

Disparities in Colorectal Cancer Stage of Diagnosis among Medicaid-Insured Residents of North Carolina

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Abstract

Objective: To evaluate the individual and community factors correlated with local disease among the North Carolina Medicaid-insured population diagnosed with colorectal cancer between 1998 and 2002.

Methods: North Carolina residents diagnosed with first primary, SEER-staged colorectal cancer between 1998-2002 and enrolled in Medicaid were included in this study. Secondary data from the North Carolina Central Cancer Registry linked to Medicaid claims were utilized for this study. Descriptive and logistic regression analyses were conducted.

Results: One out of every three individuals insured by Medicaid with colorectal cancer between 1998 and 2002 in North Carolina were diagnosed with local stage disease. Factors associated with increased likelihood of diagnosis with local disease included age ≥ 65 (OR = 1.48, 95% CI, 1.27-1.72) and living in an urban area (OR = 1.19, 95% CI, 1.03-1.36). Persons with race defined as non-white and non-black were significantly less likely than non-Latino whites to be diagnosed with local disease (OR = 0.49, 95% CI, 0.27-0.91).

Limitations: Reliance on secondary data limits the utility of data regarding factors contributing to late-stage diagnosis.

Conclusions: Interventions to increase early diagnosis of colorectal cancer among the Medicaid-insured are needed. More research is needed to confirm and explain our finding that individuals < 65 years of age and persons living in rural areas insured by Medicaid are more likely to be diagnosed at a later stage. The benefit of aging into Medicare among the Medicaid-insured population needs further elucidation.

Keywords: colorectal; cancer screening; Medicaid; rural; disparities

In North Carolina, there were 4,380 new colorectal cancer cases in 2008 and 1,400 deaths.¹ Colorectal cancer is responsible for 9% of all cancer deaths, making it the third leading cancer death among women and men. Although there has been a recent increase in colorectal cancer screening, low utilization of screening endoscopy persists. According to a 2005 National Health Interview Survey (NHIS), 44.2% of adults ages 50 to 64 underwent any type of colorectal cancer screening (e.g., endoscopy, FOBT) test within the last 10 years.¹ Unlike early detection for other prevalent cancers (e.g., breast, prostate), colorectal cancer screening may prevent the progression of colorectal polyps to cancer, thus reducing both incidence and mortality due to colorectal cancer.²⁻⁵

Many factors influence late-stage diagnosis of colorectal cancer. Among these, racial and ethnic disparities in colorectal cancer screening prominent and well-documented.⁶⁻¹¹ Whites are significantly more likely to

undergo screening than blacks and Latinos.⁶ Similarly, blacks and Latinos are up to 60% more likely to be diagnosed with late stage (stage III or IV) colorectal cancer than whites.^{7,8}

Racial disparities in cancer screening are partially explained by socioeconomic disparities.^{12,13} Hoffman-Goetz and colleagues (1998) reported that social class was a strong predictor of cancer screening.¹³ Late-stage diagnosis is also correlated to residence in medically underserved areas (MUAs); MUAs are those areas lacking adequate health care services.^{6,14-16} Further, residency in a designated MUA is a strong predictor of breast, cervical, and colorectal cancer.¹⁶ People living in areas with lower per capita income are less likely to receive colorectal cancer screening than those living in areas with higher per capita income.⁶ The likelihood of screening increases with increasing household income in the area of residence.¹⁴

Although screening rates have increased in recent years, disparities in cancer stage at diagnosis persist. This

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study evaluates the individual and community factors correlated with stage of diagnosis among the North Carolina Medicaid-insured population diagnosed with colorectal cancer between 1998 and 2002. We specifically explore the relationship between individual demographic and community characteristics that may better explain disparities in cancer stage of diagnosis among low-income North Carolina residents.

Methods

This is a retrospective study of North Carolina residents diagnosed with first primary, Surveillance, Epidemiology, and End Results (SEER)-staged colorectal cancer (C180, C181, C182, C183, C184, C185, C186, C187, C188, C189, C199, and C209) between 1998 and 2002 and who were enrolled in Medicaid during this time period.

This study was approved by the Institutional Review Boards at Davidson College, Davidson, North Carolina, by Wake Forest University Health Sciences, Winston-Salem, North Carolina, and by the North Carolina State Division of Medical Assistance (the Medicaid office in North Carolina). The North Carolina Central Cancer Registry also reviewed the study protocol. A data use agreement was established in 2007 for a limited use dataset for the conduct of this research study.

Data Sources

The North Carolina Central Cancer Registry is mandated by state law to register all incident cancer cases and first courses of treatment and follow the requirements of the North American Association of Central Cancer Registries. In addition to cancer-related information, North Carolina Central Cancer Registry address data are geocoded using the TeleAtlas GC Geocode Layer (2004 with the ESRI ArcGIS geocoding engine. Where street address level geographical information is not available, Census data are imputed from ZIP codes.

North Carolina Medicaid covers all adults participating in cash assistance programs (e.g., Work First Family Assistance, Supplemental Security Assistance), those 65 and older at 100% below the federal poverty level, and the disabled. In North Carolina, Medicaid is almost entirely fee-for-service with one small managed care program.

Data Merge and Sample

A probabilistic match routine was run against the Medicaid eligibility file based on social security number to the North Carolina Central Cancer Registry data. After the match, data were de-identified prior to data analysis and a limited use dataset was provided to the research team. Cases for this analysis were excluded if they were missing stage of disease at diagnosis ($n=344$) or missing data related to race ($n=4$), gender ($n=1$), or community poverty status ($n=1$). Data were also excluded if missing a facility

identifier ($n=8$), which was used for cluster analysis. The final analytic sample size was $n=3,777$.

Measures

The main outcome of interest in this analysis was stage at diagnosis, using SEER summary stage local, regional, and distant data from the North Carolina Central Cancer Registry database.¹⁷ SEER generally corresponds to the American Joint Committee on Cancer Tumor/Nodes/Metastases (TNM) staging system as follows: local (AJCC TNM stage I, II A, and II B), regional (AJCC TNM stage III A, B, and C), and distant (stage IV). More simply, local refers to disease confined to the primary site, regional refers to lymph node involvement or spread directly beyond the primary site, and distant refers to metastatic disease. While AJCC TNM staging is more common in clinical settings, registries are more likely to have consistent data collection using SEER staging.

Potential factors associated with local stage of disease at diagnosis were grouped into individual and community characteristics. Individual characteristics included age at diagnosis (< 65 , ≥ 65), sex (male, female), and race (white, black, other races). Community characteristics included percent in poverty (defined as < 25 th percentile, the interquartile range, and > 75 th percentile), urban residence (yes, no), and residence in a medically underserved area (yes, no). Medically underserved areas are designated by the US Department of Health and Human Services using a weighted scoring algorithm employing four indicators: ratio of primary medical care physicians per 1,000 population, infant mortality rate, percentage of the population with incomes below the poverty level, and percentage of the population age 65 or over.¹⁸ Bivariate correlations among urban, MUA, and poverty categories revealed correlation coefficients of $r < 0.11$, indicating that the three measures represent distinct constructs.

Data Analysis

Bivariate analyses were computed to determine factors associated with SEER-defined local, regional, and distant colorectal cancer. Statistical significance was computed using the chi-square statistic. Diagnosis with local colorectal cancer disease (yes, no) was regressed on the individual and community characteristics using logistic regression, controlling for clustering based on where first course of treatment was conducted. A subsequent, exploratory analysis was conducted to test whether age served as an effect modifier between significant independent correlates and stage of diagnosis. All analyses were performed using Intercooled Stata for Windows 9.2.¹⁹

Results

Characteristics of samples of Medicaid-insured North Carolina residents are displayed in Table 1 (page 208). The

Table 1.
Description of Medicaid-Insured North Carolina Residents Diagnosed with Colorectal Cancer
(1998-2002), by Stage at Diagnosis^a

	Overall	Local n=1,337 (35.4%)	Regional n=1,744 (46.2%)	Distant n=696 (18.4%)	X ²	p
	%	%	%	%		
Demographic Characteristics						
Age at diagnosis					90.59	< 0.001
< 65	37.7	29.5	44.7	25.8		
≥ 65	62.3	39.0	47.0	14.0		
Sex					8.29	0.016
Male	39.6	33.1	46.6	20.3		
Female	60.4	36.9	45.9	17.2		
Race					17.77	0.001
White	61.4	36.1	47.2	16.7		
Black	36.7	35.0	44.3	20.8		
Other	1.9	21.1	50.7	28.2		
Community Characteristics						
Residence in an urban area	51.5	37.5	44.4	18.2	7.91	0.019
Residence in a medically underserved area	51.2	35.7	45.5	18.8	0.75	0.687
Poverty status of individual's community					3.82	0.430
Lowest 25th percentile (< 9.8%)	24.6	36.3	46.9	16.8		
Interquartile range (9.8%-18.37%)	49.8	34.9	46.7	18.4		
Highest 75th percentile (> 18.37%)	25.6	35.5	44.5	20.0		

a. Excludes unstaged colorectal cancer.

majority of individuals were non-Latino white (61.4%),^a female (60.4%), and ≥ 65 years of age (62.3%). Approximately half of the sample resided in urban (51.5%) or medically underserved areas (51.2%).

Factors Associated with Diagnosis at Local Stage

Thirty-five percent of individuals in this sample were diagnosed with local stage colorectal cancer. There were significant differences in likelihood of local stage diagnosis by age, race, and location of residence. Table 2 shows that individuals ages ≥ 65 are 48% more likely to be diagnosed

with local disease compared to those < 65 years of age (OR = 1.48, 95% CI, 1.27-1.72). Among patients ages under 65, 29.5% were diagnosed with local stage disease, while 39% of those ages 65 or older were diagnosed with local disease.

Among this population, 36% and 35% of whites and blacks respectively, were diagnosed with local disease. However, of the 71 participants classified as neither white nor black (i.e., "other race"), only 21% were diagnosed with local disease. These individuals are predominately American Indian (n = 44 of 71).^b In multivariate analyses, those

a. Less than 1% of Medicaid-insured whites in North Carolina were recorded as Latino in the North Carolina Central Cancer Registry.

classified as “other race” were half as likely to be diagnosed with local disease as non-Latino whites (OR = 0.49, 95% CI, 0.27-0.91). Although being female was associated with local stage at diagnosis in bivariate analyses, this finding did not remain significant in the multivariate model.

Individuals living in urban versus non-urban areas were more likely be diagnosed with local disease (37.5% vs. 33.2%, $p = 0.02$) in bivariate analysis. This finding remained significant after controlling for other individual and community level characteristics (OR = 1.19, 95% CI, 1.03-1.36) (see Table 2). However, no significant differences were observed between residence in a designated MUA, poverty, and local diagnosis of colorectal cancer.

Table 3 (page 211) displays the stratified analysis (< 65 vs. ≥ 65), which showed that men were 29% less likely than women to have local disease among persons under age 65 (OR = 0.71, 95% CI, 0.54-0.93). This finding was not observed among those 65 and older. In addition, among persons ≥ 65 , blacks were significantly less likely than non-Latino whites to be diagnosed with local disease (OR = 0.82, 95% CI, 0.68-0.99). Further, among the elderly, persons living in urban areas were more likely to be diagnosed with local disease than persons living in rural areas (OR = 1.29, 95% CI, 1.09-1.53).

In order to test whether these age-related differences were significantly different, we conducted a multivariate model which included interaction terms of age multiplied by race and age multiplied by urban residence. In this model, the age multiplied by race interaction effect was significant (OR = 0.65, 95% CI, 0.50-0.91). Being older was associated with an increased likelihood of local stage at diagnosis for all racial groups, but was most pronounced among non-Latino whites (see Figure 1, page 210). Only 28% of non-Latino whites under age 65 were diagnosed with local disease compared to 41% of non-Latino whites age 65 and older. Thirty-three percent of blacks under age 65 were diagnosed with local disease compared to 37% of blacks 65 and older. The test for interaction between urban residence and age was not significant (OR = 1.24, 95% CI, 0.93-1.65).

Discussion

Approximately 13.9% (398,700) of nonelderly North Carolinians are insured by Medicaid.²⁰ In addition, 15% of North Carolina’s elderly (295,051) are dually-eligible for Medicaid and Medicare. Prior studies have shown that individuals with Medicaid are less likely than privately insured patients to be diagnosed with local stage colorectal cancer.²¹⁻²² In a national study, Halpern (2008) found that Medicaid or uninsured patients were twice as likely to be diagnosed with advanced-stage colon cancer compared to those with private insurance.²¹

In this retrospective study from 1998-2002, we found that 35% of North Carolinians insured by Medicaid had local disease at time of diagnosis with colorectal cancer, lower than the national average of 39%. Several important findings are noted below. Individuals ages 65 and older were 48% more likely to be diagnosed with local disease. There are several possible explanations for this finding. First, older people are more likely to interact with the health care system for other needs, and therefore have greater opportunities to be recommended for screening.²³ Second, younger individuals may be less likely to take the needed time from work to

Table 2.
Individual and Community Factors Associated with Diagnosis with Local (Versus Regional or Distant) Colorectal Cancer Among Medicaid-Insured North Carolina Residents Between 1998-2002 (n=3,777)^a

	Odds Ratio	95% Confidence Interval
Demographic Characteristics		
Age at diagnosis (< 65, referent)		
≥ 65	1.48	1.27-1.72
Sex (female, referent)		
Male	0.91	0.78-1.06
Race (white, referent)		
Black	0.94	0.83-1.07
Other	0.49	0.27-0.91
Community Characteristics		
Residence in an urban area	1.19	1.03-1.36
Residence in a medically underserved area	1.06	0.92-1.21
Poverty status (interquartile range, referent)		
Lowest 25th percentile (< 9.8%)	1.06	0.90-1.25
Highest 75th percentile (> 18.37%)	1.04	0.85-1.28

a. Standard errors adjusted for 128 clusters. Cluster defined by reporting treatment facility. Note that clustering did not change the results in any significant or meaningful way, but are reported to present the most conservative standard errors.

b. If individuals identified as “other” they had the opportunity to fill in their race/ethnicity in an adjacent comment field. It is through this comment field that we identified that 44 of the 71 “other” respondents were American Indian.

undergo an endoscopy, which requires a full day's absence from work and/or childcare responsibilities.²⁴ Retirees may have more time to address their preventive health needs. Third, younger individuals diagnosed with colorectal cancer may also have a more aggressive disease type because they are screened for diagnostic (i.e., symptom-driven) versus preventive reasons. Thus, younger persons may present with more advanced disease at time of diagnosis. Fourth, Medicare provides higher reimbursements rates for endoscopy compared to Medicaid. Although reimbursement should not affect access to preventive care, it is possible that the costs may factor into access to screening or the decision to screen.²⁴

Individuals are automatically enrolled in Medicare Part A (hospital coverage) when they turn 65 years of age. Enrollment in Medicare Part B, which covers colorectal cancer screening, is the responsibility of the individual. For individuals who are dually-eligible for Medicaid and Medicare, the Medicaid program supplements Medicare coverage (the first payer) by providing services and supplies that are available under the Medicaid program. Dual eligibility often means that individuals do not have to pay their monthly Medicare premiums, deductibles, or coinsurance, which increases payment for services for the health care providers and may be related to increased access to preventive health care. Therefore, individuals dually-eligible for Medicaid and Medicare are less hindered by preventive care costs, and may be more likely to receive screenings than those eligible for only one program.

Age (i.e., dual eligibility) was also an effect modifier in this study. Males were significantly less likely than females to be diagnosed with local disease among those under 65. This finding was not observed among persons 65 years or older. Women are generally believed to be more proactive in terms of preventive health care, but in terms of colorectal screening, gender differences may only be true for the under 65 population.²⁵ Further, older (≥ 65) urban dwellers are significantly more likely to be diagnosed with local disease; this was not found among younger (< 65) urban dwellers.

Although a formal test of an interaction between age and urban residence was not significant, there was a trend in the expected direction. Underutilization of colorectal cancer screening among rural residents has previously been shown, and highlights the importance of targeting interventions to this population that would ensure earlier stage at diagnosis.²⁶

We also note that individuals not described as white or black were significantly less likely to be diagnosed with local colorectal cancer, regardless of age. In North Carolina, 'other races' insured by the Medicaid program are predominately classified as Native Americans. However, the very small sample of 'other races' included in the Medicaid population suggests additional research among American Indian and other non-black minorities is warranted.

Noteworthy is the lack of a main effect difference between blacks and non-Latino whites among the younger (< 65) population, suggesting that black-white differences in stage at diagnosis disappeared in the North Carolina Medicaid population that controlled (via study design) for socioeconomic status. Medicaid, through its consistent means-tested program, provides a reasonably good approximation of socioeconomic status. However, in the model that evaluated the potential interaction between age and race, we find that being 65 years of age or older significantly improves the odds of diagnosis in an early stage of the disease and that this effect is most pronounced among non-Latino whites. One hypothesis deserving of further testing is whether whites may be more likely than blacks to benefit from the dual-eligibility status of Medicare-Medicaid coverage. The lack of data on factors that may contribute to local stage of diagnosis in this sample (e.g., access to screening, quality of screening modality, access to diagnostic services for symptoms, or lack of younger patients' awareness regarding the need for early detection or symptom management) preempts solid conclusions. Nevertheless, these findings do raise important questions that deserve attention.

This paper provides important information on cancer screening among the poor in North Carolina, particularly the role of age, race, and place of residence on colorectal cancer screening opportunities. However, there are several limitations that must be acknowledged. First, the analysis relied exclusively on secondary data and does not take into consideration individual preferences for colorectal cancer screening nor provider recommendations. Second, the small sample of 'other races' limits meaningful recommendations that could pertain to non-black minority residents of North Carolina. Finally, these data have limited generalizability given that the study focuses exclusively on the North Carolina Medicaid-insured population.

Figure 1.
Percentage of Persons Insured by Medicaid Diagnosed with Local Colorectal Cancer (1998-2002), by Age and Race

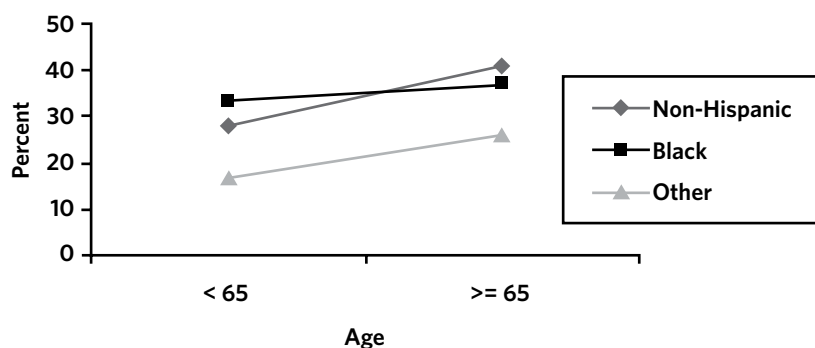


Table 3.
Individual and Community Factors Associated with Diagnosis with Local (Versus Regional or Distant) Colorectal Cancer Among Medicaid-Insured North Carolina Residents Between 1998-2002, Stratified by Age^{a,b}

	Less than 65 Years Old n=1,423		65 Years Old or Greater n=2,354	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Demographic Characteristics				
Sex (female, referent)				
Male	0.71	0.54-0.93	1.08	0.92-1.26
Race (white, referent)				
Black	1.22	0.99-1.50	0.82	0.68-0.99
Other	0.49	0.26-0.93	0.52	0.21-1.27
Community Characteristics				
Residence in an urban area	1.01	0.79-1.30	1.29	1.09-1.53
Residence in a medically underserved area	0.95	0.75-1.21	1.14	0.97-1.34
Poverty status (interquartile range, referent)				
Lowest 25th percentile (< 9.8%)	1.13	0.85-1.51	1.05	0.86-1.29
Highest 75th percentile (> 18.37%)	1.09	0.84-1.41	1.02	0.79-1.30

a. In a multivariate model that tested for interaction effects between age*race and age*urban, being older and black was significantly correlated with local stage of diagnosis (OR = 0.68, 95% CI, 0.50-0.90). Black race (OR = 1.22, 95% CI, 1.00-1.49), other race (OR = 0.50, 95% CI, 0.226-0.97), and age 65+ (OR = 1.55, 95% CI, 1.22-1.97) remained independent, significant correlates of diagnosis at local stage disease. The age*urban interaction was not significant and urban was no longer independently associated with local stage of disease among those 65+ in this analysis.

b. Standard errors adjusted for 118 clusters in the < 65 group and 123 clusters in the ≥ 65 group.

Medicaid is a joint federal-state program, which means that state funding for its Medicaid program and reimbursement profiles vary state to state.

Despite these limitations, we feel this paper demonstrates the important need for efforts to improve the timing of diagnosis of colorectal cancer among the Medicaid population given that two in three people were diagnosed with regional or advanced disease. Five-year survival rates drop from 89.7% (local) to 68.4% (regional) to 10.8% (distant) as colorectal cancer progresses.¹ Efforts to increase screening at the recommended age (50+) for average risk

populations have the potential to increase the likelihood of earlier diagnosis and to improve survival probability. **NCMJ**

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