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**INTEGRATION-REGULATION AND LETHAL VIOLENCE:  
A SOCIOLOGICAL EXAMINATION OF THE RURAL-URBAN SUICIDE  
DIFFERENTIAL IN THE U.S. GULF SOUTH 1970-2000**

**RUSSELL R. DAVIS**

ABSTRACT

Within the sociological literature rates of lethal violence have theoretically and empirically been associated with urban location. In many advanced industrial countries rising rates of rural suicide have resulted in an unprecedented reversal of the rural-urban suicide differential. This study contributes to the existing literature by examining the implications of rural-urban location within contemporary Durkheimian macro social suicide research. Combining county level mortality, demographic, economic, and religious data this study empirically: a) details longitudinal patterns of rural and urban county age-adjusted suicide rates for the Southern Gulf States from 1970-2000; b) standardizes and regresses crude white male suicide rates for rural and urban counties (separately) against a set of predictor variables commonly applied within macro-social suicide research. Findings from this study indicate several unique and significant patterns of association in rural and urban counties, suggesting the need to reconsider the theoretical and empirical implications of rural-urban space within contemporary macro-social suicide research.

Starting with the work of early scholars (Durkheim [1897] 1951; Tonnie's 1887) the social distribution and structural correlates of lethal violence rates (suicide and homicide) have held a prominent position within sociological theories of deviance. From the sociological perspective rates of lethal violence are hypothesized to co-vary in relation to the level of social Integration and Regulation (I-R) within society. While largely developed in two parallel bodies of academic literature, I-R based studies of suicide and homicide often apply common theoretical concepts and examine similar dimensions of community social structure (O'Brien and Stockard 2006). One key area of common inquiry within this literature considers the implications of rural-urban location on rates of lethal violence.

Within the sociological literature elevated rates of homicide and suicide have traditionally been associated with the social structural dimensions of urban location. Historically, the disparity in rates of lethal violence across rural-urban space and differences in the social structural characteristics of rural and urban communities have coalesced to support this underlying urban assumption within I-R based research. Consistent with classic theoretical predictions the contemporary gap between rural and urban homicide rates, as well as, many other forms of violent and nonviolent crime continue to reflect this traditional orientation (Weisheit and Donnermeyer 2000; Wells and Weisheit 2004). In many advanced industrial countries, however, recent changes in the relative distribution of rural and urban

suicide rates are starting to challenge this key theoretical assumption (Gallagher and Sheehy 1994; Page and Fragar 2002; Pesonen et al. 2001; Taylor et al. 2005; Wilkinson and Israel 1984; Zekeri and Wilkinson 1995). Within the United States rural suicide rates surpassed urban rates starting in the late 1960's (Massey 1967) and recent analysis indicates a significant and continued widening of the national rural-urban suicide differential (Singh and Siahpush 2002). This relative change in the direction of the rural-urban suicide differential: a) marks one of the only major reversals of a primary suicide differential since Durkheim's writing; and b) theoretically and empirically contradicts one of the most basic assumptions of sociology's I-R Hypothesis of Suicide (IRHS).

To date very little academic research has directly examined the macro-social correlates of rural suicide rates. Within classic and early modern literature rural communities provided a comparative reference for the analysis of newly emerging urban social problems. Contemporary I-R research has focused largely on the relationship between suicide rates and the structural dimensions of specific social institutions such as religion, family, and the economy. Very few contemporary studies have considered how these relationships vary across rural-urban geographic space. Where examined, research shows general empirical models of I-R are relatively well suited to explain urban suicide rates but have little or no explanatory power when applied to rural locations (Kowalski, Faupel, and Starr 1987).

Combined, the recent rise in rural suicide rates, the subsequent reversal in the direction of the rural-urban suicide differential, and the apparent inability of existing research methods to explain this phenomena opens a significant gap in the sociological literature. This study begins to address this gap by testing the generalizability of traditional Durkheimian measures of social I-R across contemporary rural-urban space. Combining county-level mortality, demographic, economic, and religious data this study specifically: a) details longitudinal trends in rural and urban county age-adjusted suicide rates for the Southern Gulf States Region of the U.S. from 1970-2000; and b) standardizes and regresses the five year average (1997-2001) crude white male suicide rate for rural and urban counties (separately) against a set of predictor variables commonly applied within macro-social suicide research. The purpose of this study is to provide a more detailed regionally specific analysis of the contemporary rural-urban suicide differential, as well as, establish an empirical basis for evaluating current and future research methods developed to explain rural suicide rates.

This paper is organized into three sections. Section one presents a brief outline of the epidemiological distribution of suicide within the United States. Section two

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reviews relevant theoretical and empirical literature, highlighting the historical role of rural-urban location within I-R based suicide research. Section three details data, methods, and findings of this study.

## THE EPIDEMIOLOGY OF SUICIDE

As an epidemiological phenomenon, suicide ranks as one of the leading causes of mortality within the United States. In the late 1990's the US National Center for Health Statistics ranked suicide as the eighth leading cause of mortality. In the past several years suicide has declined slightly in ranking and as of 2002 was the eleventh leading cause of mortality overall. Despite this decline, suicide continues to take significantly more US lives (30,646) annually than homicide (17,045) which ranks fifteenth (Kochanek and Smith 2004).

Dissaggregated by age, suicide is more prevalent among younger age groups (15-24), drops for middle or working-aged groups, and then rises into old-age (NCHS 2001). Due to these significant aged-based differences, researchers examining spatial patterns of suicide rates often utilize a standardized age-adjusted rate to control for skewed age-based population distributions (Feinleib and Zarate 1992; Klein and Schoenborn 2001). For multivariate regression analysis crude suicide rates and empirical controls for population age structure have been shown to produce better unbiased regression estimates (Rosenbaum and Rubin 1984).

Historically, one of the most pronounced features of the suicide rate within the industrialized world is the overwhelming contribution from males. Within the United States, males are nearly four times more likely to commit suicide than females (NCHS 2001). Racially, aggregate age-adjusted rates of suicide rank White males and Native Americans as the most susceptible to suicide mortality. Asians, Non-White Hispanics and African Americans trail significantly behind with rates at nearly one-half the previous two groups (NCHS 2001). Similar to age-adjustment procedures, studies that examine aggregate suicide rates generally control for differences in population race structure or compare very similar race-gender specific suicide rates.

Throughout the first half of the 20<sup>th</sup> century suicide rates were consistently higher in urban locations. The 1950's and 1960's served as a period of rough convergence between rural and urban suicide rates. Since the late 1960's rates of suicide mortality have been consistently higher in less urbanized and rural places. Across the U.S. the relationship between suicide and rurality holds regionally, with the highest rates of suicide in the more rural and expansive regions of the West, as well as sub-regionally, with higher rates of rural compared with urban suicide

within all regions of the country. Beginning as early as the late 1960's, National Vital Health Statistics publications demonstrate that the rural-urban suicide differential within the United States is primarily defined by the elevated rate of white male suicide in rural areas (Massey 1967).

Singh and Siahpush (2002) show from 1970-1997 rates of male suicide in the most rural counties of the US increased at an average annual rate of 1.08% (20.71 per 100,000 in 1970 to 26.88 in 1997). Rates of male suicide in the most urban counties of the US declined at an average annual rate of .46% (19.84 per 100,000 in 1970 to 17.45 in 1997). When comparing rural-urban rates of female suicide, a near opposite pattern from that of males is demonstrated. In 1970 urban female suicide rates were significantly higher than rural female rates (8.7 per 100,000 and 4.13 respectively). In the past thirty years rural female suicide rates have remained the lowest of all male or female rates and have declined slightly to 4.01 per 100,000. Urban female suicide rates have declined significantly bringing the 1997 urban female rate (4.05 per 100,000) statistically in-line with that of rural females.

#### INTEGRATION-REGULATION AND THE RURAL-URBAN SUICIDE DIFFERENTIAL

In an attempt to explain the divergent patterns in the social distribution of suicide, Emile Durkheim ([1897] 1951) hypothesized a theoretical relationship between social Integration-Regulation and the adherence to social norms. According to Durkheim social attachments integrate individuals into the normative social structures of society providing a systematic regulation of individual-level behaviors. From this theoretical perspective suicide is not viewed as an individual-level phenomena; instead the social rate of suicide serves as a tangible indicator of the relative organization and control of society over individuals (Giddens 1965, 1971). Dubbed sociology's "one law," social science researchers generally accept the underlying theoretical relationship between social I-R and suicide (Bankston, Allen, and Cunningham 1983; Bearman 1991; Pescosolido and Georgianna 1989; Pope and Danigelis 1981).

From its inception the IRHS was directly tied to rural-urban social differences. In *Suicide* ([1897] 1951) and *The Division of Labor in Society* ([1893] 1964) Durkheim developed the constructs of *Mechanical* and *Organic Solidarity* and *Integration-Regulation* to explain the social transformation from a rural-agrarian to an urban-industrial society. Routinely included in introductory-level sociology texts; agrarian society was dominated by *Mechanical Solidarity* characterized as a highly integrated social system providing a cohesive overlap of family, community,

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religion, and work life. Within agrarian societies individual-level behaviors were regulated by the informal social control mechanisms of locally-based kinship relations. Characterized by high levels of social integration and regulation, Durkheim attributed suicide within early societies to *Altruistic* and *Fatalistic* causes. As society moved into the industrial era, the mechanical bonds of agricultural society were displaced by *Organic Solidarity*. This transformation served to fragment the primary social attachments of family, work, and religious life into a more loosely connected social system weakening their collective power over individual-level behavior. In industrial society individual-level behaviors became increasingly regulated by formal social control mechanisms. Characterized by low levels of social integration and regulation, Durkheim attributed suicide in industrial society to *Egoistic* and *Anomic* forces.

While modern social science researchers generally accept the underlying theoretical relationship between I-R and suicide considerable academic debate has been generated over the precision and meaning of Durkheim's work. As later theoretical scrutiny demonstrates, Durkheim often used the two independent concepts of *Integration* and *Regulation* interchangeably, and his discussion of the I-R process fluidly shifts between various "levels-of-analysis" (Bearman 1991; Johnson 1965; Pope 1975; Pope and Danigelis 1981; Travis 1990). For modern researchers two primary theoretical concessions have been used to address these shortcomings and maintain consistency within the I-R framework. The first, outlined by Johnson (1965), is to assume that a high level of co-variation exists between *integration* and *regulation* allowing them to be simultaneously examined. The second, is to narrow the scope of the original four-way typology to consider only *Egoistic* and *Anomic* forces (Besnard 1988; Hilbert 1989). Supporting this alteration was Durkheim's assertion that "Egoistic and anomic suicide are the only forms . . . whose development may be regarded as morbid, and so we have only to consider them" (1951:373)<sup>1</sup>. Largely eliminating the possibility for elevated rates of suicide in modern society due to excessive integration (altruistic suicide) or regulation (fatalistic suicide), the Egoistic-Anomic operationalization has provided a consistent theoretical framework for explaining differentials rates of suicide across the social

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<sup>1</sup>In *Suicide Fatalism* was relegated to a footnote included for "completeness' sake" (1951:276) and was restricted to the extreme example of over regulation within human slavery. The discussion of altruistic suicide within modern society, was largely confined to the institutional context of military service; where extreme integration and self-sacrifice is required for the overall benefit of the group.

dimensions of gender, race, age, religious denomination, and rural-urban location for over 100 years (Giddens 1965, 1971).

Within classic and early modern literature the rural-urban suicide differential was easily explained by *Egoism* and *Anomie*. At the time domestically, rates of marriage and fertility were higher, and rates of divorce were lower in rural compared with urban communities. Demographically rural populations were more homogeneous and stable than urban communities, and culturally more traditional in their value and belief structures. Based on an overall assumption that rural communities would eventually lose their distinctive character and become more like urban areas, many early researchers ignored rural communities completely (Newby and Buttel 1979) or considered them the personification of community integration and regulation (Elliot and Merrill 1961). From the *Division of Labor* Durkheim states “Within each country the same kind of relationship is to be seen. Everywhere suicide is more prevalent in towns than in the countryside. Civilization is concentrated in the large towns, as is suicide” ([1893] 1964:191). For Sorokin and Zimmerman (1929) the early U.S. rural-urban suicide differential represented “the price which ‘free urbanites’ pay for their liberation from traditions, and other bonds which they style as ‘prejudices’ and ‘superstitions’; with these ties broken, the individual is left to his own reason.” (p. 179). Focusing primarily on the diminished ability of urban communities to integrate and regulate behavior early criminologist working from this egoistic-anomic framework developed the now classic theories of *Social Control* (Park and Burgess 1924), *Anomie* (Merton 1938), and *Social Disorganization* (Shaw and McKay 1942).

Starting in the early 1960's, however, detailed examinations of rural and urban community structure began to raise serious concerns over the explicit use of traditional rural-urban typologies for explaining contemporary social phenomena. By mid-century the declining farm population and the development of mass communication and transportation technologies had started to blend away many well-accepted rural-urban differences (Rogers et al. 1988). Within urban-based literature, critical essays by Dewey (1960) and Benet (1963) highlighted the contradictions between Wirth's (1938) depiction of a socially isolating urban environment and the presence of rich community-based associations described in detailed ethnographic studies, such as Gans' *Urban Villagers* (1962). Simultaneously researchers within rural sociology were also challenging the idealized notion of bucolic rural communities and the underlying assumptions about the nature of rural social life (Bealer 1978; Bell 1992; Copp 1972; Falk and Pinhey 1978; Kasarda and

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Janowitz 1974; Pahl 1966; Picou, Wells, and Nyberg 1978; Schnore 1966; Willits and Bealer 1967).

Firmly established within the urban-based Egoistic-Anomic paradigm, contemporary I-R research continued to address the structural correlates of suicide rates, but largely dropped the issue of rural-urban differences. In *Social Forces in Urban Suicide*, Marris (1969) applied a similar research approach to that used by Shaw and McKay (1942) to examine the contextual variation of suicide rates across the urban neighborhoods of Chicago. Other applications of the IRHS narrowed the scope of analyses to examine particular aspects of social institutions such as: religious denomination (Bankston et al. 1983; Pescosolido and Georgianna 1989; Stack 1985; Van Poppel and Day 1996); Marital Status and Divorce (Stack 1980, 1985); Race (Burr, Hartman, and Matteson 1999; Willis and Drentea 2003); Migration (Kushner 1984; South 1987; Trovato and Jarvis 1986); and the Economy (Austin, Bologna, and Dodge 1992; Dooley et al. 1989; Wasserman 1984; Yang 2001). Most of these contemporary studies still include some form of statistical control for rural-urban location such as, population size, density, or percent urban. Rarely are these measures accompanied by theoretical justifications or interpretations of their meaning; and with rare exception (Wilkinson and Israel 1984; Zekeri and Wilkinson 1995) conspicuously absent is an overall recognition that rural suicide rates now surpass those in urban areas.

Only one major sociological suicide study has applied an empirical model of I-R across the U.S. rural-urban county divide (Kowalski et al. 1987). Common within I-R-based studies, independent variables were organized into the three broad categories of *Integration*, *Economic Well-Being*, and *Population*.<sup>2</sup> For all US counties examined concurrently, those variables that produced a significant increase in suicide rates were: Divorce rate, % living alone, net migration change, income inequality, and median education. Only median family income expressed a significant negative relationship with suicide rates. The overall explained variance for the National model was  $R^2 = .093$ . When the analysis was divided into three geographic components (most urban, middle urban, and rural counties) findings show this general model of social I-R does not hold consistent explanatory power

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<sup>2</sup>Integration: % Catholic, % Protestant, Divorce rate, Birth rate, % female labor force, % living alone, net migration change, median age, sex ratio; Economic Well-Being: median family income, income inequality (GINI), % unemployment, occupational diversity, median education, education diversity, % black; Population: population size, % urban



across the rural-urban divide. For urban counties patterns of association were similar to those of the National model, but only one variable (females in the labor force) was significant in rural counties.

Results indicate that this general model of I-R best explains patterns of suicide within the two urban categories ( $R^2 = .81$  and  $.41$  respectively) and has limited to no effect when applied to rural counties ( $R^2 = .02$ ). While not definitive, the study by Kowalski et al. (1987) and its conclusions represent the general problem with traditional I-R based research and the contemporary study of rural suicide. As noted by the authors, "By every indicator, rural areas should have a higher variance explained, especially since there is more variation to explain" (p.93). Rather than question a potential urban bias within the I-R framework or methods of study, however, the authors conclude:

Given the very modest capacity of sociological variables to explain suicide rates in rural areas, we may take our speculation a further step and suggest that, hypothetically, rural suicide and other behavior may be better explained in such locales by psychological or personality variables. Structural sociological explanations for conduct, therefore, could largely be an enterprise best suited for urban environments.

Since the publication of Durkheim's *Suicide* the Egoistic-Anomic operationalization of the IRHS has provided a consistent theoretical basis for the sociological study of suicide rates. Within this literature elevated rates of suicide have generally been associated with urban locations. Combined the recent rise in rural suicide rates, the subsequent reversal in the direction of the rural-urban suicide differential, and the apparent inability of existing research methodology to explain this phenomena presents an interesting and unique theoretical dilemma for this well established research paradigm. At its most basic, rural communities are generally not considered highly Egoistic and Anomic types of places, especially when compared with urban areas. While many social dimensions that once separated rural from urban communities have narrowed significantly, research literature continues to show the social structures of contemporary rural communities are generally more highly integrated than urban communities (Beggs, Haines, and Hurlbert 1996; Fischer 1982). Under traditional interpretations of the IRHS these characteristics should theoretically translate into lower rates of rural suicide. Even if the hypothesis of a rural-urban convergence were correct, suicide rates should still logically remain lower in the most rural places and gradually

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increase with levels of urbanization both temporally and spatially. Further if the social forces contributing to suicide rates within rural and urban communities are of similar origin, the findings of Kowalski et al. (1987) do not corroborate this assumption.

Consistent with the macro-social perspective of sociology, the uniformity in international, national, and regional-level mortality statistics indicate the phenomena of rural suicide in the U.S. cannot be reduced to an individual-level explanation. The unanimous acceptance of the I-R framework within macro-social suicide research also suggests there is nothing theoretically inherent to the IRHS that precludes its application to rural communities. Considered as a separate and distinct social space contemporary rural communities often vary significantly from urban communities in their cultural, familial, demographic and employment structures. Determining whether these differences reflect some larger theoretical rural-urban duality continues to elude scholars and is well beyond the scope of this study. Given these systematic differences, however, it makes sense that empirical measures and methods developed to explain urban suicide rates would not be expected to perform similarly when applied to the rural social context. Unlike the well studied correlates of urban suicide no comparable body of literature currently exists to evaluate how or if these traditional explanatory measures are generalizable to the contemporary rural setting.

## DATA, METHODS, AND FINDING

To begin addressing this gap in the sociological literature the current study standardizes and regresses a general empirical model of social I-R derived from the literature against the five-year average (1997-2001) crude white male suicide rate for rural and urban counties of the U.S. Southern Gulf States Region. The rural counties of Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas share a common social and economic history shaped by natural resource extraction in mining, farming, fishing, and timber industries. Equally represented within the Southern Gulf States are several of the nations largest and fastest growing metropolitan centers. Additionally, the Southern Gulf States provide one of the few regions within the United States with a significantly large racial minority population living in both rural and urban areas.

County-level suicide rates are derived from the United States National Center for Health Statistics, Compressed Mortality Files. These data were obtained through a special request from U.S. Center for Disease Control and must be used within the specified guidelines of confidentiality. Using CDC provided annual

Census Bureau population estimates, all suicide rates are calculated annually for age-specific base populations 14 years and older, expressed as a county-level rate per 100,000 population, and averaged over a five-year period. All descriptive suicide rates are presented as age-adjusted values and reflect the newly adopted CDC Standard Population for mortality age-adjustment (Anderson and Rosenberg, 1998)<sup>3</sup>. Population and family/household data were obtained from the 2000 US Decennial Census Summary File 3a. County-level gross and net migration data were obtained from the US Census Bureau *Migration for the Population 5 Years and Over for the United States, Regions, States, Counties, New England Minor Civil Divisions, Metropolitan Areas, and Puerto Rico: 2000 (PHC-T-22)*<sup>4</sup>. Religious denomination data were obtained from the Glenmary Research Center, *2000 Religious Congregations and Membership Data*.

Rural and urban counties are defined using the United States Department of Agriculture, Economic Research Service (ERS) 2003 Rural-Urban Continuum Codes<sup>5</sup>. Designed to examine research issues related to population size, ERS Rural-Urban Continuum Codes rank counties into a nine-level rural-urban hierarchy based on urban population size and adjacency to a metropolitan area. Urban and Rural county designations applied within the present study were selected to retain the overall structure of the ERS coding system and create two comparable research samples. Urban counties are those having a metropolitan population of 50,000 or more residents (R-U codes 1-3, n=295 Urban counties). Rural counties are non-metropolitan counties with total urban populations of 20,000 or less (R-U codes 7-9, n=373).

#### *Empirical Procedures of Standardization*

To maximize the comparability of research findings and reduce the possible contamination of results due to systematic differences in rural and urban variable structure; all independent and dependent variables were examined and adjusted as necessary to approximate the empirical requirements of OLS regression analysis for each county context separately. Through a series of preliminary analyses the most significant empirical difference between rural and urban counties concerned the

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<sup>3</sup>Starting in 1999 all CDC age-adjusted mortality statistics are calculated using the US Census Bureau Estimated Year 2000 Population (Day 1996: Table 2, p. 52).

<sup>4</sup>2000 Migration tables. Retrieved August 25, 2006 (<http://www.census.gov/population/www/cen2000/phc-t22.html>).

<sup>5</sup>ERS Rural Urban Continuum Codes. Retrieved September 4, 2006 (<http://www.ers.usda.gov/Data/RuralUrbanContinuumCodes/>).

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linearity of independent and dependent variable distributions. Examining values of Skewness, Kurtosis, and the Shapiro-Wilk test for normality; Box-Cox procedures were utilized to determine the appropriate empirical power transformation of research variables. For this study the use of Box-Cox transformations systematically corrects for the unequal distribution of error associated with variable skewness, and serves to normalize this variation across rural and urban county samples empirically.<sup>6</sup> To facilitate the straightforward comparison of rural and urban results all descriptive-level statistics presented in this paper represent unadjusted real values. For regression derived results the sign of the direction of each relationship has been corrected to reflect a meaningful association between independent and dependent variables, and the standardized regression and partial correlation coefficients have been provided for comparative purposes.

The examination of inter-correlation and multicollinearity of independent variables within rural and urban counties resulted in minor variations in the specification of final research models where indicated. More rural (5.36%) compared with urban counties (0.77%) reported no white male suicides within the five-year study period. The examination of extreme outliers and influential cases at the upper end of the distribution was similar for rural and urban counties. To ensure descriptive comparability of mortality trends, longitudinal and cross-sectional mortality statistics include the full original sample of 295 Urban and 373 Rural counties. To ensure comparability of regression analyses, the full sample was trimmed by eliminating counties with no white male suicides and those with rates above 82 per 100,000. This selection criteria resulted in a final sample size of 250 urban counties and 350 rural counties for regression analysis.

*The Gulf States Rural-Urban Suicide Differential*

Table 1 details results of descriptive and ANOVA analyses of rural and urban five-year-average (1997-2001) Total, Female, Male, and White Male age-adjusted suicide rates for the Gulf States Region. Overall the social distribution of suicide rates within the study area is generally consistent with extant mortality literature and serve to highlight the gender/race-specific nature of the rural-urban suicide differential. As expected male suicide rates are significantly higher than female rates in both rural and urban counties of the Gulf States. Consistent with national-level mortality trends descriptive findings from this study show a statistically significant

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<sup>6</sup>The Appendix details transformation values used for each variable included within this study.

and theoretically counterintuitive relationship between the rates of Male and White Male suicide in the Gulf States Region. Specifically rural Male (25.30) and rural White Male (29.28) age-adjusted suicide rates are significantly higher than urban rates (male = 23.16, white-male=26.52). Also consistent with national-level trends, age-adjusted female suicide rates are not significantly different for rural and urban counties (4.69 and 5.27 per 100,000 respectively). Combined with the non-significant difference in Total age-adjusted suicide rate, cross-sectional analysis clearly demonstrates that the rural-urban suicide differential within this study region is strictly a male, and more specifically, a white male phenomena. The use of age-adjustment procedures also demonstrate the rural-urban suicide differential does not result from differences in county male population age structure.

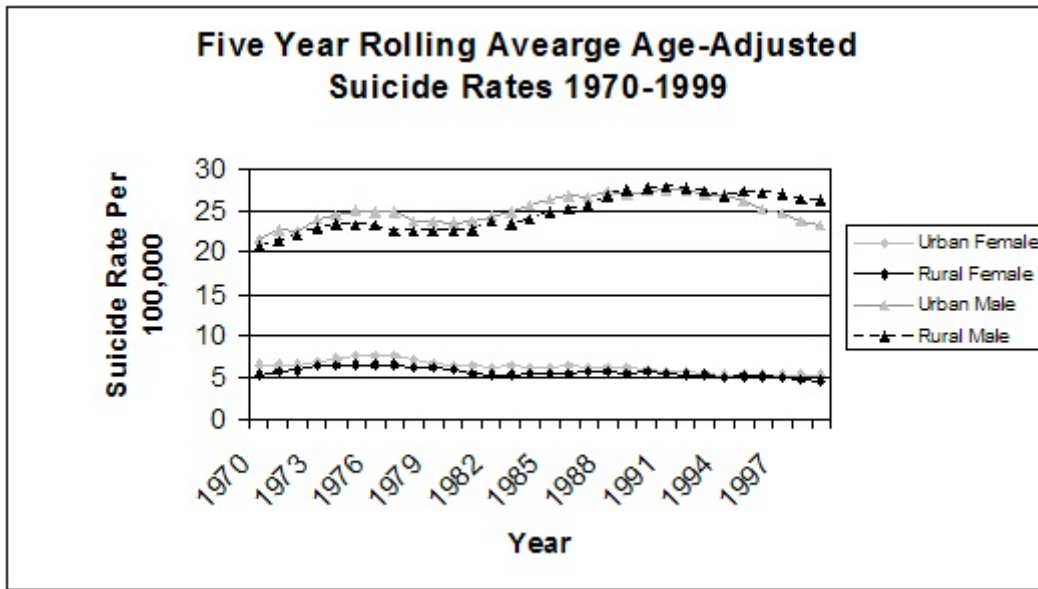
TABLE 1. FIVE YEAR (1997-2001) AGE ADJUSTED COUNTY SUICIDE RATES PER 100,000.

SUICIDE RATE	URBAN (n = 259)		RURAL (n=373)	
	MEAN	STD. DEV.	MEAN	STD. DEV.
Total age-adjusted. ....	13.93	4.20	14.73	7.18
Female age-adjusted. ....	5.27	2.87	4.69	6.11
Male age-adjusted* . ....	23.16	7.36	25.30	13.43
White male age-adjusted* . ....	26.52	10.64	29.28	15.45

\* p < .05

Figure 1 details longitudinal (1970-2000) trends in rural and urban age-adjusted gender-specific suicide rates. Overall male and female suicide rates show a relatively high level of covariation between rural and urban counties across time. Given the geographically focused scope of this study and the more inclusive criteria used to define rural and urban counties, cross-sectional deviations from national-level statistics presented earlier in this paper are generally expected in both size and direction. Longitudinally however, unlike the alarming national-level divergence in rural and urban male suicide rates reported by Singh and Siahpush (2002); analysis of the Gulf States Region shows a much more recent and less pronounced pattern of change. The significant reversal and divergence of rural and urban male suicide rates appear as a recent statistical event, with rural male suicide rates surpassing urban rates in the early to mid 1990's.

FIGURE 1. MALE AND FEMALE AGE-ADJUSTED SUICIDE RATES 1970-2000.



### Model Specification

Based on the descriptive analyses of rural-urban suicide rates, the dependent variable selected for this study is the five-year average (1997-2001) crude white-male suicide rate. The set of predictor variables employed within this study represents the traditional urban-based explanatory framework of egoistic-anomic suicide. This model generally reflects patterns of social attachment to primary social institutions and levels of social distance or heterogeneity within community social structure. To create a methodological bridge between previous and future rural suicide research this study replicates and refines, as much as possible, the methodology of Kowalski et al. (1987) detailed above. Independent variables are grouped into the four broad categories of: Economic Integration, Domestic Integration, Demographic Structure, and Religious Integration.

As a primary form of social integration higher levels of labor force attachment, measured by the *White Male Civilian Unemployment Rate* and *Female Labor Force Participation Rate*, are expected to reduce suicide rates significantly (Austin et al. 1992; Pampel 1998; Platt 1984; Stack 2000; Yang 2001). Higher levels of economic social distance measured by, *Occupational Diversity* (Index of Qualitative Variation (IQV) ranging from 0=no diversity to 1=maximum, calculated from SF3 Table P50 using six broad occupational classifications), and *Household Income*

*Inequality* (Gini coefficient<sup>7</sup> ranging from 0= Perfect equality to 100= perfect inequality, calculated from SF3 table P52 using 16 income categories) are expected to produce significant positive effects on suicide rates. While early theoretical work suggested lower levels of *Median Family Income* served as a social buffer against suicidal behavior, contemporary work predicts higher levels of economic resources will significantly reduce suicide rates (Stack 2000).

Domestic integration and familial social attachments are expected to reduce suicide rates (Kowalski et al. 1987; Kposowa, Breault, and Singh 1995; Stack 1980; Wilkinson and Israel 1984; Zekeri and Wilkinson 1995). The percent of the *Male Population Living Alone* and percent population *Divorced* are expected to have a significant positive relationship with county suicide rates. *Male-to-Female Sex Ratio*, included to measure an imbalance in local area marriage markets (Fossett and Kiecott 1991), is expected to produce a significant positive effect on suicide rates. The county *Birth Rate* is derived from CDC population data and is included as a control variable to maintain methodological consistency with Kowalski et al. (1987).

Migration is hypothesized to weaken or impeded the social I-R process and *Percent Net Migration Change*  $\left[ \frac{(\text{in migration} - \text{out-migration})}{2000 \text{ population } 5+ \text{ years}} * 100 \right]$  is hypothesized to increase suicide rates (Kushner 1984; South 1987; Stack 2000; Trovato and Jarvis 1986; Wechsler 1961). Traditionally both *Population Size* and *% Urban* would be expected to have a significant positive relationship with county suicide rates. Given the changes in the direction of the rural-urban suicide differential, these relationships are expected to be significant and negative. *Median white male age* is expected to have a significant positive relationship with suicide rates. Typically macro-based research examining mixed-race rates of suicide include measures of minority population structure to control for disproportionately low rates of minority suicide (Burr et al. 1999; Willis and Drentea 2003). Because the dependent variable of this study is race-specific, *Percent Black* is included as a measure of community social heterogeneity and is hypothesized to increase white male suicide rates.

Classic social theory predicts that collectively oriented religious denominations will work to buffer against suicidal behaviors while more individualistic denominations will not (Bankston et al. 1983; Durkheim [1897] 1951; Pescosolido and Georgianna 1989). At an individual level Stack and Wasserman (1992) find

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<sup>7</sup>Income Inequality is calculated using an executable program developed by Dr. Francois Nielsen, University of North Carolina–Chapel Hill, available at <http://www.unc.edu/~nielsen/data/data.htm>. Last accessed 9/9/2006.

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lower levels of suicide ideology among members of more conservative, nonecumenical religions. Based on extant literature, county adherence rates of *Catholic* and *Evangelical Protestant* denominations are expected to produce a significant reduction in suicide rates; and *Main-Stream Protestant* rates are expected to produce a significant positive effect on suicide rates. All religious adherence rates are expressed per 1000 total population.

*Descriptive Analysis of Independent Variables*

Examining the distribution of independent variables, one of the most significant descriptive findings generated from this study is the manner in which rural and urban counties vary significantly along each of the primary empirical dimension employed within this traditional I-R research model. Detailed in Table 2, descriptive analyses show a significant rural-urban differences for 15 of the 17 independent variables. Overall the economic, domestic, demographic, and religious differences between rural and urban counties are generally consistent with the extant literature of rural sociology, and do not culminate into a clear pattern that can differentiate between rural-urban communities. While the magnitude of these differences is generally well understood academically, it is unclear from existing literature what impact these systematic differences have for macro-based studies of suicide rates across rural-urban geographic space. The high number of predictor variables expressing a significant rural-urban difference suggests one potential empirically-based explanation for the disproportionate level of rural and urban explained variation associated with this model in the literature.

Economically rural counties have significantly lower levels of labor force attachment than urban counties. Specifically the rural white male unemployment rate (4.36%) is higher, and the rural female labor force participation rate (48.57%) is lower, compared to urban counties (4.01% and 54.69% respectively). Urban median family income averages \$10,250 higher than rural family income, while levels of household income inequality are significantly higher for rural counties. Domestically, rural and urban counties demonstrate several significant differences but in absolute terms are minor. Rural counties have a smaller percent of the population divorced (9.17% - 10.17%), but also have a higher percentage of male single-person households compared with urban counties (10.30% - 9.73%). This study shows no significant difference in the total male-to-female sex ratio, while urban county birth rates are higher than rural rates (14.79 - 14.06 per 1000 population).



TABLE 2. DESCRIPTIVE STATISTICS.

VARIABLES	URBAN (N= 255)		RURAL (N=350)	
	MEAN	STD. DEV.	MEAN	STD. DEV.
Crude white male suicide* . ....	25.70	7.85	30.08	12.80
<i>Economic Integration</i>				
White male unemployment* ...	4.01	1.56	4.36	2.40
Female L-F participation* . ....	54.69	5.49	48.57	4.13
Male occupational diversity..	0.93	0.02	0.94	0.03
Household income inequality* .....	44.25	3.74	46.25	2.96
Median family income* .....	44,705.24	9,063.12	34,454.71	4,868.80
<i>Domestic Integration</i>				
% Male single person* . ....	9.73	1.77	10.30	1.51
% Divorced* . ....	10.17	1.56	9.17	1.79
Male:Female sex ratio. ....	0.97	0.09	0.99	0.13
Birth rate* .....	14.79	3.09	14.06	2.76
<i>Demographic Structure</i>				
% Net migration change* .....	6.76	7.88	1.23	7.83
Population size* .....	184,656.87	361,364.88	17,689.58	11,758.13
% Urban* .....	55.72	32.42	29.54	24.23
Median white male age* .....	36.37	4.06	38.47	3.40
% Black* . ....	18.11	15.49	21.23	19.85
<i>Religious Integration</i>				
Evangelical protestant rate* ...	282.90	141.57	406.11	159.84
Mainstream protestant rate* ..	78.84	35.00	94.93	52.39
Catholic rate* .....	116.06	144.97	87.95	156.36

\*p &lt; .05

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By definition urban counties demonstrate a significantly higher total population and percent of the population living in urbanized areas than rural counties. Total net-migration rates are also significantly higher in urban (6.76 %) compared with rural counties (1.23%). Median age of the county white male population is significantly higher in rural (38.47 years) compared with urban (36.37 years) counties. The only counterintuitive rural-urban difference, indicative of this study region, is the significantly higher proportion of African Americans in rural counties (21.23% and 18.11% respectively). Finally rates of both Mainstream and Evangelical Protestant adherence are significantly higher in rural compared with urban counties, and rates of Catholic adherence are significantly higher in urban counties.

### *Regression Analysis Results*

Table 3 presents findings from rural and urban regression analyses. When interpreting these results it is important to note the highly stylized methods of variable transformation and sample selection criteria employed by this study are intended to maximize empirical standardization and comparability across the rural and urban county context. Absolute values of explained variation and independent variable coefficients from each model should not be interpreted as stand-alone empirical tests. Instead results from each equation should be considered within the comparative context of the overall purpose of this study.

Starting with the most basic empirical comparison, the overall explained variation attributed to this egoistic-anomic model is more than twice as large for urban ( $r^2 = .18$ ) compared to rural counties ( $r^2 = .08$ ). Throughout the numerous iterations of model specification used in preliminary analyses, the relative difference in the magnitude of explained variance (about 50% higher for urban counties) was ever-present, generally constant in size, and seems unaffected by independent variable specification. Given the methodological steps employed within this study to standardize rural and urban research variables, the persistent gap in the level of explained variation suggests that exact parity between rural and urban equations is highly unlikely. Additionally, the marked disparity in overall explained variation suggests that the underlying empirical distribution of urban suicide rates may be better suited to the statistical technique of OLS regression analysis. Because suicide is a rare occurrence, averaging rates over a five-year period generally ensures that dependent variables meet the statistical requirements of normality necessary for the robust estimation technique of OLS. While rates of rural male suicide are significantly higher than urban rates, they are also based on a significantly lower

number of statistical events and are relative less stable across time. Based on these differences, results from this study suggest that efforts to improve the overall model fit between existing measure of I-R and rural suicide may benefit from the application of an alternative count-based technique of model estimation such as Negative-Binomial Regression, similar to recent studies of rural homicide (Lee, Maume, and Ousey 2003).

Examining the main body of Table 3, regression results demonstrate a unique pattern of variable association between predictor variables and the crude white male suicide rate of rural and urban counties. First results show no significant relationship between measures of religious integration and suicide for either rural or urban counties of the Gulf States. Examining measures of economic integration, this study finds no significant relationship between measures of economic structure and urban white male suicide rates. For rural counties one economic variable, *Income Inequality*, was significantly related to white male suicide rates. Counterintuitive to theoretical predictions higher levels of inequality, or economic heterogeneity, in rural counties significantly reduces white male suicide rates. As indicated by the partial correlation coefficient, household income inequality contributes 1% of the total rural explained variation. Originally examined within the context of a larger research project (Davis 2007), this relationship is consistent with longitudinal-based findings that also show a similar significant relationship between rising levels of income inequality and reductions in rural suicide rates.

Of the domestic integration measures employed within this model only one variable (*% Divorced*) expressed a significant and expected positive relationship with urban white male suicide rates. The percent of the urban county population divorced was by far the strongest relative predictor of suicide rates included within either rural or urban county equation, constituting 5% of the total urban explained variation. Overall, measures of domestic integration consistently expressed no significant relationships with rural white male suicide rates.

The examination of county demographic variables shows several interesting patterns that further suggest a methodological need within macro-social suicide research to consider rural-urban location as a contextual dimension, rather than a cross-sectional control variable. Compared with other blocks of independent variables, measures of demographic composition created the largest empirical challenge for specifying commensurable rural and urban regression equations. For urban counties an unacceptably high level of multi-collinearity between *Population Size* and *% Urban* resulted in the necessary removal of population size from the final urban model. For rural counties a similar relationship was noted between %

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TABLE 3. RURAL AND URBAN OLS REGRESSION ANALYSIS.

VARIABLES	URBAN COUNTIES (n = 250)			RURAL COUNTIES (n = 350)		
	B	$\beta$	PARTIAL <i>r</i>	B	$\beta$	PARTIAL <i>r</i>
Intercept.....	1.44			-2.43		
<i>Economic Integration</i>						
White male unemployment rate <sup>t</sup> .....	.94	.05		-.14	-.01	
Female L-F participation rate.....	-.02	-.16		.01	.06	
Male occupational diversity <sup>t</sup> ..	.43	.03		.31	.02	
Household income inequality <sup>t</sup> .....	-.03	-.12		-222.63*	-.14	.01
Median family income <sup>t</sup> .....	208.76	.12		.00	-.09	
<i>Domestic Integration</i>						
% Male single person households.....	.04	.09		.06	.05	
% Divorced <sup>t</sup> .....	.02**	.20	.05	.01	.01	
Male:Female sex ratio <sup>t</sup> .....	-.55	-.09		-.30	-.09	
Birth rate <sup>t</sup> .....	.02	.01		.10	.05	
<i>Demographic Structure</i>						
% Net migration change <sup>t</sup> .....	.00	.04		.00	-.02	
Population size <sup>t</sup> .....		NA		-.01	-.07	
% Urban.....	.00	-.06		.00	-.05	
Median white male age <sup>t</sup> .....	.54**	.24	.02	1.05**	.24	.03
% Population black <sup>t</sup> .....	.20**	.16	.02		NA	
<i>Religious Integration</i>						
Evangelical protestant adherence.....	.01	.08		.00	-.02	
Mainstream protestant adherence.....	.00	-.04		.01	.01	
Catholic adherence rate <sup>t</sup> .....	-.03	-.03		-.08	-.09	
Adjusted R <sup>2</sup> .....	.18			.08		
F-test.....	4.52***			2.78***		

NOTE: <sup>t</sup>Transformed value included within model; \*\*\* p < .001, \*\*p < .01, \*p < .05

*Population Black* (dropped from final model) and *% Urban*. Before removal, neither variable showed any significant relationship with independent variables.

Of the variables employed within this traditional egoistic-anomic model, only *Median White Male Age* produced a significant and expected positive relationship in both rural and urban county equations. Standardized beta coefficients indicate these relationships are similar in magnitude across setting, and partial correlation coefficients indicate that age-structure accounts for a larger overall percent of rural explained variation than urban (2.7% and 1.8% respectively). Consistent with extant literature, the urban county equation indicates a significant and positive relationship between *% Population Black* and white male suicide rates. Partial correlation coefficients show this relationship accounts for 1.8% of the total urban explained variation and equals the relative contribution of urban white male age structure.

Perhaps one of the most significant findings from the block of demographic variables is the non-significant relationship between standard cross-sectional measures of rural-urban composition and suicide rates in both rural and urban equations. Typically within regression-based suicide research measures such as *percent urban/rural* or *population size* often reflects the overall direction of the rural-urban suicide differential empirically and are generally interpreted as a residual effect of rural-urban differences not otherwise captured by the explanatory model. While this standard approach empirically allows for the statistical control of rural-urban differences in suicide rates, it provides little academic insight into the underlying causes for this relationship. Within the small body of rural suicide literature previous attempts to “explain away” a significant rural effect at a state and regional-level have proven unsuccessful (Wilkinson and Israel 1984; Zekeri and Wilkinson 1995). Within the present study the non-significant relationships between *% Urban* and *Population Size* in both rural and urban equations suggest that dividing analyses into separate rural and urban research samples, and treating each as an independent and unique study population, provides one methodological means for achieving this empirical goal. Overall these non-significant findings are interpreted as further supporting evidence for the need to treat rural-urban location as a contextual dimension within macro-social suicide research rather than an unidimensional control variable.

## CONCLUSIONS

In the 100 years since the publication of Emile Durkheim’s *Suicide*, the egoistic-anomic operationalization of the IRHS has provided the primary theoretical explanation for the social distribution and structural determinants of suicide rates.

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Throughout this longstanding academic tradition elevated rates of suicide have traditionally been associated with urban location. The recent rise in rural suicide rates and the subsequent reversal in the direction of the rural-urban suicide differential directly contradicts this primary theoretical assumption. This unprecedented theoretical and empirical contradiction is further compounded by a few research studies suggesting that traditional I-R based measures are unable to explain the phenomena of rural suicide. Like all social science research this study attempts to balance, as much as possible, the role of theory and empirical method in deriving conclusions. The overwhelming urban orientation of I-R theory in many ways has served to hinder the active study of rural-specific suicide rates. The current study begins to address this theoretical and empirical disjuncture in the sociological literature by standardizing an existing model of I-R and testing its relative generalizability across contemporary rural-urban geographic space.

Cross-sectional age-adjusted mortality statistics confirm a significantly higher rate of rural male and specifically white-male suicide within the Gulf States Region of the U.S. Longitudinal patterns, however, show a much less pronounced and more recent divergence between rural-urban male suicide rates than national-level statistics indicate. Together the similar long-term trajectories of rural and urban suicide rates within this study region, coupled with the significant deviations from national-level trends, suggest a need within future research to examine how these longitudinal rural-urban patterns vary across regional context. In an effort to simultaneously reduce the possible contamination of results associated with regional differences in suicide rates, and the uneven distribution of rural and urban counties across the US, this study restricted the geographic scope of analysis to the Southern Gulf States Region. Typically within macro-social suicide research statistical controls for geographic region are generally not included among common predictor variables, and their inclusion in future research may be necessary to separate and isolate region specific impacts from the more universal rural-urban effects.

Overall findings from this study indicate a better fit between existing research methods and urban suicide rates. Contrary to the findings of previous studies however, the highly stylize methodology employed within this analysis does not support the notion that macro-social suicide research is somehow inappropriate or unable to explain rural suicide rates. Instead, differential patterns of variable association across research models indicate the need to examine rural and urban suicide rates as the unique products of location specific social processes. Unlike the relatively straightforward methods used for age standardization, the significant and

pervasive nature of rural-urban differences noted throughout this study suggest a single or composite cross-sectional measure of rural-urban composition may not empirically capture, and control for, these dynamic social differences. Findings from this study indicate that the application of separate rural and urban research models presents one empirical method for addressing these differences. Admittedly this approach may not always be a feasible option within macro-based suicide research, and future efforts will need to determine if similar statistical control can be achieved through the application of interaction terms within mixed rural-urban analysis.

In conclusion, the overwhelming theoretical association between lethal violence rates and urbanization within the sociological literature contradicts the recent temporal shifts in rural-urban suicide rates; suggesting the need to systematically reexamine the role that rural-urban location plays within contemporary I-R based research. The current study provides one small step in this direction. Overall findings from this study indicate existing research methodology commonly employed to explain suicide rates are better suited for the examination of urban locations. In addition to monitoring regional and national-level patterns in the rural-urban suicide differential, the overall lack of rural suicide research within sociology demonstrates a need for future research efforts to consider how location-specific measures of I-R can be employed to explain this rural social phenomena better.

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APPENDIX. BOX-COX VARIABLE TRANSFORMATION VALUES.

Variable	Urban Counties Transformation	Rural Counties Transformation
Crude white male suicide rate. ....	$^{.5}$	$^{.4}$
% White male unemployment rate. ....	$^{+.5 .1}$	$^{+.5 .1}$
Occupational diversity.....	$^2$	$^2$
Household income inequality. ....		$^{-1.4}$
Median family income. ....	$^{-.5}$	$^{.9}$
% Male single person household.....		$^{.7}$
% Divorced.....	$^{1.6}$	$^{.8}$
Male:Female sex ratio. ....	$^{-2}$	$^{-2}$
Birth rate. ....	$^{.5}$	$^{.5}$
% Net migration change. ....	$^{+35 .1}$	$^{+35 .1}$
Population size. ....		$^{.3}$
% Urban. ....	$^{+.5 .8}$	
Median white male age. ....	$^{.5}$	$^{.4}$
% Black.....	$^{+.5 .3}$	
Evangelical protestant rate. ....	$^{.6}$	$^{.9}$
Mainstream protestant rate. ....	$^{.7}$	$^{.4}$
Catholic rate. ....	$^{+.5 .2}$	$^{+.5 .2}$