with the act of suicide if he/she believes that the additional benefits of suicide outweigh the additional costs. Therefore, the suicide rate could be lowered by either decreasing the benefits, or increasing the costs of the act. Because benefits associated with suicide are often found in personal opinions and desires, it is difficult to find ways to alter one's mindset in order to stop them from valuing these benefits so highly. To decrease the benefits, mental health agencies could provide counseling, medication, and other emergency services in order to find new ways for individuals to cope with their pain from past experiences. Decreasing the benefits of suicide has the potential to decrease the number of suicides from  $Q_0$  to  $Q_1$  as depicted by the following graphical analysis.

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

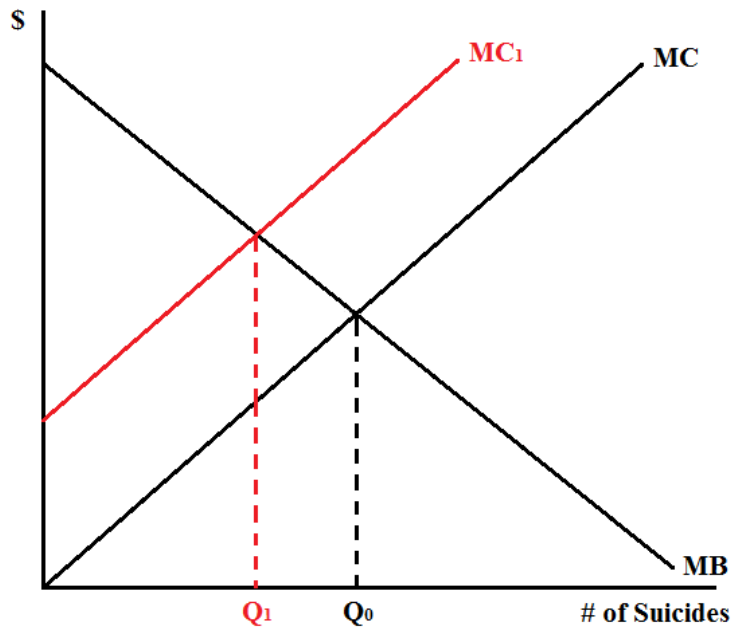
---



There are even more options for increasing the costs of committing suicide. Since there are many ways to commit suicide, and instruments used in the act are also used for many other unrelated purposes, it would be difficult to increase the monetary cost of committing suicide. However, the power appears to rest in the opportunity cost associated with ending one's life. By helping a person understand that there are other coping mechanisms, and completely outlining everything they would be missing out on by ending life early, the cost of suicide would increase. Counseling services that incorporate the feelings and emotions of loved ones could help the struggling person realize how detrimental their loss would be to those they care about, and in turn decrease their chances of committing the act. If the value of living is perceived as being greater than the value of dying, the suicide rate will decrease. The following graphical analysis depicts a potential outcome related to increasing the costs of suicide, which decreases the number of suicides from  $Q_0$  to  $Q_1$ .

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---



The costs and benefits of committing suicide detailed above and outlined in Figure 1 are innumerable and can pose difficulty when assigning quantitative values. This paper aims to delve deeper into the suicide problem by looking at a variety of social and economic variables that could explain the suicide rate on a more quantitative level.

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

*Table 1: Breakdown of Expected Costs and Benefits*

<b>Benefits to Attempting Suicide</b>	<b>Costs to Attempting Suicide</b>
Escape from emotional or physical pain	Time and money needed to obtain the necessary knowledge and equipment
Conception that the act will reinstate a more favorable reputation	Mental preparation
The idea that even an unsuccessful attempt may trigger feelings of sadness or remorse among loved ones (cry for help)	Anticipated punishment in the afterlife
Adrenaline rush from self-inflicted pain	The opportunity cost of no longer living (forgoing anything good that may happen in future periods)
Death pact/Romanticized suicide	The possibility of social and physical repercussions if the act is attempted unsuccessfully

The existing body of literature revolves around the economic, social, and physiological aspects of the suicide rate and offers a broad spectrum of suggestions and remedies. Although this provides a comprehensive understanding of the topic, most studies do not integrate the social and economic factors that explain suicide. Furthermore, many of the studies are based off of outdated information that may not be applicable to modern times. For this reason, the following research attempts to fill a void in the literature by providing a multiple regression analysis that integrates social and economic factors. In addition, a panel data set is used that incorporates the most current data available. This analysis, based off the 1974 Hamermesh and Soss economic model, aims to determine whether the variables that were significant in previous research remain important today.

**EMPIRICAL MODEL, SAMPLE, AND DATA**

Hamermesh and Soss (1974) initiated a framework for applying economics to suicide by developing the following utility maximization function:

$$U_m = U[C(m, YP) - K(m)] > 0,$$

Where  $m$  = age,  $K$  = cost of keeping oneself alive each period, and  $YP$  = permanent income. If the expected utility from staying alive is greater than zero, an individual will choose to stay alive. However, if expected utility falls below the zero threshold, an individual will choose to commit suicide. This model is then used as the foundation for present-value of expected lifetime utility at age  $a$ :

$$Z(a, YP) = \int_a^w e^{-r(m-a)} U_m P(m) dm,$$

Where  $r$  = private discount rate,  $a$  = highest attainable age,  $P(m)$  = probability of survival to age  $m$  given survival to age  $a$ . This means  $Z$  is a decreasing function of  $a$ , and an increasing function of  $YP$ . Using the framework of this utility maximization function and analysis set forth by Hamermesh and Soss, the following basic empirical model has been specified:

$$SUIC = \beta_0 + \beta_1(AGE1) + \beta_2(AGE2) + \beta_3(AGE3) + \beta_4(MALE) + \beta_5(INCM) + \beta_6(UNEM) + \mu \quad \text{Equation 1}$$

Using the above equation as a framework for the addition of more variables, the following modified model specification is estimated:

$$SUIC = \beta_0 + \beta_1(AGE1) + \beta_2(AGE2) + \beta_3(AGE3) + \beta_4(MALE) + \beta_5(INCM) + \beta_6(UNEM) + \beta_7(ALC) + \mu \quad \text{Equation 2}$$

The panel data set to be used in this regression analysis represents all fifty states and the District of Columbia for the period 2000-2010. Panel data is considered multi-dimensional as

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
***Senior Capstone Project for Andrea J. Bergeron***

---

it follows the same cross-sectional units across time, as opposed to time series and cross-sectional data, which both suffer from being one-dimensional. State and time fixed effects are also specified in the estimation equation. The state-fixed effects help to control for any unobservable factors affecting the suicide rate such as an individual state's mental health policy, and thereby reducing the bias associated with unobservable heterogeneity. The time-fixed effects capture changes common to all states over time such as federal legislation regarding suicide.

The suicide rate per 100,000 of the population (SUIC) serves as the independent variable and was retrieved from the Center for Disease Control. Table 2 lists the independent variables relevant to the estimating equations. Data sources are included as well as the expected signs of the coefficients. The specified variables incorporate economic and social factors in an attempt to provide a clear picture of the suicide rate. Population demographics are assessed using three primary age groups with different perceived risk factors for suicide, alongside a variable to look specifically at the impact of being male. Alcohol is used as a proxy for stress, as this is typically seen as a primary de-motivator among individuals and could lead to lower levels of utility. Economic variables, including the unemployment rate and real per capita personal income are both included to show how the business cycle and finances affect an individual's decision to commit suicide. Please note that the three age groups, male, income, and unemployment were all included in response to Hamermesh and Soss' original 1974 study.

Because risk of suicide increases with age, it is expected that the coefficient will be negative for the lower age group (ages 15-24), and positive for the higher age groups (ages 40-64 and ages 65+). According to the CDC, males are about four times more likely than females to commit suicide, suggesting an anticipated positive correlation between male and the suicide rate. Income and the unemployment rate are used to show the financial situation of individuals, and it is expected that the more financial secure a person is, the less likely he/she would be to commit suicide. This means that an increase in income would have a negative expected impact on the suicide rate, and an increase in the unemployment rate would be

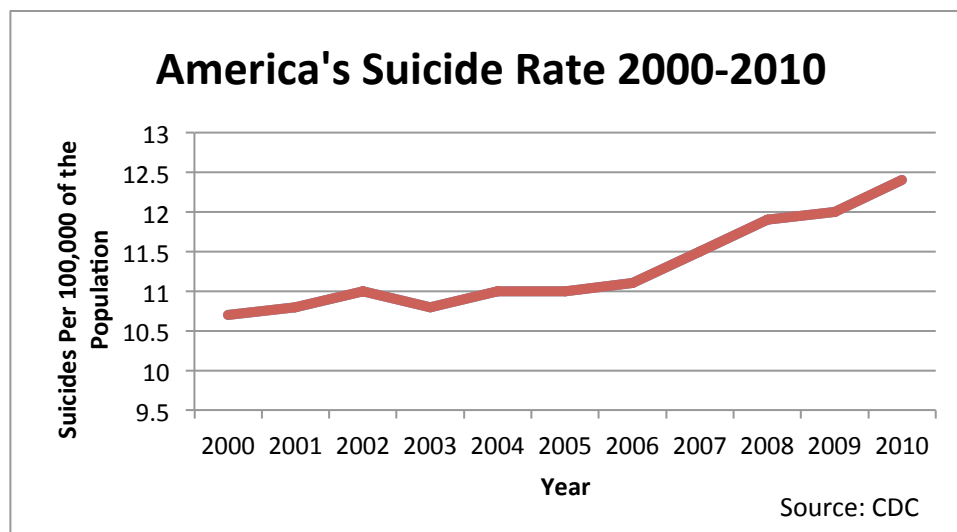
**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

expected to positively impact the suicide rate. Since alcohol is a depressant by nature, it is expected that an increase in alcohol consumption will result in an increase in the suicide rate.

There are three primary issues with the data that deserve mentioning. First, data on each individual in the United States who has committed suicide would be preferred to statewide data, but unfortunately is not collected or available for analysis. Second, many of the data sources used in this study changed the collection and presentation of data over the years from 2000-2010, making it difficult to construct a consistent data set. Third, many of the variables that would be expected to play a significant role in suicide rates are either unavailable or unquantifiable altogether. For example, the National Alliance for Mental Illness (NAMI) reported that state expenditures on inpatient psychiatric hospital beds had a statistically significant negative relationship with the suicide rate. However, this report was a special case conducted in 2009, and further data is not available. Given these data limitations, the objective of this paper is to explain the variations in the suicide rate across states and time.

Table 4 provides the descriptive statistics for the variables used in this study. The sample size includes 225 observations and 7 independent variables. Suicide has a mean of 13.19, suggesting that there were approximately 13 suicides per 100,000 of the US population on an average yearly basis from 2000-2010. The following graph provides data on the average annual suicide rate per year and helps illustrate how suicide has increased throughout this time period.



## **EMPIRICAL RESULTS**

The regression results from estimating Equation 1 are shown in column 2 of Table 4, where the estimated coefficient and associated t statistic, in parentheses, are shown beneath each explanatory variable. When estimating Equation 1, standard errors are made fully robust against arbitrary heteroskedasticity and serial correlation by clustering them at the state level (Wooldridge, 2002). Notice that approximately 94% of the variations in the suicide rate are explained by the right-hand-side variables. For a panel data study, this is a sizeable percentage to explain. Also, notice that the parameter estimates on nearly all of the control variables have their expected signs and are statistically significant at the 5% level or better.

Population demographics included in Equation 1 showed a strong relationship with suicide rates. The signs on the representative age variables came out as expected, with a negative relationship between ages 15-24 and the suicide rate, and an increasing positive relationship between ages 40-65+ and the suicide rate. For the first age group, a beta coefficient estimate of -46.58 shows that a 1% increase in the population ages 15-24 would cause the suicide rate to decrease by approximately 47 individuals per 100,000 of the population. For the second age group, a beta coefficient estimate of 42.29 shows that a 1% increase in the population ages 40-64 would increase the suicide rate by about 42 individuals per 100,000 of the population. For the oldest age group in the sample, a positive coefficient estimate of 60.02 shows that for every 1% increase in the population of individuals ages 65+, the suicide rate increases by about 60 individuals per 100,000 of the population. Age group findings are all statistically significant at the 95% confidence level.

As expected, being male has a significant positive relationship with the suicide rate. With a beta coefficient estimate of 111.05, it is expected that increasing the percentage of the total population that is male by just 1% would lead to approximately 111 more suicides per 100,000 of the population. This is consistent with the literature as well as suicide reports compiled by the CDC.



**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
***Senior Capstone Project for Andrea J. Bergeron***

---

The economic variables included in this specification are per capita personal income and the unemployment rate. The results for per capita personal income did not come out negative as expected, with the beta coefficient instead suggesting that the more income a person has, the more likely he or she is to commit suicide. However, because the coefficients on income are so miniscule, the change in suicide rates due to an increase or decrease in income is minute and negligible. The unemployment rate, on the other hand, did yield the expected results, showing a positive relationship with the suicide rate. The beta coefficient of 21.2 suggests that with a 1% increase in the annual unemployment rate, approximately 21 additional suicides per 100,000 of the population can be expected. These findings were significant at the 5% level, suggesting a strong relationship between suicide and economic factors.

An alternative regression equation is estimated to control for one other factor believed to affect the suicide rate. Equation 2 includes the impact of alcohol consumption, and finds a statistically significant positive relationship between alcohol and the suicide rate. Using the coefficient estimate of 1.65, a one-gallon increase in alcohol consumption will increase the average suicide rate (13.19) by 1.65 to equal 14.22 per 100,000. Given the coefficient of 1.65 this means that a little less than 2 people in 100,000 will commit suicide with a one-gallon increase in alcohol consumption.

**SUMMARY AND CONCLUSIONS**

Following the economic framework set forth by Hamermesh and Soss (1974), this paper revisits the question of what factors contribute to America's rising suicide rate. The research focuses on the impact of key social and economic variables on the number of suicides, while controlling for other potential factors related to the suicide decision.

Taking all of the empirical results together, it appears that the suicide rate is a multi-faceted problem impacted by social factors such as age, gender, and alcohol consumption, and economic factors such as income and the unemployment rate. Although most of these factors cannot be adequately targeted by federal or state legislation, some of them could benefit

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

substantially from government attention through programs and legislation, most notably alcohol consumption. According to the CDC, approximately 30% of all suicide victims test positive for alcohol in their systems. Findings in this study support the idea that alcohol consumption plays a significant role in explaining suicide rates.

Programs related to targeting alcohol abuse, most notably Alcoholics Anonymous, already exist in communities as private entities and are widely available to the public. Individuals cannot be forced to seek help with combatting drinking problems, but most know that the resources are available to them should they choose to utilize them. How then, should we combat high levels of alcohol consumption in relation to the suicide rate if not through state funded self-help programs? One potential solution would be to increase education regarding the detrimental effects of alcohol on the human body. We are constantly informed that drinking and driving, for example, is an unsafe practice that can endanger our lives and the lives of others. However, we are less likely to associate alcohol with other negative implications, such as the fact that it acts as a depressant and can impact our physical and emotional well-being. By providing educational programs to increase awareness of these concerns, excessive alcohol use could be targeted without requiring individuals to set foot inside of an Alcoholics Anonymous meeting. This would be beneficial to helping lower the suicide rate, while addressing a wide variety of other social concerns revolving around alcohol abuse.

A second potential approach to help lower alcohol consumption rooted deeply in neoclassical economic theory would be to impose higher taxes on alcohol. With higher alcohol prices, individuals may not have the funds to sustain their habits and therefore be forced to cut down on consumption patterns. Lower alcohol consumption would thus be expected to lead to lower suicide rates, while simultaneously combatting the deficit issue by providing increased tax revenue through alcohol sales.

The relationship between age and suicide risk was also a significant factor in this study. As individuals grow older, they become more at risk for suicide. Individuals in the younger age

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
***Senior Capstone Project for Andrea J. Bergeron***

---

group of 15-24 are extremely unlikely to commit suicide. This age group consists mostly of high school and college age students. Most schools have a network of guidance counselors, advisors, and mandatory educational sessions available to students for support during this stage of their lives. If a student is struggling with suicidal thoughts at this age, there is a strong support system that can help manage these feelings. However, once individuals get older and reach the riskier age brackets, it is likely that they are no longer attending school and this network is made unavailable to them.

In order to provide a strong network of support for the adult population, it would be beneficial to have medical practitioners address some major mental health and wellness concerns during annual physicals, paying special attention to any behaviors that might indicate depression or detachment. Part of the physician certification requirements could include a special provision for dealing with suicide risk among the older population. These doctors and nurses would be required to attend special workshops focused on understanding and interpreting patient risk based on responses to specific questions. From this point, individuals who appear to need more specialized attention could be assessed and provided with resources such as specialty therapists and support programs for encouragement. By integrating this framework at the hospital level, individuals would be able to get the necessary attention to help cope with feelings of negativity. Furthermore, since males are at higher risk than females, special attention should be placed on gender.

Finally, the unemployment rate plays a substantial role in suicide rates and should be further targeted through monetary and fiscal policy. Expansionary fiscal policy increases the deficit and has negative repercussions but if we look at these additional expenditures in terms of lives saved, increasing the deficit has substantial benefits as well. Some potential ways to lower the unemployment rate would be to stimulate job creation, revamp government assistance and welfare programs to encourage individuals to actively seek employment, and reduce illegal immigration and under-the-table compensation. By expanding the workforce and decreasing the number of individuals that face unemployment hardship, suicide rates would be expected to decline.

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

This study examined the suicide rate through a multi-dimensional analysis of social and economic factors. As with any empirical study, the findings in this paper could be expanded and improved upon through additional research and model specifications. The best way to measure suicide rates would be from an individual perspective, as this decision is ultimately made at the micro level. Collecting data at the individual level as opposed to the state level would aid this study significantly by presenting a clearer picture of the problem. Furthermore, the inclusion of additional variables that are expected to influence the suicide rate would add further insight. Some of the additional relevant variables that were considered in this study but were unobtainable for the given timeframe were per capita psychiatric hospital beds, drug use, religious affiliations, SSRI consumption patterns, expected future income, and interpersonal relationships. The study would benefit from the inclusion of any of these variables in order to mitigate the impact of the omitted variable bias. Despite the aforementioned data limitations, this study provides insight into what may be causing substantial increases in the suicide rate and serves as an adequate framework for interpreting increases in the suicide rate over time.

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
***Senior Capstone Project for Andrea J. Bergeron***

---

**APPENDICES**

***Table 2: Independent Variables***

---

<b>Abbreviation</b>	<b>Explanation and Data Source</b>	<b>Ex. Sign</b>
AGE1	Percent of the Population Ages 15-24 Years <i>Source: US Census Bureau, Population</i>	-
AGE2	Percent of the Population Ages 40-60 Years <i>Source: US Census Bureau, Population</i>	+
AGE3	Percent of the Population Ages 65+ Years <i>Source: US Census Bureau, Population</i>	+
MALE	Percent of the Population that is Male <i>Source: US Census Bureau, Population</i>	+
INCM	Real Per Capita Personal Income (2005 Dollars) <i>Source: US Bureau of Economic Analysis</i>	-
UNEM	Annual Average Unemployment Rate <i>Source: US Department of Labor Bureau of Labor Statistics</i>	+
ALC	Per Capita Alcohol Consumption (Gallons/Year) <i>Source: National Institute on Alcohol Abuse and Alcoholism</i>	+

---

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
*Senior Capstone Project for Andrea J. Bergeron*

---

*Table 3: Descriptive Statistics*

---

<b>Variable</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum Value</b>	<b>Maximum Value</b>	<b>Number of Observations</b>
Suicide	13.19	3.74	4.80	24.60	225
Ages 15-24	0.14	0.01	0.13	0.18	225
Ages 40-64	0.33	0.02	0.25	0.38	225
Ages 65+	0.13	0.02	0.07	0.17	225
Male	0.49	0.01	0.47	0.52	225
Income	35,893.82	6,420.57	26,462.67	63,970.07	225
Unemployment	0.05	0.02	0.03	0.13	225
Alcohol	2.44	0.54	1.26	4.38	225

---

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
**Senior Capstone Project for Andrea J. Bergeron**

---

*Table 4: Empirical Results*

<b>Variable</b>	<b>Equation 1</b>	<b>Equation 2</b>
Constant	-62.83** (-2.35)	-54.41** (-2.09)
Ages 15-24	-46.58** (-3.03)	-32.27** (-2.17)
Ages 40-64	42.29** (2.40)	27.38 (1.62)
Ages 65+	60.02** (2.36)	57.41** (2.34)
Male	111.05** (2.08)	95.81* (1.82)
Income	0.0001** (2.96)	8.75E-05* (1.80)
Unemployment	21.20** (2.73)	27.60** (3.46)
Alcohol		1.65** (2.57)
Number of Observations	225	225
Adjusted R <sup>2</sup>	0.9407	0.9406
Time-Fixed Effects	Yes	Yes
State-Fixed Effects	Yes	Yes

---

Notes: Coefficient estimates with t-statistics reported in parentheses

\*\* Indicates statistical significance at the 5% level

\* Indicates statistical significance at the 10% level

**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
**Senior Capstone Project for Andrea J. Bergeron**

---

**REFERENCES**

- Cameron, Samuel. (2005) "Economics of Suicide." *Economics Uncut: A Complete Guide to Life, Death, and Misadventure*. Pages 229-263.
- Chen, Joe et al. (2010) "Socio-Economic Studies on Suicide." *Journal of Economic Surveys*. Pages 272-307.
- Hamermesh, Daniel and Soss, Neal. (1974) "An Economic Theory of Suicide." *The Journal of Political Economy*. Page 83-98.
- Durkheim, Emile. (1951) "Suicide: A Study in Sociology." *The Free Press*. (Original in 1897, English Translation 1951). Pages 1-408.
- Frank, Richard and McGuire, Thomas. (2000) "Economics and Mental Health." *Handbook of Health Economics: Volume 1*. Pages 895-953.
- Kunce M, Anderson A. "The Impact of Socioeconomic Factors on State Suicide Rates: A Methodological Note." *Urban Stud* 2002; 39: Pages 155 -62.
- Ludwig, Jens and Marcotte, Dave. (2004) "Anti-Depressants Suicide, and Drug Regulation." *Journal of Policy Analysis and Management*. Pages 249-272.
- Marcotte, Dave. (2003) "The Economics of Suicide, Revisited." *Southern Economic Journal*. Pages 628-643
- Marcotte, Dave. (1999) "Prevalence and Patterns of Major Depressive Disorder in the United States Labor Force." *The Journal of Mental Health Policy and Economics*. Pages 123-131.
- Martin, Timothy W. (2013) "Suicides Soar In Past Decade: Annual Rate Surpasses Car-Crash Deaths; Rate Among Middle-Aged is Cited." *The Wall Street Journal*.
- National Alliance on Mental Illness (NAMI). (2009) "The State of Public Mental Health Services Across the Nation." *Grading the States 2009: A Report on America's Health Care System or Adults with Serious Mental Illnesses*. Pages 23-46.
- Noh, Yong-Hwan. (2009) "Does Unemployment Increase Suicide Rates? The OECD Panel Evidence." *Journal of Economic Psychology*. Pages 576-582.



**The Economics of Suicide: An Empirical Study of America's Rising Suicide Rate**  
**Senior Capstone Project for Andrea J. Bergeron**

---

- Okada, Keisuke and Samreth, Sovannroeun. (2011) "A Study on the Socio-Economic Determinants of Suicide: Evidence from 13 European OECD Countries." *Munich Personal RePEc Archive*. Pages 1-18.
- Ross, Justin et al. (2012) "Does State Spending on Mental Health Lower Suicide Rates?" *The Journal of Socio-Economics*. Pages 408-417.
- Snipes, Michael et al. (2012) "Unemployment Fluctuations and Regional Suicide: 1980-2006." *Journal of Applied Economics and Business Research*. Pages 103-123.
- Suzuki, Tomoya. (2008) "Economic Modeling of Suicide Under Income Uncertainty: For Better Understanding of Middle-Aged Suicide. *Australian Economic Papers*. Page 297-310.
- Wooldridge, J.M. (2002). "Econometric Analysis of Cross Section and Panel Data." Cambridge, MA. The MIT Press.
- Yang, Bijou and Lester, David. (1991) "Is There a Natural Suicide Rate for a Society?" *Applied Economics Letters*. Page 137-140.
- Yang, Bijou and Lester, David (1997) *The Economy and Suicide: Economic Perspectives on Suicide*. Commack, NY. Nova Science Publishers, Inc.