

Persistent Racial, Ethnic, and County-Level Disparities in Invasive Cervical Cancer Incidence in Wisconsin, 1998–2022

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ABSTRACT

Background: Invasive cervical cancer continues to disproportionately affect racially and ethnically minoritized populations and individuals living in rural areas. We analyzed trends in cervical cancer incidence by race, ethnicity, and geography in Wisconsin from 1998 through 2022.

Methods: Cervical cancer incidence rates (per 100 000 individuals with a cervix) were analyzed by race/ethnicity and county using data from the Wisconsin Cancer Reporting System.

Results: Overall incidence declined 28%, from 8.2 to 5.9 cases per 100 000, but declines were not evenly distributed across populations. Compared with non-Hispanic White individuals, non-Hispanic Black individuals had nearly twice the incidence rate throughout the study period. Although Hispanic individuals experienced the largest relative decline (40.8%, 15.7 to 9.3 per 100 000), incidence remained higher among non-Hispanic White individuals. Milwaukee County, Wisconsin's most socially vulnerable county, had among the highest incidence rates and slowest decline over time (19.8%).

Discussion: Because cervical cancer is largely preventable, the persistence of substantial disparities in Wisconsin highlights structural inequities that warrant urgent attention.

2000s, rates have plateaued over the last decade, and more than 13 000 new invasive cervical cancer cases and 4000 deaths were projected in the United States (US) in 2025.² Additionally, declines have not been shared equally across populations, and vulnerable groups, including racially minoritized groups, socioeconomically disadvantaged individuals, uninsured and underinsured individuals, and individuals living in rural areas, continue to bear a disproportionate burden of new cases.^{6–8} Addressing these disparities is particularly important as the World Health Organization (WHO) has established a global goal of eliminating cervical cancer as a public health problem by 2030.⁹

Wisconsin has some of the most disparate health care outcomes in the nation,¹⁰

BACKGROUND

Invasive cervical cancer is largely preventable through vaccination and screening.¹ Incidence rates in the United States declined significantly after the introduction of Pap smear screening in the 1970s, high-risk human papilloma virus (hrHPV) testing in 2003, and HPV vaccination in 2006 (quadrivalent) and 2014 (nonavalent).^{2–5} While overall incidence rates have declined since the early

yet cervical cancer incidence and outcomes in the state remain underexamined. This research brief provides a descriptive overview intended to highlight areas of concern and inspire more in-depth analyses. We report rates of invasive cervical cancer incidence in Wisconsin from 1998 (5 years before US Food and Drug Administration approval of hrHPV testing) through 2022, with a focus on differences by race, ethnicity, and county.

METHODS

Invasive cervical cancer data were obtained from the Wisconsin Cancer Reporting System (WCERS), and national data were obtained from the National Cancer Institute (NCI) SEER Incidence Database.¹¹ Analyses were conducted using SEER*Stat Version 9.0.32.0 (National Cancer Institute). Incidence rates were calculated using SEER Site Recode for invasive cervical cancer and were expressed as observed cases per 100 000 individuals

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with a cervix, age-adjusted to the 2000 US standard population (Census P25-1130), over 5-year intervals. For inclusivity and brevity, the term “individuals” refers to people with a cervix, acknowledging that not all individuals at risk for cervical cancer identify as female. The term “cervical cancer” is used throughout this manuscript to refer to invasive cervical cancer. Incidence rates were stratified by race/ethnicity and county of diagnosis. Rates based on fewer than 16 cases were suppressed to discourage misinterpretation of unstable data and to protect patient confidentiality. WCRS data were imported into Stata version 18 to generate descriptive tables and figures. WCRS data are categorized by sex assigned at birth.

RESULTS

Overall

The overall burden of cervical cancer in Wisconsin decreased 28.0%, from 8.2 to 5.9 cases per 100 000, and from 1138 cases in 1998-2002 to 921 cases in 2018-2022. The sharpest decline occurred between 1998-2002 and 2003-2007, when the incidence rate decreased 22.0% (8.2 to 6.4 per 100 000) (Figure 1).

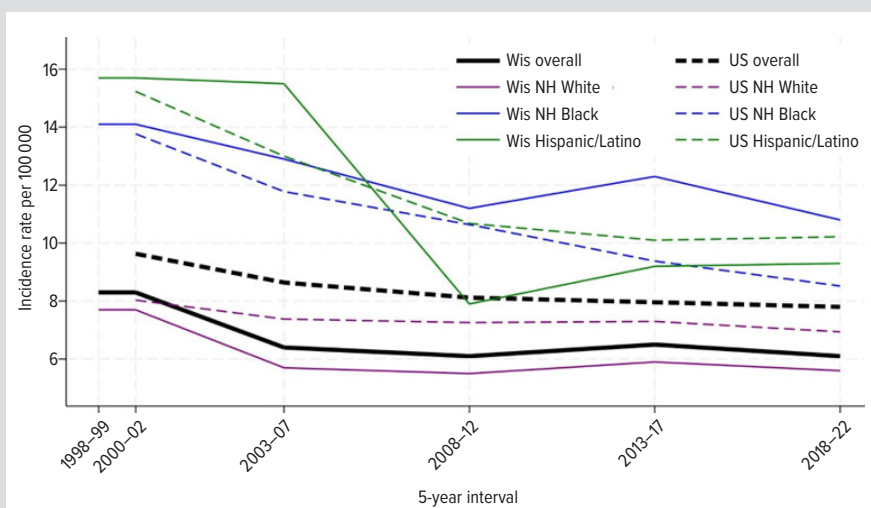
By Race and Ethnicity

Declines in cervical cancer burden in Wisconsin were not evenly distributed across racial and ethnic groups. Among non-Hispanic White individuals, cervical cancer incidence was the lowest of any measured racial/ethnic group and remained stable throughout the study period. Rates declined from 7.7 to 5.6 per 100 000 (27.3%) from 1998 through 2022, and the sharpest decline occurred between 1998-2002 and 2003-2007 (26%; 7.7 to 5.7 per 100,000). From 2003-2007 onward, rates plateaued (5.6 to 5.9 per 100 000).

Non-Hispanic Black individuals in Wisconsin had higher cervical cancer incidence rates than the statewide average and nearly twice the rate of non-Hispanic White individuals during every 5-year interval from 1998 to 2022. The percent difference between non-Hispanic Black individuals and non-Hispanic White individuals in Wisconsin increased from 83.1% higher in 1998-2002 to a peak of 119.6% higher in 2013-2017, before declining modestly to 92.9% higher in 2018-2022 (Figure 1).

Hispanic individuals experienced the largest relative decline in cervical cancer incidence in Wisconsin, decreasing 40.8% (15.7 to 9.3 per 100 000) between 1998-2002 and 2018-2022. The sharpest decline occurred between 2003-2007 and 2008-2012, when incidence decreased 49.0% (15.5 to 7.9 per 100 000). However, incidence recently increased, rising 17.7% from 7.9

Figure 1. Age-Adjusted Invasive Cervical Cancer Incidence per 100 000 by Race/Ethnicity in Wisconsin and United States, 1998-2022



Abbreviations: Wis, Wisconsin; NH, non-Hispanic; US, United States.

per 100 000 in 2013-2017 to 9.3 per 100 000 in 2018-2022. Hispanic individuals in Wisconsin also experienced a disproportionately high incidence of cervical cancer, with the most recent rate 39.8% higher than that of non-Hispanic White individuals (Figure 1).

Cervical cancer incidence data for non-Hispanic American Indian/Alaska Native individuals were suppressed because of case counts fewer than 16 for 1998-2002 and 2018-2022. During the intervals for which data were available, non-Hispanic American Indian/Alaska Native individuals had the highest rates of cervical cancer incidence of any racial/ethnic group, with incidence rates of 14.4, 19.9, and 14.4 cases per 100 000 cases in 2003-2007, 2008-2012, and 2013-2017, respectively (Appendix).

By County

Among Wisconsin's 3 most populous counties (Milwaukee, Dane, and Waukesha), Milwaukee County had the highest cervical cancer incidence rate during every 5-year interval from 1998 through 2022, peaking at 10.1 per 100 000 in 1998-2002 and declining 19.8% to 8.1 per 100 000 in 2018-2022. Dane County had the second-highest rate during each interval except 2003-2007, when it had the lowest rate among the 3 counties (4.1 per 100 000). Incidence rates declined 31.9%, from 7.2 per 100 000 in 1998-2002 to 4.9 per 100 000 in 2018-2022. Incidence rates in Waukesha County declined 43.1% (6.5 to 3.7 per 100 000) over the study period and remained below the statewide average during every interval measured (Figure 2).

DISCUSSION

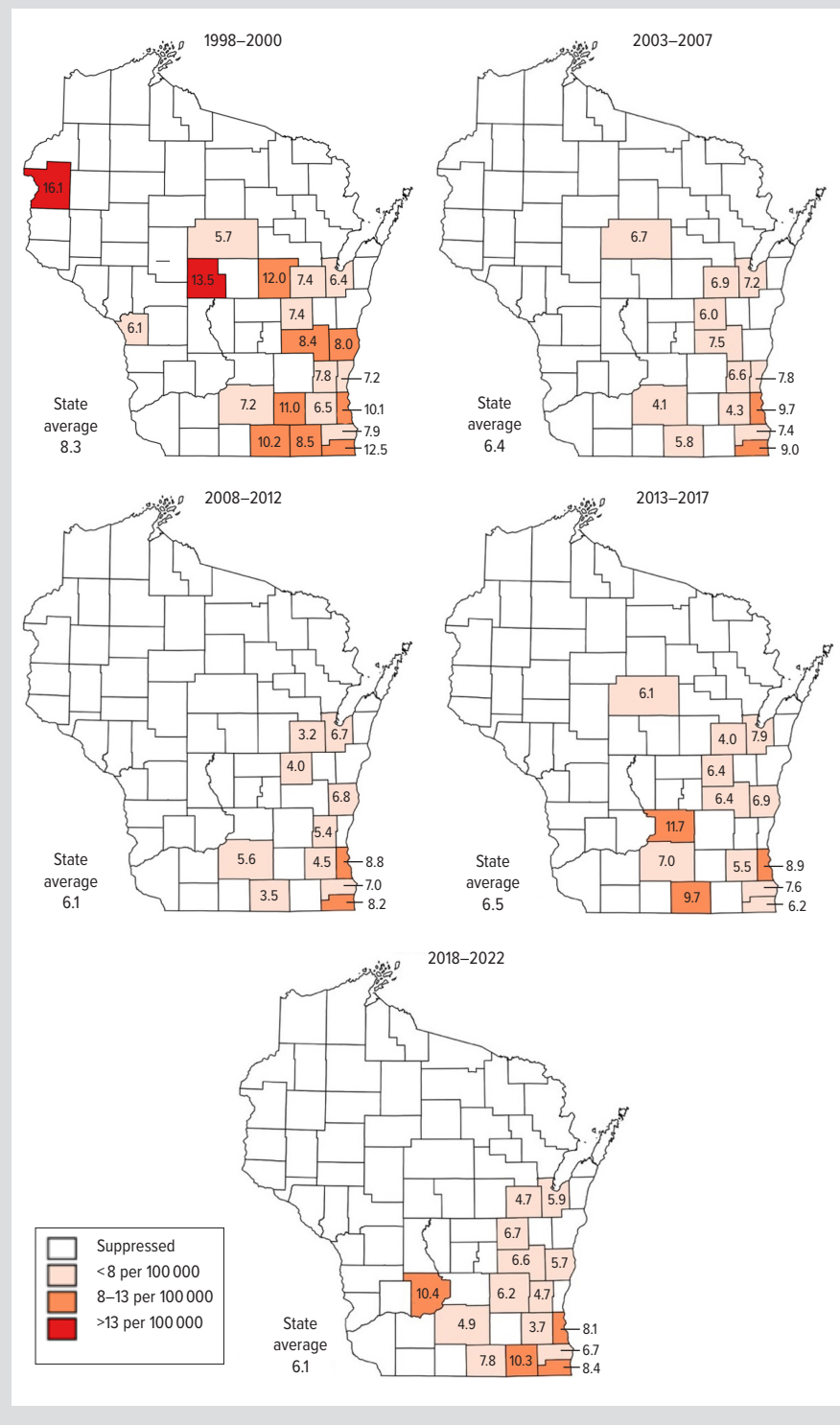
We found that while overall Wisconsin cervical cancer incidence rates are lower than US rates, notable disparities exist by race, ethnicity, and county of residence. While the state has experi-

enced an overall decline in incidence since 1998, non-Hispanic Black individuals continue to experience rates nearly double those of non-Hispanic White individuals, and this disparity has widened over time. In contrast, the national disparity between non-Hispanic Black individuals and non-Hispanic White individuals persisted throughout the 1998–2022 time frame but narrowed substantially (Figure 1). Notably, this widening disparity in Wisconsin has occurred during a period of major public health innovation, including the introduction of hrHPV testing and the quadrivalent and nonavalent HPV vaccine.^{2–5}

This inequity is unlikely to be explained by differences in vaccination uptake. Statewide data demonstrate that HPV vaccination rates among non-Hispanic Black adolescents are equal to or higher than those among non-Hispanic White adolescents.¹² Differences in cervical cancer screening are also unlikely to explain the disparity, as non-Hispanic Black individuals were as likely or more likely than non-Hispanic White individuals to report having had a Pap test within the last 3 years on every Behavioral Risk Factor Surveillance System (BRFSS) survey conducted from 2002 through 2020.¹³ The increase in racial and ethnic disparities in Wisconsin despite comparable vaccination coverage and Pap smear screening contributes to a growing body of evidence suggesting that disparities in preventable diseases such as cervical cancer may reflect systemic racism, including the structures, policies, and institutions that systematically advantage some populations over others.^{14,15}

Data for the 3 most populous counties in Wisconsin—Milwaukee, Dane, and Waukesha—form a natural case study given the substantial differences in socioeconomic context and structural vulnerability across these settings. The Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI), which ranks counties from 0 (least vulnerable) to 1 (most vulnerable) based on factors such as socioeconomic status, minority status, access to housing, and access to transportation, provides a useful measure of the differences.¹⁶ Dane County falls

Figure 2. Heat Map of Age-Adjusted Invasive Cervical Cancer Incidence per 100 000 by Wisconsin County, 5-year Intervals (1998–2022)



near the state average on key structural indicators, including SVI (0.4), poverty rate (10.0%), and median income (\$88,108). In contrast, Milwaukee County consistently ranks as the most vulnerable in the state (SVI, 1.0), has the highest proportion of people living below the poverty line (17.1%)—nearly double the statewide average (10.1%)—and ranks among the lowest Wisconsin counties for median household income (\$62,118).^{14,15}

Conversely, Waukesha County has maintained an SVI near 0 across all reporting years, has one of lowest poverty rates (5.0%), and ranks among the highest counties for median household income (\$104,100).^{16,17} It is therefore notable that Milwaukee County, the most structurally disadvantaged county in the state, had the highest cervical cancer incidence in every measured timeframe and the slowest rate of decline. Conversely, Waukesha County, one of the most resourced counties, consistently had the lowest incidence and the most rapid decline among the 3 most populous counties. These patterns underscore the influence of structural vulnerability and socioeconomic conditions on disease burden and warrant further research to better understand underlying drivers and inform development of effective mitigation strategies.

Strengths and Weakness

The strengths of this study include the use of long-term statewide cancer registry data and stratification by race, ethnicity, and geography, allowing for a more nuanced understanding of cervical cancer trends. However, several limitations should be acknowledged. Data categorization methods do not fully capture multiracial or ethnically diverse individuals, potentially masking additional disparities, and the use of binary sex categories may similarly mask disparities among gender and sexual minority populations. Counties with fewer than 16 cases had suppressed rates, limiting assessment of trends in the most rural counties. Additionally, simple comparisons were used to describe changes in cervical cancer incidence across 5-year intervals. Although this approach is straightforward and easily interpretable, it does not permit statistical testing of changes in trend direction or magnitude and may overlook inflection points detectable with more advanced analytic methods. Finally, because WCRS data through 2022 are directly observed and not delay adjusted, recent incidence may be underestimated because of reporting lag. This limitation is particularly important when comparing to WCRS data with national SEER estimates, which are delay adjusted and therefore are not directly comparable.

Future Directions

The aim of this research brief was to provide descriptive data on cervical cancer incidence in Wisconsin as a starting point for future investigation. Several areas warrant further study. First, differences in incidence by race and ethnicity could be examined using regression analyses to determine whether race or ethnicity are statistically significant modifiers of incidence. Second, rurality could not be explored in depth because of data suppression requirements for counties with fewer than 16 cases; future studies could aggregate counties by region or pool data across longer intervals to facilitate comparative analysis. Third, regression models incorporating structural measures such as SVI could provide additional insight into the relationship between community-level vulnerability and cervical cancer incidence. Finally, linking reg-

istry data with vaccination and screening measures could clarify whether disparities arise from differential access to, or uptake of, prevention and screening tools.

CONCLUSIONS

Innovation in cervical cancer prevention is accelerating. In-clinic and home-based hrHPV self-collection, extended genotyping, and dual stain cytology will position Wisconsin to meet the WHO goal of eliminating invasive cervical cancer as a public health problem by 2030. However, this rapid progress also creates urgency: if Wisconsin's persistent racial and ethnic disparities are not addressed, these advances may widen, rather than narrow, existing gaps in cervical cancer burden.

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Appendix: Available at www.wmjonline.org

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