LIBERTY UNIVERSITY

Montview Journal of Research & Scholarship

Volume 10 Article 4

2023

County-Level Trends and Potential Disparities in the Suicide Rates in Virginia, 2020 – 2022

Sharon A. Olowoyo
Liberty University

Oluwatosin M. Oduneye
Liberty University

Glodi B. Bokanya
Liberty University

Ayooluwa G. Olowoyo
Liberty University

Coralie E. Mugenga
Liberty University

See next page for additional authors

County-Level Trends and Potential Disparities in the Suicide Rates in Virginia, 2020 – 2022

Authors

Sharon A. Olowoyo, Oluwatosin M. Oduneye, Glodi B. Bokanya, Ayooluwa G. Olowoyo, Coralie E. Mugenga, Yuhan Yan, and Robyn L. Anderson

Introduction

Suicide is defined as a fatal outcome resulting from self-inflicted harm, driven by a deliberate intention to end one's life through the actions taken.[1] Suicide continues to be a tragic event, representing an extreme consequence of the ongoing mental health crisis and a major public health concern in the United States.[1,2] In 2020, the US Centers for Disease Control and Prevention (CDC) released a report highlighting that suicide ranked among the top 10 leading causes of death in the U.S. for individuals aged 10 to 64 years. What is particularly concerning is that it held the second highest position in terms of mortality for both children and adolescents aged 10 to 14, as well as adults in the 25 to 34-year age group.[3] Although a decrease of 2.1% was noted from 2018 to 2019, this marked the first year-over-year decline in suicide mortality since 1999.[4] Suicide, however, cannot be discussed without thinking about the rates and trends in subgroups in the United States and the impact of the global COVID-19 pandemic and the subsequent lockdown procedures.[3,5] In 2020, a staggering 12.2 million adults in the U.S. acknowledged experiencing significant suicidal ideation, while a concerning 1.2 million individuals made suicide attempts.[3] A recent study has also noted a 30% and 16% increase, respectively, in suicide rates amongst people of African-American descent and Asian or Pacific Island descent from 2014 to 2017.[5]

Over the years, with an increased focus on timely and efficient suicide prevention efforts and data gathering, several factors have become noticeable as significant risk factors associated with suicide. These risk factors can be grouped under psychological and mental disorders or socio-demographic risk factors.[6,7] The risk factors under these groups constantly interact, increasing human vulnerability to suicide. Some examples of psychological and mental disorders include conduct, mood, attention deficit disorders, and drug abuse. In contrast, examples of socio-demographic risk factors include men, middle-aged people, residential areas (rural, suburban, and urban), people with low income, youths raised in an environment of socioeconomic adversity, unemployment, social isolation, increased access to guns, and reduced access to mental health treatments/providers.[6,7,8]

This research shifts its focus to the state of Virginia. In 2021, according to the American Foundation for Suicide Prevention, Virginia registered a suicide rate of 13.15 per 100,000 people. This marked a slight decrease from the previous year, where Virginia had a rate of 13.44 per 100,000 people, a figure remarkably close to the national average of 13.48 per 100,000 people at that time. However, it is worth noting that the 2021 report reveals a divergence due to the overall national increase recorded that year, with a rate of 14.04 per 100,000 people across the United States.[9] At an alarming 54.64%, the use of firearms was the leading method of death by suicide. A retrospective analysis centered on veterans

utilizing the Virginia healthcare system brought to light a significant rural-urban divide within the state of Virginia. It revealed that individuals residing in rural regions faced notably higher suicide rates. Furthermore, the researchers pinpointed the racial composition within these rural and urban areas as the underlying factor driving these elevated statistics. Specifically, the study found that white individuals were three times more prone to suicide compared to their black counterparts in these areas.[10]

This study aims to investigate the influence of social determinants of health (SDH) on suicide patterns in Virginia. It seeks to understand the correlations between specific SDH domains and suicide rates, identify high-risk areas, and compare urban and rural influences. The SDH is grouped into five main domains, which include economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context.[11] The research question for this study is "How do the social determinants of health (SDH) in Virginia's counties influence patterns of suicide, and what are the distinctive correlations between specific SDH domains and suicide rates?" Therefore, the following objectives have been set to achieve this: correlate SDH with suicide rates, identify high-risk areas, propose intervention strategies, and compare urban and rural influences.

Methods

We conducted a secondary statistical analysis using publicly accessible data sourced from the County Health Rankings & Roadmaps,[12] a database managed by the University of Wisconsin Population Health Institute. The utilization of this information did not necessitate institutional review board (IRB) approval or informed consent as the data were extracted from a publicly available database without any identifiable information on mortality statistics, aligning with the Common Rule guidelines.[13] Our study had a specific focus on Virginia. As a result, we tailored our database search to gather information solely pertaining to Virginia and its counties. The data collection encompassed the period of 2020 to 2022 since summary estimates for suicide were only available for these years. The database was queried for age-adjusted suicide rates each year, and the factors that fell within the SDH were used as predictors for suicide in each county. These factors included the following and their definitions according to the County Health Rankings & Roadmaps:

1. % Rural – the percentage of population living in a rural area
   a. Geolocation tertiled into rural, suburban, and urban
2. Mental health providers – ratio of population to mental health providers

3. Median household income – the income where half of households in a county earn more and half of households earn less
4. High school completion – the percentage of adults ages 25 and over with a high school diploma or equivalent
5. Unemployment – the percentage of the population ages 16+ unemployed but seeking work
6. Race – percentage of the population with race identified

Data Analysis

The data underwent a comprehensive process involving extraction, cleaning, and organization using Microsoft Excel. For the geolocation variable (% rural), we categorized it into three ranks - rural, suburban, and urban - employing Excel's percentile function. Likewise, median household income was classified into low and high categories, with the state average acting as the dividing point.

IBM SPSS Statistics v27 was utilized to prepare the data for analysis. This software was used to manage missing data and conduct the final analysis using multiple regression. Multiple regression, a versatile technique exploring the relationship between a continuous, dependent variable and a set of independent variables, was chosen for its suitability. Summary descriptives were initially performed to comprehend the characteristics of the variables. The multiple regression model was constructed based on guidance from the "SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS" textbook.[14] Independent variables, including % rural (categorized into rural, suburban, and urban), mental health providers, median household income, high school completion, and unemployment, were selected for this model. These variables served as predictors, influencing the dependent variable, age-adjusted suicide rates.

Lastly, Tableau v2022.4 was employed to craft visualizations offering an overview of state rates, geolocation comparisons, and racial comparisons. Additionally, independent t-tests were executed in IBM SPSS to obtain p-values for the geolocation comparison, enhancing the depth of the analysis.

Results

The data from each year were first cleaned to remove missing data before any analysis was conducted (**Table 1**). The multiple regression analysis was conducted to examine if there is a correlation between the independent variables (% rural, mental health providers, median household income, high school completion, and unemployment) and the dependent variable (age-adjusted suicide rate).

Years	Number of Counties with Missing Data	Break-Down
2020	26	age-adjusted rate suicide rate (24) high school completion (2)
2021	28	age-adjusted suicide rate (22) mental health providers (1) high school completion (5)
2022	25	age-adjusted suicide rate (18) mental health providers (1) high school completion (6)

Table 1. Missing data information after data cleaning, Virginia counties, 2020 – 2022.

Regression Analysis for 2020

As shown in Table 2, a total of 107 counties for age-adjusted suicide rates were analyzed. The output shows the descriptive statistics (mean, standard deviation, and number of observations) for our variables: % rural, mental health providers, median household income, high school completion, and unemployment.

Descriptive Statistics			
	Mean	Std. Deviation	N
Suicide Rate (Age-Adjusted)	17.4019	5.96034	107
% Rural	51.5355	38.86815	107
Mental Health Providers	156.0748	183.06292	107
Median Household Income	60688.3645	22268.10996	107
High School Completion	91.3738	4.57129	107
Unemployment	3.3589	.78138	107

Table 2. Descriptive statistics of data analyzed from Virginia counties, United States,

The value of R (0.414) denotes a moderate level of association; additionally, the R^2 value of 0.172 (Table 3) signifies that the incorporation of all independent variables into the regression model accounted for 17.2% of the variance in the dependent variable, age-adjusted suicide rate, compared to the baseline mean model.

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.414[a]	.172	.131	5.55687
a. Predictors: (Constant), % Rural, Mental Health Providers, Median Household Income, High School Completion, Unemployment				
b. Dependent Variable: Suicide Rate (Age-Adjusted)				

Table 3. Model summary of % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2020.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	646.964	5	129.393	4.190	.002[b]
	Residual	3118.756	101	30.879		
	Total	3765.720	106			
a. Dependent Variable: Suicide Rate (Age-Adjusted)						
b. Predictors: (Constant), % Rural, Mental Health Providers, Median Household Income, High School Completion, Unemployment						

Table 4. ANOVA summary of % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2020.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	7.783	13.357		.583	.561	-18.713	34.279
	% Rural	.037	.019	.240	1.905	.060	-.002	.075
	Mental Health Provider Rate	.002	.004	.068	.595	.553	-.005	.010
	Median Household Income	-6.329E-5	.000	-.236	-1.808	.074	.000	.000
	High School Graduation Rate	.093	.137	.071	.677	.500	-.180	.365
	% Unemployed	.811	.952	.106	.853	.396	-1.076	2.699

a. Dependent Variable: Suicide Rate (Age-Adjusted)

Table 5. Regression coefficients for % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2020.

Interpretation of the results: A multiple regression was run to predict the age-adjusted suicide rate % rural, mental health providers, median household income, high school completion, and unemployment. As presented in Table 4, these variables significantly predicted the suicide age-adjusted rate, $F(5, 101) = 4.190$, $p = 0.002$, $R^2 = 0.172$ (17.2%). None of the predictors individually added a statistical significance to the prediction, $p < .05$. (Table 5)

A scatterplot of the dependent variable, age-adjusted suicide rate, was created to visualize the relationship between the regression standardized residual and the regression standardized predicted value developed. The plot revealed scattered points, with a few outliers present in the data distribution. (Figure 1)

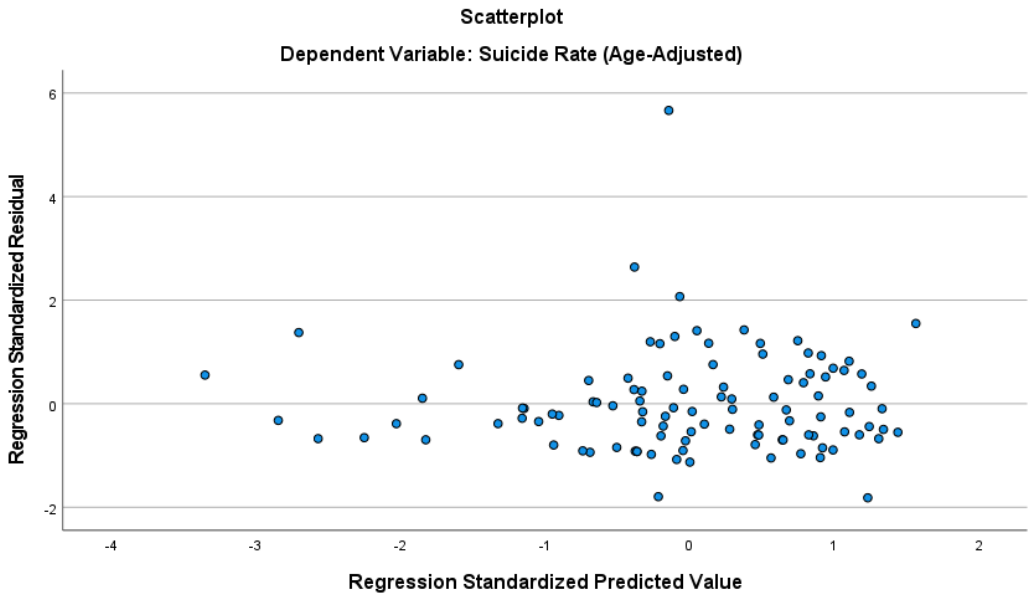


Figure 1. A standardized residual versus predicted value shows the relationship between the response variable and predictor variables. The variables are randomly scattered around zero, and there is the presence of a few outliers.

Regression Analysis for 2021

A total of 105 counties for age-adjusted suicide rates were analyzed. As depicted in Table 6, the output shows the descriptive statistics (mean, standard deviation, and number of observations) for our variables: % rural, mental health providers, median household income, high school completion, and unemployment.

Descriptive Statistics

	Mean	Std. Deviation	N
Suicide Rate (Age-Adjusted)	17.7048	5.70075	105
% Rural	51.9610	39.59866	105
Mental Health Providers	167.0667	200.46826	105
Median Household Income	63518.9524	23121.49505	105
High School Completion	87.6762	5.67128	105
Unemployment	3.2057	.75573	105

Table 6. Descriptive statistics of data analyzed from counties in Virginia, United

The value of R (0.498) denotes a moderate level of association; additionally, the R^2 value of 0.248, as shown in Table 7, signifies that the incorporation of all independent variables into the regression model accounted for 24.8% of the variance in the dependent variable, age-adjusted suicide rate, compared to the baseline mean model.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498[a]	.248	.210	5.06652

a. Predictors: (Constant), % Rural, Mental Health Providers, Median Household Income, High School Completion, Unemployment

b. Dependent Variable: Suicide Rate (Age-Adjusted)

Table 7. Model summary of % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2021.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	838.557	5	167.711	6.533	.000[b]
	Residual	2541.291	99	25.670		
	Total	3379.848	104			

a. Dependent Variable: Suicide Rate (Age-Adjusted)

b. Predictors: (Constant), % Rural, Mental Health Providers, Median Household Income, High School Completion, Unemployment

Table 8. ANOVA summary % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2021.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	15.550	9.673		1.608	.111	-3.643	34.744
	% Rural	.034	.017	.238	1.957	.053	.000	.069
	Mental Health Providers	.001	.003	.020	.184	.854	-.006	.007
	Median Household Income	-9.788E-5	.000	-.397	-3.090	.003	.000	.000
	High School Completion	.077	.101	.077	.759	.450	-.124	.278
	Unemployment	-.079	.920	-.010	-.086	.932	-1.903	1.746

a. Dependent Variable: Suicide Rate (Age-Adjusted)

Table 9. Regression coefficients for % rural, mental health provider rate, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2021.

Interpretation of the results: A multiple regression was run to predict the age-adjusted suicide rate % rural, mental health providers, median household income, high school completion, and unemployment. As shown in Table 8, these variables significantly predicted the age-adjusted suicide rate, $F(5, 99) = 6.533$, $p = 0.000$, $R^2 = 0.248$ (24.8%). Only the median household income individually added a statistical significance to the prediction, $p < .05$. (Table 9)

A scatterplot of the dependent variable age-adjusted suicide rate was created to visualize the relationship between the regression standardized residual and the regression standardized predicted value developed. The plot revealed scattered points, with a few outliers present in the data distribution. (Figure 2)

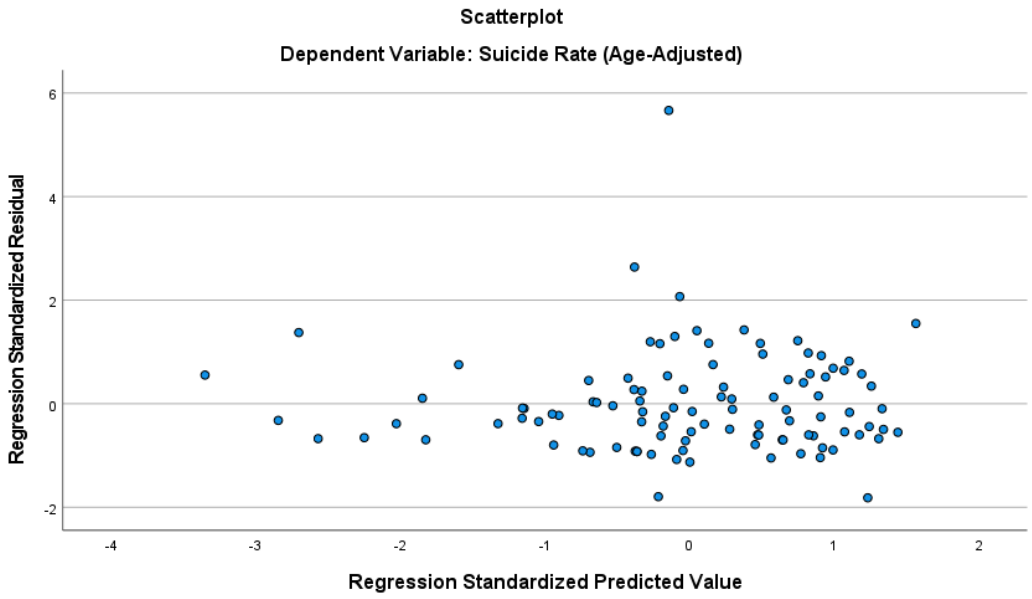


Figure 2. A standardized residual versus predicted value shows the relationship between the response variable and predictor variables. The variables are randomly scattered around zero, and there is the presence of a few outliers.

Regression Analysis for 2022

A total of 108 counties' age-adjusted suicide rates were analyzed. As found in Table 10, the output shows the descriptive statistics (mean, standard deviation, and number of observations) for our variables: % rural, mental health providers, high school completion, and unemployment.

Descriptive Statistics

	Mean	Std. Deviation	N
Suicide Rate (Age-Adjusted)	17.9537	6.06874	108
% Rural	51.5333	39.76110	108
Mental Health Providers	187.0370	224.07246	108
Median Household Income	65758.7685	24030.58046	108
High School Completion	87.7778	5.89841	108
Unemployment	6.4194	1.61109	108

Table 10. Descriptive statistics of data analyzed Virginia counties, United States,

In Table 11, the value of R (0.475) denotes a moderate level of association. Additionally, the R^2 value of 0.225 signifies that the incorporation of all independent variables into the regression model accounted for 22.5% of the variance in the dependent variable, age-adjusted suicide rate, compared to the baseline mean model.

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.475[a]	.225	.187	5.47126
a. Predictors: (Constant), % Rural, Mental Health Providers, Median Household Income, High School Completion, Unemployment				
b. Dependent Variable: Suicide Rate (Age-Adjusted)				

Table 11. Model summary of % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2022.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	887.432	5	177.486	5.929	.000[b]
	Residual	3053.336	102	29.935		
	Total	3940.769	107			
a. Dependent Variable: Suicide Rate (Age-Adjusted)						
b. Predictors: (Constant), % Rural, Mental Health Providers, Median Household Income, High School Completion, Unemployment						

Table 12. ANOVA summary of % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2022.

Coefficients[a]					
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B

		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5.328	11.543		.462	.645	-17.568	28.225
	% Rural	.024	.020	.159	1.215	.227	-.015	.064
	Mental Health Providers	.001	.003	.053	.487	.627	-.004	.007
	Median Household Income	-9.927E-5	.000	-.393	-3.189	.002	.000	.000
	High School Completion	.179	.108	.174	1.660	.100	-.035	.393
	Unemployment	.301	.500	.080	.602	.548	-.691	1.293

a. Dependent Variable: Suicide Rate (Age-Adjusted)

Table 13. Regression coefficients for % rural, mental health providers, median household income, high school completion, unemployment; and age-adjusted suicide rate, Virginia counties, United States, 2022.

Interpretation of the results: A multiple regression was run to predict the age-adjusted suicide rate % rural, mental health providers, median household income, high school completion, and unemployment. As shown in Table 12, these variables significantly predicted the suicide age-adjusted rate, $F (5, 102) = 5.929$, $p = 0.000$, $R^2 = 0.225$ (22.5%). Only the median household income individually added a statistical significance to the prediction, $p < .05$. (Table 13)

A scatterplot of the dependent variable age-adjusted suicide rate was created to visualize the relationship between the regression standardized residual and the regression standardized predicted value developed. The plot revealed scattered points, with a few outliers present in the data distribution. (Figure 3)

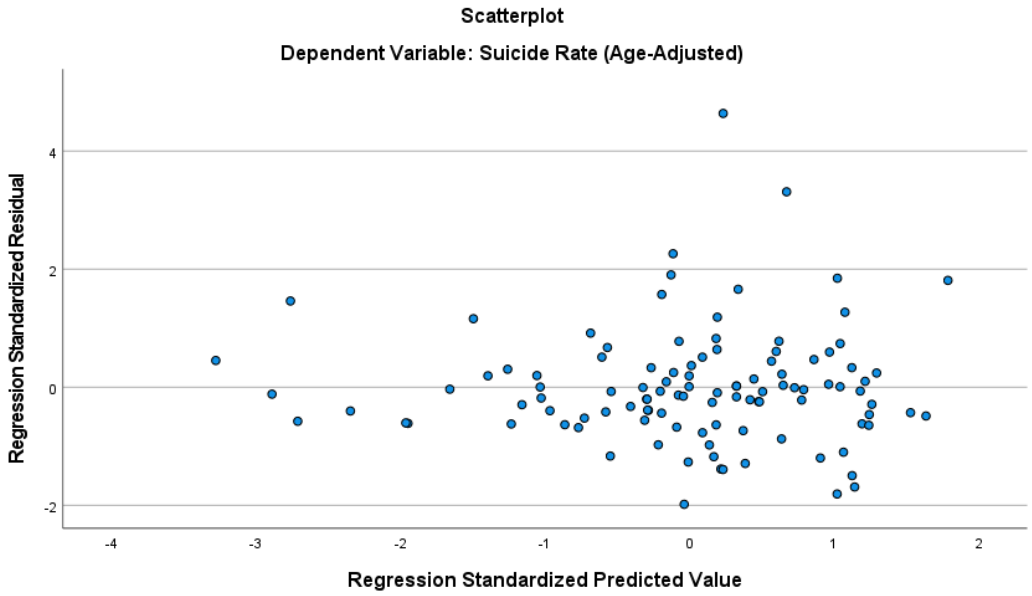


Figure 3. A standardized residual versus predicted value shows the relationship between the response variable and predictor variables. The variables are randomly scattered around zero, and there is the presence of a few outliers.

General Overview of Virginia

Throughout 2020 to 2022, the graphical representation indicates a decline in age-adjusted suicide rates in 2021, evidenced by the reduced intensity of shading on the maps (Figure 6). Rural and suburban counties are seen to have a higher burden of suicide in comparison to urban counties. (See Figures 5 and 6 for comparison). While the incidence of suicide rates appears relatively uniform throughout the state, it is discernible that the southern counties exhibit a slightly elevated occurrence of high suicide rates.

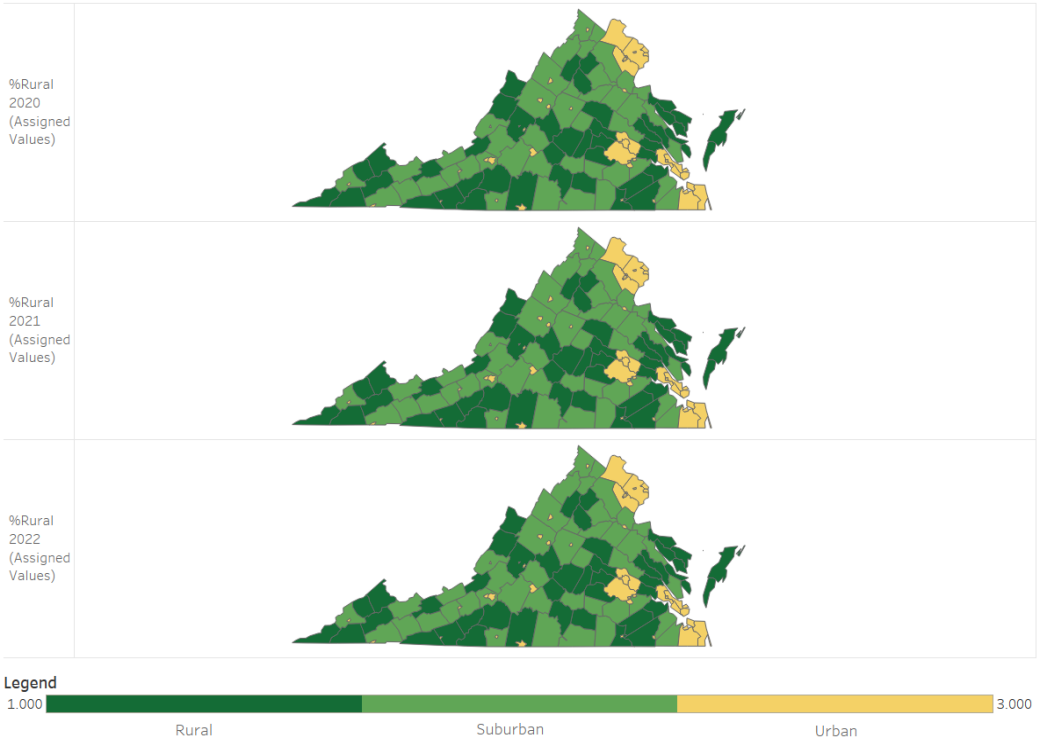
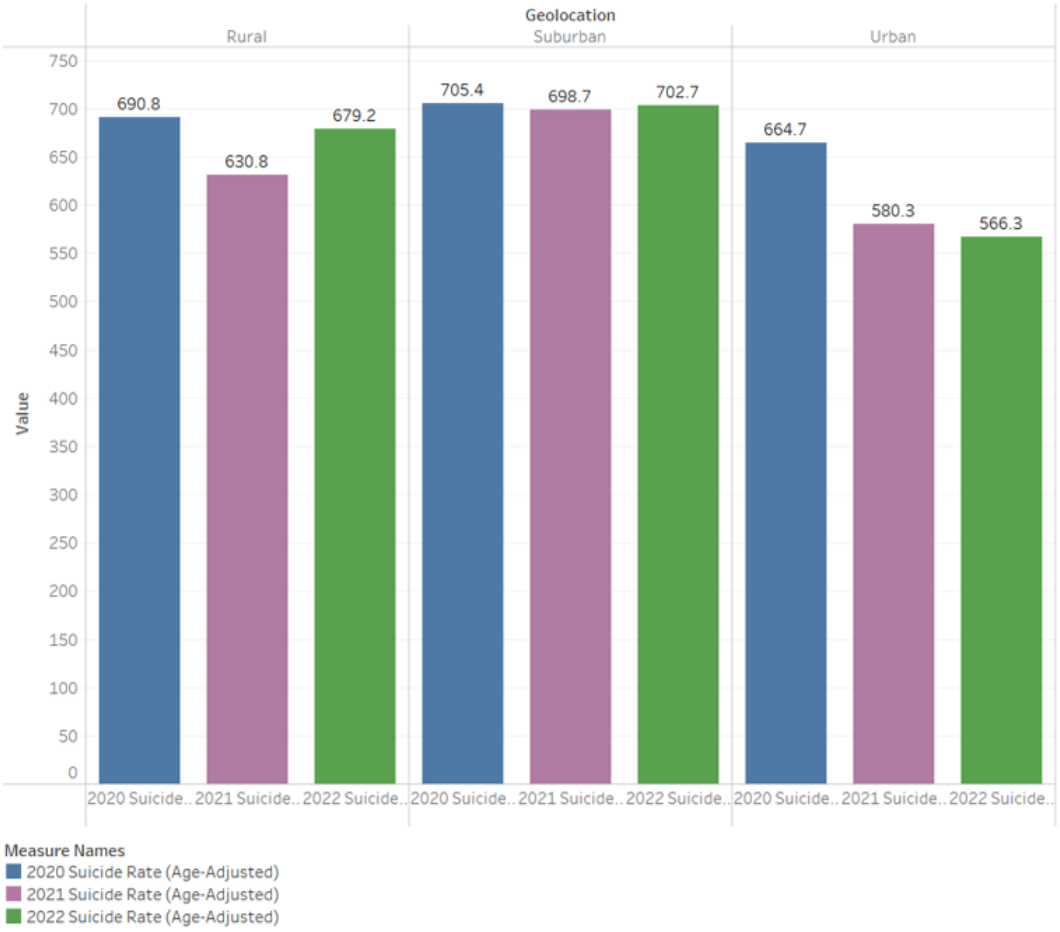


Figure 5. Geographical representation percent of rural areas in Virginia counties, United States, 2020 – 2022.

Figure 6. Geographical representation of age-adjusted suicide rates distribution in Virginia counties, United States, 2020 – 2022.

Geolocation

The age-adjusted suicide rates in rural areas from 2020 – 2022 were 690.8, 630.8, and 679.2 per 100,000, respectively. A decline was observed in 2021, but the rates increased in 2022. Across all years, 2020 – 2022, suburban areas had the highest combined rates of age-adjusted suicide in Virginia: 705.4, 698.7, and 702.7 per 100,000, respectively. The combined rates of suicide in urban areas from 2020 – 2022 were 664.7, 580.3, and 566.3 per 100,000, respectively. A pattern of a steady decline was also noted in the urban areas. (Figure 7)



Racial Demographics

The data indicated that individuals who identified as White, non-Hispanic are at a higher risk for suicide than individuals of other races (Figure 8); this conclusion was reached due to the presence of high age-adjusted suicide rates noticed in the few counties that had data on racial demographics and the comparison to other racial groups in Virginia. For this research people of African American descent or Black, non-Hispanic were used for comparison (Figure 9).

However, the available data were not sufficient to draw a comprehensive conclusion on the pattern of suicide in Virginia counties and observe differences amongst racial groups. More research and data collection may be necessary to gain a better understanding of the factors that contribute to suicide rates in different racial groups in Virginia.

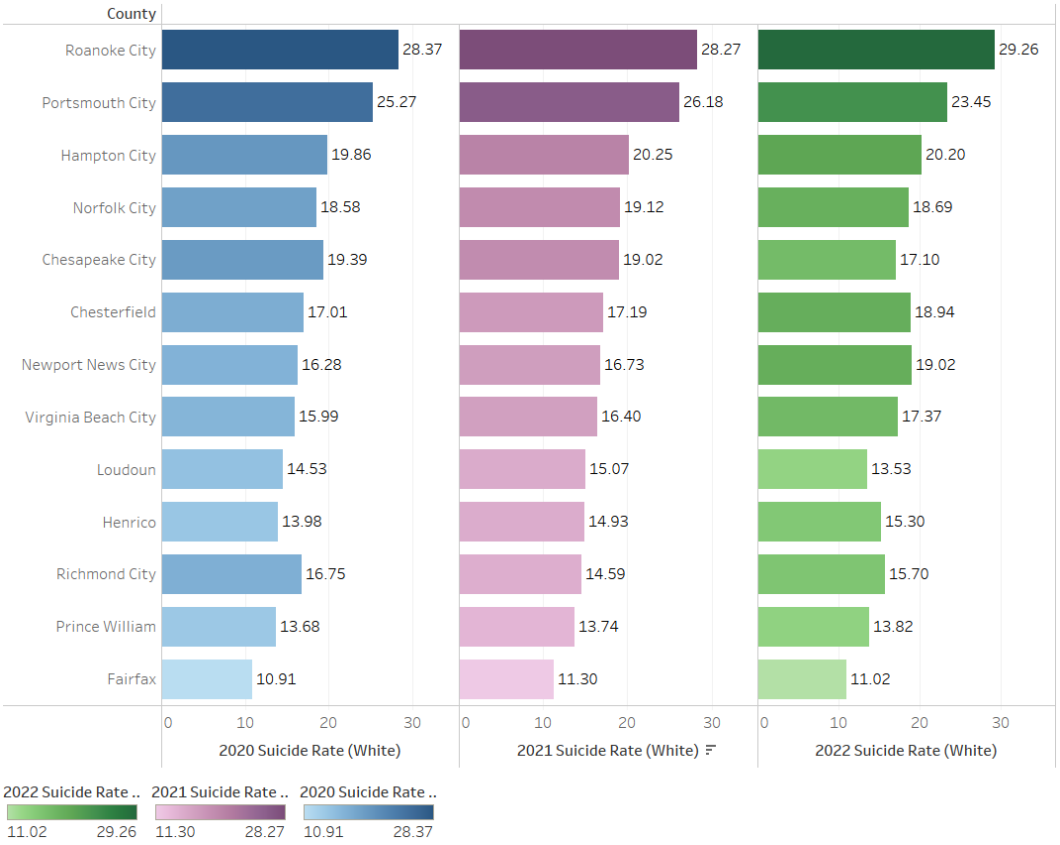


Figure 8. Age-adjusted suicide rates among White, non-Hispanic, Virginia counties, United States, 2020 – 2022.

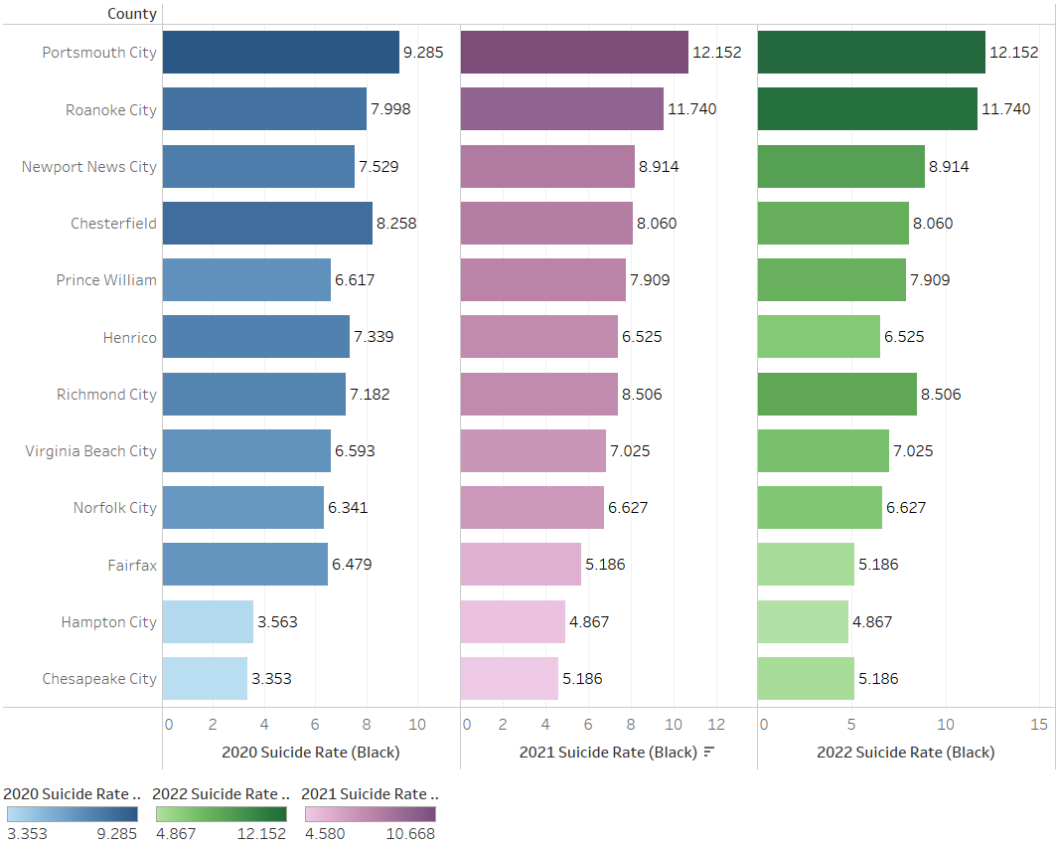


Figure 9. The sum of age-adjusted suicide rates among African Americans or Black, non-Hispanic, Virginia counties, United States, 2020 – 2022.

Discussion

The social determinants of health (SDH) have always been linked to health outcomes and a person's quality of life. This study examined several factors under the SDH, geolocation (% rural), mental health providers, median income, high school completion, and unemployment that can influence suicide. The analysis of the variables, in correlation with age-adjusted suicide rates, provides crucial insights into how specific aspects of economic stability, education, healthcare, and community context interplay with suicide.

Although more insight would have been gained if the study comprised a longer time, the three-year analysis confirmed findings from numerous studies on the topic of suicide. The results of the analysis showed that the variables significantly predicted suicide across all the years. This shows how the SDH are not independent of each other but instead interact to give an outcome, either negative or positive. A study showed that even after the researchers adjusted for

mental health diagnoses, the SDH had a strong association with suicide ideations and attempts.[15]

In the years 2021 and 2022, when the statistical significance for each independent variable was analyzed (Tables 9 and 13), median household income was constantly a single predictor of suicide. Research has shown that for each increase in median household income, there is a decrease in suicide risk.[16] Perhaps a link can be drawn between this and the recent increase in the cost of living in the United States. A report from the U.S. Census Bureau showed that there was a 2.6 percent decrease in the median household income between 2021 and 2022.[17]

Through the evaluation of the geographic distribution of age-adjusted suicide rates across Virginia and the categorization based on the % rural variable, high-risk areas were identified, particularly in rural and suburban regions (Figure 7). Southern counties were also noted to have a higher burden of suicide (Figure 6). These findings align with other studies that have shown that people who live in rural areas are at more risk for suicide when compared to their urban counterparts.[18] Factors like access to lethal means of committing suicide, firearms, and poisons, and poor access to mental healthcare services have been noted to play a vital role in this.[19] The significantly higher suicide rates in these areas underline the urgent need for targeted interventions in these regions. Understanding the spatial distribution of suicide rates helps in allocating resources and tailoring preventive measures to address the needs of these high-risk areas effectively.

This study had various limitations. Firstly, there was difficulty accessing comprehensive suicide rate data for Virginia. Despite the intent to analyze trends and variations in suicide rates across the state, only data spanning from 2020 to 2022 was available, and several counties had missing data. Additionally, the study lacked a consideration of intersectionality in the gathered data. It would have been valuable to assess suicide rates concerning factors such as race, ethnicity, gender, and sexual orientation. These limitations underscore the necessity of incorporating a broader range of demographic variables when collecting mortality data.

This study establishes a foundational framework for future research and initiatives aimed at preventing suicide in Virginia, posing critical inquiries for further exploration. For instance, it prompts an investigation into the specific factors within rural and suburban areas that contribute to elevated suicide rates and how interventions can be effectively tailored to address these factors. Furthermore, the observed racial disparities in suicide rates necessitate a deeper examination of root causes and the development of precise, targeted interventions.

The outcomes of this study hold significant implications for both policy and practice. Suicide prevention initiatives in Virginia should intricately consider the influence of Social Determinants of Health (SDH), giving specific attention to ameliorating economic instability, enhancing accessibility to mental health

services, and fostering social and community well-being. Customized interventions, especially in rural and suburban regions, are imperative to mitigate existing disparities. Health behavior models, notably the Social Ecological Model,[19] offer an apt approach to addressing suicide in the context of SDH, presenting a comprehensive understanding of how individual, interpersonal, community, and societal factors collectively shape health behaviors and outcomes.

From a Christian perspective, life is considered valuable and purposeful, and suicide is viewed as a tragic loss of potential and contributions to the world.[20] Christians are motivated to study suicide trends, address disparities, and understand its root causes to prevent such losses, promote healing, and reflect Christ's love and compassion.[20] This involvement is reinforced by the belief that religious faith, strong social networks, and community ties serve as protective factors against suicide.[21] Therefore, Christians can provide empathy and valuable insights to support those in distress and advocate for their needs.

Conclusion

This study delved into the intricate dynamics of suicide patterns within the state of Virginia, utilizing the lens of social determinants of health (SDH) to unravel key insights. By examining several factors, including geolocation (% rural), mental health provider rate, high school graduation rate, and unemployment percentage, significant correlations with suicide rates were identified. The analysis emphasized the interplay of economic stability, education, healthcare accessibility, and community context in influencing suicide rates. Notably, median household income emerged as a consistent predictor, highlighting the potential influence of economic fluctuations. The study underscored the critical need for targeted interventions, especially in rural and suburban areas, where high-risk regions were identified. Understanding the spatial distribution of suicide rates is paramount for resource allocation and tailored prevention strategies, advocating for a proactive approach to suicide prevention in the state of Virginia.

References

1. National Institute of Mental Health. *Suicide*. NIMH. Accessed September 25, 2023. https://www.nimh.nih.gov/health/statistics/suicide

2. Niederkrotenthaler T, Gunnell D, Arensman E, et al. Suicide research, prevention, and covid-19. *Crisis*. 2020;41(5):321-330. doi:10.1027/0227-5910/a000731

3. Ehlman DC. Changes in suicide rates — united states, 2019 and 2020. *MMWR Morb Mortal Wkly Rep*. 2022;71. doi:10.15585/mmwr.mm7108a5

4. Stone DM, Jones CM, Mack KA. Changes in suicide rates — united states, 2018–2019. *MMWR Morb Mortal Wkly Rep*. 2021;70(8):261-268. doi:10.15585/mmwr.mm7008a1

5. Ramchand R, Gordon JA, Pearson JL. Trends in suicide rates by race and ethnicity in the united states. *JAMA Netw Open*. 2021;4(5):e2111563. doi:10.1001/jamanetworkopen.2021.11563

6. Junior AC, Fletes, Lemos T, Teixeira E, Souza M deLourdes D. Risk factors for suicide: systematic review. *Saudi J Health Sci*. 2020;9(3):183. doi:10.4103/sjhs.sjhs_83_20

7. Berkelmans G, van der Mei R, Bhulai S, Gilissen R. Identifying socio-demographic risk factors for suicide using data on an individual level. *BMC Public Health*. 2021;21(1):1702. doi:10.1186/s12889-021-11743-3

8. Reger MA, Stanley IH, Joiner TE. Suicide mortality and coronavirus disease 2019—a perfect storm? *JAMA Psychiatry*. 2020;77(11):1093-1094. doi:10.1001/jamapsychiatry.2020.1060

9. American Foundation for Suicide Prevention. *Suicide statistics*. AFSP Accessed September 25, 2023. https://afsp.org/suicide-statistics

10. Shiner B, Peltzman T, Cornelius SL, Gui J, Forehand J, Watts BV. Recent trends in the rural–urban suicide disparity among veterans using V.A. health care. *J Behav Med*. 2021;44(4):492-506. doi:10.1007/s10865-020-00176-9

11. Office of Disease Prevention and Health Promotion. *Social determinants of health - healthy people 2030*. OASH. Accessed September 25, 2023. https://health.gov/halthypeople/priority-areas/social-determinants-health

12. County Health Rankings & Roadmaps. *About Us.* CHR&R. Accessed October 3, 2023. https://www.countyhealthrankings.org/about-us

13. U.S. Department of Health and Human Services. *Protections (ohrp) o for hr. exemptions(2018 requirements).* HHS. Published March 8, 2021. Accessed October 3, 2023. https://www.hhs.gov/ohrp/regulations-and-policy/regulations/45-cfr-46/common-rule-subpart-a-46104/index.html

14. Pallant J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*. Seventh edition. Routledge; 2020.

15. Blosnich JR, Montgomery AE, Dichter ME, et al. Social determinants and military veterans' suicide ideation and attempt: a cross-sectional analysis of electronic health record data. *J GEN INTERN MED*. 2020;35(6):1759-1767. doi:10.1007/s11606-019-05447-z

16. Kandula S, Martinez-Alés G, Rutherford C, et al. County-level estimates of suicide mortality in the USA: a modelling study. *The Lancet Public Health*. 2023;8(3):e184-e193. doi:10.1016/S2468-2667(22)00290-0

17. United States Census Bureau. *Income, poverty and health insurance coverage in the united states: 2022*. USCB. Accessed October 11, 2023. https://www.census.gov/newsroom/press-releases/2023/income-poverty-health-insurance-coverage.html

18. Casant J, Helbich M. Inequalities of suicide mortality across urban and rural areas: a literature review. *IJERPH*. 2022;19(5):2669. doi:10.3390/ijerph19052669

19. Mohatt NV, Kreisel CJ, Hoffberg AS, Mph LW, Beehler SJ. A systematic review of factors impacting suicide risk among rural adults in the united states. *The Journal of Rural Health*. 2021;37(3):565-575. doi:10.1111/jrh.12532

20. Bazley R, Pakenham K, Watson B. Perspectives on suicide prevention amongst members of christian faith-based organizations. *Community Ment Health J*. 2019;55(5):831-839. doi:10.1007/s10597-018-0355-4

21. Teo DCL, Duchonova K, Kariman S, Ng J. Religion, spirituality, belief systems and suicide. In: Alfonso CA, Chandra PS, Schulze TG, eds. *Suicide by Self-Immolation: Biopsychosocial and Transcultural Aspects*. Springer International Publishing; 2021:183-200. doi:10.1007/978-3-030-62613-6_14