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The State-Level Risk and Protective Factors of Suicide for American Indians and Alaska Natives

Carmela Roybal

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**STATE-LEVEL RISK AND PROTECTIVE FACTORS OF SUICIDE FOR
AMERICAN INDIANS AND ALASKA NATIVES**

By

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B.A., Sociology, University of New Mexico, 2006

Submitted in Partial Fulfillment of the
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ABSTRACT

Objective. To identify the risk and protective factors of suicide among American Indians and Alaska Natives. *Methods.* Using a negative binomial regression analysis and state-level data, pooled data from the Center for Disease Control and Prevention (2005-2010), and the 2000 U.S. Census to examine the state-level predictors of suicide among American Indians and Alaska Natives.

Results. An increase in the states' urban population is associated with increased suicide rates among American Indians and Alaska Natives. An increase in the young male population is associated with decreased suicide risk for the population. No association was found related to religious adherence, or gun ownership. *Conclusion.*

The results underscore the need for further demographic controls in the assessment of suicide for American Indians and Alaska Natives.

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Introduction

Suicide is the 10th leading cause of death in the United States, claiming approximately 38,364 lives in 2010 (CDC 2012). According to a report from the Substance Abuse & Mental Health Services Administration (SAMHSA) (2009), more than 922,725 attempted suicides are recorded each year. Suicide is defined as a “fatal self-inflicted destructive act with explicit or inferred intent to die” (Institute of Medicine 2002:27). American Indian and Alaska Native populations, however, experience suicide at alarming rates and average greater numbers than all other racial and ethnic groups in the United States (Wallace et al. 1996; Olson and Wahab 2006). From 2005-2009, American Indians and Alaska Natives age 10 and older experienced the highest suicide rates among all racial and ethnic populations—17.48 per 100,000 population, a rate higher than that of non-Hispanic Whites, which was 15.99 per 100,000 (CDC 2010). Reported suicide rates for American Indians and Alaska Natives vary from tribe to tribe, with some experiencing an annual suicide rate as high as 150 per 100,000 and others reporting no suicides (Olson and Wahab 2006; Range et al. 2000; May and Van Winkle 1994).

Prior suicide research on American Indians and Alaska Natives has addressed suicide at the tribal and regional levels (Shore 1975; Lester 1997; Borowsky et al. 1999; Berlin 1987) but has been limited by sample size (Olson and Wahab 2006), rendering results specific to individual tribes or geographic regions (Shore and Manson 1983). Although prior research has suggested that the high rate of suicide among American Indians and Alaska Natives can be attributed to rapid social and economic change, poverty, substance abuse, domestic violence, cultural attributes,

and historical traumas (Echo-Hawk 1997; and Van Winkle 2002; Borowsky, Hogan, and Ireland 1997; Niezen 2000), the state-level risk and protective factors of suicide for this population are not clear. To the best of my knowledge extant research has not looked at the state-level risk and protective factors of suicide for the American Indian and Alaska Native population.

State-level predictors are characteristics of geographic areas—such as counties, states, or nations—as they relate to suicide rates (Pratt and Cullen 2005). Pertinent to this study, state-level predictors are the state-level characteristics that influence suicide. While state-level predictors have been used extensively to explain suicide among non-Hispanic Whites [henceforth Whites] (Breault 1986), African Americans (Chu et al. 2010; Stack and Wasserman 1995; Stack and Kposowa 2011; Wadsworth, Kubrin, and Herting 2013), and Hispanics (Range et al. 2000; Oquendo et al. 2005; Garza and Gramer 2011), a state-level approach across all 50 states and the District of Columbia has yet to be taken to study suicide among American Indians and Alaska Natives. This study seeks to answer two key questions:

1. What are the state-level risk and protective factors of suicide for American Indians and Alaska Natives?
2. Are the key risk and protective factors of suicide found among other racial and ethnic populations applicable to American Indians and Alaska Natives?

After examining suicide literature on Whites, African Americans, and Hispanics, I identify key risk and protective factors for these populations and test their applicability to American Indian and Alaska Native populations across all 50

states and the District of Columbia. Efforts to understand the sociology of suicide since Durkheim's classic work have increasingly focused on ethnic or racial subgroups. This study contributes to this literature by examining the risk and protective factors of suicide for American Indians and Alaska Natives.

Risk and Protective Factors of Suicide for Whites

Background. Suicide in the United States has increased over the past decade, with annual suicide rates ranging from 10%-12% since 1990 (CDC 2010). Kessler et al. (2005) found that suicide-related behaviors are elevated for subgroups, including the young, women, individuals with low education, and individuals who lack stable relationships or employment. Males have higher suicide rates than women across all populations in the United States and generally complete suicide at a rate 3.85 times greater than females; females attempt the act but do not complete it three times more often than males (CDC 2010). Whites have high suicide rates when compared to racial and ethnic minorities, except for American Indians and Alaska Natives.

Unemployment, poverty, and educational attainment.

Unemployment and poverty have often been associated with increased suicide rates among Whites (Purselle et al. 2009). Research has found strong associations amid unemployed individuals and suicide for Whites (Kposowa 2001; Grunebaum et al. 2004 Durkheim [1897] 1966; Stack and Lester 1991; Kessler et al. 2005). Powell's (1958) study suggests that the greatest stressor for males is a lack of occupation. Kposowa (2001) found unemployed males twice as likely to commit suicide as employed individuals. Both Kposowa (2001) and Purselle et al. (2009) found that

low socioeconomic status was linked directly to an increase in suicide for the White population. Unemployed females were more than three times as likely to commit suicide as their employed counterparts (Purselle et al. 2009). Kposowa (2001) also found that after four years, unemployment has little or no effect on suicide, except for females, who remained at a greater risk for suicide. His study suggests that the impact of unemployment and suicide may decrease with time, suggesting that the effect and depressive symptoms of unemployment are transient in nature.

Educational attainment is a protective factor of suicide for the White population and decreases the risk of suicide (Kposowa 2001). As education increases among Whites, suicide rates decrease. Kposowa (2001) found that low educational attainment influenced suicide, while higher levels of education were associated with a decrease in the suicide rate for Whites. Research suggests that education provides access to employment, social capital, and to economic stability (Lantz et al. 2005). Lantz et al. (2005) found that individuals with more years of formal schooling are buffered from suicide risk.

Urban and region. Living in either urban or rural areas has been associated with increased suicide among Whites. Living in urban areas has historically been associated with industrialization, suicide, and anomie. Durkheim associated living in urban settings with increased alienation, social isolation, and increased suicide rates. In a national study, Singh and Siahpush (2002) found contrasting results indicating that rural areas had significantly higher suicide rates when compared to urban areas. They found that between 1995 and 1997, rural male suicide rates were 60% higher than that of urban males. Singh and Siapush (2002)

suggest that the increase of rural suicides can be attributed to changes in social and demographic factors, such as low social integration and increased divorce. Gessert (2003) suggests that increased suicide rates in rural areas can be attributed to cultural differences and or geographic barriers to mental health services.

Age and gender. According to Durkheim ([1897] 1966), the risk of suicide increases with age. He states that “repeated experiences are needed to reveal the complete emptiness of egoistic life or the total vanity of limitless ambition” (1966:325). The risk of suicide for Whites has been shown to increase with age. According to the CDC (2010), suicide rates for Whites are highest in the 45-54 age group. The White elderly population (aged 85+) experience suicide at a rate 36% higher than populations under 85 (www.suicidology.org). White males are more likely to commit suicide than females (Stack, 1996). Kposowa (2001) found that in men, the suicide risk decreased at the age of 24, then rises again after nine years.

Religion, family, and cultural factors. Various degrees of religious participation have been associated with an influence on suicide rates (Stack and Lester 2001). According to Durkheim ([1897] 1966), shared religious beliefs and practices safeguard individuals from the act of suicide. Low levels of religiosity have been shown to result in higher suicide rates nationally (Stack 1983). Stack and Lester (1991) found that increased church attendance decreased suicide rates.

Marriage has been used often to explain suicide among Whites (Breault 1986; Pescoslido and Wright 1990; Kposowa, Breault, and Singh 1995). Marital ties and responsibility to one’s spouse lower the risk of suicide, while divorce increases suicide (Stack 1990; Kposowa et al. 1995). Singh and Siapush (2002) suggest that

increased divorce rates in U.S. counties have increased the number of individuals living alone, which may be partly responsible for increased suicide rates. Kposowa (2001) found that living alone was highly associated with suicide. According to his study, individuals living alone were 55% more likely to commit suicide than those living with others.

Gun ownership and substance use. Gun ownership also is related to an increased suicide risk among Whites. In 2010, 7.3% of White suicides were gun related (CDC 2012). Along with gun ownership, substance-related suicide deaths make up a large portion of the suicide deaths for Whites. Substance use, defined as the use of alcohol and illicit drugs, is a significant predictor of suicide for Whites. Castle et al. (2004) also found alcohol use to be significant predictor of suicide among Whites. The use of illicit drugs such as cocaine has frequently been associated with suicide among Whites (Garlow et al. 2007).

Risk and Protective Factors of Suicide for African Americans

Background. Among African Americans, suicide is the 12th leading cause of death in the United States. African Americans have the lowest suicide rates of all racial and ethnic minorities (Utsey, Stanard, and Hook 2007). Despite economic disadvantages and social stressors, African Americans have considerably lower suicide rates compared to Whites as well as to American Indians and Alaska Natives. These low suicide rates have been attributed to cultural beliefs and religious participation (e.g., Gibbs 1997; Stack 1992; Walker, Lester, and Joe 2006). Some scholars argue that the low rates can be attributed to cultural factors that buffer the effects of economic marginalization. Early and Akers (1993) argue that suicide is a

“White thing,” not highly associated with African American cultural norms. Early and Akers (1993) argue that African Americans are culturally adapted to endure social and economic marginalization. Although African Americans are affected by high rates of unemployment and tend to live in large metropolitan areas, cultural factors such as religion and social networks buffer the effects of suicide. Risk factors for African American suicide are low levels of religious adherence, educational attainment, divorce, gun availability, and substance use (Klaslow et al. 2006; Kaslow et al. 1998).

Unemployment, poverty, and education. Studies regarding socioeconomic status (SES) (e.g., higher poverty, higher unemployment) and suicide vary for African Americans. While poverty and unemployment have been found to increase suicide for African Americans (Joe 2006), other studies have found SES to have the opposite effect. Lester (1993) found no relationship between unemployment and suicide among African Americans. Burr, Hartman, and Matteson (1999) found that when racial disparities were present, SES was positively related to suicide. Gould et al. (1996) found that African American suicide victims in their study had higher SES; the study also found an over-representation of middle-class African American suicide victims. In fact Kubrin, Wadsworth, and DiPietro (2006) found unemployment and poverty do not have an aggravating effect on African American suicide.

Educational attainment is a debated predictor of suicide for African Americans. Several studies have found educational attainment to be an influential predictor of suicide (Davis 1980; Lester 199; Stack 1998; Fernquist 2004; Cutright

and Fernquist 2000; and Burr et al. 1999). Stack (1998) argues that African Americans have experienced significant increases in educational attainment but have yet to benefit from their expected economic gains as a result of higher education, which may result in suicide. Stack (1998) found that educational attainment increases the likelihood of suicide for African American males. This trend among minority groups suggests that the positive relationship between suicide and education is due to the “structural imbalance between educational means and economic ends.” Fernquist (2004) found suicide to be relatively high for African American males with a college education. Walker et al. (2006) found that among college students, African Americans were less likely to attribute suicide to interpersonal conflict. Instead they were more likely to attribute suicide to social stressors caused by structural disadvantages beyond their control.

Urban and region. African Americans are at higher risk for suicide in Western states (Shaffer, Gould, and Hicks 1994; Davis 1979; Hawkins, Crosby, and Hammet 1994). Western states have the highest suicide rates for African Americans, while northern states have the lowest (Davis, 1979). Sieden (1972) suggests that states with higher suicide rates for African Americans can be attributed to urbanization and the lack of employment within urban areas.

Age and gender. Despite the overall low suicide rate among African Americans, a steady increase has been found among African American males. The majority of African American suicides are among young males (20-34 yrs.) (Davis, 1980; Sieden 1972). Suicides tend to peak and decline after age 30. Fernquist (2004) argues that an increased rate of police contact is the cause of elevated suicide among

young African American males. The overall suicide rate of Blacks decreases with age, opposed to suicide among Whites, which increases with age (Davis 1980).

Religion, family, and cultural factors. A number of studies have found religious participation to be a key protective factor against suicide for African Americans (Kaslow et. 2004; Walker, Utsey, Bolden, and Williams 2005). Previous research on religion and suicide has revealed that religious participation and religious attitudes toward suicide significantly decreases suicide for African Americans (Stack 1998; Walker et al. 2006). According to Stack and Wasserman (1995) and to Stack (1998), religious participation and church attendance deterred suicide for African Americans by providing access to church communities. Church communities are considered lifesaving institutions, offering social support that can serve as a protector from racism and impoverishment (Davis 1980; Early 1992; Stack and Wasserman 1995). Stack and Wasserman (1995) also suggests that historical discrimination has led to the creation of a “survival strategy” for African Americans that is centered on religious involvement and community ties.

African American family structure as it related to suicide has been debated. Early studies suggest that a key protective factor for African Americans is marriage (Davis and Short 1979; Davis 1980; Swanson & Breed 1976). Stack (1996) found divorce increased the risk of suicide among African Americans. Stack’s (1996) study of marital integration and suicide found that being divorced significantly increased the risk of suicide for African Americans. Other studies found no association between marriage and suicide (Davis 1980). Davis (1980) measured family ties by the percent of the population living alone. He found that marriage was conceptualized differently

for African Americans. Davis (1980) found that a more important risk or protective factors were community ties and extended family networks. He found that a greater emphasis was placed family structures, including extended family ties that provided resources protective of suicide, such as financial and emotional support.

Gun ownership and substance use. Research has suggests that lethal handguns are one of the greatest predictors of suicide for African Americans (Willis et al. 2003). According to Price, Thompson and Dake (2004), African Americans are more likely than other racial and ethnic populations to commit suicide by firearm. Kubrin and Wadsworth (2009) found that socioeconomic disadvantage increases access to firearms for African Americans, which elevates gun-related suicides by African Americans. Other scholars also have found that socioeconomic disadvantage is highly related to gun ownership among African American males due to the increased likelihood of living within a disadvantaged community (Anderson 1999; Krivo and Peterson 1996). Along with gun ownership, the possession of illicit substances was found to increase the risk of suicide for African Americans. Willis et al. (2003) found cocaine to increase suicide risk.

Acculturation. Previous studies suggest that acculturative stress is associated with increased levels of suicide among African Americans (Walker et al. 2005; Gibbs 1997). Gibbs (1997) found acculturative stresses place African Americans at risk for mental health problems. Walker et al. (2005) found that African Americans less acculturated to mainstream society were more likely to experience suicidal thoughts and suffer psychological distress.

Risk and Protective Factors of Suicide for Hispanics

Background. Hispanics are one of the fastest growing populations in the United States, constituting 16.3% of the U.S. population (U.S. Bureau of Census 2010). In 2010, suicide rates for the Hispanic population (5.85/100,000) were significantly lower than that of the general population (12.43/100,000) (CDC 2010). Hispanic suicide victims were more likely to have fewer years of education, live in urban areas, and be born outside of the United States (Chang et al. 2010). Despite their overall socioeconomic disadvantages, Hispanics maintain lower suicide rates than Whites (Kubrin and Wadsworth 2007; Sorenson and Golding 1988) or American Indians and Alaska Natives. Research suggests that acculturation and acculturative factors are influential in predicting suicide for Hispanics. Previous research suggests that the low suicide rates among Hispanics can be attributed to cultural objections to suicide, religious participation, and responsibility to family (Oquendo et al. 2005; Garza and Cramer 2011). Hispanic suicide is influenced by cultural, economic, and demographic factors.

Unemployment, poverty, and education. Wadsworth and Kubrin (2007) found that when Hispanics are culturally isolated and economically disadvantaged, they are susceptible to suicide. However, researchers also suggest that Hispanics may be impacted by poverty differently depending on their immigrant or native status. Foreign-born Hispanics may come from socioeconomically disadvantaged countries and when relocating to the United States may fare better economically and be less impacted by poverty in the United States. Kubrin and Wadsworth (2007) find that the greater the presence of economically and

educationally successful Hispanics within in a community, the lower the overall suicide rate. One explanation they give is that successful Hispanics in the community serve as role models, creating a sense of hope. In contrast, Pickering (2002) found that Hispanic females with graduate degrees were at greater risk for suicide, compared to females with less than a high school education.

Region and urban. The majority of Hispanics live in urban areas and within the Southwest region of the United States. According to Vega and Amaro (1994), nine out of 10 Hispanics live in urban areas. Metropolitan Statistical Areas or MSAs with larger immigrant populations experienced less suicide (Kubrin and Wadsworth 2007). According to Pickering (2002), Hispanics born in the United States who reside in cities with a population of 500,000 or more were significantly less likely to commit suicide. Studies have shown that Hispanic females living in urban areas are at risk for attempted suicide. The largest percentage of Hispanic suicides in 2010 took place in the Western region of the United States (CDC 2014).

Age and gender. Suicide is the third leading cause of death for Hispanics aged 15-24 (CDC 2010), and suicide among Hispanics declines with age (Hovey and King 1997). Smith, Mercy, and Rosenberg (1986) found that young Hispanic males also are affected by suicide, with a greater rate of suicide for the 20-24 age group and peaking at about age 30. Hispanic females attempt suicide at greater rates but have lower completion rates.

Religion, family, and cultural factors. Aspects of the Hispanic culture may contribute to the lower suicide rates for this population. Religious affiliation and family ties, which have an emphasis on extended family networks, are considered to

be a buffer against suicide among Hispanics (Sue, Ivey, and Peterson 1996).

Although Hispanic populations cannot be overgeneralized due the inclusion of various ethnic groups with diverse cultural backgrounds under one racial umbrella, the Hispanic population is historically Catholic. According to scholars, involvement in the Catholic Church has contributed to the low suicide rates among Hispanics (Hovey and King 1997). Hovey and King (1997) found aspects of Catholicism to be protective against suicide by influencing cultural norms and moral beliefs related to the taking of one's life. Durkheim believed that Catholicism may provide a certain level of community integration, which is protective of suicide.

The status of interpersonal relationships, including those of family and friends (referred to as familism or familismo), has been identified as one of the fundamental protective factors against suicide among Hispanics (Bernal, Cuba-Aviles, and Santiago 2006; Garza and Cramer 2011; Chang et al. 2010). Kubrin and Wadsworth (2007) have found that divorce significantly increases suicide among Hispanics. Not being able to maintain interpersonal and family relationships is a risk factor for Hispanics (Chang et al. 2010). Along with moral objections to suicide, family responsibility and child-related concerns were found to be protective of suicide for Hispanics. Garza and Cramer (2011) found that the presence of children in the home, regardless of the number of children, is a protective factor. Social support in child rearing and living arrangements may buffer Hispanics from suicide. Range et al. (2000) note that extended family networks often include several nuclear families residing in a single household.

Gun ownership and substance use. Betz et al. (2011) found that Hispanic suicides were equally likely to involve substance use and firearms. Hispanics born in the United States have higher rates of substance and alcohol use (Canon and Levy 2008). Hispanic suicide victims between the ages of 20-29 were found to have higher alcohol content in their blood than other racial and ethnic minority suicide victims (CDC.MMWR Weekly, June 19, 2009 / 58(23); 637-641). Hispanics who commit suicide are likely to use a firearm (Chang et al. 2010). Firearm related suicide deaths accounted for 37% of all suicides by Hispanics in 2010 (CDC 2012).

Acculturation. Immigration and nativity often is discussed when studying suicide among Hispanics. More than half of the Hispanic population was born outside of the United States (Porter 2003; Kubrin and Wadsworth 2007). Immigrant status was found to be influential in the deterrence of suicide. Kubrin and Wadworth (2007) found that Hispanics born outside the country have significantly lower suicide rates than native-born Hispanics. They also found acculturation to significantly increase suicide. Ortega et al. (2008) found that acculturated Hispanics were more likely to suffer from substance abuse disorders and suicide risk.

Risk and Protective Factors of Suicide for American Indians and Alaska Natives

Background. Today, the estimated U.S. population of American Indians and Alaska Natives is 2.9 million (U.S. Census Bureau, 2010), and more than 566 tribes are federally recognized, not including those currently petitioning for state and government recognition (Department of the Interior, Bureau of Indian Affairs,

2012). Tribal nations continue to be affected by significant hardships that contribute to high rates of suicide. American Indians have the highest suicide rate among racial and ethnic groups (Wallace et al. 1996). Poverty, education, substance use, and acculturative stress have all been identified as a risk factor of suicide (Lester 1997; Van Winkle and May 1986).

Unemployment, poverty, and education. In 2010, more than 28.4% of the reservation-dwelling American Indian population was living in poverty. Adverse living conditions on reservations and the lack of steady employment for those living on reservations contribute to elevated suicide rates (Bachman 1992). American Indians and Alaska Native have the highest poverty rate among all racial and ethnic groups with a rate of 29%, compared to national average of 15.9% (ACS 2012).

Studies frequently mention the lack educational attainment among American Indians and Alaska Natives as a contributing factor of suicide, yet few studies have addressed the association between suicide and education among American Indians and Alaska Natives (Wissow et al. 2001; Olson and Wahab 2006). Beals et al. (2005) concluded that educational attainment was associated with a greater risk of trauma, anxiety or comorbid disorders compared with no disorder than were those with less formal education.”

Region and urban. Lester (1995) found that American Indian and Alaska Native suicide rates were associated with wealth and urbanization. According to the Office of Minority Health (OMH), more than 60% of the U.S. American Indian populations reside in an urban area. According to the 2010 Census, 41% of the American Indian and Alaska Native population lived in the West, while the second

largest population resides in the South. Western states contain the largest tribal statistical and federally designated reservation areas. Lester (1995) concluded that American Indian and Alaska Native suicide rates were elevated in impoverished Western states, a result attributed to large reservations in those states.

Age and gender. Potter et al. (1995) found that suicide rates declined for middle-aged adults in the general population, while MacMahon et al. (2003) found that for American Indians and Alaska Natives, suicide rates do not decline for middle-aged adults but increase or spike. Further studies have shown that among American Indians and Alaska Natives, the “age distribution of suicide rates for American Indians and Alaska Natives is quite unlike that for the general population, because of high rates among young adults and lower rates among the elderly” (Wallace et al. 1996). Males are more likely to complete suicide than females.

Religion, family, and cultural factors. Family and cultural disruptions are often mentioned in the literature as a predictor of suicide among American Indians and Alaska Natives (Hill 2009; Lanier 2010). Lanier’s (2010) research suggests that family disruption is a major factor influencing suicide among American Indian groups. Lanier (2011) found the prevalence of female-headed households to be a significant predictor of suicide among American Indians and Alaska Natives. Previous suicide research has not looked at the direct impacts of marriage or divorce on suicide among American Indians and Alaska Natives although it is often mentioned as a contributing factor.

Gun ownership and substance use. An association between substance use and suicide has been found by individual studies. A suicide study conducted by

May et al. (2002) in New Mexico found that 66% percent of suicide deaths recorded for American Indians and Alaska Natives in the state were alcohol related. In a suicide prevention study among a Southwestern tribe, Holden and Trimble (1990) found that illicit drug and alcohol use was prevalent among American Indian and Alaska Native youth. Kunitz and Levy (1997) argue that alcohol consumption is characteristic of the younger American Indian and Alaska Native population and is directly related to suicide.

Another risk factor mentioned in previous studies is access to lethal weapons. Borowsky et al. (1999) found gun availability to be positively associated with suicide attempts among female American Indian and Alaska Native adolescents.

Acculturation. According to several studies, acculturation is a risk of suicide and other lethal behaviors among American Indians and Alaska Natives. Olson and Wahab (2006:21) describe acculturation among American Indians and Alaska Natives as the “modification of the culture of a group or individual as a result of contact with a different culture.” Acculturation for American Indians and Alaska Natives has been described as the loss of American Indian languages, tribal beliefs, and the lack of connectedness to family networks (Range et al 2000; Hill 2009). In a suicide study conducted among a Southwestern tribe, Wissow et al. (2001) found that suicide victims came from families that predominantly used a tribal language at home, rather than English. According to May and Van Winkle (1994) and to Range et al. (2000), acculturation has led to family disruption, divorce, and alcoholism. Other studies have found that acculturative pressures have affected family structures and extended family networks (Range et al 2000; Garrett and Carroll 2000). Van Winkle

and May (1986) found that acculturation plays a considerable role in predicting elevated suicide rates among American Indians.

Summary of Hypothesized Relationships

Arguments concerning the influence of poverty, unemployment, state-level gun ownership, religion, and economic factors on suicide rates provide several hypotheses to explain the connection between these social conditions and suicidal behavior. These hypothesized relationships are summarized in Table 1. While literature reports the effects of poverty, unemployment, and other risk and protective factors of suicide for racial and ethnic groups, racial studies have yet to establish state-level risk and protective factors for the American Indian and Alaska Native population. For this study, the hypothesized relationships between risk and protective factors of suicide for American Indians and Alaska Natives were derived from previous suicide literature. The first column illustrates the relationship between the risk and protective factors of suicide for Whites, African Americans, and Hispanics. The second column illustrates the effect the predictor has on each population according to previous studies. The third and final column states the expected relationship between each predictor and American Indians and Alaska Native suicide.

Table 1: Summary of Hypothesized Relationships Between State-Level Characteristics and American Indian and Alaska Native Suicide

Hypothesized Relationship	Effect			Hypothesis for AI/AN
	White	African American	Hispanic	
Unemployment on suicide (Kposowa 2001; Lester 1993; kubrin and Wadsworth 2007)	(+)	(0)	(+)	An increase in AI/AN unemployment will increase AI/AN suicide.
Percent Urban population on suicide (Singh and Siahpush 2002; Vega and Amaro 1994)	(+)	(+)	(+)	An increase in the states total urban population will increase suicide for AI/AN.
Poverty on suicide (Purselle et al. 2009)	(+)	(0)	(0)	AN increase in AI/AN poverty will increase suicide for AI/AN.
Educational Attainment on suicide (Kposowa 2001; Stack 1998; Pickering 2002)	(-)	(+)	(-)	An increase in educational attainment will increase AI/AN suicide.
Young Male (14-25 yrs) (Davis 1980; Kposowa 2001; Hovey and King 1997)	(0)	(+)	(+)	A increase in the young AI/AN male population (14-25 yrs) will increase suicide for AI/AN.
Region (West = 1) on suicide (Shafer, Gould and Hicks 1994)	(+)	(+)	(+)	The suicide rate for region (West=1) will be greater for AI/AN than other regions.
Gun ownership on suicide (Kubrin and Wadsworth 2009; Chang et al. 2006)	(+)	(+)	(+)	A state-level increase in gun ownership will increase suicide among AI/AN.
Living alone on suicide (Kposowa 2001; Davis 1980; Chang et al. 2006)	(+)	(+)	(+)	An increase in AI/AN population living alone will increase AI/AN suicide.
Substance Use on suicide (Castle et al. 2004; Vega et al. 1993; Willis et al. 2003)	(+)	(+)	(+)	An increase in state-level substance use will increase AI/AN suicide.
Religion on suicide (Stack 1993; Garroutte et al. 2003; Oquendo et a. 2005)	(-)	(-)	(-)	An increase in state-level religious adherence will decrease AI/AN suicide.
Acculturation on suicide (Gibbs 1997; Ortega et al. 2008)	(0)	(+)	(+)	A decrease in AI/AN language use will decrease AI/AN suicide.

Data and Measures

Data was collected from multiple sources, including the 2000 U.S. Census and the Center for Disease Control and Prevention (CDC). State-level data was collected for all 50 states and the District of Columbia. Data for the dependent variable consisted of suicide counts for American Indians and Alaska Natives collected from the CDC. Data on state-level religious affiliation was collected from the Association of Religion Data Archive (ARDA), while substance-use data was collected from the 2000 National Survey of Substance Abuse Treatment Services (N-SSATS) of the Substance Abuse & Mental Health Services Administration (SAMSHA). Data used to measure state-level percentages of American Indians and Alaska Native males aged 14-25 was drawn from the National Historical Geographic Information System (NHGIS).

Dependent Variables

Suicide. The incidence of suicide in each state was collected from the CDC. All recorded suicide events for American Indians and Alaska Natives were collected for the years 2005-2010, totaling 2,358 records. Suicide events were pooled to add stability to the estimates. All suicide events were classified as suicides by the International Classification of Diseases (ICD). Data for the dependent variable is representative of all 50 states and the District of Columbia.

Independent Variables

Data for independent variables was collected for the year 2000. State-level indicators include poverty, unemployment, educational attainment, living alone, and

young male population. Measures of gun ownership, urban, substance use, and state-level religious adherence were not race-specific measures.

Unemployment. Unemployment was measured by the percentage of American Indians and Alaska Natives per states who are of working age 16 and older and who are unemployed. Data was collected from the Census 2000.

Urban. Urban was measured by the percentage of the total state population living in an urban residence. According to the Office of Minority Health (OMH), more than 60% of the American Indian and Alaska Native population live in urban areas. Urban areas include all urbanized areas (more than 50,000 population) and urban clusters (2,500 to 49,999 population) as defined by the Bureau of the Census in the 2000 Decennial Census. This measure is not race specific and includes the total population. Data was collected from the Census 2000.

Poverty. Poverty was measured by the percentage per state of American Indians and Alaska Natives living below the poverty threshold. The federal poverty level is calculated by a set of dollar values determined by the federal Office of Management and Budget (OMB). Poverty thresholds vary by family size and composition but do not vary geographically.

(<http://www.census.gov/acs/www/UseData/Def.htm>). Data for the poverty measure was collected from the U.S Census for the year 2000.

Educational attainment. Educational attainment was measured by the percentage per state of American Indians or Alaska Natives who hold a bachelor's degree. Data for the educational attainment measure was collected from the U.S. Census for the year 2000.

Young male. The variable for young males was calculated using the percentage of male American Indian and Alaska Natives between the ages of 14-25. Data used to create this measure were drawn from the National Historical Geographic Information System (NHGIS). Adolescent males are considered to be a high-risk population for suicide. States with elevated young male populations may experience higher suicide rates.

Region. A control variable for region is introduced into the model. The variable for region controlled for the West. The western states are Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Not only does the western region of the United States have the highest regional suicide rates (<http://www.cdc.gov/injury/wisquars/index.html>), but research regarding the geographic variation has also shown that African American residents of Western states are at greater risk for suicide, more so than Southern states (Davis 1979; Hawkins Crosby and Hammet 1994; Lester 1990-1991).

Gun ownership. A measure for gun ownership was included in the model. In the absence of state-level data on gun ownership for the general population, levels of gun ownership were measured using a proxy. State gun ownership data is nonexistent; therefore, a common proxy consisting of the proxy for gun ownership included total number of firearm homicides divided by the total number of homicides (FH/H), thus indicating state-level gun ownership (Wadsworth and Kubrin 2009; Kleck and Patterson 1993; Lester 1987). Similar suicide studies use the total amount of gun-related suicides over the total number of gun-related suicides

(Wadsworth and Kubrin 2009) to determine gun ownership. Due to conflation between the dependent variable, the total number of homicides rather than suicides was used to generate the gun ownership proxy. Gun-related homicides were not race specific due to low levels of homicides among American Indians.

AI/AN living alone. American Indians and Alaska Natives living alone was measured by the state percentage of American Indians and Alaska Natives who live in single-person households per state. The measure for living alone captures an aspect of social and family integration. Data was collected from the U.S. Census for the year 2000. Living in single-person households has been used to capture aspects of social integration (Burr, Hartman, and Matteson 1999) and has been identified as a predictor of increased suicide risk among the White and Hispanics populations.

Substance use. Substance use was measured using data from the National Survey of Substance Abuse Treatment Services (N-SSATS) of the Substance Abuse & Mental Health Services Administration (SAMSHA). Data was collected for the year 2000 and included the percentage per state of persons who engaged in illicit drug or alcohol use. Substance use is associated with an increased risk of suicide (Rivara et al. 1997).

Religion. To assess the effect of religious factors among American Indians and Alaska Natives, a variable for mainline religious adherence was included in the model. Religion was measured by the percentage of individuals per state who participate in mainline religious denomination. Garrouette et al. (2003) found several tribal populations to practice religious inclusivity and participate in mainline religions, as well as aboriginal religious practices. This measure is not race specific

and Data was drawn from the Association of Religion Data Archive (ARDA) for the year 2000.

Acculturation. Acculturation was measured using the percentage of American Indian and Alaska Native population age 5 and older who spoke non-English languages in the home. Languages spoken include Native North American Indian and Alaska Native languages. Data was collected from the U.S. Census for the year 2000.

Analytic Strategy

I assess the association between state-level predictors of suicide and American Indian and Alaska Native suicide using a negative binomial regression analysis. The negative binomial regression is a Poisson-Gamma mixture-distribution regression model used for modeling over dispersed count data (Hilbe 2011; Cameron and Trivedi 1998). Signs of overdispersion can be seen when the conditional variance exceeds the conditional mean for a proposed Poisson model, but overdispersion essentially describes the inability of the model to capture the full range of data. The negative binomial regression contains the parameter α to capture (negative binomial) overdispersion. Due to the nature of the dependent variable (count data), the negative binomial regression analysis is more appropriate than the ordinary least squares (OLS) regression model (Osgood 2000) or the Poisson model. The dependent variable is right skewed because overall suicide is a rare event.

The probability density function for the negative binomial regression following Hilbe (2011) is given by:

$$f(y, \mu, \alpha) = \frac{\Gamma(y_i + 1/\alpha)}{\Gamma(y_i + 1)\Gamma(1/\alpha)} \left(\frac{1}{1 + \alpha\mu_i}\right)^{\frac{1}{\alpha}} \left(1 - \frac{1}{1 + \alpha\mu_i}\right)^{y_i}$$

Where $\mu = \exp(x_i'\beta)$. The marginal effects from an increase in a factor is given by:

$$\frac{\partial y}{\partial x_k} = \beta_k \exp(x_i'\beta)$$

While not reported, the marginal effects provide the change in the count variable with respect to a change in an independent variable.

Given the small sample (N=51), it is important to view results with caution. I report the estimated negative binomial coefficients, robust standard errors. I explored the possible presence of multicollinearity by examining the variance inflation factor (VIF) scores. The VIF measures the impact of multicollinearity among variables within regression models (Long and Freese 2003). In all the models, the VIF scores were lower than 5, indicating that the parameter estimates are not impacted by multicollinearity. Descriptive statistics are listed in Table 2.

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Suicide</i>	51	47.20	79.35	0	325
<i>Unemployment</i>	51	6.66	1.94	3.80	12.40
<i>Urban</i>	51	72.25	15.28	38.20	100.00
<i>Percent poverty</i>	51	23.18	4.04	16.40	33.40
<i>Educational Attainment</i>	51	9.09	2.38	5.40	16.10
<i>Young male</i>	51	11.20	1.43	9.06	15.47
<i>Region</i>	51	0.24	0.43	0.00	1.00
<i>Gun Ownership</i>	51	0.58	0.14	0.07	0.75
<i>Live Alone</i>	51	22.36	4.72	15.70	45.00
<i>Substance Use</i>	51	6.72	0.76	5.14	8.29
<i>Religion</i>	51	505.51	110.13	313.11	747.30
<i>Acculturation</i>	51	0.09	0.12	0.01	0.54

Findings

Table 3 presents a series of negative binomial regression models estimating the effects of state-level characteristics on suicide rates for American Indians and Alaska Natives. In Model 1, I test hypotheses 1-6: Model 1 consists of baseline predictors of suicide, including unemployment, urban, poverty, education, region, and young male population aged 15-24. Baseline predictors are universal risk or protective factors of suicide among all racial and ethnic populations.

Table 3: Negative Binomial Regression

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>
Variables	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
<i>Dependent Variable: Suicide counts for American Indians and Alaska Natives (2005-2010)</i>						
Percent AI/AN Unemployment	0.1424 (.1301)	.2140 (.2290)	-.0350 (.2145)	.2520 (.2064)	.1356 (.1774)	.1480 (.1304)
Percent Urban Population	0.0407*** (.0161)	.0381** (.0169)	.0081 (.0309)	.0467*** (.0179)	.0404** (.0163)	.0412** (.0169)
Percent AI/AN Poverty	0.1031 (.1056)	.1111 (.1080)	-.0190 (.1529)	.1102 (.1036)	.0979 (.1187)	.1036 (.1036)
Educational Attainment	-0.1803 (.1540)	-.1451 (.1756)	-.2218 (.1722)	-.1663 (.1573)	-.1849 (.1712)	-.1889 (2.195)
Young Male (14-25 yrs)	-0.6607 (.2356)	-.6918*** (.2350)	-.0483 (.4840)	-.6954*** (.2481)	-.6588*** (.2361)	-.6954*** (.2482)
Region (West =1)	0.9120** (.4509)	.8511* (.4875)	.6535 (.4098)	1.1207** (.5628)	.9476 (.6358)	.9127** (.4488)
State Level Gun ownership		1.2910 (2.6344)				
Percent AI/AN Live alone			-.3478 (.2141)			
Substance Use				-.4654 (.5569)		
Religion					.0002 (.0031)	-.3537 (2.1947)
Acculturation						
N	51	51	51	51	51	51
Constant	5.8120	4.6267	13.3437	7.8070	5.8937	5.9277
Alpha	3.7292	3.7206	3.4532	3.7081	3.7282	3.730
- 2 LL	-194.25	-194.1809	-192.4842	-194.0171	-194.2494	-194.2470

* Significance at 10% level, ** Significance at 5% level, *** Significance at 1% level
 Note.-Entries are unstandardized coefficients; Robust Standard errors in parentheses.

Hypothesis 1 (H1): As state-level unemployment increases for American Indians and Alaska Natives, I expect suicide to increase.

In Model 1, I did not find support for unemployment (H1). State-level unemployment did not increase suicide for American Indians and Alaska Natives. The coefficient for unemployment was not significant at standard levels.

Hypothesis 2 (H2): An increase in American Indian and Alaska Native poverty will increase American Indian and Alaska Native suicide.

In Model 1, I tested Hypothesis 2, which expected state-level poverty rates to increase suicide among American Indians and Alaska Natives. However, I did not find support for this hypothesis. The coefficient for poverty was not significant at standard levels.

Hypothesis 3 (H3): A percentage increase in the total state urban population will increase suicide among American Indians and Alaska Natives.

I found support for (H3), which states that as the state percentage of urban-dwelling population increases, so will suicide among American Indians and Alaska Natives. Urban was positively related to suicide for American Indians and Alaska Natives ($B=.0407, p<.05$).

Hypothesis 4 (H4): A state-level increase in the education levels of American Indians and Alaska Natives will increase suicide among this population.

In Model 1, I tested Hypothesis 4. I expected to see higher levels of education to increase suicide rates among American Indians and Alaska Natives. I did not find support for this hypothesis. State-level increases in educational attainment were not associated with suicide for American Indians and Alaska Natives.

Hypothesis 5 (H5): An increase in the young American Indian and Alaska Native male population (14-25 yrs.) will increase suicide rates for American Indians and Alaska Natives.

I did not find support for young male (H5), but findings were interesting and noteworthy. Young male was statistically significant and negative ($B = -.6607$, $p < .01$).

Hypothesis 6 (H6): American Indians and Alaska Natives will be experience increased suicide rates within the Western region of the United States.

In model 1, a variable for region was included in the model. The variable controlled for the West= (1). The coefficient for region was significant and positive ($B = .9120$, $p < .05$).

Hypothesis 7 (H7): A state-level increase in gun ownership will increase suicide among American Indians and Alaska Natives.

In Model 2, I tested Hypothesis 7. Model 2 included all baseline predictors and a proxy for state-level gun ownership. The coefficient for gun ownership is not significant at standard levels. However, in Model 2 the coefficient for urban, region, and young male remained significant. Urban was positive and significant ($B = .0381$, $p < .05$). The coefficient for young male was negative and significant ($B = -.6918$, $p < .05$). The variable region was marginally significant and positive ($B = .8511$, $p < .10$).

Hypothesis 8 (H8): As the percentage of American Indians and Alaska Natives who live alone increases per state, I expect suicide to increase among American Indians and Alaska Natives.

In Model 3, I included a measure for the percentage of the American Indian and Alaska Native population who live in single-person households. According to previous research, living alone is associated with increased levels of suicide (Kposowa 2001). The variable for living alone was not significant at standard levels. I do not find support for H8. Living alone does not increase suicide for American Indians and Alaska Natives. However, when the variable for living alone is included in the model, it mediates the effects of the variables urban and young male.

Hypothesis 9 (H9): As state-level percentage of substance use increases, I expect suicide among American Indians and Alaska Natives to increase.

In Model 4, I test Hypothesis 9 by including a measure for state-level substance use. The coefficient for substance use was not significant at standard levels. Although previous findings suggest substance use is a significant predictor of suicide (Betz et al. 2011), I do not find support for this Hypothesis at the state-level. However, the variables urban, region, and young male were significant at standard levels. Urban was positive and significant ($B = .0466, p < .01$); the control variable for region also was positive and significant ($B = 1.1207, p < .05$); and young male was significant and negative ($B = -.6954, p < .01$).

Hypothesis 10 (H10): As the state-level religious adherence increases, I expect suicide among American Indians and Alaska Natives to decrease.

In Model 5, I test Hypothesis 10. Model 5 included a variable for religious adherence, as well as for all baseline predictors. The measure for religion was not statistically significant at standard levels. I did not find support for H10. State-level religious adherence was not statistically significant and did not decrease suicide

among American Indians and Alaska Natives. The baseline predictors urban and young male, which were included in Model 5, remained statistically significant. Urban ($B=.0404$, $p<.05$), along with the measure for young male, also was significant and negative ($B=-.6588$, $p<.001$).

Hypothesis 11 (H11): As the percentage of American Indian and Alaska Native language decreases (acculturation), I expect suicide to decrease among American Indians and Alaska Natives.

In Model 6, I test Hypothesis 11. Hypothesis 10 states that as the percentage of acculturation decreases, suicide also will decrease. However, I do not find support for this hypothesis. The coefficient for acculturation was not significant at standard levels. The percentage of American Indians and Alaska Native languages spoken in the home had no association with the state-level suicide rate for American Indians and Alaska Natives. Similar to Model 5, urban, region, and young male remained significant.

Discussion and Conclusion

The objective of this analysis was to examine the state-level indicators of suicide for American Indians and Alaska Natives across all 50 states and the District of Columbia. More specifically, I tested various indicators identified in studies of non-American Indian and Alaska Native populations that have been considered important predictors of suicide. I hypothesized that the state-level indicators of suicide for American Indians and Alaska Natives would differ from that of the non-American Indian and Alaska Native populations. Findings suggest that the state-level predictors of suicide for American Indians and Alaska Natives differ from other racial and ethnic populations.

An increase in a state's urban population was positively associated with an increase in American Indian and Alaska Native suicide. This finding is consistent with previous suicide research for other racial and ethnic populations. Other notable findings include a negative relationship between the young American Indian and Alaska Native males and suicide. Several studies have shown that young males aged 15- 24 are at greater risk for suicide (Blakely, Collings, Atkinson 2003; Gould et al. 2003; Breault 1986; Hendin 1969). Previous research suggests a positive association between young male populations and increased levels suicide. However, contrary to previous research, my findings suggest that an increase in the young male population is associated with a decrease suicide for American Indians and Alaska Natives. I found that the percent of males in the suicide-prone age (15-24) was negatively associated with suicide. This finding is similar to that of state-level research on American Indian and Alaska Native homicide (Painter-Davies 2010; Peterson and

Krivo 1993) that found a similar effect in studies of homicide and American Indian and Alaska Native populations.

Previous research suggests that state-level poverty, living alone, substance use, and gun ownership are risk factors of suicide for other racial and ethnic populations. Contrary to expectations, I found that state-level poverty, gun ownership, and living alone were not significant predictors of American Indian and Alaska Native suicide. There are several possible explanations for these findings. Poverty was measured using absolute poverty vs. relative deprivation. American Indians and Alaska Natives historically and contemporarily experience socioeconomic disadvantage at significant rates. Therefore using an alternate measure of poverty for American Indians and Alaska Natives would render different results.

Another interesting finding unique to American Indians and Alaska Natives is that state-level gun ownership did not impact suicide. This finding is contrary to previous studies that have found state-level gun ownership to be a significant predictor of suicide across gender, age, and racial and ethnic populations (Seltzer 1994; Kaplan and Gelling 1998). Consistent with the findings of Kubrin and Wadsworth (2009), gun ownership impacts racial populations differently due to racial differences in gun ownership and storage. Race-specific gun ownership for American Indians and Alaska Natives may impact suicide differently and warrants further research.

Previous studies found that living alone significantly increased suicide (Kposowa 2001; Kowalski, Faupel, and Star 1987). I found that living alone did not

increase suicide among American Indians and Alaska Natives. One possible explanation is that living alone may be a proxy for income. As individuals become financially stable or gain a measure of wealth through other means of income stability, they can afford to live alone. Previous research suggests that living alone creates social isolation, which then leads to suicide. For American Indians and Alaska Natives, living alone may suggest increased earnings.

There are several limitations to this study. First, there is a possible undercount of suicide deaths for American Indians and Alaska Natives in official suicide data. American Indians and Alaska Natives are often racially misclassified by coroners (Arias et al. 2008). Along with racial misclassification, suicide as the cause of death is also subject to misclassification. Suicide deaths are often classified as traffic accidents or accidental deaths, which may further lower the count of actual suicides by this population. Warshauer and Monk (1978) argued that underreporting of suicides can impact analysis. However, Pescosolido and Mendelsohn (1986) found that under-reporting was not significant enough to alter outcomes. Finally, the models used to assess risk and protective factors of suicide were based on risk and protective factors of suicide for Whites, African Americans, and Hispanics, which failed to explain a large portion of the difference in suicide risk for American Indians and Alaska Natives.

This research represents an important step towards understanding the state-level risk and protective factors of suicide for American Indians and Alaska Natives. Future research should extend this analysis in a number of ways. First, all variables included in the analysis were either risk or protective factors of suicide for Whites,

African Americans, and Hispanics. Future research should include variables specific to the American Indian and Alaska Native populations. Second, due to the non-significant findings of gun ownership, additional research might re-examine gun ownership using different methods of analysis and testing for regional differences in gun ownership. Third, additional research should include an analysis of structural disadvantage and suicide among American Indians and Alaska Natives, using alternative measures such as female head of household. Fourth, additional research should extend the use of racial invariance for suicide among American Indians and Alaska Natives. The racial invariance theory assumes that the root causes of deviance (suicide) are the same for all racial and ethnic groups and that differences in rates stem from disparities produced by social conditions in African American and White communities (Sampson and Wilson 1995; Shaw and McKay 1969).

This study has made a contribution to suicide research for American Indian and Alaska Natives. Research regarding the state-level risk and protective factors for the American Indian and Alaska Native population contributes to the understanding of suicide for ethnic and racial subgroups. Not only did the study highlight the importance of continuing research on suicide among American Indians in order to account for the differences in predictor outcomes for this population, but the outcome variable identified high-risk regions of suicide for American Indians and Alaska Natives. For several reasons, the findings are important for social policy. Reported suicide counts for American Indians and Alaska Natives vary considerably across states. For example, for the aggregate five years Arizona had 325 American Indian suicide incidents, while New Mexico had 243 events, and some states, such as

Michigan (50) and Florida (29), had comparatively low counts. Focusing social-policy intervention and prevention efforts on high-risk states may significantly impact the disproportionate suicide rates among American Indians and Alaska Natives.

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