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The Effect of Community Health Linkages on Suicide Rates in Veterans

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This is to certify that the doctoral dissertation by

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Abstract

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MPA, Park University, 2010

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

Suicide risk is a public health issue. It is a complex and poorly understood mental health and societal threat. This study examined veteran suicide rates and their relationship to family and social support, as measured by the social association rate, mental health funding per capita, and the lethality of the method rate. The interpersonal-psychological theory of suicide and the social ecological model are the theoretical frameworks that guided the study. Both theories emphasize the complexity surrounding suicide at the state level as it is related to the individual, social, environmental, and political landscape related to veteran suicide. The quantitative bivariate correlation and chi-square study analyzed the associated relationships, at the state level, between the variables. The results of the correlation, chi-square test, and multivariate analysis were significant. Social associations were significant to include 2009 mental health funding, with 2011 mental health funding reporting less significant contribution to the model than social associations. The lethality of the method reported less significance than mental health funding to the model with firearms and suffocation reporting the highest significance. The data presented are valuable to advocates, health care leaders, policymakers, researchers, and survivors to develop a coordinated approach to mitigate the consequences of unmet needs associated with suicide. The social change implications may help guide improvements in mental health practice to reduce suicide rates amongst the veteran population.

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Dedication

I dedicated this work to my family and friends. A special feeling of gratitude to my loving husband, Dustin Rothwell, whose words of encouragement and push for tenacity resonate daily in his support. My children, Isabella and Calvin Rothwell, whose inspiration and reassurance have driven me forward. They are my constant cheerleaders and always watching my behavior and actions as I have undertaken this journey. My parents John and Linda Anderson and brother Luke Anderson whose words of praise lift me up and keep me going. I also dedicate this dissertation to my friends and family who have supported me throughout the process. Especially, Lesley Newton and her husband Robert Newton for their unwavering support. I will always appreciate all they have done to support me and allow me the time to dedicate to this journey and work.

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Chapter 1: Introduction to the Study

In this study, the veteran suicide rate was observed to understand the strength of the relationship between family and social supports, measured by social association rates, mental health funding per capita, and the lethality of the method of suicide, measured by the method rates of veteran suicide based on the method counts of suicide per state. The interpersonal-psychological theory of suicide (IPTS) and the social ecological model (SEM) were the theoretical frameworks that guided the study. The theories underscore the complexity surrounding suicide at the state level as it related to the individual, social, environmental, and political landscape related to the veteran and suicide. The research presented in this paper stresses the importance of understanding the associated relationships at the state level between family and social supports, as measured by the social association rate, mental health funding per capita, and lethality of the method rate to reduce veteran suicides (Chu et al., 2017; Dang et al., 2019; Holliday et al., 2018). The social change opportunity is that the findings may help guide change advocates and system leaders to influence programmatic practices currently underway and drive improvements in mental health practice to reduce suicide rates amongst the veteran population. Social advocates looking to be change advocates in this space should co-develop a strong multi-sectoral health framework to address the full range of risk and protective factors. This chapter provides an overview of the study and a discussion of the problem, the purpose of the study, the research questions, and their hypotheses. Also included is a discussion of aligning the theoretical foundations, the scope of the research, and significance of the study.

Background

Depression, anxiety, and traumatic injuries among Veteransand their difficulty adjusting to life after deployment have pushed Veteran suicides to devastating levels. Understanding and reducing suicide risk among Veteransshould be a primary concern for public health leaders and community health organizations. There have been few studies specifically related to the prevention of suicide among this population and to understanding potential linkages between community health resource availability, suicide methods, and mental health community-based funding at the local level. Understanding access to health care, support mechanisms, and suicide mortality at the state level could address gaps in care and mitigate suicide mortality risk (Dang et al., 2019; Olenick et al., 2015; Villatte et al., 2015).

This socioecological study assessed these associated relationships based on two pathways. The first is the IPTS, and the second is the SEM. Both theories reinforced an understanding of unmet psychological needs associated with social associations and relationships to community and society related to access to lethal methods of suicide (Chu et al., 2017; Cramer & Kapusta, 2017; Holliday et al., 2018). Further, the research compiled in the literature demonstrated community mental health access, Veteran suicide, mental health funding, and method of suicide have not been studied holistically. This study provided the opportunity to dive deeper into the variables/predictors and understand relationships as well as potential social change opportunities (Chu et al., 2017; Cramer & Kapusta, 2017; Holliday et al., 2018).

Problem Statement

U.S. Veterans have faced social and mental health obstacles upon integration into civilian life. The current prioritization of veteran resources has created uneven access to health services. Funding barriers, health inequity, and quality mental health services have shaped shortcomings in our health care system that affect our veterans. These incongruities have resulted in increased suicide rates among veterans. The veteran suicide rate has been reported to be 1.5% greater than that of the general population. Estimates report 27.7/100,000 Veterans commit suicide every year, compared with 17.0/100,000 persons in the general population, resulting in 16.8 Veterans committing suicide each day (Office of Mental Health and Suicide Prevention, 2019). The method preference in the civilian population, by more than 50%, was firearms with suffocation a close second at 27% (Centers for Disease Control and Prevention [CDC], (n.d.b).

Prior to this study, the associated relationships, at the state level, between the veteran suicide rate by state, social association rate, mental health funding per capita, and the lethality of the method rate had not been examined from a state perspective for the veteran population. Addressing the problem of inadequate access to quality mental health services is critical in advocating for a strong veteran mental health infrastructure (Reisman, 2016). Hence, this research was needed to better understand this critical social issue. The research adds to the current research and to the dialogue specific to community health linkages, in the form of family and social support, mental health funding, the lethality of the method lethality, and its relationship to veteran suicide rates (see Kintzle et al., 2018; Villatte et al., 2015).

Purpose of the Study

The purpose of this study was to examine the relationship between family and social supports, measured by social association rates, mental health funding per capita, the rate of the lethality of the suicide method and veteran suicide rates. In the United States, 22 veterans, aged 18–44 years, commit suicide every day (Office of Mental Health and Suicide Prevention, 2021a). Adequate access to health services and social factors have been linked to depression and increased suicide rates in the veteran population (Pietrzak et al., 2017; van der Velden et al., 2018). The literature reinforced the need for new, emerging inquiries. Adams et al. (2017) supported the need for increased social support, innovative approaches to mental health support, and its underlining drivers. Cramer and Kapusta (2017) and Kelley et al. (2019) reinforced a need for community health linkages through an understanding of the SEM to understand gaps and develop innovative strategies. Bauer et al. (2021), Chu et al. (2017), and Holliday et al. (2018) asserted a need to study levels of capability associated with suicide, and lethality of the method related to the IPTS.

To address the gap, I conducted this quantitative correlation and chi-square study exploring the associated relationships, at the state level, between the variables. The dependent variable was veteran suicide rates. The predictor variables included a social association rate, mental health funding per capita, and a rate for the lethality of the method. This study built upon the current literature, annotated in this study, and reinforced the authors' recommendations to explore the relationships between social

associations, mental health funding, the lethality of the suicide method and veteran suicide.

Research Questions and Hypotheses

The study employed quantitative design. Correlation, bivariate descriptive statistics, chi-square test and multivariate analysis to evaluate the impact of all independent variables on the outcome findings and results was conducted on the nominal and scale variables to assess the strength of the relationships. The following research questions and hypotheses were proposed to explore the associated relationships, at the state level, between family and social supports, as measured by social associations, mental health funding per capita, the rate of lethality of the suicide method and veteran suicide rates.

RQ1: Is there a significant relationship between state veteran suicide rates and family and social support?

$H_0 1$–There is no significant relationship between state veteran suicide rates and family and social support.

$H_a 1$–There is a significant relationship between state veteran suicide rates and family and social support.

RQ2: Is there a significant relationship between veteran suicide rates and mental health funding at the state level?

$H_0 2$–There is no significant relationship between veteran suicide rates and mental health funding at the state level.

H_a2–There is a significant relationship between veteran suicide rates and mental health funding at the state level.

RQ3: Is there a significant relationship between veteran suicide rates and lethality of the suicide method?

$H_0 3$–There is no significant relationship between veteran suicide rates and lethality of the suicide method.

H_a3–There is a significant relationship between veteran suicide rates and lethality of the suicide method.

Theoretical Framework

The theoretical foundation for this socioecological study was based on two models—the IPTS and the SEM. Joiner (2005) proposed the IPTS as a way to explain the desire to commit suicide combined with the ability and means to acquire lethal means, the perceived burdensomeness that one's life is not worth its existence, and repeated exposure to painful or fearful experiences (Holliday et al., 2018). Higher tolerance for pain and a sense of fearlessness when faced with death has been cited by veteran combat and suicide survivors (Kelley et al., 2019; Pietrzak et al., 2017; Soberay et al., 2021). It also asserts that acquired capability is a continuous construct (Joiner, 2005). Chu et al. (2017) affirmed that repeated exposure to trauma-related combat experiences coupled with pain and fight-or-flight stimulating experiences confer a greater capacity for suicide. Further, IPTS driven by levels of changing connectedness and unmet psychological needs leads to a proximal and sufficient cause of active suicidal desire and further withdrawal from family and social connections (Chu et al., 2017; Holliday et al., 2018).

The second model studied to support the theoretical foundation for this socioecological study was the SEM, an ecological paradigm developed by Urie Bronfenbrenner. The CDC (n.d.a) has adopted the SEM and employs it to organize risk and protective factors to support grant funded activities and to inform prevention strategies. The SEM addresses both the macro and micro levels within the community, societal, relational, and individual levels of the framework (Bronfenbrenner, 1994). Several levels pertain to this study. Societal factors could inform social and cultural norms including policies and regulations for transitioning veterans. Community-level influences inform social associations and access to community-based organizations at the local level. Relational factors define direct interaction at the local level or a lack thereof, resulting in social isolation and loneliness due to withdrawal. Lastly, the individual level informs the characteristics of the individual in the SEM (Cramer & Kaputa, 2017). In support of a multilevel approach for this study, within the IPST and the SEM model, a system-level approach was developed to explore the associated relationships at the state level between family and social supports, as was measured by the social association state rate, mental health funding per capita, the lethality of the method rate and their relationship to the veteran suicide rate in this bivariate correlation study employing chi-square analysis.

Nature of the Study

The nature of this study was quantitative with a bivariate correlation and chi-square analysis design. The independent variables or predictors explored to determine the associated relationship to the dependent variable veteran suicide rates were (a) social

association rate, (b) mental health funding per capita, and (c) rate for the lethality of the method(s). The data collected were secondary data. The rationale used for these analyses was based on bivariate correlation and chi-square's ability to explore a relationship between multiple independent variables, categorical variables, and a single dependent variable. The chi-square test for independence, also called Pearson's chi-square test or the chi-square test of association, is used to discover if there is a relationship between two categorical variables and bivariate correlation measuring the strength and of association that exists between two variables.

Definitions

Interpersonal-theory of suicide: Theory developed by Thomas Joiner (2005) in which he attempted to explain individuals' risk for suicide. The theory asserted an individual's desire to commit suicide paired with the ability and means to acquire lethal means, coupled with perceived burdensomeness that one's life is not worth its existence combined with repeated exposure to painful or fearful experiences increases risk (Joiner, 2005; see also Chu et al., 2017).

Lethality of suicide method rate: The data were collected from an Office of Mental Health and Suicide Prevention, a specific office within the U.S. Department of Veterans Affairs (VA) (2021d). The data were Suicide Prevention State-Level Veteran Suicide Data: 2019 State Data Appendix (Office of Mental Health and Suicide Prevention, 2021d). The data for this variable are secondary data. The VA acquired the data from the VA and Department of Defense (DoD) Suicide Data Repository (SDR) and CDC Wide-Ranging Online Data for Epidemiologic Research (WONDER).

The *Veteran Suicide Surveillance: Methods Summary* compiled from the Office of Mental Health and Suicide Prevention (a specific office within the U.S. Department of Veterans Affairs (2021d) reported the method of suicide data from ICD–10 codes: firearm (X72–X74), suffocation (X70), poisoning (X60–X69), and all other (U03, X71, X75–X84, Y87.0). State clinicians identified suicide from the primary cause of death and codes based on the definitions selected by the Veterans Administration (see Table 1).

Table 1

VA Selected ICD - 10 Methods of Suicide Codes

Method	Code	Cause of death
Firearm	X72–X74	Suicide – Firearm and explosives
Other	X60–X84,	Suicide - All injury
Other	U03.0,Y87.0	Suicide - All injury
Other	X78	Suicide – Cut or pierce
Other	X71	Suicide – Drowning
Other	X80	Suicide – Fall, jumping from high place
Other	X76–X77	Suicide - Fire or hot object or substance
Other	X76	Suicide - Fire or flame
Other	X77	Suicide - Hot object or substance
Other	X82	Suicide – All transport
Poisoning	X60–X69	Suicide – Poisoning, by solid or liquid
Other	X79	Suicide – Struck by or against
Suffocation	X70	Suicide – Suffocation, hanging and strangulation
Other	X83,Y87.0	Suicide Other – specified, not classified
Other	U03.9, X84	Suicide – Unspecified

(World Health Organization, 2022).

Data defined by the Office of Mental Health and Suicide Prevention (a specific office within the U.S. Department of Veterans Affairs (2021d), suicide method presented indicated the number of suicide deaths in each year. The data were collected from the Office of Mental Health and Suicide Prevention State-Level Veteran Suicide Data: 2019 State Data Appendix (Office of Mental Health and Suicide Prevention, 2021d). The data

collection period ranged from 2001 to 2019. The rate used to calculate the lethality of the

method was: Veteran Suicide Rate = [total number (by method) veteran suicide death in

each year) / (population) * 100,000] (Office of Mental Health and Suicide Prevention,

2019d).

Social ecological model (SEM): The SEM is an ecological paradigm developed

by Bronfenbrenner. The SEM addresses both the macro and micro levels within the

community, societal, relational, and individual levels of the theoretical framework

(Bronfenbrenner, 1994).

State veteran suicide rate: Defined by the Veteran Administration National

Suicide Report. The suicide rates presented indicated the number of suicide deaths in

each year as it relates to the estimated population. The data for this variable were

acquired from the VA/DoD SDR and CDC WONDER. The data collection period ranged

from 2001 to 2019 for the Veteran Administration data. Table 1 depicts the VA selected

methods of suicide for reporting. The VA calculated the veteran suicide rate using the

Veteran Population Projection Model 2016 (Office of Mental Health and Suicide

Prevention, 2019). The formula for the calculation was as follows: Veteran Suicide Rate

= [(total number veteran suicide deaths in each year) / (population) * 100,000] (Office of

Mental Health and Suicide Prevention, 2019).

Social association rate: Refers to a system of community assets to improve the

quality of community life. The measure refers to family and social support, at the zip

code level, as determined by the Census Bureau (Community Tool Box, 2020; County

Health Rankings and Roadmaps, 2021). The social associations at the state level have

been coded to indicate the strength of the social network as a resilient social support

network has been identified as a strong predictor of health behaviors (County Health

Rankings and Roadmaps, 2021). These data are refreshed yearly and published the

following year after the ranking has been reassessed, in this case 2020 measure data

published in 2021. The supports are coded by The North American Industry

Classification System (NAICS) codes. It is the standard used by Federal statistical

agencies in classifying entity establishments for the purpose of collecting, analyzing, and

publishing statistical data related to the U.S. business economy. These NAICS codes; the

unique census identifiers were used to calculate the rate, as listed by County Health

Rankings and Roadmaps (2021), as follows:

- civic organizations (813410)

- bowling centers (713950)

- golf clubs (713910)

- fitness centers (713940)

- sports organizations (711211)

- religious organizations (813110)

- political organizations (813940)

- labor organizations (813930)

- business organizations (813910)

- professional organizations (813920)

Further, the County Health Rankings and Roadmaps (2021) utilized the following

formula to calculate the rate that was used in the secondary date set: Social Associations

Rate: [total number of associations (NAICS = 813410 + 713950 + 713910 + 713940 + 711211 + 813110 + 813940 + 813930 + 813910 + 813920) / (2020 population) *10,000].

State mental health funding per capita: Data were based on figures from Substance Abuse and Mental Health Services Administration (SAMHSA) reported to the National Alliance on Mental Illness (NAMI) from state general funds allocated to state mental health agencies for community mental health service years 2009 and 2011 and extracted from a report issued in 2020 (NAMI, 2011). The mental health funding per capita was calculated based on the following: [total mental health general fund dollar amounts) / (population) * 100,000] (U.S. Census Bureau, 2021).

Assumptions

In this study, it was assumed that all data were consistent. It was assumed that the secondary data would include all individual veteran data points. The secondary data available to the public, and data analyzed by the Veteran's Administration, were cumulative data. The data used for this research to measure the relationships between variables were chosen from peer-reviewed publications and surveys, assumed to accurately measure what they intended to measure (Office of Mental Health and Suicide Prevention, 2021).

Scope and Delimitations

The specific focus for this study was chosen to develop a better understanding of predictors for veteran suicide rates. In addition, this topic has the potential to inform public health systems change as it pertains to access to community resources, mental health funding allocation, and access to lethal means (Bauer et al., 2020; Soberay et al.,

2021). In previous studies, a veteran's relationship to social connections dictated coping mechanisms, violent tendencies, and perceived burdensomeness (Hester, 2017; Ribeiro et al., 2018, Van Voorhees et al., 2018). The research emphasized the importance of understanding the associated relationships, at the state level, between the veteran suicide rate, the social association rate, mental health funding per capita, and the lethality of the method rate (Chu et al., 2017; Dang et al., 2019; Holliday et al., 2018). The theories selected for the theoretical framework, IPTS and the SEM, underlined the complexity surrounding suicide at the state level.

The unit of analysis was state level data. The population studied consisted of Veterans who committed suicide within the United States of America. The social association scope consisted of the rate of social associations in a state. The mental health funding data consisted of dollars, in the millions, at the state level for all 50 states, based on the per capita population rate. The lethality of the method rate data consisted of counts of suicide calculated based on the population for each state and categorized by suicide method for the states. The generalizability that existed with this study yielded data from all 50 U.S. states; not all states reported data for all fields. In cases where fields were missing or indicated low rates due to significance the data were not included for analysis. The results may not be generalizable to all veteran suicides, all mental health funded programs, all social supports, and all lethal means of taking one's life.

Limitations

The limitations exist in the data itself and deaths that occurred outside of the United States that are not included and therefore are not considered. Additionally, the

data rely on a combination of data sources, data processing, and determination of decedent veteran status and properly coded lethal method used at time of death (Office of Mental Health and Suicide Prevention, 2019). It was also assumed that the secondary data would include all individual veteran data points, and in some cases the data were missing due to low data or states that did not report data. The data made publicly available by NAMI were annual general budget mental health data from two points in time: 2009 and 2011. The County Health Rankings data for family and social support, as measured by the social association rate, were refreshed in 2020 and published in 2021. Limitations exist in the data ranges; however, these were mitigated through ensuring all data represented rates for all variables. No bias existed based on these data sets or regarding overcoming limitations. Limitations also exist with the social association rate. County Health Rankings (2021) reports, the measure uses the primary business code of organizations, which were self-reported by businesses in any given county across the United States. Further, County Health Rankings (2021) states, there is not a reliable, national source of data for measuring social or community support at the local level. This is the only measure at this time. In addition, this measure does not account for perceived support or social connections offered from family support structures, informal networks, or community service organizations that are not a registered business organization (County Health Rankings, 2021).

The secondary data made available to the public and data analyzed by the Veteran's Administration were cumulative data. The data used for this research to measure the relationships between variables were chosen from peer-reviewed

publications and surveys, assumed to accurately measure what they intended to measure (Office of Mental Health and Suicide Prevention, 2021d). To overcome this limitation, meetings were held with the U.S. Veterans Administration, Office of Mental Health and Suicide Prevention, Department of Veterans Affairs. The Director for Epidemiology provided guidance based on the Veterans Affairs Administration methodology, data collection, and analysis of the cumulative data set.

Significance of the Study

It is essential to understand the drivers that lead to suicide. The knowledge gained will significantly advance the discipline by means of insights and thought leadership channeled through the research agenda and publications focused on health and social sciences. The significance lies within the study results and the identified drivers for suicide. This topic could be meaningful due to the upward trending rates of suicide in the veteran population and a lack of interventions that have lowered the trend (Lemle, 2018).

The knowledge attained advances practice through its ability to provide subject matter expertise and consensus statements summarizing current knowledge and offering best practice recommendations based on the study results. Understanding the associated relationships at the state level between suicide and method of suicide and access to health care could inform social change interventions to increase the availability of crisis interventions and mental health services. Further, this socioecological study aimed to improve our understanding of the etiology of suicide and therefore mitigate its upward trend.

The policy implications are rooted in suicide as a public health issue. As suicide is a complex and poorly understood mental health and societal threat, the IPTS and the SEM are positioned to frame the community, state-level, and national conversations in support of policy, systems, and environmental change strategies to mitigate the consequences of unmet needs associated with suicide. The social change implications are that the findings may help guide change advocates and system leaders to influence programmatic practices currently underway and drive improvements in mental health practice to reduce suicide rates amongst the veteran population.

Summary

There is limited literature exploring the associated relationship between the family and social supports, as measured by the social association state rate, mental health funding per capita, the lethality of the method rate and their relationship to the veteran suicide rate amongst a significant veteran population in a unit of state analysis. Prior to this study, the associated relationships at the state level between rates of veteran suicides, the social association rate, mental health funding per capita, and the lethality of the method rate had not been examined in this population. Reisman (2016) asserted that understanding the drivers of suicide is vital in advocating for a strong veteran mental health infrastructure. Hence, this research was needed to better understand this critical social and public health issue (see Van Voorhees et al., 2018). The research also adds to the current literature and to the dialogue specific to community health linkages (see Kintzle et al., 2018; Villatte et al., 2015).

In support of the problem, the purpose of this quantitative study was to examine the relationship between the social association rate, mental health funding, the lethality of the suicide method, and veteran suicide rates amongst a significant veteran population in a unit of analysis focused on all 50 states. To address this gap, this quantitative correlation and chi-square study explored the associated relationships between the variables. This study built upon the current literature and reinforced the authors' recommendations to explore the relationships between social associations, mental health funding, the lethality of the suicide method and veteran suicide rates (see Adams et al., 2017; Bauer et al., 2020; Van Voorhees et al., 2018). To this end, the study answered the question: What is the relationship between social associations, mental health funding, the lethality of the suicide method and veteran suicide rates?

The remaining chapters in this dissertation review the study in detail. Chapter 2 provides an overview of the current literature related to this study, its theoretical framework, and the current gap in the literature. Chapter 3 details the research rationale, design, and methodology. Chapter 4 presents the analysis of the variables and highlights the significance of the findings. Lastly, Chapter 5 includes a discussion of recommendations as they relate to the findings. The last chapter also aligns the social problems, literature and gap, and theoretical underpinnings. The recommendations will inform potential social change proposals to build upon new evidence for future research and transform cross-functional and wide-reaching partnerships to effect social change.

Chapter 2: Literature Review

Introduction

The need for social support and innovative approaches to mitigate the slow preventable death associated with veteran suicides has been overdue. The purpose of this quantitative study was to examine the associated relationships, at the state level, between the veteran suicide rate, the social association rate, mental health funding per capita, and the lethality of the method rate, which had not been examined in a significant veteran population. The literature provided an understanding of the mental health barriers U.S. Veterans face as they return to civilian life (Kintzle et al., 2018; Lemle, 2018). However, few Veterans seek support for posttraumatic stress disorder (PTSD), combat-related injury, and depression associated with lack of social connections due to the stigma associated with accessing and seeking care for mental health issues (Adams et al., 2017; Dang et al., 2019; Hester, 2017). The literature also supported the need for community health linkages through an understanding of how the SEM could be leveraged to understand gaps and develop innovative strategies to address the community and societal (Cramer & Kapusta, 2017; Kelley et al., 2019).

Pietrzak et al. (2017) and Villatte et al. (2018) also noted the need for further study to understand linkages between social connections, method access, and access to health care resources to include peer-to-peer social support community health linkages at the community level and improvements for community and clinic-based linkages. The following sections provide an overview of the search strategy and theoretical foundation as it relates to the literature, and a review of the current literature.

Literature Search Strategy

The keywords used in searching for the literature included the following: *combat-related injury*, *community linkages, community health theories and frameworks, interpersonal theory of suicide, loneliness, mental health funding and resources, the lethality of suicide method/mode, post-traumatic stress disorder, social ecological model , social factors, social networks, state-level mental health funding, suicide, suicide ideation, theories of suicide, trauma,* and *Veterans* with the Boolean operators AND/OR.

The following Walden University databases were utilized: Google Scholar, ProQuest Central, PubMed, EBSCO, and Thoreau Multi-database. In addition, the CDC, Community Tool Box, NAMI, Robert Wood Johnson Foundation, County Health Rankings, SAMHSA, and the U.S. Veterans Administration were searched to understand the problem and used to strengthen the background information through the collection of statistics.

Theoretical Foundations

The theoretical foundation for this socioecological study was based on two models—the IPTS and the SEM.

Interpersonal-Psychological Theory of Suicide

The IPTS, the theoretical foundation guiding the underpinnings associated with suicide, originated with Thomas Joiner. Joiner (2005) proposed the IPTS as a concept to understand suicide risk as well as potential protective factors. Its premise was built upon capability, a way to acquire lethal means, paired with perceived burdensomeness, triggered by repeated exposure to painful or fearful experiences (Holliday et al., 2018). In

addition, higher tolerance for pain and a sense of fearlessness when faced with death has been considered a strength of the theory (Chu et al., 2017; Holliday et al., 2018). The theory has been applied to understand capability constructs, repeated exposure to trauma-related combat experiences, psychological needs associated with perceived burdensomeness, and the lethality of the method as it relates to access, means, and the proximal and sufficient cause of active suicidal desire related to fearlessness when faced with death (Bauer et al., 2020; Chu et al., 2017; Cramer & Kapusta; 2017; Holliday et al., 2018; Joiner, 2005).

The rationale for the choice of this theory was foundationally built upon a need to understand the primary divers for veteran suicide. It was chosen to understand the relationship between lethal means, combat-related injury, and perceived fearlessness associated with exposure to death stimuli from combat experiences (Kelley et al., 2019; Pietrzak et al., 2017; Soberay et al., 2021). Further, the selected theory relates to the present study in that it can be used to understand the relationship between the lethality of the method used by the veteran and potential social change implications resulting from the findings. The research questions relate to the IPTS implicitly because, to address the premise, social associations, supports, mental health funding, the lethality of the method must be understood to influence change. The findings build upon the existing research by aligning the current conversation for this social problem to the issue of lethal means and access to resources.

Social ecological model

      The theoretical foundation guiding the ecological paradigm associated with the SEM was developed by Bronfenbrenner. Bronfenbrenner, (1994) advanced the SEM framework to understand as well organize the risk and protective factors driving health. The CDC (n.d.a) reported that the SEM addresses both the macro and micro levels within the community, societal, relational, and individual levels of the framework. The SEM was developed in layers to explain and provide multiple levers that could be pulled to initiate change. Of concern for this study are the community and societal level influences. The community-level influences informed social associations and access to community-based organizations at the local level (Cramer & Kapusta, 2017), whereas the societal level informed social and cultural norms including policies and regulations (Bauer et al., 2020; Ribeiro et al., 2018; Van Voorhees et al., 2018)

      The SEM has been applied to understand a wide range of factors that influence veterans' risk for violence, access to community and social supports, induvial behavior change supports at the local level, and potential policy and environmental strategies that could be employed to mitigate suicide ideation and risk (Dang et al., 2019; Lemle, 2018; Van Voorhees et al., 2018). The rationale for the choice of this theory was built upon a desire to understand the levels of influence in which the veteran integrates into from military life. It was chosen to understand the relationship between associated social associations, mental health funding, and potential social change implications resulting from the findings (Kintzle et al., 2018; Ribeiro et al., 2018).

The research questions relate to the SEM implicitly because to address the levels of influence that impact a veteran, social associations, supports, mental health funding, and an understanding of the lethality of the method must be understood to influence change. The findings build upon the existing research by aligning the current dialogue for this social problem to the issue of social associations, mental health supports, and access to lethal means, as well as potential opportunities to mitigate negative influences.

Literature Review Related to Key Variables and/or Concepts

Suicide is defined as the intentional act of taking one's own life (Joiner, 2005). Suicide has become an epidemic in the United States. It is a complicated invisible slow preventable death. Prevention and risk mitigation has become a critical component of public health and public health programming. Research has determined that perceived moral injury, burdensomeness, and lack of fear of death has become an influential factor in the increasing rates of veteran suicides. Higher levels of PTSD have been found to increase a veteran's potential for suicide ideation and/or suicide attempts. These decisive findings about veteran suicide risks and their relationship to social associations, mental health resources, and funding, as well as access to lethal means must be further studied (Adams et al., 2017).

In recent years, stigma associated with a mental health diagnosis, combat injury, and conceal and carry state policies have impacted individuals' desire to speak up, access care, and admit to personal gun ownership. Additionally, the fabric of mental health services and the availability of service providers has been drastically reduced. The following is an overview of the literature as it relates to the research questions.

Veteran Suicide

Suicide is a major public health challenge that disproportionately affects Veterans. Researchers have been studying veteran suicide rates and prevention strategies to examine and address the effect of moral injury in combat-wounded Veterans (Kelley et al., 2019). Researchers have identified opportunities to improve risk identification of suicidal behaviors related to non-successful suicide (Villatte et al., 2018) as well as evaluation, support, and treatments and interventions related to various mental health diagnoses and a further need to understand relationships between the characterization of suicide attempts in Veterans to understand overall suicide risk.

Family and Social Support/Social Association

Family and social support at the local level are protective factors to mitigate suicide. Researchers asserted that suicide prevention requires targeted support strategies for veterans' transition from military to civilian life (Lemle, 2018). Lemle noted that the approach required non-VA community-based program adoption and community-based referral integration for the VA. However, strategies are lacking that support funding allocated to implement programming or support to community health linkages.

In another study, Pietrzak et al. (2017) examined risk and protective factors associated with suicidal ideation. The data were acquired from a National Health and Resilience in Veterans Study and consisted of 2,093 vets from 2011 to 2015. A multivariate binary logistic regression analysis was employed to assess baseline predictors of incident suicidal ideation with the following independent variables: socio-demographic, military status, mental health diagnosis, and protective factors. Pietrzak et

al. found an increased risk for suicidal ideation when associated with loneliness in white

men. The study showcased the importance of understanding community health linkages,

available social support based on race, resources specific to mental health diagnosis, and

contributing social factors leading to suicide ideation.

In a similar study, Ribeiro et al. (2018) examined the association between PTSD

status and functional impairment in military inpatients diagnosed with acute suicide risk.

The analysis reviewed post-admission cognitive therapy survey data from 166 inpatient

military records. Logistic bivariate correlation and chi-square, between-subjects *t* tests,

chi-square tests, and Cohen's *d* were employed to understand PTSD association in

conjunction with alcohol use, work, sleep quality, social problem-solving social

adjustment. The authors found women at a higher risk than men, especially when

combined with poor sleep and difficulties with work and social connectedness. This study

reinforced a need to understand the role of PTSD in suicidal individuals, community

health linkages, social support related to social factors, and effects of impaired

functioning.

Mental Health

Mental health funding drives access to programmatic interventions. support at the

local level are protective factors to mitigate suicide. Researchers analyzed data from the

U.S. Office of Suicide Prevention. The authors asserted mental health disparities were

driving the high suicide rates among Veterans due to a lack of diagnosis and funded

health care access. This study reinforced a need to understand non-profit and for-profit

community health linkages in addressing access to mental health care aimed at mitigating suicide rates.

Similar results were found by Dang et al. (2019). The authors examined the impact of social isolation and loneliness in high-need Veterans with a mental health diagnosis. Data were acquired from a Veterans Affairs assessment of High Need High Risk (HNHR) Veterans. A bivariate correlation and chi-square analysis was utilized to identify the Barthel ADL score, which assesses activities of daily living related to social isolation. Dang et al. found high-need Veterans with mental health challenges had higher levels of depression, lack of mobility, transportation barriers, which led to higher levels of social isolation and loneliness. The study emphasized the importance of understanding needs related to daily life and their association to mental health challenges which precipitate levels of social isolation and loneliness.

Lethality of the Method

Discharge and access to health resources play a vital role in addressing drivers for suicide. In a study conducted by Cramer and Kapusta (2017), the authors evaluated the SEM and its correlation to suicide by analyzing data from the CDC and the U.S. Surgeon General's Office SEM suicide prevention strategy. The authors purported that hopelessness and access to lethal suicide methods were a primary drive. This study supported a need to understand linkages between social connections, method access, improvements for community and clinic-based associations. Further, the authors stated that additional SEM research is needed and educational and training specific to the SEM framework.

In another study, related to functional impairment and perceived burdensomeness, Van Voorhees et al. (2018) examined violent behavior and the impact of resilient coping coupled with social support in military veterans. The analyses consisted of survey results from 1,090 Veterans that completed the National Post-Deployment Adjustment Survey. Bivariate and multivariate analyses were conducted to understand associations among psychosocial risk and protective factors and their relationship to social connections and support. Results found decreases in resilient coping over time lead to violent tendencies, lack of connectedness, and decreased social support access. The study underscores the need to understand physical, mental, and social behavior interventions to increase social support focused on resiliency to mitigate access to lethal means and use of lethal means to commit suicide.

Interestingly Bauer et al. (2020) showed a lack of correlation mean association of fearlessness about death in persons previously identified with a suicide attempt. In an analysis of participant data from 848 reports generated from the Military Suicide Research Consortium database, the authors found no significant correlation between the study population and fearlessness about death. Additionally, the authors asserted that fearlessness about death does not relate to the method. This study reinforced the need to further add to the literature on suicide lethality as well as understand behaviors associated with capability and the lethality of the method.

In addition, Kintzle et al. (2018) assessed the influence of social connectedness on combat experience and PTSD in discharged veterans. The authors analyzed data from a San Francisco Bay Area community-based needs assessment consisting of 722 Veterans.

Bivariate correlations were constructed in Strata to understand the relationship between combat experiences, PTSD, and social connectedness. The authors found PTSD symptoms were significantly correlated to social connectedness at the bivariate level but found no significant association to the type of discharge status. This study supports a need to understand linkages between social connectedness, protective factors for PTSD at discharge, and suicide mitigation.

Summary and Conclusions

In summary, the literature referenced showcased a need to understand the strength of the relationship between family and social supports, as measured by social associations, mental health funding, and the lethality of the method of suicide. The literature underscored the complexity surrounding suicide at the state level as it related to the individual, social, environmental, and systems landscape related to the veteran and suicide. The research presented in this paper stresses the importance of understanding the associated relationships between social associations, funding for mental health, and the lethality of the method to reduce the rate of suicide and develop upstream strategies and interventions for families and Veterans(Chu et al., 2017; Dang et al., 2019; Holliday et al., 2018). Prior to this study, the associated relationships, at the state level, between the veteran suicide rate, the social association rate, mental health funding per capita, and the lethality of the method rate had not been examined in a significant veteran population. Addressing the problem of inadequate access to quality mental health services is critical in advocating for a strong veteran mental health infrastructure (Reisman, 2016). Hence, this research is needed to better understand this critical social issue that has become an

epidemic. The research will add to the current gap in literature specific to community

health linkages, in the form of family and social support, mental health funding, the

lethality of the method, and its relationship to veteran suicide rates (Kintzle et al., 2018;

Villatte et al., 2015). The next chapter will delve into the methodology and provide an

overview of the study conducted related to how the study was designed to address the

social problem, add to evidence, and answer the research questions.

Chapter 3: Research Method

Introduction

The purpose of this quantitative study was to examine the associated

relationships, at the state level, between veteran suicide rate, social association rate,

mental health funding per capita, and the lethality of the method rate. These have not

been examined in a veteran population. Chapter 3 includes the research methodology,

research questions, the purpose, data collection sources, and procedures. The

methodology includes a discussion around the secondary data and data sources chosen for

this socioecological study. The research methods addressed the purpose of this study,

which was focused on understanding drivers related to veteran suicide risk. Additionally,

the bivariate correlation and chi-square, quantitative study analyzed the relationships to

understand the social problem.

Research Design and Rationale

This was a quantitative study and employed bivariate correlation and chi-square

analysis to understand the relationships associated with the variables. The independent

variables or predictors explored to determine their associated relationships to the

dependent variable veteran suicide rate were (a) social association rate, (b) mental health

funding per capita, and (c) lethality of the method rate. The data analyzed were secondary

data. The rationale used for these analyses was based on bivariate correlation and chi-

square's ability to explore a relationship between pairs of variables. More specifically,

this socioecological study was built to understand the statistical significance of the

bivariate correlation and chi-square tests among the variables and how much of the

variation in the one variable was explained by the other variables. The design choice is consistent with the overall study and the desire to understand the relationships for the research questions.

Methodology

In this quantitative study, I analyzed secondary data for a deceased veteran population in the United States. State level data for 50 U.S. states was chosen. The data were retrieved from four sources: (a) social association data from the County Health Rankings and Roadmaps (2021); (b) veteran suicide and method data from the Office of Mental Health and Suicide Prevention (2021d); (c) mental health state funding data from the NAMI (2020); and (d) U.S. Census Bureau (2021). The data collection period ranged from 2001 to 2019 for the Veteran Administration data and 2021 for the Robert Wood Johnson Foundation, County Health Rankings data, as this data set is refreshed yearly and published the following year; in this case 2020 measure data published in 2021. The NAMI data were collected for the years 2009 and 2011. All data sets represented data from 50 states. The data were collected after institutional review board (IRB) approval. The data were then exported from the sources as Microsoft Excel files. The variables in the data set that were not applicable to the study were not imported over to SPSS and coded.

A power analysis was conducted in SPSS Statistics (Version 28; https://www.ibm.com/products/spss-statistics) for sample size estimation, based on data for this study. The effect size was large using Cohen's (1988) criteria. With a significance criterion of $\alpha = .05$ and power $= .80$, the minimum sample size needed with this effect

size was $N = 50$ for bivariate correlation and chi-square. Thus, the obtained sample size of $N = 50$ was adequate to test the study hypothesis (IBM SPSS Statistics Version 28, 2022). It should be noted that in the available data sets, the comparison between variables was based on unequal sample sizes within each category but the unit of analysis remained consistent based on the data from all 50 states for each variable.

Data Analysis Plan

The data analysis aimed to demonstrate an alignment and consistency among each element of the socioecological study. SPSS (Version 28) was used for data analysis. The data analyzed in this study was secondary data. Data collection was performed by the following national organizations and government institutions: Robert Wood Johnson Foundation; County Health Rankings, a program of the University of Wisconsin Population Health Institute; NAMI and its partner SAMHSA; the Office of Mental Health and Suicide Prevention; and the U.S. Census Bureau. The data collection period ranged from 2001 to 2019 for the Veteran Administration data, 2021 for the Robert Wood Johnson Foundation and County Health Rankings data, as this data set is refreshed yearly and published the following year; in this case 2020 measure data published in 2021. The NAMI data were collected for years 2009 and 2011. All data sets represented data from 50 states. Mental Health funding per capita data was represented from 50 states and provided on a fiscal year (FY) general budget basis.

The unit of analysis was state level data; thus, the sample size was 50 units for each variable: State Veteran Suicide Total Rate 2001–2019; State Veteran Suicide Method Rate 2001–2019; State Social Support Total Rate; State FY 2009 Mental Health

funding per capita rate (millions); State FY 2011 Mental Heah funding per capita rate (millions); and Census Bureau state population data. The data were exported into Microsoft Excel and reviewed for errors in the porting process; no errors were found. The Excel data were analyzed by state and sum scores of relevant data were calculated to merge into one data set including data for all 50 states imported into SPSS. It should be noted that in the available data sets, the comparison between variables was based on unequal sample sizes within each category yet the unit of analysis remained consistent representing all 50 states for each variable.

Dependent Variable

The following delineates the process that was taken to calculate the rate, code, and analyze the following variables.

Veteran Suicide Rate

Veteran suicide rate was extrapolated from the 2001–2019 veteran suicide state data appendix. Suicide rates presented are the number of suicide deaths in each year divided by the estimated population and multiplied by 100,000; this number was already calculated by the VA and represented in the data set. The formula for the calculation was as follows: Veteran Suicide Rate = [total number veteran suicide deaths in each year) / (population) * 100,000] (Office of Mental Health and Suicide Prevention, 2019). The data for veteran suicides by state rate was cumulatively organized in Excel. U.S. Totals and All Totals were removed from the data as they were duplicative. This continuous, scale variable was labeled "Veteran Suicide Rate" and its role marked as the target variable. It was also re-coded into a different variable and categorized, based on the

frequency output. It was re-coded so that the higher the score, the greater the rate of veteran suicides in a particular state could be evaluated. The "transform, recode into different variable" function was used in SPSS to recode the variable into a categorical variable to be able to analyze as a categorical variable to report levels of suicide rate by state: 1 = low suicide rate, 2 = medium suicide rate, and 3 = high suicide rate. The case groups were chosen based on the standard median split. The determination was made by reviewing the analyses and placing cases below the median into a "low" group, cases above the median into a "high" group, and values at the median into a "moderate" group.

Independent Variables

States

I entered the states ($N = 50$) into SPSS as a nominal variable and assigned each state a value. The values ranged 1–50 with each value alphabetically aligned to a state in the continental United States. The data were reviewed one last time for analysis.

Social Association Rate (Family and Social Support)

The variable of interest in Research Question 1 was social association rate. This is operationalized by family and social support data. This was a continuous, scale variable also recoded as a categorical variable so that the higher the social association rate, the higher the social associations available in a particular state could be examined.

Family and social support was measured as the social association rate based on census business associations, at the state level, per 10,000 population. The numerator for this variable, as calculated by County Health Rankings, was the total number of membership associations in a county. The membership organizations (NAICS code) in

this measure include civic organizations (813410), bowling centers (713950), golf clubs (713910), fitness centers (713940), sports organizations (711211), religious organizations (813110), political organizations (813940), labor organizations (813930), business organizations (813910), and professional organizations (813920) (2021). The denominator for this variable was the total resident population of a county. This variable came over as a rate calculated by County Health Rankings - social association rate = [total number of associations (NAICS = 813410 + 713950 + 713910 + 713940 + 711211 + 813110 + 813940 + 813930 + 813910 + 813920) / (2020 population) *10,000] (County Health Rankings and Roadmaps, 2021).

I recoded the variable to report levels of social association rates: 1 = low social association state rate, 2 = medium social association state rate, and 3 = high social association state rate (see County Health Rankings and Roadmaps, 2021). For categorization, the standard median split was utilized. The determination was made by reviewing the analyses and placing cases below the median into a "low" group, cases above the median into a "high" group, and values at the median into a "equal" group. The data were reviewed one last time for analysis.

Mental Health Funding Per Capita

The variable of interest in Research Question 2 was mental health funding. Mental health funding per capita was measured as mental health funding based on NAMI mental health state general funds. The data were extracted from a report issued in 2020 for years 2009 and 2011 (NAMI, 2020). The census general population cumulative data were utilized to calculate the rate based on the population. The formula employed in

SPSS was mental health funding per capita = [total mental health general fund dollar amounts) / (population) * 100,000]. The new mental health per capita variable was transformed into a new variable for analysis.

After the rate was calculated, the variables for 2009 and 2011 were recoded into different variables to understand their funding levels at the state level: 1 = lower than the average per capita funding rate, 2 = equal to the average per capita funding rate, and 3 = higher than the average per capita funding rate. The standard median split was employed to group the funding rate. The determination was made by reviewing the analyses and placing cases below the median into a "low" group, cases above the median into a "high" group, and values at the median into an "equal" group. The data were reviewed one last time for analysis.

Lethality of the Method Rate

The variable of interest in Research Question 3 is the lethality of the method. This variable provides counts by types of suicide. The lethality of the method was measured as suicides by method based on five veteran suicide methods: firearm, poisoning, suffocation, other and low, and other. Methods are counts of suicides and based on ICD-10 codes. Each code had a pre-determined definition as is presented in Table 1.

This nominal variable with more than two categorical, independent groups was analyzed in Excel, filtered cumulatively by state for all five method categories (firearm, poisoning, suffocation, other and low, and other). The data were filtered cumulatively in Excel by state veteran suicide method count. The data were bought into SPSS for the method(s) by category. The transform compute variable function was used in SPSS to

recode the variable into a rate. The census general population cumulative data were

utilized to calculate the rate for the various methods based on the population. The

formula for the calculation was as follows: The lethality of the method rate: [total count

(by method) veteran suicide death) / (population) * 100,000]. After the rate(s) was

calculated, the variables were recoded into different variables using the transform feature

in SPSS to understand their relationship to the states based on the following categories: 1

= lower than the average suicide rate by [method], 2 = equal to the average suicide rates

by [method], and 3 = higher than the average suicide rates by [method]. The standard

median split was utilized. The determination was made by reviewing the analyses and

placing cases below the median into a "low" group, cases above the median into a "high"

group, and values at the median into a "equal" group. The data were reviewed one last

time for analysis.

Population Independent Variables

Lastly, veteran suicide age, sex, and population data were evaluated in Excel. For

veteran age and sex, the data were analyzed and filtered cumulatively by state for veteran

suicide rates for age and sex. For the population data, the data were analyzed by state.

The variables were bought into SPSS. The general population data were used as a rate to

calculate the formulas in SPSS. For the variables the standard median split was

employed. The determination was made by reviewing the analyses and placing cases

below the median into a "low" group, cases above the median into a "high" group, and

values at the median into a "moderate" group.

The transform, recode into different variable feature was utilized to categorically code the four age categories for suicide and the two genders for sex. Age was categorized into four groups (18–34, 35–54, 55–74, and 75 plus). Suicide rate 1 = low suicide rate, 2 = moderate suicide rate, and 3 = high suicide rate and two gender categories: male and female 1 = low suicide rate, 2 = moderate suicide rate, and 3 = high suicide rate. After analysis, the veteran suicide by sex variable was not included. The VA reports that variation in reporting based on small numbers of deaths are considered unreliable (Office of Mental Health and Suicide Prevention, 2019). As was stated earlier, the sex data set came back statistically unreliable in all statistical analyses and therefore was removed from the study. It was removed due to missing cases, fewer than 10 reported deaths in a particular state; and therefore, the VA guidance states to utilize caution with interpretation of these results for the sex data.

Research Questions

The research questions and working hypotheses were as follows:

RQ1: Is there a significant relationship between state veteran suicide rates and family and social support?

$H_0 1$–There is no significant relationship between state veteran suicide rates and family and social support.

$H_a 1$–There is a significant relationship between state veteran suicide rates and family and social support.

RQ2: Is there a significant relationship between veteran suicide rates and mental health funding at the state level?

$H_0 2$–There is no significant relationship between veteran suicide rates and mental health funding at the state level.

$H_a 2$–There is a significant relationship between veteran suicide rates and mental health funding at the state level.

RQ3: Is there a significant relationship between veteran suicide rates and lethality of the suicide method?

$H_0 3$–There is no significant relationship between veteran suicide rates and lethality of the suicide method.

$H_a 3$–There is a significant relationship between veteran suicide rates and lethality of the suicide method.

Statistical Tests

The three research questions listed were analyzed. The assumptions of bivariate correlation and chi-square were tested. Bivariate correlation and chi-square were conducted to examine the associated relationships between family and social supports, as measured by the social association rate, mental health funding per capita, lethality of the method(s) rate, and the veteran suicide rate at the state level. Three main objectives were identified to understand significance from the bivariate correlation and chi-square output: (a) determine how well the model fits; (b) understand the proportion of variation in the dependent variable explained by the independent variable(s); and (c) determine significance based on the dependent variable and the independent variable(s).

The justification to analyze the variables and to create categorical variables with more than two groups was due to its ability to better replicate the patterns found in the

original continuous variable (Laired, 2022). In addition, for these variables, it became clear it would be useful to review three levels as it pertained to the states. This enabled an understanding of how the categorical variable appropriately represents a U-shape or inverted U-shape relationship (Laerd, 2022). For categorization, the standard median split was utilized. It can be used with continuous or ordinal variables to turn them into dichotomous variables (Laerd, 2022). The determination for the split labels was made by reviewing the analyses output from SPSS and placing cases below the median into a "low" group, cases above the median into a "high" group, and values at the median into an "equal" group. For veteran suicide rate, the cases were grouped based on "low", "moderate" and "high" groups.

To test the data, the data examination, coding, and analysis was conducted. Analyses were conducted to pass the assumptions for both bivariate correlation, chi square test, and multivariate for the data. The assumptions for Pearson's correlation were met to include: (a) two variables measured at the continuous level; (b) linear relationship between two variables; (c) identify outliers in scatterplots; and (d) variables approximately normally distributed testing with the Shapiro-Wilk test of normality (Laerd, 2022).

The chi-square assumptions that were met identified that the two variables should be measured at an ordinal or nominal level therefore be categorical data (Laerd, 2022). The second assumption met identified that the two variables consisted of two or more categorical, independent groups (Laerd, 2022. Overall, the results were interpreted and presented in APA format per the descriptive statistics, bivariate correlation, chi-square

test and multivariate analysis to evaluate the impact of all independent variables on the outcome findings and results.

Threats to Validity

External Validity

In this study, it was assumed that all data were consistent. The data collection dates varied for the data sets as not all of the data had secondary data sets available for the 2001–2019 period. The data ranged from 2001 to 2019 for the Veteran Administration data, 2021 for the Robert Wood Johnson Foundation, County Health Rankings data, as this data set is refreshed yearly and published the following year; in this case 2020 measure data published in 2021. The NAMI data were collected for years 2009 and 2011. All data sets represented data from 50 states. The secondary data available to the public, and data analyzed by the Veteran's Administration (VA), was cumulative data. The data made publicly available by NAMI was annual general budget mental health data from two points in time: 2009 and 2011. The County Health Rankings data for family and social support, as measured by the social association rate, was refreshed in 2020 and published in 2021. Limitations exist in the data ranges; however, these were mitigated through ensuring all data represented rates for all variables.

Limitations also existed in the sex and age variable. The VA related to sex and age was brought into SPSS for analysis. Sex was removed from the analysis due to the data provided within the data set resulted in multiple 0 counts for suicide based on sex within the states and some states had inconsistent reporting. This is also documented within the VA's methodology and is noted.

The age variable was brought into SPSS but upon analysis its significance was not important to the study and therefore was listed as a variable reviewed but not included in the overall discussion due to its missing data and low counts <10 in multiple age categories for multiple states. Additionally, the data relies on a combination of data sources, data processing, and determination of deceased veteran status and properly coded lethal method used at time of death (Office of Mental Health and Suicide Prevention, 2021a). Additionally, limitations exist in the data itself and deaths that occurred outside of the United States that are not included and therefore are not considered.

Lastly, limitations exist with the social association rate. County Health Rankings (2021) reports, the measure uses the primary business code of organizations, which were self-reported by businesses in any given county across the United States. Further, County Health Rankings (2021) states, there is not a reliable, national source of data for measuring social or community support at the local level. This is the only measure at this time. In addition, this measure does not account for perceived support or social connections offered from family support structures, informal networks, or community service organizations that are not a registered business organization (County Health Rankings, 2021).

To overcome these threats and limitation, meetings were held with the County Health Rankings, and the United States Veteran's Administration, Office of Mental Health and Suicide Prevention, Department of Veterans Affairs. The Director for Epidemiology provided guidance based on the VA's methodology, data collection, and

analysis of the cumulative data set. The Director for Data and Methods provided clarity around the measure. Lastly, it is possible that the results may not be generalizable to all veteran suicides. The sample used for this study may not accurately reflect the entire veteran suicide decedent population. Future research that looks at a different population or sampling method could yield unique results.

Internal Validity

In this study, a bivariate correlation and chi-square test analyses was run to understand how much of the variation in the dependent variable is explained by the independent variables. The use of this study design was based on bivariate correlation and chi-square's ability to explore a relationship based on variation between multiple independent variables and a single dependent variable. The test needed to be able to determine the independent variables associated relationships to the dependent variable veteran suicide rates.

The justification to analyze the variables and create categorical variables with more than two groups was due to its ability to better replicate the patterns found in the original continuous variable (Laired, 2022). In addition, for these variables it became clear it would be useful to review three levels as it pertained to the states. This enabled an understanding of how the categorical variable appropriately represents a U-shape or inverted U-shape relationship (Laerd, 2022). For categorization the standard median split was utilized. It can be used with continuous or ordinal variables to turn them into dichotomous variables (Laerd, 2022). The determination for the split labels was made by reviewing the analyses output from SPSS and placing cases below the median into a

"low" group, cases above the median into a "high" group, and values at the median into an "equal" group.

Ethical Procedures

Ethical precautions and considerations were controlled for this study. No participants were engaged. All data collected was secondary data and was secured from public sources. IRB approval was applied for and granted by Walden University. The IRB approval number granted was 10-07-21-0722507. This ensured that the study complied with Walden University's ethical standards to include U.S. federal standards. In addition, the ethical considerations provided by the Office of Mental Health and Suicide Prevention (2022) were followed and this researcher made no attempt to no attempt to learn the identity of any person or establishment included in this data, and to not present or publish death counts or death rates based on counts of nine or fewer.

Summary

The purpose of this quantitative study was to examine the associated relationships, at the state level, between the veteran suicide rate, the social association rate, mental health funding per capita, and the lethality of the method rate in a significant veteran population. In the chapter, the research methodology, research questions, the purpose, data collection sources, and procedures were discussed. The methodology included a review of the secondary data and data sources chosen for the study. The statistical tests included bivariate correlation, chi-square test, and multivariate analyses and G power reasoning was provided. Lastly, a review of validity and ethical

considerations was discussed to ensure compliance with the IRB. Chapter 4 presents a

more thorough review of the results.

Chapter 4: Results

Introduction

The purpose of this quantitative study including bivariate correlation, chi-square test, and multivariate analyses was to determine whether and to what extent a relationship existed among the following variables: veteran suicide rates (dependent variable) and family and social support, as measured by the social association rate, mental health funding per capita, and the lethality of the suicide method(s) rate (independent variables). Among the variables studied, the definitions for the methods z-codes (see Table 1) were investigated to enhance the analysis and provide clarity around the category definitions. These definitions were presented in Chapter 3. Although researchers have investigated this issue, the topic has not been explored in this way which was to understand the relationship of community health linkages on suicide rates in veterans. The following research questions and hypotheses were employed to guide this study:

RQ1: Is there a significant relationship between state veteran suicide rates and family and social support?

$H_0 1$–There is no significant relationship between state veteran suicide rates and family and social support.

$H_a 1$–There is a significant relationship between state veteran suicide rates and family and social support.

RQ2: Is there a significant relationship between veteran suicide rates and mental health funding at the state level?

$H_0 2$–There is no significant relationship between veteran suicide rates and mental health funding at the state level.

$H_a 2$–There is a significant relationship between veteran suicide rates and mental health funding at the state level.

RQ3: Is there a significant relationship between veteran suicide rates and lethality of the suicide method?

$H_0 3$–There is no significant relationship between veteran suicide rates and lethality of the suicide method.

$H_a 3$–There is a significant relationship between veteran suicide rates and lethality of the suicide method.

The findings discussed in Chapter 4 provide an understanding of the strengths of the associations between these relationships. Research thus far has established that veteran suicide rates are influenced by access or lack of access to multiple social determinants and structural determinants of health at the local level. The first is access to social and community programs to address behavioral and mental health. The second is access to such programming based on funding provided by federal programs based on state mental health funding levels. The final determinant is access to lethal means. Holliday et al. (2018) asserted that perceived moral injury–suicidality association driven by physical pain tolerance and a lack of fear of dying drives access to lethal means and suicide ideation. Tying it all together, in Chapter 4, I discuss the data preparation, reliability of the analysis, descriptive and frequency statistics, bivariate correlation, chi-

square tests, and multivariate analysis, the research questions, and hypotheses. The chapter concludes with a summary of the results.

Preparation of the Data

The data analyzed in this study were secondary data retrieved from public data warehouses. The following organizations were contacted to collect data for this study: Robert Wood Johnson Foundation; County Health Rankings, a program of the University of Wisconsin Population Health Institute; NAMI and its partner SAMHSA; the Office of Mental Health and Suicide Prevention (VA); and U.S. Census website per capita population data on all 50 states. The data collection period was 2001–2019 for the Veteran Administration data, 2020 for the Robert Wood Johnson Foundation, County Health Rankings data, as this data set is refreshed yearly and published the following year; in this case 2020 measure data published in 2021. The NAMI data were collected for years 2009 and 2011. All data sets represented data from 50 states.

I exported the data into Microsoft Excel and reviewed them for errors in the porting process; no errors were found. The data were then analyzed in Excel by state and cumulative consolidated data for each variable was calculated to develop one data set by state for all 50 states that could be imported into SPSS. During the analysis, the file was sorted by state to remove fields containing data that were not aligned to a specific state. The fields "All" and "Total U.S." were sorted out of the data set leaving 50 states due to the removal of the District of Columbia. In addition, comparison between variables was based on evaluation of data with missing fields due to the Veteran Administration secondary data sets having incomplete data for all variables.

After evaluation, District of Columbia across all years in this data set, 2001–2019 did not have enough data to support inclusion in the analysis. Per the Methodology section, rates are suppressed when based on fewer than 10 deaths (2019). The secondary data set denotes these data points as <10. Further, rates based on small numbers of deaths are considered unreliable, and suicide rates based on fewer than 20 suicide deaths are considered statistically unreliable. In addition, researchers should use caution when making any interpretations of age-adjusted rates with underlying age-specific rates with fewer than 20 suicide deaths (2019). For these reasons, the District to Columbia was removed from the analysis, leaving the total sample size at 50, and states with <10 were coded as missing.

The final unit of analysis was state level data. The data consisted of 50 units for each variable. Some comparison between variables was based on evaluation of data with missing fields due to the nature of the secondary data sets. After Excel analysis, the states were entered into SPSS as a nominal variable. Each state was provided a value. The values ranged 1–50 with each value alphabetically aligned to a state in the continental United States (1 = Alabama, 2 = Alaska, etc.). After adding the states to the SPSS data set, I added all Excel variables to SPSS as string variables. String variables were assigned numeric values and labeled in SPSS per the label assigned by the organization where the data originated and as described in chapter three. Each variable was then calculated, coded, and analyzed based on its role in the analysis. Overviews of the process follow.

Dependent Variable

Veteran Suicide Rate

The dependent variable, veteran suicide rate, was extrapolated from the 2001–2019 veteran suicide state data appendix. Suicide rates presented are the number of suicide deaths, for both male and female, in each year divided by the estimated population and multiplied by 100,000 as performed by the VA and represented in the data set. The formula for the calculation was as follows: Veteran Suicide Rate = [total number veteran suicide deaths in each year) / (population) * 100,000] (Office of Mental Health and Suicide Prevention, 2019). After importing data into Microsoft Excel, I analyzed them by state. The data for veteran suicides by state rate was cumulatively organized. In Excel. U.S. Totals and All Totals were removed from the data as they were duplicative. During the analysis, the file was sorted by state to remove fields containing data that were not congruent with reliability or significance. This resulted in the removal of the District of Columbia due to its values consistent <10 in the data sheet.

After review, I imported the cumulative veteran suicides by state rate into SPSS. This continuous, scale variable was labeled "Veteran Suicide Rate by State" and its role marked as the target variable. It was also re-coded into a different variable and categorized, based on the frequency output, such that the higher the score, the greater the rate of veteran suicides in a particular state could be evaluated. The transform, recode into different variable function was used in SPSS to recode the variable into a categorical variable to be able to analyze as a categorical variable to report levels of suicide rate by state: 1 = low suicide rate, 2 = moderate suicide rate, and 3 = high suicide rate.

Independent Variables

States

I entered the states ($N = 50$) into SPSS as a nominal variable. Each state was provided a value. The values ranged 1–50 with each value alphabetically aligned to a state in the continental United States. The data were reviewed one last time for analysis.

Family and Social Support – Social Association Rate

The variable of interest in Research Question 1 was family and social support measured as the social association rate. This was a continuous, scale variable also recoded as a categorical variable so that the higher the social association rate, the higher the social associations available in a particular state could be examined.

Family and social support was measured as social association rates based on census business associations, at the state level, per 10,000 population. The formula for this rate was developed by County Health Rankings. The numerator for this variable, as calculated by County Health Rankings, was the total number of membership associations in a county. The membership organizations are coded based on NAICS codes. The meanings for the codes, in this measure, are attributed to civic organizations tracked by the Census Bureau. The codes identified by County Health Rankings for this measure are as follows: (813410), bowling centers (713950), golf clubs (713910), fitness centers (713940), sports organizations (711211), religious organizations (813110), political organizations (813940), labor organizations (813930), business organizations (813910), and professional organizations (813920) (2021). The denominator for this variable was the total resident population of a county. This variable came over as a rate calculated by

County Health Rankings. The formula provided by the organization was: social association rate = [total number of associations (NAICS = 813410 + 713950 + 713910 + 713940 + 711211 + 813110 + 813940 + 813930 + 813910 + 813920) / (2020 population) *10,000]. (County Health Rankings and Roadmaps, 2021). The data were re-coded to report levels of social association rates: 1 = low social association state rate, 2 = medium social association state rate, and 3 = high social association state rate (County Health Rankings and Roadmaps, 2021). The data were reviewed one last time for analysis.

Mental Health Funding Per Capita

The variable of interest in Research Question 2 was mental health funding. This looked at two separate years. The variables were continuous, scale variables, also recoded as categorical variables so that the higher-than-average per capita funding rate, the greater the state's mental health funding in a particular state could be understood.

Mental health funding per capita was measured as mental health funding based on NAMI mental health state general fund budget report. The budgeted dollars were extracted from a report issued in 2020 for years 2009 and 2011 (NAMI, 2020). The data were imported into SPSS. The transform compute variable function was used in SPSS to calculate the mental health funding per capita for the study. The census general population cumulative data were utilized to calculate the rate based on the population. The mental health funding per capita formula: [total mental health general fund dollar amounts) / (population) * 100,000] was employed in SPSS. The new mental health per capita variable was transformed into a new variable for analysis. After the rate was calculated, the variables for 2009 and 2011 were recoded into different variables to

understand their funding levels at the state level: 1 = lower than the average per capita

funding rate, 2 = equal to the average per capita funding rate, and 3 = higher than the

average per capita funding rate. The data were reviewed one last time for analysis.

Lethality of the Method(s) Rate

The variable of interest in Research Question 3 was the lethality of the method

which looked at the counts for types of methods a veteran utilized to commit suicide. The

lethality of the method was measured as suicides by method based on five veteran suicide

methods: firearm, poisoning, suffocation, other and low, and other. Methods are counts of

suicides and based on ICD-10 codes. Each code had a predetermined definition (see

Table 1 in the Definitions section of Chapter 1).

This nominal variable with more than two categorical, independent groups was

analyzed in Excel, filtered cumulatively by state for all five method categories (firearm,

poisoning, suffocation, other and low, and other). The data were filtered cumulatively in

Excel by state veteran suicide method count. The data were brought into SPSS for the

method(s) by category. The transform compute variable function was used in SPSS to

recode the variable into a rate. The census general population cumulative data were

utilized to calculate the rate for the various methods based on the population. The

formula for the calculation was as follows: The lethality of the method rate = [total count

(by method) veteran suicide death) / (population) * 100,000] (Office of Mental Health

and Suicide Prevention, 2019). After the rates were calculated, the variables were

recoded into different variables using the transform feature in SPSS to understand their

relationship to the states based on the following categories: 1 = lower than the average

suicide rate by [method], 2 = equal to the average suicide rates by [method], and 3 = higher than the average suicide rates by [method]. The data were reviewed one last time for analysis.

Population Independent Variables

Lastly, veteran suicide age, sex rate data and Census Bureau population data were evaluated in Excel. For veteran age and sex, the data were analyzed and filtered cumulatively by state for veteran suicide rates for age and sex. For the population data, the data were analyzed by state. The variables were brought into SPSS. The Census Bureau general population data were used as a rate to calculate the formulas in SPSS.

The transform, recode into different variable feature was utilized to categorically code the four age categories for suicide and the two genders for sex. The categories for age and gender were categorized in the following groupings: (age: 18–34, age 35–54, age 55–74, and 75 plus, sex: male, female). The rate for each category was transformed to understand their relationship to the states based on the following categories 1 = low suicide rate, 2 = medium suicide rate, and 3 = high suicide rate and two gender categories: male and female 1 = low suicide rate, 2 = medium suicide rate, and 3 = high suicide rate. After analysis, the veteran suicide by sex variable was not included. The VA reports, variation in reporting based on small numbers of deaths are considered unreliable (Office of Mental Health and Suicide Prevention, 2019). The sex data set came back statistically unreliable in all statistical analysis and was therefore removed from the study.

All variables were reviewed one last time prior to analysis.

Research Questions

The research questions and working hypotheses were as follows:

RQ1: Is there a significant relationship between state veteran suicide rates and family and social support?

$H_0$1–There is no significant relationship between state veteran suicide rates and family and social support.

H_a1–There is a significant relationship between state veteran suicide rates and family and social support.

RQ2: Is there a significant relationship between veteran suicide rates and mental health funding at the state level?

$H_0$2–There is no significant relationship between veteran suicide rates and mental health funding at the state level.

H_a2–There is a significant relationship between veteran suicide rates and mental health funding at the state level.

RQ3: Is there a significant relationship between veteran suicide rates and lethality of the suicide method?

$H_0$3–There is no significant relationship between veteran suicide rates and lethality of the suicide method.

H_a3–There is a significant relationship between veteran suicide rates and lethality of the suicide method.

Statistical Tests

The three research questions reviewed were analyzed. The assumptions of bivariate correlation, chi-square and multivariate analyses were tested. Bivariate correlation, chi-square and multivariate tests were conducted to examine the associated relationships between family and social supports, as measured by the social association rate, mental health funding per capita, lethality of the method(s) rate, and the veteran suicide rate at the state level.

To test the data, the data examination, coding, and analysis was conducted. Analyses were conducted to pass the assumptions for both bivariate correlation and chi square test for the data. The assumptions for Pearson's correlation were met to include: (a) two variables measured at the continuous level; (b) linear relationship between two variables; (c) identify outliers in scatterplots; and (d) variables approximately normally distributed testing with the Shapiro-Wilk test of normality (Laerd, 2022).

The chi-square assumptions that were met identified that two variables should be measured at an ordinal or nominal level and therefore be categorical data (Laerd, 2022). The second assumption identified that the two variables consisted of two or more categorical, independent groups (Laerd, 2022). Overall, the results were interpreted and presented in APA format per the descriptive statistics, bivariate correlation, chi-square test and multivariate analysis to evaluate the impact of all independent variables on the outcome findings and results.

Presentation of Results and Findings

State Suicide Descriptive Statistics

The descriptive statistics of the sample were evaluated. The unit of analysis was state level data representing the 50 U.S. states. The data consisted of 50 units for each variable.

When considering the suicide rate across the states, Veterans ages 18–34 ($n = 46$, $M = 50.63$, $SD = 101.41$) indicated a higher rate of suicides; with Vermont reporting the most veteran suicides and Nebraska the lowest (see Figure 9). Category 75 plus reported Utah had the highest suicides ($n = 43$, $M = 32.39$, $SD = 14.27$) and New Hampshire had the lowest (Figure 12), trailed by Veterans aged 35–54 years (n = 50, $M = 31.15$, $SD = 14.64$). Montana reported the highest and Rhode Island having the lowest veteran suicides (see Figure 10). Lastly, Veterans aged 55–74 years experienced the lowest veteran suicide rate (n = 50, $M = 25.45$, $SD = 10.01$) with Delaware having the lowest amongst the states and Montana having the highest veteran suicides by state in the 55–74 age category (see Figure 11).

When considering family and social support for veterans, the majority of the states (52%) had a high level of social association rate while the least of the states (48%) in the sample had a low level of social association rate. South Dakota had the highest social support in place and Utah had the lowest. This indicates that most of the states had measures in place to support their Veterans(see Figure 2).

Considering the 2009 per capita mental health funding rate, results indicate that the majority of the states (58%) had a lower-than-average rate of funding for the veterans.

Additionally, considering the 2011 per capita mental health funding rate, results show the

majority of the states (56%) also had a lower-than-average rate of funding for veterans.

This shows a decline in the number of states with lower-than-average states of funding

between 2009 and 2011. Vermont invested the highest each year and Indiana invested

lowest each year (see Figures 3 and 4).

Considering that various methods were used by the Veterans to commit suicide;

an analysis was completed to understand the method rates at the state level. Most of the

states (61%) had a lower-than-average suicide rate where firearm was used as the method

of committing suicide with the least of the states (38.8%) having a higher-than-average

suicide rate where firearm was used as the method of committing suicide with California,

Florida, and Texas having the highest rates of firearms and Delaware and Rhode Island

having the lowest (see Figure 5 and Table 8).

Considering suffocation as the method of suicide, most of the states (67.6%) had

lower than the-average suicide rate with most of the states (32.4%) having higher than the

average suicide rate through this method with California, Florida, and Texas having the

highest and Idaho having the lowest (see Figure 7 and Table 10). For poisoning as the

method of suicide, most of the states (65.7%) had lower than the average suicide rate

with many of the states (34.3%) having higher than the average suicide rate through this

method with Texas having the highest rates of suicide and New Jersey having the lowest

in this method category (see Figure 6 and Table 9). Considering other and low methods

of suicide, most of the states (60.4%) had lower than the average suicide rate with many

of the states (39.6%) having higher than the average suicide rates through this method

with California having the highest rates and Connecticut, Kentucky, Maryland, and Tennessee having the lowest (see Figure 8 and Table 11). Considering other as the method of suicide, most of the states (80%) had lower than the average suicide rate with many of the states (20%) having higher than the average suicide rates through this method with California and Florida having medium rates of suicide on this category and Maryland, Nevada, and Tennessee having the lowest (see Figure 9 and Table 12).

Table 2

Descriptive Summary of State Characteristics (N = 50)

Variables	Frequency	%
Veteran Suicide by Age 18–34		
Low suicide rate	19	41.3
Moderate suicide rate	12	26.1
High suicide rate	15	32.6
Total	46	100.0
Veteran Suicide by Age 35–54		
Low suicide rate	15	30.0
Moderate suicide rate	30	60.0
High suicide rate	5	10.0
Total	50	100.0
Veteran Suicide by Age 55–74		
Low suicide rate	28	56.0
Moderate suicide rate	21	42.0
High suicide rate	1	2.0
Total	50	100.0
Veteran Suicide by Age above 75		
Low suicide rate	11	25.6
Moderate suicide rate	27	62.8
High suicide rate	5	11.6
Total	43	100.0
Veteran Suicide by State Rate		
Low suicide rate	15	30.0
Moderate suicide rate	22	44.0
High suicide rate	13	26.0
Total	50	100.0
Social Association Rate		
Low social association rate	24	48.0
High social association rate	26	52.0
Total	50	100.0
2009 Per Capita MH Funding Rate		
Lower than the average rate	29	58.0
Higher than the average rate	21	42.0
Total	50	100.0
2011 Per Capita MH Funding Rate		
Lower than the average rate	28	56.0
Higher than the average rate	22	44.0
Total	50	100.0
Firearm Veteran Suicide Method by State		
Lower than the average suicide rate	30	61.2
Higher than the average suicide rate	19	38.8
Total	49	100.0
Suffocation Veteran Suicide Method by State		
Lower than the average suicide rate	25	67.6
Higher than the average suicide rate	12	32.4
Total	37	100.0
Poisoning Veteran Suicide Method by State		
Lower than the average suicide rate	23	65.7
Higher than the average suicide rate	12	34.3
Total	35	100.0
Other, Low Veteran Suicide Method by State		
Lower than the average suicide rate	29	60.4
Higher than the average suicide rate	19	39.6
Total	48	100.0
Other Veteran Suicide Method by State		
Lower than the average suicide rate	20	80.0
Higher than the average suicide rate	5	20.0
Total	25	100.0

Veteran Suicide Rate by State Statistics

A descriptive analysis was conducted to examine the average veteran suicide rates of the 50 states. The results established are presented in Table 2. Based on Table 2 and Figure 1, California, Florida, and Texas had the highest veteran suicide rates distinctively more than any other state. Other average veteran suicide rate statistics are presented in Table 2. It should be noted that in the available data sets, some states had missing values for different rates variables within each category as was discussed in the methodology discussion in Chapter 3. The veteran suicide rate was categorized as: low = 0–25, medium = 26–50 , high = greater than 50.

Table 3

Veteran Suicide Rate by State Statistics (N = 50)

State	No. of Suicides	Population	Veteran suicide rate	Low/medium/high
1 Alabama	2331	4726.63	45.7059	Medium
2 Alaska	446	701.41	21.2381	Low
3 Arizona	3961	6346.23	66.0167	High
4 Arkansas	1645	2886.77	35.0000	Medium
5 California	10234	37255.33	134.6579	High
6 Colorado	3053	5057.67	51.7458	High
7 Connecticut	660	3545.78	16.5000	Low
8 Delaware	312	893.48	15.6000	Low
9 Florida	10236	18958.02	134.6842	High
10 Georgia	3617	9597.75	60.2833	High
11 Hawaii	404	1350.88	16.1600	Low
12 Idaho	972	1552.58	28.5882	Medium
13 Illinois	3363	12730.44	45.4459	Medium
14 Indiana	2602	6454.88	44.8621	Medium
15 Iowa	1272	3045.57	24.0000	Low
16 Kansas	1324	2830.31	27.5833	Medium
17 Kentucky	2141	4309.45	38.9273	Medium
18 Louisiana	1730	4556.33	39.3182	Medium
19 Maine	598	1324.13	22.1481	Low
20 Maryland	1644	5772.12	27.8644	Medium
21 Massachusetts	1014	6603.95	23.0455	Low
22 Michigan	3687	9967.55	55.0299	High
23 Minnesota	1875	5310.08	30.7377	Medium
24 Mississippi	1299	2945.45	38.2059	Medium
25 Missouri	3180	5939.94	53.0000	High
26 Montana	925	988.15	27.2059	Medium
27 Nebraska	711	1826.65	22.9355	Low
28 Nevada	2049	2652.59	34.1500	Medium
29 New Hampshire	472	1316.68	18.1538	Low
30 New Jersey	1233	8755.44	25.6875	Medium
31 New Mexico	1360	2015.02	30.2222	Medium
32 New York	3278	19374.01	46.1690	Medium
33 North Carolina	3762	9428.87	62.7000	High
34 North Dakota	345	692.01	16.4286	Low
35 Ohio	4746	11542.08	65.0137	High
36 Oklahoma	2116	3733.03	39.1852	Medium
37 Oregon	2555	3833.72	43.3051	Medium
38 Pennsylvania	4936	12631.57	69.5211	High
39 Rhode Island	277	1059.45	15.3889	Low
40 South Carolina	2142	4604.28	38.9455	Medium
41 South Dakota	438	817.54	19.0435	Low
42 Tennessee	3114	6312.49	53.6897	High
43 Texas	8985	25169.19	119.8000	High
44 Utah	1111	2742.58	24.6889	Low
45 Vermont	297	623.05	17.4706	Low
46 Virginia	3376	7963.04	52.7500	High
47 Washington	3334	6745.74	46.3056	Medium
48 West Virginia	1149	1830.29	32.8286	Medium
49 Wisconsin	2316	5655.98	38.6000	Medium
50 Wyoming	479	551.06	22.8095	Low

Figure 1

Veteran Suicide Rate by States
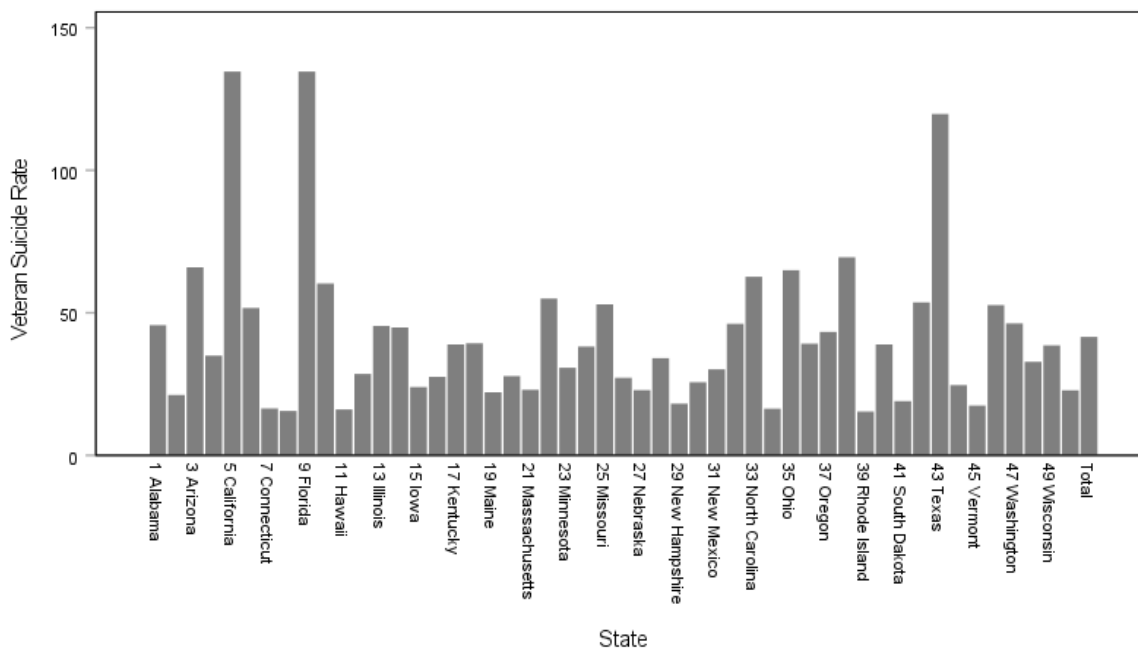
Social Association Rate (Family and Social Support) by State Statistics

A descriptive analysis was conducted to examine the social associations that exist in the form of social support in the 50 states. The results established are highlighted in Table 4. Utah and Nevada have the lowest social associations in place. South Dakota and North Dakota reported more social associations per state than any other state. The social association rate was re-coded and categorized as: low = 0–5, medium = 6–10 , high = greater than 10.

Table 4

Social Association Rate (Family and Social Support) by State Statistics (N = 50)

State	No. of associations	Population	Association rate	Low/medium/high
1 Alabama	6022	4726.63	12.3000	High
2 Alaska	832	701.41	11.3000	High
3 Arizona	4023	6346.23	5.6000	Medium
4 Arkansas	3612	2886.77	12.0000	High
5 California	23360	37255.33	5.9000	Medium
6 Colorado	5005	5057.67	8.8000	Medium
7 Connecticut	3345	3545.78	9.4000	Medium
8 Delaware	1001	893.48	10.3000	High
9 Florida	14903	18958.02	7.0000	Medium
10 Georgia	9271	9597.75	8.8000	Medium
11 Hawaii	935	1350.88	6.6000	Medium
12 Idaho	1299	1552.58	7.4000	Medium
13 Illinois	12724	12730.44	10.0000	High
14 Indiana	8216	6454.88	12.3000	High
15 Iowa	4736	3045.57	15.0000	High
16 Kansas	3966	2830.31	13.6000	High
17 Kentucky	4732	4309.45	10.6000	High
18 Louisiana	4441	4556.33	9.5000	Medium
19 Maine	1506	1324.13	11.3000	High
20 Maryland	5457	5772.12	9.0000	Medium
21 Massachusetts	6516	6603.95	9.4000	Medium
22 Michigan	9789	9967.55	9.8000	Medium
23 Minnesota	7239	5310.08	12.9000	High
24 Mississippi	3783	2945.45	12.7000	High
25 Missouri	7134	5939.94	11.6000	High
26 Montana	1520	988.15	14.3000	High
27 Nebraska	2693	1826.65	14.0000	High
28 Nevada	1337	2652.59	4.4000	Low
29 New Hampshire	1417	1316.68	10.4000	High
30 New Jersey	7721	8755.44	8.7000	Medium
31 New Mexico	1707	2015.02	8.1000	Medium
32 New York	15832	19374.01	8.1000	Medium
33 North Carolina	11893	9428.87	11.5000	High
34 North Dakota	1213	692.01	16.0000	High
35 Ohio	12909	11542.08	11.0000	High
36 Oklahoma	4541	3733.03	11.5000	High
37 Oregon	4280	3833.72	10.2000	High
38 Pennsylvania	15628	12631.57	12.2000	High
39 Rhode Island	1068	1059.45	10.1000	High
40 South Carolina	5884	4604.28	11.6000	High
41 South Dakota	1439	817.54	16.3000	High
42 Tennessee	7628	6312.49	11.3000	High
43 Texas	21592	25169.19	7.5000	Medium
44 Utah	1106	2742.58	3.5000	Low
45 Vermont	838	623.05	13.4000	High
46 Virginia	9600	7963.04	11.3000	High
47 Washington	6431	6745.74	8.5000	Medium
48 West Virginia	2354	1830.29	13.0000	High
49 Wisconsin	6660	5655.98	11.5000	High
50 Wyoming	800	551.06	13.8000	High

Figure 2

Social Association Rate (Family and Social Support) by State

Family and Social Support: Social Association State Rate
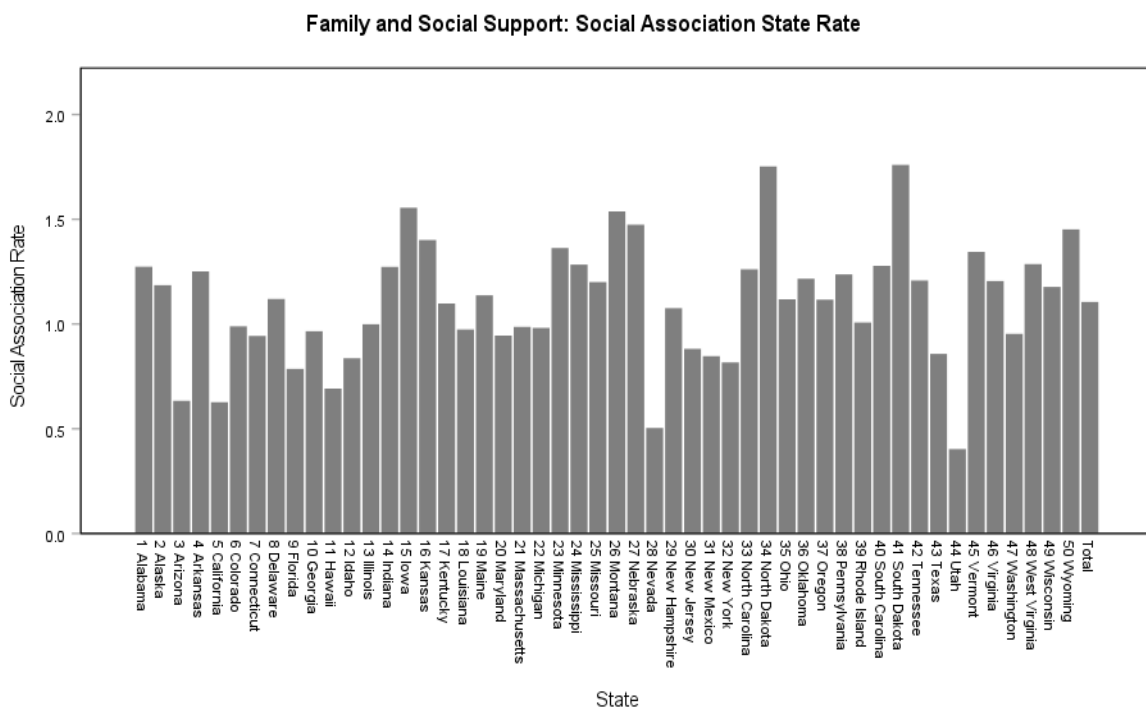
Mental Health Funding Per Capita, 2009 and 2011, by State Statistics

A descriptive analysis was conducted to examine the mental health per capita funding levels of the 50 states. The results established are presented in Table 5 and 6. Based on the results, Vermont and Alaska invested the highest in 2009, and Vermont and Connecticut invested the highest in 2011. Comparing the lowest funding rates in 2009 and 2011, we that Indiana and New Mexico had invested the lowest in mental health funding per capita for both years. Other average mental health per capita funding statistics are presented in Table 5 and 6 and can be seen in Figures 3 and 4. The mental health funding rate was categorized as: low = 0–0.5, medium = 0.501–1 , high = greater than 1.

Table 5

Mental Health Per Capita Funding 2009 by State Statistics (N = 50)

State	Funding (millions)	Population	Funding rate	Low/medium/high
1 Alabama	498.70	4726.63	1.0551	High
2 Alaska	137.00	701.41	1.9532	High
3 Arizona	477.60	6346.23	.7526	Medium
4 Arkansas	71.40	2886.77	.2473	Low
5 California	3612.80	37255.33	.9697	Medium
6 Colorado	152.00	5057.67	.3005	Low
7 Connecticut	676.00	3545.78	1.9065	High
8 Delaware	78.60	893.48	.8797	Medium
9 Florida	231.70	18958.02	.3024	Low
10 Georgia	573.30	9597.75	.4104	Low
11 Hawaii	393.90	1350.88	1.6708	High
12 Idaho	225.70	1552.58	.2989	Low
13 Illinois	46.40	12730.44	.5915	Medium
14 Indiana	753.00	6454.88	.1887	Low
15 Iowa	121.80	3045.57	.5602	Medium
16 Kansas	170.60	2830.31	.4077	Low
17 Kentucky	115.40	4309.45	.4112	Low
18 Louisiana	177.20	4556.33	.9121	Medium
19 Maine	415.60	1324.13	1.5195	High
20 Maryland	201.20	5772.12	1.1320	High
21 Massachusetts	653.40	6603.95	1.0379	High
22 Michigan	685.40	9967.55	.3220	Low
23 Minnesota	321.00	5310.08	.3744	Low
24 Mississippi	198.80	2945.45	.8912	Medium
25 Missouri	262.50	5939.94	.7581	Medium
26 Montana	450.30	988.15	1.2458	High
27 Nebraska	123.10	1826.65	.5956	Medium
28 Nevada	108.80	2652.59	.8520	Medium
29 New Hampshire	226.00	1316.68	.7899	Medium
30 New Jersey	104.00	8755.44	.9269	Medium
31 New Mexico	811.50	2015.02	.2208	Low
32 New York	44.50	19374.01	1.9263	High
33 North Carolina	3732.00	9428.87	.2963	Low
34 North Dakota	279.40	692.01	.9263	Medium
35 Ohio	64.10	11542.08	.4435	Low
36 Oklahoma	511.90	3733.03	.5489	Medium
37 Oregon	204.90	3833.72	.7992	Medium
38 Pennsylvania	306.40	12631.57	.5725	Medium
39 Rhode Island	723.20	1059.45	.7985	Medium
40 South Carolina	84.60	4604.28	.3875	Low
41 South Dakota	178.40	817.54	.5553	Medium
42 Tennessee	45.40	6312.49	.2633	Low
43 Texas	166.20	25169.19	.3669	Low
44 Utah	923.40	2742.58	.3333	Low
45 Vermont	91.40	623.05	2.4412	High
46 Virginia	152.10	7963.04	.5328	Medium
47 Washington	424.30	6745.74	.4640	Low
48 West Virginia	313.00	1830.29	.7808	Medium
49 Wisconsin	142.90	5655.98	.8455	Medium
50 Wyoming	478.20	551.06	1.9109	High

Table 6

Mental Health Per Capita Funding (2011) by State Statistics (N = 50)

State	Funding (millions)	Population	Funding rate	Low/medium/high
1 Alabama	511.00	4726.63	1.0811	High
2 Alaska	89.10	701.41	1.2703	High
3 Arizona	369.20	6346.23	.5818	Medium
4 Arkansas	75.60	2886.77	.2619	Low
5 California	3025.40	37255.33	.8121	Medium
6 Colorado	141.80	5057.67	.2804	Low
7 Connecticut	693.70	3545.78	1.9564	High
8 Delaware	76.20	893.48	.8528	Medium
9 Florida	187.50	18958.02	.3030	Low
10 Georgia	574.50	9597.75	.4125	Low
11 Hawaii	395.90	1350.88	1.4694	High
12 Idaho	198.50	1552.58	.2647	Low
13 Illinois	41.10	12730.44	.5022	Medium
14 Indiana	639.30	6454.88	.1831	Low
15 Iowa	118.20	3045.57	.5102	Medium
16 Kansas	155.40	2830.31	.3410	Low
17 Kentucky	96.50	4309.45	.4237	Low
18 Louisiana	182.60	4556.33	.8862	Medium
19 Maine	403.80	1324.13	1.5980	High
20 Maryland	211.60	5772.12	1.0866	High
21 Massachusetts	627.20	6603.95	.9417	Medium
22 Michigan	621.90	9967.55	.2884	Low
23 Minnesota	287.50	5310.08	.3797	Low
24 Mississippi	201.60	2945.45	.7602	Medium
25 Missouri	223.90	5939.94	.7859	Medium
26 Montana	466.80	988.15	1.2721	High
27 Nebraska	125.70	1826.65	.6186	Medium
28 Nevada	113.00	2652.59	.7042	Medium
29 New Hampshire	186.80	1316.68	.7230	Medium
30 New Jersey	95.20	8755.44	.9208	Medium
31 New Mexico	806.20	2015.02	.2164	Low
32 New York	43.60	19374.01	1.8582	High
33 North Carolina	3600.00	9428.87	.3584	Low
34 North Dakota	337.90	692.01	.9682	Medium
35 Ohio	67.00	11542.08	.3935	Low
36 Oklahoma	454.20	3733.03	.5360	Medium
37 Oregon	200.10	3833.72	.9844	Medium
38 Pennsylvania	377.40	12631.57	.5458	Medium
39 Rhode Island	689.40	1059.45	.8580	Medium
40 South Carolina	90.90	4604.28	.2995	Low
41 South Dakota	137.90	817.54	.5773	Medium
42 Tennessee	47.20	6312.49	.2367	Low
43 Texas	149.40	25169.19	.3559	Low
44 Utah	895.80	2742.58	.2953	Low
45 Vermont	81.00	623.05	2.5135	Low
46 Virginia	156.60	7963.04	.4845	Low
47 Washington	385.80	6745.74	.4129	Low
48 West Virginia	278.50	1830.29	.8327	Medium
49 Wisconsin	152.40	5655.98	.8557	Medium
50 Wyoming	484.00	551.06	1.8546	High

Figure 3

Mental Health Funding per Capita, 2009 by State

Mental Health Funding Per Capita, 2009
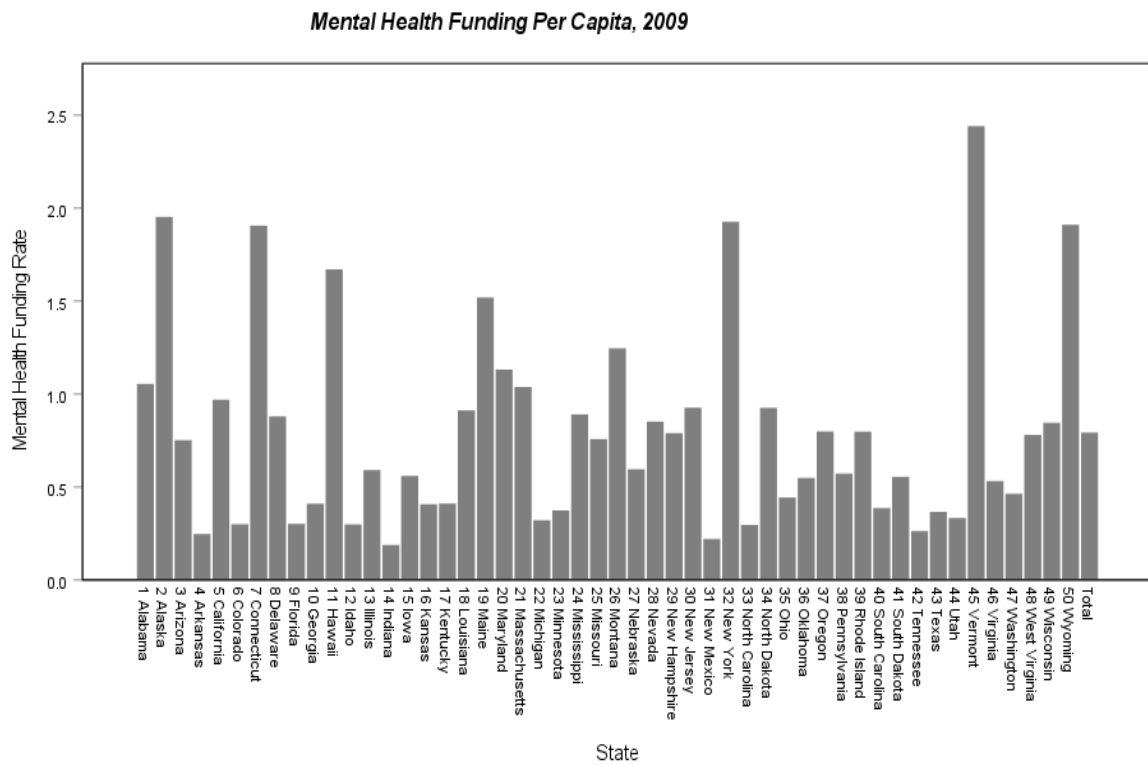
Figure 4

Mental Health Funding per Capita, 2011 by State
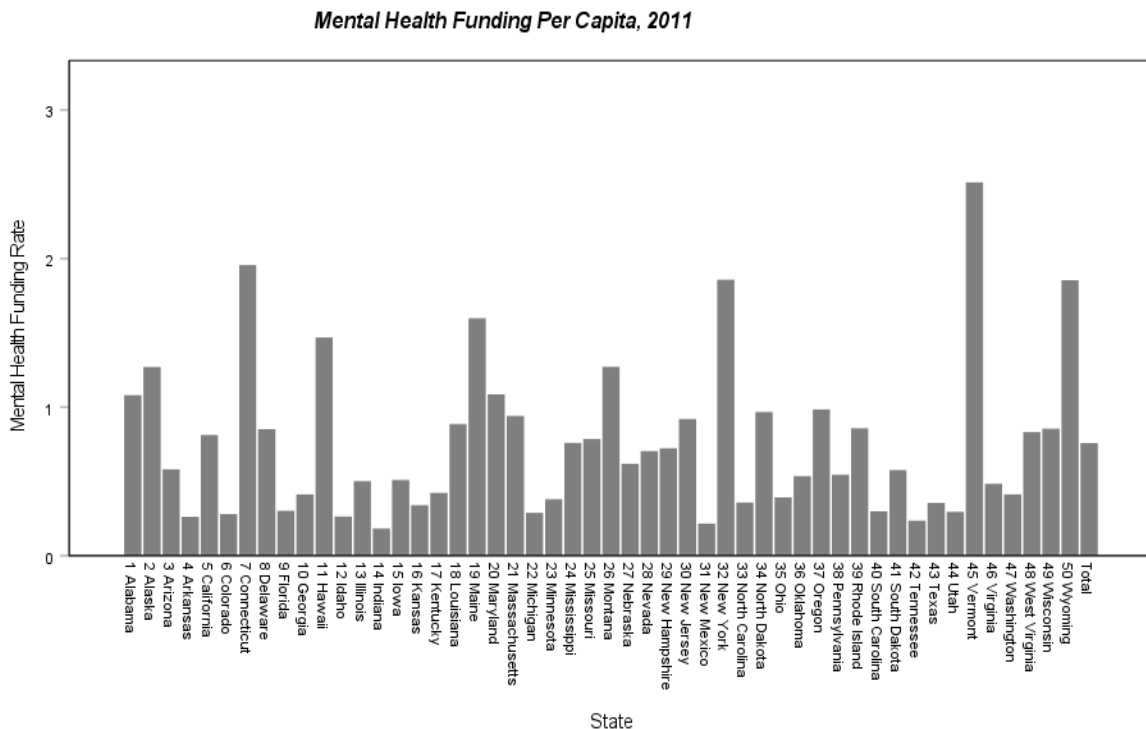
Suicide Methods Descriptive Statistics

A descriptive analysis was conducted to examine which suicide method has the highest average suicide rate across the states. The descriptive statistics utilized were mean and standard deviation. Considering the results presented in Table 7, the method with the highest average suicide rate across the states was firearm method ($n = 49$, $M = 87.32$, $SD = 80.72$), followed by suffocation ($n = 37$, $M = 26.11$, $SD = 18.00$), followed by poisoning ($n = 35$, $M = 22.32$, $SD = 14.47$), followed by other and low ($n = 48$, $M = 21.55$, $SD = 7.95$), and lastly other ($n = 25$, $M = 14.98$, $SD = 7.81$) method.

Table 7

Descriptive Summary of the Rate of Suicide by Various Methods (N = 50)

Method	N	Minimum	Maximum	M	SD
Firearm suicide rate	49	10.00	367.84	87.32	80.72
Poisoning suicide rate	35	10.00	74.26	22.32	14.47
Suffocation suicide rate	37	10.00	94.68	26.11	18.00
Other low suicide rate	48	14.35	58.00	21.55	7.95
Other suicide rate	25	10.00	45.05	14.98	7.81

Firearm Rate by State Statistics

A descriptive analysis was conducted to examine the veteran suicide method by state. The results established are presented in Table 8. Based on Table 8 and Figure 5, Texas, California, and Florida have high rates of firearm suicide. With Rhode Island and Delaware reporting the lowest. Other average veteran mental health per capita funding statistics are presented in Table 8 and Figure 5. It should be noted that in the available data sets, some states had missing values for different variables within each category as was discussed in the methodology discussion in Chapter 3. The firearm rate was categorized as: low = 0–25, medium = 26–50 , high = greater than 50.

Table 8

Firearm Suicide Rate by State Statistics (N = 49)

| State	# Firearm suicides	Population	Firearm rate	Low/medium/high
1 Alabama	1852	4726.63	97.4737	High
2 Alaska	32	701.41	16.0000	Low
3 Arizona	2928	6346.23	154.1053	High
4 Arkansas	1199	2886.77	63.1053	High
5 California	6168	37255.33	324.6316	High
6 Colorado	1982	5057.67	104.3158	High
7 Connecticut	315	3545.78	21.0000	Low
8 Delaware	10	893.48	10.0000	Low
9 Florida	6989	18958.02	367.8421	High
10 Georgia	2748	9597.75	144.6316	High
11 Hawaii	11	1350.88	11.0000	Low
12 Idaho	535	1552.58	38.2143	Medium
13 Illinois	1994	12730.44	104.9474	High
14 Indiana	1795	6454.88	94.4737	High
15 Iowa	781	3045.57	41.1053	Medium
16 Kansas	891	2830.31	46.8947	Medium
17 Kentucky	1598	4309.45	84.1053	High
18 Louisiana	1349	4556.33	71.0000	High
19 Maine	366	1324.13	28.1538	Medium
20 Maryland	1045	5772.12	55.0000	High
21 Massachusetts	388	6603.95	27.7143	Medium
22 Michigan	2433	9967.55	128.0526	High
23 Minnesota	1119	5310.08	58.8947	High
24 Mississippi	846	2945.45	56.4000	High
25 Missouri	2287	5939.94	120.3684	High
26 Montana	548	988.15	36.5333	Medium
27 Nebraska	300	1826.65	25.0000	Low
28 Nevada	1361	2652.59	71.6316	High
29 New Hampshire	251	1316.68	20.9167	Low
30 New Jersey	582	8755.44	38.8000	Medium
31 New Mexico	951	2015.02	50.0526	High
32 New York	1738	19374.01	96.5556	High
33 North Carolina	2719	9428.87	143.1053	High
34 North Dakota	22	692.01	11.0000	Low
35 Ohio	3171	11542.08	166.8947	High
36 Oklahoma	1526	3733.03	80.3158	High
37 Oregon	1784	3833.72	93.8947	High
38 Pennsylvania	3266	12631.57	181.4444	High
39 Rhode Island	10	1059.45	10.0000	Low
40 South Carolina	1583	4604.28	83.3158	High
41 South Dakota	54	817.54	13.5000	Low
42 Tennessee	2332	6312.49	122.7368	High
43 Texas	6538	25169.19	344.1053	High
44 Utah	745	2742.58	39.2105	Medium
46 Virginia		623.05	123.8947	High
47 Washington	2354	7963.04	111.8947	High
48 West Virginia	2126	6745.74	47.7500	Medium
49 Wisconsin	1455	1830.29	76.5789	High
50 Wyoming	40	5655.98	20.0000	Low

Figure 5

Firearm Suicide Rate by State

Firearm Suicide Rate
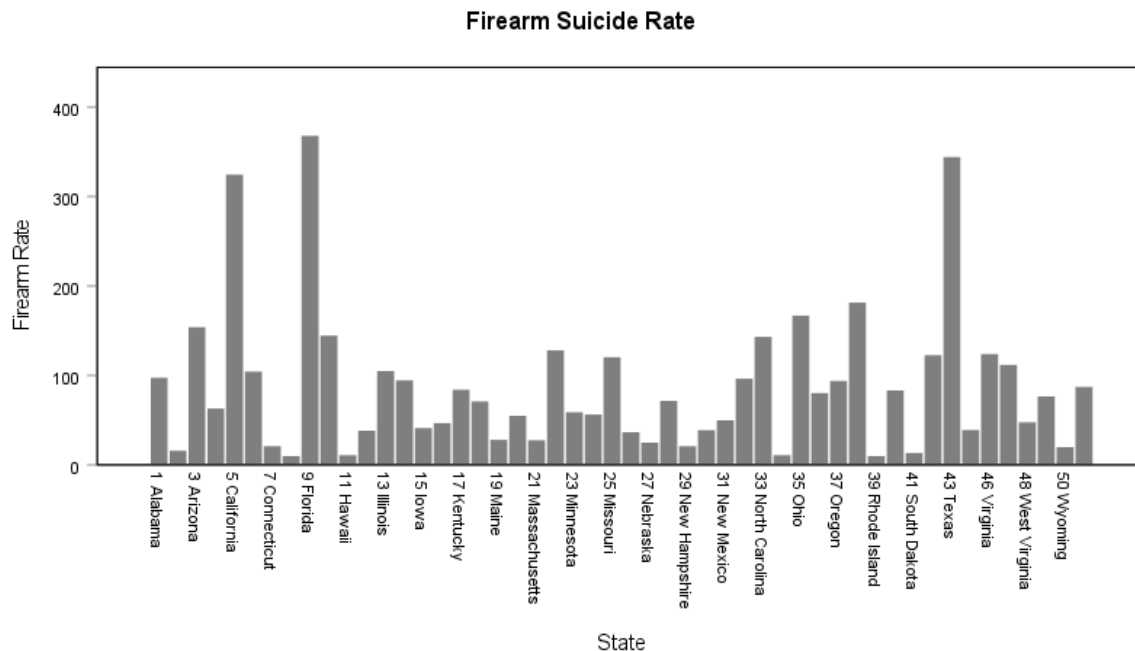
Poisoning Rate by State Statistics

A descriptive analysis was conducted to examine the poisoning rates of the states. The results established are highlighted in Table 9. Based on Table 9 and Figure 6, Texas has the highest rates of poisoning by suicide with New Jersey reporting the lowest. The remainder of the poisoning rates statistics are presented in Table 9 and the graph in Figure 6. The poisoning rate was categorized as: low = 0–25, medium = 25–50 , high = greater than 50.

Table 9

*Poisoning Suicide Rate by State Statistics (N = 35)*

State	No. of poisoning suicides	Population	Poisoning rate	Low/medium/high
1 Alabama	26	4726.63	13.0000	Low
3 Arizona	315	6346.23	12.0000	Low
4 Arkansas	12	2886.77	74.2632	High
5 California	1411	37255.33	30.0833	Medium
6 Colorado	361	5057.67	14.0000	Low
7 Connecticut	14	3545.78	13.0000	Low
9 Florida	1343	18958.02	70.6842	High
10 Georgia	156	9597.75	19.5000	Low
13 Illinois	407	12730.44	23.9412	Low
14 Indiana	64	6454.88	16.0000	Low
15 Iowa	115	3045.57	14.3750	Low
16 Kansas	51	2830.31	12.7500	Low
17 Kentucky	27	4309.45	13.5000	Low
18 Louisiana	11	4556.33	11.0000	Low
20 Maryland	36	5772.12	12.0000	Low
21 Massachusetts	27	6603.95	13.5000	Low
22 Michigan	358	9967.55	27.5385	Medium
23 Minnesota	148	5310.08	16.4444	Low
25 Missouri	191	5939.94	21.2222	Low
28 Nevada	265	2652.59	17.6667	Low
30 New Jersey	20	8755.44	10.0000	Low
31 New Mexico	13	2015.02	13.0000	Low
32 New York	388	19374.01	22.8235	Low
33 North Carolina	287	9428.87	26.0909	Medium
35 Ohio	480	11542.08	30.0000	Medium
36 Oklahoma	59	3733.03	14.7500	Low
37 Oregon	211	3833.72	19.1818	Low
38 Pennsylvania	526	12631.57	30.9412	Medium
40 South Carolina	45	4604.28	15.0000	Low
42 Tennessee	123	6312.49	17.5714	Low
43 Texas	787	25169.19	41.4211	Medium
44 Utah	33	2742.58	11.0000	Low
46 Virginia	226	623.05	20.5455	Low
47 Washington	483	7963.04	28.4118	Medium
49 Wisconsin	206	1830.29	20.6000	Low

Figure 6

Poisoning Suicide Rate by State
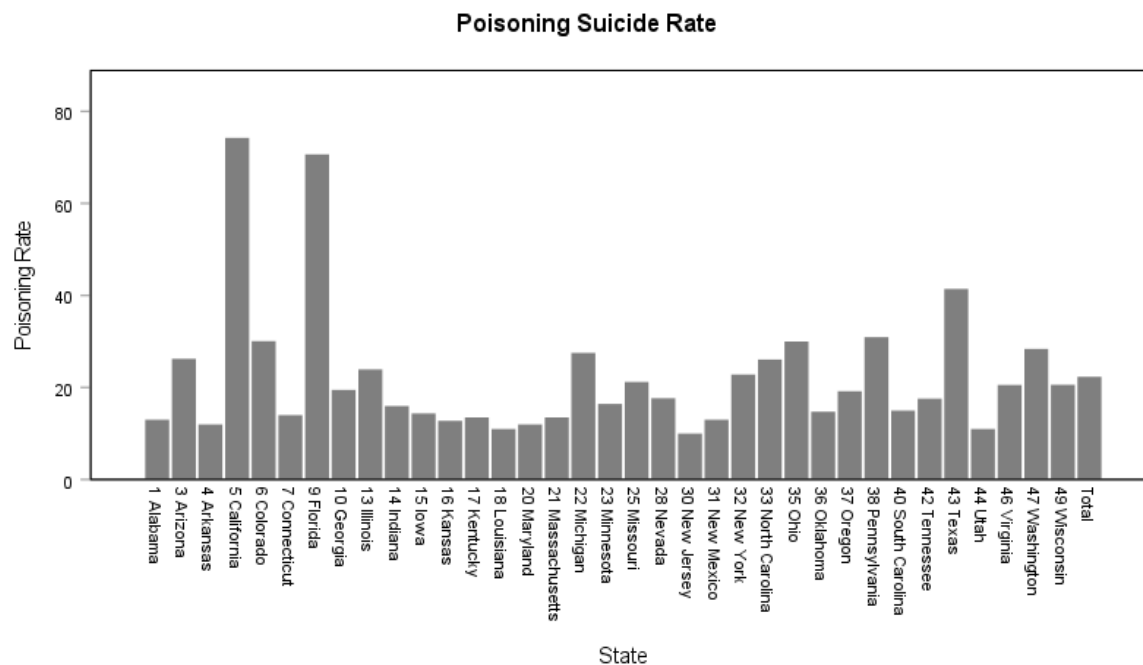
Suffocation Rate by State Statistics

      A descriptive analysis was conducted to examine the suffocation rates of the states. The results established are highlighted in Table 10. Based on Table 10 and Figure 7, we see that California, Florida, and Texas had the highest rates of suffocation by suicide followed by Hawaii and Idaho reporting the lowest. The remainder of the suffocation rates statistics are presented in Table 10. The suffocation rate was categorized as: low = 0–25, medium = 26–50 , high = greater than 50.

Table 10

Suffocation Suicide Rate by State Statistics (N = 38)

State	Suffocation suicides	Population	Suffocation rate	Low/medium/high
1 Alabama	139	4726.63	13.9000	Low
3 Arizona	264	6346.23	26.4000	Medium
4 Arkansas	127	2886.77	15.8750	Low
5 California	1799	37255.33	94.6842	High
6 Colorado	218	5057.67	24.2222	Low
7 Connecticut	110	3545.78	12.2222	Low
9 Florida	1322	18958.02	69.5789	High
10 Georgia	316	9597.75	22.5714	Low
11 Hawaii	53	1350.88	10.6000	Low
12 Idaho	10	1552.58	10.0000	Low
13 Illinois	662	12730.44	34.8421	Medium
14 Indiana	375	6454.88	23.4375	Low
15 Iowa	88	3045.57	12.5714	Low
16 Kansas	87	2830.31	14.5000	Low
17 Kentucky	240	4309.45	16.0000	Low
18 Louisiana	76	4556.33	15.2000	Low
20 Maryland	299	5772.12	16.6111	Low
21 Massachusetts	387	6603.95	27.6429	Medium
22 Michigan	518	9967.55	32.3750	Medium
23 Minnesota	252	5310.08	18.0000	Low
25 Missouri	297	5939.94	22.8462	Low
28 Nevada	109	2652.59	15.5714	Low
30 New Jersey	342	8755.44	24.4286	Low
31 New Mexico	71	2015.02	11.8333	Low
32 New York	758	19374.01	42.1111	Medium
33 North Carolina	292	9428.87	26.5455	Medium
35 Ohio	772	11542.08	40.6316	Medium
36 Oklahoma	202	3733.03	16.8333	Low
37 Oregon	195	3833.72	19.5000	Low
38 Pennsylvania	811	12631.57	45.0556	Medium
40 South Carolina	221	4604.28	15.7857	Low
42 Tennessee	286	6312.49	22.0000	Low
43 Texas	1203	25169.19	66.8333	High
44 Utah	47	2742.58	11.7500	Low
46 Virginia	405	623.05	27.0000	Medium
47 Washington	414	7963.04	24.3529	Low
49 Wisconsin	263	1830.29	21.9167	Low

Figure 7

Suffocation Suicide Rate by State
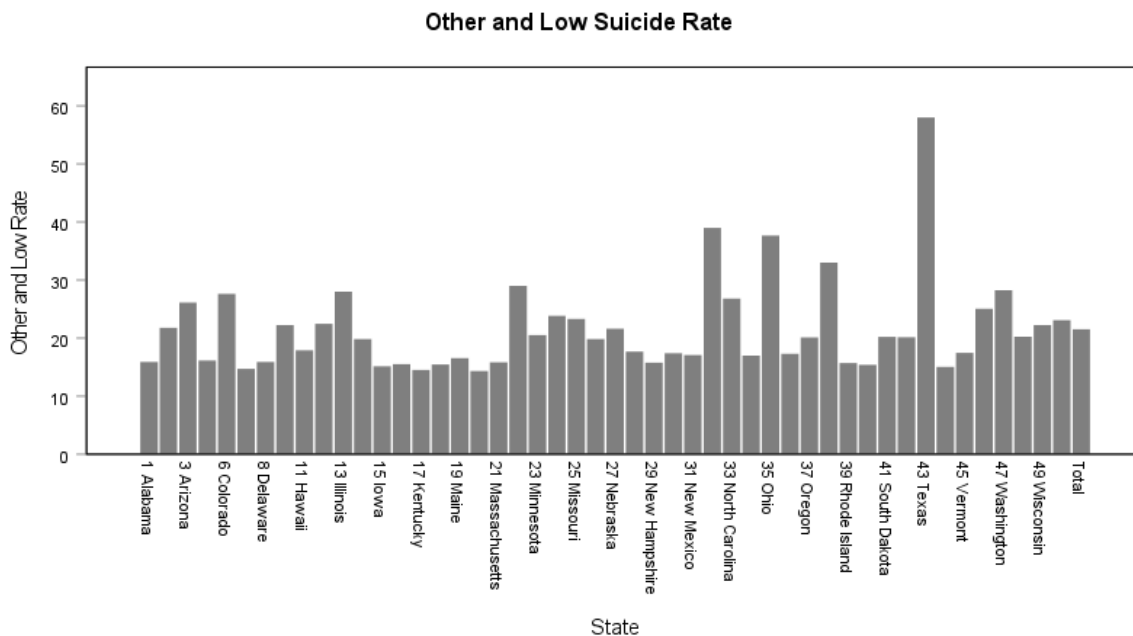

Suffocation Suicide Rate
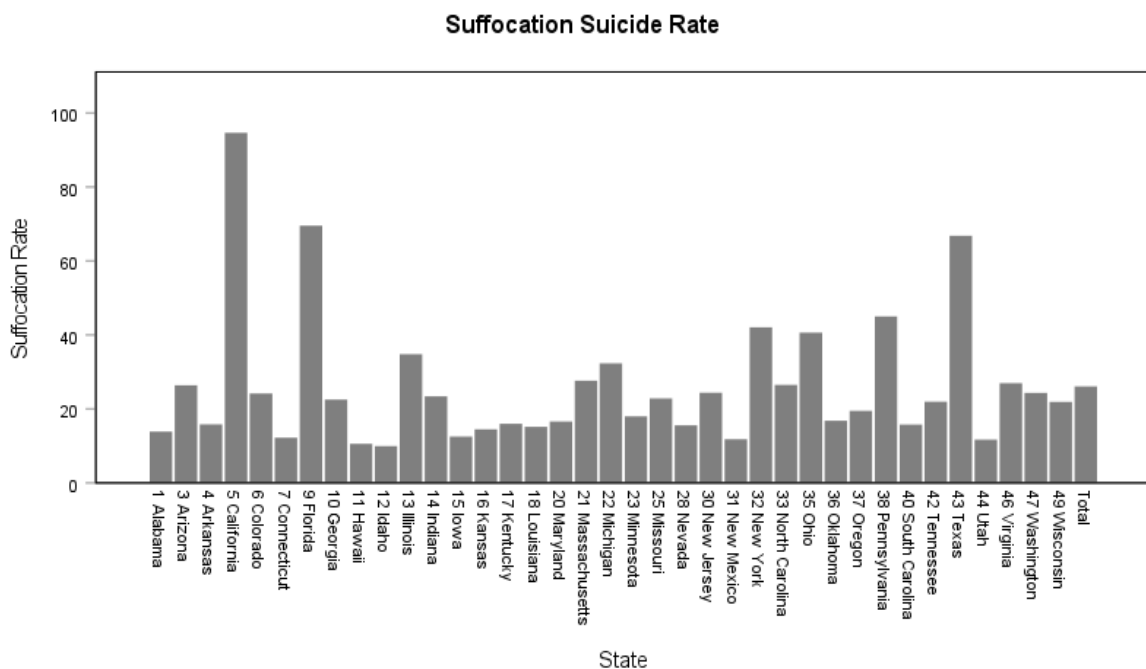
Other and Low Rate by State Statistics

A descriptive analysis was conducted to examine the other and low method of suicide for the states. The results established are presented in Table 11. Based on Table 11 and Figure 8, we see that Texas has the highest rate and Iowa and Connecticut report the lowest rates of suicide for these methods in this category. Other and low rates of suicide statistics are presented in Table 11 and in the graph presented in Figure 8. The other and low rate was categorized as: low = 0–25, medium = 26–50 , high = greater than 50.

Table 11

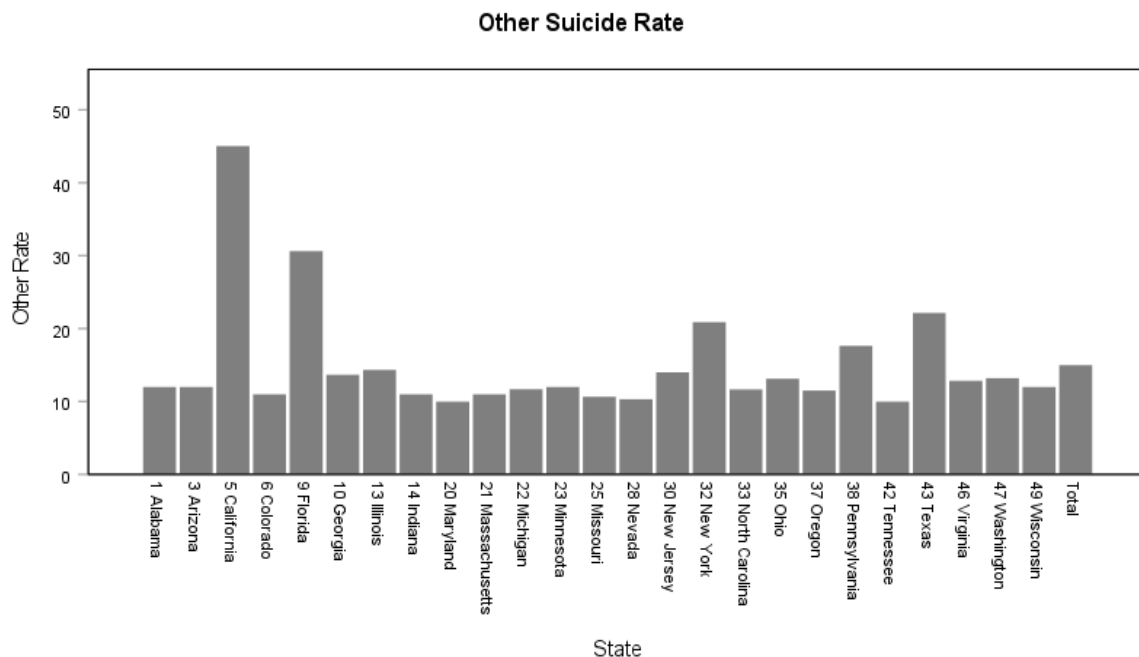*Other and Low Suicide Rate by State Statistics (N = 48)*

State	Other/Low suicides	Population	Other, Low rate	Low/medium/high
1 Alabama	302	4726.63	15.8947	Low
2 Alaska	414	701.41	21.7895	Low
3 Arizona	418	6346.23	26.1250	Medium
4 Arkansas	307	2886.77	16.1579	Low
6 Colorado	470	37255.33	27.6471	Medium
7 Connecticut	221	5057.67	14.7333	Low
8 Delaware	302	3545.78	15.8947	Low
10 Georgia	356	893.48	22.2500	Low
11 Hawaii	340	18958.02	17.8947	Low
12 Idaho	427	9597.75	22.4737	Low
13 Illinois	56	1350.88	28.0000	Medium
14 Indiana	357	1552.58	19.8333	Low
15 Iowa	288	12730.44	15.1579	Low
16 Kansas	295	6454.88	15.5263	Low
17 Kentucky	276	3045.57	14.5263	Low
18 Louisiana	294	2830.31	15.4737	Low
19 Maine	232	4309.45	16.5714	Low
20 Maryland	244	4556.33	14.3529	Low
21 Massachusetts	190	1324.13	15.8333	Low
22 Michigan	261	5772.12	29.0000	Medium
23 Minnesota	308	6603.95	20.5333	Low
24 Mississippi	453	9967.55	23.8421	Low
25 Missouri	373	5310.08	23.3125	Low
26 Montana	377	2945.45	19.8421	Low
27 Nebraska	411	5939.94	21.6316	Low
28 Nevada	283	988.15	17.6875	Low
29 New Hampshire	221	1826.65	15.7857	Low
30 New Jersey	261	2652.59	17.4000	Low
31 New Mexico	325	1316.68	17.1053	Low
32 New York	39	8755.44	39.0000	Medium
33 North Carolina	429	2015.02	26.8125	Medium
34 North Dakota	323	19374.01	17.0000	Low
35 Ohio	113	9428.87	37.6667	Medium
36 Oklahoma	329	692.01	17.3158	Low
37 Oregon	342	11542.08	20.1176	Low
38 Pennsylvania	33	3733.03	33.0000	Medium
39 Rhode Island	267	3833.72	15.7059	Low
40 South Carolina	293	12631.57	15.4211	Low
41 South Dakota	384	1059.45	20.2105	Low
42 Tennessee	363	4604.28	20.1667	Low
43 Texas	58	817.54	58.0000	High
44 Utah	286	6312.49	15.0526	Low
45 Vermont	297	25169.19	17.4706	Low
46 Virginia	301	2742.58	25.0833	Medium
47 Washington	113	623.05	28.2500	Medium
48 West Virginia	385	7963.04	20.2632	Low
49 Wisconsin	356	6745.74	22.2500	Low
50 Wyoming	439	1830.29	23.1053	Low

Figure 8

Other and Low Veteran Suicide Rate by State

Other and Low Suicide Rate

Other Rate by State Statistics

A descriptive analysis was conducted to examine the other methods of suicide for the states. The results established are presented in Table 12. Based on Table 12 and Figure 9, California, and Florida had medium rates with Maryland and Tennessee tying for the lowest number of suicides in this category. Other rates of suicide statistics are presented in Table 12 and can be visualized in the graph presented in Figure 9. The other and low rate was categorized as: low = 0–25, medium = 26–50 , high = greater than 50.

Table 12

Other Suicide Rate by State Statistics (N = 25)

State	Other/Low suicides	Population	Other, Low rate	Low/medium/high
1 Alabama	12	4726.63	12.0000	Low
3 Arizona	36	701.41	12.0000	Low
5 California	856	6346.23	45.0526	Medium
6 Colorado	22	2886.77	11.0000	Low
9 Florida	582	37255.33	30.6316	Medium
10 Georgia	41	5057.67	13.6667	Low
13 Illinois	244	3545.78	14.3529	Low
14 Indiana	11	893.48	11.0000	Low
20 Maryland	20	18958.02	10.0000	Low
21 Massachusetts	22	9597.75	11.0000	Low
22 Michigan	117	1350.88	11.7000	Low
23 Minnesota	48	1552.58	12.0000	Low
25 Missouri	32	12730.44	10.6667	Low
28 Nevada	31	6454.88	10.3333	Low
30 New Jersey	28	3045.57	14.0000	Low
32 New York	355	2830.31	20.8824	Low
33 North Carolina	35	4309.45	11.6667	Low
35 Ohio	210	4556.33	13.1250	Low
37 Oregon	23	1324.13	11.5000	Low
38 Pennsylvania	300	5772.12	17.6471	Low
42 Tennessee	10	6603.95	10.0000	Low
43 Texas	399	9967.55	22.1667	Low
46 Virginia	90	5310.08	12.8571	Low
47 Washington	198	2945.45	13.2000	Low
49 Wisconsin	36	5939.94	12.0000	Low

Figure 9

Other Suicide Rate by State


Age Suicide Rates by State Statistics

A descriptive analysis was conducted to evaluate the age categories, and which has the highest average suicide rate across the states. The rate was calculated based on a population size of 100,000. The descriptive statistics utilized were mean and standard deviation. The minimum and maximum values were analyzed to determine low, medium, and high levels of suicide for the age backets provided in the VA data set. The age variable was categorized as: low = 0–25, medium = 26–50 , high = greater than 50. Considering the results presented in Table 12, the age category with the highest average suicide rate across the states was Veterans ages 18–34 (n = 46, M = 50.63, SD = 101.41) with Vermont reporting the highest veteran suicides and Nebraska the lowest (Figure 8).

For those Veterans aged 18–34, the average suicide rate was 50.63, the state with the

minimum suicide rate had a rate of 10 while the state with the highest suicide rate had a

rate of 701.63. Other minimum and maximum values for other different age categories

are as presented in Table 12. In the age category 75 plus, Utah had the highest suicides (n

= 43, M = 32.39, SD = 14.27) and New Hampshire had the lowest (Figure 11), trailed by

Veterans aged 35–54 years (n = 50, M = 31.15, SD = 14.64) with Montana having the

highest and Rhode Island having the lowest veteran suicides by state (Figure 9). Lastly

Veterans aged 55–74 years (n = 50, M = 25.45, SD = 10.01) with Delaware having the

lowest and Montana having the highest veteran suicides by state (Figure 10).

Table 13

Veteran Age at Suicide Statistics by State

Age	n	Minimum	Maximum	M	SD
Age 18–34 Suicide Rate	46	10.00	701.63	50.6269	101.40852
Age 35–54 Suicide Rate	50	10.00	71.00	31.1480	14.63763
Age 55–74 Suicide Rate	50	10.00	55.09	25.4520	10.01281
Age 75+ Suicide Rate	43	10.00	66.70	32.3899	14.26622
Valid N (listwise)	41				

Figure 10

Age 18–34 Suicide Rate by State
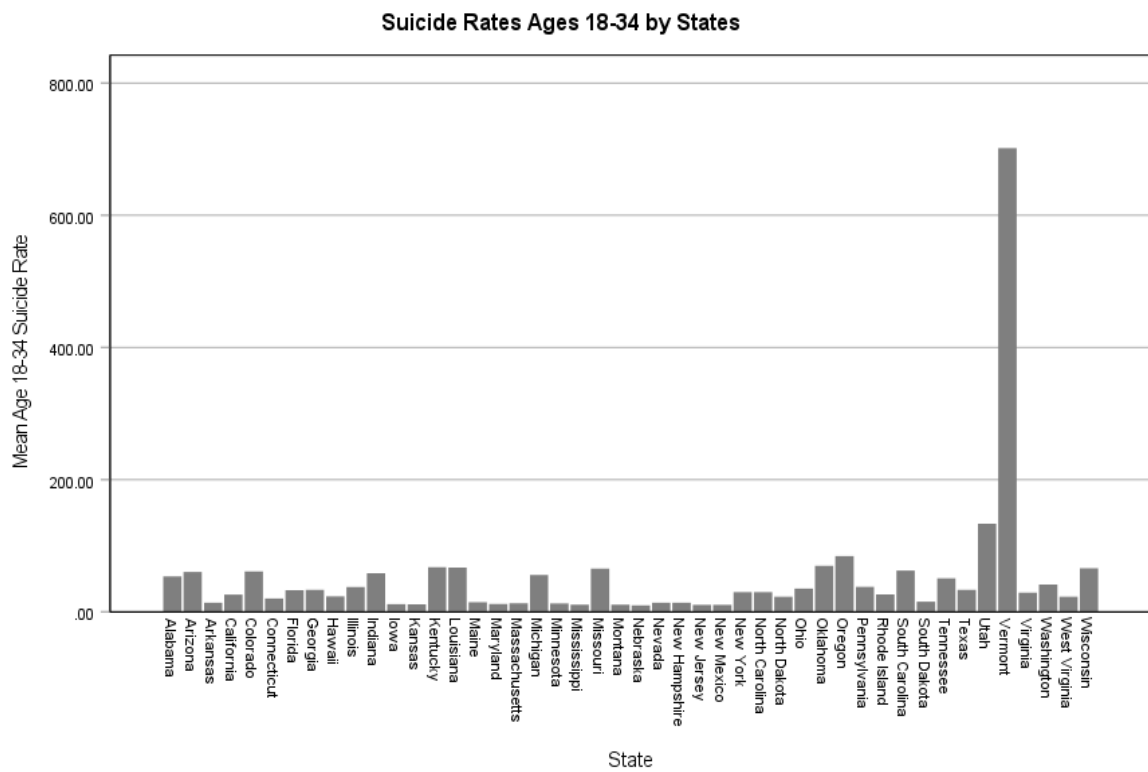
Figure 11

Age 35–54 Suicide Rate by State

Suicide Rates Ages 35-54 by States
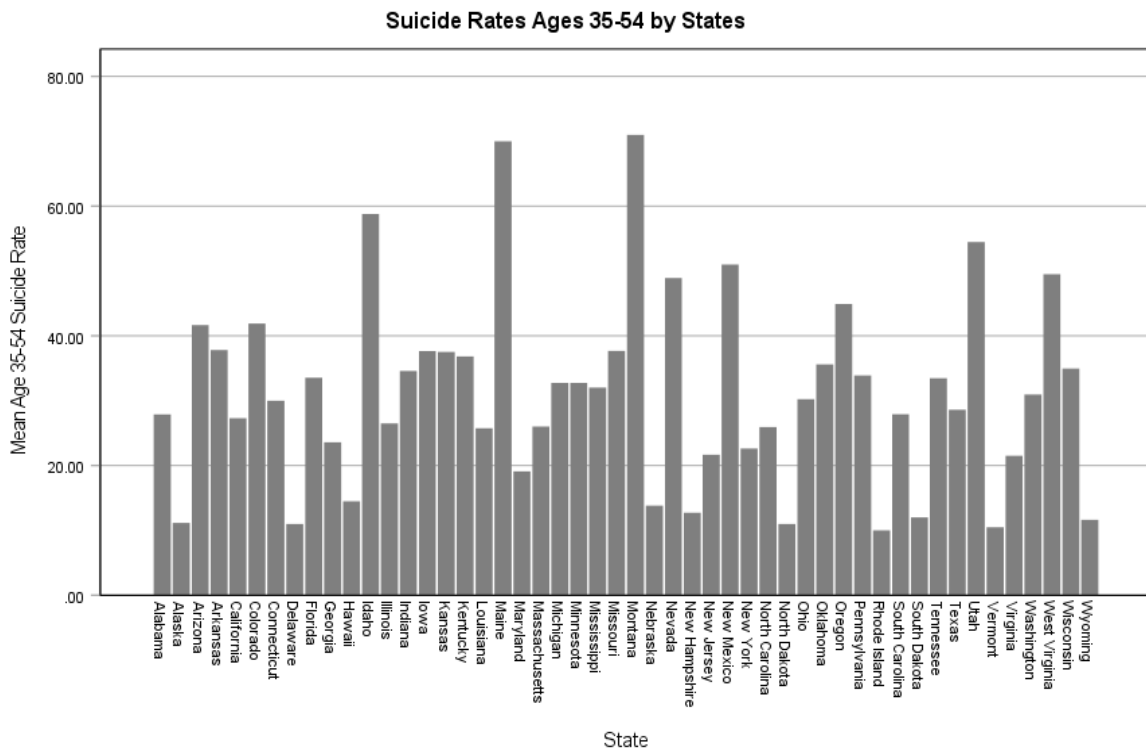
Figure 12

Age 55–74 Suicide Rate by State

Suicide Rates Ages 55-74 by States
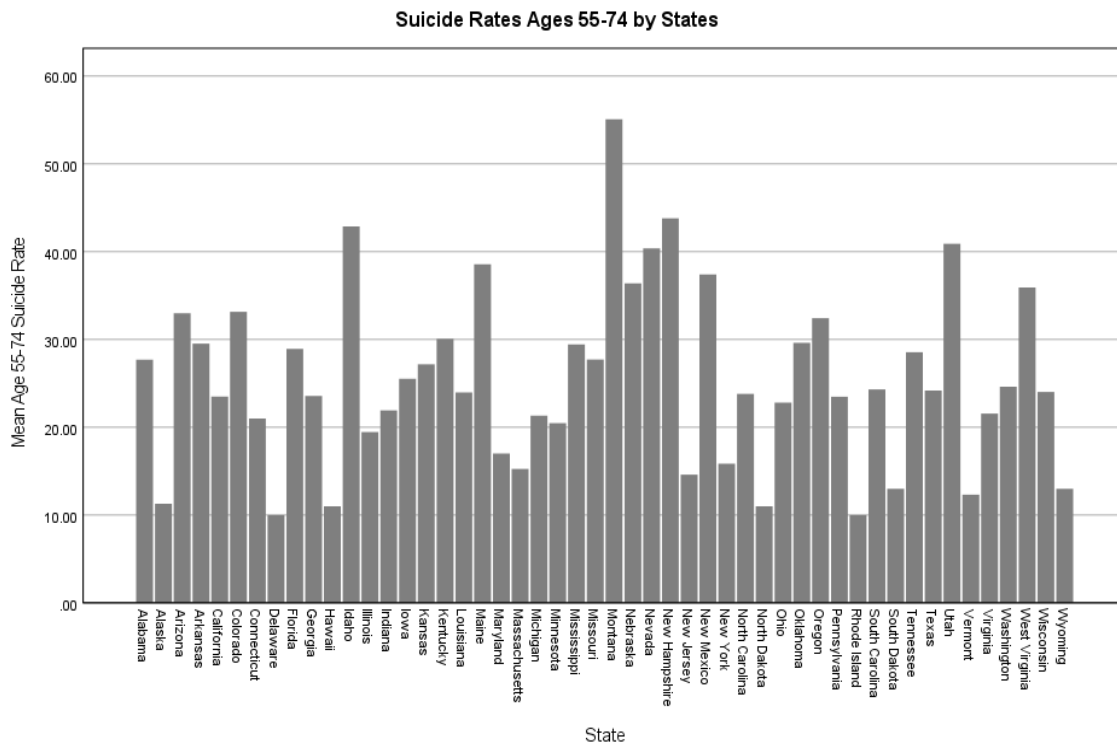
Figure 13

Age 75+ Suicide Rate by State
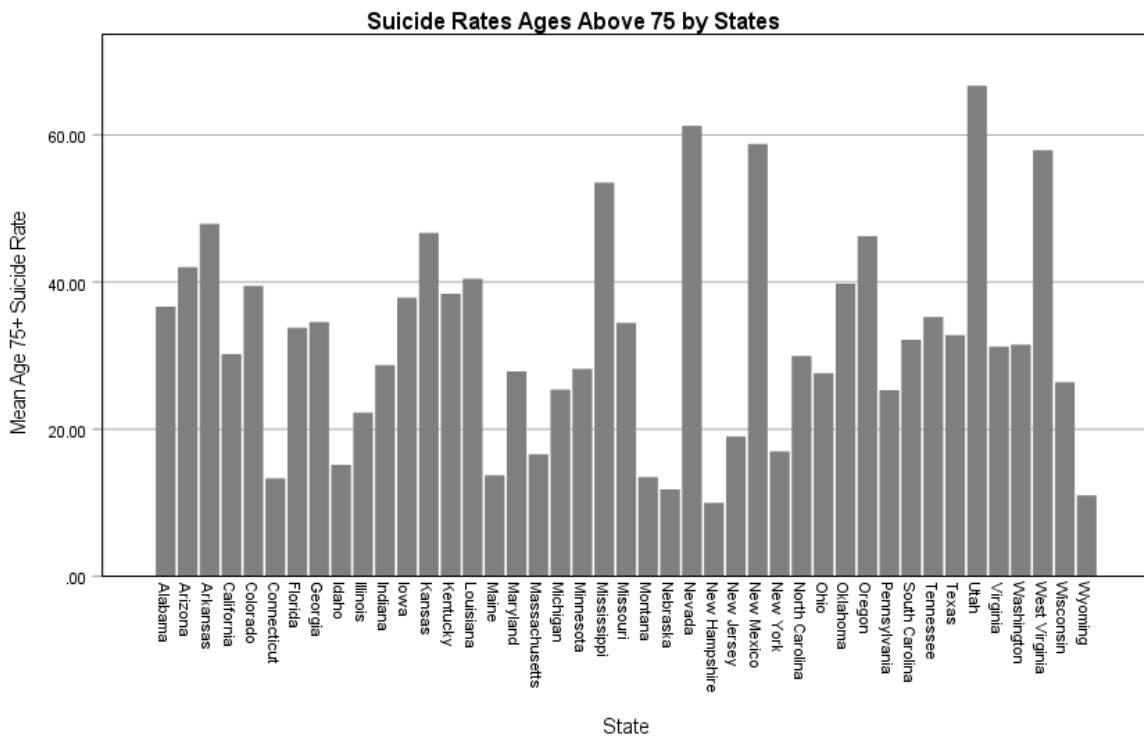
Results: Research Questions and Hypothesis Testing

The three research questions were tested. Preliminary analyses were conducted to assess the assumptions of multicollinearity, outliers, normality, linearity, homoscedasticity, and independence of residuals; no violations were noted. The results of the correlation and chi-square analysis were significant.

To further understand the variables and their relationship to the dependent variable each variable was tested and analyzed to test its significance based on the research questions and hypotheses. The results will review each research question and

report on the findings based on each hypothesis with a summary concluding the outcomes.

Research Question 1: Family and Social Supports – State Social Associations

RQ1: Is there a significant relationship between state veteran suicide rates and family and social support?

$H_0$1–There is no significant relationship between state veteran suicide rates and family and social support.

H_a1–There is a significant relationship between state veteran suicide rates and family and social support.

Correlation Analysis: Relationship Between State Veteran Suicide Rates and Family and Social Support

Correlation analysis was conducted to validate the first hypotheses of the study and determine whether there is a relationship between veteran suicide rates and family and social support. The Pearson correlation coefficient statistic (r) was used to examine this relationship. The researcher tested the null hypothesis that there is no significant relationship between veteran suicide rate and family and social support. A 5% level of significance was utilized for the test. The results of the analysis are presented in Table 14.

Table 14

*Correlation Summary of Population Variables (N = 50)*

	1	2	3	4
1.Veteran suicide rate	-			
2. Social association rate	-.342*	-		
3. Mental health per capita funding 2011	-.350*	.081	-	
4. Mental health per capita funding 2009	-.337*	.030	.976*	-

*$p < .05$.

The results presented in Table 14 indicate that a significant weak negative correlation between veteran suicide rates and family and social support, $r = -.342$, $p < .05$. This inverse relationship suggests that as the social association rate level increases veteran suicide rates will tend to decrease. Therefore, we reject the first null hypothesis of the study and conclude that there is a significant relationship between state veteran suicide rates and family and social support, as is measured by the social association rate. This is demonstrated by the scatterplot graphical representation in Figure 14. Based on Figure 14, the social association rate per capita explains 11.7% of the variation in veteran suicide rates. Additionally, one unit increase in the social association rate contributes to a 32.06 decrease in the veteran suicide rate. This can be seen in the graphical presentation (Figure 14) reflecting the potential decrease in veteran suicides y = 77.03 – 32.06*x , if social association rates are increased by one unit in each state.

Figure 14

Scatter Plot of Veteran Suicide Rate by Social Association Rate

Scatter Plot of Veteran Suicide Rate by Family and Social Support Per Capita Rate
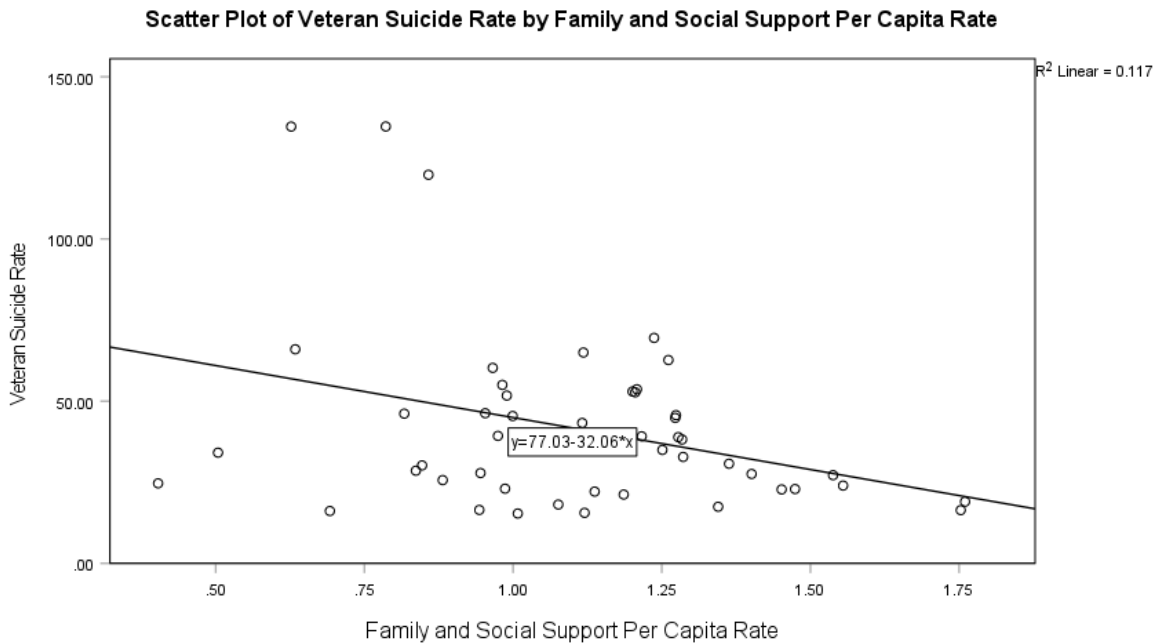
Research Question 2: State Mental Health Funding

RQ2: Is there a significant relationship between veteran suicide rates and mental health funding at the state level?

Null Hypothesis (H02)–There is no significant relationship between veteran suicide rates and mental health funding at the state level.

Alternative Hypothesis (Ha2)–There is a significant relationship between veteran suicide rates and mental health funding at the state level.

Correlation Analysis: Relationship Between State Veteran Suicide Rates and Mental

Health Funding

Correlation analysis was conducted to test the second hypotheses of the study and

determine whether there is a relationship between veteran suicide rates and mental health

funding. The null hypothesis is that there is no significant relationship between veteran

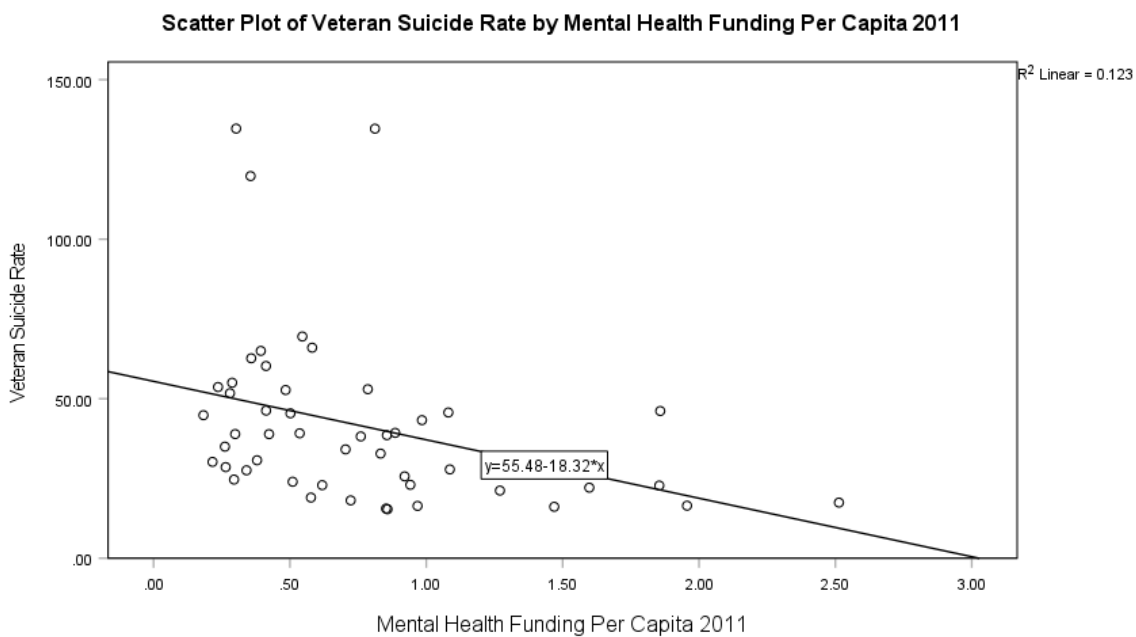suicide rate and mental health funding. The results of the analysis are presented in Table

14.

The results established show a significant weak negative correlation between

veteran suicide rates and mental health funding for both 2009 (r = -.337, p < .05) and

2011 (r = -.350, p < .05). Based on these results veteran suicide rate and mental health

funding have a negative relationship. Therefore, we reject the second null hypothesis of

the study and conclude that there is a significant relationship between state veteran

suicide rates and mental health funding. This inverse relationship suggests that as mental

health funding level increases veteran suicide rates will tend to decrease. This is

demonstrated by the scatterplot graphical representation in Figures 15 and 16.

Considering, 2009 mental health funding explains 11.4% (Figure 15) of the variation in

veteran suicide rates. This can be n in y=55.14-17.08*x as presented in Figure 15. While

the 2011 mental health funding explains 12.3% (Figure 16) of the variation in veteran

suicide rates. This can be n in y=55.48-18.32*x as presented in Figure 16. Besides, one

unit increase in the 2009 mental health rate per capita contributes to a 17.08 decrease in

veteran suicide rate. Moreover, one unit increase in the 2011 mental health rate per capita

contributes to an 18.32 decrease in veteran suicide rate.

Figure 15

Veteran Suicide Rate by Mental Health Funding Per Capita, 2009

Scatter Plot of Veteran Suicide Rate by Mental Health Funding Per Capita 2009
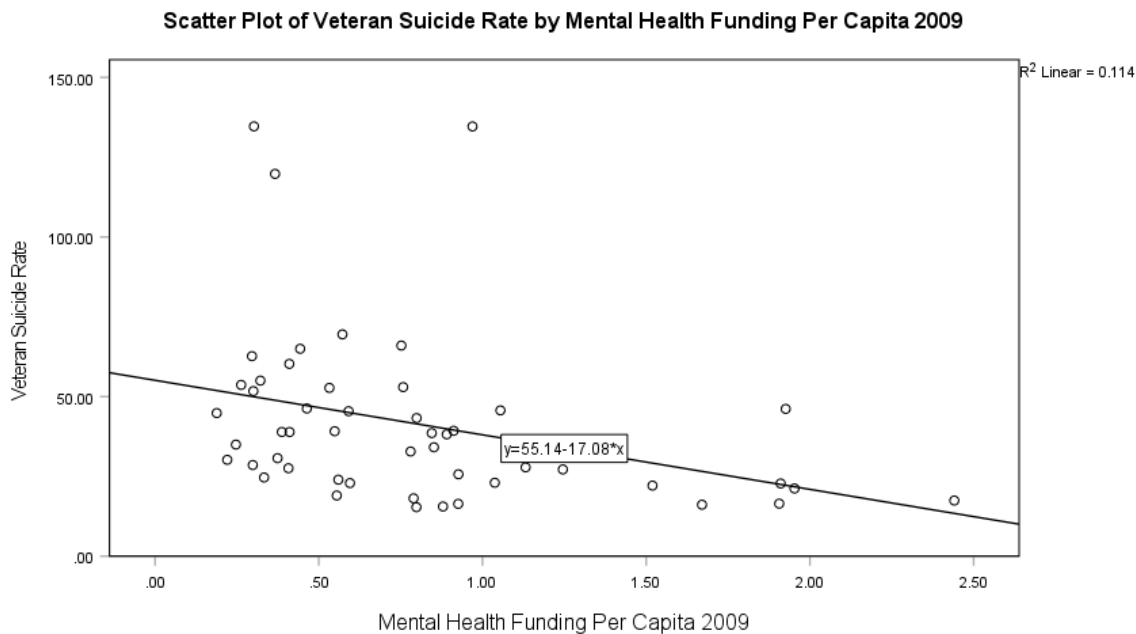
Figure 16

Veteran Suicide Rate by Mental Health Funding Per Capita, 2011

Scatter Plot of Veteran Suicide Rate by Mental Health Funding Per Capita 2011

Multivariate Analysis: Examining the Impact of Social Isolation Rate and Mental

Health Funding Rate on Veteran Suicide Rate

A multiple regression analysis was conducted to explore the impact of the

independent variables, social isolation rate and mental health funding rate (2009 and

2011), on the dependent variable, veteran suicide rate. A 5% level of significance (α =

0.05) was set for the regression test.

Considering the regression results established and summarized in Table 15, the

social association rate has a statistically significant impact on veteran suicide rate, t = -

2.446, $p < .05$. However, mental health funding rate for both 2009 (t = -.397, $p > .05$) and

2011 (t = -.140, $p > .05$) did not have a statistically significant impact on veteran suicide

rate. These results suggest that the state rate of social association has a significant effect

on veteran suicide rates which is not the case when considering mental health funding for

both 2009 and 2011.

Table 15

Multivariate Analysis—Summary of Regression Analysis (N = 50)

Variable	b (*SE* b)	*t*	*p*-value
Constant	88.741 (15.032)	5.903	<.001
Mental health per capita funding 2009	-12.323 (31.014)	-.397	.693
Mental health per capita funding 2011	-4.505 (32.118)	-.140	.889
Social association rate per capita	-30.713 (12.556)	-2.446	0.18
Model R^2 (Adjusted R^2)	.473 (.173)		
F (*p*) (*df*1) (*df*2)	4.424 (.008) (3) (46)		

Despite the findings, the regression model formulated between the three

independent variables and the dependent variable was a significant model, $F_{(3,46)}$ = 4.424,

$p < .05$. The independent variables, social association rate and mental health funding rate

for 2009 and 2011 explained 47.3% of the variation in the veteran suicide rate which suggests a high impact. The regression model formulated is as follows:

Veteran suicide rate = 88.741 - 12.323 (X_1) - 4.505 (X_2) - 30.713 (X_3)

Where X_1 = mental health per capita funding 2009, X_2 = mental health per capita funding 2011, and X_3 = social association per capita rate.

Based on the formulated prediction regression model, one unit increase in social association rate would result to a 30.713 decrease in the state veteran suicide rate. Additionally, one unit increase in mental health funding rate for 2009 would result in a 12.323 decrease in state veteran suicide rate. Consequently, one unit increase in mental health funding rate for 2011 would result in a 4.505 decrease in the state veteran suicide rate as is seen in Table 15.

Research Question 3: Lethality of the Method – Method(s) of Suicide

RQ3: Is there a significant association between veteran suicide rates and the lethality of the method?

Null Hypothesis (H03)–There is no significant association between veteran suicide rates and the lethality of the method?

Alternative Hypothesis (Ha3)–There is significant association between veteran suicide rates and the lethality of the method?

Chi-Square Analysis: Relationship Between State Veteran Suicide Rates and the Lethality of the Method(s)

Chi-square analysis was conducted to examine whether there was an association between veteran suicide rates and the method rates of veteran suicides. A 0.05% level of

significance was utilized for the chi-square test. The chi-square null hypothesis that was

tested was there a significant association between veteran suicide rates and t the lethality

of the method. The results of the analysis are presented in Table 16.

Table 16

Chi-Square Test of Association Results (N = 50)

Suicide method	X^2 value	df	p-value	Cramer's V
Firearm	30.619	2	<.001	.790
Poisoning	11.613	2	.003	.576
Suffocation	12.546	2	.002	.582
Other and low	15.917	2	<.001	.576
Other	2.010	2	.366	.284

Based on the results presented in Table 16, there was a significant association

between veteran suicide rate and firearm ($X^2_{(2)} = 30.619$, $p < .05$), poisoning ($X^2_{(3)} = 1$, p

$< .05$), suffocation ($X^2_{(2)} = 12.546$, $p < .05$), as well as other and low ($X^2_{(2)} = 15.917$, $p <$

$.05$) suicide methods. All these methods had a significant association with veteran suicide

rate except for other ($X^2_{(2)} =$, $p > .05$). Therefore, we reject the null hypothesis and

conclude that there is a significant association between veteran suicide rates and the

method rate of suicides by various suicide methods except "other". This means that there

is a greater likelihood of a veteran committing suicide with the following methods:

firearm, poisoning, suffocation as well as other and low suicide methods.

<div align="center">

Summary

</div>

The resulting research sample was $N = 50$. The findings resulted in social support

and method of suicide significantly predicted the state veteran suicide rate. The results of

the correlation and chi-square were significant. Family and social supports, as measured

by the social association rate, were significant as well as 2009 mental health funding per capita and 2011 mental health funding per capita though with slightly less significant contribution to the model than social associations. The regression model highlighted a one unit increase in social association rate which would result in a 30.713 decrease in the state veteran suicide rate. Additionally, one unit increase in mental health funding rate for 2009 would result in a 12.323 decrease in state veteran suicide rate. Consequently, one unit increase in mental health funding rate for 2011 would result to a 4.505 decrease in the state veteran suicide rate. Additionally, the lethality of the method rate significantly contributed to the model, and more so than mental health funding per capita.

In Chapter 5, the discussion provides greater detail as to the relationship between family social supports, the lethality of the method and impacts of mental health funding and suicide rates. Additionally, I discuss the limitations and implications of the study for public health and mental health professionals as well as potential implications for future programming. Lastly, Chapter 5 will include state level opportunities and recommendations for policy and social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to examine the relationship between veteran suicide rates, family social support, mental health funding at the state level, and the lethality of the suicide mode. Suicide is a national public health issue. Veterans commit suicide 52.3% more often than non-veteran U.S. adults (Office of Mental Health and Suicide Prevention, 2022). Little research has been conducted to understand the impact mental health funding at the state level has on suicide rates as well as how social supports impact these rates coupled with the method of suicide a veteran chooses to utilize to end one's life (Pietrzak et al., 2017; van der Velden et al., 2018). To understand the drivers, this socioecological study was conducted to assess the statistical significance and how much of the variation in the dependent variable is explained by the independent variables. The analysis sought to answer three research questions.

The results of the correlation and chi-square analysis were significant, $F(4, 46) = 30.83$, $p < .001$, $R^2 = .73$. Social associations were significant (B = .939, $t = 6.401$, $p < .001$), 2009 mental health funding (B = 1.991, $t = 2.260$, $p < .029$) with 2011 mental health funding (B = -2.088, $t = -2.392$, $p < .021$) providing less significant contribution to the model than social associations. Lethality of the method (B = -.073, $t = -.615$, $p < .541$) providing even less significance than mental health funding and contribution to the model. Table 2 in Chapter 4 depicts the descriptive statistics. The bivariate correlation and chi-square formula was $Y = 691.838 + .776$ (social association rate) + 12.507 (mental health funding per capita, 2009) − 14.450 (mental health funding per capita,

2011) -.14.010 (lethality of the method rate). Results of the study revealed, suicide rates across the states, Veterans ages 18–34 ($n = 46$, $M = 50.63$, $SD = 101.41$) indicated a higher rate of suicides; with Vermont reporting the highest veteran suicides and Nebraska the lowest (Figure 10). Category 75 plus reported Utah had the highest suicides ($n = 43$, $M = 32.39$, $SD = 14.27$) and New Hampshire had the lowest (Figure 13), trailed by Veterans35–54 ($n = 50$, $M = 31.15$, $SD = 14.64$) with Montana having the highest and Rhode Island having the lowest veteran suicides by state (Figure 11). Lastly, Veterans55–74 experienced the lowest veteran suicides ($n = 50$, $M = 25.45$, $SD = 10.01$) with Delaware having the lowest amongst the states and Montana having the highest veteran suicides by state in the 55–74 age category (see Figure 12).

Considering the 2009 per capita mental health funding rate, results indicate that the majority of the states (58%) had a lower-than-average rate of funding for veterans. Additionally, considering the 2011 per capita mental health funding rate, results show the majority of the states (56%) also had a lower-than-average rate of funding for the veterans. This shows a decline in the number of states with lower-than-average states of funding between 2009 and 2011. Vermont invested the highest each year and Indiana invested lowest each year (see Figures 3 and 4).

Considering that various methods were used by the Veterans to commit suicide; an analysis was completed to understand the method rates at the state level. Most of the states (61%) had a lower-than-average suicide rate where firearm was used as the method of committing suicide with the lowest of the states (38.8%) having a higher-than-average suicide rate where firearm was used as the method of committing suicide, with Florida

and Texas having the highest rates of firearms and Delaware and Rhode Island having the

lowest (see Figure 5, Table 6, and Table 16).

Considering suffocation as the method of suicide, most of the states (67.6%) had

lower than the average suicide rate with most of the states (32.4%) having higher than the

average suicide rate through this method with California and Florida having the highest

and Idaho having the lowest (see Figure 7 and Table 10). For poisoning as the method of

suicide, most of the states (65.7%) had lower than the average suicide rate, with many of

the states (34.3%) having higher than the average suicide rate through this method with

California having the highest and New Jersey having the lowest (see Figure 6 and Table

9). Considering other and low methods of suicide, most of the states (60.4%) had lower

than the average suicide rate with many of the states (39.6%) having higher than the

average suicide rates through this method with Texas having the highest and Maryland

having the lowest (see Figure 8 and Table 11). Considering other as the method of

suicide, most of the states (80%) had lower than the average suicide rate with many of the

states (20%) having higher than the average suicide rates through this method with

California having the highest and Maryland and Tennessee having the lowest (see Figure

9 and Table 12).

Considering the regression results established and summarized in Table 15, the

social association rate had a statistically significant impact on veteran suicide rate, t

$= -2.446, p < .05$. The Mental health funding rate for both 2009 ($t = -.397, p > .05$) and

2011 ($t = -.140, p > .05$) did not have a statistically significant impact on veteran suicide

rate. The regression results indicated the state rate of social association had a significant

effect on veteran suicide rates which is not the case when considering mental health funding for both 2009 and 2011. Despite the findings, the regression model formulated between the three independent variables and the dependent variable was a significant model, $F_{(3,46)} = 4.424$, $p < .05$. The independent variables, social association rate and mental health funding rate for 2009 and 2011 explained 47.3% of the variation in the veteran suicide rate which suggests a high impact (see Table 15). The regression model formulated was as follows:

Veteran Suicide rate = 88.741 - 12.323 (X_1) - 4.505 (X_2) - 30.713 (X_3)

Where X_1 = mental health per capita funding 2009, X_2 = mental health per capita funding 2011, and X_3 = social association per capita rate.

Based on the formulated prediction regression model, one unit increase in social association rate would result in a 30.713 decrease in the state veteran suicide rate. Additionally, one unit increase in mental health funding rate for 2009 would result in a 12.323 decrease in state veteran suicide rate. Consequently, one unit increase in mental health funding rate for 2011 would result to a 4.505 decrease in the state veteran suicide rate.

Understanding the role each of these variables play in the rate of veteran suicides was important to understand risk mitigation and develop sustainable prevention measures. This chapter provides discussion and conclusions drawn from the results of this study, as well as recommendations for the future.

Interpretation of the Findings

This quantitative study employed correlation, chi-square test, and multivariate analysis. The research design and rationale were based on two models—the IPTS and the SEM. The IPTS informed thwarted belongingness, perceived burdensomeness, physical pain tolerance, and a lack of fear of dying due to habitual exposure to death stimuli (Holliday et al., 2018). Additionally, IPTS asserted changing connectedness and unmet psychological needs lead to suicidal desire (Chu et al., 2017; Holliday et al., 2018). The second model, the SEM, informed associations pertinent to community health linkages, process and policies, familial and social connections, and community infrastructure (Chu et al., 2017; Cramer & Kapusta, 2017; Holliday et al., 2018).

Hypothesis 1: Family and Social Support – Social Associations

Hypothesis 1was proposed to understand whether there was a significant relationship between state veteran suicide rates and family and social support. Bivariate correlation and multivariate analyses were conducted to validate the hypothesis. The findings suggest family and social support for Veterans were in place for the majority of the states (52%) had a high level of social association rate while the lowest of the states (48%) in the sample had a low level of social association rate. South Dakota had the highest social support in place, and Utah had the lowest. This indicates that most of the states had measures in place to support their Veterans(see Figure 2). The results showed a significant relationship between veteran suicide rates and family and social support, as measured by the social association rate. The regression model (see Table 15) resulted in one unit increase in the social association rate would result to a 30.713 decrease in the

state veteran suicide rate. Additionally, one unit increase in mental health funding rate for 2009 would result in a decrease of 12.323 in state veteran suicide rate. Consequently, one unit increase in mental health funding rate for 2011 would result to a decrease of 4.505 in the state veteran suicide rate. Research associations were drawn between lack of social connections and increased mental health challenges with reduced service utilization to include a correlation between suicide risk and the SEM (Adams et al., 2017; Cramer & Kapusta, 2017; Dang et al., 2019). Cramer and Kapusta (2017) asserted that further research was needed to understand the connections between the SEM framework and access to specific resources related to suicide risk.

Further, the research indicated combat-wounded Veterans are at a greater risk for suicide ideation due to moral injury-suicidality association and a lack of connection to family and social supports; all of which contribute to veteran suicide rates (Kelley et al., 2019; Kintzle et al., 2018; Van Voorhees et al., 2018). Research was not as prevalent through the lens of state level community resource data looking at family and social support available across the nation. Pietrzak et al. (2017) reported a mental health diagnosis and contributing social factors that leads to suicide attempts. Understanding resiliency and how family and social supports can impact and intervene when violent tendencies, lack of connectedness and protective factors come into play become integral to mitigating risk and lowering the rate of veteran suicides (Van Voorhees et al., 2018). The findings support further research to understand the specific community-based social support resources veterans' access and the barriers in accessing health care resources from a mental health perspective.

Hypothesis 2: State Level Mental Health Funding

Bivariate correlation and multivariate analyses were conducted to validate the

second hypotheses of the study and determine whether there is a relationship between

veteran suicide rates and mental health funding pe capita based on the states. The results

indicate that the null hypothesis, that there is no significant relationship between veteran

suicide rate and mental health funding, is rejected. A 5% level of significance was

utilized for the test. The results of the analysis are presented in Tables 14 and 15. The

results established show that there was a significant weak negative correlation between

veteran suicide rates and mental health funding for both 2009 ($r = -.337, p < .05$) and

2011 ($r = -.350, p < .05$). Considering the regression results, mental health funding rate

for both 2009 ($t = -.397, p > .05$) and 2011 ($t = -.140, p > .05$) did not have a statistically

significant impact on veteran suicide rate.

Based on these results, veteran suicide rate and mental health funding have a

negative relationship. Therefore, I reject the second null hypothesis of the study and

conclude that there is a significant relationship between state veteran suicide rates and

mental health funding. This inverse relationship suggests that as mental health funding

level increases veteran suicide rates will tend to decrease. This is demonstrated by the

scatterplot graphical representation in Figures 15 and 16. Considering 2009 mental health

funding explains 11.4% (see Figure 15) of the variation in veteran suicide rates. This can

be *n* in $y = 55.14-17.08*x$ as presented in Figure 15. While the 2011 mental health

funding explains 12.3% (Figure 16) of the variation in veteran suicide rates. This can be *n*

in $y = 55.48-18.32*x$ as presented in Figure 16. Besides, one unit increase in the 2009

mental health rate per capita contributes to a decrease of 17.08 in veteran suicide rate. Moreover, one unit increase in the 2011 mental health rate per capita contributes to a decrease of 18.32 in veteran suicide rate.

Cramer and Kapusta (2017) purported even with the implementation of community and clinical processes; rates of hopelessness continued to rise in conjunction with lethal suicide methods. Mental health challenges coupled with higher levels of depression, challenges with mobility and transportation barriers have led to increased levels of loneliness and suicide risk (Dang et al., 2019; Pietrzak et al., 2017). Lemle (2018) and Hester (2017) asserted a need for funded systems and programming focused on building capacity for community-based programming. Van Voorhees et al. (2018) and van der Velden et al. (2018) asserted the need for mental health social services, and a need for providers to assess and understand physical, mental, and social behavior to develop interventions aimed towards suicide risk and mitigation. The study supports the need to understand veteran clinical and functional challenges to include health-related social needs assessments to develop fully funded programs aimed at preventing veteran suicides.

Hypothesis 3: Lethality of the Method of Suicide – Method(s) of Suicide

Hypothesis 3 was proposed to evaluate whether a significant relationship existed between lethality of the suicide method and veteran suicide rates. Chi-square analysis was conducted to examine whether there was an association between veteran suicide rates and the method rates of veteran suicides. A 0.05% level of significance was utilized for the chi-square test. The chi-square null hypothesis that was tested was there a significant

association between veteran suicide rates and t the lethality of the method. The results of the analysis are presented in Table 12.

Based on the results presented in Table 14, there was a significant association between veteran suicide rate and firearm ($X^2_{(2)} = 30.619$, $p < .05$), poisoning ($X^2_{(3)} = 1$, $p < .05$), suffocation ($X^2_{(2)} = 12.546$, $p < .05$), as well as other and low ($X^2_{(2)} = 15.917$, $p < .05$) suicide methods. All these methods had a significant association with veteran suicide rate except for other ($X^2_{(2)} = $, $p > .05$). Therefore, I reject the null hypothesis and conclude that there is significant association between veteran suicide rates and the method rate of suicides by various suicide methods except "other". This means that there is a greater likelihood of a veteran committing suicide with the following methods: firearm, poisoning, suffocation as well as other and low suicide methods. In Table 1, the ICD-10 codes attributed to the various methods a veteran employ to commit suicide are identified. Table 14, in relation to the way veteran suicides are coded, showcases a need to understand how to better attribute the method to the actual cause of death versus lumping the method into an "other" category. The development of interventions focused on the various methods requires an accurate portrayal of the method that was used at the time of death and appropriate code attributes to the mortality database.

These results are like other studies that also found strong associated relationships between firearms and veteran suicide (Bauer et al., 2020; Soberay et al., 2021). Van Voorhees et al. (2018) found among psychosocial risk and protective factors a veteran's relationships to social connections led to decreases in coping over time and violent tendencies resulting in suicide. Another research publication by Cramer and Kapusta

(2017) evaluated the SEM and its correlation to suicide. The authors purported hopelessness and access to lethal suicide methods as being a primary driver within communities. Overall, the strength of the significance in this study suggests that access to lethal methods of suicide was a strong determinant of veteran suicides in the 50 U.S. states, specifically related to firearms. This research underpins the need to study the other types of methods that are used and a potential link to mental health or social supports as a mediator to address the rising rates.

Limitations of the Study

Three research questions were developed for investigation. Veteran suicide rate was chosen as the dependent variable and the independent variables chosen were family and social support, measured by the social support rate, mental health funding per capita and the lethality of the method rate. The veteran suicide surveillance data compiled death certificate data from the CDC to include combined data from Veterans Health Administration, the United States Veterans Eligibility Trends and Statistics (USVETS), VA Health Outcomes Military Exposure (HOME) data (Office of Mental Health and Suicide Prevention, 2021b). The Veteran Suicide Surveillance Methods Summary (2021b) reported the method of suicide data captured from ICD–10 codes: firearm (X72–X74), suffocation (X70), poisoning (X60–X69), and all other (U03, X71, X75–X84, Y87.0). Table 1 showcases the ICD-10 codes and the method the code is attributed to from a vital statistical perspective. The limitations exist in the data itself and deaths that occurred outside of the United States that are not included and therefore are not considered. Additionally, the data rely on a combination of data sources, data processing,

and determination of decedent veteran status (Office of Mental Health and Suicide

Prevention, 2021b).

Limitations also exist with the social association rate. County Health Rankings

(2021) reports used the primary business code of organizations, which were self-reported

by businesses in any given county across the United States. Further, County Health

Rankings (2021) stated that there is not a reliable, national source of data for measuring

social or community support at the local level. This is the only measure currently. In

addition, this measure does not account for perceived support or social connections

offered from family support structures, informal networks, or community service

organizations that are not a registered business organization (County Health Rankings,

2021).

The limitations that exist regarding generalizability in this study yielded data from

all 50 U.S. states, in relations to veteran suicide rates, mental health funding per capita,

family, and social supports, as measured by the social association rate and the lethality of

the method rate based on data from the states. Limitations exist in the variation in date

ranges. The data made publicly available by NAMI was annual general budget mental

health data from two points in time: 2009 and 2011. The County Health Rankings data

for family and social support, as measured by the social association rate, were refreshed

in 2020 and published in 2021. These limitations were mitigated through ensuring all data

represented rates for all variables.

The results may not be generalizable to all veteran suicides, all mental health

funded programs and all social supports. As noted earlier, Veterans do commit suicide

outside of the United States. Additionally, funded programs and social support associations at the state level are programs and supports that are community and state based and contingent themselves on funding and access to these services by those that need these services. Limitations exist in the availability of resources to sustain community-based organization. The existence of these organizations is based on funding and funding is fluid. Future research may not be ablet to duplicate this study based on the fluidity of funding and the political public funding landscape at the time of the study.

Recommendations

The literature reinforces the need for new and emerging research on the variables outlined. The need for social and family support and innovative approaches to mental health support was reinforced by Adams et al. (2017) to mitigate suicide risk and its underlining drivers. As noted, one increase in the family and social support rate per capita contributes to a 32.06 decrease in the veteran suicide rate. This can be n in the graphical presentation in Figure 15. In addition, Cramer, Kapusta (2017) and Kelley et al. (2019) reinforced the need for community health linkages through an understanding of how the SEM can be used to understand gaps and develop innovative strategies. The authors also noted the need for further study to understand linkages between social connections, method access points, as well as improvements for community and clinic-based linkages. Dang et al. (2019) and van der Velden et al. (2018) underscored current data which showed high-need Veterans with mental health challenges had higher levels of depression, lack of mobility, transportation barriers, which led to higher levels of social isolation and loneliness. Therefore, the need to further study social connections and their

linkages to suicide risk has become a public health priority. This study reinforced the need for future studies to understand veteran suicide risk at the individual level as well as the community level regarding support and firearm access.

As we understand how community-based care and clinical care connect, Hester (2017) and Pietrzak et al. (2017) asserted access to mental health services at the state level related to veteran suicide rates coupled with lack of mental health care access, protective factors for veterans, and funding disparities reinforced new ways to think about how mental health services are delivered. Discharge and access to mental health resources play a vital role in mitigating drivers for suicide (Kintzle et al., 2018). Villatte et al. (2018) stated a need to understand the relationships between the behavioral health services, psychosocial, rehabilitation, and skilled multidisciplinary service providers. In addition, Lemle (2018) and Ribeiro et al. (2018) reinforced the relationship between post traumatic syndrome disorders, social factors, and effects of impaired functioning in suicidal individuals as a necessary step in the development of future integrated models. This is reinforced by the results from the regression model (Table 14) indicated the independent variables, social association rate and mental health funding rate for 2009 and 2011 explained 47.3% of the variation in the veteran suicide rate which suggests a high impact and one unit increase in social association rate would result to a 30.713 decrease in the state veteran suicide rate to include one unit increase in mental health funding rate for 2009 would result in a 12.323 decrease in state veteran suicide rate, one unit increase in mental health funding rate for 2011 would result to a 4.505 decrease in the state veteran suicide rate.

The recommendations resulting from this study support the development of statewide suicide prevention efforts. This researcher is suggesting the development of a model to support an infrastructure that aligns to the White House and its priority goals for reducing military and veteran suicides (White House, 2021). In addition, the infrastructure should support service members upon re-entry to civilian life as well as their families/community. This study has emphasized the importance of establishing a holistic, community-based, fully funded approach to health to impact suicide prevention. In addition, the literature reinforced a need to ensure that military culture is infused throughout a holistic framework. These suggestions consider the context of broader community and environmental factors per the SEM model.

The infrastructure proposed would be responsible for development, implementation, and oversight of a suicide reduction plan specific for each state for military and family members. An office within the Department of Defense and at the state level would be charged with aligning to the National framework to form a collective to streamline the efforts to address the following goals:

- "Priority goal 1: Improve lethal means safety.

- Priority goal 2: Enhance crisis care and facilitate care transitions.

- Priority goal 3: Increase access to and delivery of effective care.

- Priority goal 4: Address upstream risk and protective factors.

- Priority goal 5: Increase research coordination, data sharing, and evaluation" (White House, 2021).

Primary goals of the Office(s) would be to (a) organize collaborative efforts among government, health professionals, service organizations and policy advocates to build consensus and align strategic objectives/funding opportunities to collaborate with government agencies and avoid duplication of complimentary services; (b) enact data sharing agreement to establish bi-directional and a longitudinal health record for those leaving service; (c) provide discharged service members a Veteran Service Officer (VSO) or Community Support Officer at time of discharge; (d) assess veteran and family members health related social needs (HRSNs) and social determinant of health (SDoH) challenges and refer to services at the time of assessment; (e) establish a timeline for integration for each service member based on service risk score, and (f) develop a veteran and family coalition focused on state policy to reduce veteran suicide and its impacts on family and community to include stakeholders from a broad spectrum of social work professionals, military, and community stakeholders.

The statewide Suicide Prevention Offices would also be tasked with the development of a civilian work integration program. The service risk score would identify a service member's time and skill sets needed for re-integration. A period of 4–8 weeks would be established to prepare the service member to re-enter civilian life. The service member would attend courses on his/her military base and in the community to begin the re-integration process. This would include skill-based readiness, applying for jobs, finding a home, arranging transportation, and attributing the member to a provider for clinical and mental health care, depending on what is needed. The wrap around support would be provided for every service member prior to leaving any military service

and in theory based on the social support rate analysis should reduce veteran suicides once implemented.

Implications

The implications for this study are strongly associated with the socioecological model. The data analysis presented demonstrated alignment with the community aspect of the SEM as a potential to drive social change. The research cited in this dissertation reports rising rates of suicide related to a lack of community health linkages, mental health funding, and unmanaged posttraumatic stress from a family, peer, and social level. Adams et al. (2017) and Kintzle et al. (2018) reported social connectedness was directly related to depression and unmanaged posttraumatic stress syndrome. Further, it was a driver for suicide ideation coupled with reduced mental service utilization (Hester, 2017). Dang et al. (2019) noted the importance of understanding needs related to daily life and their association with mental health challenges. Coupled with a strong associated relationship between firearms and veteran suicide dictates the need to develop policies to mitigate firearm access (Bauer et al., 2020; Soberay et al., 2021).

Social Change

This study revealed numerous implications for social change. First, the awareness of veteran suicides and their rising rates in relation to mental health funding, social support, and the method of suicide. An understanding of the levels of mental health funding is warranted to address the various methods of suicide and interventions to address the types of suicides potentially related to method related suicide ideation. In addition, the types of social associations and supports that are accessed by Veterans at the

local level should be assessed to understand programs developed by these agencies based on a gap analysis as well as a client/customer experience score to be able to develop a plan to address the programming and funding changes that are needed to develop interventions focused on rates of suicide in states with higher rates, lower funding levels and higher rates of method specific suicides (see Tables 3, 4, and 7). More understanding is also needed around the types of methods and suicide ideation based on these different methods that have been used.

Moreover, veteran health and mental health have been studied in clinical and nonclinical settings but not in relation to veteran suicide rates, family and social support, mental health funding per capita and levels of lethal methods of suicides from a state perspective. We must understand from a collective impact perspective through the socioecological lens how these variables interplay. More research is needed to understand the role of suicide advocates, policy makers and stakeholders and the actions that are taken to address military resilience as well as suicide rates in this population. We have an opportunity to rethink how we manage to care for this population to develop a holistic warrior centric approach for the service members and their community.

Additional study considerations should consider an analysis of suicide exposure as a variable of interest. Soberay et al. (2021) asserts fearlessness associated with death and exposure to suicide coupled with trauma and loss increases suicide risk. The individual level of the SEM addresses health behavior changes at the individual level and can include family and social support from a peer-to-peer perspective through interventions aimed at assessing and improving self-efficacy, knowledge, skills, and

experience (Chu et al., 2017; Cramer & Kapusta, 2017; Holliday et al., 2018). In this study, individual-level veteran characteristics were not explored. Data at the individual level for deceased Veterans was not available. Therefore, it was recommended to study veteran relationships at the individual-level and the SEM's social and environmental higher-level influence on suicide rates as it relates to their access and engagement with programming. Further studies should focus on the social environment concepts to include friends, family, and service members. Additionally, screening, referring, and coding to understand health and social need access at the local level associated with mental health social support should inform the development of new programming for at-risk veterans. These studies should consider a qualitative or mixed-method approach to ensure an in-depth focus on perceptions of fearlessness about death and the method associations related to combat experiences.

Additionally, future research may need to understand density and perform heat mapping. Mental health programming, clinic density and access to lethal weapon purchases in areas where there are high rates of suicide could inform future local policy efforts to reduce veteran suicide rates and inform local programming. Objective data may need to be collected to determine the cost variances associated with accessing mental health services and compare it to other states to determine if the cost could be an indicator for suicide risk.

There should be a focus on technology. We must improve the way we are coding suicide deaths to be able to develop method-based interventions. In addition, technology improves the veteran experience when it comes to clinical care but also when it comes to

accessing community resources; this should be a consideration when developing tools.

We must think outside of the box. Tele-health platforms must be leveraged to deliver

community-based services to ensure we are being inclusive and understanding the

challenges and barriers many faces when it comes to health-related social needs (HRSNs)

as well as barriers associated with health equity and structural determinants of health at

the local level. Access to resources is reliant on technology to drive their adoption

forward (Bauer et al., 2020; Soberay et al., 2021).

      Lastly, access to firearms must include a dialogue around access to lethal means

and safety measures to include a discussion related to mental health. The Office of

Mental Health and Suicide Prevention (2018) reported that nearly 7 out of every 10

Veterans die because of a firearm injury. Programs that promote safe storage and use of

firearms, to include giving away free gunlocks are preventative measures should be put

into place to reduce the rate of veteran suicide. Programs educating families on the

warning signs and risks should be available in schools, workplaces, and community

settings as a preventative measure.

      All these efforts should be driven in concert with a National Office leading and

directing satellite office at the local level. Local efforts should also focus on the

development of youth coalitions to drive social change regarding firearm perceptions and

social norms about suicide ideation. Youth can be a powerful voice and advocate when it

comes to policy change within the legislature but also within their own community and

home. We must support and educate those willing to take action to drive change.

Conclusion

In conclusion, veteran suicide risk is a public health issue. It is a complex and poorly understood mental health and societal threat. The rate at which veteran suicides are trending creates reason for concern. If this trend continues, we will continue to the mental health crisis in America spiraling out of control. Change is warranted on many fronts. Understanding the change that is needed is still a priority. This study examined veteran suicide rates and their relationship to family and social support, as measured by social associations, mental health funding, and the lethality of the method of suicide.

The IPTS and the SEM were both evaluated to determine their foundational support for this study. Both theories provided the framework needed to understand the basis for the hypothesis. The findings supported the theories as well as the hypothesis that veteran suicide rates are affected by community health linkages. The linkages at the local level or lack thereof relate to the variation n in the veteran suicide rates. The study saw a significant relationship between social support and suicide rates as well as the mode of suicide specific to firearms. The social change implications may help guide social, behavioral change advocates and system leaders to influence programmatic practices currently underway and drive improvements in mental health practice to reduce suicide rates amongst the veteran population.

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