

Correlation between General Population Suicide Rates and
NIH Funding in the United States

by

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Dedication

THIS PROJECT IS DEDICATED TO MY WONDERFUL FAMILY. TO MY HUSBAND, STEVE, AND MY SON, TREVOR, FOR THEIR CONTINUAL LOVE AND SUPPORT. TO MY MOTHER, MARTHA, FOR ALWAYS BELIEVING IN ME AND ENCOURAGING ME TO NEVER GIVE UP.

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Abstract

Suicide is a multifactorial disease that has far reaching effects on mankind. Suicide research receives a portion of funding through various National Institutes of Health (NIH), and institutes of disease that are considered comorbidities to suicide. The NIH Institutes of interest are the National Institute of Mental Health (NIMH), the National Institute for Alcohol Abuse and Alcoholism (NIAAA) and the National Institute for Drug Abuse (NIDA). These three disorders are commonly seen in victims of suicide. The aim of this study was to investigate whether funding for these Institutes for the years 1999-2012 is correlated with suicide rates in the United States. Suicide data was gathered from the public database of the Centers for Disease Control Prevention (CDC) Web-based Injury Statistics Query and Reporting System (WISQARS) system. Funding data was gathered from the public database, of the NIH, using the NIH Research Portfolio Online Reporting Tools (RePORT) system. All funding data was adjusted for inflation using the Consumer Price Index (CPI) inflation calculator from the Bureau of Labor Statistics.

Funding for these three institutes showed various correlations when individually compared to suicides rates for each specific year of interest. Correlation was calculated using the Pearson Function Correlation Coefficient test for years 1999-2012. A highly positive correlation was seen for years 1999 through 2005. From 2006 to 2012, the correlation changed from highly positive to moderately negative. Therefore, in the last several years federal funding to NIMH, NIAAA, and NIDA has not kept pace with the increase in suicide rates. This suggests a disconnect between our nation's health research priorities and the need to address this devastating outcome of substance and alcohol abuse, and mental illness.

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Introduction

Suicide is a tragic occurrence. The series of events and circumstances leading to suicide are very complicated. Suicide knows no boundaries. It affects both males and females of all races and in most age groups. (Center for Disease Control and Prevention (CDC), 2009) Suicide, by definition, is when violence is directed towards one's self to end one's life. Death is the result of the action taken by this individual. (CDC, 2009) However, when suicide occurs, the effects are far-reaching on friends and relatives. According to the CDC (n.d.), suicide is the 10th leading cause of death for person ages 10 and older in the United States (US). In 2010, 38,364 deaths could be attributed to suicide. (CDC, n.d.) In 2012, suicide still ranked a solid 10th for loss of life. (CDC, n.d.) There were 40,600 suicides reported in 2012 and this figures to approximately one death by suicide every 12.9 minutes. (CDC, n.d.; AFSP, 2012)

Suicide is multifactorial in cause, but mental illness, alcohol, and substance abuse are significant factors contributing to suicide. Therefore, it stands to reason that improving our understanding of the nature, diagnosis, and treatment of these risk factors will have a beneficial impact on suicide rates, as it has been recognized by the National Strategy for Suicide Prevention (see below). Ideally, federal funding for mental health, alcohol, and substance abuse should be proportional and commensurate with the rate of suicide in the US.

Background

In 1986 the suicide rate was as high as 13 per 100,000 people. The suicide rate showed a steady decrease to the rate of 10.4 per 100,000 people, by the year 2000. (CDC, n.d.; AFSP, 2012) Unfortunately, from 2000 to 2012, the rate had increased back to levels similar to those seen in the 1988 (12.5 per 100,000). (The White House, 2013) As a demonstration of its importance, suicide is the third leading cause of death in adolescents ages 12 to 17 in the US and the second leading cause of death in ages 15 to 29 worldwide in 2012. (World Health Organization, n.d.) The CDC, (n.d.) in 2011, stated that self-harm injuries accounted for 487,700 Americans, including adolescents and adults, being treated in emergency rooms, yearly. Self-harm injuries include both suicidal and non-suicidal behaviors such as self-mutilation. According to the CDC (2009), female high school students, who had 1) considered, 2) planned, or 3) attempted suicide, in 2009, had a higher percentage in all three categories than their male counterparts. High school females lead males in:

1. considered suicide 17.4 % versus 10.5 %;
2. planned suicide 13.2 % versus 8.6 %;
3. attempted suicide 8.1 % versus 4.6 %.

Yet across all age groups, males are four times more likely than females to commit suicide. This pattern between the genders has been fairly constant from 1981 to current statistics. In 2012, the suicide rate in men was 20.3 per 100,000, while the female rate was 5.4 per 100,000. Males complete suicide about 4 times the rate of females and account for 78.3 % of all US suicides. Even though males are more likely to die, females attempt suicide approximately 3 times more than males. (CDC, n.d.)

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With the population as a whole in 2012 the highest suicide rates were seen in the age group of 45-64 years (19.1 per 100,000) with the second highest being in individuals 85 years and older (17.8 per 100,000). Age groups of 25 to 44 and 65 to 84 were very similar with rates of 15.7 and 15 per 100,000, respectively. Rates in adolescent populations lagged further behind. Yet, still tragic, the rates in age groups of 15 to 24 and 14 years and younger were 10.4 and 0.5 per 100,000, respectively. (CDC, n.d., AFSP, 2012)

According to the American Foundation for Suicide Prevention (AFSP) (2012) the economic impact of 2010 suicide instances was determined to be more than \$44 billion annually. It is the adult working population that had contributed to the bulk of this cost from both losses in wages and work productivity. (The White House, 2013) Additionally, medical costs related to self-harm injuries were estimated at \$2 billion annually. (AFSP, 2012) These kinds of statistics have drawn the attention of The White House and specifically, the Office of National Drug Control Policy (2013), which stated: “When we prevent or successfully treat substance abuse, we prevent suicides.”

Alcohol and Substance Abuse

It is well documented that alcohol and drug use disorders are associated with suicidal behavior. According to Substance Abuse and Mental Health Services Administration (SAMHSA) (n.d.) from 2000 to 2012 drug-poisoning deaths increased from 17,415 to 38,329. This was an increase of 120 % during this twelve-year span, with more than half of the deaths involving pharmaceuticals and 75 % of those deaths being caused by prescription analgesics. (SAMHSA, n.d.) With individuals who abuse substances the risk of suicide greatly increases. Substance abusers seeking professional treatment have high rates of depression diagnoses. In 2009, 33.3 % of those succeeding in the act of suicide tested positive for alcohol, 23 % were

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positive for antidepressants, and 20.8 % were positive for opiates including heroin and prescription pain medications. (Karch D.L., Logan J., McDaniel D., Parks S, Patel N., 2012)

Narcotic analgesia is quite often implicated in suicide attempts. Of the 202,000 people admitted to emergency rooms in 2010 for drug-related attempted suicide, 33,000 of those cases involved narcotic pain relievers. (The White House, 2013)

According to the National Institute for Alcohol Abuse and Alcoholism (NIAAA) (2009), there are many reasons why an individual turns to alcohol and alcohol abuse. The most common reasons why individuals abuse alcohol include: anxiety and depression, growing up in a home where alcohol and drug use was considered the norm, financial worries, and peer pressure. Individual cases of alcohol abuse quite often involve drug abuse. Many times, alcohol and drugs are referred to “hand-in-hand” as individuals that abuse one substance are most likely to abuse the other substance. (NIAAA, 2009) NIAAA (2009) describes the consequences of alcohol and/or substance abuse as confusion, slurred speech, reduced inhibitions, breathing problems, even coma and death. Another high-risk behavior is driving under the influence of these substances. It is the risky and/or violent behaviors that typically result in suicidal and homicidal behavior. (NIAAA, 2009) Also, traumatic experiences tend to increase the risk of suicidal thoughts and behaviors. This is particularly true for individuals with substance abuse issues. (Knox K.L., 2008) According to the CDC (n.d.) some of the behavioral reasons why alcohol influences suicidal tendencies include decreased inhibition, increased impulsivity and decreased self-esteem. Alcohol also deepens depression, which continues to increase the longer alcohol is used. This in turn fosters an “all or nothing” thought process that can conclude with a suicide attempt. Many suicide attempts occur during binge drinking. (CDC, n.d.) According to the Alcohol Alert, a publication from NIH and NIAAA (2009), 15.3 million adults meet the criteria

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for what is labeled as alcohol use disorder. Of those, 2.3 million adults meet the criteria for drug use disorder. To complicate this scenario patients with both alcohol- and drug-use disorders typically have more severe dependence-related problems. These patients are more likely to have psychiatric disorders and consequently, are more likely to attempt suicide. This data was acquired from NIAAA's first and second series of the National Epidemiologic Surveys on Alcohol and Related Conditions (NESARC). The CDC (n.d.) states that "a combination of individual, relational, community and societal factors contribute to the risk of suicide." For individuals with a history of alcohol and substance abuse, these factors "might or might not" (CDC, n.d.) actually be the direct cause of suicide but are considered definite risk factors.

Depression

Mental health problems like substance abuse are substantially associated with a several-fold increase in suicide risk. (Moscicki, 2001) However, people whom are clinically depressed are considered at a higher risk of suicide than those patients with other mental health disorders such as substance abuse. (The White House, 2013) Understanding the causes of these factors, followed with better treatment should result in a lower risk (lower rate) of suicide. Therefore, national investment in these risk factors would decrease overall suicide rates.

In 1999, Surgeon General David Satcher brought suicide into the national forefront. His intention was to break the silence and stigma surrounding suicide in the US by issuing *The Surgeon General's Call to Action to Prevent Suicide*. (U.S. Department of Health & Human Services, 2012) The objective of this document was to guide the development of the National Strategy for Suicide Prevention (National Strategy), or simply, to serve as a "blueprint for suicide prevention." (U.S. Department of Health & Human Services, 2012) This broad-ranging document was released two years later, in 2001, and it included 11 goals and 68 objectives.

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(AFSP, 2012) In 2010, the SAMHSA identified many factors that improved the assistance to those seeking help since the release of the document. (AFSP, 2012) These factors included the creation of the National Suicide Prevention Lifeline in partnership with the Veterans Crisis Line, establishment of the Suicide Prevention Resources Center and increased training of clinicians, to name only a few improvements. (U.S. Department of Health & Human Services, 2012; SAMHSA, n.d.)

Almost two decades after the National Strategy was released, National Action Alliance for Suicide Prevention (Action Alliance), along with the Office of the Surgeon General, released the revised *2012 National Strategy for Suicide Prevention: Goals and Objectives for Action*. (US Department of Health & Human Services, 2012) Previous efforts were evaluated regarding progress, and new findings from scientific research and enhanced suicide prevention and care were updated within the document. This public-private partnership was comprised of members of the Action Alliance and Secretaries of Health and Human Services as well as Defense. Their goal was to decrease the occurrence of suicide within our nation and continue the work originally proposed by Dr. Satcher. The revised National Strategy highlighted:

- Improved understanding of how suicide relates to mental illness, substance abuse, violence, etc.
- Better methods to identify at-risk groups
- More effective types of interventions to prevent suicide.

The entire document included 13 goals and 60 objectives which relate to working on this national strategy.

NIH Funding

As it has been succinctly stated by Callahan (2014), “budgets are essentially a statement

Correlation between General Population Suicide Rates and NIH Funding in the United States of priorities,” and “tracking the distribution of federal resources is one of the best indicators of our national priorities.” This of course includes federal funding for biomedical research. The National Institutes of Health (NIH) has many institutes specifically dedicated to the funding of, and research and treatment for individuals who suffer from a wide range of comorbidities that could eventually result in suicide or increases the chances of this occurrence. Specifically, the National Institute of Mental Health (NIMH), the National Institute on Drug Abuse (NIDA) and the NIAAA address the bulk of these comorbidities. Early intervention is critical to saving lives. When initially investigating research dollars spent by the NIH by disease for fiscal year 2012, suicide appears far down the list of dollars spent. Top funding went to HIV/AIDS (\$3,075 million), diabetes (\$1,079 million), breast cancer (\$712 million), asthma (\$221 million), Parkinson’s disease (\$151 million) and then suicide (\$49 million dollars). (NIH, 2014; AFSP, 2012) However, other critically-related areas overlap with suicide such as alcoholism, and depression. NIH funding (2014) included alcoholism (\$455 million), depression (\$429 million) and suicide prevention (\$22 million). Drug abuse and substance abuse are two separate funding categories. The NIH reported these funding data in a way that is not typical for the NIH Research Condition and Disease Categorization Process. Additionally, the NIH only reported the projects specifically funded for drug abuse and substance abuse. However, drug and substance abuse dollars share a degree of overlap with their funding. The 2012 NIH funds totaled approximately \$1,052 million for Drug Abuse projects and \$1,634 million dollars for Substance Abuse projects.

Research Question

Is there a correlation between general population suicide rates and NIH funding in the United States? More specifically, is there a correlation between yearly total successful suicides and funding changes for three major institutes of the NIH (NIMH, NIAAA, NIDA) that are implicated with suicidality.

Methodology

To answer the research question, mortality rates were taken from the CDC Web-based Injury Statistics Query and Reporting System (WISQARS) data tables from the Fatal Injury Reports. The WISQARS output range was sorted for suicide, age, sex and year (1999-2012). WISQARS mortality reports provide tables of the total numbers of suicide-related deaths and the death rates per 100,000 people. WISQARS calculates age-adjusted rates and standardizes them to the total U.S. population. It is possible to select one of five standard years: 1940, 1970, 1980, 1990, and 2000, to use for comparison. For purposes of analyzing data for this project, 2000 was chosen as the standard year.

Funding appropriations by the NIH Institute were selected from the NIH Office of Budget using the NIH Research Portfolio Online Reporting Tools (RePORT) system. The three institutes selected were NIMH, NIAAA and NIDA for years 1999-2012. The Consumer Price Index (CPI) was used to correct the appropriations based on inflation. The United States Department of Labor's Bureau of Labor Statistics CPI calculator was used to calculate the change in buying power for a dollar for each year of this analysis. Each year was compared to the standard year of 1998 (year zero) to help observe the change in inflation, over time from 1999 to 2012. Lastly, simple correlation statistics were calculated using the Pearson Correlation Coefficient Function test.

Results

The variables included in Tables 1 and 2 and Figures 1-4 will be analyzed to determine if there is a correlation between suicides and NIH funding. Table 1 shows annual deaths by suicide, and annual appropriations for NIMH, NIAAA and NIDA for the years 1999 to 2012. Total deaths were collected from the CDC WISQARS database. All NIH funding appropriations were retrieved from the NIH RePORT system. The NIH fund values are in millions, and expressed as thousands.

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Table 1. US General Population Suicides and NIH Funds by Institute, 1999-2012

	Year	Total Suicides	Unadjusted NIH Funds (\$ x 1000)		
			NIMH	NIAAA	NIDA
1	1999	29,199	860,638	259,575	602,874
2	2000	29,350	973,146	292,369	685,781
3	2001	30,622	1,106,305	340,453	780,833
4	2002	31,655	1,246,640	383,615	886,718
5	2003	31,484	1,341,014	416,051	961,721
6	2004	32,439	1,381,774	428,669	990,953
7	2005	32,637	1,411,933	438,277	1,006,419
8	2006	33,300	1,403,515	435,930	1,000,029
9	2007	34,598	1,404,494	436,259	1,000,621
10	2008	36,035	1,412,951	438,579	1,006,022
11	2009	36,909	1,450,491	450,230	1,032,759
12	2010	38,364	1,489,372	462,346	1,059,848
13	2011	39,518	1,476,294	458,286	1,050,541
14	2012	40,600	1,480,265	459,519	1,053,367

Table 1 displays the total suicides per year from 1999 to 2012. These values are shown with the correlating unadjusted NIH funds for NIMH, NIAAA, and NIDA for the corresponding year. Total deaths were collected from the CDC WISQARS database. (CDC, n.d.) All NIH funding appropriations were retrieved from the NIH RePORT system. (NIH, 2014) Table 1 shows larger consistent increases in NIMH, NIAAA, and NIDA funding in the years 1999 through 2003. Funding amounts both increased and decreased in years 2003 through 2012. Suicide numbers showed a gradual increase from 1999 through 2012 except for 2003 which slightly decreased. In 2004, the suicides, not only increased from what was seen in 2003, but it also exceeded the total number seen in 2002.

Correlation between General Population Suicide Rates and NIH Funding in the United States

Figure 1. US General Population Suicides and NIH Funds by Institute, 1999-2012

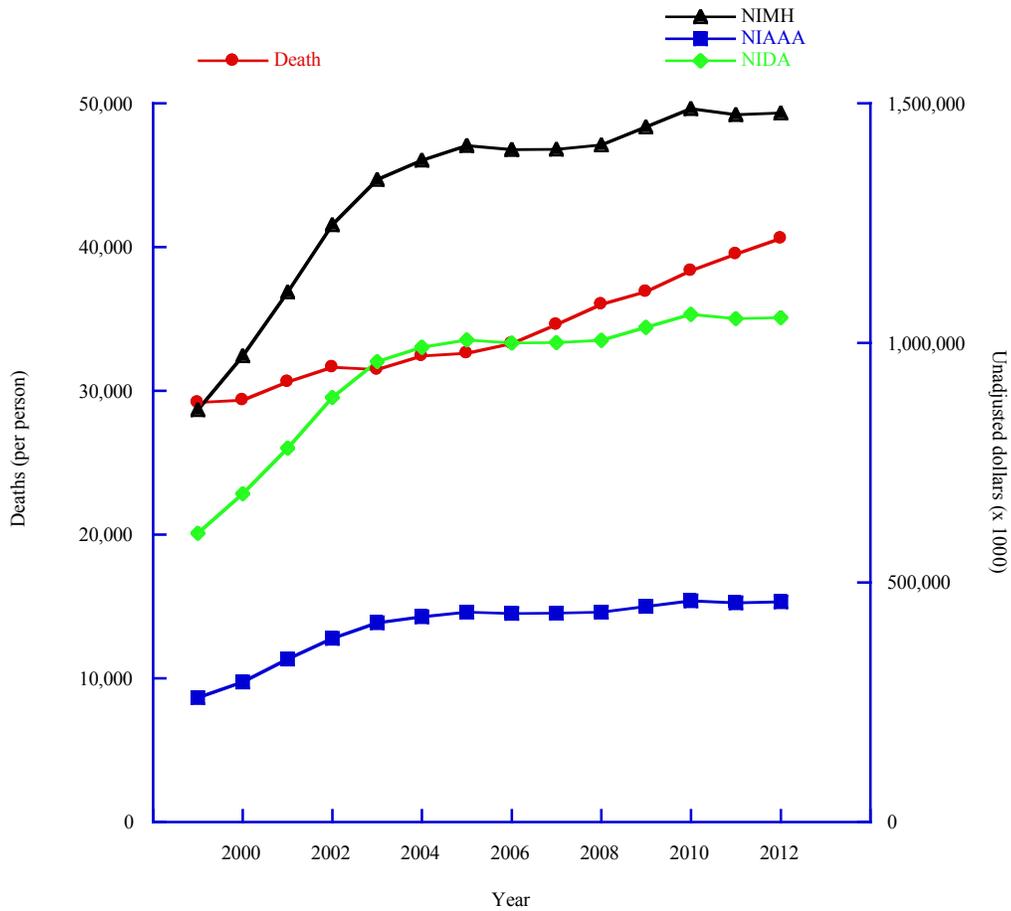


Figure 1 is the graphical representation of the data in Table 1. Data sets were analyzed to determine if there is a correlation between suicides and NIH funding. Table 1 shows annual deaths by suicide and annual appropriations for NIMH, NIAAA, and NIDA for the years 1999 to 2012. There is a steady increase in suicides for this time frame except for a small decrease in 2003. However, funding for NIMH, NIAAA and NIDA appear to keep pace with suicides until 2004 when increases in funding amounts slow down.

Adjusting for Inflation with the Consumer Price Index

The NIH funding appropriation for each institute of interest was entered into the Bureau of Labor Statistics CPI inflation calculator to determine the buying power of the dollar as compared to 1998, which was used as year zero. Comparing back to a year zero will give an appropriate representation of inflation for years 1999 to 2012. (US Bureau of Labor, n.d.)

Pearson Correlation Coefficient

According to the website Social Science Statistics (n.d.), “this test is used to measure the strength of a linear association between two variables, where the value $r = 1$ means a perfect positive correlation and the value $r = -1$ means a perfect negative correlation.” In this study the Pearson’s correlation coefficient calculator was used to determine the r and p values to compare the correlation of suicide rate, separately, with each of the three funding sources. A p value of less than 0.05 is considered significant. (Social Science Statistics, n.d.)

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Table 2. US General Population Suicides Rates and NIH Funds, Adjusted for Inflation, by Institute, 1999-2012

	Year	Death Rate (per 100,000)	CPI Adjusted NIH Funds (\$ x 1000)		
			NIMH	NIAAA	NIDA
1	1999	10.46	842,040	253,966	589,847
2	2000	10.43	921,154	276,749	649,142
3	2001	10.75	1,018,225	313,347	718,666
4	2002	11.01	1,129,529	347,578	803,419
5	2003	10.85	1,104,360	368,567	851,959
6	2004	11.08	1,192,320	369,894	855,084
7	2005	11.04	1,178,418	365,792	839,971
8	2006	11.16	1,134,786	352,463	808,555
9	2007	11.49	1,104,130	342,961	786,629
10	2008	11.85	1,069,706	332,036	761,632
11	2009	12.03	1,102,048	342,074	764,351
12	2010	12.43	1,113,327	345,610	792,252
13	2011	12.68	1,069,783	332,093	761,265
14	2012	12.94	1,050,912	326,235	747,837

Table 2 includes the US suicide rate per 100,000 for the years 1999-2012. These values are placed with the corresponding year NIMH, NIAAA, and NIDA funds which have been adjusted for inflation using the CPI. Table 2 data was collected from the WISQARS database and NIH RePORT system. (CDC, n.d.; NIH, 2014) CPI inflation adjustments were made using the US Department of Labor Inflation calculator. (US Bureau of Labor, n.d.) Amounts were adjusted to 1998 dollars to account for inflation.

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Figure 2. US General Population Suicide Rates and NIH Funds, Adjusted for Inflation, by Institute, 1999-2012

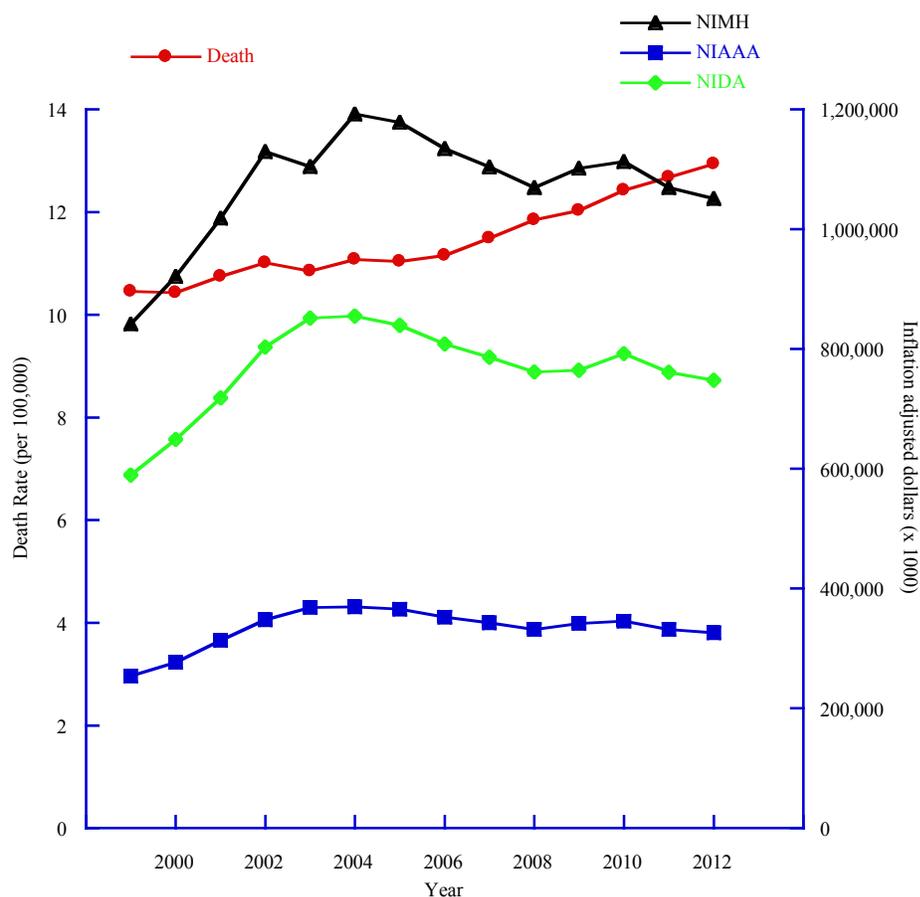


Figure 2 is the graphical representation of the data in Table 2. Data sets were analyzed to determine if there is a correlation between death rate and NIH funding. Table 2 shows death rate per 100,000 by suicide and annual appropriations for NIMH, NIAAA, and NIDA, adjusted for inflation for the years 1999 to 2012. The graphical representation of suicide rates shows an inconsistent increase from years 1999-2005 which changes to a steady increase through 2012. The graphical representation of the NIAAA shows minor increases through 2003 but they level out or decrease through 2012. The graphical representation of NIMH shows an increase through 2002 but then a decrease in 2003. In 2004 NIMH showed an even larger increase above the level seen in 2002. However, from 2005 to 2012 there was a slow but steady decrease. NIDA values showed a steady increase through 2003 where they began an inconsistent decrease through 2012. Since 2007 NIDA's yearly funding has remained below the 2002 funding levels. Since increases seen for all three institutes were inconsistent for the first 7 of the 14 years examined it seemed reasonable to divide the time frame in Figure 2 into two equal halves. Figure 3 represents the early years

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and Figure 4 represents the later years of interest that are used for further analysis.

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Figure 3. Correlation between US General Population Suicide Rates and NIH Funds, Adjusted for Inflation, by Institute, 1999-2005

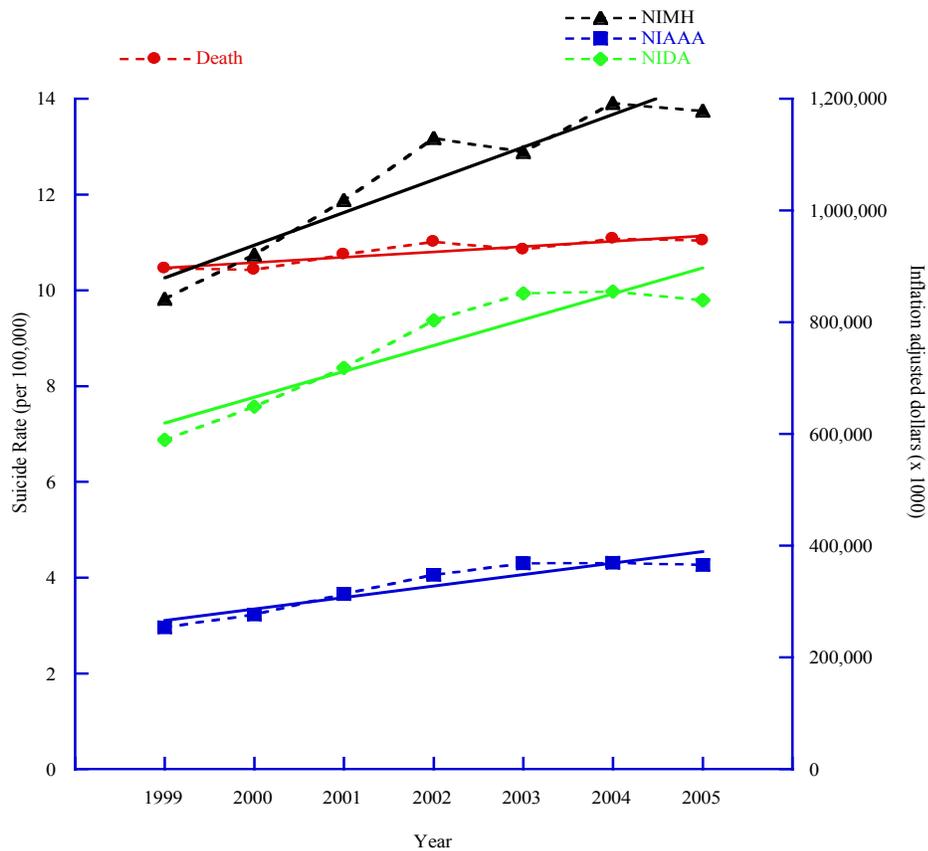


Figure 3 is a closer look at years 1999-2005 from Table 2. A very steady increase is visible for CPI adjusted funds for all three institutes (NIMH, NIAAA and NIDA). Pearson's Correlation coefficient was applied to each funding institute and compared to the suicide death rate for the year of interest using a significance level of $p < 0.05$.

Pearson test values: NIMH $r = 0.9717$, P value = 0.0003; NIAAA $r = 0.9331$, P value = 0.0021; NIDA $r = 0.9257$, P value = 0.0028.

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Figure 4. Correlation between US General Population Suicide Rates and NIH Funds, Adjusted for Inflation, by Institute, 2006-2012

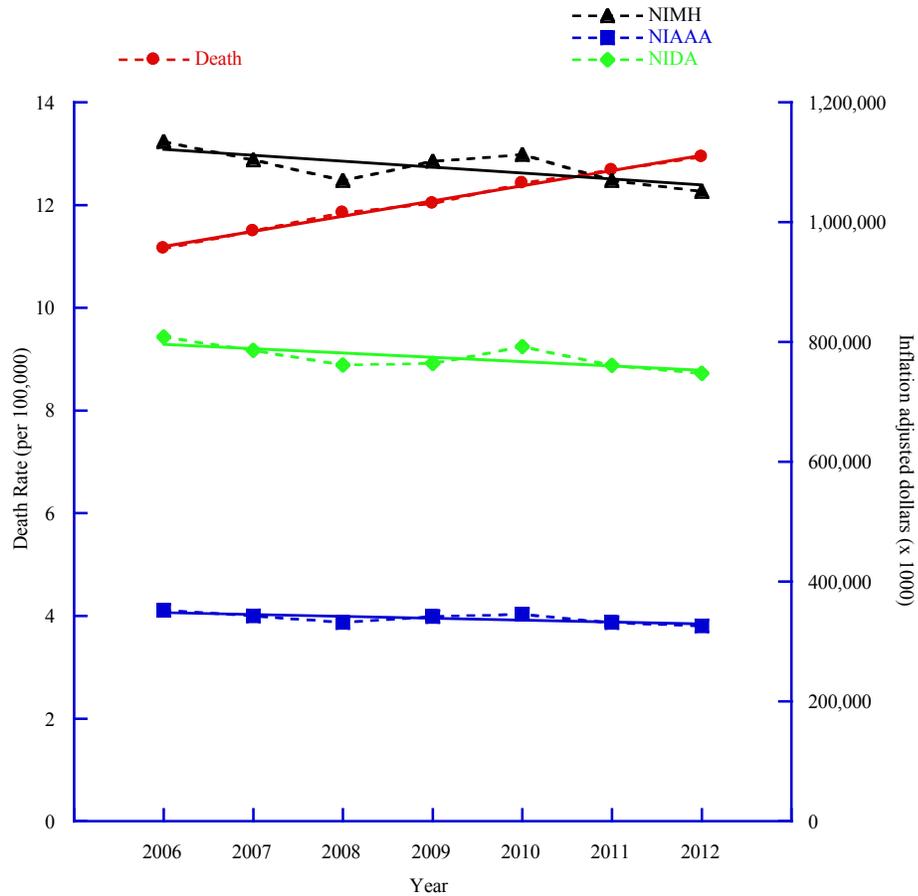


Figure 4 is a closer look at years 2006-2012 from Table 2. The steady funding increase seen in the previous 6 years was not repeated in the later 6 years. Funding appropriations for all three institutes consistently decreased while the suicide rates showed a steady increase. Pearson's Correlation coefficient was applied to each funding institute and compared to the suicide death rate for the year of interest using a significance level of $p < 0.05$.

Pearson test values: NIMH $r = -0.7321$, P value = 0.0614; NIAAA $r = -0.7352$, P value = 0.0597; NIDA $r = -0.7204$, P value = 0.0679.

Discussion

The main findings from this analysis can be summarized as follows:

1. There was a steady increase in national suicide rates from 1999 to 2012.
2. From 1999 to 2005 federal funding in research areas which are directly relevant to suicide risk (i.e., mental health, and drug and alcohol abuse) kept pace with this increase in suicide rates.
3. However, from 2006 to 2012 funding for the major institutes in charge of research in these three areas showed a decline and was, in fact, negatively correlated with suicide rates.

What are the Potential Implications of these Findings?

Figure 1 details the relationship between incidents of death by suicide and unadjusted funding appropriations for each of the NIH Institutes that were potentially related to suicides. Figure 2 shows the relationship between suicide rates and funding amounts adjusted for inflation. Although funding for the three institutes plateaus as depicted in Figure 1, funding actually decreases when corrected for inflation. Figure 2 was divided, by year, equally into Figures 3 and 4. Figure 3 showed a steady increase in funding as the suicide rate from 1999-2005 declined. Yet, Figure 4 showed the opposite results for 2006-2012. Suicide steadily increased, but funding to the three institutes did not increase concomitantly, in fact they showed a slow but steady decrease. It is possible that the decreased funding was too abrupt to maintain the decrease of suicide rate.

Pearson's Correlation coefficient was applied to the data for both Figure 3 and 4 to determine if the correlations between suicide rates and each of the three funding institutes were significant. Figure 3 was found to have a strong, positive, significant correlation (p value < 0.05)

Correlation between General Population Suicide Rates and NIH Funding in the United States between funding and suicide from 1999 to 2005. However, Figure 4 showed a strong trend for an inverse correlation between suicide rates and funding in 2006 to 2012. Although this trend was not considered significant from 2006-2012, it could become significant if the current trends in funding for all three institutes and the suicide rate continue into the future.

Decreases in funding, in these key NIH areas, are not the sole causal factor for the observed increases in suicide rates. Nevertheless, decreases in funding could have indirect, and/or long-term impact on the incidence of suicidal behavior.

In 2008, reductions in the labor force and productivity were a prelude to an increase in suicide rates among men in 27 industrialized countries. (Brenner, M. H., 2012) Many people resort to the use of drugs and alcohol to alleviate stressors such as unemployment or everyday anxiety and depression. As discussed, historically drug abuse and alcohol abuse greatly increase the chance of suicidal behavior. There are multiple societal factors contributing to suicide rates either directly through life events or indirectly through increases in mental health problems, alcohol abuse and drug abuse.

Mental health disorders, alcohol abuse and drug abuse are important and significant risk factors for suicide. Further research into the etiology and treatment of these conditions is a definite way to develop a better understanding of how to affect the upward trend in suicide rates observed over the past several years. As stated by AFSP, “our effectiveness in preventing suicide ultimately depends on more fully understanding how and why suicide occurs.” The stigma surrounding suicide, which Dr. Satcher addressed in the first version of the National Strategy, has been shown to limit society’s investment in suicide research. (AFSP, 2012) Our understanding of the causes of and treatment for suicide greatly lags behind the knowledge learned about more publicized illnesses. Decreases in funding to NIMH, NIAAA, and NIDA

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have resulted in a decreased ability to collect data and gain knowledge thus indirectly impacting suicidal behavior. (AFSP, 2012)

It would be impossible to state that increased suicide rates were caused by a decrease in funding. However, it is reasonable to consider that complicated societal issues such as war and recession have fueled the increase in suicide rates over this time frame. This project supports the importance of continued evaluation of suicidal rate trends to justify research to learn more about, and discover better diagnostics, treatments, and preventive methods, for people at risk of suicide. Unfortunately, it appears that the government priorities regarding funding of mental health diseases are waning as seen by the decreases in funding for NIMH, NIAAA, and NIDA. There appears to be a disconnect between decreasing mental health, alcohol and substance abuse funding and the increasing suicide rate. This disconnect is clearly evident in the report from The National Center on Addiction and Substance Abuse (CASA) at Columbia University (2009). For every dollar spent by state and federal governments to prevent and treat substance abuse and addiction, \$59.83 was spent in public programs to address the aftermath caused by these devastating illnesses. Further research, as recommended by this report, focusing on early identification of suicidal symptomology. This recommendation should help to reverse the trend of treating the aftermath of the disease.

A suicidal trend to consider would be unemployment rates versus suicide rate. A look at the aging US population and rapidly increasing costs of retirement and medical health care could also identify an influential factor in suicidal behavior. Similarly, research into the trauma of war and mental health outcomes upon veterans is critical. The media continually make the case that strife and disease have the world on the verge of chaos, and personal challenges faced in modern times may lead to a variety of mental health disorders. Lastly, a look at adolescence suicide may

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strongly justify the need for research to identify triggers for suicide. It is the knowledge achieved through research that identified links between environment stressors, mental disorder and suicide risk. This association is very apparent in research involving adolescence bullying and suicide. (AFSP, 2012)

Rapid diagnosis, treatment, and long term prevention are the keys to managing this devastating multifactorial condition as we will never truly know all reasons for suicide as they are as diverse as mankind. However, without appropriate funding, research into the etiology and treatment of suicidal behavior will continue to lag behind other high profile diseases, and we will be unable to fulfill the goals of the *National Strategy for Suicide Prevention: Goals and Objectives for Action*. Declining research dollars will halt the steady increase of knowledge that could potentially unlock the secrets to increasing suicide rates that we have observed for more than a decade.

Conclusion

There are many potential influences on suicide rates that deserve investigation. The purpose of the analysis within this project was to determine if there was a correlation between general population suicide rates and NIH funding in the United States. More specifically, is there a correlation between yearly total successful suicides and funding changes for three major institutes of the NIH (NIMH, NIAAA, NIDA) that are implicated in suicides. It is shown that funding decreased but suicide continued to steadily increase. Data analysis shows that there was a significant positive correlation between suicide death rates and inflation adjusted funding appropriations individually for NIMH, NIAAA, and NIDA for years 1999-2005. This was confirmed by applying the Pearson's Correlation coefficient. However for years 2006-2012 the correlation became moderately negative but not significant. These variable trends suggest that suicide death rates are not causal of changes in NIH funding or vice versa. Present research funding appropriations may not alter the continued rise in the suicide rate.

This data should serve as a warning that decreases in funding will impact research that directly influences the gathering of scientific knowledge that is essential to understand the basis of mental health disorders, alcoholism and substance abuse. If investments in funding decrease, then progress of research and discovery will be hindered along with the creation of new diagnostics and treatments. Thus it is clear that more research funding is needed.

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