



Social disparities in survival after diagnosis with colorectal cancer: Contribution of race and insurance status



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ABSTRACT

Background: Both minority race and lack of health insurance are risk factors for lower survival in colorectal cancer (CRC) but the interaction between the two factors has not been explored in detail.

Methods: One to 5-year survival by race/ethnic group and insurance type for patients with CRC diagnosed in 2007–13 and registered in the Surveillance Epidemiology, and End

Results: database were explored. Shared frailty models were computed to further explore the association between CRC specific survival and insurance status after adjustment for demographic and treatment variables.

Results: Age-adjusted 5-year survival estimates were 70.4% for non-Hispanic whites (nHW), 62.7% for non-Hispanic blacks (nHB), 70.2% for Hispanics, 64.7% for Native Americans, and 73.1% for Asian/Pacific Islanders (API). Survival was greater for patients with insurance other than Medicaid for all races, but the differential in survival varied with race, with the greatest difference being seen for nHW at +25.0% and +20.2%, respectively, for Medicaid and uninsured versus other insurance. Similar results were observed for stage- and age-specific analyses, with survival being consistently higher for nHW and API compared to other groups. After confounder adjustment, hazard ratios of 1.53 and 1.50 for CRC-specific survival were observed for Medicaid and uninsured. Racial/ethnic differences remained significant only for nHB compared to nHW.

Conclusions: Race/ethnic group and insurance type are partially independent factors affecting survival expectations for patients diagnosed with CRC. NHB had lower than expected survival for all insurance types.

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1. Introduction

Colorectal cancer (CRC) is one of the most common cancers in the United States (US), with an estimated 134,490 cases and 49,190 deaths from CRC expected in 2016 [1]. Survival after diagnosis with CRC is strongly dependent on stage and treatment. However, demographic factors including age, race, gender, and insurance status have been demonstrated to affect survival and mortality rates in CRC as well [2–4]. In particular, poorer outcomes for black patients have been well documented [2,4–7], though less has been published concerning the survival expectations of patients of other races or of Hispanic ethnicity, although available prior work does

indicate a disparity between survival between non-Hispanic whites (nHW) and most other ethnic and racial groups, with the possible exception of Asian/Pacific Islanders (API) [4,7,8].

In the US, people of minority racial or ethnic backgrounds are more likely to be uninsured or insured only with Medicaid than nHW [9]. Lack of insurance and insurance with Medicaid only, have been associated with lower survival estimates for a number of cancer types, including CRC [10–13]. In addition, patients without insurance or with public insurance only are less likely to receive screening [14,15], may receive less complete evaluation of symptoms [16], and may be less likely to receive chemotherapy for advanced disease [17].

Currently, it is uncertain whether insurance and race/ethnicity are independent predictors or whether the differences in insurance explain the differences in survival by race or vice versa. One recently published paper suggests that the racial and ethnic disparity in cancer specific survival decreases when patients with

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non-Medicaid insurance are considered [18]. However, this manuscript, which examined survival broadly for a number of solid tumors, does not describe differences in survival within CRC in detail.

Here, we examine survival for patients with CRC diagnosed in 2007–13 by insurance status and race/ethnicity for patients <65 years of age.

2. Methods

Data were extracted from the SEER18 database. The SEER18 database includes data from 18 regional cancer registries throughout the US. Together, the SEER registries draw on a base population of about 86 million people [19]. The population within the SEER registry is similar to the general US population in most respects, although there is deliberate oversampling of some minority ethnicities and a higher proportion of foreign-born persons than in the general US population [19]. Adults with a diagnosis of CRC, selected by ICD-10 codes C18–C20, were included in the analysis. Cases diagnosed by death certificate only (DCO) were excluded.

According to the coding in the SEER database, insurance type was recorded at the time of initial diagnosis or treatment of the condition and categorized as previously described [10]. Briefly, patients were categorized according to their insurance type as per the SEER insurance recode variable, to Medicaid, no insurance, other insurance, or information missing. Patients with Medicaid Health Maintenance Organization, Medicaid, or Indian Health Services were categorized as Medicaid. Patients with private insurance, Medicare, Veteran's Affairs insurance, military insurance, insurance not otherwise specified, or any combination of the above were categorized as "other insurance". Because the vast majority of people age 65 and over have Medicare insurance, the study was limited to patients age 15–64.

Race and ethnic groups were identified as follows: Patients coded as ethnically Hispanic were considered "Hispanic" regardless of race. For patients coded as non-Hispanic, the following racial groups were used: nHW, non-Hispanic black (nHB), Native

Americans/Native Alaskan (NA), and API. Race and ethnicity were treated as a single variable for the analysis.

Complete analysis [20] was used to determine 1-, 3- and 5-year absolute survival by insurance status for patients diagnosed with CRC in 2007–2013 followed for vital status through 2013. Because the case numbers for some ethnic groups were small, two age groups, ages 15–49 and 50–64, were used for the survival analysis. Age standardization was performed using the relative percentage of each age group in the overall population under study. Survival is lower for people who live in poverty [21,22] and life tables taking income into account are not readily available; therefore, absolute rather than relative survival was calculated. Survival estimates were calculated by stage, using the SEER summary stage variable (stages I, II, III, and IV) [19]. Case numbers were small for stage I–II in some ethnic groups, so these stages were combined to an "early stage" category.

Because age, race, gender, marital status, income, and stage can affect the prognosis in patients with CRC, an analysis of the effect of race/ethnicity and insurance status on CRC-specific survival after adjusting for these variables was performed. Cox proportional hazard analysis was used for all analyses except those in which income was included as a variable. For these analyses, a shared frailty analysis was used to account for clustering effects observed in the initial development of the model. Individual income is not available in the SEER database, so income was estimated using county level income data from the US Census Fact Finder tool [23] and income quintiles were derived. Treatment factors including number of lymph nodes (LN) examined and whether definitive surgery was performed were included in the analysis. In CRC-specific survival, death from CRC was counted as an event, while death from any other cause was counted as censoring. Patients for whom cause of death information was missing were excluded.

All calculations were carried out using SAS software (version 9.4, SAS, Carey, NC, USA). Macros developed for population-based survival analysis [24,25] were used to estimate survival at 1–5 years after diagnosis. Shared frailty models were estimated using standard SAS procedures. Statistical significance was tested two-sided with $\alpha = 0.05$ and no multiple comparison corrections.

Table 1

One, 3- and 5-year age-adjusted survival by insurance type and race/ethnicity for patients with CRC in 2007–13.

Race	Year	Insurance type				Diff (3) – (1)	Diff (3)– (2)
		All	Medicaid (1)	None (2)	Other (3)		
All	1	88.7 (88.5–88.9)	79.6 (78.9–80.3)	80.3 (79.4–81.3)	91.2 (91.0–91.4)	+11.6	+10.9
	3	73.9 (73.6–74.2)	57.7 (56.7–58.6)	61.2 (59.9–62.5)	77.7 (77.4–78.0)	+20.0	+16.5
	5	65.6 (65.3–66.0)	46.7 (45.6–47.8)	52.0 (50.4–53.5)	69.7 (69.3–70.1)	+23.0	+17.7
Non-Hispanic white	1	89.0 (88.7–89.2)	77.5 (76.4–78.5)	78.4 (77.0–79.7)	91.2 (91.0–91.5)	+13.7	+12.8
	3	75.0 (74.6–75.3)	56.4 (55.0–57.8)	59.9 (58.1–61.7)	78.2 (77.8–78.6)	+21.8	+18.3
	5	66.9 (66.5–67.4)	45.4 (43.8–47.1)	50.2 (48.1–52.3)	70.4 (69.9–70.9)	+25.0	+20.2
Non-Hispanic black	1	85.4 (84.8–86.0)	77.2 (75.7–78.7)	81.1 (79.2–83.1)	88.7 (88.0–89.3)	+11.5	+7.6
	3	67.0 (66.1–67.8)	53.1 (51.1–55.2)	59.7 (57.0–62.3)	72.1 (71.1–73.1)	+19.0	+12.4
	5	57.7 (56.7–58.7)	42.9 (40.6–45.3)	50.1 (47.0–53.2)	62.7 (61.5–64.0)	+19.8	+12.6
Hispanic	1	89.0 (88.4–89.5)	84.0 (82.7–85.4)	83.5 (81.4–85.7)	91.8 (91.2–92.4)	+7.8	+8.3
	3	73.5 (72.7–74.4)	61.8 (59.8–63.9)	66.7 (63.6–69.8)	78.6 (77.6–79.6)	+16.8	+11.9
	5	64.3 (63.2–65.4)	49.4 (46.9–52.0)	57.5 (53.7–61.3)	70.2 (68.9–71.5)	+20.8	+12.7
Native American/Alaskan Native	1	84.7 (82.2–87.2)	80.8 (76.6–84.9)	NA	89.2 (86.0–92.4)	+8.4	NA
	3	69.3 (65.8–72.8)	63.8 (58.2–69.4)	NA	75.6 (70.8–80.3)	+11.8	NA
	5	59.3 (55.0–63.5)	53.0 (46.2–59.7)	NA	64.7 (58.6–70.8)	+11.7	NA
Asian/Pacific Islander	1	91.5 (90.9–92.1)	84.1 (82.1–86.2)	84.3 (81.1–87.6)	93.6 (93.0–94.2)	+9.5	+9.3
	3	76.8 (75.8–77.8)	62.8 (59.8–65.8)	63.3 (58.3–68.2)	80.4 (79.4–81.5)	+7.6	+7.1
	5	69.2 (67.9–70.4)	52.0 (48.5–55.6)	57.8 (52.2–63.4)	73.1 (71.8–74.5)	+11.1	+15.3

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