Correlation of Suicide Prevalence and Education Expenditure in American High Schools

Katherine M. Kuang, Abhinav S. Agnani

Abstract

Introduction: Rates of suicidal behavior amongst youths are increasing at an alarming rate in the United States, and have rapidly become a public health priority. Schools are key settings for suicide prevention, as awareness, support, and education can be combined to holistically address the physical, mental and emotional health of students. Previous literature reviews have demonstrated that the largest subcategory for youth suicide prevention include educational initiatives for both students, parents, and teachers alike.

Methods: We collected data on suicide attempt incidence among high schoolers nationwide from the CDC's Youth Risk Behavior Surveillance System (YRBSS) as well as state elementary & secondary education expenditure data from the National Association of State Budget Officers' (NASBO) between 1991 to 2021. For each state, we plotted education expenditure versus suicide attempt incidence and conducted linear regression to assess for potential correlation. We aggregated the following values for each state for comparison: sample size, slope of the trendline, and coefficient of determination (R^2).

Results: Across the 47 states, sample sizes varied greatly with a range of 3 to 15 while trendline slopes were between approximately -0.002 and 0.005. The coefficient of determination (R^2) across states exhibited a more varied range of approximately 0 to 0.915.

Conclusion: Contrary to our initial assumption, there were no discernable linear correlations between state funding and youth suicide rate across all participating states. While inconclusive, our study prompts future research into motives behind youth suicides, and identifying resources and policies that can help capitalize on funding.

Introduction

As of 2021, suicide ranks among the top nine leading causes of death around the world, and the third leading cause of death among youths aged 15-19 after unintentional injuries and homicide.[1] While suicide rates vary by country, the age-adjusted rate in the United States has increased by 33% from 1999 – 2017, with more than 120 Americans dying by suicide every day.

Schools provide a health care setting often more easily accessible for many adolescents and, in the 2021-2022 school year, only one-third (34%) reported providing outreach services such as mental health screenings for all students.[7] While state legislatures have typically increased funding for schools over time, incidence of suicide attempts by adolescents continues to worsen and its reduction is a key objective of Healthy People 2030.[11] In early 2023, the U.S. Department of Health and Human Services (HHS) awarded nearly $245 million in Bipartisan Safer Communities Act funding to support youth mental health and to help the healthcare workforce address mental health needs.[4] In our study, we aimed to determine on a per state basis if there was a correlation between state funding and suicide incidence in high schools.

Methods

The CDC's Youth Risk Behavior Surveillance System (YRBSS) biennially surveys behaviors in students grades 9 through 12 nationwide.[2] We aggregated YRBSS results for all participating states in the US between 1991 and 2021 for the following question: "During the past 12 months, how many times did you actually attempt suicide?" We collected results for "Elementary & Secondary Education Expenditures" for each state within the same time frame using the National Association of State Budget Officers' (NASBO) archive of annual state expenditure reports. For each state, we plotted suicide attempt prevalence versus education expenditure and conducted linear regression to assess potential correlation. Some states did not provide YRBSS responses for some years and thus plots for individual states differ in sample size. Washington, Oregon, and Minnesota did not participate in YRBSS and thus were not included.

Results

Across the 47 states, sample sizes varied greatly with a range of 3 to 15. All trendline slopes were between approximately -0.002 and 0.005. The coefficient of determination (R^2) across states exhibited a more varied range of approximately 0 to 0.915.

Table 1. Coefficient of Determination (R^2), Trendline Slope and Sample Size Per State

	R² Values:	Trendline Slope:	Sample Size:
Alabama	0.4484851563	1.04E-03	11
Alaska	0.196553992	5.41E-03	9
Arizona	0.02614499671	-1.68E-04	10
Arkansas	0.3324871802	1.34E-03	13
California	0.124848236	5.10E-05	3
Colorado	0.009335702158	-1.06E-04	6
Connecticut	0.5082060779	-1.49E-03	10
Delaware	0.0391322752	2.58E-04	11
Florida	0.01128725369	-4.72E-05	11
Georgia	0.5209711395	4.47E-04	10
Hawaii	0.06083838473	-7.23E-04	13
Idaho	0.2366839667	1.62E-03	11
Illinois	0.1066914097	-1.74E-04	10
Indiana	0.7405397612	7.34E-04	7
Iowa	0.2874191423	1.00E-03	7
Kansas	0.6050757058	2.71E-03	8
Kentucky	0.002722628961	-5.53E-05	11
Louisiana	0.4512071196	2.28E-03	8
Maine	0.01427264419	4.53E-04	13
Maryland	0.8667128592	1.70E-03	5
Massachusetts	0.5947304235	-5.63E-04	15
Michigan	0.08798673758	-1.58E-04	13
Mississippi	0.3117870085	2.05E-03	13
Missouri	0.01348060678	1.37E-04	13
Montana	0.0167041357	7.23E-04	15
Nebraska	0.01498738245	3.20E-04	10
Nevada	0.0000003235034414	1.06E-06	14
New Hampshire	0.251854961	-2.05E-03	12
New Jersey	0.02181159542	5.97E-05	5
New Mexico	0.0438969111	-4.82E-04	10
New York	0.3021484123	9.92E-05	12
North Carolina	0.0006009772598	1.41E-05	8
North Dakota	0.2990379547	3.89E-03	13
Ohio	0.1616533604	-2.47E-04	10
Oklahoma	0.3587542072	2.60E-03	10
Pennsylvania	0.9150992336	5.29E-04	5
Rhode Island	0.2098662008	3.58E-03	12
South Carolina	0.1552198265	4.67E-04	13
South Dakota	0.03479544756	1.54E-03	15
Tennessee	0.2041251979	5.91E-04	11
Texas	0.3607371727	9.58E-05	9
Utah	0.0678232271	2.50E-04	15
Vermont	0.4296187062	-1.67E-03	15
Virginia	0.0695255962	-4.37E-04	6
West Virginia	0.003119087299	2.50E-04	14
Wisconsin	0.2758083582	-3.57E-04	12
Wyoming	0.1390180321	1.83E-03	11

Figure 1. Sample Size Per State

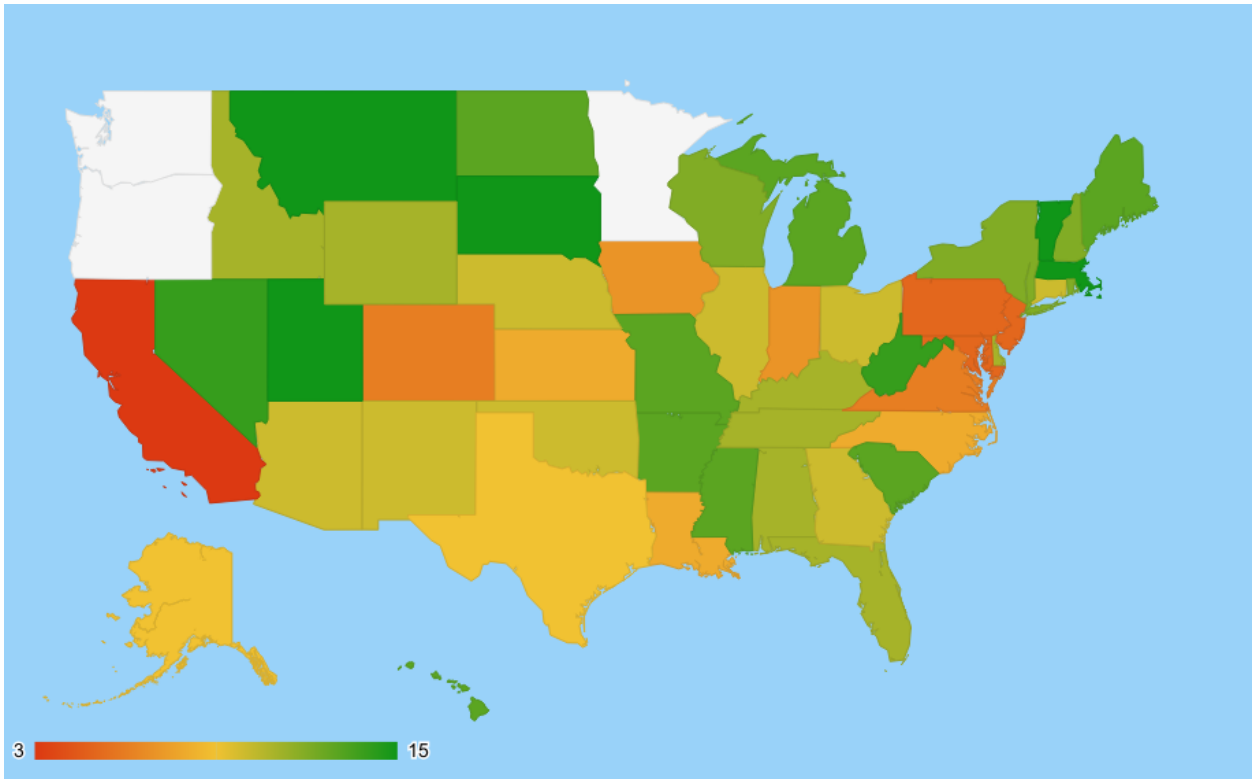


Figure 2. Trendline Slope Per State

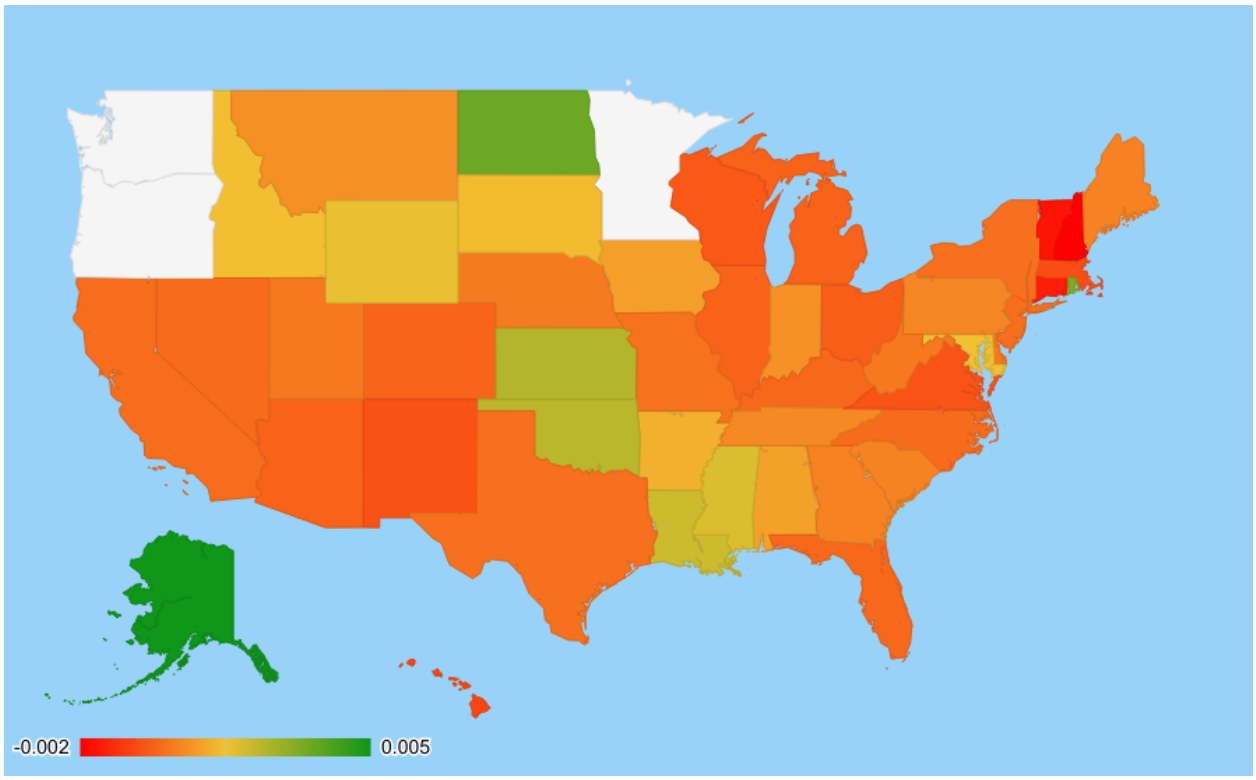
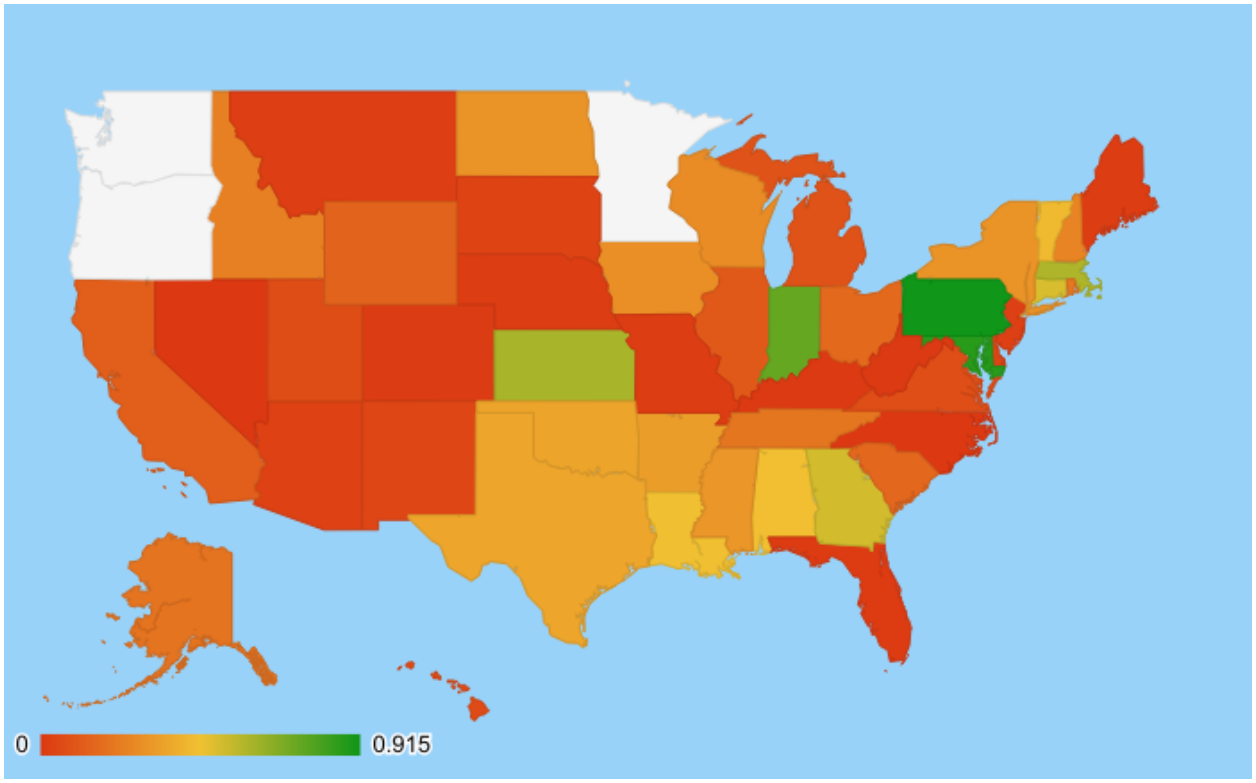


Figure 3. Coefficient of Determination (R^2) Values Per State Trendline



Conclusions

Despite the lack of clear linear correlations found in our study, there is a continued need to address the underlying relationship between educational funding and suicide incidences in high schools across the United States. While the data sets used in our study covers a wide timeframe, from 1991 to 2021, and come from the amalgamation of many reliable sources, they are not without limitations.

While the YRBSS remains the largest public health surveillance system in the United States, it is subjected to a number of constraints. The extent of underreporting or overreporting of health-related behaviors cannot be determined despite the survey questions demonstrating good test-retest reliability. Furthermore, not all states and local school districts administer the YRBSS, and those that do may not include all the standard questions in their selection. Finally, difficulties have been encountered when it comes to the assessment of sexual and gender identity in high school aged youths.[10]

In terms of data analysis, there are also a number of drawbacks of using linear regression. The assumption of linearity between variables may lead to inaccurate results that tend to overfit the data and make future observations unreliable. Linear regressions are also more error prone when it comes to outlier data, something that was not correct for in our study. This is made more prominent by the small sample sizes in certain states, calling into question the reliability of the R^2 values between states.

While the results of our study are inconclusive, it brings forth many topics for future research. Exploring different motives behind youth suicides can help efforts target specific areas to support and reduce suicide mortalities. It is also important to identify resources that can help improve mental health in youths in order to capitalize on funding. The largest subcategories for suicide prevention strategies are currently education, youth-specific initiatives, and information initiatives. It has been found that many rural schools and communities are not only lacking in sufficient school based mental health professionals, but that teachers do not receive adequate training on identifying and intervening in suicidal ideations.[8] Finally, further studies should be conducted on the importance of cultivating safe and inclusive school environments for minority[9] and LGBTQ+ youths[5], as multiple school-related factors hold the potential to influence suicidal thoughts and behavior within such groups.

The findings of this study, along with that of many others, highlights the importance of improving youth mental health as a way of reducing suicide mortalities. Policies such as the Bipartisan Safer Communities Act (BSCA) represent opportunities for the country to improve school-based mental health services and support the integration of mental health training for school personnel, emergency first responders and primary care clinicians.[12] The national impact of the BSCA serves as a model for future state legislation. Additional research can also help provide frameworks to help policy makers as they consider the cross over effects of preventing youth suicide through funding of existing school-based resources.

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