

# Increased Alcohol-Related Mortality in Wisconsin Pre-COVID: A Two-Decade Trend

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## ABSTRACT

**Introduction:** Alcohol-related mortality is increasing nationally, but state-specific trends still need to be explored. This paper reviews the patterning of alcohol-related deaths among Wisconsin residents in the 2 decades prior to the COVID-19 pandemic.

**Methods:** Data are from death certificates for state residents from 2000 through 2019. We used underlying cause of death codes (ICD-10) to classify deaths as 100% attributable to alcohol (ie, acute, chronic liver, and other chronic). Demographic characteristics were available for the most recent decedents (2015-2019). We assess trends in alcohol-related mortality and used chi-square tests to assess demographic differences compared to deaths from all other causes.

**Results:** The number of alcohol-related deaths more than doubled from 2000 through 2019 in Wisconsin, rising from 394 in 2000 to 857 in 2019. In the 5 most recent years (2015-2019), the populations with significantly higher rates of alcohol-related deaths included men, middle-aged adults, Black residents, and those of Hispanic descent. Education level also was significantly related to alcohol-attributable mortality, as those with the highest and lowest education levels were the least likely to die from this cause.

**Discussion:** Results of these analyses show that the number of deaths due to alcohol-related diseases has risen significantly since 2000, and this trend preceded the COVID-19 pandemic. These rising mortality rates deserve the attention of the medical and public health communities. Our findings show that, in recent years, Hispanic individuals, men, and middle-aged adults are at a higher risk for alcohol-related deaths. Stakeholders may wish to consider interventions targeted to these groups.

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## INTRODUCTION

Alcohol-related mortality is increasing in the United States.<sup>1,2</sup> A national review of death certificates found that alcohol-induced deaths from both chronic and acute causes nearly doubled from 1999 to 2017<sup>3</sup> while they generally declined in Europe.<sup>4</sup> In addition, national rates of high-risk drinking and the number of individuals with alcohol use disorder have both increased in recent years.<sup>5</sup>

Wisconsin leads the United States in excessive drinking per capita.<sup>6</sup> Results from the National Survey on Drug Use and Health (NSDUH) show that 64% of Wisconsin adults drank alcohol in the past 30 days and 32% binge drank (ie, drank 5 or more drinks at least once per week).<sup>7</sup> By comparison, in the United States as a whole, 56% of adults reported drinking alcohol in the past 30 days, and 27% reported binge drinking.<sup>7</sup> Perceptions of drinking as a health risk behavior are also lower in Wisconsin. According to

NSDUH, only 39% of Wisconsin adults consider it risky to binge drink; nationally, 45% of adults consider binge drinking risky.<sup>7</sup>

Alcohol consumption is a risk factor for mortality and has other serious consequences for health.<sup>8,9</sup> While the proportion of Wisconsin residents who report drinking has held steady in recent years (at roughly 66%),<sup>10</sup> the national trends in alcohol-related mortality are alarming for a state that is known for its culture of drinking.<sup>11</sup> However, national statistics often disguise nuances at the state level and may not reveal trends for subpopulations. The

goal of this study is to explore the alcohol-related mortality trends in Wisconsin prior to the COVID-19 pandemic. We sought to assess: (1) trends over time and (2) how alcohol-related mortality may differ for demographic groups within the state.

## METHODS

### Data Source

This study analyzed Wisconsin vital statistics data provided by the Office of Vital Records at the Wisconsin Department of Health Services. Our sample included resident deaths from January 2000 through December 2019 (N = 299,425). The underlying cause of death was used to identify alcohol-related deaths. This code is filled out on the death certificate by the attending medical examiner or coroner. Only deaths that were fully attributable to alcohol were retained for these analyses. Alcohol-related deaths included both acute causes and chronic conditions.

### Classification of Deaths

Acute causes of alcohol-related death include: (1) alcohol poisonings, (2) excessive blood alcohol, and (3) alcohol-related suicide. Chronic causes of alcohol-related death include: (1) mental disorders related to alcohol, (2) chronic liver disease (eg, cirrhosis), and (3) all other health disorders due to alcohol (ie, polyneuropathy, myopathy, cardiomyopathy, gastritis, liver disease, and pancreatitis). Underlying cause of death ICD-10 codes include F10.0, F10.1, F10.[3-9] I426, F102, G312, G621, K860, K292, K70, G721, O354, P043, Q860, R780, T51.[0,1,9], X45, X65, Y15.<sup>12,13</sup>

### Demographic Variables

Demographic variables have only recently been captured electronically in vital records. Thus, race and ethnicity, age, sex, Department of Health Services (DHS) region, geographic location (ie, urban vs rural classification), and educational attainment are available only for 2015 through 2019 (Table). Urban and rural classifications were based on the US Office of Management and Budget designations of metropolitan statistical areas, as categorized by the Wisconsin Office of Rural Health.<sup>14</sup>

### Statistical Analysis

Rates were calculated based on Wisconsin resident population data provided by the Wisconsin Interactive Statistics on Health.<sup>15</sup> Trend

**Table.** Demographic Characteristic of Wisconsin Residents Who Died From Alcohol-Related Causes, 2015-2019

	Alcohol-Related Deaths (N)	Proportion of Alcohol-Related Deaths (%)	Deaths From All Other Causes (N)	Proportion of Deaths From Other Causes (%)	Chi-square Test
	3,772	100%	256,722	100%	
Race and ethnicity					<i>P</i> < 0.002
Black, non-Hispanic	248	6.57%	12,797	4.98%	
Hispanic	138	3.66%	3,817	1.49%	
Other, non-Hispanic	146	3.87%	4,241	1.65%	
White, non-Hispanic	3,240	85.90%	235,867	91.88%	
Age					<i>P</i> < 0.002
18-34	153	4.06%	6,530	2.54%	
35-44	324	8.59%	5,534	2.16%	
45-54	922	24.44%	12,508	4.87%	
55-64	1,360	36.06%	29,345	11.43%	
65+	1,013	26.86%	202,805	79.00%	
Sex					<i>P</i> < 0.002
Female	1,069	28.34%	127,735	49.76%	
Male	2,703	71.66%	128,986	50.24%	
Missing	—	—	1	0.00%	
Department of Health Services region					<i>P</i> = 0.54
Northeastern	825	21.87%	57,923	22.56%	
Northern	393	10.42%	25,376	9.88%	
Southeastern	1,379	36.56%	91,701	35.72%	
Southern	664	17.60%	46,325	18.04%	
Western	511	13.55%	35,331	13.76%	
Missing	—	—	66	1.01%	
Urbanicity					<i>P</i> = 0.23
Rural	1,160	30.75%	81,311	31.67%	
Urban	2,612	69.25%	175,349	68.30%	
Missing	—	—	62	0.02%	
Educational attainment					<i>P</i> < 0.002
High school or less	2,320	61.51%	169,521	66.03%	
College/Undergrad	1,259	33.38%	71,424	27.82%	
Graduate school	137	3.63%	12,941	5.04%	
Unknown	56	1.48%	2,836	1.10%	

tests were used to determine if changes in alcohol-attributable mortality were statistically significant. Chi-square tests were used to determine significant differences in the proportion of deaths by demographic factors in the most recent years (2015-2019).

## RESULTS

### Demographic Analysis (2015-2019)

From 2015 through 2019, Black and Hispanic residents made up a significantly higher percentage of alcohol-related deaths when compared with deaths from all causes (Table). Males also made up a disproportionate percentage of alcohol-related deaths when compared to deaths from all causes (71.7% vs 50.2%, respectively; *P* < 0.002). Additionally, some differences by education were notable. Only 3.6% of individuals with an alcohol-related cause of death had graduate-level education, compared with 5% of individuals who died from other causes (*P* < 0.002). Decedents with an alcohol-related cause of death were more likely to be college educated and less likely to have only a high school degree

than those who died from other causes ( $P < 0.002$ ).

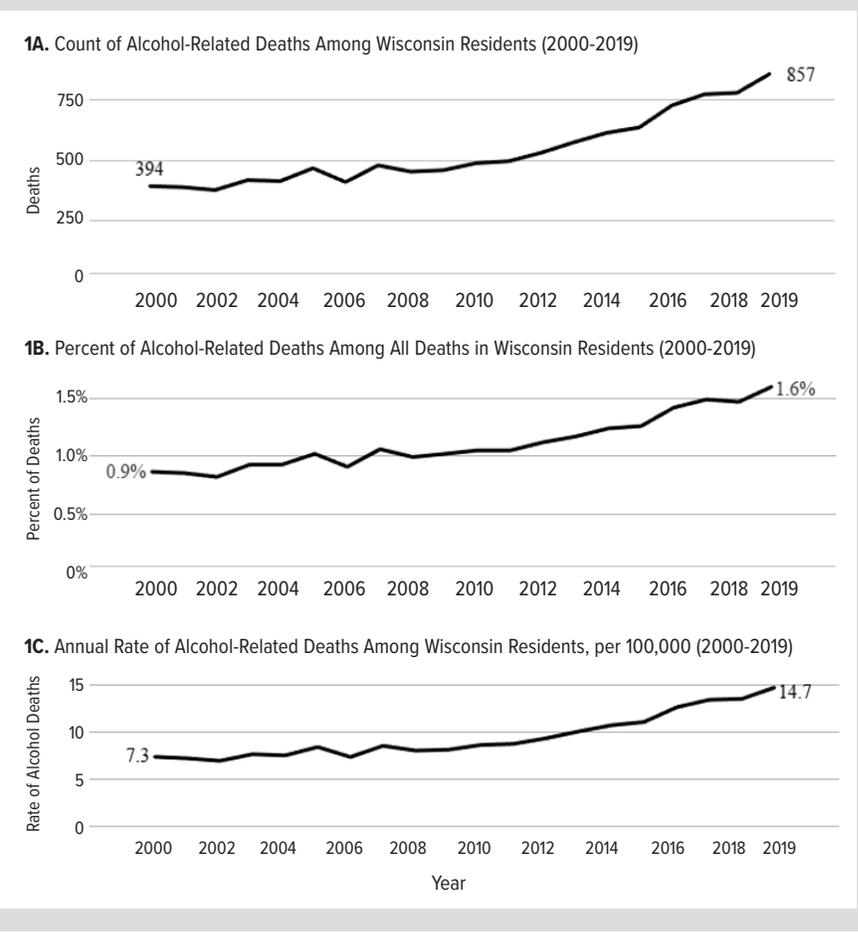
There were also significant differences by age. Middle-aged individuals were disproportionately likely to die from an alcohol-related cause. The largest proportion of alcohol-related deaths was among individuals aged 55-64 (35.1%), followed by individuals 45-54 (24.4%) ( $P < 0.002$ ). The mean age at death for decedents who died of an alcohol-related cause was 57.8 (SD, 11.9) years old, compared with 76.2 (SD, 16.0) for those who died from other causes ( $P < 0.002$ ) (data not shown). Finally, this study did not find any statistically significant differences in alcohol-related mortality by geographic region or urbanicity. This included both differences by DHS region ( $P = 0.54$ ) and rural-urban county classification ( $P = 0.23$ ).

### Trends Over Time (2000-2019)

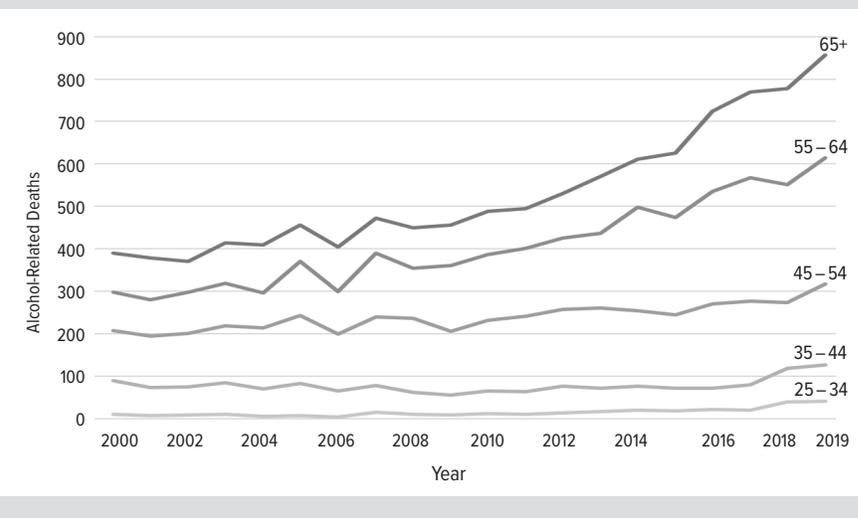
The total number of alcohol-related deaths in Wisconsin more than doubled from 394 in 2000 (less than 1% of all deaths) to 857 in 2019 (1.6% of all deaths) (Figures 1A and 1B). The rate of alcohol-related mortality more than doubled as well, from 7.3 deaths per 100,000 residents in 2000 to 14.7 in 2019 (Figure 1C).

These data also show differential trends for age groups. Alcohol-related mortality was most prevalent for those individuals in the oldest age categories (ie, 65 and older and 55-64 years of age). The 55-64 age group had the highest percentage increase in mortality over the time period, with a more than 3-fold increase in the number of cases (from 90 to 297 deaths, a 230% increase) (Figure 2). The 65+ age category also more than doubled in this time period (from 92 to 243 deaths, a 164% increase) (Figure 2). Alcohol-related deaths remained more stable for individuals in the 35-44 and 45-54 age ranges, with a small increase (8%) in the former and a somewhat larger (62%) increase in the latter. The most dramatic increase was among those in the 25-34 age range. While the absolute numbers were low, they more than tripled over the period, from only 11 deaths in 2000 to 41 deaths in 2019 (a 272% increase) (Figure 2).

**Figure 1.** Counts, Proportions, and Rates of Alcohol-Related Deaths Among Wisconsin Residents, 2000-2019



**Figure 2.** Alcohol-Related Mortality by Age Category in Wisconsin by Age, 2000-2019



### DISCUSSION

Our findings confirm recent reports<sup>16,17</sup> that show stark increases in alcohol-related deaths in Wisconsin and demonstrate differences across demographic groups. We show that alcohol mortality has been trending upward for 20 years prior to the COVID-19

likely to see binge drinking as a risky behavior compared to youth nationwide and that binge-drinking among Wisconsin youth outpaces the rest of the nation.<sup>18</sup> However, it also may be later in life when alcohol use patterns are established. Our findings show that college-educated individuals had the highest likelihood of alcohol-related mortality. It is important to note that the relationship between education and alcohol use is potentially complex. For example, data from the Behavioral Risk Factor Surveillance System show that whereas education is positively correlated with binge-drinking (up to college), intensity and frequency of binge drinking is inversely correlated with education.<sup>19</sup> As such, our data are unlikely to reveal the full story. Still, given our findings and the well-known culture of drinking on college campuses,<sup>20</sup> future research should consider a deeper exploration of the relationships between age, education, and alcohol use.

Dramatic increases in the higher age categories in our analyses are also a cause for concern. Gender differences, with males more likely to die of alcohol-related causes than females, and differences by race and ethnicity should be kept in mind for targeting interventions and public health messaging. Organizations around Wisconsin have identified excessive drinking as a public health concern. The Wisconsin Department of Health Services continues to choose alcohol as a priority in the Healthy Wisconsin plans.<sup>21</sup> The Wisconsin Cancer Coalition has pointed out the association of alcohol with cancer deaths and, as such, has made it a priority to “create environments that discourage excessive alcohol use” and to promote policies and practices to do the same.<sup>22</sup> The Wisconsin Association of Local Health Departments and Boards also has identified alcohol as a key improvement area, making alcohol-related grants and resources available to its members.<sup>23</sup>

Wisconsin has less restrictive alcohol use policies than many other states. The state ranks 45th in the United States when compared to other states on policies including impaired driving, youth drinking, and restricting alcohol sales.<sup>24</sup> If state policies remain static, the number of alcohol-related deaths may continue to increase. To avoid this outcome, Wisconsin should consider creating policies to discourage excessive alcohol use. Policy changes can reduce unsafe access to alcohol and improve cultural norms to prevent excessive and harmful drinking.<sup>25</sup> For instance, a significant body of evidence exists that shows reductions in consumption when taxes on alcohol are increased.<sup>26</sup>

A recent report from the State Council on Alcohol and Other Drug Abuse reviewed state and national efforts and recommends several evidence-based policies that can reduce excessive alcohol use.<sup>27</sup> These include: (1) raising the price of alcohol (which can reduce youth consumption and curb binge drinking); (2) reducing density of alcohol outlets (which can reduce access to alcohol); (3) creating alcohol compliance checks to ensure outlets are not selling to minors; (4) instituting Place of Last Drink (POLD) policies to help stakeholders understand where excessive alcohol drinking is happening within their communities; and (5) screen-

ings and brief interventions by medical providers (which can help reduce binge drinking and identify those drinkers who should be referred for treatment). All of these policies are potential avenues to curb excessive alcohol consumption in Wisconsin which, in turn, could lessen the future burden of alcohol-related morbidity and mortality in the state.

### Limitations

Determining the degree to which alcohol plays a part in a death is difficult, particularly because alcohol use—both long term and acute—is not always apparent at the time of death. The CDC uses Alcohol-Related Disease Impact (ARDI) fractions to estimate alcohol deaths based on epidemiological studies of the underlying cause of death.<sup>13</sup> As the goal of our study was not to estimate the true rate of alcohol-related mortality in the state, but rather to assess trends and differences of deaths directly related to alcohol by demographic groups, we chose not to use the ARDI fractions (which try to estimate the contribution of alcohol to deaths of multiple causes) but, rather, to use only deaths that are fully attributable to alcohol in our analyses. This likely means that our estimates of the rates of alcohol-related deaths in the state are conservative and that this cause of mortality is more widespread than we show here. Readers interested in comparison estimates of alcohol-related deaths for Wisconsin using ARDI fractions can find recent years on the Alcohol: Attributable Deaths by County Dashboard from the Wisconsin Department of Health Services.<sup>28</sup>

Wisconsin deaths are collected and recorded by individual coroners and medical examiners at the county level. In Wisconsin, 31 counties have elected coroners and 40 have appointed medical examiners. Training and education requirements are different for coroners and medical examiners and may result in differences in classification of the underlying cause of death. Still, if there was a trend toward improved reporting on alcohol-related mortality, it could be that some of the increases are related to that improved reporting. However, we are unaware of any evidence that suggests such a trend has occurred in Wisconsin. Moreover, the mixed system of elected coroners and appointed medical examiners—paired with the differences in training and education—does not suggest a high likelihood of systematic bias stemming from reporting within this group. Finally, early evidence suggests that during the COVID-19 pandemic consumption of alcohol increased in both frequency and quantity for Wisconsin residents who drink.<sup>16,29</sup> Future research will be needed to see if—and how—this unprecedented scenario affects alcohol-related mortality in the state. This study represents a vital step in our continued understanding of alcohol-related mortality in Wisconsin.

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