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Predictors of Delayed-Stage Colorectal Cancer: Are We Neglecting Critical Demographic Information?

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PURPOSE: We sought to distinguish roles of demographic variables and bowel segments as predictors of delayed versus early stage colorectal cancer in California.
METHODS: Demographic and anatomic variables for 66,806 colorectal cancers were extracted from the California Cancer Registry for 2004–2008 and analyzed using logistic regression as delayed versus early stage.
RESULTS: Odds ratios (OR) for binary stage categories comparing age <40 (OR=2.58; 95% CI=2.26–2.94), 40–49 (1.71; 95%=1.60–1.83) and 75+ (1.05; 1.02–1.09) relative to 50-74 years were computed. Compared with non-Hispanic whites, ORs for stage categories were: 1.05; 0.99–1.13 (non-Hispanic blacks), 1.08; 1.02–1.13 (Hispanics), and 1.05; 1.00–1.10 (Asian/others). Females had higher odds of delayed diagnosis (1.09; 1.06–1.13) than males. Descending ORs were measured for successively lower to highest socioeconomic status (SES) quintiles (OR 4:5=1.08; 1.03–1.14, OR 3:5=1.13; 1.08–1.19, OR 2:5=1.18; 1.12– 1.24, and OR 1:5=1.21; 1.14–1.28).
CONCLUSIONS: Younger and older than age 50-74; females; Hispanic ethnicity; bowel segment contrasts (right/left, proximal/distal, cecum plus appendix/distal), and lower SES were independent predictors of delayed diagnosis. Low SES was the most robust predictor of delayed diagnosis, independent of other covariates. Approximately 77% of delayed diagnoses were in non-Hispanic whites and Asian/others. These findings illustrate the value of a community SES index for targeting egalitarian colorectal cancer screening.
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KEY WORDS: Cancer, Colorectal, Demographic, Socioeconomic Status, SES, Race, Ethnicity, Race/Ethnicity, Delayed Stage.

INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer death in the United States; third to breast cancer among females and to prostate cancer among males (1,2). Approximately 94% of invasive colorectal cancers and in situ carcinomas are adenocarcinomas (CRCs) (3). The risk of CRC is greatest among non-Hispanic black (NH black; 58.9 per 100,000) followed by non-Hispanic white (NH white; 48.7 per 100,000), Asian and Pacific Islander (39.2 per 100,000), and Hispanic (37.3 per 100,000) Americans (2).

The authors of a comprehensive assessment found that NH black Californians experienced greater odds of colorectal cancer in the right versus left bowel than NH white (3), whereas Asian and Pacific Islander and Hispanic residents experienced lower odds in the right bowel (3). Similar differences in anatomic distribution by race/ethnicity are also evident for proximal versus distal segments (3).

Mortality rates and relative survivals for colorectal cancer are predicted by diagnostic stage (2). Predictors of delayed diagnosis include comorbidities (4,5), lower education (4,5), younger age (5), not screened endoscopically (5), nonwhite race (5–7), and rural residence (5). Age and endoscopic screening were the strongest predictors of diagnostic stage in Canadians, whereas fecal occult blood testing (FOBT) did not predict stage (5).

FOBT screening is more commonly used than endoscopy, although the success has been challenged (5). Both the American Cancer Society (8) and the U.S. Preventive Services Task Force (9) have issued recommendations that average risk persons age 50–74 years receive screening using

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Selected Abbreviations and Acronyms

CRC = colorectal cancer
NH black = non-Hispanic black
NH white = non-Hispanic white
Asian/PI = Asian and Pacific Islander
FOBT = fecal occult blood testing
SES = socioeconomic status
CCR = California Cancer Registry
OR = odds ratio
CI = confidence interval
FAP = familial adenomatous polyposis
HNPCC = hereditary nonpolyposis colorectal cancer

one of the following modalities: annual FOBT; sigmoidoscopy every 5 years; sigmoidoscopy every 5 years, and FOBT every 1 to 3 years; or colonoscopy every 10 years. FOBT predicts a 15% to 33% reduction in colorectal cancer mortality (10–12); however, poor single-test sensitivity (13) limited success (5), and meager specificity challenges this screening method.

Colonoscopic screening has a sensitivity of 95% to detect cancer (13, 14) regardless of stage. Sigmoidoscopy shows sensitivity like colonoscopy for malignancies in the left bowel (13) but does not reach bowel segments accounting for approximately 40% of colorectal cancers (3). Findings from the Behavioral Risk Factor Surveillance System showed that fewer than 60% of Americans ages 50 and older complied with established colorectal cancer screening guidelines (15). Men are more likely than woman to receive colorectal cancer screening (15, 16) and are less likely to receive FOBT (16). Underutilization of colorectal cancer screening is more common among persons age 50–64 relative to 65–74 years (16), whereas black Americans, especially women, report lower colorectal cancer screening compared with whites (17). Hispanic and Asian and Pacific Islander Americans report the lowest CRC screening compliance (16), whereas they are more likely to be screened with the use of endoscopic methods than white patients (16).

Inadequate health insurance predicts decreased colorectal cancer screening (18), late-stage diagnosis (19–21), increased mortality (22), and more FOBT (23). Patients having more comprehensive insurance express greater intent to be screened compared with patients without insurance and are more likely to receive a physician recommendation (24) in accordance with America Cancer Society recommendations (8) and to receive colonoscopy (25).

Current practices target underserved populations for colorectal cancer screening by the use of race/ethnicity (26). Limited availability of health insurance data in population-based cancer registries encourages reliance on race/ethnicity as predictors of colorectal cancer risk (1–3) and health care access (5–7). Although the authors of previous studies reported that race/ethnicity, socioeconomic status (SES) (15–19, 21–23, 25), and health insurance (20, 24) predict screening, their independent roles remain obscure.

Direct SES measures are seldom available in population-based cancer registries in the United States. Although individual health insurance data may be available in some registries, the quality of data is questionable. Rather than imputing SES with the use of race and ethnicity, geographic SES indices that use aggregate measures for small, homogeneous population units provide surrogate SES measures.

Ecologic SES indices have been developed (27, 28) for measurement of treatment (29–31) and quality care patterns (29, 32). The California Cancer Registry (CCR) developed a geographic SES index on the basis of Census-derived variables aggregated at the block group level (33). This community SES quintile index is based on seven economic and education variables (33). Age, sex, and race/ethnicity are not included in this imputation (33), providing independence between the index and these characteristics.

The aim of this study was to determine independent roles for age, sex, race/ethnicity, a community SES index, and anatomic subsite as predictors of delayed-stage colorectal adenocarcinoma. On the basis of previous findings for CRC (3–7) and breast cancer (33), we hypothesized that the CCR community SES index and race/ethnicity would each predict CRC stage at diagnosis, independent of other covariates. If confirmed, these empirical findings could be used to improve targeting in demographic segments of the California population for early CRC detection. Our study builds on previous findings by examining the diverse California population by using a compliment of demographic variables, the most recent data, and anatomic subsite to predict delayed CRC diagnosis.

METHODS

We conducted a population-based, nonconcurrent cohort study of CRC in California for 2004 to 2008. Data for all 75,630 invasive colon and rectum cancer or in situ carcinoma cases among California residents were extracted from the CCR. Among these, 6487 cases, including 41 sarcomas, were not retained for analyses because they did not include information necessary for staging, subanatomic site determination, or demographic classification required for the study. Another 457 cases were removed because they were reported by death certificates only, and 58 cases were dropped from analysis because they were miscoded as colon cancer. Among the remaining 68,628 cases, 1822 included rare histology types. Removing these cases yielded