A Comparison of Wisconsin’s Suicide Rates by Urbanization and Sex

Zachary J. Baeseman, BS

ABSTRACT

Background: This report compares suicide rates in Wisconsin and the United States by sex and degree of urbanization.

Methods: Suicide mortality rates for Wisconsin and the United States from 1999 to 2005 were compared by sex and degree of urbanization using data from the Centers for Disease Control and Prevention. Data were also analyzed using Beale Codes to determine the appropriateness of the definition of “rural.”

Results: While both Wisconsin and US males residing in rural areas are at increased suicide risk compared to their urban counterparts, Wisconsin males are at a much lower risk than the national average (Odds Ratio [OR]=1.14 [95% Confidence Interval (CI), 1.06-1.23] and OR=1.33 [95% CI, 1.32-1.35], respectively). US women in rural areas are also at increased risk of suicide compared to females in urban areas (OR=1.09 [95% CI, 1.07-1.12]). In contrast, Wisconsin females in rural areas—verified by both classification system’s definitions of “rural”—are not at increased risk of committing suicide compared to their urban counterparts (OR=1.03 [95% CI, 0.89-1.20]).

Conclusion: In Wisconsin’s rural areas, suicide rates for males are lower than the national average, especially in Wisconsin’s most rural counties. However, the suicide rate for Wisconsin’s rural females was very similar to the national average. Additionally, suicide rates for males and females from Wisconsin’s only large metro area (Milwaukee County) are significantly higher than the corresponding national urban rates.

INTRODUCTION

The effects of suicide are devastating for individuals, families, and communities. In recent years, a number of articles have described disparities in suicide rates by sex, age, and geographic locale on the state, national, and international levels.2-4 This article investigates the role of sex and geographic location in Wisconsin’s suicide rates as compared to national rates.

Wisconsin is comprised predominantly of rural areas and small towns. Rural suicide victims are 1.54 times more likely to use a firearm to complete suicide than urban victims.5-9 Being white, being male, living in a rural area, and committing suicide by firearm are often considered typical characteristics of suicide victims, although literature presenting country-specific data indicates this is not universally the case.10-12 Still, a study conducted by Singh and Siahpush illustrates that this pattern holds true in the United States, and disparities between the suicide rates of rural and urban males have increased from 1970 to 1997.5 Additionally, when controlling for geographic variation in divorce rate and ethnicity, the gap between the suicide rates of rural males versus urban males widens further.

Conversely, before 1980, urban females in the United States were more likely to commit suicide than rural females. This trend has diminished; currently, urban female suicide rates are decreasing and are much closer to the suicide rate among rural females.5 However, from 1995 to 1997, there were 2 caveats to these lower suicide rates among urban females: (1) rural working-aged females had a 55% higher suicide rate than their urban peers, and (2) females >65 years of age living in the most rural areas had a much lower suicide rate than their urban peers.

Suicide rates have changed over the years, highlighting the importance of surveillance. Middleton et al found that suicide prevalence in England and Wales for certain age demographics switched between rural and urban in both males and females during the early 1990s.6 This study augments the analysis of suicide in Wisconsin by comparing suicide rates by location and sex.

METHODS

Data were obtained from the Centers for Disease Control and Prevention (CDC).13 The CDC WONDER
database was queried for intentional self-harm mortality (ICD-10 Codes X60-X84) for both national and Wisconsin data. The data were age-adjusted to the US 2000 standard population and were categorized based on the National Center for Health Statistics (NCHS) 6-level urban-rural classification system: (1) Large Central Metro, (2) Large Fringe Metro, (3) Medium Metro, (4) Small Metro, (5) Micropolitan (non-metro), and (6) NonCore (non-metro). The age-adjusted data were converted to adjusted cases and person-time rates were calculated. Male and female suicide rates were statistically compared by metro and non-metro classification (OpenEpi version 2.2.1, www.openepi.com/Menu/OpenEpiMenu.htm). All 6 urbanization levels for Wisconsin and the United States also were compared by sex.

To test the validity of the 2 non-metro levels of urbanization defined as rural, data were also categorized according to Beale Codes (ie, USDA Rural-Urban Continuum Codes). Based on this 9-stage scheme—a guideline often used for grant applications by the Corporation of National and Community Service—levels 1-5 were considered urban and levels 6-9 were considered rural (Figure 1). This scheme is different from the NCHS system (Table 1). The CDC WONDER database was also queried for suicide data by Wisconsin county. Rural and urban counties were separated based on their respective Beale Code numbers and statistically analyzed using OpenEpi (OpenEpi Standard Mortality Ratio, www.openepi.com) (Table 2).

The standard mortality ratio (2-tailed $P$ exact test) and age-adjusted suicide rates were calculated as a point of interest for each county to display the burden of county-level suicide throughout the state. They are listed in Table 2 by age-adjusted suicide rate.

**RESULTS**

As the urbanization level increases, the suicide risk of US males decreases ($P<0.001$), except for the 2 largest categories (ie, Large Central Metro and Large Fringe Metro), which are statistical equivalents (Figure 2). US males living in rural areas commit suicide at higher rates than their urban peers (Odds Ratio [OR]=1.33 [95% Confidence Interval [CI], 1.32-1.35] versus 1.00, respectively) (Figure 3). Wisconsin males living in rural areas also commit suicide at a higher frequency than their urban Wisconsin peers (OR=1.14 [95% (CI), 1.06-1.23] versus 1.00, respectively) (Figure 3), although there is some divergence from the national trends (Figure 2). Wisconsin males living in the most

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**Table 1. Comparison of Metro Versus Non-Metro Definitions Using 2006 NHCS Metro Non-Metro Classification**

<table>
<thead>
<tr>
<th>Metro</th>
<th>Non-Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Central Metro: Counties of metro area of ≥1 million population</td>
<td>Micropolitan: Counties 20,000–49,999, adjacent to metro area</td>
</tr>
<tr>
<td>Large Fringe Metro: Counties of ≥1 million population</td>
<td>NonCore: Counties &lt;50,000, excluding Micropolitan</td>
</tr>
<tr>
<td>Medium Metro: Counties in metro area of 250,000–1 million population</td>
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</tr>
<tr>
<td>Small Metro: Counties in metro area of 50,000–249,999 population</td>
<td></td>
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</tbody>
</table>

**Table 2. Comparison of Urban Versus Rural Definitions Using 2003 USDA Beale Codes (Rural-Urban Continuum Codes)**

<table>
<thead>
<tr>
<th>Urban</th>
<th>Rural</th>
</tr>
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<tbody>
<tr>
<td>Counties in metro area of ≥1 million population</td>
<td>Urban population of 2500–19,999, not adjacent to a metro area</td>
</tr>
<tr>
<td>Counties in metro area of 250,000–1 million population</td>
<td>Completely rural or &lt;2500 urban population, not adjacent to a metro area</td>
</tr>
<tr>
<td>Counties in metro areas 50,000–249,999 population</td>
<td>Completely rural or &lt;2500 urban population, adjacent to a metro area</td>
</tr>
<tr>
<td>Urban population of 20,000–49,999, adjacent to a metro area</td>
<td></td>
</tr>
<tr>
<td>Urban population of 20,000–49,999, not adjacent to a metro area</td>
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females are statistically equivalent (OR=1.03, P=0.66) (Figure 3). If the Beale urban-rural classification is used rather than the NCHS definition, the findings are consistent (Figure 4). Similar to Wisconsin males, the suicide rate for Wisconsin females living in the most urban areas (ie, Large Central Metro) is notably increased (P<0.001) compared to US rates for this group (Figure 2).

DISCUSSION
This study draws attention to some interesting data both nationally and within Wisconsin. Given the previous literature by Singh and Siahpush, it is tempting to speculate that the statistical similarity between rural and urban Wisconsin females could be explained
in part by a protective effect of elderly females living in a rural environment. However, this likely is not the driving factor behind the statistical equivalence of Wisconsin females (Figure 2). Conversely, Wisconsin females from the most urban areas commit suicide at higher rates than their US peers. The divergence of suicide rates in Wisconsin’s most urban areas from national trends for both females and males is of particular concern considering that, by definition, Milwaukee County is the only Large Centro Metro county in Wisconsin.

It is not clear why Milwaukee County has higher suicide rates than similar cohorts nationally, or why rural Wisconsin males exhibit lower suicide rates than their national peers. Social capital, support networks, and social integration play an essential role in the etiology of suicide and are perhaps active factors in Wisconsin.17-19 These factors are likely to be further complicated by the current socioeconomic circumstances and decreasing access to services.1 Additionally, access to firearms in rural areas has been implicated as a potential etiology.8,12

A study by McLaren and Hopes indicated that people living in rural areas report significantly “more to live for” than those living in urban areas. The researchers concluded that this information contradicts current data, which indicates increased trends toward suicide completion in rural versus urban areas.20 Further research is necessary to clarify what role age, alcohol use, firearm access, and social isolation play in Wisconsin’s suicide rates.

This study is limited by its geographic nature, which precludes the control of probable confounders (eg, ethnicity; individual marital status; county divorce rates; an individual’s social integration, social capital, support networks). Differing definitions of rurality have proven problematic in urban-versus-rural research15,21 and, despite attempting to control for this problem by using 2 classification systems, it is a limitation of this study as well. For example, based on its population, Douglas County has an urban Beale Code of 2, even though the vast majority of this county is arguably very rural. This particular scenario would have a washout effect on the findings’ significance and, consequently, yield a more conservative estimate of the rural-urban disparity.

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REFERENCES


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