Racial Disparity in the Incidence and Case-Fatality of Colorectal Cancer: Analysis of 329 United States Counties

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Abstract

In the United States, blacks have higher death rates from colon cancer than whites, and the survival disparity may be due in part to differences in screening programs and acute medical care in counties with a high concentration of blacks. We studied 148,947 Medicare beneficiaries with newly diagnosed colorectal cancer in 1989–1991 who resided in the 329 most populous counties in the United States to determine the relationship of race and county racial composition to cancer incidence and survival. Counties were divided into quartiles based on proportion of blacks in the population, and aggregate incidence and 2-year case-fatality rates were compared within and between quartiles. Within each quartile, the adjusted incidence rate for whites was consistently higher than that for blacks ($P < 0.0001$), and case-fatality rates were consistently lower among whites ($P < 0.0001$) for all but the quartile with the lowest proportion of blacks. Between quartiles, the incidence rates for both whites ($P = 0.0001$) and blacks ($P = 0.008$) decreased progressively, and case fatality rates increased progressively for both whites ($P = 0.001$) and blacks ($P = 0.007$) as the proportion of blacks increased. When counties were grouped into three different geographic areas, racial disparity in survival was observed in all regions. The variability between groups of counties in colon cancer incidence and mortality for both white and black patients may suggest differences at the county level in screening and treatment. However, consistent racial disparity within county quartiles may reflect persistent deficiencies in access to and quality of care for black patients.

Introduction

Colorectal cancer is currently the second most common fatal cancer in Americans (1). Among patients with colorectal cancer, blacks have higher death rates than whites, even when stage of cancer is controlled for (1–5). The reasons for the disparity in survival have not been elucidated and may include differences in access to preventive medical care, as well as the quality and type of care received after diagnosis. Because both screening programs and acute medical care are often organized at a county or local level, differences in the quality of care in regions with a large proportion of black patients compared to other regions may account in part for racial variation in long-term survival. In contrast, the finding of racial disparity within individual counties would suggest that other factors, such as persistent racial inequities in care, differences in comorbidities, or possibly variation in biology of disease, could be implicated.

Our goal was to determine whether race was associated with differences at the county level in the incidence rate and long-term survival rates of patients with colorectal cancer. We conducted a retrospective cohort study that included a 100% sample of Medicare beneficiaries ages 65 years and older, which includes virtually all non-Veterans Administration hospitalizations for this segment of the United States population.

Materials and Methods

An inception cohort of all hospitalized Medicare beneficiaries ages 65 and older with a first documented discharge diagnosis of colon or rectal cancer [International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes 153.0–153.4, 153.6–153.9, 154.0, or 154.1] was identified from the 1989–1991 MEDPAR files. Approximately two-thirds of new cases occur in this age group. Patients were excluded for the following reasons: age younger than 65 and enrollment in Medicare because of end-stage renal disease or chronic disability; race not specified; ulcerative colitis; and preexisting colorectal malignancy according to MEDPAR files from 1984 to the year prior to admission. Data from the Social Security Administration were used to assess survival to 2 years following hospital discharge. Data from the 1990 United States Census were used to obtain the total county population (including sex and racial composition), median household income, proportion of high school graduates, and whether the county was urban or not.

Using software resident on our computer, we matched patients to county of residence by the ZIP code listed in the MEDPAR file. To produce stable estimates, we considered only patients residing in the 329 counties that both had a minimum of 100 newly identified (incident) cases and contained at least 2% blacks in the adult population. These counties accounted for 57 and 79% of the total United States white and black populations, respectively, and 58 and 75% of the white and black populations ages 65 and older, respectively. Counties were also divided into three geographic regions that consisted of roughly equal number of cases in black patients: Northeast, South, and Midwest/West.

The 329 counties were divided into quartiles based on the proportion of blacks in the adult population, and age- and sex-adjusted 3-year incidence rates were determined for white
and black patients in each quartile. SEs for each estimate of incidence were calculated based on the binomial distribution. The age- and sex-adjusted colorectal cancer incidence rates for both white and black patients were also compared between county quartiles using Poisson regression analysis, with the number of cases divided by the county population as the dependent variable in the equation.

Because staging data were not available, 2-year case-fatality rates (number of patients dead at 2 years divided by the number of incident cases) were used as a surrogate measure. The black-white differences in case-fatality rates within each quartile were evaluated with logistic regression analysis, after being adjusted for age and sex. The 2-year case-fatality rates were also compared between the four groups of counties with \( \chi^2 \) analysis for trend. Median household income and educational level were also contrasted between the four groups of counties with ANOVA, in which the differences between counties in each quartile was compared, while considering variation within quartiles.

To determine whether racial disparities were consistent across geographic areas, both 3-year incidence and 2-year case-fatality rates were compared between black and white patients in the three regions. All rates were age and sex adjusted, as described above, and comparisons were made between racial groups within a given region, as well as across regions.

### Results

In 1989–1991, a total of 265,470 patients ages 65 and older with newly diagnosed colorectal cancer were identified, and the 148,947 patients who resided in the 329 study counties were considered further. The characteristics of each quartile of counties are shown in Table 1. The average proportion of blacks in the adult population (≥18 years) and in the total population varied between quartiles from 3.5 to 26.4% and 5.2 to 26.5%, respectively. Although the lowest income and proportion of high school graduates and highest percentage of urban counties were found in the quartile with the most blacks, there was no clear increment in these measures from lowest to highest quartile.

The aggregate colorectal cancer incidence and case-fatality rates for each quartile of counties are shown in Table 2. Within each quartile, the 3-year incidence rate for white patients was consistently higher than that for black patients \( (P < 0.0001) \). In addition, the age- and sex-adjusted incidence rates decreased from the lowest to highest county quartiles for both white \( (P = 0.0001) \) and black \( (P = 0.008) \) patients.

The adjusted 2-year case-fatality rates for colorectal cancer were consistently lower among white patients than black patients in three of the four quartiles \( (P < 0.0001) \). However, in the quartile with the lowest proportion of blacks, the adjusted differences in case-fatality were smaller \( (P < 0.05) \). In addition, for both white patients and black patients, case-fatality rates increased from lowest to highest quartiles \( (P = 0.001 \text{ for whites}; \ P = 0.007 \text{ for blacks}) \).

Adjusted incidence rates for both white and black patients were highest in the Northeast (Table 3). Moreover, incidence rates were significantly higher for whites than for blacks in the Northeast and South and did not differ in the Midwest/West, the region with the lowest proportion of blacks in the adult population. In all three geographic regions, case-fatality rates were higher in black than in white patients and also differed between the three regions (Table 3).

### Discussion

In this national study of older Americans to examine racial disparity in incidence and survival of colon cancer at the county level, we emphasize four findings. First, within each group of counties, the incidence of colorectal cancer was higher for whites than for blacks, and the case-fatality rates were higher in blacks than in whites. However, the case-fatality rates were less disparate for counties with lower proportions of blacks. Second, as the proportion of blacks in the county population increased, the age- and sex-adjusted incidence rates for both white and black patients decreased. Third, as the proportion of blacks in the county population increased, the 2-year case-fatality rates for both white and black patients increased as well. Fourth, racial differences in case-fatality were consistent across geographic regions, and incidence rates were higher in whites in all
but the region with the lowest proportion of blacks. Although race is frequently used as a surrogate for socioeconomic status (6), the data suggest that race may be associated with colon cancer incidence and survival independent of social class. Several study limitations should be recognized. First, Health Care Financing Administration data are not designed for measurement of cancer-related characteristics, such as staging and tumor histology, or other prognostic factors, such as comorbidity. Second, although the accuracy of diagnostic and procedure coding has been questioned, diagnostic coding for colon cancer appears to be more accurate, with a sensitivity and positive predictive value of 92 and 88%, respectively (7). Moreover, in a study that compared incidence rates for colorectal cancer as determined by MEDPAR data with the corresponding Surveillance, Epidemiology and End Results data, at least 95% of cases were included in the MEDPAR files (8). The study may also be limited by the problems inherent in ecological analyses (i.e., the overall relationships of incidence, mortality, and racial composition may not be representative of all individuals residing in a given county). Although ecological studies cannot substitute for individual-level data, they are informative and can generate preliminary data for further study (9).

The findings from this study confirm our previous work with Medicare databases that documented both lower incidence rates and higher death rates for colon cancer in blacks (4, 10). The racial differences in incidence within county quartiles, as well as the higher incidence rates for both whites and blacks in counties with a higher proportion of white patients, are supported by other studies as well. In both the United States and Europe, the incidence of colorectal cancer is higher among whites, as well as among men and women in higher social classes (11). The lower incidence in people of lower socioeconomic groups may be due to differences in risk factors, such as fiber or animal fat consumption, or detection bias due to less access to medical care and diagnosis prior to death. In contrast, the higher case-fatality rates for both white and black patients residing in counties with a larger proportion of blacks suggest global differences between counties in use of screening programs, chronic health status, and/or access to medical care.

Several factors may contribute to the observed differences between blacks and whites in survival from colorectal cancer. Other investigators, using data from Surveillance, Epidemiology and End Results (1) and comprehensive cancer centers (3), have found that distant metastases were more often present in black than in white patients. The difference in staging may reflect disparity in access to screening programs (12) or medical care after development of symptoms. However, even after controlling for stage of disease at diagnosis, survival was reduced in blacks (1). The racial disparities may also be confounded by more severe comorbid diseases in black patients. Our data did not assess comorbidity; thus, differences in baseline clinical characteristics may have confounded the results. Differences in patient preferences for surgery and follow-up care, including adjuvant treatment and surveillance procedures, and differences in access and quality of care, including screening programs and therapy, may also account in part for the survival disparity.

The findings of the present study indicate significant variability between groups of counties in colon cancer incidence and mortality for both white and black patients, which may suggest differences at the county level in screening programs, as well as treatment after diagnosis. However, the consistent racial differences within county quartiles also may be due in part to deficiencies in access and quality of care for black patients. Further studies are needed to determine whether differences between and within counties are due to risk factors, including diet and lifestyle; patient preferences for and adherence to recommendations about screening or therapy; or the availability of screening, diagnostic facilities, and/or cancer treatment.

References
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