The Implications of Unemployment on US Suicide Rates

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Abstract

Although suicide is, by definition, an individual act, it is speculated to be caused by psychological, environmental, and economic factors. This study attempts to identify the effect the United States unemployment rate has on the national suicide rate. Previous research has found that in countries without unemployment benefits there is a significant positive relationship between the two, but what about a country with established aid like the United States? While my initial assumption was that this trend would continue to be positive, I find that when controlling for confounding variables there is no significant correlation between unemployment and suicide, all else held constant.

According to the World Health Organization, approximately eight hundred thousand people die from suicide every year. For perspective, that is one person every 40 seconds (WHO, 2020). For years, researchers and mental health experts have attempted to discover what factors contribute to this shockingly high figure with the hope of reducing the frequency of suicides worldwide. While by definition suicide is an individual act, evidence indicates that suicide is also influenced by social, environmental, and economic factors (Won et al, 2013).

In a study conducted in Taiwan, economists compared the nexus between unemployment and suicide (Chan et al, 2018). They found that up until the nineties, there was a strong, positive effect between the two, however, this relationship all but disappeared soon after. What happened? Well in the nineties, Taiwan had implemented a welfare program that would provide benefits to aid those heavily affected by the stress of unemployment. So now, when Taiwanese citizens experience mental, financial, or otherwise stress caused by job loss, there is a system in place that helps reduce that anxiety thus reducing suicides nationally.

Another study published in the European Journal of Public Health provided further evidence, finding that in countries with a secure welfare regime there is an initial devastating psychological effect when the unemployment rate spikes (Gajweski & Zhukovska, 2017). However, after a prolonged period of time, that effect is reduced significantly. This suggests that when precautions are in place to give people financial help there is not a lasting disadvantage of unemployment. I keep these studies in mind as I conduct my own testing, as it is important to note that the United States currently has such unemployment benefits available to its population. Thus, I do not expect lasting impacts on the suicide rate as employment shifts, but perhaps, as found in the Gajweski & Zhukovska article, there is a chance I will see a dramatic initial increase or decrease in unemployment.

The purpose of this paper is to establish a relationship between the unemployment rate and the national suicide rate in the United States – a country where unemployment benefits are available to those who need it. In the midst of the coronavirus pandemic of 2020, the United States has seen record high unemployment. While it is important to consider that there are countless possible factors that contribute to suicide, understanding the relationship between suicide and unemployment will allow us to continue to take precautions as we learn what to expect in situations such as this. As it stands, my prediction is that as the unemployment rate increases, I expect to see an increase in the suicide rate as well. However, given the safeguards in place to help American people through unemployment benefits, I do not expect the results to be lasting and they may not be significant. Ultimately, it is the hope that evidence of this relationship will help increase the overall understanding of suicide in the United States.

Data:

To answer this question, data was pulled from the Center for Disease Control and Prevention (CDC) and the U.S. Bureau of Labor Statistics (BLS); both reputable, government funded programs which offer data on the national suicide statistics and seasonal unemployment rates respectively. The CDC defines suicide as "death caused by injuring oneself with the intent to die" (WHO, 2020) and thus the data is a record of mortality rates where the cause of death corresponds with this definition. Additionally, this death rate is measured as the number of deaths per 100,000 people sorted by gender, race, and state for each year from 2000 to 2018. This figure is important to the study as it will be the primary output variable for my models; I want to be able to see how the number of suicides changes while unemployment changes, holding gender, race, and state constant as controls. Furthermore, to represent unemployment, I

took the seasonal unemployment rate from the BLS database for each state in the US from 2000

to 2018. I then merged the two data sets by State and Year, allowing it to act as one large data set
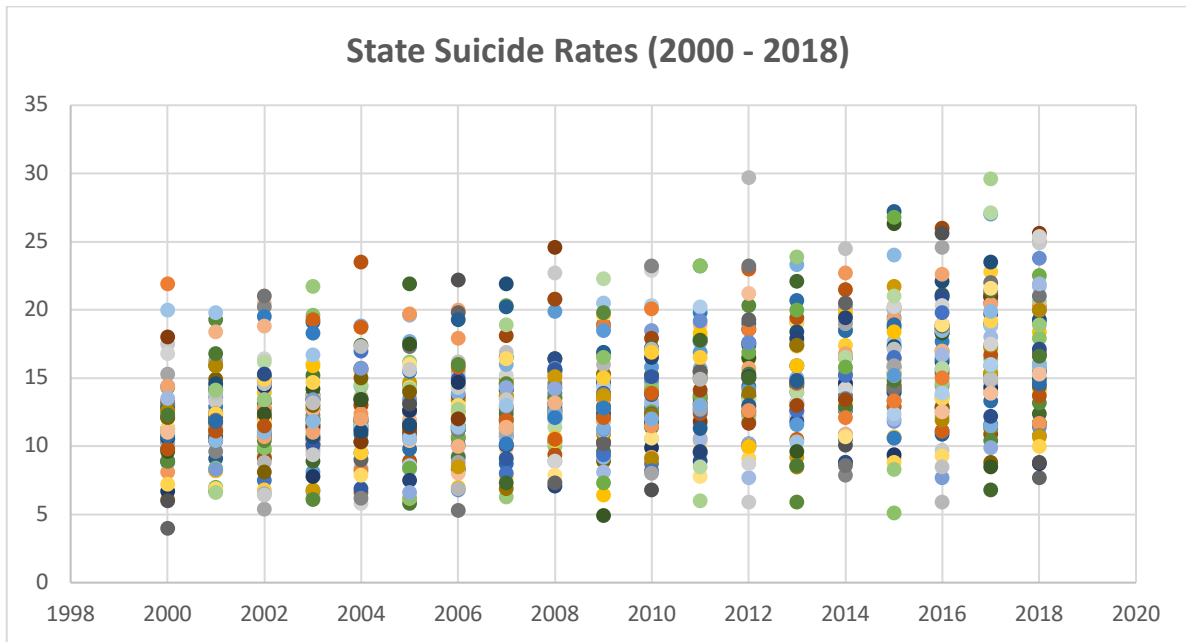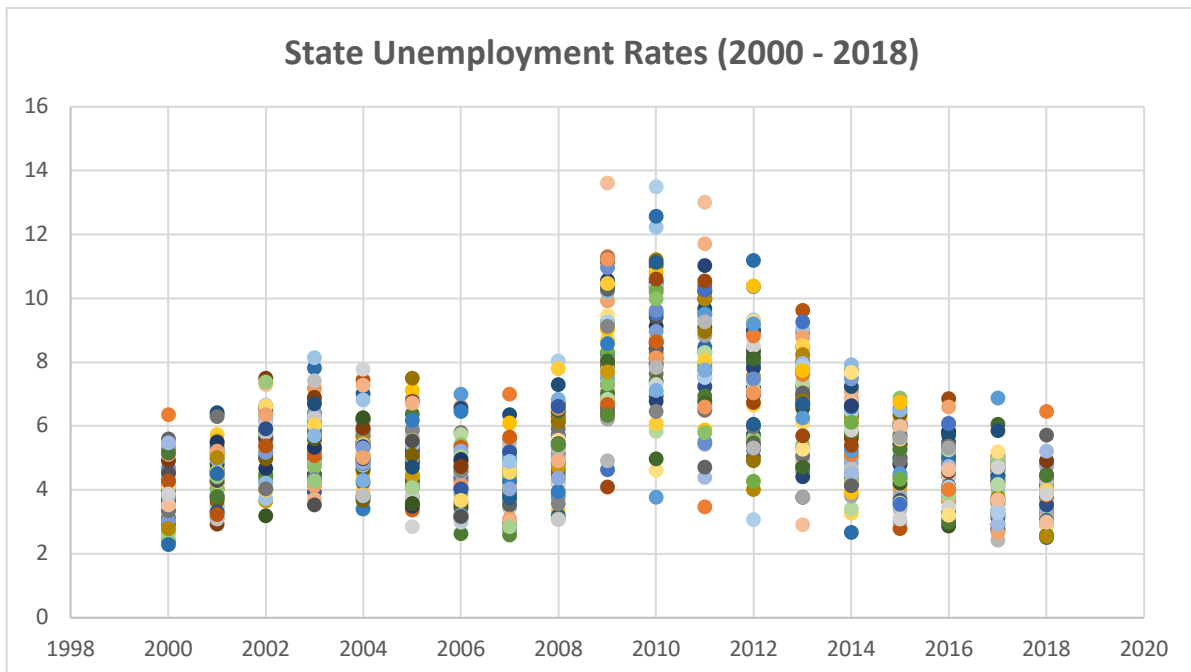
to run regressions and gain insights from.

Figure 1:

Figure 2:

Figures 1 and 2 above demonstrate the trend of the state suicide rate and state unemployment rate respectively over the years included in the data set. Here it is evident that there is a somewhat steady increase in the national suicide over time while unemployment rates seem to fluctuate year to year with a spike around 2009, likely a result of the housing market crash in 2008. It is interesting to note that while we see a spike in the unemployment rate, we do not see a subsequent spike in the suicide rate.

The intent behind the inclusion of year, race, gender, and state is to help the model control for some of the context of the individual, ensuring the comparison of people from similar demographics and hopefully isolating the affect unemployment rates have on the number of suicides in the United States. Note, controlling for state will be particularly important as each state has a unique suicide rate compared to the next. Controlling for year is also important as seasonal unemployment can greatly change each year.

However, there are many limitations to this current data set. First, as noted previously, there are many driving forces that contribute to the likelihood that someone might consider suicide. As this data is not taken at the individual but instead a state level, I was unable to take into account some important demographic specifics of the individuals who commit suicide that are proven to correlate with mental health concerns. These factors include, but are not limited to, the person's socio-economic status, pre-existing mental health concerns or diagnoses, history of drugs or alcohol abuse, history of physical or sexual abuse, etc. Additionally, the unemployment variable does not control for their marital status or level of education which might also produce misleading findings. The inability to account for individual effects limits the study's predictive capabilities. However, I still believe that there are important universal inferences that can be deduced from this data.

Methods:

In assessing my hypothesis, I created the following naïve model with the intent of establishing a baseline relationship between the national suicide rate and unemployment rate in the United States[1]:

$$(1) \quad SuicideRate_t = \beta_0 + \beta_1 UnemploymentRate_t + u_{it}$$

Once the baseline was created, it was important to introduce the relevant control variables into the model which may contribute to or confound the initial trend. Consequently, the primary model used (model 2) is a linear model including dummy variables for gender and race demographic statistics of those who commit suicide. The resulting model is as follows[2]:

$$(2) \quad SuicideRate_t$$
$$= \beta_0 + \beta_1 UnemploymentRate_t + \beta_2 Gender_i + \beta_3 Race_i + \lambda(Year)_t$$
$$+ \mu(State)_i + u_{it}$$

This should allow me to see the increase or decrease of the suicide rate of each demographic as the unemployment rate increases or decreases. Additionally, year was added as a control to account for any years of substantial economic recessions, and state was added as a control to limit the effects of natural, imperative patterns in the suicide rate of outlying states. Once these control variables are added, the subsequent β_1 coefficient and significance should be a more accurate indicator of the actual effect unemployment rate has on the national suicide rate.

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[1] The use of t and i subscripts are to notate the time and individual levels of observation respectively.

[2] The use of symbols λ and μ in models (2) and (3) are to notate the year and state fixed effects respectively.

In addition to these models, I wanted to also include the log of both rates. This should allow me to see the percentage change of the suicide rate compared to the percentage change of the unemployment rate. The following model accounts for this change:

(3) $lnSuicideRate_t$

$$= \beta_0 + \beta_1 lnUnemploymentRate_t + \beta_2 Gender_i + \beta_3 Race_i + \lambda(Year)_t$$
$$+ \mu(State)_i + u_{it}$$

These models have many limitations due to the complexity of suicide and the absence of individual depth in the dataset used; the data only provides information on a large scale and not on the individual level. Consequently, it isn't possible to control for individual characteristics such as pre-existing mental health concerns or who received government supplemented unemployment benefits that might decrease stress financial strain or stress.

Note that this model satisfies the Gaus-Markov assumptions as best as the dataset allows. The variables used are linear and independent of each other and the dataset is representative of the entire United States population. However, as stated previous, the data used is limited and there are likely factors in our error term that might affect the suicide rate which are outside the parameters of the data set.

Results:

Upon running the naïve baseline model (1) with the data, I found that there is a significant negative correlation between unemployment rate and suicide rate. More specifically, as the national unemployment rate goes up by 1 the suicide rate actually decreases by 0.7. This effect was significant at the 0.01 alpha. Model (2) then included the aforementioned control variables and applied them to the base model. This time I found that when controlling for gender,

race, year, and state variables the significance of the unemployment variable goes away, while

all of the other variables added are significant at the 0.01 alpha. This means that the control

variables are much better explanatory factors of whether individuals will commit suicide. This

further disproves my hypothesis, claiming that unemployment does not have a significant

influence on the suicide rate.

Model (3) then took the log of both rates and demonstrated that as the unemployment rate

increases by one percent, the suicide rate decreases by -0.00492 percent, all else held constant.

This effect was also not significant at any level, and again, all other control variables included

were significant at the 0.01 alpha. Table 1 below shows the abridged coefficients and levels of

significance of the three models[1]:

Table 1:

VARIABLES	Model (1) SuicideRate	Model (2) SuicideRate	Model (3) lnSuicideRate
Unemployment Rate	-0.413***	-0.0376	
	[0.0933]	[0.160]	
lnUnemploymentRate			-0.00492
			[0.0605]
Gender		13.67***	1.277***
		[0.249]	[0.0146]
Race		0.969***	0.188***
		[0.144]	[0.00846]
Constant	15.84***	-13.26***	-0.546***
	[0.568]	[1.452]	[0.114]
Observations	3,525	3,525	3,525
R-squared	0.006	0.607	0.762
Standard errors in brackets			
*** p<0.01, ** p<0.05, * p<0.1			

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[3] Appendix A includes the unabridged output for Table 1.

These results are likely akin to the aforementioned studies who demonstrated that countries who have implemented welfare aid to those effected by unemployment have actively done so to help remove the stresses that come with unemployment. This is one possible explanation as to why there is no significant relationship between the two variables; having no relationship between suicide and unemployment could help support the case that government provided unemployment benefits truly work in helping limit the amount of stress and anxiety that comes with losing a job. However, more studies would have to be done to say with certainty that is the case. Overall, this is good information to have as it contributes to the understanding of the effect of unemployment on mental health; these results demonstrate that there are more significant variables than unemployment when predicting the number of suicides in the United States.

Conclusion:

There is not enough evidence to prove my initial hypothesis that an increase in the unemployment rate would result in an increase in the national suicide rate. In future studies, I suggest studying the effectiveness of unemployment benefits by attaining data on an individual level that can control for household economic variables such as income level, marital status, level of education, and whether they are affected by unemployment and consequently whether they receive government funded aid. This would help further prove the explanation of how government aid can reduce the negative psychological effects of unemployment. Another possible addition to this study which might provide more insight into this question would be to look into sustained trends in the unemployment rate instead of only the current rate. For example, if the unemployment rate has been consistently down for a month perhaps that might

have a greater effect on suicide rate as opposed to a singular dip in unemployment. This would allow researchers to see how unemployment benefits provide sustained aid to those who get it. It is logical to believe that when losing a job would have a negative impact on one's mental state, however, being out of a job for an extended period of time might have a more significant effect as they might not be able to provide in during a longer term with paying bills and the like. Ultimately, it is my hope that this study aids in understanding the economic effects unemployment has on the psychological well-being of those affected by it.

APPENDIX A:

VARIABLES	Model (1) SuicideRate	Model (2) SuicideRate	Model (3) lnSuicideRate
Unemployment Rate	-0.413***	-0.0376	
	[0.0933]	[0.160]	
lnUnemploymentRate			-0.00492
			[0.0605]
Gender		13.67***	1.277***
		[0.249]	[0.0146]
Race		0.969***	0.188***
		[0.144]	[0.00846]
2001		0.173	0.00377
		[0.783]	[0.0467]
2002		0.247	0.0224
		[0.817]	[0.0502]
2003		0.202	0.0210
		[0.822]	[0.0509]
2004		1.020	0.0763
		[0.800]	[0.0489]
2005		1.030	0.0554
		[0.786]	[0.0474]
2006		0.441	0.0429
		[0.768]	[0.0456]
2007		0.574	0.0697
		[0.766]	[0.0454]
2008		1.027	0.111**
		[0.798]	[0.0489]
2009		1.153	0.108
		[1.077]	[0.0656]
2010		1.910*	0.163**
		[1.111]	[0.0670]
2011		1.550	0.146**
		[1.046]	[0.0640]
2012		2.003**	0.166***
		[0.957]	[0.0596]
2013		2.312***	0.187***
		[0.890]	[0.0558]
2014		2.426***	0.223***
		[0.812]	[0.0505]
2015		3.081***	0.268***
		[0.765]	[0.0465]
2016		3.290***	0.294***
		[0.749]	[0.0449]
2017		4.083***	0.340***
		[0.738]	[0.0435]
2018		4.164***	0.357***
		[0.730]	[0.0429]
Alaska		20.58***	1.124***
		[1.236]	[0.0730]
Arizona		3.595***	0.464***
		[1.136]	[0.0667]
Arkansas		1.126	0.144*
		[1.272]	[0.0747]
California		-4.381***	-0.256***
		[1.090]	[0.0640]
Colorado		2.459**	0.337***
		[1.216]	[0.0718]
Connecticut		-4.611***	-0.284***
		[1.308]	[0.0769]
Deleware		0.110	0.107
		[1.367]	[0.0805]
District of Columbia		-8.271***	-0.458***
		[1.507]	[0.0887]
Florida		-2.146*	-0.186***
		[1.127]	[0.0663]
Georgia		-2.613**	-0.236***
		[1.149]	[0.0675]
Hawaii		1.513	0.285***
		[1.244]	[0.0746]
Idaho		7.314***	0.436***
		[1.443]	[0.0850]
Illinois		-5.133***	-0.470***
		[1.138]	[0.0669]
Indiana		-1.411	-0.0104
		[1.249]	[0.0735]
Iowa		0.422	0.0378
		[1.483]	[0.0880]
Kansas		1.205	0.168**
		[1.329]	[0.0782]

VARIABLES	Model (1) SuicideRate	Model (2) SuicideRate	Model (3) lnSuicideRate
Kentucky		0.324	0.0951
		[1.286]	[0.0756]
Louisiana		-0.888	-0.119*
		[1.222]	[0.0718]
Maine		2.973**	0.229***
		[1.455]	[0.0856]
Maryland		-4.483***	-0.368***
		[1.175]	[0.0691]
Massachusetts		-6.845***	-0.471***
		[1.244]	[0.0732]
Michigan		-1.709	-0.0843
		[1.170]	[0.0686]
Minnesota		-0.634	0.0597
		[1.218]	[0.0720]
Mississippi		0.247	0.0252
		[1.264]	[0.0744]
Missouri		0.0208	0.0625
		[1.232]	[0.0724]
Montana		14.24***	0.807***
		[1.338]	[0.0787]
Nebraska		-0.456	-0.0274
		[1.498]	[0.0902]
Nevada		3.610***	0.388***
		[1.217]	[0.0713]
New Hampshire		2.291	0.214**
		[1.488]	[0.0887]
New Jersey		-6.458***	-0.552***
		[1.138]	[0.0669]
New Mexico		10.33***	0.820***
		[1.246]	[0.0732]
New York		-5.599***	-0.523***
		[1.109]	[0.0651]
North Carolina		-2.003*	-0.168**
		[1.162]	[0.0683]
North Dakota		10.29***	0.427***
		[1.522]	[0.0930]
Ohio		-2.163*	-0.156**
		[1.176]	[0.0691]
Oklahoma		2.880**	0.399***
		[1.200]	[0.0707]
Oregon		3.710***	0.366***
		[1.342]	[0.0789]
Pennsylvania		-2.638**	-0.184***
		[1.151]	[0.0676]
Rhode Island		-1.708	-0.109
		[1.447]	[0.0850]
South Carolina		-0.339	-0.0257
		[1.237]	[0.0727]
South Dakota		13.95***	0.735***
		[1.334]	[0.0809]
Tennesee		-0.220	-0.00846
		[1.226]	[0.0721]
Texas		-3.956***	-0.312***
		[1.116]	[0.0655]
Utah		5.887***	0.460***
		[1.419]	[0.0842]
Vermont		3.598**	0.270***
		[1.499]	[0.0892]
Virginia		-2.881**	-0.184***
		[1.172]	[0.0698]
Washington		0.265	0.224***
		[1.115]	[0.0656]
West Virgina		4.782***	0.319***
		[1.446]	[0.0850]
Wisconsin		-0.565	0.0545
		[1.247]	[0.0734]
Wyoming		9.606***	0.591***
		[1.477]	[0.0874]
Constant	15.84***	-13.26***	-0.546***
	[0.568]	[1.452]	[0.114]
Observations	3,525	3,525	3,525
R-squared	0.006	0.607	0.762

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

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