The Burden of Suicide and Homicide of Wisconsin's Children and Youth

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ABSTRACT
Objective: To describe the epidemiology of violent deaths (suicides and homicides) of children and youth in Wisconsin.

Methods: Linked data from death certificates, coroners or medical examiners, Uniform Crime Reports, police case reports and crime laboratories were analyzed using SPSS 11.5. Analyses from 2000 to 2002 describe suicides and homicides of children and youth under age 25. Rates are per 100,000 population per year.

Results: A total of 585 persons under age 25 in Wisconsin died from suicide or homicide during 2000-2002. Suicides outnumbered homicides 323 (55%) to 262 (45%). Firearms were involved in 59% (n=344) of cases. Fatality rates increased with advancing age, ranging from 2.0 in 0-13 year olds to 26.9 in youth age 21-24. There were over twice as many violent deaths compared to cancer and infectious disease deaths combined (n=253).

Conclusion: Suicides and homicides are a significant burden on the children and youth of Wisconsin. An investment in reducing this burden requires comprehensive data and informed programs and policies. We recommend that physicians and public health community leaders collaborate with the criminal justice community and policy makers to develop, implement, and evaluate prevention programs and policies.

INTRODUCTION
Assault and self-inflicted injuries to children and youth under age 25 in the United States accounted for over 10,000 deaths (40% suicides [n=4250], 60% homicides [n=6458]) and an estimated 930,000 injuries in 2001.1 Firearms were the most common method, accounting for 52% (n=2220) of suicides and 70% (n=4533) of homicides in this age group.

Wisconsin's children and youth averaged 143 suicide deaths annually between 1984 and 1988, decreasing to an average of 101 annually between 1994 and 1998.2 Homicides doubled from 41 in 1985 to 82 in 1998.3 Demographic analysis of violent deaths for the years 1984-1988 and 1994-1998 found 5 times as many suicides among males (n=1023) as females (n=197).3 However, little is known about regional differences, methods of fatalitly, and circumstances surrounding these events.

Linking information from medical examiner's, coroner's, law enforcement, and crime laboratories can provide a more comprehensive understanding of violent deaths.45 Using the Violent Injury Reporting System (VIRS) of the Firearm Injury Center at the Medical College of Wisconsin, a statewide linked data system,6 we are able to describe the burden of suicide and homicide of children and youth in Wisconsin.

METHODS
Approval to analyze linked data was given by an institutional review board of the Medical College of Wisconsin. Death certificates, coroner or medical examiner information, Uniform Crime Reports, police case reports, and crime laboratories were linked for all suicides and homicides, ages 0-24, in Wisconsin.

We aggregated the 3 study years 2000-2002. Rates are for 100,000 population per year and calculated using 2000 US census data. Analyses were performed using the software program SPSS 11.5.

The age groupings of "child" and "youth" are based on the Bureau of Alcohol, Tobacco and Firearms (ATF) conventions for statistical reporting, which define a child as 0-17 years old and a youth as 18-24 years old.7 We used the following age groupings for our analysis: 0-13, 14-17, 18-20, and 21-24. Years of productive life lost are calculated as the sum of differences from age of death to age 65.
We report alcohol post mortem testing results only. Analyses of alcohol testing are limited to 2001 and 2002, years with complete data.

We used the 5 public health regions in Wisconsin for geographical comparisons. It should be noted that Vernon County belonged to the Western Region during the years included in this study, not to the Southern Region as shown in Figure 2. Rates in Figure 2 are based on 2000 Wisconsin Interactive Statistics on Health (WISH) database population estimates for these regions.

During the study period there were 13 firearm fatalities where the intent was undetermined and 15 firearm fatalities where the death was determined to be unintentional. These deaths were excluded from further analysis.

RESULTS
A total of 585 suicides and homicides involving children and youth in Wisconsin occurred during 2000-2002 (mean=195 per year). This corresponds to an annualized violent death rate of 10.3 in Wisconsin, (the United States 2000-2001 violent death rate for the same age group is 10.6). Compared to the death rates of infectious disease (1.0, n=59) and all types of cancer (5.4, n=194) in Wisconsin's children and youth during 2000-2002, the violent death rate of Wisconsin children and youth is 10 and 3 times higher respectively (Figure 1). The annualized Wisconsin suicide rate for persons under age 25 was 5.7, 36% higher than the national annual average of 4.2. In contrast, Wisconsin's annualized homicide rate for this age group was 4.6, 27% lower than the national average of 6.3.

Suicides accounted for 55% (n=323) of the violent deaths, and homicides 45% (n=262) during the study years. Firearms were the most common method of violent death, involved in 59% (n=344) of cases including 52% (n=167) of suicides and 68% (n=177) of homicides. Suffocation (which includes methods such as suicide by hanging and homicide by choking) was the most common non-firearm method of violent death, accounting for 53% (n=127) of the 241 non-firearm cases, most commonly suicides (91%, n=116).

The following results are grouped according to the public health model for disease investigation that addresses characteristics of the affected person, the environment, and the method of death.

Affected Person

Years of Productive Life Lost—Violent deaths accounted for a total of 27,429 years of productive life lost between 2000-2002, 54% (n=14,768) from suicide and 46% (n=12,661) from homicide.

Gender—Overall, 484 males and 101 females experienced violent deaths during the study years (Table 1). Death rates of male suicide and homicide exceeded those of females (suicide 9.5 to 1.7; homicide 7.1 to 2.0, respectively).

Alcohol Toxicology—Victims were identified as testing positive, testing negative, or were not tested for alcohol in 96% (n=378) of the 395 violent deaths in 2001 and 2002: 4% (n=17) were unknown. Of the 316 victims tested, 27% (n=86) were positive. Alcohol was not present in any of the tested children under 13. In the 14-17 age group, 11% (n=7) of those tested were positive. However, in the 18-20 age group 38% (n=33) of those tested were positive compared to 35% (n=46) of those tested positive in the 21-24 age group.

Testing for alcohol varied among the public health regions displayed in Figure 2. Statewide, 16% (n=62) of
Table 1. Gender and Age Groups of Suicide and Homicide Victims Less than 25 Years Old in Wisconsin

<table>
<thead>
<tr>
<th></th>
<th>Suicide</th>
<th>Homicide</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FA</td>
<td>Non-FA</td>
<td>Total</td>
</tr>
<tr>
<td>All Fatalities</td>
<td>157 (2.9)</td>
<td>158 (2.8)</td>
<td>325 (5.7)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>150 (5.2)</td>
<td>127 (4.4)</td>
<td>277 (9.5)</td>
</tr>
<tr>
<td>Female</td>
<td>17 (0.8)</td>
<td>29 (1.0)</td>
<td>46 (1.7)</td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-13</td>
<td>5 (0.2)</td>
<td>10 (0.3)</td>
<td>15 (0.5)</td>
</tr>
<tr>
<td>14-17</td>
<td>36 (3.7)</td>
<td>43 (4.4)</td>
<td>79 (8.1)</td>
</tr>
<tr>
<td>18-20</td>
<td>58 (7.9)</td>
<td>46 (6.3)</td>
<td>104 (14.2)</td>
</tr>
<tr>
<td>21-24</td>
<td>68 (8.2)</td>
<td>57 (6.9)</td>
<td>125 (15.1)</td>
</tr>
</tbody>
</table>

Rates in parentheses are per 100,000 population per year. FA=Firearm, Non-FA=Non-Firearm. Rate totals may not add up due to rounding.

Figure 2. Suicides and homicides in persons under age 25 by method for public health regions in Wisconsin years 2000-2002. FA=Firearm, NFA=Non-Firearm. Rates in parentheses are per 100,000 population per year. Rate totals may not add up due to rounding.

victims were not tested. Percentages of those not tested ranged from a low of 9% to a high of 30%.

Age Groups—Violent death rates for the 3 older age groups were significantly higher compared to the 0-13 age group. The 14-17, 18-20, and 21-24 age groups were 6.6, 11.6, and 22.8 times more likely, respectively, to experience violent death than 0-13 year olds (P<0.001, 95% CI=3.8-11.4; P<0.001, 95% CI= 6.9-19.8; and P<0.001, 95% CI= 12.5-34.8, respectively).

Environment

Geographic Variation—Violent death rates ranged from 6.9 to 14.6 in the 5 public health regions of Wisconsin (Figure 2). The highest suicide rate, 6.8, was in the Northern Region, which was 19% higher than the overall state suicide rate of 5.7. The highest homicide rate, 9.5, was in the Southeastern Region, and was more than twice the overall state homicide rate of 4.6.

In the Southeastern Region, 78% (n=121) of firearm deaths involved handguns and 22% (n=35) involved
long guns. In the other 4 regions combined, 33% (n=44) of firearm deaths involved handguns and 67% (n=89) of involved long guns (Table 2).

Method of Injury

Firearm—Firearms were involved in 59% (n=344) of the violent deaths, including 52% (n=167) of suicides and 68% (n=177) of homicides. The type of gun was identified in 84% (n=289) of the events, including 99% (n=166) of suicides and 69% (n=123) of homicides. Handguns were the most common type of firearm used when gun type was identified. They were involved in 57% (n=165) of the firearm cases, including 36% (n=59) of firearm suicides and 86% (n=106) of firearm homicides (Table 2). Long guns were involved in 43% (n=124) of the firearm-related fatalities (Table 2) with rifles and shotguns each accounting for 50% (n=62) of these cases.

When stratified by age, gun-related violent events varied significantly. In the 0-13 age group, firearms were the method of fatality in only 19% (n=12) of cases (Table 1). In the 14-17 age group, however, firearm-related fatalities accounted for 58% (n=74) of the events. Firearm suicides in this age group were not significantly different from 0-13 year olds (P=0.350); however, homicides involving 14-17 year olds were 20.2 times more likely to involve firearms than homicides involving 0-13 year olds (P<0.001, 95% CI=7.1-57.6).

Firearm-related events had similar distributions in the 18-20 and 21-24 age groups with 65% (n=112 and 146 respectively) of the violent deaths in each age group involving guns. Homicide decedents from the 18-20 age group and the 21-24 age group were 24.3 and 22.8 times more likely to die from firearm injuries, respectively, than 0-13 year olds (P<0.001, 95% CI=8.9-66.4 and P<0.001, 95% CI=8.9-58.5, respectively).

The owner of the firearm was identified in 74% (n=124) of firearm suicides. In 57% (n=71) of the cases, the deceased used someone else's gun. The gun owner was a family member or guardian 48% (n=59) of the time.

Non-Firearm Methods

There were 241 non-firearm suicides and homicides, of which 75% (n=181) were by suffocation (includes suicides by hanging and homicides by choking), blunt/sharp trauma does not include falls, or poisoning. Suffocation accounted for 53% (n=127) of non-firearm violent deaths and was the method of 74% (n=116) of the 156 non-firearm suicides. The next most common methods were blunt/sharp trauma (13%, n=32) and poisonings (9%, n=22). Blunt/sharp trauma was the most common method of the 85 non-firearm homicides, accounting for 35% (n=30) of these homicides. Prescription medications were involved in 27% (n=6) of the 22 deaths due to poisoning. The remaining 60 fatalities were by other methods or involved multiple non-firearm methods.

DISCUSSION

Previous examinations of US mortality data have suggested that improving the health status of the United States will require strategies extending beyond medical care to include social concerns.11 The burden of suicide and homicide for individuals under age 25 is far greater than the burden of better-recognized biomedical diseases. During the years of this study, there were more than 3 times the number of violent deaths (n=585) compared to cancer deaths (n=194) and more than 9 times the number of infectious disease deaths (n=59).12 Suicides and homicides in the young have a significant impact on families and communities in Wisconsin, accounting for over 27,000 years of productive life lost during 2000-2002. Similar to other diseases like infections, these lost lives have patterns, changing high-risk groups and environments, and are amenable to intervention.

Population health sciences such as epidemiology and biostatistics provide physicians, public health leaders, law enforcement agencies, and policy makers with a broader understanding of these deaths. Further analysis of these deaths provides more comprehensive information that describes the affected populations, the environment, and the methods used. The National Academy of Sciences has recommended implementation and funding of systematic data collection and research on violent death, including the National Violent Death Reporting System.12
At-Risk Populations

Boys and young men are at far greater risk for both suicide and homicide than girls and young women. The death rate increases significantly after age 13, the time of transition from grade school to high school. These findings support the need for focused age- and gender-specific prevention programs as called for in the Department of Health and Family Services' Wisconsin Suicide Prevention Strategy.13

Prevention program guides on the state and community level in the United States have also been developed, including objectives targeting binge drinking of alcoholic beverages among young persons.34 Selected elements of program implementation discussed include the importance of collaboration, assessment of needs and assets, use of data to provide benchmarks and measure progress, identifying specific content, resources needed and length of intervention, and evaluating the program. We support implementation of health improvement programs that include collaboration and evaluation between physicians, public health leadership, law enforcement, and policy makers.

Toxicology Testing

The post mortem toxicology testing status in Wisconsin varies considerably and depends on coroner or medical examiner requests, requested testing (alcohol, illicit drugs, prescription medications), and result records. This non-uniformity confounds efforts to determine the true prevalence of alcohol and other drug use among victims and limits our understanding of important risk factors.43-13 Our study was limited by other gaps in the data such as method of fatality not identified, non-uniformity of post mortem toxicology testing, unidentified role of prescription medications, and an incomplete data-set for 2000. Filling these gaps with standardized, uniform, statewide toxicology testing of all violent deaths involving children and youth would improve our knowledge of these events.

An extensive discussion on the role of prescription medications, illicit drugs, and alcohol in violent deaths is beyond the scope of this study. However, we did find, of those tested, that 38% of victims in the 18-20 age group tested positive for alcohol. Alcohol has been shown to be an important factor in suicides and homicides.16 Greater efforts aimed at reducing 18-20 year olds' access to alcohol are needed to reduce the risk of violent deaths.

Environment

Regional Differences—We found important regional differences in violent death rates among Wisconsin's children and youth. Regional- and community-focused collaborations, coalitions, programs, and policies are needed so that unique environmental factors can be addressed. Balancing statewide efforts with regional and local efforts allows physicians, public health leaders, law enforcement agencies, and policy makers to identify and evaluate focused programs and policies. Youth access to handguns in southeastern Wisconsin, especially Milwaukee County, is a significant challenge, and multiple strategies are needed. Local regulations and environmental modifications are important violence prevention strategies.17,18 Efforts focused on primary prevention are needed and must consider access to firearms, which are the most common and have the highest case fatality rates of suicide methodologies.19

Method of Death

Firearms—Access to firearms is an important determinant for youth suicide and homicide in Wisconsin. Several states including Wisconsin have passed “Child Access Prevention” legislation (CAP laws) designed to reduce access to guns by young children. These laws are designed to punish adults if children obtain and misuse loaded firearms left unsecured. Modest but statistically significant reduction in firearm suicides for 14-17 year olds in the United States associated with child access prevention laws has been reported.20 The effect of child access prevention laws on unintentional shootings was found to be a reduction in only 1 of 15 states with these laws.21 It is estimated that one third of US households contain at least 1 firearm and in almost one quarter of these homes the guns were stored unlocked and loaded.22

We found that the violent deaths in all age groups after age 13 were significantly more likely to be linked with firearms. The 14-17 age group has restricted access to firearms, generally requiring adult supervision, yet nearly half of suicide deaths involved guns, most often someone else's. Engineering strategies such as trigger locks and lock boxes are available and can reduce unauthorized access but rely on behavioral change.23 Technology changes to gun design, "personalized" handguns, incorporating semiconductor chips, and biometric identifiers could further reduce unauthorized youth access to guns.24

Other Methods of Fatality

Suffocation accounted for the majority of non-firearm violent deaths. This method poses a different risk, compared to firearms or medications, in which access can be modified and regulated. Suffocation was second only to firearms as a method of suicide and has been found to
have a high case fatality ratio, making this methodology particularly challenging, and stressing the need for primary prevention programs. One potential example of suicide prevention involved interim telephone calls to patients treated for depression to assess depressive symptoms and adherence to prescribed medication. By evaluating and updating a clinical practice, physicians provide themselves an important opportunity to reduce violent death risk of their patients.

CONCLUSION

Suicides and homicides are a significant burden for children and youth in Wisconsin. These fatalities far exceed the number of deaths from cancer and infectious disease. However, unlike suicides and homicides, cancer and other diseases are being comprehensively addressed to reduce risk and deaths. A similar effort is needed to reduce the burden of violent deaths among Wisconsin’s children and youth.

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REFERENCES