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Original Research

An Ecological Approach to Preventing Suicide Using the National Violent Death Reporting System and County Level Health Status Data

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***Abstract*:** Violence is a leading cause of mortality in the United States, accounting for about 50,000 deaths per year; the majority of violent deaths are suicides. We employ Poisson regression modeling to identify combinations of county level characteristics that are associated with elevated suicide rates. The most striking finding in our study was as unemployment increases so does the rate of county suicides. Knowledge about characteristics of communities in which suicide is more common may suggest how best to construct effective interventions and target limited resources for those interventions.

Keywords: Violent Death, Homicide, Suicide, Health Status, Ecological Model, Counties

Violence is a leading cause of mortality in the United States, accounting for about 50,000 deaths per year or 2.1% of all deaths (Centers for Disease Control and Prevention. Atlanta, GA 2009). Violent death, which includes homicides, suicides and unintentional gun related fatalities, affects all ages and has no geographical boundaries (Georgia. Centers for Disease Control and Prevention. Atlanta, 2009; Karch, Lubell, Friday, Patel, & Williams, 2008). According to the Centers for Disease Control and Prevention (CDC), every year an estimated $52 billion in medical care, from injury leading to death, and lost productivity, associated with the value of goods and services never produced because of fatality, are attributed to violent death in the United States (Corso, Mercy, Simon, Finkelstein, & Miller, 2007). Suicides account for the majority of violent deaths with an overall age-adjusted rate of 11.26 suicide deaths per 100,000 people in 2007. Nationally suicides outnumbered homicides by nearly two to one between 1999 and 2007(Georgia. Centers for Disease Control and Prevention. Atlanta, 2009).

Previous ecological suicide studies have found associations between suicide rates and access to health care, specifically psychiatric care (Shah, Bhandarkar, & Bhatia, 2010; Tondo, Albert, & Baldessarini, 2006). A study in Denmark shows a decrease in suicide rates in the past 20 years perhaps attributed to recent improvements in psychiatric care and treatment(Qin et al., 2006) or changing autopsy rates(Kapusta et al., 2011; Reseland et al., 2008). Another study found increasing suicide rates in China partially attributed to the lack of availability and quality of mental health services. That same study documented reductions in elderly suicide rates in Singapore, urban China, England, and Wales, due in

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some measure to improvements in healthcare and social services (Shah et al., 2010).

Economic risk factors have also been linked to suicide rates, dating back to Durkheim, who considered suicide and society in 1897. According to his theory, suicide rates are expected to increase in periods of economic instability (Durkheim, 1897). Several studies have confirmed the link between economic factors and suicide rates (Ceccherini-Nelli & Priebe, 2011; Lester, 2001). Maki and Martikainen showed that suicide rates rise during recession, and Blakely associated personal unemployment with a two to threefold increased of risk of suicide (Blakely, Collings, & Atkinson, 2003; Maki & Martikainen, 2010). A study by Davila and colleagues found that working was associated with lower risks of suicide and other forms of premature mortality, particularly in young adults 18-24 (Davila et al., 2010).

The CDC's National Center for Health Statistics (NCHS) provides suicide information initially recorded on death certificates (completed by funeral directors, attending physicians, medical examiners, and coroners). Death certificate information proves useful but remains incomplete in both content and coverage. Data from the National Violent Death Reporting System (NVDRS) are now available, and published studies from this data provide a more detailed picture of suicide than previously available (Karch, Barker, & Strine, 2006; Karch, Logan, & Patel, 2011; Sanford et al., 2006). Prior to the development of the NVDRS, studies have been limited to the NCHS death certificate data system, which contains limited information on the circumstances of the injury incident and factors contributing to death. Additionally, public access to these data is usually not available until two years after the calendar year of death (Centers for Disease Control and Prevention. Atlanta, 2011). Suicide prevention efforts across the United States are hampered by the inherent limitations of death certificate data. An issue for prevention is record keeping and classification by death scene investigators. Statewide suicide coverage could be compromised if suicide deaths are uniformly misclassified or there are differences in investigations and classifications between counties. If cases are not correctly classified, results can be misinterpreted. The Kentucky Violent Death Reporting System (KVDRS) collects information from multiple investigative sources statewide (providing greater coverage of a violent event), as part of the NVDRS.

In this study we examine characteristics at the county level, including but not limited to those mentioned above (for example, economic conditions and healthcare access), to better understand the context of suicide. In particular, we employ Poisson regression modeling to identify combinations of county level characteristics that are associated with elevated suicide rates. Geographic distributions of suicide are readily available, using NCHS information, but this study moves beyond counts and rates to incorporate ecological predictive factors. Though there are numerous ecological suicide studies in other countries, little has been published recently in the U.S(Agerbo, Sterne, & Gunnell, 2007; Cutright & Fernquist, 2004; Hawton, Harriss, Hodder, Simkin, & Gunnell, 2001; Kposowa & D'Auria, 2010; Rehkopf, 2006; Rezaeian, Dunn, St Leger, & Appleby, 2005; Stack, 2000a, 2000b). The NVDRS is a population-based surveillance system which incorporates more comprehensive suicide data, but these data have not been linked to community health indicators or other county-level information. Furthermore, NVDRS public use on-line data are not available at the county level and therefore cannot be utilized as in this study.

Hence, with more specific data and more elaborate statistical modeling than in many other recent studies, the present study has the potential to offer fresh insights into the context of suicide. This is relevant to suicide prevention efforts because knowledge about characteristics of communities in which suicide is more common may suggest how best to construct effective interventions and target limited resources for those interventions.

Background

Compiling more informative data is essential to a comprehensive understanding of suicide. In 2002, the CDC established a national system for collecting data on violent deaths, including homicides, suicides, and firearm-related fatalities. The NVDRS provides timely and detailed information about "the magnitude, trends, and characteristics of violent deaths," thereby aiding in the evaluation and continuous improvement of state-based violence prevention policies and programs (Georgia. Centers for Disease Control and Prevention. Atlanta, 2009).

As of 2010, 18 states benefit from the additional data gathering capabilities provided by affiliation with the NVDRS. Key elements of suicide are recorded from coroners' (and medical examiners') reports uniformly in these 18 states. In particular, a narrative is included that thoroughly describes the circumstances surrounding a suicide. As part of the NVDRS, the Kentucky Violent Death Reporting System (KVDRS) collects statewide information about the precipitating circumstances leading to suicide from multiple investigative sources, such as law enforcement, coroners and crime laboratory personnel (Walsh, Dignan, & Caldwell, 2007).

The present study uses KVDRS data in conjunction with data from the Community Health Status Indicators (CHSI) report. The latter represents the culmination of a national project aimed at

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Table 1. List of Variables, Definitions and Data Sources for the Ecological Analysis

Variable Name	Variable Definition	Data Source and Variable Value
Motor Vehicle Crashes	Death due to unintentional motor vehicle crashes	NCHS (94-08) Age-Adjusted Rate*
Unemployment	Percentage of persons who had no employment, were available for work and had made specific efforts to find employment	Bureau of Labor Statistics (08) Annual Average
Access to Primary Care Physicians	Active, primary care physicians	AMA (04) Per 100,000 people
Access to Dentists	Active dentists	ADA (05) Per 100,000 people
Uninsured Status	Percentage of individuals in the county without health insurance coverage	SAHIE (05) Rate
Recent Drug Use	Percentage of individuals using illicit drugs within the past month	NSDUH (06-07) Annual Average
Colon Cancer	Malignant neoplasm	NCHS (94-03) Age-Adjusted Rate
Lung Cancer	Malignant neoplasm	NCHS (94-03) Age-Adjusted Rate
Breast Cancer	Malignant neoplasm	NCHS (94-03) Age-Adjusted Rate
Hepatitis B	Reported cases	CDC (94-03) Percentage
Diabetes	Doctor confirmed diabetes	BRFSS (00-06) Percentage
Coronary Heart Disease	Diseases of the heart	NCHS (94-03) Age-Adjusted Rate
Stroke	Death due to cerebrovascular diseases	NCHS (94-03) Age-Adjusted Rate
Appalachian Status	Of the 120 Kentucky counties, 51 are considered Appalachian (Estimated 28% of the state's population)	Appalachian Regional Commission
Obesity	Percentage BMI≥30	BRFSS (00-06) Average
Smoking Status	Self reported current smoker	BRFSS (00-06) Average
No High School Diploma	25 and older who have not graduated from high school	Census Bureau (00) Prevalence estimates
Self-rated Health Status	Percentage of adults (≥18) who report "fair" or "poor" overall health	BRFSS Survey (00-06) Average
Average number of unhealthy days in the past month	Average number of unhealthy days (mental or physical), past 30 days, (≥18)	BRFSS Survey (00-06) Average
Major Depression	Having at least one major depressive episode during the past year	SAMHSA (04-05) Average
Work Disability	The inability to work due to health problems: mental or physical	Census Bureau Prevalence estimates
Not Engaging in Physical Exercise	Percentage of individuals reporting no participation in any leisure-time physical activities or exercises	BRFSS (00-06) Average
Poverty	Percentage of individuals living below the poverty level	SAIPE, U.S. Census Bureau (03) Average
Race	Percentages of white, black, Asian American/Pacific Islander, American Indian	U.S Census Bureau (05) Percentage
Ethnicity	Percentage of Hispanics	U.S Census Bureau (05) Percentage

*Per 100,000 person years; ADA: American Dental Association; AMA: American Medical Association; SAHIE: Small Area Health Insurance Estimates Program; SAIPE: Small Area Income Poverty Estimates; SAMHSA: Substance Abuse and Mental Health Services Administration; BRFSS: The Behavioral Risk Factor Surveillance System; NSDUH: The National Survey on Drug Use and Health

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documenting county-level indicators of key public health areas. The CHSI report contains over 200 indicators, from all 120 Kentucky counties, which are intended to encourage improvement in health standards and action toward enhancing a community's health. The CHSI data can be used to measure the community's health. This data serves as a starting point for community assessment of needs, identification of vulnerable populations, and measurement of preventable diseases, disabilities, and deaths. CHSI indicators eligible for inclusion in this manuscript's ecological model for suicide include: motor vehicle crashes, unemployment, access to primary care physicians, access to dentists, uninsured status, recent drug use, colon, lung and breast cancer rates, Hepatitis B, diabetes, coronary heart disease, stroke, Appalachian status, obesity, smoking status, no high school diploma, self-rated health status, average number of unhealthy days in the past month, major depression, work disability, not engaging in physical exercise, poverty, race, and ethnicity (Table 1). The CHSI report is publicly available, having been designed for consumption by both public health professionals and community members interested in public health (Group, 2008). Several studies have used CHSI data in preventing disease (Kanarek, Bialek, & Stanley, 2008; Metzler et al., 2008; Sondik, 2008).
This study utilizes information from the CHSI report to formulate an ecological model through which disparities in suicide rates, within a state, may be related to county-level factors not quantified in NCHS or NVDRS data. Thus, the present study provides new insights about suicide that may be relevant to prevention policies and programs, including the identification of geographic regions to which resources and interventions may be most beneficially targeted.

Methods

Data Acquisition

Kentucky's office of vital statistics provided a monthly electronic death certificate file to the KVDRS beginning March 2005. A subset was then generated using The International Statistical Classification of Diseases and Related Health Problems: Tenth Revision (ICD-10 Codes) meeting the CDC's definition of suicide. Additionally, information was requested from coroners, the Kentucky State Police and the state toxicology laboratory. This study includes suicides, from January 2005 until December 2007, where an investigation occurred within Kentucky.

Cases were linked to electronic death certificate data and coroners' reports by name, date of death, and county of death and then combined in the KVDRS database to yield aggregate numbers of suicides by county.

The CHSI report contains over 200 county-level measures; CHSI variables eligible for inclusion in this manuscript's ecological model are listed in Table 1. County population size was based on the 2005 U.S. Census Bureau estimates.

Statistical Modeling

Suicide counts were modeled using Poisson regression with county as the unit of analysis. The logarithm of county population size was used as an offset in the Poisson regression so that the logarithm of the suicide rate (rather than of the expected suicide count) would be expressed as a linear combination of explanatory variable values. Explanatory variables were selected from among the candidates identified in Table 1 via backward elimination with significance threshold 0.05. The rationale for backward elimination was to achieve an appropriately parsimonious ecological model not only for ease of interpretation but also for precision in estimating rate ratios; including extraneous explanatory variables could inflate standard errors and widen confidence intervals. Finally, the ratio of deviance to degrees of freedom in the Poisson regression was close to unity, and so overdispersion was deemed not to be an issue.

Results

Between 2005 and 2007, 2,637 people died violently in Kentucky. Of these, 1,790 (67.9%) died by suicide. Precipitating circumstances were recorded in 1,304 (72.8%) of these 1,790 suicides. Table 2 provides the circumstantial breakdown of suicides by year and gender. Consistent with previously published reports, a depressed mood was the most frequently documented contributing factor (Karch et al., 2006; Karch et al., 2011; Sanford et al., 2006; Walsh, Clayton, Liu, & Hodges, 2009). Not surprisingly, two other frequently cited contributing factors were a diagnosed mental health problem and treatment for mental illness.

Table 3 presents rate ratio estimates from the Poisson regression model. Motor vehicle crashes, unemployment, access to primary care physicians, colon cancer, lung cancer, and recent drug use (all percentages or rates measured at the county level) were significantly associated with county suicide counts over the three years spanned by this study. Controlling for county population size and all other explanatory variables in the Poisson regression model, a 1% additive increase in unemployment increases the expected county suicide count by an estimated 24.8%. Moreover, an increase of 10 motor vehicle crashes per 100,000 person-years increases the expected county suicide count by an estimated 10.8%, while an increase of 10 primary care physicians per 100,000 persons yields an estimated 3.4% increase.

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Table 2. Social and Psychological Contributing Factors for Suicide in Kentucky: Data from the NVDRS for Kentucky, by Year and Gender

	All			Male			Female		
	2005	**2006**	**2007**	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**
Total Suicides	557	605	628	451	502	516	106	103	112
Circumstances known*	435 (78.1%)	409 (67.6%)	460 (73.2%)	348 (77.2%)	337 (67.1%)	378 (73.3%)	87 (82.1%)	72 (69.9%)	82 (73.2%)
Current depressed mood	239 (54.9%)	219 (53.5%)	238 (51.7%)	183 (52.6%)	171 (50.7%)	191 (50.5%)	56 (64.4%)	48 (66.7%)	47 (57.3%)
Current diagnosed mental health problem	228 (52.4%)	160 (39.1%)	179 (38.9%)	166 (47.7%)	121 (35.9%)	136 (36.0%)	62 (71.3%)	39 (54.2%)	43 (52.4%)
Current treatment for mental illness	228 (52.4%)	152 (37.2%)	170 (37.0%)	166 (47.7%)	114 (33.8%)	129 (34.1%)	62 (71.3%)	38 (52.8%)	41 (50.0%)
Intimate partner problem	124 (28.5%)	129 (31.5%)	128 (27.8%)	103 (29.6%)	117 (34.7%)	115 (30.4%)	21 (24.1%)	12 (16.7%)	13 (15.9%)
Physical health problem	88 (20.2%)	102 (24.9%)	110 (23.9%)	72 (20.7%)	85 (25.2%)	85 (22.5%)	16 (18.4%)	17 (23.6%)	25 (30.5%)
Crisis in the past two weeks	99 (22.8%)	72 (17.6%)	60 (13.0%)	87 (25.0%)	60 (17.8%)	51 (13.5%)	12 (13.8%)	12 (16.7%)	9 (11.0%)
Alcohol problem	58 (13.3%)	64 (15.6%)	64 (13.9%)	47 (13.5%)	54 (16.0%)	50 (13.2%)	11 (12.6%)	10 (13.9%)	14 (17.1%)
Other substance abuse problem	57 (13.1%)	60 (14.7%)	70 (15.2%)	43 (12.4%)	47 (13.9%)	58 (15.3%)	14 (16.1%)	13 (18.1%)	12 (14.6%)
History of suicide attempts	76 (17.5%)	50 (12.2%)	47 (10.2%)	51 (14.7%)	31 (9.2%)	34 (9.0%)	25 (28.7%)	19 (26.4%)	13 (15.9%)
Recent criminal/legal problem	50 (11.5%)	35(8.6%)	46 (10.0%)	46 (13.2%)	33 (9.8%)	44 (11.6%)	4 (4.6%)	2 (2.8%)	2 (2.4%)
Person left a suicide note	91 (20.9%)	95 (23.2%)	95 (20.7%)	67 (19.3%)	71 (21.1%)	76 (20.1%)	24 (27.6%)	24 (33.3%)	19 (23.2%)
Person disclosed intent to commit suicide	120 (27.6%)	99 (24.2%)	96 (20.9%)	98 (28.2%)	84 (24.9%)	81 (21.4%)	22 (25.3%)	15 (20.8%)	15 (18.3%)

*The numbers in this row provide the denominators for the percentages in subsequent rows. More than one circumstance may be listed for each suicide death.

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Table 3. The Effect of County Characteristics on County Suicide Counts/Rates (N=120): Estimated rate ratios, 95% confidence intervals, and p-values for Poisson regression model

Explanatory Variable	Estimated Rate Ratio	95% Confidence Interval	p-value
Motor vehicle crashes**	1.108	1.045 to 1.176	0.001
Unemployment *	1.248	1.093 to 1.425	0.001
Access to primary care physicians**	1.034	1.020 to 1.047	<0.001
Colon cancer**	0.901	0.847 to 0.958	0.001
Lung cancer**	0.923	0.878 to 0.971	0.002
Recent drug use*	0.818	0.686 to 0.975	0.025

*These estimated rate ratios and their associated 95% confidence intervals are based on a 1% additive increase (for example, from 5% to 6%).

** These estimated rate ratios and their associated 95% confidence intervals are based on a 10 events per 100,000 persons or person-years increase (for example, from 50 to 60 events per 100,000 persons or person-years).

On the other hand, a 1% additive increase in recent drug use decreases the expected county suicide count by an estimated 18.2%. Further, an increase of 10 colon cancer cases per 100,000 person-years decreases the expected county suicide count by an estimated 9.9%, while an increase of 10 lung cancer cases per 100,000 person-years yields an estimated 7.7% decrease.

Discussion

Our approach to mixing both county level and individual level suicide data provides a context where a more comprehensive understanding of suicide might be gained. KVDRS data provides individual circumstances leading to a suicide incident and CHSI data provides a community perspective.

The circumstance "job problem" had such a low count it was not included in Table 2, yet is clearly identified as a significant county-level predictor of suicide in our ecological model. Several conclusions might be made: job problem is undercounted in the KVDRS because job problem is not identified by death scene investigators. Additionally, depression (the most common circumstance, Table 2) might be due to unemployment (job problem) or crisis in the past two weeks might be job loss. In light of the current economic environment in the United States, our finding about unemployment suggests that death scene investigators might retrieve potentially important information, not being systematically acquired at present, by explicitly inquiring about the employment status of the decedent. Also, the results in Table 3 may reflect both the impact of county-level unemployment and the influence of any unmeasured county-level variables for which county-level unemployment may be a surrogate. It is important to take into account that county-level associations do not always track individual-level associations, a well-known limitation of ecological studies. In this instance we have no viable alternative to an ecological study since the KVDRS does not provide individual-level data on a representative sample of people not committing suicide.

This study provides important community level associations with suicide. The findings relate rates of suicide to motor vehicle crashes, unemployment, limited access to medical care, colon and lung cancers, and drug use. While these factors may or may not play a role in suicide at individual levels, they are indicators of the types of communities where suicide is more likely. County level predictors of suicide rate are likely to indicate the extent of healthy community functioning and integration of resources.

Prevention efforts hinge on the quality of data gathered at the site of a suicide event. Without accurate and detailed investigative documentation, pertinent information might be lost and the ability to identify patterns for prevention efforts diminished. Disparities in suicide rates may be partly confounded with the quality of data collection on suicide, so that the results of the Poisson regression model should be interpreted with even greater caution than is customary for ecological analyses.

Improving data gathering capabilities among first responders must represent a top priority in suicide prevention (Walsh et al., 2007). As coroners move increasingly toward a detailed, uniform reporting system, comprehensive analysis on factors relevant to suicide, such as job problem, might be more readily disseminated.

Prevention also depends on suicides being accurately identified and classified. Medicolegal investigators determine manner and cause of death based on a criterion of "beyond reasonable doubt." Evidence such as a suicide note or disclosure of suicide intent to a family member, for instance, would establish intent. Lack of such evidence could result in an undercounting of suicides (Atkinson, 1975; Rockett, 2010).

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The difficulty in establishing intent often leaves death investigators to classify deaths as either undetermined or accidental/unintentional. For example, numerous studies have documented underreporting of suicides due to unintentional/intentional poisoning (Goldsmith, 2002; Mok, 2000; Platt, 1988). With women more apt to use poisoning as a method of suicide, there could be a particular undercounting of suicides among females due to misattribution of death as undetermined or accidental/unintentional (Rockett, 2010). In addition, race might play a role in systematic misclassification of suicides (Huguet, 2012).

The most striking finding in our study was as unemployment increases so does the rate of county suicides. Considering the national economic crisis, becoming apparent in 2008, and a turn in the housing market, if the relationship between local unemployment rates and local suicide rates extrapolates to higher local unemployment rates and is not moderated by the overall condition of the United States economy, then there is cause to be concerned about elevated local suicide rates during a national economic crisis.

Some studies have indicated the economy may be a risk factor for suicide with those already having mental health disorders (Agerbo et al., 2007; Lineberry, 2009). And males, who account for the majority of suicides and who are disproportionately affected by job loss, may become more at risk in these economic times (Lineberry, 2009). Additionally, loss of job can potentially mean increased isolation and social fragmentation, a known risk factor in suicide, and a particular vulnerability in males (Hawton et al., 2001; Middleton et al., 2004). This vulnerability in males is relevant to prevention efforts because of the high rate of male suicides, with potentially behaviorally modifiable circumstantial factors, and suggest a need for gender-specific initiatives (Sanford et al., 2006; Sher, 2006). Current practices might not be effective in targeting males (Sanford et al., 2006; Sher, 2006). This study suggests the need for more evidence-based primary prevention programs tailored specifically for those that are unemployed or have mental or physical health conditions.

Physical health problem is the fifth most common precipitating factor in 2005-2007, but our Poisson regression model identified two types of cancer as predictors of lower county suicide rates. Chronic conditions are a continued source of community concern and this study furthers evidence of an association between physical illness and suicide. But this study also poses the question: if more people are dying because of cancer is that lessening the rate at which they are dying by suicide in a specific county? Perhaps colon cancer and lung cancer are not the specific type of physical health problem that would increase one's risk of committing suicide? More detailed data by first responders might provide answers to these questions if various types of physical health problems were identified at suicide incidents. Additionally, a distinction between individual-level predictors and county-level predictors must be made. Personally having cancer is quite different from living in a county with a high cancer rate. Such a county may have other characteristics to which a low suicide rate is attributable, with the high cancer rate effectively being a surrogate for those other characteristics. Or, equivalently, a low cancer rate may be a surrogate for characteristics that contribute to a high suicide rate in the county. For instance, the cancer rate may be artificially low in a county with very weak public health initiatives (including efforts at suicide prevention) because in such a county disproportionately many people may not have their cancer diagnosed until the late stages.

Substance abuse problems are a continued concern in regard to violence, including that directed by individuals against themselves. The rate of recent illicit drug use at the county level reveals a surprising protective effect and a need to consider, if genuine, how this might be the case. Perhaps rates of recent illicit drug use are artificially low in counties where such activity is not effectively monitored? And, if such activity is not effectively monitored, then perhaps there is a more general negligence that extends to efforts at suicide prevention. Increased knowledge of drug and alcohol resources and policies in these communities might help identify these contradictory findings. If negligence is indeed an issue perhaps increased resources in health departments and clinics might be beneficial.

Our study has limitations. Some variables, possibly relevant to this study, and identified in previously published studies, were not available in the CHSI data (I.e. divorce rates, marriage rates, other family factors, and religious factors). The CHSI report contains some data that are estimated and are not concordant with the official Department of Health and Human Services statistics (Group, 2008). Additionally, many of the items in the CHSI data are self-reported and might be subject to recall or other bias. For instance, an individual might not want to report illicit drug use for fear of criminal consequence and may fail to report this information, leading to an undercount of county level illicit drug use.

KVDRS data is retrospective and relies partially on information provided on death forms completed by the coroners. Documented circumstances are subjective; survivors often communicate their perceptions as to the intentions of the decedent while investigators consider precipitating circumstances leading to the unexpected death. There also might be differential recall between family and

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friends depending on their motivations. Additionally, a friend or family member might wish to deny the possibility of a suicide and therefore not disclose relevant information.

Our study is limited by ecological data so we, therefore, call for future research to see if there are similar findings at the individual level. To the extent that there are, we offer the following recommendations. Firstly, we recommend partnering with the media and community based programs and services to systematically disseminate information on the possible elevation in suicide risk among unemployed individuals, particularly males. Further research utilizing geographical and spatial/mapping techniques is essential in the identification of areas of elevated suicide rates in combination with community risk factors. With limited resources it is especially important to monitor at-risk populations and develop specific, whether media driven or community based, interventions designed to assist individuals, from these populations, in the midst of crisis. Supported by improved data gathering, targeted interventions can better address the dynamics influencing the decisions leading to suicide. We also echo recommendations to continue violent death surveillance to improve risk factor identification and treatment of potential victims (Georgia. Centers for Disease Control and Prevention. Atlanta, 2009; Karch et al., 2011). Further study into ecological associations with suicide rates is also recommended (Rezaeian et al., 2005). Finally, greater granularity in the data collected by first responders would help to elucidate the circumstances leading to suicide with greater specificity and thereby facilitate the development of the targeted interventions.

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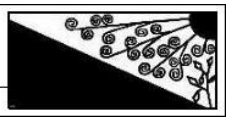

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