

Trends in Adult Suicide Rates in Milwaukee County, Wisconsin, 2002 through 2020

Andrew T. Schramm, PhD; Jacey Kant, BS; Carissa W. Tomas, PhD; Arnitta R. Holliman, MS, LPC; Vaynesia T. Kendrick, MS; Hason Khan, MS; Susan Cronn, APNP, DNP; Terri A. deRoon-Cassini, PhD; Sara A. Kohlbeck, MPH

ABSTRACT

Background: Monitoring suicide rates is an important public health strategy to inform prevention efforts. We describe rates of adult suicide in Milwaukee County, Wisconsin, over a 19-year period.

Methods: Data on all adult suicides from 2002 through 2020 ($n = 981$) were obtained from the Milwaukee County Medical Examiner's Office. Subpopulation rates were identified using the Wisconsin Interactive Statistics on Health System.

Results: Suicide rates increased significantly over the study period, with disproportionate increases among Black and Latinx residents.

Discussion: Expanded prevention efforts are needed to reverse this concerning trend. Further research should guide development of culturally relevant interventions, provide data for the equitable allocation of limited resources.

BACKGROUND

Surveillance of county-level suicide rates is key to understanding the evolving nature of this public health problem within local communities. A recent statewide report cites a 40% increase in all Wisconsin suicides from 2000 to 2017, with significant variability across rural and urban counties.¹ We sought to build upon these state-level findings by describing adult suicide rates over time in Milwaukee County, the largest and most diverse urban county in the state.²

• • •

Author Affiliations: Department of Surgery, Trauma and Acute Care Surgery, Medical College of Wisconsin (MCW), Milwaukee, Wisconsin (Schramm, Cronn, deRoon-Cassini); Comprehensive Injury Center, MCW, Milwaukee, Wis (Schramm, Tomas, Cronn, deRoon-Cassini, Kohlbeck); Institute for Health Equity, MCW, Milwaukee, Wis (Tomas); Office of Violence Prevention, Milwaukee Health Department, Milwaukee, Wis (Holliman, Kendrick); Kansas City University of Medicine and Biosciences, Kansas City, Missouri (Khan).

Corresponding Author: Andrew T. Schramm, PhD, 8701 W Watertown Plank Rd, Milwaukee, WI 53226, phone 414.955.1746; email aschramm@mcw.edu; ORCID ID 0000-0002-3168-026X

METHODS

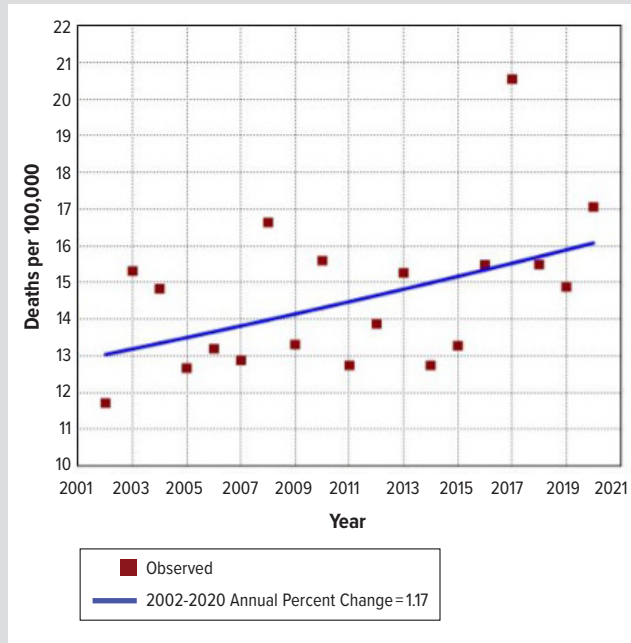
Study Design

Data were obtained from the Milwaukee County Medical Examiner's Office (MCMEO) on all deaths determined to be suicides by the MCMEO from 2002 through 2020. Variables included name, date of birth, date of death, race, sex, cause of death, and location of injury. Text variables (eg, mechanism of injury, sex) were recoded into numerical, categorical variables to allow for statistical analysis (eg, sex was coded as 0 = male, 1 = female). Race categories included Hispanic ethnicity and

were recoded according to the categories used by the MCMEO (White, Black, Asian/Pacific Islander, American Indian/Alaska Native, Hispanic, Eastern Indian, and multiracial). A variable for racial/ethnic minority status also was created (0 = nonminority/White, 1 = minority). Cause of death was recoded into 9 categories based on the most prevalent causes (firearm; asphyxia, suffocation, hanging; poisoning; fall from heights; motor vehicle crash; drowning; burns; cut with sharp object; and "other," which included all causes not represented in other categories). Finally, population-level data from the Wisconsin Interactive Statistics on Health (WISH) query system's Population Module were used to calculate county-level annual suicide rates per 100 000 as there were significant increases in the Milwaukee County population from 2002 through 2020 ($r^2 = .91$, $P < .001$).³

Frequency tabulations were conducted to summarize demographic information and rates of suicide by year. Logistic regression was utilized to calculate odds ratios based on sex and race to examine associations with relevant factors, such as cause of death. Probability values of $P < .05$ were considered statistically significant. Finally, joinpoint regression models were estimated to

Figure. Number of Suicides per Year and Results of Joinpoint Regression Analyses



Annual percent change = 1.17 is significantly different from zero at the alpha = 0.05 level.

Table 1. Demographic Characteristics and Descriptive Statistics, N=1,981

	n	% Total
Race		
White	1541	77.8
Black	265	13.4
Asian/Pacific Islander	37	1.9
American Indian/Alaska Native	12	0.6
Hispanic	105	5.3
Eastern Indian	11	0.6
Multiracial	9	0.5
Not recorded	1	0.05
Immediate cause of death		
Firearm	811	40.9
Asphyxia/hanging/suffocation	632	31.9
Poisoning	305	15.4
Fall from heights	102	5.1
Motor vehicle crash	31	1.6
Drowning	30	1.5
Burns	11	0.6
Cut from sharp object	55	2.8
Other	0	0
Not recorded	4	0.2
Year of death		
2002	82	4.1
2003	107	5.4
2004	104	5.2
2005	89	4.5
2006	92	4.6
2007	91	4.6
2008	117	5.9
2009	94	4.7
2010	111	5.6
2011	91	4.6
2012	100	5.0
2013	110	5.6
2014	92	4.6
2015	96	4.8
2016	124	5.7
2017	149	7.5
2018	112	5.7
2019	108	5.5
2020	124	6.3

identify changes in the number of suicides in Milwaukee County from 2002 through 2020 using the Joinpoint Regression Software, Version 4.9.0.0 (Surveillance Research Program, National Cancer Institute). This analytic method uses counts or rates of occurrence for a given phenomenon of interest to isolate subsets of the data with distinct linear trends. (For a detailed description of this analytic approach, see Kim et al and the methodological guidelines cited here).^{4,5}

RESULTS

A total of 1981 deaths from 2002 through 2020 were determined to be suicides by the MCMEO. The average age at the time of death was 45 years (SD=16.8). As displayed in the Figure, the greatest number of suicides occurred in 2017 (n = 149, rate = 20.54) and the fewest occurred in 2002 (n = 82, rate = 11.73). Descriptive statistics are displayed in Tables 1 and 2. Suicide decedents were most commonly White, non-Hispanic (77.8%; n = 1541), and 76.7% (n = 1520) of decedents were male. However, results indicate an increase in the proportion of suicides among Hispanic decedents (almost half of whom were women) over time (from 4.9% of all suicides in 2002 to 8.9% of all suicides in 2020), and an increase in the proportion of suicides among Black decedents was noted in later years (from 6.3% in 2015 to 15.3% in 2020). This trend in suicides by race mirrors overall population trends for the county between 2002 and 2020. The proportion of White residents decreased from 70% in 2002 to 65% in 2020, while the proportion of Black

residents rose from 26% in 2002 to 29% in 2020. Proportions of Asian and American Indian residents remained stable over time. Similarly, the proportion of non-Hispanic residents decreased from 90% in 2002 to 84% in 2020, while the proportion of Hispanic residents increased from 10% to 16% over the same time period.⁶

The three most common suicide methods were self-inflicted gunshot wound (40.9%; n=811); asphyxiation, suffocation, or hanging (31.9%; n=632); and poisoning (15.4%, n=305). Logistic regression (Table 3) revealed that Black decedents were significantly less likely than White decedents to have died from self-inflicted gunshot wounds versus other methods. White, Latinx, and female decedents were significantly more likely use a firearm as a method of suicide.

Table 2. Wisconsin Suicide Rates by Year

	White		Black		Hispanic	
	Milwaukee County	Other Counties	Milwaukee County	Other Counties	Milwaukee County	Other Counties
2002	11.6	12.1	5.7	6.5	4.3	3.8
2003	12.4	11.9	8.4	*	5.3	3.5
2004	13.3	12.1	8.0	6.9	5.1	5.9
2005	11.7	11.8	5.2	4.7	5.8	4.9
2006	11.8	12.2	7.9	7.2	3.7	4.6
2007	12.2	13.6	6.1	5.2	4.4	4.9
2008	15.8	13.4	5.4	4.1	6.0	5.1
2009	12.2	13.5	8.4	9.6	3.3	5.9
2010	15.1	14.3	5.2	11.0	4.0	3.8
2011	14.0	13.8	1.9	9.1	3.9	6.4
2012	13.5	13.7	5.2	*	4.6	3.1
2013	14.5	16.1	4.1	6.5	5.2	2.6
2014	12.4	14.5	4.5	4.2	6.6	8.9
2015	13.2	16.9	3.3	*	4.3	5.8
2016	14.2	15.8	6.7	6.1	5.7	7.3
2017	21.0	16.2	7.4	6.6	10.4	5.9
2018	15.6	16.1	6.3	9.0	3.4	7.4
2019	13.6	15.3	6.3	6.9	8.8	7.5
2020	16.6	15.4	8.1	9.1	9.2	8.0

Suicide rates by year are displayed for White residents, Black residents, and Hispanic residents only, as numbers by year were <5 for other race groups and are suppressed to protect confidentiality. Values of * indicate that rates are not available due to numbers <5.

Table 3. Association Between Demographic Characteristics and Use of Firearm as Suicide Method

	Odds Ratio	SE	P value	95% CI
Race (White is referent)				
Black	0.67	0.09	0.002 ^a	0.51-0.86
Asian/Pacific Islander	1.27	0.44	0.50	0.64-2.51
American Indian/Alaska Native	3.44	2.67	0.10	0.75-15.75
Hispanic	2.45	0.59	<0.001 ^a	1.53-3.94
Eastern Indian	3.10	2.42	0.10	0.67-14.37
Multiracial	0.34	0.24	0.10	0.09-1.38
Sex (Male is referent)				
Female	3.71	0.47	<0.000*	2.89-4.77

^aP < 0.05.

In order to identify trends over time, we utilized joinpoint regression. Models were estimated using 0, 1, 2, or 3 joinpoints. The final model selected had 0 joinpoints, suggesting that the best fitting model did not contain any breaks in the trend of suicides between 2002 and 2020 (Figure). Using a Monte Carlo Permutation method, the annual percentage change/average annual percentage change was significantly different than zero, with a 1.17% increase in suicide rates throughout the timeframe. Based on the methodology for characterizing trends set forth by the Cancer Trends Progress Report, an annual percentage change greater than 0.5 is considered rising as opposed to stable.⁷ Thus, the trend in Milwaukee County suicides has increased steadily and significantly since 2002, without any shifts in direction or magnitude.

Milwaukee County and the city of Milwaukee contained within are highly segregated across race and ethnicity.⁹ Systemic and structural racism—drivers of segregation—heighten the risk for suicide among people of color.¹⁰ Our identification of growing rates of suicides among Black and Latinx individuals in Milwaukee County underscores the multifaceted health effects of racism on historically marginalized communities.

Limitations

While the data source is a strength of this study, it also came with limitations. There were several demographic variables that we would have liked to include to better characterize the sample (eg, socioeconomic status). However, these were unavailable because they are not a standard part of the medical examiner’s death investigation reports. Future research should seek to include this infor-

DISCUSSION

The purpose of this study was to evaluate trends in suicide rates over time from 2002 to 2020 in Milwaukee County, Wisconsin. We found that the annual rate of adult suicides increased significantly during this timeframe. This increase was disproportionately greater among Black and Latinx decedents than White decedents. This raises concern over the factors driving this finding, which is an important area for future research. Although suicidology research has identified the importance of culturally relevant suicide prevention initiatives for specific subpopulations (eg, veterans; lesbian, gay, bisexual, transgender, queer or questioning, and more individuals; farmers; and racial/ethnic minorities), development of such approaches has been limited.⁸

Our results call attention to the need for suicide prevention initiatives tailored for people living in more densely populated communities. Population-level data (WISH Data Query System) indicate that in Wisconsin, Black American and Latinx individuals are more likely to reside in urban rather than rural counties. Therefore, prioritizing the development of culturally responsive suicide prevention approaches for Black American and Latinx individuals is an important step toward eliminating health disparities in urban settings. This is a health equity issue that demands our attention.

mation where possible to provide more information about the generalizability of the findings. Additionally, there is not a standardized process used to determine manner of death as a suicide. For example, it is possible that some drug overdoses that were made with suicidal intent were not labeled suicides due to insufficient evidence available to the medical examiner. This is a known issue in forensic science in light of research showing, for example, that cognitive bias may influence individual decisions around manner of death.¹¹ Although beyond the scope of the present study, future research on factors influencing manner of death classification is needed to elucidate these effects and identify solutions.

Implications

Our finding that suicide rates have risen significantly in Milwaukee County over the last 19 years, especially among Black and Latinx residents, has important implications for policy, clinical practice, and research endeavors. Data-informed policy is key to the equitable allocation of resources across the state. Evidence of the expanding scope and disparities of this public health issue reflect the urgent need to develop culturally relevant suicide prevention initiatives in urban settings, particularly for marginalized communities. Additionally, clinicians should be aware that suicide rates are trending upward in Milwaukee County and that this increasing risk disproportionately affects their Black and Latinx patients.

Future research and suicide prevention programming should leverage community-based partnerships to examine unique factors that contribute to suicide risk among racial/ethnic minorities. Cultural context is an important consideration in suicide prevention efforts; however, many suicide prevention strategies are framed by White, non-Hispanic paradigms. A qualitative research approach could elucidate how experiences of racism and discrimination in the community contribute to suicide risk. Future studies should evaluate suicide rates relative to proportion of each race in the population. In addition, it is imperative to continue quantitative surveillance of suicide trends in both urban and rural counties to improve community health across Wisconsin.

Financial Disclosures: None declared.

Funding/Support: None declared.

REFERENCES

1. Prevent Suicide Wisconsin. Suicide in Wisconsin: Impact and Response. September 2020. Accessed July 10, 2021. <https://www.dhs.wisconsin.gov/publications/p02657.pdf>
2. Ratcliffe M, Burd C, Holder K, Fields A. Defining rural at the US Census Bureau. United States Census Bureau. United States Census Bureau report number ACSGEO-1. December 2016. Accessed July 10, 2021. <https://www.census.gov/content/dam/Census/library/publications/2016/acs/acsgeo-1.pdf>
3. Wisconsin Department of Health Services. Population module. WISH (Wisconsin Interactive Statistics on Health) Query System. Updated May 18, 2023. Accessed August 13, 2021. <https://www.dhs.wisconsin.gov/wish/index.htm>
4. Kim H, Fay M, Feuer E, Midthune D. Permutation tests for joinpoint regression with applications to cancer rates. *Stat Med*. 2000;19(3):335-351. doi:10.1002/(sici)1097-0258(20000215)19:3<335::aid-sim336>3.0.co;2-z
5. National Cancer Institute. Methodology for characterizing trends. Accessed August 21, 2021. <https://progressreport.cancer.gov/methodology>
6. Wisconsin Department of Health Services. Population module. WISH (Wisconsin Interactive Statistics on Health) Query System. Updated May 18, 2023. Accessed March 9, 2023. <https://www.dhs.wisconsin.gov/wish/index.htm>
7. Silva C, Van Orden KA. Suicide among Hispanics in the United States. *Curr Opin Psychol*. 2018;22:44-49. doi:10.1016/j.copsyc.2017.07.013
8. Joe S, Canetto SS, Romer D. Advancing prevention research on the role of culture in suicide prevention. *Suicide Life Threat Behav*. 2008;38(3):354-362. doi:10.1521/suli.2008.38.3.354
9. Loyd JM, Bonds A. Where do Black lives matter? Race, stigma, and place in Milwaukee, Wisconsin. *Socio Rev*. 2018;66(4):898-918. doi:10.1177/0038026118778175
10. Alvarez K, Polanco-Roman L, Samuel Breslow A, Molock S. Structural racism and suicide prevention for ethnoracially minoritized youth: a conceptual framework and illustration across systems. *Am J Psychiatry*. 2022;179(6):422-433. doi:10.1176/appi.ajp.21101001
11. Dror I, Melinek J, Arden JL, et al. Cognitive bias in forensic pathology decisions. *J Forensic Sci*. 2021;66(5):1751-1757. doi:10.1111/1556-4029.14697

advancing the art & science of medicine in the midwest

WMJ

WMJ (ISSN 1098-1861) is published through a collaboration between The Medical College of Wisconsin and The University of Wisconsin School of Medicine and Public Health. The mission of *WMJ* is to provide an opportunity to publish original research, case reports, review articles, and essays about current medical and public health issues.

© 2023 Board of Regents of the University of Wisconsin System and The Medical College of Wisconsin, Inc.

Visit www.wmjonline.org to learn more.