

Original Article

Increasing disparity in colorectal cancer incidence and mortality among African Americans and whites: A state's experience

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ABSTRACT

Objectives: To measure disparities between African Americans and whites in colorectal cancer incidence and mortality rates between 1995-2006 in Wisconsin.

Methods: Cancer incidence data were obtained from the Wisconsin Cancer Reporting System. Cancer mortality data were accessed from the SEER. Trends in incidence and mortality rates were calculated and changes in relative disparity were measured using rate ratios.

Results: The relative disparity in incidence grew from 1.0 in 1995 and 1.3 in 2006. The relative disparity in death rates for African Americans widened as well, from 1.2 to 1.5.

Conclusion: A persistent and widening colorectal cancer racial disparity exists.

KEY WORDS

colorectal cancer, epidemiology, disparities

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Introduction

Cancer health disparities, defined by the National Cancer Institute (NCI) as “differences in the incidence, prevalence, mortality, and burden of cancer and related adverse health conditions that exist among specific population groups” (1), are an important and growing concern. Although treatments for cancer are improving and cancer mortality is decreasing, not all Americans benefit equally from these successes (2). National organizations such as the NCI, US Department of Health and Human Services, and American Cancer Society have targeted the elimination of cancer health disparities, as have many state comprehensive cancer control plans (3).

Disparities in colorectal cancer (CRC) are often

highlighted as being a particular source of concern. Nationwide CRC is the second leading cause of cancer mortality and the fourth leading source of new cancer cases (4). African Americans experience higher CRC incidence rates, leading some organizations to recommend screening African Americans at age 45 (5). The most recent national data from NCI's Surveillance, Epidemiology, and End Results (SEER) program shows that from 2002 to 2006 the CRC incidence rate among white males was 58.2 cases per 100,000, while among African American men, the rate was 68.4. There is a similar disparity in mortality nationally (death rate among white men of 21.4 per 100,000, compared to 31.4 per 100,000 among African American men) (6). Although national incidence and mortality rates for CRC have been decreasing in recent years, the decrease has not been as pronounced among African Americans as it has been in whites (7, 8). There is also evidence that African Americans present with more advanced stage disease at diagnosis, and at a younger age (7, 9-11). Other studies have identified disproportionate survival differences by race, despite equal treatment (10, 12-15). Some authors have suggested that these differences may reflect variations in tumor biology and genetics by race (7, 8, 16). Additional causes of CRC disparities by race are thought to be multi-

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factorial and include differences in socioeconomic status (8, 9), rates of obesity (17), screening rates (18), and health care utilization (19), as well as a trend towards more right-sided (proximal) tumors among African Americans (13, 20-24).

The purpose of this study is to present trends in African American/white disparities in CRC incidence and mortality in Wisconsin. Monitoring trends in cancer incidence and mortality is an important part of any coordinated state plan to reduce disparities, providing critical information to cancer prevention programs, clinicians, and policy makers who seek to reduce the burden of cancer. While there is evidence of trends in African American/white CRC disparities at the national level, there are no such trend data for Wisconsin, as previously published reports (25-28) have combined several years of data in order to present data for multiple ethnic groups. By filling these gaps, the paper provides an example of state-level surveillance required for CRC control.

Methods

Data sources

We obtained incidence data from the Wisconsin Cancer Reporting System (WCRS) for the period 1995 to 2006, the most recent year for which data were available. As required by state law, cancer cases are reported to WCRS by Wisconsin hospitals, clinics, and physician offices. All invasive and noninvasive malignant tumors, except basal and squamous cell carcinomas of the skin and *in situ* cancers of the cervix uteri, are reportable to WCRS. Incidence rates were age-adjusted using the 2000 US standard population and calculated using NCI's SEER*Stat software.

Mortality data used in this study reflect Wisconsin resident death records from the Vital Records Section, Wisconsin Department of Health Services. We accessed mortality data from the National Center for Health Statistics (NCHS) public use data file of Wisconsin deaths covering the period 1995 to 2006. Population data used in calculating cancer rates are obtained periodically by NCHS from the Census Bureau; those used in this study were age-adjusted to the 2000 US standard population. We used SEER*Stat software to calculate mortality rates. We also applied race categories used by NCHS ("White" and "Black or African American") (29).

Stage of diagnosis was obtained from WCRS, which codes cases based on SEER staging guidelines. Precise American Joint Committee on Cancer TNM staging (30) is not currently available from WCRS; cancers are described as "localized" (invasive tumor that is confined to the organ of origin), "regional" (tumor spread beyond the organ of origin to adjacent organs or tissue by direct extension, or

through the regional lymph nodes, or both, but appears to have spread no further) or "distant" (tumor has spread to parts of the body remote from the primary organ, or a systemic malignancy) (28). Some cases are unstaged, due to insufficient information. The stage data are not age-adjusted.

Analysis

The observed annual incidence and mortality rates were plotted over the period 1995 to 2006 for all Wisconsin residents, by race and gender. (Due to data variability resulting from small populations, averages over three years are presented in the figures below.) Using slopes and intercepts derived from ordinary least squares regressions, trend lines of the incidence and mortality data were then plotted. The ratio of the African American rate to the white rate (rate ratio) in 1995 and 2006, based on the 1995-2006 trend line, was calculated. This ratio constitutes the measure of relative disparity (31), and was compared between the beginning and the end of the period.

Due to limited number of African American cases in some years, we combined stage data in three-year increments: 1995-1997, 1998-2000, 2001-2003, and 2004-2006. Due to the small number of distant cases among African Americans (fewer than 30 per year in the state), only localized and regional disease were analyzed.

Results

Stage at diagnosis

Among white and African American men and women of both races, the percentage of malignant CRC cases which were localized at diagnosis increased over the period 1995-2006, with the percentage for all groups reaching nearly 40% in 2004-2006 (Figure 1). In contrast, the percentage of cases which involved regional tumors at diagnosis decreased for all groups, falling to approximately 30% of all cases in 2004-2006 (Figure 2). There were 20 or fewer cases of distant disease annually among African Americans in Wisconsin (45 in 1995-1997, 52 in 1998-2000, 61 in 2001-2003, and 81 in 2004-2006). Due to the small number of distant cases over these periods, it is difficult to draw conclusions about the trends in these advanced cases relative to earlier staged CRC among African Americans, however, the number of distant cases increased over time.

Mortality and incidence, both sexes combined

Incidence: During 1995-2006, CRC was diagnosed in 36,877 Wisconsin residents, including 35,108 whites and 1,192 African Americans. Age-adjusted CRC incidence decreased 26% from 59 per 100,000 in 1995 to 44 per

100,000 in 2006. Incidence decreased quite dramatically for whites over the period, but not for African Americans. Moreover, an absolute disparity in rates persisted, with African American rates higher than white rates over virtually the entire period (Figure 3). Relative disparity, measured using the ratio of the African American incidence rate to the white incidence rate based on the 1995-2006 trend line, grew from 1.0 in 1995 and 1.3 in 2006 (Table 1).

Mortality: From 1995-2006, there were 13,207 deaths due to CRC among Wisconsin residents, including 12,645 whites and 450 African Americans. Age-adjusted CRC mortality declined 29% from 22 per 100,000 in 1995 to 16 per 100,000 in 2006. Mortality decreased markedly over

the period among whites, but not for African Americans, and an absolute disparity in rates persisted over the period (Figure 3). The relative disparity in death rates grew over the period, with the rate ratio increasing from 1.2 in 1995 to 1.5 in 2006 (Table 1).

Mortality and incidence, males

Incidence: During 1995-2006, CRC was diagnosed in 18,645 Wisconsin men (including 17,746 whites and 585 African Americans). Over this period, age-adjusted CRC incidence among men decreased 29% from 70 per 100,000 in 1995 to 50 per 100,000 in 2006. Incidence among African Americans was higher than that of whites over most of the period. In addition, while white rates fell, rates for

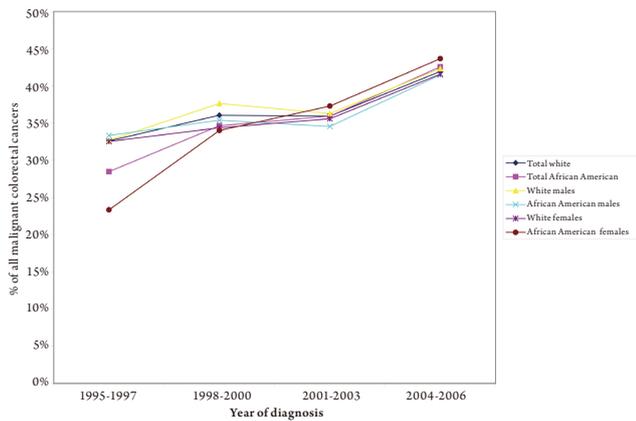


Figure 1 Percentage of all malignant colorectal cancer cases with local stage at diagnosis, by race and sex, Wisconsin, 1995-2006. Source: Wisconsin Cancer Reporting System.

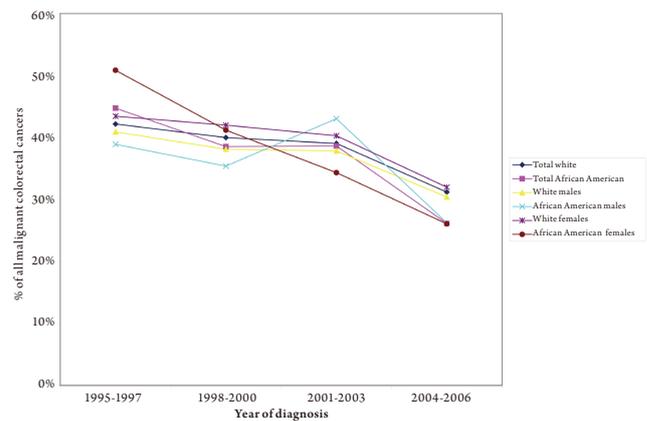


Figure 2 Percentage of all malignant colorectal cancer cases with regional stage at diagnosis, by race and sex, Wisconsin, 1995-2006. Source: Wisconsin Cancer Reporting System.

Table 1 Age-adjusted colorectal cancer incidence and mortality rates*, African Americans and whites, Wisconsin, 1995-2006

	1995			2006		
	African American rate	White rate	Rate ratio (based on trend) [†]	African American rate	White rate	Rate ratio (based on trend) [†]
Incidence						
Both sexes	47.8	58.6	1.0	49.4	42.8	1.3
Men	59.1	69.5	0.9	63.4	48.8	1.3
Women	41.1	50.2	1.0	40.2	37.8	1.4
Mortality						
Both sexes	19.4	22.4	1.2	26.4	15.4	1.5
Men	26.4	27.4	1.2	30.2	18.5	1.6
Women	15.7	18.8	1.3	22.9	13.2	1.5

* Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population.

[†] Ratio of African American rate to white rate, based on 1995-2006 trend line.

Source: Wisconsin Cancer Reporting System (incidence) and National Center for Health Statistics (mortality).

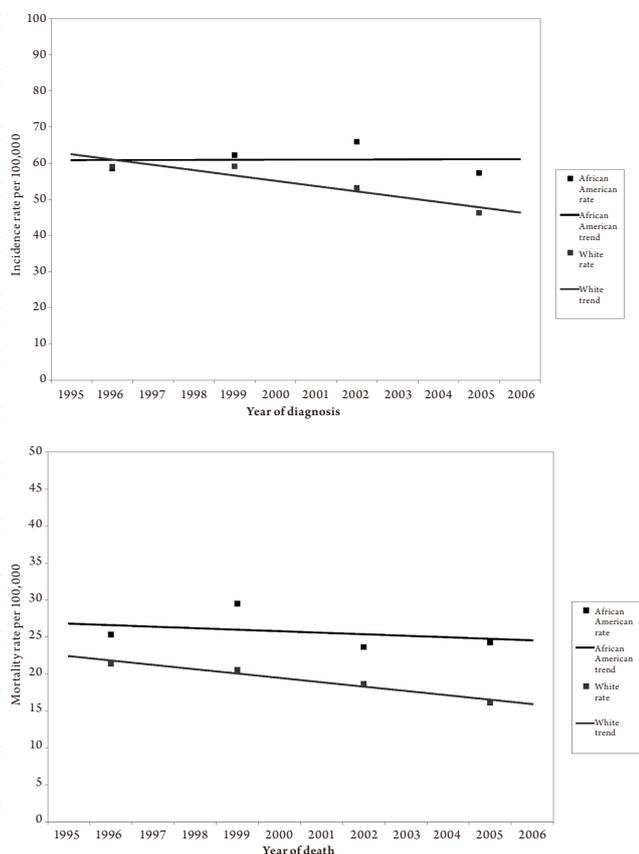


Figure 3 Age-adjusted colorectal cancer incidence and mortality rates, both sexes, by race, Wisconsin, 1995-2006. Note: Trend line calculated based on ordinary least squares regression of 1995-2006 rates. Rates presented are 3-year averages. Source: Wisconsin Cancer Reporting System (incidence) and National Center for Health Statistics (mortality).

African Americans remained stable (Figure 4). The relative disparity in male incidence rates grew from a rate ratio of 0.9 in 1995 to 1.3 in 2006 (Table 1).

Mortality: Between 1995 and 2006, there were 6,594 deaths due to CRC among Wisconsin men (including 6,309 whites and 224 African Americans). Over this period, age-adjusted male CRC mortality decreased 31% from 27.4 per 100,000 in 1995 to 19.0 per 100,000 in 2006. CRC mortality among African American men was consistently higher than that among white men. Over the period, the disparity in CRC mortality rates between African Americans and white men increased due to the sharper decline in white rates compared to African American rates (Figure 4). The ratio between African American and white CRC mortality rates increased from 1.2 in 1995 to 1.6 in 2006 (Table 1).

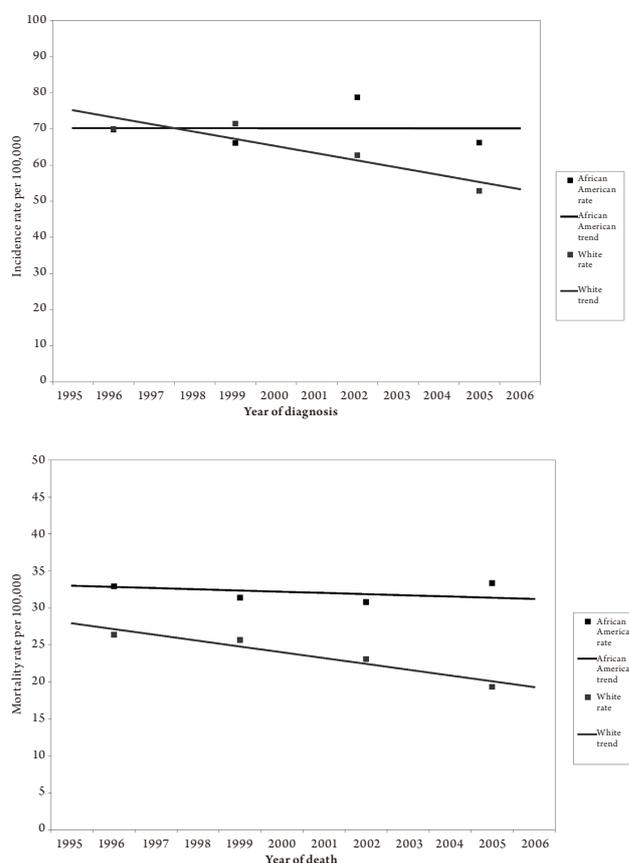


Figure 4 Age-adjusted colorectal cancer incidence and mortality rates, males, by race, Wisconsin, 1995-2006. Note: Trend line calculated based on ordinary least squares regression of 1995-2006 rates. Rates presented are 3-year averages. Source: Wisconsin Cancer Reporting System (incidence) and National Center for Health Statistics (mortality).

Mortality and incidence, females

Incidence: From 1995-2006, CRC was diagnosed in 18,232 Wisconsin women (including 17,362 whites and 607 African Americans). During this period, age-adjusted CRC incidence among women decreased 24% from 51 per 100,000 in 1995 to 38 per 100,000 in 2006. Over this time frame, the incidence among African American women was more than that of white women in nearly every year (Figure 5). The relative disparity in female CRC incidence also increased as African American rates increased and white rates decreased. The ratio between African American and white rates was 1.0 in 1995 and 1.4 in 2006 (Table 1).

Mortality: Between 1995 and 2006, there were 6,613 deaths due to CRC among Wisconsin women (including 6,336 whites and 226 African Americans). During this period, age-adjusted CRC mortality decreased 28% from 19 per 100,000 in 1995 to 14 per 100,000 in 2006. In this time

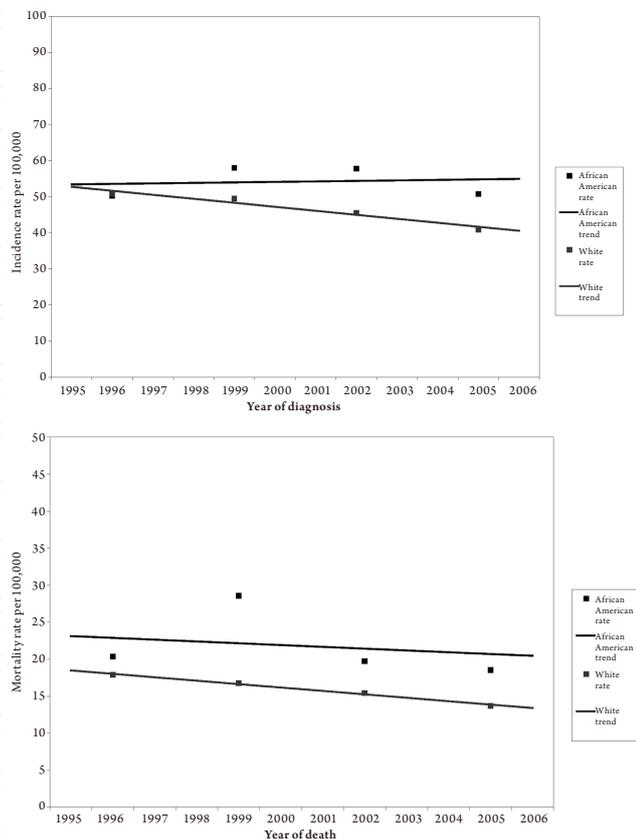


Figure 5 Age-adjusted colorectal cancer incidence and mortality rates, females, by race, Wisconsin, 1995-2006. Note: Trend line calculated based on ordinary least squares regression of 1995-2006 rates. Rates presented are 3-year averages. Source: Wisconsin Cancer Reporting System (incidence) and National Center for Health Statistics (mortality).

frame, the disparity in female CRC mortality rates between African Americans and whites persisted (Figure 5), and the ratio between African American and white CRC mortality rates increased from 1.3 in 1995 to 1.5 in 2006 (Table 1).

Discussion

The results indicate that disparities in CRC incidence and mortality between African Americans and whites in Wisconsin are large and have increased over the last decade. These results are similar in trajectory to those observed at the national level over the same period, although the scale of change in Wisconsin was much larger. For the U.S. as a whole, CRC mortality rates decreased for both whites and African Americans from 1999 to 2006, but the rate ratio increased from 1.4 to 1.5. National CRC incidence rates have also decreased, but the relative disparity has

remained stable at 1.2 (32). The state-level data are critical to understanding where Wisconsin is in its effort to reduce the burden of CRC, and to informing research and interventions for CRC prevention and control.

The reasons for the alarming increase in disparities in CRC mortality and incidence between African Americans and whites in Wisconsin are unknown, but may be due to changes in risk factors in these two populations, such as obesity. Results from the Wisconsin Behavioral Risk Factor Survey reveal that between 2000 and 2009, overweight/obesity rates among African Americans increased 26% (from 64% to 86%). Overweight/obesity rates also increased among whites, but the increase was much smaller (11%, from 58% to 65%) (33).

Low socioeconomic status has been shown to be associated with an increase in the incidence of and poorer survival from CRC (34, 35). The fact that in Wisconsin, African Americans are more likely to live in poverty and less likely to have graduated from high school than whites (36) may explain some of the observed CRC disparities. Cancer disparities have also been explained by differential access to screening, diagnosis, and treatment (2). African American residents of Wisconsin are twice as likely to be uninsured as whites (36). It is thus possible that African Americans are less likely to receive appropriate CRC screening (18, 19), appropriate, timely treatment for CRC (15, 37-40), or services known to prevent CRC (41, 42). The staging distribution presented here shows that there have been increasing numbers of limited stage CRC diagnosed amongst African Americans, suggesting a possible screening effect. Finally, health care access has also improved for African Americans. In 1996-2000, the uninsurance rate among African Americans was 17% (47), compared to 13% in 2001-2005 (46).

A number of limitations should be considered when interpreting the results of this study. First, the scope is limited to differences in CRC incidence and mortality rates between African American and whites. The decision to focus on these two groups was determined by the demographic composition of Wisconsin and the rarity of cancer events. Wisconsin has relatively small non-white populations, making the comparisons in the present study difficult to replicate between other racial or ethnic groups in the state. Cancer incidence and mortality rates among many minority populations vary widely from year to year. However, this variation is likely due to the small size of the population groups rather than real changes in disease burden. The African American population in Wisconsin has been stable in numbers for some time in Wisconsin, and is concentrated in larger urban areas, chiefly Milwaukee. This is in contrast to southern United States where African

Americans are distributed in rural and urban areas and not heavily concentrated. Thus, in Wisconsin migration is not a large issue for the African American population in such a way to make raise concern about selection bias.

Second, WCRS, as a central state cancer registry participating in the National Program of Cancer Registries, maintains a passive system of data collection and therefore, the various reporting facilities are largely responsible for the quality and timeliness of the data submissions to WCRS. Reporting variability may impact the relatively small annual numbers reported in this analysis. WCRS has made data collection improvements and suggestions in determining the race and ethnicity of cancer cases (the numerator for incidence rates). However, it is likely that an unknown degree of misclassification or under-reporting of race still exists. There are no national standards for collecting race data, and facilities vary in the methods used for collecting racial and ethnic data. Especially when the number of cases is relatively small, the quality of data collection and reporting can greatly impact annual incidence numbers and rates. Cancer registry stage is also reported in a format different from the American Joint Commission on Cancer TNM staging that clinicians use in practice, so one cannot compare the two directly. The WCRS does not report data on geographic location, age distribution or socioeconomic status. Additionally, the treatment data collected in the WCRS is not reliably validated and so is not reported.

In summary, disparities in CRC incidence and mortality between African Americans and whites in Wisconsin are large and have worsened over the period 1995 to 2006. Statewide action to reduce CRC disparities must start with this evidence. First, African Americans may fall into a higher risk group warranting earlier initiation of colorectal screening than the currently recommended starting age for all average risk adults. There is also promise in efforts to reduce exposure to risk factors and improve access to appropriate screening, treatment, and prevention (2) among all Wisconsin residents, and in particular among African Americans. Patient navigation is one such tool (43-45). Care must be taken that any plan carefully balance resources and set appropriate priorities to target inequities in CRC burden.

Conflict of interest / study support

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