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RURAL SUICIDE: A THREE MANUSCRIPT DISSERTATION UTILIZING THE NATIONAL VIOLENT DEATH REPORTING SYSTEM

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RURAL SUICIDE:
A THREE MANUSCRIPT DISSERTATION UTILIZING THE
NATIONAL VIOLENT DEATH REPORTING SYSTEM

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Social Work
at the University of Kentucky

By
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ABSTRACT OF DISSERTATION

RURAL SUICIDE: A THREE MANUSCRIPT DISSERTATION UTILIZING THE NATIONAL VIOLENT DEATH REPORTING SYSTEM

Purpose: Rural residents and veterans are at a greater risk of death by suicide but there is little research to compare rural versus urban suicide decedents. There is also a lack of research specific to rural veteran suicide. This three-manuscript dissertation study explores 1. epidemiology of suicide specific to rural areas comparing rural veterans to rural non-veterans 2. veteran suicide decedents that lived in rural areas compared to veterans that live in urban areas and 3. How the continuum of rurality is related to demographic and circumstantial variables associated with suicide

Methods: Data was obtained from the Centers for Disease Control Restricted Access Database. The data included suicide decedents from 40 states from 2003-2017 $n=199,730$. Within this sample, the rural population was $n=36,032$ and the veteran population was $n=7,421$.

Findings: Rural decedents had a mean age ($M=61.16$ $SD=18.08$) when compared to urban decedents ($M=45.14$ $SD=16.45$). Rural decedents died using firearm (77.9%) compared to urban residents (58.6%). Rural veterans had a reported issue with on-going physical health problems 35.7% compared to rural non-veterans 17.2%. When controlling for age the suicide decedents in the sample were 11.70 times likely to be male veterans. When looking at only the veteran population within the sample rural veterans were 1.43 times more likely to die using firearm compared to urban veterans. When looking at suicide across the rurality gradient death by firearms increased as the gradient moves from urban to rural.

Conclusions: Rurality influences the reported characteristics of suicide decedents. Rural residents are less likely to have reported mental health treatment, report of alcohol problems, report of substance abuse problems, are more likely to die by suicide using a firearm, and there is increased use of long guns as rurality increases. Rural veterans were 1.43 times more likely to die using firearm compared to rural non-veterans. Firearms are more accessible in rural areas, rural residents are more familiar with firearms, and there is greater variety of firearms, namely long guns, in rural areas.

KEYWORDS: Suicide, Rural, Veteran Suicide, Isolation, Loneliness

James W. Watts

November 18, 2022

RURAL SUICIDE:
A THREE MANUSCRIPT DISSERTATION UTILIZING THE NATIONAL VIOLENT
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Chapter One: Introduction

Introduction

Suicide is an important and complex public health issue involving a variety of psychological, biological, and societal factors (Curtin, Warner, & Hedegaard, 2016; DeBeurs, Fried, Wetherall, Cleare, O’Conner, Ferguson, O’Carroll, & O’Conner, 2019; Klonsky, May, & Saffer, 2016; O’Conner & Nock, 2014). Throughout the world suicide accounts for 56% of all violent deaths (WHO, 2014). In the United States, suicide is the tenth leading cause of death in adults and the second leading cause of death for those 10-34 years of age (CDC, 2020; NIH, 2019; Xu, Murphy, Kockanek, & Arias, 2016). During 2018, it was reported that 48,344 persons died by suicide in the United States (CDC, 2020). Notwithstanding attempts to reduce the number of deaths by suicide the United States the rate of suicide deaths continued to increase (Hedegaard, Curtin, & Warner, 2020). Within the literature, several studies have indicated that there is an underreporting of suicide by coroners in the United States. This misclassification of the cause of death may be due to a lack of data available to law enforcement officers, coroners, and medical examiners or the possibility of a bias regarding classifying suicide as the cause of death (Mohler & Earls, 2001; Moyer, Boyle, & Pollock, 1989; Phillips, Robin, Nugent, & Idler, 2010; Shepard, Gurewich, Aung, Reed, & Silverman, 2017; Steelsmith, Fontanella, Campo, Bridge, Warren, & Root, 2019). The overall rate of suicide had continued to increase in the United States over the past two decades (Curtin et al., 2016).

The National Violent Death Reporting System (NVDRS) collects more than 600 data elements into an anonymous database regarding all reported suicide deaths for those states or territories that participate in the reporting system (CDC, 2019). The information

found within the NVDRS allows national and local policy makers to leverage the findings gleaned from the data to aid with the formation and refinement of violence prevention strategies. For those states that participate in the NVDRS reporting system, program participation has shown early promise for suicide prevention strategies (CDC, 2019; Hemenway, Barber, Gallagher, & Azrael, 2009; Kaplan, Caetano, Giesbrecht, Huguet, Kerr, McFarland, & Nolte, 2017; Powell, Barber, Hedegaard, Hempstead, Hull-Jilly, Shen, Thorpe, & Weis, 2006).

In the United States there has been a reported geographic disparity in the rates of suicide. Consistently higher suicide rates are reported in rural areas when compared to those that lived in more urbanized areas (Arbore, 2019; Conner, Azrael, & Miller, 2019; Harp & Borders, 2019; Ivey-Stephenson, Crosby, Jack, Haileyesus, & Kresnow-Sedacca, 2017; Hedegaard, Curtin, Warner, 2018; Kegler, Stone, & Holland, 2017; Rossen, Hedegaard, Khan, & Warner, 2018; Searles, Valley, Hedgaard, & Betz, 2014; Tarlow, Johnson, & McCord, 2018). This ‘rural mortality penalty’ has been reported to be persistent for many reasons for mortality including suicide among those that live in non-urban areas (Anderson, Saman, Lipsky, & Lutfiyya, 2015; Brown, & Hanna, 2019; Crosby, McDoom-Echebiri, James, Khandekar, Eberhardt, & Pamuk, 2004; Crosby, Wendel, Vanderpool, & Casey, 2012; Pettrone & Curtin, 2020). The ‘mortality penalty’ for rural residents emerged during the 1980’s and has continued to grow (Eberhardt & Pamuk, 2004; James, Moonesinghe, Wilson-Frederick, Hall, Penman-Aguilar, & Bouye, 2017). The widening of the rural-urban suicide disparity may be due to the lack of social integration in those geographic areas (Singh & Siahpush, 2002). Social integration is defined as the perceived ability to experience social support (Handley, Inder, Kelly, Attia,

Lewin, Fitzgerald, & Lambkin, 2012). Previous research has shown that as the population density in a given area decreases that the rate of suicide increases (Opoliner, Azrael, Barber, Fitzmaurice, & Miller, 2014).

Veterans are at an increased risk of suicide than those that had not served in the military (Elbogen, Fuller, Johnson, Brooks, Kinner, Calhoun, & Beckham, 2010; Hogan, 2019; Hom, Stanley, Gutierrez, & Joiner, 2017; Kemp & Bassarte, 2013; Logan, Fowler, Patel, & Holland, 2016; VA, 2019). Most veterans who die from suicide use firearms (Valenstein, Walters, Pfeiffer, Gonoczy, Miller, Fiorillo, & Bossarte, 2018; VA, 2016). Veterans are reported to be the largest demographic group that owns firearms (Cleveland, Azrael, Simonetti, & Miller, 2017; Hamilton, Lemeshow, Saleska, Brewer, & Strobino, 2018). Veterans who live in rural areas are at greater risk for suicide than non-veterans that live in non-rural areas (Mohatt, Billera, Demers, Monteith, & Bahraini, 2018; Monteith, Wendleton, Bahraini, Matarazzo, Brimmer, & Mohatt, 2020). It was reported that veterans that reside in rural areas are at a 20% greater risk of suicide than their non-veteran counterparts (McCarthy, Blow, Ignacio, Iigen, Austin, & Valenstein, 2012). There is a higher level of enlistment of citizens into military service from rural areas and those veterans typically to return to those rural areas after the conclusion of their military service (Heady, 2011; Jameson, Farmer, Head, Fortney, & Teal, 2011; Kane, 2005). There is a paucity of research specific to rural veteran suicide (Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutschman, Bonnell, & Cardin, 2017).

Geographic isolation is one aspect of rural life that may lead to feelings of isolation and loneliness. Other cultural factors may influence the incidence of decreased help-seeking behaviors for rural residents (Hirsch, 2006; Hirsch & Cukrowicz, 2014;

Niederkrötenhaler, Reidenberg, Benedikt, & Gould, 2014). An additional risk factor for suicide in rural areas may be increased access to lethal means (Hirsch, 2006). In the United States the leading mechanism of suicide is using a firearm (CDC, 2019). There is a highly stable tradition in rural areas to own firearms at a higher rate than those that live in more urbanized areas (Azrael, Cook, & Miller, 2004; Cleveland, Azrael, Simonetti, & Miller, 2017; Miller, Lippmann, Azrael, & Henenway, 2007; Miller, Barber, White, & Azrael, 2013; Nestadt, Triplett, Fowler, & Mojtabai, 2017; Prickett, Gutierrez, & Deb, 2019; Siegel & Rothman, 2016). Those that live in rural areas have a greater familiarity with firearms when compared to those that live in more urbanized areas (Alban, Nuno, Ko, Barmparas, Lewis, & Margulies, 2018; Allchin, Chaplin, & Horwitz, 2018; Anestis & Capron, 2018; Anestis & Houtsma, 2018; Houtsma, Butterworth, & Anestis, 2017; Shenassa, Catlin, & Buka, 2003). Additionally, those that live in rural areas also have more limited access to physical health care, limited access to mental health care, decreased willingness to seek assistance, an actual or perceived stigma regarding seeking assistance, economic distress, and issues related to social isolation (Cully, Jameson, Phillips, Kunik, & Fortney, 2010; Fortney et al., 2010; Hirsch & Cukowicz, 2014; Kegler, Stone, & Holland, 2017; Monteith et al., 2019; Thorne, Price, Fiske, & Scotti, 2017). Those who live in specific areas have a set of shared values which define membership within the community (Vogl, 2016). Being a part of a specific rural community can influence the actions of members, which may range from values about gun ownership to the degree of acceptance for help-seeking behaviors, among other factors (Crosby, Wendel, Vanderpool, & Casey, 2012).

Theoretical Background

The Interpersonal Theory of Suicide purports that the desire for suicide is present when a person experiences the intractable feelings of perceived burdensomeness, thwarted belongingness, and an acquired ability for suicide (Barzilay, Feldman, Snir, Apter, Carli, Hoven, Wasserman, Sarchiapone, & Wasserman, 2015; Chu et al., 2017; Joiner, 2005; Van Orden et al., 2010). Perceived burdensomeness is defined as a self-perception that one is defective, and their existence has an ill effect upon family, friends, and society (Joiner, Van Orden, Witte, & Rudd, 2009; Van Orden et al., 2010). Thwarted belongingness is the actual or perceived lack of strong and effective affectional social bonds (Joiner, 2005; Joiner et al., 2009; Van Orden et al., 2010). The acquired capability factor within The Interpersonal Theory of Suicide is the habituation to the thought and action of the suicidal act. The capability for suicide is developed after having had recurrent exposures to painful stimulus. The result of those repeated exposures is reported to reduce a person's innate fear of death (Chu et al., 2017; Joiner, 2005; Joiner et al., 2009; Orbach, Stein, Palgi, Asherov, Har-Even, & Elizur, 1996; Van Orden, Witte, Gordan, Bender, & Joiner, 2008; Van Orden et al., 2010).

The Interpersonal Theory of Suicide is relevant to the current dissertation project, as isolation is a relevant part of the Thwarted Belongingness aspect of the theory. These feelings of loneliness and feeling as though one does not belong makes a person feel alienated from the smaller and larger social units of their communities (Gunn et al., 2016). The feeling of thwarted belongingness has been reported to be a risk factor for suicidal ideation (Ma, Batterham, Calear, & Sunderland, 2019). Feeling removed from

the basic social units within a person's life leads to loneliness and a lack of reciprocal relationships within defines social integration (Baumeister & Leary, 1995; Chu et al., 2017; Durkheim, 1897). Types of geographic and social isolation result in less face-to-face contact with family, friends, and a lack of other consistent social supports that are significant to those that live in specific areas (Fontanella et al., 2015).

Isolation

As stated by Sigmund Freud (1922), a person feels incomplete if they are alone. Whether a person is physically alone or if they experience loneliness in the psychological sense, the lack of social integration may lead to suicidal thoughts and actions (Durkheim, 1897). The relationship between the person and others, through their innate social structures, can aid with social integration and social regulation (Phillips, 2014). Our connection to other humans helps to influence our physical and psychological well-being (Putnam, 2000). Connection and the feeling of belongingness within social networks is a basic need of human existence (Lieberman, 2013).

Through those networks of support, we can have different types of contact, at different intervals, and at various levels of intensity. Those connections help to meet our innate physical and psychological needs (Berkman, Glass, Brissette, & Seeman, 2000). These psychosocial and behavioral supports influence our psychological states, our views of ourselves, and our general ideas of security (Berkman et al., 2000). To feel complete and connected we have a need to form and maintain close affectional bonds (Fonagy, 1996). It has been stated that humans are social organisms (Cacioppo & Patrick, 2008). It is part of our human nature to long for belongingness (Aronson & Aronson, 2018). A portion of our social processes is to make and socially attend to those with whom we

have close affectional bonds. Without those affectional bonds the isolation that one might feel can lead to various levels of social dysregulation, emotional dysregulation, and general poorer health outcomes that may lead to depression and suicidal ideation (Frey, Hans, & Sanford, 2016; Cacioppo & Hawkley, 2003; Leigh-Hunt, Bagguley, Bash, Turner, Turnbull, Valtorta, & Caan, 2017). The perception of loneliness is a known risk factor for suicidal behavior (Cacioppo & Patrick, 2008; Calati, Ferrari, Brittner, Oasi, Olie, Carvalho, & Couret, 2018; Stravynski & Boyer, 2001; Levitin, 2014).

The loss of or the lack of connectedness to others produces a type of emotional pain. As noted by Shneidman (2005) when this psychological pain, psychache, becomes unbearable suicide can be a resulting action to diminish the psychache experienced by the person. As reported by Gunn et al., (2016) psychache is caused by the deprivation of a person's vital needs and these needs which drawn from Murray's (1938) theory. Murray (1938) discussed the effect on a person if their psychological needs are not met. One of those needs is to connect socially and maintain social connections with other humans. We have an innate need for connecting with others and it is reported to be one of our most basic survival needs throughout the life cycle (Lieberman, 2013). Humans need to be or need to perceive that we are part of a larger group to not only thrive but to also survive (Gunn & Lester, 2014; Joiner et.al, 2009; Lieberman, 2013; Zang & Sun, 2017). There is safety in belongingness (Sapolsky, 2017).

Trotter noted that, "it will be an obvious truth to him that it is not good for the man to be alone. Loneliness will be a real terror, insurmountable by reason" (1916, p. 31). According to Biblical scripture, "And the Lord God said, it is not good that the man should be alone..." (Genesis 2:18 King James Version). Trotter also noted that the

feeling of being alone, along with the fear of being alone, increases a person's intolerance of isolation (1916). Humans have a fundamental need to belong (Baumeister & Leary, 1995; Shneidman, 1998). When the need to belong is not met the resulting loneliness may lead to a range of negative health outcomes (Cacioppo & Cacioppo, 2014; Holt-Lunstad, Smith, & Layton, 2010; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Hawkey & Cacioppo, 2010). Those negative health outcomes can include suicidal ideation, actions, and fatalities across the life span (Fässberg et al., 2012; Trout, 1980; Turecki & Brent, 2016).

A dimension of thwarted belongingness may include loneliness, having fewer friends, living alone, distancing oneself from family, interpersonal conflicts with family and friends, and a generalized behavior of social avoidance (Chu, Buchman-Schmitt, Stanley, Hom, Tucker, Hagan, Rogers, Podlogar, Chiurliza, Ringer, Michaels, Patros, & Joiner, 2017; Van Orden et al., 2010). The social unit of affectional bonds can provide a "protective shell in times of need" (Holmes, 1993, p. 81). It has been noted that social isolation is arguably the strongest and most reliable predictor of lethal suicidal behavior among various samples (Conwell, 1997; Dervic, Brent, & Oquendo, 2008; Joiner & Van Orden, 2008; Trout, 1980; Van Orden et al, 2010). Isolation can be a predictor of suicidal ideation because humans are by nature social beings. Without other humans, we begin to lose part of our humanity (Breed, 1972). The psychological pain from loneliness may inspire a desire to escape the pain through suicide (Baumeister, 1990; Schneidman, 2005).

Research Agenda

This dissertation addresses three general areas within three separate manuscripts. The overarching focus of these manuscripts is to examine the epidemiology of suicide in rural areas compared to urban areas. The degree of rurality is considered a macrosocietal measure leading to a geographic variation in the rate of suicide (Dewey, 1963; Judd, Cooper, Fraser, & Davis, 2006; Singh & Siahpush, 2002). Rurality is generally defined by being a remote area as noted by a lower level of population density within a defined geographic area (Fontanella, Saman, Campo, Hiance-Steelesmith, Bridge, Sweeney, & Root, 2018). Within the literature the term rural and urban has been defined utilizing a variety of measures. Those measures include but are not limited to the following: Core Based Statistical Areas (CBSA), Frontier and Report Area (FAR), Rural Urban Commuting Areas (RUCA), Rural Urban Continuum Codes (RUCC), Urban Influence Codes (UIC), Index of Relative Rurality (IRR), Urbanized Areas, Urban Clusters, and variations of definitions employed by the Office of Rural Health, and The Department of Veterans Affairs (Hall et al., 2006; Isserman, 2005; Waldorf, 2006; West, Lee, Shambaugh-Miller, Bair, Mueller, Lily, Kaboli, & Hawthorne, 2010; Morrill, Cromartie, & Hart, 1999).

There are two major definitions of rurality along with several variations. The first is used by the U. S. Census Bureau and the other is by the Office of Management and Budget (OMB) (Health Resources & Services Administration, 2019). The Census Bureau uses population density to help with defining an area as urban if there are 50,000 or more people living in a given area and an urban cluster of 2,500 to 50,000 within a given geographic area (HRSA, 2019; Ratcliffe, Burd, Holder, & Fields, 2016). The basic

definition of rurality noted by the Census Bureau and the OMB are those areas that are not defined as urban (Ratcliffe et al., 2016). This is a classification by exclusion of areas not identified as urban or an urban cluster within a given geographic boundary (Cromartie & Bucholtz, 2008; Cromartie & Parker, 2018; Hall, Kaufman, & Ricketts, 2006; HSRA, 2019). Those boundaries can include but are not limited to the following: states, regions, counties/county level equivalents, zip codes, or census tracts (HSRA, 2019; Ratcliffe et al., 2016). Rural communities continue to experience higher rates of suicide compared to those that live in urban areas (Branas et al., 2004; Cukrowicz et al., 2017; Fontanella et al., 2015; Hirsch & Cukrowicz, 2014; James, 2014; Kegler et al., 2017; Neufeld et al., 2015; Searles et al., 2014; Thorne et al., 2017). Rural areas are not only defined by different measures of population density within a given boundary, but also by the shared values of those specific cultures residing in rural areas (Hirsch, 2006).

The existing literature has identified a lack of mental health care in rural areas (Hirsch & Cukrowicz, 2014; Judd et al., 2006). Even in rural areas where mental health services are available, they are often underutilized (Fortney, Harman, Xu, & Dong, 2010; Jones, Cook, & Wang, 2011; Probst, Laditka, Moore, Harun, Powell, & Baxley, 2006; Wang, 2004). There is a reluctance to seek mental health care due to a variety of factors. One factor is the stigma of mental health care and the concern that another member of a small community may know that they are seeking treatment (Cukrowicz et al., 2017; Hirsch & Cukrowicz, 2014; Thorne et al., 2017). Some who live in rural areas may consider seeking assistance to be a sign of weakness (Neufeld et al., 2015). Rural beliefs typically promote the idea of independence through the belief of being a ‘rugged individual’ (Hirsch, 2006). Seeking assistance is then deemed to be the antithesis of being

self-reliant (James, 2014; Thorne et al.,2017). As noted earlier there is a widening gap of suicide rates in rural areas as compared to urbanized areas (Branas, 2004; Fontanella et al., 2015; Searles et al, 2014). Those that live in rural areas have a disproportionate poorer general health and a higher rate health disparity (Dyk, Radunovich, & Sano, 2018). Many of these chronic health issues involve illnesses and maladies involving chronic pain. Within the literature the presence of chronic pain is a noted risk factor for suicide (Igor, Borsook, & Volkow, 2013; Ilgen, Zivin, Austin, Bohnert, Czyz, Valenstein, & Kilbourn, 2010; Petrosky, Harpaz, Fowler, Bohm, Helmick, Yuan, & Betz, 2018; Racine, 2018). Another issue in rural areas is the ease of access to lethal means. Those that live in rural areas typically have greater access to firearms and are more familiar with firearms than those that live in urbanized areas (Judd et al., 2006; Nestadt et al., 2017).

These manuscripts examined three specific topics within the larger context of rural suicide. The first examined the epidemiology of suicide among rural veterans compared to rural non-veterans. The aim of that manuscript was to examine the relationship of veteran status upon the circumstances and characteristics surrounding suicide in rural areas. The second manuscript examined the epidemiology of veteran suicide with a special focus on differences in rural and urban veterans. The aim of that manuscript was to examine the effect of rurality upon the circumstances and characteristics surrounding rural veteran suicide and non-rural veteran suicide. The third manuscript examined the impact of the degree of rurality upon the epidemiology of suicide. The aim of that manuscript examined the differences in the circumstances and characteristics of suicide comparing the impact of rurality at the county level of each decedent.

Those that died from suicide after the act of homicide are included. Some posit that suicide following a homicide is a separate phenomenon (Liem, 2010; Large, Smith, & Nielssen, 2010; McNally, Patton, & Fermouw, 2016). However, those decedents are included due to the decedents did die by suicide (Joiner, 2014). The data were acquired from NVDRS after application. These studies were approved by The University of Kentucky Institutional Review Board.

Definition of Terms

Suicide is a fatal intentional self-injurious act with some evidence of the intent to die (Joiner, 2005; Marris, Berman, & Silverman, 2000; Silverman, M., Berman, A., Sanddal, N., O'Carrol, P., & Joiner, T., 2007a; Silverman, M., Berman, A., Sanddal, N., O'Carrol, P., & Joiner, T., 2007b; Turecki & Brent, 2015; Van Orden et al, 2010).

Rural, for the purpose of this dissertation, is defined as any geographic area not considered urban or metropolitan (Hart, Larson, & Lishner, 2005; Paulozzi, 2008,). These studies utilized the National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to denote areas as rural or urban. The scheme was developed to reflect health variations in demographics, economic, social, and community characteristics relative to the availability of health care resources. The NCHS Urban-Rural Classification Scheme for Counties is a taxonomy used to identify each county or county level equivalent as either rural or urban. The NCHS Scheme classifies each county or county level equivalent into one of six possible classification categories. Categories one through four are urban (metropolitan). Categories five and six are described as rural (non-metropolitan) (Ingram, & Franco, 2012).

Urban, for the purpose of this dissertation, is defined as any geographic area not considered rural or non-metropolitan (West, Weeks, & Wallace, 2008; West, Lee, Shambaugh-Miller, Blair, Mueller, Lilly, Kaboli, & Hawthorne, 2010). These studies utilized the National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to denote areas as rural or urban as noted in the definition of rural (Ingram, & Franco, 2012).

Veteran, for the purpose of this dissertation, is defined as a person that served in an active-duty capacity in the United States military. National Guard members and reservists are also included if they were deployed or activated for greater than 180 days which did not include training time. National Guard and reservists are also included if they served for 20 years or more. Veteran status is also denoted by the medical examiner, coroner, or family member and coded as a Veteran by the CDC staff data extractors (CDC, 2018; C.F.R., §38, 3.1(d); M21-1, Part III, Subpart iii, 2.K.3;; Huguet, Kaplan, & McFardland, 2014; McCarthy et al, 2012; Perl, 2015; Sohn, Arnold, Maynard, & Hynes, 2006; York, Lamis, Pope, & Egede, 2012; VA, 2018).

Significance

Findings from these manuscripts may have implications toward a greater understanding of the impact of rurality upon the incidence and characteristics of suicide. Each rural area in the United States is a distinct community with a myriad of beliefs and cultural norms (Hirsch, 2006; Hirsch & Cukrowicz, 2014). These varied beliefs and cultural norms not only define the residents of an area but also their attitudes and behaviors about suicide. Increased understanding about rural suicide may guide clinicians and policy makers toward new and innovative ways to focus on suicide prevention in

rural areas. Not only might this knowledge help to reduce the incidence of suicide in rural areas but also to reduce the emotional suffering that may lead to suicidal behavior (Carpenter-Song et al., 2010; Carpenter-Song et al., 2016; Hirsch & Cukowricz, 2014; Fuller, Edwards, Procter, & Moss, 2000; Keller & Wilkinson, 2014; Philo, Parr, & Burns, 2003).

Research Questions and Hypotheses

The following research questions were developed after an extensive review of rural suicide, veteran suicide, methods for classification of rurality, and the effect of thwarted belongingness.

Study 1 – The purpose of this study was to investigate the epidemiology of suicide among rural veterans compared to rural non-veterans. The aim of this manuscript was to examine the relationship of veteran status upon the circumstance and characteristic variables in relation to suicide in rural areas. Both rural veterans and non-veterans would experience similar environmental and cultural norms.

Research Question 1. Do the circumstance and characteristic variables differ among rural veterans compared to rural non-veterans?

H_a^1 : It was anticipated that there are differences in the characteristics i.e., age, sex, marital status of rural veteran decedents compared to rural non-veteran decedents.

H_a^2 : It was anticipated that the mechanism of death will differ from rural veterans compared to non-veteran decedents with more rural veterans using firearms.

H_a^3 : History of mental health treatment, substance use issues, and physical health problems was examined to compare rural veteran decedents to non-veteran rural

decedents. Given the lack of previous research, there are no a priori hypotheses priori hypotheses.

Study 2 – The purpose of this study was to investigate the general epidemiology of rural veteran suicide in comparison to non-rural veterans. The aim of this manuscript examined the effect of rurality upon the circumstance and characteristic variables in relation to rural veteran suicide compared to non-rural veteran suicide.

Research Question 1. Are there differences in the demographics, mechanism of death, use of mental health treatment, and physical health problems among rural veteran suicide decedents compared to non-rural veteran suicide decedents?

H_b^1 : There are differences in the mechanisms of death (firearm, poisoning, and strangulation) when comparing rural veterans compared to non-rural veterans.

H_b^2 : There are differences in the current or historical use of mental health treatment when comparing rural veterans to rural non-veteran suicide decedents.

H_b^3 : There are differences in the rate of physical health problems when comparing rural veterans to rural non-veteran suicide decedents.

Study 3 – The third manuscript examined the impact of degree of rurality on the epidemiology of suicide. The aim of this manuscript was to examine the differences in the circumstance and characteristic variables of suicide depending on the degree of rurality of the suicide decedent.

Research Question 1. Do the mechanism of death, demographics or decedents, use of mental health treatment, and physical health problems differ among suicide decedents based upon the degree of rurality of the decedent?

H_c^1 : There are differences in the mechanism of death among suicide decedents based upon the degree of rurality of the decedent. As rurality increases, the rate of firearm death will increase, and the rate of poisoning and strangulation will decrease.

H_c^2 : There are differences in the rate of mental diagnosis and the use of mental health treatment among suicide decedents based upon the degree of rurality of the decedent. As the rate of rurality increases the rate of mental health diagnosis and treatment will decrease.

H_c^3 : There are differences in the report of physical health problems among suicide decedents based upon the degree of rurality of decedent. As the rate of rurality increases the rate of reported physical health problems will increase.

Method

These analyses included decedents from the National Violent Death Reporting System (NVDRS) Restricted Access Database (RAD) that died by suicide from 2003-2017. These studies utilized the National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to denote an area as rural or urban. Each decedent was coded using the National Center for Health Statistics to denote their level of rurality. The scheme was developed to reflect health variations in demographics, economic, social, and community characteristics relative to the availability of health care resources. The NCHS Urban-Rural Classification Scheme for Counties is a taxonomy used to identify each county or county level equivalent as either rural or urban. The NCHS Scheme classifies each county or county level equivalent into one of six possible classification categories. Categories one through four are urban (metropolitan).

Categories five and six are classified as rural (non-metropolitan) (Ingram, & Franco, 2012).

Research Design and Approach

All three of the proposed studies employed quantitative research strategies to fully examine the research questions noted above. The studies investigated the epidemiology of specific circumstance and characteristic variables of suicide decedents that reside in rural and urban areas.

Study Sample

The study sample are those decedents listed in the NVDRS RAD from 2003-2017. The NVDRS RAD is a de-identified, multi-state, case level microdata set comprised of a variety of unique variables. The RAD data for the timeframe 2003-2017 includes decedent information for up to 40 participating states, the District of Columbia, and Puerto Rico n=199,730. In addition to the specific decedent information the RAD also uses short narratives to describe the specific circumstances related to the death. The narratives include descriptions from law enforcement and medical examiner or coroner reports. The narrative information helped the researcher to gather additional information regarding the life and death of the decedent. The narrative information helps to clarify ambiguous information noted in the initial CDC abstractor's coding. The NVDRS is an ongoing state-based surveillance system funded by the Centers for Disease Control and Prevention (CDC) that collects data on all violent death occurring in participating states or territories of the United States (Blair, Fowler, Jack, & Crosby, 2016).

The NVDRS collects specific data from death certificates, coroner/medical examiner reports, law enforcement reports, and toxicology reports. Abstractors input

specific data regarding variables such as the mechanism of death, type of weapon used, type of method used, and antecedent circumstances using coding guidance from the Centers for Disease Control. Abstractors also include narrative information provided by the coroner/medical examiner or law enforcement to provide a better description of the fatal event (CDC, 2019). An application was approved for use of the restricted database to the Centers for Disease Control and Prevention.

Analytical Approach

Study 1. Cases were selected to only include those 17 years of age or older in the non-veteran population. Citizens are permitted to enlist into military service if they are at least 17 years of age with parental consent. This operation was completed to provide a greater degree of similarity between the veteran and non-veteran groups. Descriptive analysis of the characteristics and circumstance variables among rural veteran suicide decedents compared to rural non-veteran suicide decedents were conducted. Analysis of the decedent's age, sex, race, ethnicity, marital status, educational level, history of mental health treatment, alcohol problems, substance abuse problem, physical health problems, and mechanism of death were completed. Chi-square tests and t-tests were used to compare rural veterans and rural non-veteran decedents. Two-tailed p-values <0.001 were considered statistically significant due to the size of the sample (Huck, 2012; Mertler & Vanetta-Reinhart, 2017). Variables were further analyzed using a logistic regression model, controlling for age, veteran status, and rurality status, and presented as AORs and 99% CIs. All statistical analyses were performed using SPSS, version 27 software.

Study 2. Descriptive analysis of the characteristic and circumstance variables among rural veteran suicide decedents compare to non-rural veteran suicide decedents

were conducted. Analysis of the decedent's age, sex, race, ethnicity, marital status, educational level, history of mental health treatment, alcohol problems, substance abuse problem, physical health problems and mechanism of death were completed. Chi-square tests and t-tests were used to compare rural and urban decedents. Two-tailed p-values <0.001 were considered statistically significant due to the size of the sample (Huck, 2012; Mertler & Vanetta-Reinhart, 2017;). Variables were further analyzed using a logistic regression model, controlling for age, veteran status, and rurality status, and presented as AORs and 99% CIs. All statistical analyses were performed using SPSS, version 27 software.

Study 3. Descriptive analysis of the characteristic and circumstance variables among suicide decedents were conducted including decedent's age, sex, race, ethnicity, marital status, history of mental health treatment, alcohol problems, substance abuse problem, physical health problems, and mechanism of death. The degree of rurality was used the independent variable and the characteristic and circumstance variables will used as dependent variables. Chi-square tests and an ANOVA were used to compare rural and urban decedents across the six levels of rurality. Two-tailed p-values <0.001 were considered statistically significant due to the size of the sample (Huck, 2012; Mertler & Vanetta-Reinhart, 2017). Variables were further analyzed using a logistic regression model, controlling for age, sex, and veteran status presented as AORs and 99% CIs. The degree of rurality will be utilized rurality a continuous variable using the NCHS Urban-Rural Classification Scheme for Counties i.e., classifications 1-6. All statistical analyses will be performed using SPSS, version 27 software.

Chapter 2: Differing Characteristics of Rural Veteran and Rural Non-veteran Suicide Decedents.

Introduction

Within the United States there is a consistently higher suicide rate in rural areas when compared to those that lived in more urbanized areas (Arbore, 2019; Conner, Azrael, & Miller, 2019; Harp & Borders, 2019; Ivey-Stephenson, Crosby, Jack, Haileyesus, & Kresnow-Sedacca, 2017; Hedegaard, Curtin, Warner, 2018; Kegler, Stone, & Holland, 2017; Rossen, Hedegaard, Khan, & Warner, 2018; Tarlow, Johnson, & McCord, 2018). Living in a rural area is reported to be a significant risk factor for suicide (Searles, Valley, Hedgaard, & Betz, 2014). Some factors that may influence the increased rate of suicide in rural areas are social isolation, access to firearms, decreased access to mental health treatment, lack of willingness to receive mental health treatment, stigma about receiving mental health services, and socioeconomic stresses (Hirsch, 2006; Hirsch & Cukrowicz; 2014, Mohatt, Kreisel, Hoffberg, Wendleton, & Beehler, 2020).

Veterans are at an increased risk of suicide than those that had not served in the military (Elbogen, Fuller, Johnson, Brooks, Kinner, Calhoun, & Beckham, 2010; Hogan, 2019; Hom, Stanley, Gutierrez, & Joiner, 2017; Kemp & Bassarte, 2013; Logan, Fowler, Patel, & Holland, 2016; VA, 2019; VA, 2021). After military service many veterans experience a degree of social isolation when they are no longer with their compatriots (Wilson, Hill, & Kiernan, 2018). The Interpersonal Theory of Suicide is relevant as isolation is a relevant part of the Thwarted Belongingness aspect of the theory (Joiner, 2005; Joiner, Van Orden, Witte, & Rudd, 2009). These feelings of loneliness and feeling as though one does not belong makes a person feel alienated from the smaller and larger

social units of their communities (Cacioppo & Patrick, 2008; Gunn et al., 2016; Aronson & Aronson; Liberman, 2013). The feeling of thwarted belongingness has been reported to be a risk factor for suicidal ideation (Ma, Batterham, Callear, & Sunderland, 2019; Calati, Ferrari, Brittner, Oasi, Olie, Carvalho, & Courtet, 2019). Feeling removed from the basic social units within a person's life leads to loneliness and a lack of reciprocal relationships within defines social integration (Baumeister & Leary, 1995; Chu et al., 2017; Durkheim, 1897). Types of geographic and social isolation result in less face-to-face contact with family, friends, and a lack of other consistent social supports that are significant by those that live in specific areas (Fontanella et al., 2015; Calati, Ferrari, Brittner, Oasi, Olie, Carvalho, & Courtet, 2018).

Most veterans who die from suicide use firearms (Valenstein, Walters, Pfeiffer, Gonoczy, Miller, Fiorillo, & Bossarte, 2018; VA, 2016). Veterans have a greater familiarity with firearms therefore a higher degree of acquired capacity for lethal means of suicide (Lambert & Fowler, 1997; Joiner, 2009). Veterans have a higher rate of firearm ownership when compared to the non-veteran population (Cleveland, Simonetti, & Miller, 2017; Miller, Swanson, & Azael, 2016). Having access to a firearm in the home increases the risk of suicide using a firearm (Dahlberg, Ikeda, & Kresnow, 2004). A part of military culture has traditionally been to not seek mental health services (Sharp, Fear, Rona, Wessely, Greenber, Jones, & Goodwin, 2014). Part of that tradition is born out of fear of stigma and concern about the ability to remain in the military and a concern about the possible negative impact upon their career for seeking assistance for depression, anxiety, and Post Traumatic Stress Disorder (Seal, Bertenthal, Minder, Sen, & Marmar, 2007). Veterans who live in rural areas are at greater risk for suicide than non-veterans

that live in rural areas (Mohatt, Billera, Demers, Monteith, & Bahraini, 2018; Monteith, Wendleton, Bahraini, Matarazzo, Brimmer, & Mohatt, 2020). It was reported that veterans that reside in rural areas are at a 20% greater risk of suicide than their non-veteran counterparts (McCarthy, Blow, Ignacio, Iigen, Austin, & Valenstein, 2012). There is a paucity of research specific to rural veteran suicide. Within the literature, a variety of studies look at suicide based upon rurality and research on veteran suicide but there is a lack of research looking at the epidemiology of rural veteran suicide (Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutschman, Bonnell, & Cardin, 2017).

Generally stated, those that live in a specific area have a set of shared values that define group membership within that specific community (Vogl, 2016). A subpopulation within any gradient of rurality or urbanicity would be those persons that are serving or have served in any capacity within the military. Both those that reside in rural areas and those that are veterans are further described by having a greater familiarity with firearms, decreased access to physical health care, limited access to mental health care, lack of the use of mental health care even when available, and social isolation (McCarthy, Blow, Ignacio, Iigen, Austin, & Valenstein, 2012; Hirsch, 2006; Hirsch & Cukrowicz, 2014; Crosby, Wendel, Vanderpool, & Casey, 2012; Alban, Nuno, Ko, Barmparas, Lewis, & Margulies, 2018; Allchin, Chaplin, & Horwitz, 2018; Anestis & Capron, 2018; Anestis & Houtsma, 2018; Houtsma, Butterworth, & Anestis, 2017; Shenassa, Catlin, & Buka, 2003; Monteith et al., 2019).

The Present Study

Given the robust association of suicide with rurality status and with veteran status, it is of utmost importance to examine this public health issue. The purpose of this study is

to examine the variables that differ when comparing rural veteran to rural non-veteran suicide decedents. Specifically, this study examined those variables related to suicide that are well document within the existing literature related to suicide. Because of the existing literature the author has a priori hypotheses regarding the differences between the groups. It is reported that as rurality increases the rate of mental health treatment, alcohol treatment, and substance abuse treatment decreases. This may be due to a lack of access to these types of treatment and an unwillingness of rural residents to receive treatment even if it were available (Hirsch, 2004, Mohatt et al., 2020, Monteith, Smith, Holliday, Dorsey, LoFaro, & Mohatt, 2019). Thus, I hypothesized that rural veteran decedents would be less likely to have received mental health treatment, less likely to have reported problems with alcohol, and less likely to have reported problems with substance abuse compared to non-veteran rural decedents. Also, as rurality increases, the rate of suicide using a firearm increases (Kegler, Stone, & Holland, 2017). There is some research regarding the specific type of firearm used i.e., handgun, rifle, or shotgun. Thus, I hypothesized that non-veterans would be more likely to use long guns (shotgun/rifle) compared to veterans. Long guns are more prevalent in rural areas and therefore more accessible to the general population that live in those rural areas (Hanlon, Barber, Azrael, & Miller, 2019; Azrael, Cook, & Miller, 2004 Cleveland, Azrael, Simonetti, & Miller, 2017). The current study will add to the existing literature in that regard. The literature did not allow for hypotheses about the report of physical problems that might differ between rural veterans and rural non-veterans.

Method

This analysis included decedents from the National Violent Death Reporting System (NVDRS) Restricted Access Database (RAD) that died by suicide from 2003-2017. This study utilized the National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to denote an area as rural or urban. Each decedent was coded using the National Center for Health Statistics to denote their level of rurality as a dichotomous variable as either urban or rural residency at the time of death. The scheme was developed to reflect health variations in demographics, economic, social, and community characteristics relative to the availability of health care resources. The NCHS Urban-Rural Classification Scheme for Counties is a taxonomy used to identify each county or county level equivalent as either rural or urban. The NCHS Scheme classifies each county or county level equivalent into one of six possible classification categories. Categories one through four are urban (metropolitan). Categories five and six are classified as rural (non-metropolitan) (Ingram, & Franco, 2012).

The study sample are those decedents listed in the NVDRS RAD from 2003-2017. The NVDRS RAD is a de-identified, multi-state, case level microdata set comprised of a variety of unique variables. The RAD data for the timeframe 2003-2017 includes decedent information for up to 40 participating states and the District of Columbia n=199,730. The NVDRS is an ongoing state-based surveillance system funded by the Centers for Disease Control and Prevention (CDC) that collects data on all violent death occurring in participating states or territories of the United States (Blair, Fowler, Jack, & Crosby, 2016).

The NVDRS collects specific data from death certificates, coroner/medical examiner reports, law enforcement reports, and toxicology reports. Abstractors input specific data regarding variables such as the mechanism of death, type of weapon used, type of method used, and antecedent circumstances using coding guidance from the Centers for Disease Control. Abstractors also include narrative information provided by the coroner/medical examiner or law enforcement to provide a better description of the fatal event (CDC, 2019).

Analytic Procedure

Case selection was completed to only include those 17 years of age and older. Citizens are permitted to enlist into military service at age 17 with parental consent. This operation was completed to provide a greater degree of similarity between the two groups. Descriptive analyses of the characteristics and circumstance variables among rural veteran suicide decedents compared to rural non-veteran suicide decedents were conducted. Analyses compared decedent's age, sex, race, ethnicity, marital status, relationship status, alcohol use problems, substance abuse problems, history of mental health treatment, educational level, and mechanism of death. Chi-square tests were used to compare rural veterans and rural non-veteran decedents (Healey & Danoghue, 2021). Two-tailed p-values <0.001 was considered statistically significant due to the size of the sample (Huck, 2012; Mertler & Vanetta-Reinhart, 2017). Variables were further analyzed using a logistic regression model, controlling for age, and sex, and presented as AORs and 99% CIs. Veteran status was used as the dependent variable with age, sex, marital status, education level, method of suicide, history of mental health treatment, alcohol problem, substance abuse problem, and physical health problems as the independent

variables. All statistical analyses were performed using SPSS version 27 software (SPSS Inc., Chicago, IL).

Results

Cases were selected from the larger national dataset to only include suicide decedents that resided in rural areas ($N=38,374$). Decedents were between 17 and 103 years of age ($M=48.16$, $SD = 18.14$). Most of the decedents were identified as White ($N=35,109$, 91.8%) and were predominately male ($N=31,010$, 80.8%). Ethnicity was reported as predominately non-Hispanic ($N=36,651$, 95.5%). The CDC abstractors had 8 categories to describe marital status with the largest groups reported as follows: Married/Civil Union/Domestic Partnership ($N=14,238$, 37.1%), Never Married ($N=10,354$, 27%), and Divorced ($N=9,049$, 23.6%). The abstractors had 9 differing categories to code the educational status for each suicide decedents with the three largest groups as follows: 9th to 12th grade without graduation ($N=5,262$, 13.7%), High School graduate or GED recipient ($N=13,629$, 35.5%), and some college ($N=4,102$, 10.7%). A fifth of the sample reported veteran status ($N=7,421$, 20.6%). Within the entirety of the United States, only 7% of the population are currently serving or have served in the military (VA, 2021). Within all those that lived in rural areas (veteran and non-veteran) had a history of mental health treatment was ($N=10,691$, 27.9%). Those that were reported to having had as alcohol problem was ($N=5,774$, 15%). Those that were reported to have substance abuse problem ($N=4,995$, 13%). Within this sample, the report of physical health problems was ($N=7,969$, 20.8%). The combined cause of death was collapsed into four main categories: Firearm, Hanging/Suffocation, Poisoning, and Other. Within this sample of rural decedents, the breakdown of each category is as follows:

Firearm ($N=24,094$, 62.9%), Hanging/Suffocation ($N=7,654$, 20%), Poisoning ($N=4,941$, 12.9%), and Other ($N=1,625$, 4.2%). Additionally, each decedent that died by firearm suicide were coded to specify which type of firearm that was used. Firearm Type: $N=20,904$, Handgun ($N=13,944$, 66.7%), Rifle ($N=3,233$, 15.5%), and Shotgun ($N=3,727$, 17.8%).

Bivariate Analysis

Chi-square tests and a t-test were completed to examine the relationship between veteran status and characteristics of each suicide decedent (Sex, Race, Marital Status, Educational Level, Alcohol Problems, Substance Abuse Problems, History of Mental Health Problems, History of Physical Health Problems, Combined Cause of Death, and Firearm Type). Post hoc analyses were conducted via examination of adjusted residuals that were greater than 1.96. See table 1.1

Age: A t-test was completed to compare rural veteran and rural non-veteran suicide decedents. Rural veterans had a considerable higher mean age ($M=61.16$ $SD=18.08$) compared to rural non-veterans ($M=45.14$ $SD=16.45$), $t(38,373)=520.07$, $p<.001$.

Sex: Within this study, 97.2% of veterans were male compared to 76.5% of non-veterans, $X^2(1, N=36,032)=1,633.23$, $p<.001$. The effect size for this finding, Phi, was small, .21 (Cohen, 1988).

Race: The overall diversity of this rural sample was small with 94.9% of rural veterans reported as white compared to 90.9% non-veterans. $X^2(5, N=35,960)=161.96$, $p<.001$ The effect size for this finding, Cramer's V, was small .07 (Cohen, 1988).

Ethnicity: The overall diversity of this rural sample was limited with veterans reported at 97% non-Hispanic compare to non-veterans that were non-Hispanic at 95.1% $X^2(2, N=36,032) = 63.31, p < .001$. The effect size for this finding, Phi, was small .04 (Cohen, 1988).

Marital Status: The largest percentage for rural veterans was 45.8% were reported to be married, be in a civil union, or a declared domestic partnership compared to 34.8% for non-veterans. Rural veterans were reported to be widowed at 13.4% compared to 5.7% of rural non-veterans. Rural veterans were reported to have never been married at 12.5% compared to 31.1% of rural non-veterans. $X^2(6, N=36,032) = 1,499.60, p < .001$ the effect size for this sample, Cramer's V, was large .215 (Cohen, 1988).

Educational Level: The overall educational level for veterans residing in rural areas was consistently higher than their non-veteran counterparts beginning at the HS/GED completion level which remained higher through the doctorate level $X^2(8, N=36,032) = 340.63, p < .001$. The effect size for this finding, Cramer's V, was large .110 (Cohen, 1988).

Combined Mechanism of Death: Overall, firearms were the largest method of suicide for 62.6% of all rural residents. 77.9% of rural veterans died using firearms compared to 58.6% of rural non-veterans. Conversely, rural veterans were less likely to die using hanging/suffocation, poisoning, or other means of suicide when compared to rural non-veterans $X^2(3, N=35,980) = 942.04, p < .001$. The overall effect for this finding, Phi, was moderate .162 (Cohen, 1988).

Physical Health Problems: Rural veterans had a higher report of physical health issues at 34.9% compared to 17.2% of rural non-veterans $\chi^2 (1, N=36,032) = 1,208.43, p < .001$. The effect size for this finding, Phi, was small .183 (Cohen, 1988).

Alcohol Problems: Rural veterans were less likely to have reported alcohol problems compared to rural non-veterans (12.3% vs 16.1%). $\chi^2 (1, N=36,032) = 63.96, p < .000$. The effect size for this finding, Phi, was small .042.

Substance Abuse Problem: Rural veterans were reported to have a lower rate of substance abuse problems (5.8%) compared to non-veterans at (15.2%). $\chi^2 (1, N=36,032) = 454.47, p < .000$. The effect size for this finding, Phi, was small .112 (Cohen, 1988).

History of Mental Health Treatment: Rural veterans had a low reported percentage of history of mental health treatment (23.8%) compared to 29.5% of rural non-veterans. $\chi^2 (1, N=36,032) = 92.37, p < .000$. The effect size for this finding, Phi, was small -.051 (Cohen, 1988).

Table 2.1
Bivariate Analysis Rural Decedents, Comparison of Veterans and Non-Veterans

	Veteran		Non-Veteran		Test	p	Effect Size
	N	%	N	%			
					T-Test		
Age	7421		28611		t(38,032) =520.07 $\chi^2 (df)$	<.001	N/A
Sex					1,633.23 (1)	<.001	Phi = .213
Female	205	2.8%	6,728	23.5%			
Male	7,216	97.2%	21,883	75.2%			

Table 2.1 (continued)

	Veteran		Non-Veteran		Test	p	Effect Size
	N	%	N	%			
Race					161.96 (5)	<.001	C'sV = .07
White	7031	94.9%	25,947	90.9%			
Black	211	2.8%	953	3.3%			
AI/PI	123	1.7%	1,326	4.6%			
Asian	32	.8%	223	.4%			
Latino	11	.1%	91	.3%			
Ethnicity					63.31 (2)	<.001	Phi = .04
Not Hispanic	7,201	97%	27,197	95.1%			
Hispanic	167	2.3%	1,213	4.2%			
Marital Status					1,499.6 (6)	<.001	C'sV=.204
Married	3,401	45.8%	9,943	34.8%			
Never Married	925	9.4%	8,907	31.1%			
Widowed	996	13.4%	1,625	5.7%			
Divorced	1,850	24.9%	6,672	23.3%			
Education					340.63 (8)	<.001	C'sV = .10
8 th Grade <	344	4.6%	1370	5.4%			
9 th to 12 th	473	6.4%	4011	14%			
HS or GED	2861	38.6%	10358	36.2%			
Some Coll	892	12%	3079	10.8%			
Associate Degree	394	5.3%	1515	5.3%			
Bachelor's Degree	479	6.5%	1514	5.3%			
Master's Degree	187	2.5%	534	1.9%			
Doctorate	87	1.2%	220	.8%			

Table 2.1 (continued)

	Veteran		Non-Veteran		Test	p	Effect Size
	N	%	N	%			
Physical Health Prob					1208.43(1)	<.001	Phi=.183
No	4772	64.3%	23679	82.8%			
Yes	2649	35.7%	4953	17.2%			
Alcohol Prob					63.96(1)	<.001	Phi=.042
No	6506	87.7%	24010	83.9%			
Yes	915	12.3%	4601	16.1%			
Sub Problem					454.46(1)	<.001	Phi=.112
No	6991	94.2%	24257	84.8%			
Yes	430	5.8%	4354	15.2%			
HX of MH TX					92.37(1)	<.001	Phi=.05
No	5653	76.2%	20181	70.5%			
Yes	1768	23.8%	8430	29.5%			
Mechanism					942.04(3)	<.001	C'sV=.162
Firearm	5772	77.9%	16752	58.6%			
Suffocation	811	10.9%	6442	22.5%			
Poisoning	614	8.3%	4051	14.2%			
Other	213	2.9%	1325	4.6%			
Firearm (when used)					46.38(2)	<.001	C'sV=.05
Handgun	3589	70.7%	9591	65.7%			
Rifle	670	13.2%	2384	16.3%			
Shotgun	814	16%	2631	18%			

C'sV = Cramer's V

HS/GED = Received a High School Diploma or General Educational Development

Prob = Problem

Sub = Substance

HX of MH TX = History of Mental Health Treatment

AI/PI = American Indian / Pacific Islander

Multivariate Analysis

Military veteran status was chosen as the dependent variable with the following variables as the independent (predictor) variables: Age, Sex, Marital Status, Educational Level, Mechanism of Death, History of Mental Health Treatment, Alcohol Problems, Substance Abuse Problems, and Physical Health Problems. Some variables were marked as categorical: marital status, education level, and mechanism of death. A forward stepwise binary logistic regression model was completed using a dichotomous variable of whether the decedents were a veteran or not a veteran. A stepwise regression was used to help identify a more parsimonious sub model relative to a full model by evaluating the relative contribution of each variable at a given step of the procedure (Young, 2022).

The regression model was created to examine the characteristic variables of rural veteran and rural non-veteran decedents. The overall model had a greater ability to predict group membership into the veteran category as compared to the null model. Collinearity diagnostics were completed to check for outliers. The data was checked for multivariate outliers and multicollinearity. 657 outliers were removed from the analysis. The outliers were removed as to not unduly influence the results of the analysis. Reference categories were designated as follows: Marital (first -married), Education Level (first - < 8th grade), Mechanism of Death (last -other). Confidence intervals for exponentiated B were amended to 99%. The regression model indicated that the overall model was questionable ($-2 \text{ Log likelihood} = 29413.3$) but was reliable in distinguishing between veteran and non-veteran status [$\chi^2 (1) = 11.32, p < .001$]. The Hosmer and Lemeshow test was noted to be significant $p < .001$ (Hosmer, Lemeshow, & Sturdivant, 2013). However, the overall model was able to accurately classify 82.1% of group

membership into the veteran category. The model explained 28.2% (Nagelkerke R²) of the ability to predict veteran status.

Table 2.2
Binary Logistic Regression Rural Decedents

							99% C.I. for EXP(B)	
Variable	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Sex	2.5	.25	696.87	1	.000	11.7	9.6	14.25
Age	.05	.001	1776.9	1	.000	1.05	1.05	1.05
Substance Abuse	-.38	.04	44.06	1	.000	.68	.59	.79
Physical Health	.13	.04	14.20	1	.000	1.14	1.04	1.30
Firearm	.36	.083	18.42	1	.000	1.43	1.15	1.77

Substance Abuse Problem
Physical Health Problem

Discussion

We sought to determine differences in rural veterans who died by suicide compared to rural non-veterans who died by suicide to better understand how suicide prevention might be similar or different for these two populations. Only rural decedents were included in the analysis. Veteran status was used as the dependent variable. When controlling for age, the suicide decedents in the sample were 11.70 times more likely to be male veterans. Rural Veterans were 31.8% less likely to have reported substance abuse problem compared to rural non-veterans. This may be due to the stigma of seeking treatment within the veteran and rural communities (Hirsch, 2006; Seal, Bertenthal, Minder, Sen, & Marmar, 2007; Hirsch & Cukrowicz, 2014; Sharp, Fear, Rona, Wessely,

Greenber, Jones, & Goodwin, 2014). Alcohol use, marital status, and race did not meet statistical significance and was removed from the analysis as part of the stepwise process.

The regression model also showed that rural veterans were more 14.3% more likely to have physical health problems compared to rural non-veterans. In some studies, it was found that rural veterans were older, had more physical comorbidities, and mental health comorbidities than non-veterans (Weeks, Wallace, Wang, Lee, & Kazis, 2006; Weeks, Wallace, West, Heady, & Hawthorne, 2008). Due to the increased incidence of comorbidities each decedent would be more likely to seek treatment for those conditions. This might provide additional opportunities for screening for suicide during those routine episodes of care. Medical providers should also be cognizant of the intersection of chronic medical problems and the incidence of suicide risk (LeFevre, 2014; Gaynes, West, Ford, 2004; O'Neil et al., 2012).

Consistent within the existing literature (Monteith, Smith, Holliday, Holliman, LoFaro, & Mohatt, 2020, McCarthy, Blow, Ignacio, Ilgen, Austin, & Valenstein, 2011, Shiner, Peltzman, Cornelius, Gui, Forehand, & Watts, 2021). the regression model showed that rural veterans were 1.43 times more likely to die using a firearm compared to rural non-veterans. With this increased risk for rural veterans, screening should be completed as a portion of every physical health and mental health episode of care. A focus on harm reduction by clinical staff should include gun locks that are specific to the guns with the greater risk i.e., handgun locks. Discussions with the client and their family should include harm reduction strategies that include storing a firearm in locked location, storing the firearm unloaded, storing the ammunition in a different location, and having a family/friend retain the firearm during times of crisis (McCourt, 2021; Mann, & Micel,

2016). As previously stated, veterans and rural residents have a greater rate of firearm ownership (Kim, Mickelson, Brenner, Haws, Yurgelun-Todd, Renshaw, 2011; Cleveland, Azrael, Simonetti, & Miller, 2017). Those that own firearms are not normally readily willing to part with their firearms. These conversations will require more time and energy from the medical/mental health providers but are important given how commonly guns are used in rural veteran suicides. A patient should be assessed for suicidality at every appointment. Suicide is “everyone’s business” and should be assessed as a portion of routine health care services (Ahmedani, Simon, Stewart, Beck, Waitzfelder, Rossom, Lynch, Owen-Smith, Hunkeler, Whiteside, Operskalski, Coffey, & Solberg, 2014; Turecki, Brent, Gunnell, O’Conner, Oquendo, Pirkis, & Stanley, 2019). The Department of Veterans Affairs are also implementing a community-based approach in addition to the traditional clinical avenues. With the VA the Together With Veterans (TWV) program involves partnering with veteran clients and the rural communities in which they reside. These measures involve veteran community members and other veterans to directly address issues of loneliness, isolation, and lethal means reduction (VA, 2022).

Limitations and Future Directions

The present study was able to compare characteristics of rural veterans and rural non-veteran suicide decedents to identify differences between these two populations. However, there are several limitations to the study. First, the sample only includes up to 40 states at the time data were available and is therefore not fully representative of their entirety of the United States. Secondly, deaths are sometimes misclassified by law enforcement officers, coroners, and medical examiners or there is the possibility of bias regarding classifying suicide as the cause of death (Mohler & Earls, 2001; Moyer, Boyle,

& Pollock, 1989; Phillips, Robin, Nugent, & Idler, 2010; Shepard, Gurewich, Reed, & Silverman, 2017). The classification and/or misclassification of veteran status within the NVDRS is reported to be approximately 95% accurate. This information is gleaned from the death certificate and the self-reported (family/friend informant) report of veteran status (Huguet, Kaplan, & McFarland, 2014).

Future studies should include a greater majority of the United States population to be more representative of the entire population. The National Violent Deaths Reporting System (NVRS) now includes as 50 states and the District of Columbia (CDC, 2022). NVDRS through the Affordable Care Act enabled funding for the entirety of the United States (Safe States, 2020). With the addition of all the states of United States, reporting will improve researchers' ability to gather and study variables specific to suicide and other violent death phenomena in rural veterans and non-veterans. These future directions could be specific to the type of the potential mechanisms of harm used by rural veterans and rural non-veterans. A harm reduction strategy could further be tailored to the specific type of firearms found within the homes of those that live in rural areas. Open dialogue should occur between the physical/mental health provider and the client regarding how, where, and condition (loaded/unloaded) firearms are stored. This would afford an opportunity to discuss with whom the weapon may be temporarily stored with during a time of crisis. This would allow the client to make concrete choices about their options and include a larger span of support. Additional directions could be consistent with the reported physical and mental comorbid conditions being treated within the realm of primary care providers. Those primary care providers could screening for suicidality during the treatment of the rural resident's physical or mental health issues.

Chapter 3: Comparison of Rural Veteran and Urban Veteran Suicide Decedents

Introduction

Rural and veteran suicide decedents within the United States consistently have a higher-than-average rate of suicide when compared to the general population (Arbore, 2019; Harp & Borders, 2019; Conner, Azrael, & Miller, 2019; Hogan, 2019; VA, 2019). There is a wealth of information within the existing literature about veteran suicide (Hogan, 2019; Stanely, Gutierrez, & Joiner, 2017; VA, 2019). Veterans have a higher rate of death by suicide when compared to the general population (Wood, Wood, Watson, Sheffield, & Hauter, 2020; McCarthy et al., 2015; Elbogen, Fuller, Johnson, Brooks, Kinneer, Calhoun, & Beckham, 2010; Hogan, 2019). Most veterans that die by suicide use a firearm (Valenstein, Walters, Pfeiffer, Gonoczy, Miller, Fiorillo, & Bossarte, 2018; VA, 2016). Veterans have a higher familiarity with lethal means of suicide and have a higher rate of firearm ownership when compared to other groups within our modern society (Cleveland, Azrael, Simonetti, & Miller, 2017; Hamilton, Lemeshow, Saleska, Brewer, & Strobino, 2018).

To a lesser degree, the topic of rural suicide has been explored (Hirsch, 2006; Hirsch & Cukrowicz, 2014; Niederkrotenthaler, Reidsenburger, Benedikt, & Gould, 2014). Living in a rural area places a person at a greater risk of death by suicide when compared to urban residents (Searles, Valley, Hegaard, & Betz, 2014). Firearms are more readily available in rural areas. It is more of an accepted social norm to own and use firearms for those that reside in rural areas (Cleveland, Azrael, Simonetti, & Miller, 2017; Mohatt, Kreisel, Hoffberg, Wendleton, & Beehler, 2020). Both rural residents and veterans have a

greater familiarity with firearms than non-rural or non-veteran populations. However, there is a marked lack of existing research regarding the topic of rural veteran suicide (Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutschman, Bonnell, & Cardin, 2017).

The Present Study

Both veteran status and rural status increase risk for suicide. Therefore, it is important to explore the relationship of veteran status and rurality status in relation to those who have died by suicide to determine how prevention techniques might need to be targeted based on each of these. The purpose of this study was to examine the variables that differ when comparing rural veteran and urban veteran suicide decedents.

It has been stated that as rurality increases (lower population density) that the rate of suicide increases (Opoliner, Azrael, Barber, Fitzmaurice, & Miller, 2014). The Interpersonal Theory of Suicide is relevant to the current study. Specifically, the feeling of isolation as part of the Thwarted Belongingness aspect of the theory. The feeling of thwarted belongingness is a risk factor for suicidal ideation (Ma, et al., 2019). Geographic isolation can be an aspect rural life however social isolation can occur in either a rural or urban areas (Chu et al, 2017). However, feelings of social isolation are not fully dependent on rurality status. Some may feel isolated while in a room full of people.

Being a veteran further subdivides this group apart from the general population. As a portion of training provided to military service personnel, they have a greater familiarity with firearms. Throughout the nation, firearms remain the highest mechanism of death in all reported suicides (CDC, 2022). The combined factors of familiarity of

firearms and a high percentage of gun ownership with the veteran population add to the risk of suicide using firearms in the veteran population (McCarthy et al., 2015). This study examines differences in veterans in rural areas compared to urban ones. I hypothesized that rural veterans were more likely than urban veterans to die using a firearm and rural veterans were less likely to have a history of mental health treatment.

Method

This analysis included decedents from the National Violent Death Reporting System (NVDRS) Restricted Access Database (RAD) that died by suicide from 2003-2017. This study utilized the National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to denote an area as rural or urban. Each decedent was coded using the National Center for Health Statistics to denote their level of rurality as a dichotomous variable as either urban or rural residency at the time of death. The scheme was developed to reflect health variations in demographics, economic, social, and community characteristics relative to the availability of health care resources. The NCHS Urban-Rural Classification Scheme for Counties is a taxonomy used to identify each county or county level equivalent as either rural or urban. The NCHS Scheme classifies each county or county level equivalent into one of six possible classification categories. Categories one through four are urban (metropolitan). Categories five and six are classified as rural (non-metropolitan) (Ingram, & Franco, 2012).

The study sample are those decedents listed in the NVDRS RAD from 2003-2017. The NVDRS RAD is a de-identified, multi-state, case level microdata set comprised of a variety of unique variables. The RAD data for the timeframe 2003-2017 includes decedent information for up to 40 participating states and the District of

Columbia n=199,730. The NVDRS is an ongoing state-based surveillance system funded by the Centers for Disease Control and Prevention (CDC) that collects data on all violent death occurring in participating states or territories of the United States (Blair, Fowler, Jack, & Crosby, 2016).

The NVDRS collects specific data from death certificates, coroner/medical examiner reports, law enforcement reports, and toxicology reports. Abstractors input specific data regarding variables such as the mechanism of death, type of weapon used, type of method used, and antecedent circumstances using coding guidance from the Centers for Disease Control. Abstractors also include narrative information provided by the coroner/medical examiner or law enforcement to provide a better description of the fatal event (CDC, 2019).

The National Violent Death Reporting System (NVDRS) collects more than 600 data elements into an anonymous database regarding all reported suicide deaths for those states or territories that participate in the reporting system (CDC, 2019).

Analytic Procedure

Descriptive analyses of the characteristics and circumstance variables among rural veteran suicide decedents compared to urban veteran suicide decedents were conducted. Analyses compared decedent's age, sex, marital status, mechanism of death (firearm, suffocation, poisoning, or other), history of mental health treatment, alcohol problem, substance abuse problems, and physical health problems. Chi-square tests and a t-test were used to compare rural veterans and urban veteran decedents. Two-tailed p-values <0.001 was considered statistically significant due to the size of the sample (Huck, 2012; Mertler & Vanetta-Reinhart, 2017). Variables were further analyzed using a logistic

regression model, controlling for age, sex, veteran status, and rurality status, and presented as AORs and 99% CIs. The binary rurality variable was used as the dependent variable with age, sex, marital status, education level, method of suicide, history of mental health treatment, alcohol problem, substance abuse problem, and physical health problems as the independent variables. All statistical analyses were performed using SPSS, version 27 software (SPSS Inc., Chicago, IL).

Results

Cases were selected from the larger national dataset to only include suicide decedents that were identified as veterans ($N=35,217$). Suicide decedents were between 18 and 101 years of age ($M=47.4$, $SD=19.91$). Most of the decedents were identified as White ($N=32,533$, 92.7%) and were mostly male ($N=33,974$, 96.5%). Ethnicity was reported as mainly non-Hispanic ($N=33,981$, 96.5%). The abstractors at the CDC had eight different categories to describe the marital status of each decedent. The largest groups within the category of marital status were as follows: Married/Civil Union/Domestic Partnership ($N=15,466$, 43.9%), Divorced ($N=8,631$, 24.5%), Never Married ($N=5,545$, 15.7%), and Widowed ($N=4,212$, 12%). The abstractors had eight different categories to classify the educational level of each decedent. The four largest groups were as follows: High School Graduation or GED ($N=11,578$, 32.9%), some college ($N=4,709$, 13.4%), Associate Degree ($N=2,035$, 5.8%), and bachelor's degree ($N=3,009$, 8.5%). Within this veteran population ($N=9,937$, 28.8%) had a reported history of mental health treatment. More than one in ten were reported to having had an alcohol problem ($N=4,961$, 14.1%). Veterans that were reported to having had a problem with substance were ($N=2,576$, 7.3%). Within this sample, about a third of veterans had

reported physical health problems (N=11,651, 33.1%). The combined method of death was collapsed into four categories: Firearm, Hanging/Suffocation, Poisoning, and other. Within this sample of veteran decedents, the breakdown of each category is as follows: Firearm (N=24,571, 69.9%), Hanging/Suffocation (N=5,282, 15%), Poisoning (N=3,669, 10.4%), and Other (N=1,627, 4.6%). For those that died using a firearm, almost 2/3 (N=17,222, 77.1%) used a handgun followed by shotgun (N=2,948, 13.2%) and rifle (N=2,169, 9.7%).

Bivariate Analysis

Chi-square tests and a t-test were then completed to examine the relationship between rurality status (rural/urban) and characteristics of each suicide decedent (Sex, Race, Ethnicity, Marital Status, Alcohol Problems, Substance Abuse Problems, History of Mental Health Treatment, Physical Health Problems, Combined Cause of Death, and Firearm Type) and a t-test was utilized to examine difference in age. Post hoc analyses were conducted via examination of adjusted residuals that were greater than 1.96 to appropriately identify statistical significance of specific subgroups within the overall chi-square test. No issues were noted via the post hoc analysis.

Age: A t-test was completed to compare rural veterans and urban veterans. Rural veterans had a higher mean age (M=61.16 SD=18.08) compared to urban veterans (M=57.76 SD=19.06), $t(35161)=-13.80$, $p<.001$.

Sex: Within this study sample, 97.2% of the rural veteran suicide decedents were identified as male compared to 96.3% of urban veteran decedents. $X^2(1, N= 35,188) = 16.39$, $p <.001$. The effect size for this finding, Phi, was small .022 (Cohen, 1988).

Race: Veteran decedents were predominately white with 94.9% (rural) and 92.1% (urban) $X^2(5, N = 35,076) = 279.6, p < .001$. The overall effect size for this finding, Cramer's V, was small .089 (Cohen, 1988).

Ethnicity: There was a lack of ethnic diversity in the sample with 97% of the reported rural sample as non-Hispanic compared to 96.4% of the urban sample $X^2(2, N=35,188) = 8.35, p < .001$. The effect was small, Phi, .08 (Cohen, 1988).

Marital Status: The CDC abstractors have several choices for classifying marital status. The largest group reported was Married/Civil Union/ Domestic Partnership at 45.9% (rural) vs. 43.3% urban. The differences between the group categories were small $X^2(6, N=35,188) = 97.44, p < .001$. The effect size for this sample, Cramer's V was small .05 (Cohen, 1988).

Physical Health Problems: Rural veterans were reported to have a higher percentage (22.7%) of reported physical health compared to urban veteran decedents (20.3%) $X^2(1, N=35,188) = 27.68, p < .001$. The effect size for this finding, Phi, was small .03 (Cohen, 1988).

Alcohol Problems: A smaller percentage of rural veteran decedents had reported alcohol problems (12.3%) compared to urban veteran decedents (14.6%). $X^2(1, N=35,188) = 24.27, p < .001$. The effect size for this finding, Phi, was small .03 (Cohen, 1988).

Substance Abuse Problems: Rural veteran decedents had a lower reported percentage of substance abuse problems (5.8%) compared to urban veteran decedents (7.7%). $X^2(1, N = 35,188) = 32.23, p < .001$. The effect size for this finding was small, Phi, .03 (Cohen, 1988).

History of Mental Health Treatment: Rural veterans had a lower percentage of mental health treatment (23.8%) compared to urban veteran decedents (29.5%). $X^2(1, N=35,188) = 90.95, p<.000$. The effect size for this finding, Phi, was small .05 (Cohen, 1988).

Mechanism of Death: Rural veterans were more likely (77.9%) to use a firearm as a means of suicide compared to urban veterans at (67.8%). Rural veterans were less likely to die by hanging/suffocation (10.9%) compared to urban veterans (16.1%). Rural veterans were less likely to die by the use of poisoning (8.3%) compared to urban veterans (11%). $X^2(3, N=35,127) = 291.54, p<.000$. The effect size for this finding, Cramer's V, was small .091 (Cohen, 1988).

Firearm Type: Rural veterans used a rifle 13.2% of the time compared to 8.7% for urban veterans. Rural veterans used a shotgun 16% of the time compared to 12.3% for urban veterans. Rural veterans used a handgun 70.7% compared to urban veterans who used a handgun 79%. $X^2(3, N=22,337) = 158.18, p <.000$. The effect size for this finding, Cramer's V, was small .084 (Cohen, 1988).

Table 3.1
Bivariate Analysis Veteran Decedents, Comparison of Rural and Urban Suicide Decedents

	Rural Veteran		Urban Veteran		Test Statistic	p	Effect Size
	n	%	n	%			
Age	7421	21.10	27742	78.90	t-test		N/A
Mean	61.16		57.76		t(35161)=-13.80	<.001	
SD	18.08		19.06		X^2 (df)		
Sex					16.39 (1)	<.001	Phi = .02
Female	205	2.8%	1037	3.7%			
Male	7223	97.2%	26723	96.3%			

Table 3.1 (continued)

	Rural Veteran		Urban Veteran		Test Statistic	p	Effect Size
	n	%	n	%			
Race					279.6 (5)	<.001	C'sV = .09
White	7038	94.9%	25471	92.1%			
Black	211	2.8%	1757	6.4%			
AI/PI	123	1.7%	118	0.4%			
Asian	32	0.4%	232	0.8%			
Latino	11	0.1%	100	0.3%			
Ethnicity					8.35 (2)	.015	Phi = .08
Not Hispanic	7,206	97%	26755	96.4%			
Hispanic	169	2.3%	803	2.9%			
Marital Status					97.44 (6)	<.001	C'sV=.05
Married	3,406	45.9%	12055	43.4%			
Never Married	925	12.5%	4614	16.6%			
Widowed	997	13.4%	3216	11.6%			
Divorced	1851	24.9%	6767	24.4%			
HX of MH TX					90.95 (1)	<.001	Phi = .05
No	5660	76.2%	19596	70.6%			
Yes	1768	23.8%	8164	29.4%			
Alcohol Problem					24.27 (1)	<.001	Phi = .03
No	6513	87.7%	23719	85.4%			
Yes	915	12.3%	4041	14.6%			
Substance Abuse					32.23 (1)	<.001	Phi = .03
No	6998	94.2%	25617	92.3%			
Yes	430	5.8%	2143	7.7%			

Table 3.1 (continued)

	Rural Veteran		Urban Veteran		Test Statistic	p	Effect Size
	n	%	n	%			
Physical Health Problem					27.68(1)	<.001	Phi=.03
No	4779	64.3%	18758	67.6%			
Yes	2649	35.7%	9003	32.4%			
Mechanism					291.54(3)	<.001	C'sV=.09
Firearm	5777	77.9%	18793	67.8%			
Suffocation	811	10.9%	4464	16.1%			
Poisoning	616	8.3%	3044	11%			
Other	213	2.9%	1409	5.1%			
Firearm (for those used a firearm)					158.18(3)	<.001	C'sV=.08
Handgun	3589	70.7%	13633	79%			
Rifle	670	13.2%	1498	8.7%			
Shotgun	814	16%	2132	12.3%			

AI/PI = American Indian/ Pacific Islander
 C'sV = Cramer's V
 SD = Standard Deviation
 HX of MH TX = History of Mental Health Treatment

Multivariate Analysis

Rurality status was chosen as the dependent variable with the following variables as the independent (predictor) variables: Age, Sex, Marital Status, Mechanism of Death, History of Mental Health Treatment, Alcohol Problems, Substance Abuse Problems, and Physical Health Problems. Cases were selected to only include veteran decedents. A binary variable was created to provide a dichotomous option of rural or urban. Marital status and mechanism of death were marked as categorical within the regression

equation. A forward stepwise binary logistic regression model was completed using a dichotomous variable of whether the decedent was a rural or urban resident. A stepwise regression was used to help identify a more parsimonious sub model relative to a full model by evaluating the relative contribution of each variable at a given step of the procedure (Young, 2022). The regression model was created to examine the characteristics of rural veteran and urban veteran decedents. The model had a greater predictive capability than the null model. Collinearity diagnostics were completed check for multivariate outliers. The data was checked for multivariate outliers and multicollinearity. 286 outliers were removed from the analysis. The outliers were removed as to not unduly influence the results of the analysis. Reference categories were designated as follows: Marital (first-married), Mechanism of Death (last-other). Confidence intervals for exponentiated B were amended to 99%. The overall regression model indicated that the model was questionable ($-2 \text{ Log likelihood} = 34,569.7$) but was found to be reliable in the ability to distinguish between rural veterans and urban veterans [$X^2 (1) = 39.02, p < .001$]. The Homer and Lemeshow test was noted to be non-significant $p = .076$ (Hosmer, Lemeshow, & Sturdivant, 2013). The overall model was able to accurately classify 78.7% of group membership into the rural veteran category. The model was only capable at 19% (Nagelkerke R^2) to measure the total variability of the dependent variable as explained by the independent variables in the stepwise regression.

Table 3.2
Binary Logistic Regression – Urban Veteran and Rural Veteran Suicide Decedents

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Age	.007	.001	93.704	1	.000	1.007	1.05	1.009
HX MH TX	-.195	.032	38.29	1	.000	.823	.758	.89
Mechanism of Death			183.28	3	.000			
Firearm	.657	.078	70.58	1	.000	1.93	1.58	2.36
Suffocation	.237	.086	7.57	1	.006	1.27	1.02	1.58
Poisoning	.317	.090	12.396	1	.000	1.37	1.09	1.73

HX MH TX History of mental health treatment

Discussion

We sought to determine differences in rural veterans who died by suicide compared to urban veterans who died by suicide to better understand how suicide prevention might be different for these two populations. Through the regression process, the following variables were retained in the stepwise process: Sex, Marital Status, Alcohol Abuse, Substance Abuse, and Physical Health Problems. When controlling for age, rural veterans were 1.929 times more likely to die by suicide from the use of firearm compared to urban veterans. Firearms are more readily available in rural areas. It is more of an accepted social norm to own and use firearms for those that reside in rural areas (Mohatt, Kreisel, Hoffberg, Wendleton, & Beehler, 2020). Both rural residents and veterans have a greater familiarity with firearms than urban or non-veteran populations. Rural veterans were more likely to die by firearms. Because rural veterans are two times more likely to die using firearms, this type of harm reduction discussion should be a

specific focus of providers. This type of intensified focus should include the ability of the client to access firearms, if they are stored in a locked location, if the weapon(s) are stored loaded, if the weapon(s) are stored in a different location than the ammunition, and if the client has a trusted person to store the weapon(s) during the time of a crisis. The inclusion of a trusted second party might also provide another avenue of support for the client that might be considering suicide. The inclusion of secondary support should be age specific. Younger veterans have reported hesitancy to be present within traditional Veteran Service Organizations such as Veterans of Foreign Wars or Legion Halls. Not all rural areas have formal support networks in place therefore the need of new and different type supports for veteran old and young.

Rural veterans were less likely (17.7%) to have a reported history of mental health treatment compared to non-rural veterans. This is consistent with other research regarding a lack of access to mental health services in rural areas. Additionally, even in rural areas that have mental health services, it has been shown that residents were resistant to accepting those services even if available (Hirsch, 2006; Hirsch & Cukrowicz, 2014; Seal, Bertenthal, Minder, Sen, & Marmar, 2007; Sharp, Fear, Rona, Wessely, Greenber, Jones, & Goodwin, 2014; Mohatt, Kreisel, Hoffberg, Wendleton, & Beehler, 2020). Within the military there has been and continues to be a culture of resistance to seeking or receiving mental health services. This is reported to be due to the stigma of having mental health issues and concerns about the presumed negative effect upon the service person's career (Quartana, Wilk, Thomas, Bray, Rae-Olmsted, Brown, Williams, Kim, Clarke-Walper, & Hoge, 2014, Hom, Stanley, Schneider, & Joiner, 2017; Waizkin, Cruz, Shuey, Smithers, Muncy, & Noble, 2018).

Suicide screening should be a portion of every episode of health care. This may allow for those at risk to garner assistance to decrease their suicide risk while having their physical needs addressed. However, universal suicide screening is not universally supported in the medical community due to a reported lack of evidence to support this practice as well as the limits on availability of providers for those screened (Bryan, Allen, & Hoge, 2022). As part of the VA's primary care focus every veteran is screened for suicide risk at every appointment and the VA has sufficient providers to refer every veteran who screens positive. The time constraint upon providers is minimal to screen for indication of suicidality (Bowers, et al., 2018). A positive screening will then result in a more in-depth suicide assessment by a mental health provider (VA,2020). In addition to the routine screening and assessment completed by the VA, rural veterans need additional support. Providers could attempt to garner additional social support in those rural areas of residence. The Veterans Health Administration could partner with the Veterans Center, Veteran Service Organizations, Community Clubs/Organizations, or Community Health Organizations to help begin support groups. These groups could be led by peers or include a mental health provider from the community. The purpose of these groups could provide a consistent mechanism of support for these rural veterans. This type of civic service could help veterans with reintegration, identity adjustment, and possibly reduce the subjective feelings of loneliness felt by prior service members (Lawrence, Matthieu, & Robertson-Blackmore, 2019). These types of group-oriented activities can focus on isolation. This may improve veteran's sense of identity, belongingness, and purpose while giving the veteran the ability to help themselves and their fellow service members (Gettings, Kirtley, Wilson-Menzfled, Oxburgh, Farrell, & Kiernan, 2022).

Not all veterans receive care through the Department of Veterans Affairs. Approximately one-fifth of the nation's veterans receive services from the VA (McCarthy et al., 2012). Not all veterans are eligible for health care due not wanting to receive care through the VA, not having a service-connect illness/injury, having received less than an honorable discharge, and because their income exceeds current thresholds (VA, 2022). Because a minority of veterans receive care at the VA, the suicide screening practices of the VA could be beneficial to those serviced outside of the VA. This assumes that there is capacity for referral to a qualified mental health professional in a timely fashion. Suicide screening adds a small amount of time to each episode of care, but the benefits well outweigh the associated time burden (Bowers et al., 2018). Primary care outside of the VA does not normally include having a mental health provider on staff to complete a thorough suicide assessment for every patient that screens positive for suicidality. As portion of the episode of care providers should discuss the reduction of lethal means including safe storage of firearms, storing the firearm unloaded, storing the firearm in a different location than ammunition, and having a friend or family store the firearm during times of crisis (VA, 2022). In addition, the care provider should provide the client with available support that are needed to meet the specific needs of their client. Those supports could be providing the crisis line number, local mental health providers, and might even include involving the court system as a last resort for those that are at the highest risk for suicide. The follow-up services recommended by the provider would be specific to meet the needs of the client. Some may need information to whom they may contact if they were to have suicidal thoughts. Other clients may need an in-depth mental health assessment to identify those with a specific plan and access to lethal means. As a

last resort the provider may need to contact the court system to work toward a civil commitment. This the process when a person can be placed in a mental health unit against their will. During this process the client's civil liberties are temporarily removed to safeguard against those that are deemed an imminent risk to themselves or others. Involuntary hospitalizations should be used sparingly and only when truly needed due to the increased risk of suicide post hospitalization (Chung, Hadzi-Pavlovic, Wang, Swaraj, Olfson, & Large, 2019; Kessler, Bauer, Biship, Delmer, Dobscha, Gildea, Goulet, Karras, Kreyenbuhl, Landes, Liu, Luedtke, Mair, McAuliffe, Nock, Petukhova, Pigeon, Sampson, Smoller, Weinstock, & Bossarte, 2020).

Limitations and Future Directions

The present study compared the characteristics of rural veteran suicide decedents and urban veteran suicide decedents to identify differences in these two populations. However, there are several limitations this study. Suicide has been found to be underreported (Mohler & Earls, 2001; Moyer, Boyle, & Pollock, 1989; Phillips, Robin, Nugent, & Idler, 2010; Shepard, Gurewich, Aung, Reed, & Silverman, 2017; Steelsmith, Fontanella, Campo, Bridge, Warren, & Root, 2019). This sample only included 40 states and therefore is not truly representative of the entirety of the United States. NVDRS data only includes information that may be evident to the Medical Examiner or Coroner at the time of the person's death. This is not related to a specific substance use or substance abuse diagnosis but is part of the reporting process based upon the information that is available to them at the time of their examination (CDC, 2021). As noted with the underreporting of death by suicide there is also a reluctance to note issues with mental health and substance use/abuse within the existing literature (Mohler & Earls, 2001;

Moyer, Boyle, & Pollock, 1989; Phillips, Robin, Nugent, & Idler, 2010; Shepard, Gurewich, Aung, Reed, & Silverman, 2017; Steelsmith, Fontanella, Campo, Bridge, Warren, & Root, 2019). The reporting of variables regarding a death are also different in form and function throughout the nation. In more urban areas a medical examiner may be used to examine each decedent. Within rural areas coroners are used which may or may not be medically trained. In the state of Kentucky Coroners are a constitutional office where they are elected to office (KRS,72). Most of the time each coroner is affiliated with funeral home in the area. However, some a merely elected to office. Because of the possible lack of medical training issues with substance use, mental health issues, and other items may be underreported or not reported due to the bias noted above. A cornerstone of this study was the issue of isolation. The use of rurality was used as proxy for isolation however isolation was not specifically measured in this study.

Future studies should include every state to be more representative of the entire population. The National Violent Death Reporting System now includes all 50 states and the District of Columbia (CDC, 2022). With the additional of all the states of United States reporting will improve researchers' ability to gather and study variables specific this this and other violent death phenomena.

Chapter 4: Differences of Variables of Suicide Decedents Depending on the Degree of Rurality

Introduction

The rate of suicide has consistently been reported to be higher in rural areas of the United States (Arbore, 2019; Conner, Azrael, & Miller, 2019; Harp & Borders, 2019; Ivey-Stephenson, Crosby, Jack, Haileyesus, & Kresnow-Sedacca, 2017; Hedegaard, Curtin, Warner, 2018; Kegler, Stone, & Holland, 2017; Rossen, Hedegaard, Khan, & Warner, 2018; Searles, Valley, Hedgaard, & Betz, 2014; Tarlow, Johnson, & McCord, 2018). Some theorize that the increased rate of suicide in rural areas may be due to a lack of social integration within rural areas (Singh & Siapush, 2002). Research has shown that as the population density in each area decreases the rate of suicide increases (Opoliner, Azrael, Barber, Fitzmaurice, & Miller, 2014).

Most previous research has evaluated the characteristics of suicide decedents based upon larger categories of rurality and urbanicity i.e., either rural or urban (Searls, Valley, Hedegaard, & Betz, 2014). Some studies have looked at suicide at a more granular level using up to 10 degrees of classification (Branas, Nance, Elliott, Richmond, & Schwab, 2004). Each of these approaches has provided useful information regarding gathering information to better inform future research, policy changes, and clinical interventions. Theoretically the areas of consideration could be further delineated but the usefulness of the information may not garner any additional information. Other studies have used a variety of rurality classifications based upon the questions to be answered within the given studies. The current study uses National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties due to the specific questions being asked within the study framework (Ingram, & Franco, 2012).

Geographic isolation is one facet of rural life. This isolation can lead to feelings of isolation and the feeling of loneliness. Additional cultural factors may influence behaviors related to not seeking assistance with mental health needs or other health care needs (Hirsch & Cukrowicz, 2014; Niederkrotenthaler, Reidenberg, Benedikt, & Gould, 2014). Access to lethal means is another portion of the reality in rural areas. Throughout the United States, the leading mechanism of suicide is using a firearm (CDC, 2021). Within rural areas there is a stable tradition to own firearms and a greater familiarity with firearms than those that live in urban areas (Cleveland, Azrael, Simonetti, & Miller, 2017; Prickett, Gutierrez, & Deb, 2019; Alban, Nuno, Ko, Barmparas, Lewis, & Margulies, 2018; Allchin, Chaplin, & Horwitz, 2018).

The Present Study

There is documented association between rurality status and suicide. It is imperative to further explore the relationship of rurality to prevention future suicides. The purpose of this study to further examine the relationship of how rurality might influence the characteristics of those that die by suicide. This study employs a more granular classification of the degrees of rurality and urbanicity across a spectrum of classification versus a dichotomous perspective of either rural or urban. Utilizing this type of rurality classification will add in gaining further specificity of the characteristics of suicide decedents across the classification gradient. Within this current framework we anticipated being able to reveal the marked difference across the gradient. Specifically, we assumed that as rurality increases, fewer suicide decedents would either have access to or use mental health treatment. Additionally, we hypothesized that there would be difference in racial differences, ethnicity differences, and the average age of suicide decedents across

the rurality spectrum with more rural suicides being less diverse and older. Due to the availability and familiarity with firearms in rural areas, we anticipated a greater preponderance of firearm usage as rurality increased. Lastly, we anticipated that those that used a firearm as the method of suicide would use different types of weapons as rurality increased. Namely, we anticipated a higher rate of long gun usage in rural areas as compared to less rural areas with a higher incidence of handgun use.

Method

This analysis included decedents from the National Violent Death Reporting System (NVDRS) Restricted Access Database (RAD) that died by suicide from 2003-2017. This study utilized the National Center for Health Statistics' (NCHS) Urban-Rural Classification Scheme for Counties to denote an area as rural or urban. Each decedent was coded using the National Center for Health Statistics to denote their level of rurality as a dichotomous variable as either urban or rural residency at the time of death. The scheme was developed to reflect health variations in demographics, economic, social, and community characteristics relative to the availability of health care resources. The NCHS Urban-Rural Classification Scheme for Counties is a taxonomy used to identify each county or county level equivalent as either rural or urban. The NCHS Scheme classifies each county or county level equivalent into one of six possible classification categories. Categories one through four are urban (metropolitan). Categories five and six are classified as rural (non-metropolitan) (Ingram, & Franco, 2012).

The study sample are those decedents listed in the NVDRS RAD from 2003-2017. The NVDRS RAD is a de-identified, multi-state, case level microdata set comprised of a variety of unique variables. The RAD data for the timeframe 2003-2017

includes decedent information for up to 40 participating states and the District of Columbia n=199,730. The NVDRS is an ongoing state-based surveillance system funded by the Centers for Disease Control and Prevention (CDC) that collects data on all violent death occurring in participating states or territories of the United States (Blair, Fowler, Jack, & Crosby, 2016).

The NVDRS collects specific data from death certificates, coroner/medical examiner reports, law enforcement reports, and toxicology reports. Abstractors input specific data regarding variables such as the mechanism of death, type of weapon used, type of method used, and antecedent circumstances using coding guidance from the Centers for Disease Control. Abstractors also include narrative information provided by the coroner/medical examiner or law enforcement to provide a better description of the fatal event (CDC, 2019).

Analytic Procedure

Descriptive analyses of the characteristics and circumstance variables among suicide decedents along the rurality gradient were conducted. Analyses compared decedent's age, sex, marital status, mechanism of death (firearm, suffocation, poisoning, or other), history of mental health treatment, alcohol problems, substance abuse problems, and physical health problems. Two-tailed p-values <0.001 was considered statistically significant due to the size of the sample (Huck, 2012; Mertler & Vanetta-Reinhart, 2017). Variables were further analyzed using a logistic regression model, controlling for age, sex, veteran status, and presented as AORs and 99% CIs. The rurality gradient variable was used as the dependent variable with age, sex, marital status, education level, method of suicide, history of mental health treatment, alcohol problem,

substance abuse problem, and physical health problems as the independent variables. All statistical analyses were performed using SPSS, version 27 software (SPSS Inc., Chicago, IL).

Results

Cases were selected from the national dataset to only include suicide decedents ($N=199,730$). Suicide decedents were between 6 and 103 years of age ($M=46.21$, $SD=18.07$). Most of the decedents were identified as White ($N=176,659$, 88.9%) and over three fourths male ($N=155,252$, 77.7%). Ethnicity was reported as mainly non-Hispanic ($N=187,442$, 93.8%). The largest groups within the category of marital status were as follows: Married/Civil Union/Domestic Partnership ($N=67,343$, 33.7%), Never Married ($N=67,356$, 33.7%), Divorced ($N=43,044$, 21.6%), and Widowed ($N=11,854$, 5.9%). The four largest educational level groups were as follows: High School Graduate or GED recipient ($N=59,696$, 29.9%), some college ($N=24,127$, 12.1%), 9th to 12th grade without graduation ($N=22,100$, 11.1%), and bachelor's degree ($N=16,808$, 8.4%). Within this sample the veteran population was reported at ($N=35,217$, 19%). The rurality variable was coded using the coding scheme that classified each decedent along the 6-point scale of rurality or urbanicity (1 $N=33,957$, 17.1%, 2 $N=56,584$, 28.4%, 3 $N=47,776$, 24%, 4 $N=21,483$, 10.8%, 5 $N=22,649$, 11.4%, 6 $N=16,581$, 8.3%).

More than one in five decedents were reported to having had an alcohol problem ($N=32,092$, 16.1%) and a similar percentage had a problem with substance were ($N=28,538$, 14.3%). Within this sample the report of physical health problems was 19.6% ($N=39,150$). A third of decedents were reported to have a history of mental health treatment were ($N=67,912$, 34%). The combined method of death was collapsed into four

categories: Firearm, Hanging/Suffocation, Poisoning, and other. The breakdown of each category is as follows: Firearm ($N=100,717$, 50.5%), Hanging/Suffocation ($N=52,396$, 26.3%), Poisoning ($N=31,825$, 16%), and Other ($N=14,349$, 7.2%). Additionally, each decedent that died using a firearm was coded to specify the type of firearm used.

Handgun ($N=67,369$, 74.3%), Rifle ($N=9,698$, 9.7%), and Shotgun ($N=13,590$, 15%).

Bivariate Analysis

Chi-square tests and an ANOVA were then completed to examine the relationship between rurality status and demographic (Sex, Veteran Status, Race, Ethnicity, Marital Status) and circumstantial characteristics of each suicide decedent (Alcohol Problems, Substance Abuse Problems, History of Mental Health Treatment, Physical Health Problems, Combined Method of Death, and Firearm Type). Post hoc analyses were conducted via examination of adjusted residuals that were greater than 1.96 to appropriately identify statistical significance of specific subgroups within the overall chi-square test. No issues were noted via the post hoc analysis.

Demographics of Suicide Decedents

See Figure 4.1

Age: An ANOVA was completed that showed that the mean age was significantly different across the different degrees of rurality $F(5,198890)=69.18$, $p<.001$. The mean age was generally higher as rurality increased with the noted exception at level 3. Level 1 ($M=45.04$ $SD=17.73$), Level 2 ($M=46.23$ $SD=17.74$), Level 3 ($M=45.88$ $SD=17.99$), Level 4 ($M=46.51$ $SD=18.51$), Level 5 ($M=47.13$ $SD=18.53$), Level 6 ($M=47.77$ $SD=18.72$).

Sex of Decedent: Within this study sample, the distribution of sex at each classification level along the rurality scale were as follows: Level 1 (Male N=25,900, 76.3%, Female N=8,046, 23.7%), Level 2 (Male N=43,533, 76.9%, Female N=13,043, 23.1%), Level 3 (Male N=36,784, 77%, Female N=10,983, 23%), Level 4 (Male N=16,829, 78.3%, Female N=4,651, 21.7%), Level 5 (Male N=18,136, 80.1%, Female N=4,503, 19.9%), Level 6 (Male N=13,488, 81.4%, Female N=3,090, 18.6%). As rurality increased, the percentage of male decedents increased and the percentage of female decedents decreased $X^2(5, N= 198,986) = 279.76, p <.001$. The effect size for this finding, Cramer's V, was small .04 (Cohen, 1988).

Veterans Status: Within this study sample the distribution of veteran status at each classification level along the rurality scale were as follows: Level 1 (Veteran N=5,061, 15.8% Non-Veteran N=26,963, 84.2%), Level 2 (Veteran N=9,382, 18.1%, Non-Veteran N=42,369, 81.9%), Level 3 (Veteran N=9,009, 20.4%, Non-Veteran N=35,209, 79.6%), Level 4 (Veteran N=4,308, 21.2%, Non-Veteran N=16,007, 78.8%), Level 5 (Veteran N=4,279, 20%, Non-Veteran N=17,108, 80%), Level 6 (Veteran N=3,136, 20.3%, Non-Veteran N=12,329, 79.7%). Overall, as the degree of rurality increased (more rural) the percentage of non-veteran status increased at a slight rate $X^2(5, N=185,160) = 387.13, p<.001$. The overall effect size for this finding, Cramer's V, was small .05 (Cohen, 1988).

Race: Within this study sample, diversity was small with each classification level along the rurality scale were as follows: Level 1 (White N=27,373, 81.2%, Black N=4,367, 12.9%, AI/PI N=190, .6%, Asian N=1,389, 4.1%, Latino N=371, 1.1%), Level 2 (White N=50,109, 89%, Black N=3,842, 6.8%, AI/PI N=189, .3%, Asian 1,747, 3.1%,

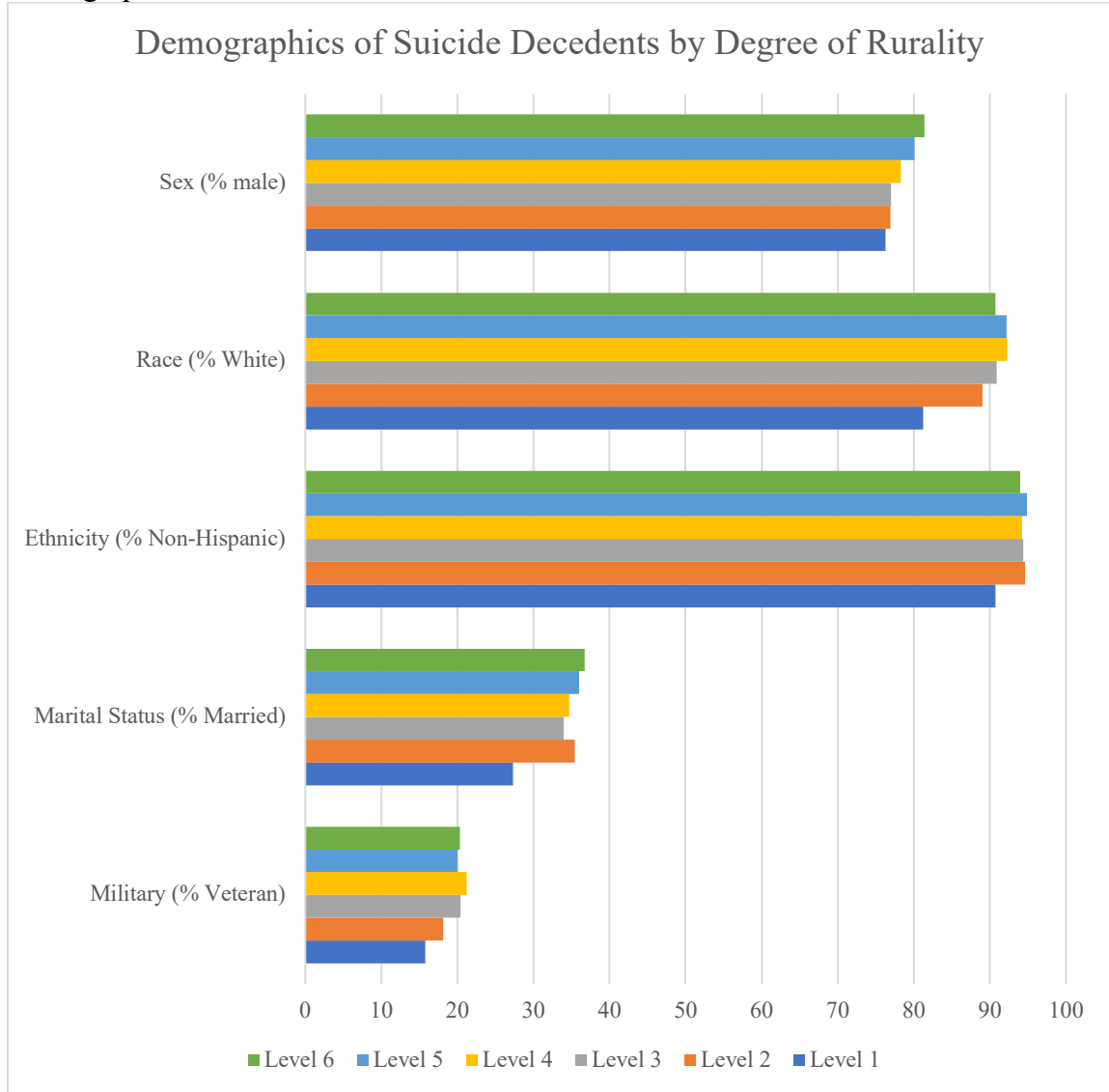
Asian N=1,747, 3.1%), Level 3 (White N=43,129, 90.9%, Black N=2,592, 5.5%, AI/PI N=550, 1.2%, Asian N=804, 1.7%, Latino N=356, .8%), Level 4 (White N=19,698, 92.3%, Black N=945, 4.4%, AI/PI N=329, 1.5%, Asian N=253, 1.2%, Latino N=105, .5%) Level 5 (White 20,805, 92.2%, Black N=764, 3.4%, AI/PI 707, 3.1%, Asian N=203, .9%, Latino N=81, .4%), Level 6 (White N=14,992, 90.7%, Black N=522, 3.2%, AI/PI N=908, 5.5%, Asian N=74, .4%, Latino N=36, .2%). As the degree of rurality increased (more rural) the percentage of diversity continued to decrease $X^2(25, N=197,950) = 7766.72, p < .001$. The overall effect size for this finding, Cramer's V, was small .09 (Cohen, 1988).

Ethnicity: The overall diversity of this sample was small and became less diverse as the degree of rurality increased. In the United States the population in rural areas is reported to be much less diverse than the population in urban areas (Peltzman, Gottlieb, Levis & Shiner, 2022). Level One (Not-Hispanic N=30,801, 90.7%, Hispanic N=2,847, 8.4%), Level Two (Not-Hispanic N=53,520, 94.6%, Hispanic N= 2,434, 4.3%), Level Three (N=45,086, 94.4%, Hispanic N=2,434, 5.6%), Level Four (Not-Hispanic N=20,030, 94.2%, Hispanic N=1044, N=4.9%), Level Five (Not Hispanic N=21,487, 94.9%, Hispanic N=972, 4.3%), Level Six (Not-Hispanic N=15,963, 96.3%, Hispanic N=477, 2.9%) $X^2(10, N=199,030) = 1143.53, p < .001$. The effect was small, Cramer's V, .05 (Cohen, 1988).

Marital Status: The CDC abstractors have several choices for classifying marital status. The largest groups reported were Married/Civil Union/ Domestic Partnership Never Married, Divorced, and Widowed and were distributed as follows: Level One (Married N=9,258, 27.3%, Never Married N=14,189, 41.8%, Divorced N=6,968, 20.5%,

Widowed N=1,700, 5%), Level Two (Married N=20,031, 35.4%, Never Married N=19,226, 34%, Divorced 11,400, 20.1%, Widowed N=3239, 5.7%) Level Three (Married N=16,227, 34%, Never Married N=15,549, 32.5%, Divorced N=10,627, 22.2%, Widowed N=2,817, 5.9%), Level Four (Married N=7,451, 34.7%, Never Married N=6,919, 32.2%, Divorced N=4,870, 22.7%, Widowed N=1,305, 6.1%), Level Five (Married 8,153, 36%, Never Married N=6,551, 28.9%, Divorced N=5,297, 23.4%, Widowed N=1,532, 6.8%), Level Six (Married N=6,077, 36.7, Never Married N=4,650, 28%, Divorced N=3,749, 22.6%, Widowed N=1,231, 7.4%). The overall percentage of married and widowed decedents increased as rurality increased. $\chi^2(30, N=199,030) = 2,063.39, p < .001$. The effect size for this sample, Cramer's V was small .05 (Cohen, 1988).

Figure 4.1
Demographics of Suicide Decedents



Circumstance Variables of the Suicide Decedents

See Figure 4.2

Physical Health Problems: Generally, as rurality increased there was a greater proportion of decedents that were reported to have physical health problems with peaks at level three and level six. Level One (N=6,166, 18.2%), Level Two (N=10,614, 18.8%), Level Three (N=9,923, 20.8%), Level Four (N=4,382, 20.4%), Level Five (N=4,569,

20.2%), Level Six (3,409, 20.6%). $X^2(5, N=199,030) = 134.6, p < .001$. The effect size for this finding, Cramer's V, was small .03 (Cohen, 1988).

Alcohol Problems: As rurality increased, the percentage of decedents with a reported problem with alcohol decreased with marked declination at level five and six. This is consistent with previous research and may be due to stigma, lack of services, or a reluctance to use services even if available in more rural areas (Crosby, Wendel, Vanderpool, & Casey, 2012; Hirsch & Cukrowicz, 2014; Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutchman, Bonnell, & Cardin, 2017). Level One (N=5,456, 16.1%), Level Two (N=9,372, 16.6%), Level Three (N=7,780, 16.3%), Level Four (N=3,599, 16.8%), Level Five (N=3,374, 14.9%), Level Six (N=2,406, 14.5%). $X^2(5, N=199,030) = 72.25, p < .001$. The effect size for this finding, Cramer's V, was small .02 (Cohen, 1988).

Substance Abuse Problems: As rurality increased (more rural) the percentage of decedents with a reported problem with substances decreased. As with alcohol abuse noted above the treatment of substance abuse issues is consistent with previous research and may be due to stigma, lack of services, or a reluctance to use services even if available in more rural areas (Crosby, Wendel, Vanderpool, & Casey, 2012; Hirsch & Cukrowicz, 2014; Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutchman, Bonnell, & Cardin, 2017). Level One (N=5,315, 15.7%), Level Two (N=8,105, 14.3%), Level Three (N=7,126, 14.9%), Level Four (N=2,819, 13.1%), Level Five (N=2,998, 13.2%), Level Six (N=2,051, 12.4%). $X^2(5, N = 199,030) = 161.22, p < .001$. The effect size for this finding was small, Cramer's V, .03 (Cohen, 1988).

History of Mental Health Treatment: Urban decedents had a higher percentage of a history of mental health treatment compared to rural decedents. As the degree of rurality increased (more rural) the percentage of mental health treatment decreased. Whether it is a perceived stigma for seeking treatment, lack of willingness to receive treatment, or a lack of access to treatment, the decedents in rural areas were reported to have a lower percentage of mental health treatment (Hirsch & Cukrowicz, 2014; Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutchman, Bonnell, & Cardin, 2017). Level One (N=12,492, 36.8%), Level Two (N=21,002, 37.1%), Level Three (N=16,61, 34.8%), Level Four (N=6,776, 31.5%), Level Five (N=6,566, 29%), Level Six (N=4,316, 26%). $\chi^2(5, N=199,030) = 1,154.98, p<.001$. The effect size for this finding, Cramer's V, was small .08 (Cohen, 1988).

Combined Mechanism of Death: As the degree of rurality increased (more rural) a greater proportion of the decedents died by firearms. Conversely as urbanicity increased the other means of suicide (suffocation, poisoning, and other) increased. Level One (Firearm N=13,887, 41.1%, Suffocation N=10,293, 30.5%, Poisoning N=5,763, 17.1%, Other N=3,828, 11.3%), Level Two (Firearm N=25,412, 45%, Suffocation N=16,746, 29.7%, Poisoning N=9,662, 17.1%, Other N=4,654, 8.2%), Level Three, (Firearm N=24,899, 52.2%, Suffocation N=11,856, 24.8%, Poisoning N=8,076, 16.9%, Other N=2,907, 6.1%), Level Four (Firearm N=11,889, 55.4%, Suffocation N=5,128, 23.9%, Poisoning N=3,251, 15.2%, Other N=1,176, 5.5%), Level Five (Firearm N=13,492, 59.7%, Suffocation N=4,916, 21.7%, Poisoning N=3,138, 13.9%, Other N=1,063, 4.7%), Level Six (Firearm N=10,998, 66.4%, Suffocation N=3,128, 18.9%, Poisoning N=1,849, 11.2%, Other N=584, 3.5%). $\chi^2(15, N=198,595) =$

5,314.39, $p < .001$. The effect size for this finding, Cramer's V, was small .09 (Cohen, 1988). See Figure 4.3.

Firearm Type: Handgun was the most used firearm at each level of rurality. However, as the degree of rurality increased (more rural) the proportion of use of a long gun (rifle or shotgun) increased. As the degree of urbanicity increased (more urban) the percentage of handgun use increased. Level One (Handgun N=10,664, 82.6%, Rifle N=808, 6.3%, Shotgun N=1,434, 11.1%), Level Two (Handgun N=17,503, 76.6%, Rifle N=2,034, 8.9%, Shotgun N=3,303, 14.5%), Level Three (Handgun N=17,402, 75.5%, Rifle N=2,238, 9.7%, Shotgun N=1,634, 15.5%), Level Four (Handgun N=7,639, 72.4%, Rifle N=1,279, 12.1%, Shotgun N=1,634, 15.5%), Level Five (Handgun N=8,199, 69.5%, Rifle N=1,581, 13.4%, Shotgun N=2,019, 17.1%), Level Six (Handgun N=5,881, 62.5%, Rifle N=1,752, 18.6%, Shotgun N=1,777, 18.9%). $\chi^2(15, N=90,563) = 1,602.8$, $p < .001$. The effect size for this finding, Cramer's V, was small .08 (Cohen, 1988). See Figure 4.3

Figure 4.2
 Comparison of the Demographics of Suicide Decedents by Rurality Level

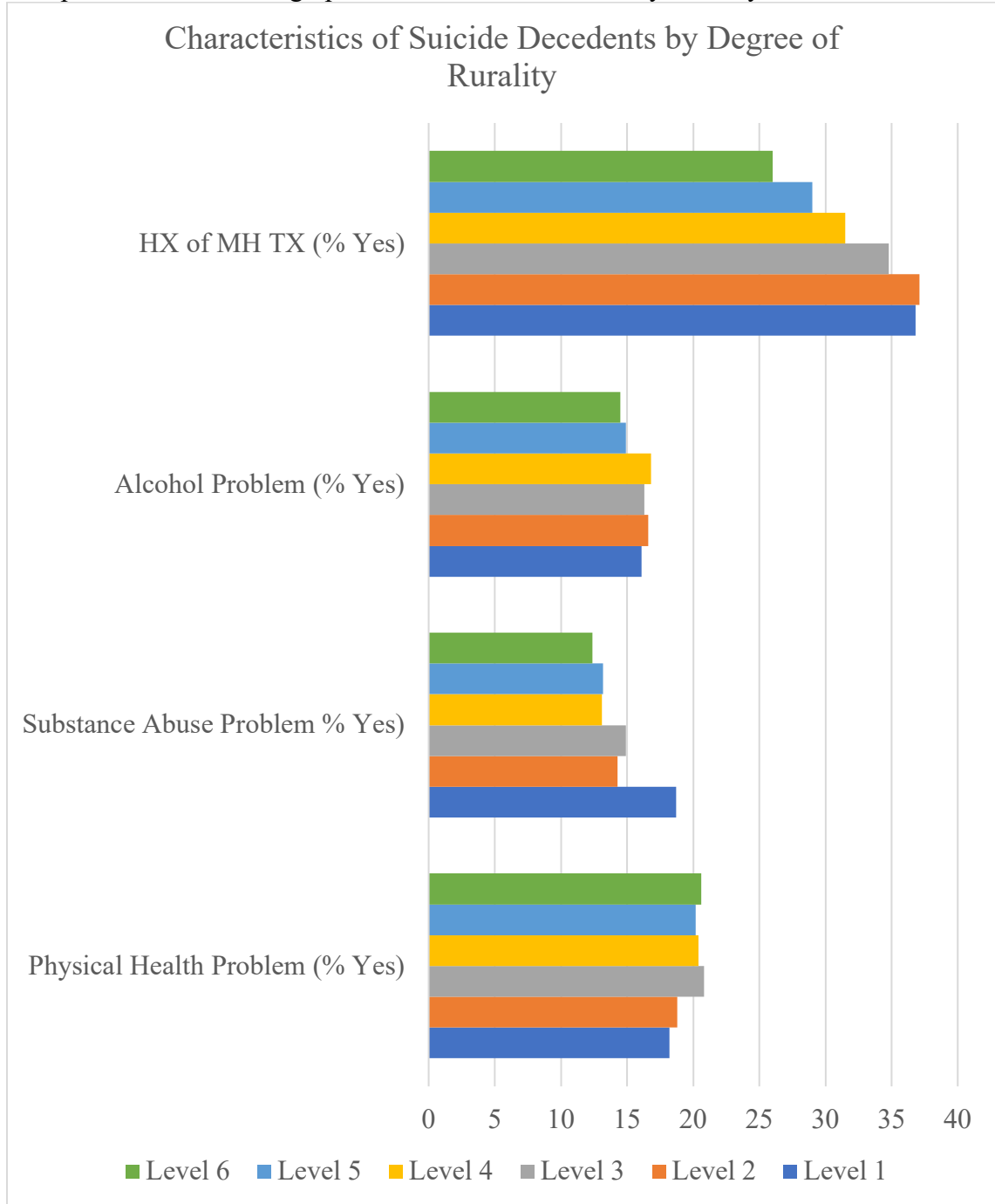


Figure 4.3
 Bivariate Comparison of the Method of Suicide by Degree of Rurality

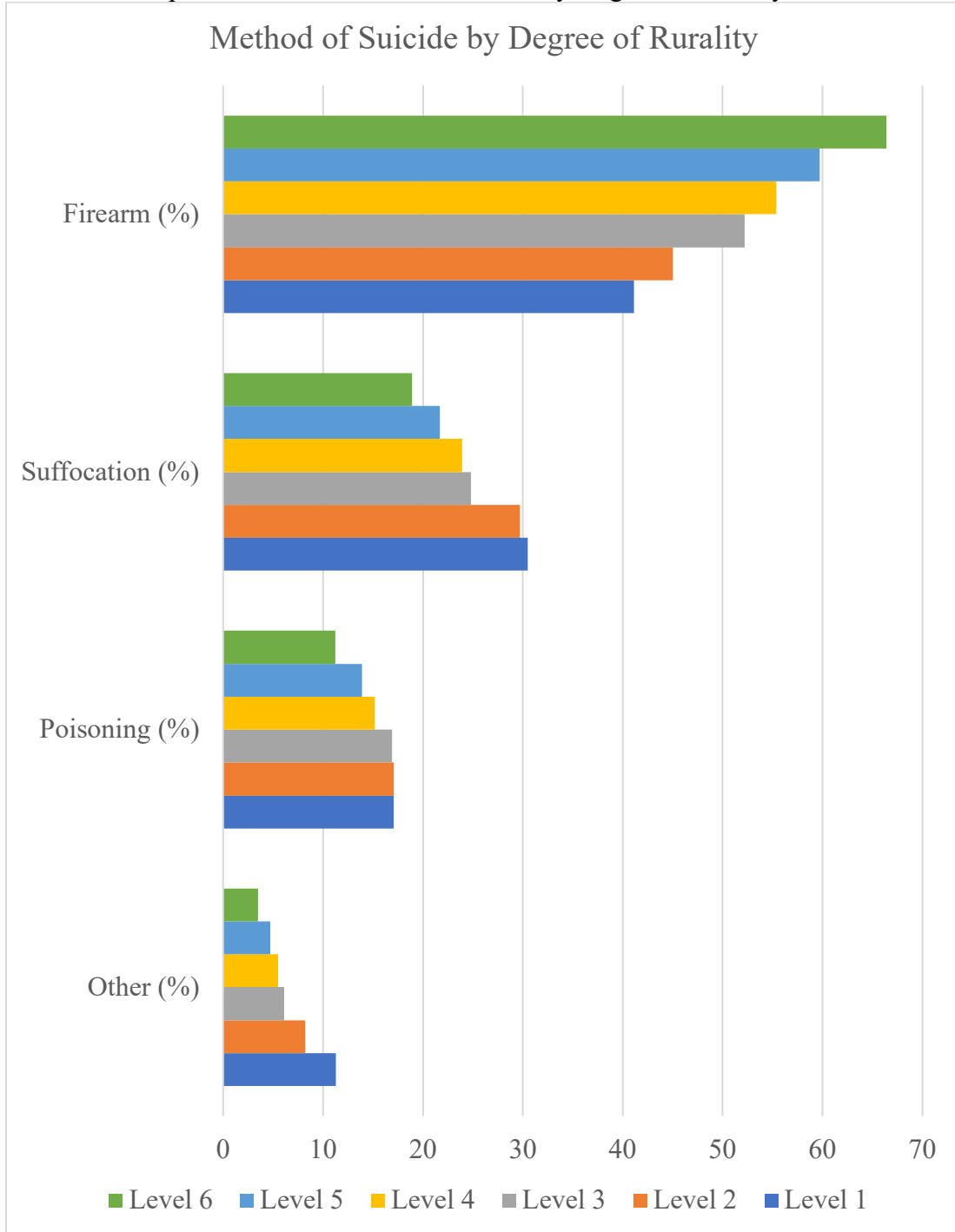
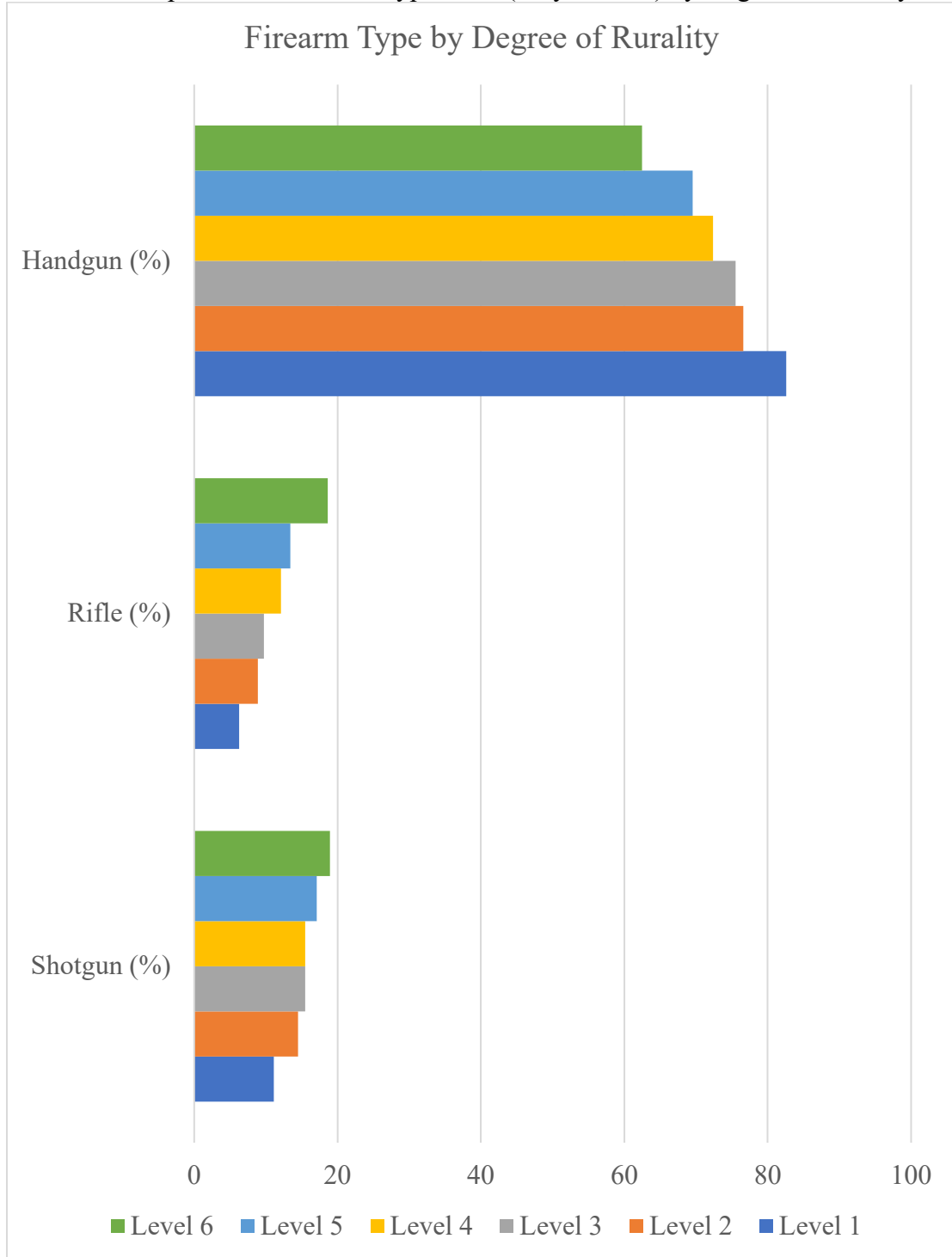


Figure 4.4
 Bivariate Comparison of Firearm Type Used (if by firearm) by Degree of Rurality



Multivariate Analysis

A multinomial logistic regression was used due to the dependent variable contained more than two categories. The decedents were coded along the 6-point scale (1=most urban through 6=most rural) based upon their residence at the time of their death. The category of rural (6) was used as the reference category for the regression model. The confidence interval was set at 99%. The regression model was marked to search for main effects. An ordinal logistic regression could not be use secondary to the proportional odds assumption not being met. The independent variables used were as follows: Age, Sex, Marital Status, History of Mental Health Treatment, Alcohol Problems, Substance Use Problem, Physical Health Problems, and Mechanism of Death. All data were analyzed using IBM SPSS version 27 (SPSS Inc., Chicago, IL).

The regression model was created to examine the differences in the characteristics of the decedents along the rurality/urbanicity spectrum. The model had a greater predictive capability than the null model. Collinearity diagnostics were completed check for multivariate outliers. The data was checked for multivariate outliers and multicollinearity.

The full model indicated statistical significance which show an improvement over the null model $X^2(55)=6,416.92$, $p<.001$. The Person's chi-square test noted significance which indicates the data did not fit the data well which is a mixed result $X^2(20,5235)=214,109.59$, $p<.001$. The pseudo R^2 is reported McFadden=.01 which was below the range of a good fitting model. The results of likelihood ratio test indicated that each included independent variables contributed to the model all at $p<.001$. The model only correctly predicted 24% of the observed cases. The results provide information

comparing each rural classification in comparison to the reference category (Level 6 – Rural). Each set of coefficients represents the comparison of each group in relation to Level 6 – Rural. See table 5 below. Each classification will only include those that were found to be statistically significant and with the corresponding odds ratio. The analysis of racial diversity was consistent with the bivariate analysis with the largest diversity between level one (most urban) and the most rural at 1.28 times more diverse.

Throughout the gradient, each level had a greater incidence of mental health treatment (Level 1=1.44, Level 2=1.48, Level 3=1.37, Level 4=1.18, Level 5= 1.09) compared to Level six. Within the multinomial regression analysis, a history of alcohol abuse problems was only statistically significant when compared level six to levels two (1.11) and four (1.16). The method of death variable was significant across each level of the rurality gradient when comparing each level with the most rural classification (Level 1= 1.64, Level 2= 1.49, Level 3=1.32, Level 4=1.27, Level 5=1.2). As noted, the incidence of firearm use increased across the gradient with the highest level of use in the more rural areas. Conversely the incidence of strangulation/hanging, poisoning, or other were higher as the classification was more urban. We were not able to also include the firearm type within this analysis as this would violate the mutual exclusivity assumption of the analysis.

Table 4.1
 Multinomial Logistic Regression of Suicide Decedents Along the Rurality Gradient

Variable	<i>B</i>	SE	Wald	df	sig	Exp <i>B</i>
Urban Class 1						
Age	-.005	.001	56.14	1	<.001	.995
Race	.247	.016	245.49	1	<.001	1.28
Ethnicity	.086	.013	41.94	1	<.001	1.09
HX of MH TX	.362	.022	261.31	1	<.001	1.44
Method of Death	.496	.012	1686.77	1	<.001	1.64
Urban Class 2						
Age	-.002	.001	12.79	1	<.001	.998
Race	.061	.016	14.99	1	<.001	1.06
Ethnicity	.050	.013	14.74	1	<.001	1.05
Marital Status	-.062	.007	87.37	1	<.001	.940
HX of MH TX	.391	.021	345.27	1	<.001	1.48
Alcohol Problem	.108	.026	16.63	1	<.001	1.11
Method of Death	.4	.012	1194.64	1	<.001	1.49
Urban Class 3						
Sex	-.105	.025	17.55	1	<.001	.9
Age	-.007	.001	132.52	1	<.001	.99
Military	.225	.026	77.54	1	<.001	1.25
HX of MH TX	.313	.021	213.05	1	<.001	1.37
Physical Problem	.131	.025	26.63	1	<.001	1.14
Method of Death	.227	.012	546.57	1	<.001	1.32

Table 4.1 (continued)

Variable	<i>B</i>	SE	Wald	df	sig	Exp <i>B</i>
Urban Class 4						
Age	-.005	.001	60.85	1	<.001	.995
Race	-.133	.02	44.75	1	<.001	.88
Ethnicity	.054	.015	13.49	1	<.001	1.01
Marital Status	-.022	.008	7.92	1	<.001	.98
HX of MH TX	.169	.024	47.99	1	<.001	1.18
Alcohol Problem	.144	.03	22.56	1	<.001	1.16
Method of Death	.236	.013	314.61	1	<.001	1.27
Urban Class 5						
Race	-.096	.019	24.72	1	<.001	.91
HX of MH TX	.089	.024	13.52	1	<.001	1.1
Method of Death	.163	.013	149.13	1	<.001	1.2

Reference category: Level 6

HX of MH TX = History of Mental Health Treatment

Discussion

The purpose of this study was to compare characteristics of suicide decedents across a six-step rurality gradient from urban to most rural. The most rural category was used as the reference category to which all other rurality gradients were compared. Not every variable under consideration was statistically significant through each rurality level. Across all levels of rurality, the most rural group were older than each other group having a negative slope at each level.

The findings of this research is consistent with previous research regarding a lack of mental health services in more rural areas in addition to a lack of willingness to accept treatment if available (Hirsch, 2006; Hirsch & Cukrowicz, 2014; Seal, Bertenthal, Minder, Sen, & Marmar, 2007; Sharp, Fear, Rona, Wessely, Greenber, Jones, & Goodwin, 2014; Mohatt, Kreisel, Hoffberg, Wendleton, & Beehler, 2020). Throughout the nation suicide deaths are predominately by firearms but the usage of firearm increases even more as rurality increases. The issue of mental health treatment and firearm use should be an item of continued attention with every interaction with a health care provider. The Department of Veterans Affairs is using a focused approach to address these issues. In terms of treatment and assessment suicidality is assessed at every appointment. In addition to in-person assessment the VA uses virtual modalities of care which includes telephone follow-up and Veterans Video Connect (VVC). VVC allows interaction in areas of lower bandwidth where the clinician and client can see and hear each other during the interaction. In terms of harm reduction strategies, the VA provides specific gun locks for each type of firearm and includes an open and frank discussion regarding the use of gun locks, storing weapons in a locked location, not storing weapons that are loaded, and storing the ammunition in a different location than the firearm. A portion of the firearm discussion also includes a plan to have a trusted person keep the weapon during times of crisis (VA, 2022). Having knowledge of the typical weapon in a given area i.e. rural would indicate a greater need of long gun locks in addition to handgun locks. VA staff inquire about the type of weapon that is accessible to the client. This would be helpful practice used in all primary care and mental health settings.

Limitations and Future Directions

This study compared suicide decedents across the rurality gradient to those that resided in the most rural area. This sample only included 40 states and therefore is not representative of the entire population. Also, suicide has been underreported (Mohler & Earls, 2001; Moyer, Boyle, & Pollock, 1989; Phillips, Robin, Nugent, & Idler, 2010; Shepard, Gurewich, Aung, Reed, & Silverman, 2017; Steelsmith, Fontanella, Campo, Bridge, Warren, & Root, 2019). The National Violent Death Reporting System now includes every state and the District of Columbia which can provide greater detail of those that die by suicide (CDC, 2022).

Increased reporting throughout the nation will improve the ability of researchers to gather and study characteristics specific to suicide and other violent death phenomena. These possible future directions can be specific to the mechanisms of harm by U.S. residents across the rurality gradient. Harm reduction strategies can be tailored to the specific level of rurality of each client. These harm reduction strategies can include open and frank discussion between providers and clients regarding if firearms are in the home, how they are stored (locked/unlocked), where they are stored, and if they stored in a loaded condition. These discussions can lead to safety planning for firearm storage during times of crisis. An option would be to allow the weapon to be kept by a trusted person during those times of crisis. This would also help to foster an additional close affectional relationship that could be further beneficial for the client.

Chapter 5: Conclusion

Suicide is a leading cause of death throughout the United States (Hedegaard, Curtin, & Warner, 2018, 2019, 2021). The incidence of suicide is higher in rural areas when compared to more urbanized areas (Arbore, 2019; Conner, Azrael, & Miller, 2019; Harp & Borders, 2019; Ivey-Stephenson, Crosby, Jack, Haileyesus, & Kresnow-Sedacca, 2017; Hedegaard, Curtin, Warner, 2018; Kegler, Stone, & Holland, 2017; Rossen, Hedegaard, Khan, & Warner, 2018; Tarlow, Johnson, & McCord, 2018; Searles, Valley, Hedgaard, & Betz, 2014). The rate of suicide is also higher within the veteran community compared to non-veterans (Mohatt, Billera, Demers, Monteith, & Bahraini, 2018; Monteith, Wendleton, Bahraini, Matarazzo, Brimmer, & Mohatt, 2020). The intersection of these two populations increases the overall risk for suicide for those that live in rural areas and are veterans (McCarthy, Blow, Ignacio, Iigen, Austin, & Valenstein, 2012). There is existing research regarding rural suicide and veteran suicide but there is a lack of research specific to rural veteran suicide (Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutschman, Bonnell, & Cardin, 2017).

The purpose of this dissertation was to gain a greater understanding of the effect of rurality upon the factors faced by those that die by suicide. The three papers that comprise this dissertation focus on demographic variables, characteristic variables, and are specific to those that die by suicide throughout the United States. The study sample are those decedents listed in the National Violent Death Reporting System (NVDRS) Restricted Access Database (RAD) from 2003-2017. The NVDRS RAD is a de-identified, multi-state, case level microdata set comprised of a variety of unique variables. The RAD data for the timeframe 2003-2017 includes decedent information for

up to 40 participating states and the District of Columbia n=199,730. The NVDRS is an ongoing state-based surveillance system funded by the Centers for Disease Control and Prevention (CDC) that collects data on all violent death occurring in participating states or territories of the United States (Blair, Fowler, Jack, & Crosby, 2016).

The NVDRS collects specific data from death certificates, coroner/medical examiner reports, law enforcement reports, and toxicology reports. Abstractors input data regarding variables such as the mechanism of death, type of weapon used, type of method used, and antecedent circumstances using coding guidance from the Centers for Disease Control. Abstractors also include narrative information provided by the coroner/medical examiner or law enforcement to provide a better description of the fatal event (CDC, 2019).

The National Violent Death Reporting System (NVDRS) collects more than 600 data elements into an anonymous database regarding all reported suicide deaths for those states or territories that participate in the reporting system (CDC, 2019). The information found within the NVDRS allows national and local policy makers to leverage the findings gleaned from the data to aid with the formation and refinement of violence prevention strategies. For those states that participate in the NVDRS reporting system, program participation has shown early promise for suicide prevention strategies (CDC, 2019; Hemenway, Barber, Gallagher, & Azrael, 2009; Kaplan, Caetano, Giesbrecht, Huguet, Kerr, McFarland, & Nolte, 2017; Powell, Barber, Hedegaard, Hempstead, Hull-Jilly, Shen, Thorpe, & Weis, 2006).

Manuscript One examined the epidemiology of suicide among rural veterans compared to rural non-veterans. The aim of the manuscript was to examine the

relationship of veteran status upon the circumstances and characteristics surrounding suicide in rural areas. The first study found when controlling for age, rural veterans were nearly two times more likely to die by suicide from the use of a firearm compared to urban veterans. Firearms ownership is more prevalent in rural areas compared to urban areas. Those that reside in rural areas are more familiar with firearms. Having access to and familiarity with firearms may contribute to the increased use of firearms in rural suicides. Rural non-veterans use firearms as a means of suicide compared to urban non-veterans. Rural veterans were less likely (17.7%) to have a reported history of mental health treatment compared to rural non-veterans. This may be due to the long-standing behavior of military personnel not seeking mental health treatment even if treatment is available. There are less options for rural residents (veteran and non-veteran) to receive physical health and mental health services. This also consistent within the culture of rural residents. Rural residents are less likely to openly share issues related to alcohol use, substance use, or other issues that might be considered “private.” Rural veterans were 15% more likely to have to have reported physical health problems compared to rural non-veterans. Rural residents have a greater likelihood of physical health problems secondary to a predominantly agrarian lifestyle and vocations that tend to be more physical in nature. Compounding this issue with rural veterans are injuries that may have occurred or been aggravated by military service.

Manuscript Two examined the epidemiology of veteran suicide with a focus on the differences in rural and urban veterans. The aim of the manuscript was to examine the effect of rurality upon the circumstances and characteristics surrounding rural veteran suicide and urban veteran suicide. Rural veterans had a higher mean age compared to

urban veterans. Rural veterans were reported to have a higher percentage of physical health compared to urban veteran decedents. Older persons have a greater likelihood of having comorbid physical problems as they age. With average mean age within this sample this could explain a greater percentage of physical health concerns. A greater proportion of rural residents enlist into military service and then return to their rural origin after their military service. Additionally, the types of occupations within rural areas tend to more physical in nature and therefore may be more prone to physical injuries through time. A smaller percentage of rural veteran decedents had reported alcohol problems (12.3%) compared to urban veteran decedents (14.6%). There are fewer opportunities for treatment in rural areas compared to urban areas. Even if services are available, veterans are less likely to seek or receive treatment services. Rural veteran decedents also had a lower reported percentage of substance abuse problems (5.8%) compared to urban veteran decedents (7.7%). As noted above there are fewer opportunities for treatment in rural areas compared to urban areas. Rural veterans had a lower percentage of mental health treatment (23.8%) compared to urban veteran decedents (29.5%). Veterans generally are less likely to seek mental health treatment due to long held beliefs to not seek mental health treatment during their active-duty period of service and after their service is completed; this could be compounded for rural veterans who also have the stigma in rural life around seeking mental health treatment. Rural residents in generally are less open with expressing their concerns with others. This also consistent within the culture of rural residents. Rural residents are less likely to openly share issues that are deemed “private” with others. Rural veterans were more likely (77.9%) to use a firearm as a means of suicide compared to urban veterans at (67.8%).

Firearm ownership is more prevalent in rural areas. Rural residents have greater familiarity with firearms and more likely to use a firearm as means for suicide. Rural veterans used a shotgun 16% of the time compared to 12.3% for urban veterans. Long guns are more prevalent in rural areas as they are used for hunting therefore are more likely to be used for suicide compared to urban areas. Ownership of firearms in rural areas can also be utilitarian in nature. In addition to hunting and sporting they are often used for protection. This protection is not relegated to mere physical safety but also to protect livestock from predatory animals. In this way owning firearms are a necessary portion of rural life. Rural veterans used a handgun 70.7% compared to urban veterans who used a handgun 79%. When controlling for age, rural veterans were almost twice more likely to die by suicide from the use of firearm compared to urban veterans.

Manuscript Three examined the impact of the degree of rurality upon the epidemiology of suicide. The aim of the manuscript examined the differences in the circumstances and characteristics of suicide comparing rurality at the county level of each decedent. Mean age was significantly different across the different degrees of rurality in that in more rural counties, suicide decedents were more likely to be older. As the degree of rurality increased, (more rural) the percentage of non-veteran status increased slightly. Generally, as rurality increased, there was a greater proportion of decedents that were reported to have physical health problems with peaks at rurality level three and level six. As rurality increased (more rural), the percentage of decedents with a reported problem with alcohol decreased with marked declination at level five and six. As rurality increased (more rural) the percentage of decedents with a reported problem with substances decreased. This may be due to stigma, lack of services, or a reluctance to use

services even if available in more rural areas (Crosby, Wendel, Vanderpool, & Casey, 2012; Hirsch & Cukrowicz, 2014; Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutchman, Bonnell, & Cardin, 2017). Urban decedents had a higher percentage of a history of mental health treatment compared to rural decedents. As the degree of rurality increased (more rural) the percentage of mental health treatment decreased. Whether it is a perceived stigma for seeking treatment, lack of willingness to receive treatment, or a lack of access to treatment, the decedents in rural areas were reported to have a lower percentage of mental health treatment (Hirsch & Cukrowicz, 2014; Bumgarner, Polinsky, Herman, Fordiani, Lewis, Hansen, Rutchman, Bonnell, & Cardin, 2017). As the degree of rurality increased (more rural) a greater proportion of the decedents died by firearms. Conversely as urbanicity increased the other means of suicide (suffocation, poisoning, and other) increased. For those that died using firearm handguns were the most commonly used firearm type at each level of rurality. However, as the degree of rurality increased (more rural) the proportion of use of a long gun (rifle or shotgun) increased. Long gun ownership is more prevalent in rural areas due to hunting and other gun sporting events (skeet/clay shooting). As the degree of urbanicity increased (more urban) the percentage of handgun use increased. Handguns ownership and usage is more prevalent in more urbanized regions. The multinomial logistic regression showed a negative slope regarding age which was consistent with ANOVA. The mean age increased as the sample area became more rural. Generally, the average age in rural areas is older when compared to urban areas. The method of death indicated that as rurality increased the greater the likelihood of firearm usage of the suicide decedents and less

likelihood of other means of suicide (hanging/suffocation, poisoning, and other) in comparison to reference group (most rural).

Implications

The findings will help clinicians to more appropriately intervene with each client knowing that the degree of rurality influences the person currently before them. These findings help to expand our understanding of the suicidal person. It provides a greater understanding of some of the issues experienced by those across the rurality gradient. Rural residents are less likely to have reported alcohol problems, substance abuse problems, and mental health problems. This is most likely due to stigma, lack of services, and a lack of willingness to receive care for these issues by rural residents compared to urban residents. Rural residents have a greater likelihood of physical health problems. While treating rural residents for their physical health problems would give providers an opportunity to assess and attend to alcohol problems, substance abuse problems, and mental health problems that might be previously untreated. This information provides additional information to aid with suicide prevention and provides additional information when planning for safety and specifically informs possible concerns regarding planning for harm reduction. As a portion of harm reduction strategies, the information gleaned from this study will aid providers in harm reduction specific the areas in which the client lives. Rural residents will need a variety of gun locks that are specific to the types of firearms owned by those residents. In addition to firearm harm reduction decreasing other means of harm (medications, drugs, knives, ligature materials...) need to be assessed and be a portion of safety planning and are used more in urban areas compared to rural areas.

In the search for greater understanding of rural suicide future studies could include gaining more knowledge about the cultural determinants of those that reside in rural areas. Those studies could include searching for a greater understanding of the stressors faced by rural residents that lead to suicidal thoughts and behaviors. Those stressors might include the following: economic, droughts, flooding, predation of life stock, negative agrarian pricing trends, sickness, physical maladies, social isolation, lack of mental health care, lack of willingness to accept mental health care, lack of physical health care, lack of willingness to accept physical health care, and educational disparities. Rurality was used a proxy for isolation in these studies. Future studies could attempt to empirically measure loneliness to measure the impact of loneliness more directly upon rural residents. These findings could help better inform intervention strategies to not only prevent suicide but also the suffering that can lead to suicidal behaviors.

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EDUCATION

- 1997 University of Kentucky
 Master of Social Work
- 1995 Morehead State University
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PEER-REVIEWED PUBLICATIONS

- Kennedy, A., Cerel, J., Kheibari, A., Leske, S., & Watts, J. (2021). A comparison of farming and non-farming-related suicides from the United States' national deaths reporting system, 2003-2016. *Suicide and Life-Threatening Behavior*, 00, 1-11.

PROFESSIONAL EXPERIENCE

- 2020-Present Department of Veterans Affairs, Lexington, KY.
 Associate Director.
- 2011-2020 Department of Veterans Affairs, Lexington, KY.
 Social Work Service Chief.
- 2008-2011 Department of Veterans Affairs, Lexington, KY.
 Social Work Supervisor/Medical Foster Home Coordinator.
- 2007-2008 Department of Veterans Affairs, Morehead, KY.
 Primary Care and Home-Based Primary Care Social Worker
- 2001-2007 Pathways, Inc., Gateway Region Kentucky.
 Mobile Crisis Therapist.
- 2000-2001 Pathways, Inc., Morehead, KY
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HONORS and AWARDS

- VISN 9 Leadership Institute
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