Proximity to State-of-the-Art Cancer Care

and Stage at Diagnosis:

North Carolina, 1988

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Proximity to State-of-the-Art Cancer Care and Stage at Diagnosis in North Carolina, 1988

ABSTRACT

There is a growing perception that rural residents and minority groups have limited access to optimal cancer care. To address this issue in North Carolina, incident cancer cases reported by 17 hospitals to the North Carolina Central Cancer Registry (CCR) for calendar year 1988 were analyzed for geographic differences in stage at diagnosis for cancers of the colon, rectum, lung, breast, uterine cervix, and prostate, and for all sites combined. The 9 counties containing a comprehensive cancer center or a hospital with three or more oncologists were classified as central counties, the remaining 91 counties were classified as peripheral. Odds ratios of regional or distant *versus* localized diagnoses for peripheral *versus* central county residence were calculated. Unstaged and *in situ* cases were not considered in the comparative analysis of stage at diagnosis, and cases initially diagnosed at a facility other than the reporting center were excluded from all analyses. Two major patterns were evident in the data: a greater proportion of Black cases were unstaged at diagnosis; and cases from peripheral counties were diagnosed at later stages. The two exceptions were lung cancer in Whites and colon cancer in Blacks, for which a greater proportion of cases from central counties were unstaged at diagnosis.

Introduction

Determining the health status of rural *versus* urban populations is important for the appropriate allocation of health care resources. Recent comparisons of the distribution of health care resources and of health status between rural and urban populations have shown the former to be at a disadvantage (U.S. Congress, 1990). Studies reviewed by the U.S. Congress' Office of Technology Assessment showed that there are important differences in the incidence of cardiovascular disease, infant mortality, and communicable diseases between urban and rural populations, especially among the poor and minorities. Those differences may be accounted for by differences in demographic structure of rural *versus* urban communities (Miller et al., 1987), but also may be due to differential availability, access, and utilization of health care resources.

In North Carolina, there is growing interest in cancer care among rural populations and for Nonwhites (Central Cancer Registry, 1991). Approximately 2.1 million North Carolina residents (34% of the state population) lived in rural areas in 1990 (U.S. Department of Commerce, 1991), giving the state the second largest rural population in the nation (after Texas). North Carolina also has a large population of rural Blacks--772,016 in 1990 (Sheps Center, 1991). Mortality rates for cancer among minorities in North Carolina have been stable over the past decade, but overall, mortality rates for minorities have been dropping nationally. North Carolina has the highest mortality from prostate cancer among minorities in the United States and very wide racial divergence for death rates from cervical and breast cancer (Central Cancer Registry, 1991).

Tumor registry data indicate that there are substantial differences in stage-at-diagnosis for urban *versus* rural patients in Georgia (Liff, et al., 1991). Staging--determining the size of a tumor and extent of its metastases, if any--at the time of diagnosis can be thought of as one component of state-of-the-art cancer care (DeVita,

1989; Feigl, Patmont, Rodenbaugh, 1987). Staging tumors is important in planning treatment; the staging process provides prognostic information, assists evaluation of end results, facilitates the exchange of information between treatment centers, and aids ongoing cancer research (Williams, 1990). The Georgia study (Liff et al., 1991) prompted questions concerning the stage-at-diagnosis among cancer cases included in the North Carolina Central Cancer Registry. In particular, we are interested in whether rural cancer patients are receiving care equal to that of urban cancer patients and whether differences may exist on the basis of race.

Methods

Data Source and Definitions

This study analyzed incident cancer cases reported to the North Carolina Central Cancer Registry (CCR) during 1988 by the tumor registries of 17 hospitals located across the state. Cases represented residents of all 100 counties in North Carolina. Each county was classified based on the presence or absence of state-of-the-art cancer care within the county. Although there is some correlation between urbanization and presence of sophisticated medical care, this categorization is *not* an urban-rural designation based on degree of urbanization or population density--two criteria commonly used in rural-urban comparison studies. In this classification scheme, state-of-the-art cancer care was defined on the basis of presence of a comprehensive cancer center or a hospital with three or more oncologists; counties with this level of care were designated "central." All other counties were classified as "peripheral".

Staging criteria for cases reported to the CCR are based on guidelines developed by the SEER program (Shambaugh, 1976). Cases are classified as staged at diagnosis if staging was conducted within 2 months following diagnosis. Cases not staged within 2 months of diagnosis are reported as stage unknown at initial diagnosis (unstaged). Stage at diagnosis is reported as *in situ*, localized, regional, or

distant. An *in situ* cancer has not penetrated or spread beyond the basement membrane of the epithelial tissue involved. A localized tumor is invasive but is confined entirely to the organ of origin--there is no evidence of metastasis. A regional tumor has extended beyond the limits of the organ of origin or beyond the anatomical limits of the primary site directly into surrounding organs or tissues and/or to regional lymph nodes. Cancers classified as distant are characterized by metastases to parts of the body that are far removed from the primary tumor.

The analysis dataset is hospital-based, not population-based. Of the 13 counties in which the reporting hospitals are located, seven are in central counties and the remaining six are in peripheral counties. Compared to hospitals situated in central counties, those in peripheral counties had a greater proportion of Medicaid/Medicare patients and a greater proportion of their patients lived in the county where the hospital is located (Table 1). Only cases of White or Black race were analyzed

Hospitals report cancer cases diagnosed at the facility and cases initially diagnosed elsewhere and referred to the reporting facility. To minimize the influence of referral patterns on the analysis, only cases diagnosed at the reporting facility were analyzed. The study compares stage-at-diagnosis for six cancer sites (colon, rectum, lung, breast, cervix, and prostate) and all cancer sites combined for peripheral *versus* central residents. Only localized, regional, and distant stages were included; *in situ* cases were excluded. Only cases of White or Black race were analyzed; cases of neither White nor Black race constituted less than one percent of total cases and less than five percent of Nonwhite cases diagnosed at reporting facilities.

Statistical Methods

Logistic regression was performed using Statistical Analysis Software, version 6.06 (SAS Institute Inc., 1990). Odds ratios representing the relative odds of

nonlocalized (regional or distant stages) *versus* localized diagnoses for cases from peripheral *versus* central counties were calculated after adjustment for age (all models) and gender (colon, rectum, lung, all sites). Ninety-five percent confidence intervals were calculated around the odds ratios.

Results

Tables 2 and 3 show the number of cancer cases and the distribution by stage (including unstaged) by anatomic site and residence category, for Whites and Blacks, respectively. White patients (Table 2) show no consistent stage-at-diagnosis patterns for peripheral *versus* central patients. When comparing localized *versus* nonlocalized diagnoses, a pattern is evident among Blacks. Except for breast cancer, peripheral patients experience a higher proportion of distant diagnoses compared to central patients. An additional pattern, apparent from comparing Tables 2 and 3, is that Black cases tend to be unstaged at diagnosis to a greater degree than White cases, regardless of anatomic site or residence category.

Table 4 presents odds ratios comparing the odds of regional or distant (*versus* localized) disease among peripheral patients compared to central patients. Odds ratios greater than 1.0 represent an excess of nonlocalized disease among peripheral patients. There are significant differences for breast cancer among Whites, for prostate cancer among Blacks, and for all sites combined for both races. Colon cancer among Whites and rectal cancer among Blacks show opposite trends. The number of colon cancer cases among Whites yields a relatively stable estimate, although the 95% confidence interval fails to exclude 1.0. The number of rectum cancer cases among Blacks is very small (17 peripheral, 17 central), and the wide 95% confidence interval around the odds ratio suggests potential instability of the point estimate.

Discussion

Overall, two patterns are suggested (Tables 2, 3, and 4):

(1) a greater proportion of cancer cases among Blacks are unstaged at diagnosis; and

(2) cancers among peripheral patients are diagnosed at later stages.

Extensive staging is justified only if there is an active treatment available for advanced disease or if a "toxic" treatment is planned for early disease (Williams,

1990). In this dataset, unstaged cases may include those that were unstaged because they were so advanced at diagnosis that treatment was not practical, cases in which the patient refused further diagnostic evaluation, cases in which the primary care physician did not recommend further tests, and cases that were staged more than 2 months after the initial diagnosis. The greater proportion of unstaged Black cases is consistent with the greater proportion of Black cases diagnosed at nonlocalized stages.

The distribution-by-stage pattern varies between Blacks and Whites for all anatomic sites except rectum, and the percent of cases diagnosed at the localized stage is lower for Blacks than for Whites for all site-residence categories except for colon cancer in central patients. The distribution by stage for colon cancer in Whites and for breast cancer in Blacks differs rather dramatically from the pattern noted for the other sites, in which higher proportions of cancer cases among peripheral patients are diagnosed at later stages. For colon cancer in Whites, a higher proportion of localized and distant disease is diagnosed in peripheral patients, whereas a higher proportion of regional disease is diagnosed in central patients. The reverse is true for breast cancer in Blacks, i.e., a higher proportion of local and distant disease is diagnosed in central patients, but a higher proportion of regional disease is diagnosed in peripheral patients.

Screening procedures for early detection of cancers of the breast and of the uterine cervix are well established. If these procedures had been utilized equally by Black and White women of both residence categories, there would be no state-at-diagnosis differences--i.e., the odds ratios in Table 4 would approximate 1.0. There is no significant residence differential for stage at diagnosis for cervical cancer among both races and for breast cancer among Blacks, although the odds ratios for these site-race combinations exceed 1.0. The odds ratio for breast cancer among Whites indicates that White women in peripheral counties are 1.3 times more likely to be

diagnosed at regional or distant stage of disease than are White women in central counties.

This suggests that White women residing in peripheral counties may not be getting early screening for breast cancer to the same extent as White women living in central counties. Rural communities tend to have fewer cancer prevention activities (Battista and Spitzer, 1983), residents with lower income and less education, more nonelderly residents with no health insurance (Summer, 1991), and an older age distribution compared to urban areas (Miller et al., 1987). Also, utilization of health care services tends to be greater in urban than in suburban and rural areas (Wilkinson and Wilson, 1983; Oleske et al., 1983).

The high proportion of distant breast cancer among Black patients from central counties may reflect lower health care utilization by Blacks of lower socioeconomic status (SES) in urban areas. Utilization of health care services tends to be higher among groups with higher SES than among lower SES groups (Wilkinson and Wilson, 1983; McCoy et al., 1991). Lower socioeconomic status has been associated with later stage-at-diagnosis (Farley and Flannery, 1989; Liff et al., 1991; Mandelblatt, 1991) and a higher risk of more distant disease (Farley and Flannery, 1989; Mandelblatt, 1991). Postmenopausal age, black race, low education, and public hospital use have been associated with late-stage diagnosis of breast cancer (Mandelblatt, 1991).

Access to cancer care is problematic for the poor, minorities, and women. The 1985 National Access to Care Survey indicated that:

* Low income women were less likely than the nonpoor to have received a Pap smear within recommended time frames;
* The uninsured and the poor and near poor were less likely to have received a breast examination;
* Older women were less likely to have received preventive cancer services;

and,

* The poor and uninsured were more likely to receive episodic, often symptomatic care, with no follow-up and limited diagnostic services in outpatient clinics and emergency clinics than in physicians' offices. (Steiner, 1991)

Consistent excesses of cancer mortality among the economically disadvantaged in the United States are a function of higher incidence and/or lower survival. Survival differentials observed for colon, rectum, breast, cervical, and prostate cancers are due, in part, to late diagnosis (Steiner, 1991). Steiner concluded that "it is reasonable to predict that lack of access has influenced survival among the economically disadvantaged."

There are substantial demographic differences between the state population and the 1988 CCR cases. Based on estimates using the 1988 population for North Carolina and 1986-87 SEER rates, the 11,453 incident cancer cases reported to the CCR represent 46% of the 24,946 cases expected for the state. Table 5 contains the race (White *versus* Nonwhite) and residence distributions, by gender, of incident cancer cases reported to the CCR in 1988, incident cancer cases diagnosed at the reporting facilities, and the North Carolina state population. Nearly half (48%) of the cases came from the nine central counties, whereas those counties contained only 33% of the state population in 1988 (North Carolina Office of State Budget and Management, 1988). The state population was approximately 24% Nonwhite in 1988, but only 17% of the reported cases were Nonwhite. Of the 8263 cases diagnosed at reporting hospitals, 69--less than 1% of total cases and less than 5% of Nonwhite cases--were neither White nor Black.

Since the analysis dataset was hospital-based, only cases among Whites and Blacks were analyzed, and the study population differed from the state population with respect to several key demographic characteristics, widespread generalization of

the results is inappropriate. Further, there were small numbers in several situations. For Blacks, all of the anatomic sites presented in Table 3 have at least one residence-stage category with fewer than 20 cases. This circumstance is also true of cancers of the rectum and cervix in Whites (Table 2). The estimated odds ratios for these sites are potentially unstable and may not accurately reflect the association between residence category and stage at diagnosis. In spite of these data limitations, and the fact that no North Carolina county is as urban as the counties centrally located in the metropolitan Atlanta area, it is noteworthy that the two major patterns observed in this study are consistent with trends identified in the population-based Georgia study (Liff et al., 1991).

This apparent disadvantage of rural residents with regard to cancer care, suggested in the Georgia data and by North Carolina's cancer mortality data (State Center for Health Statistics, 1989), is now reinforced in this analysis of hospital-based incidence data. Although only a few of the odds ratios in Table 4 reach statistical significance, the overall trend toward later stage at diagnosis among patients from peripheral counties seems to indicate a pattern worthy of further investigation. Beginning in 1990, cancer incidence data are being collected from all hospitals in the state of North Carolina. The residence classification scheme is being refined to develop sub-county classifications that more accurately reflect varying degrees of urbanization within counties.

Access to cancer care is being studied by evaluating cancer treatment patterns in the Community Clinical Oncology Project (CCOP). Patients treated by the CCOPs are being compared to patients treated in other settings and who are tracked by the SEER program. However, that analysis will focus on patients who participate in experimental cancer treatment protocols. There is a need for comprehensive population-based research that includes substantial minority and rural residents.

The National Cancer Institute has initiated a Rural Cancer Outreach Program

which is to fund a number of demonstration and research projects in the fall of 1992. These projects may be able to identify problems in access to state-of-the art treatment for rural populations and suggest potential solutions. Removing recognized barriers to early cancer detection is clearly in order and should include public education activities, financial assistance, and enhanced access to and utilization of diagnostic facilities.

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Table 1. Characteristics of Hospitals Contributing to the North Carolina Central Cancer Registry in 1988.

Hospital	Percent medicaid/medicare[a]	Percent local patients[b]
Urban Hospitals (Academic)		
Duke University	43	17
NC Baptist Hospital	51	22
Pitt County Memorial	55	41
Univ. of North Carolina	47	18
	(median=49)	(median=20)
Urban Hospitals (General)		
Charlotte Memorial	40[c]	91
Durham County General	47	87
Forsyth Memorial	52	89
Memorial Mission	49	88
Presbyterian	38	95
Rex	43	95
St Joseph's	65	86
	(median=47)	(median=63)
Rural Hospitals (General)		
Alamance County	54	93 (100)
Alamance Memorial	53	85 (99)
Camp LeJeune Naval Hospital	[d]	74 (95)
Iredell Memorial	57	94 (98)
Nash General	65	48 (97)
Valdese General	53	95 (100)
	(median=54)	(median=76)

[a] North Carolina Medical Database Commission, 1990

[b] The percent of patients residing in the county in which the hospital is located. Patients diagnosed at the reporting center only (all races, all sites, both genders).

[c] North Carolina Medical Database Commission, 1989

[d] Not included in Database Commission Reports

Table 2. Distribution of Stage at Diagnosis for White Patients by Anatomic Site and Residence

Anatomic Site	Residence[b] Category	Number	Percent Distribution By Stage[a] Local	Regional	Distant	Unstaged
Colon	Peripheral	268	32.8	43.7	21.3	2.2
	Central	305	27.2	53.8	17.4	1.6
Rectum	Peripheral	86	39.5	50.0	9.3	1.2
	Central	134	41.0	45.5	11.2	2.2
Lung/Bronchus	Peripheral	708	26.7	30.2	37.6	5.5
	Central	626	25.2	26.8	39.3	8.6
Breast	Peripheral	471	53.1	39.7	6.8	0.4
	Central	579	66.0	27.1	6.7	0.2
Cervix	Peripheral	80	52.5	35.0	12.5	0.0
	Central	37	62.2	21.6	16.2	0.0
Prostate	Peripheral	330	57.0	23.6	14.8	4.6
	Central	310	62.9	20.3	12.3	4.5
All Sites	Peripheral	3527	39.3	28.4	25.8	6.5
	Central	3285	43.4	26.4	23.9	6.3
	Total	6812				

[a] Cases diagnosed at the reporting center.

[b] Central=counties with a comprehensive cancer center or a hospital with 3 or more oncologists (n=9); Peripheral=all other counties (n=91)

Table 3. Distribution of Stage at Diagnosis for Black Patients by Anatomic Site and Residence

Anatomic Site	Residence[b] Category	Number	Percent Distribution By Stage[a] Local	Regional	Distant	Unstaged
Colon	Peripheral	51	21.6	51.0	27.4	0.0
	Central	71	33.8	46.5	15.5	4.2
Rectum	Peripheral	17	35.3	23.5	35.3	5.9
	Central	17	23.5	29.4	23.5	23.5
Lung/Bronchus	Peripheral	121	14.9	25.6	47.1	12.4
	Central	103	20.4	29.1	41.8	8.7
Breast	Peripheral	81	32.1	55.6	11.1	1.2
	Central	94	39.4	45.7	13.8	1.1
Cervix	Peripheral	36	36.1	38.9	25.0	0.0
	Central	16	43.8	37.5	18.8	0.0
Prostate	Peripheral	74	44.6	18.9	24.3	12.2
	Central	73	61.6	8.2	20.6	9.6
All Sites	Peripheral	731	27.0	31.6	32.8	8.6
	Central	651	33.3	28.4	29.5	8.8
	Total	1382				

[a] Cases diagnosed at the reporting center.

[b] Central=counties with a comprehensive cancer center or a hospital with 3 or more oncologists (n=9); Peripheral=all other counties (n=91)

Table 4. Odds Ratios[a] of Nonlocalized[b] Malignancies in Peripheral Residents by Race

	Whites		Blacks	
Anatomic Site	OR[c]	(95% CL)	OR[c]	(95% CL)
Colon	0.86	0.72,1.03	1.38	0.91,2.10
Rectum	1.04	0.79,1.37	0.76	0.32,1.79
Lung	0.98	0.86,1.11	1.11	0.78,1.59
Breast	**1.31**	**1.15,1.48**	1.19	0.86,1.63
Cervix	1.13	0.73,1.75	1.20	0.64,2.26
Prostate	1.15	0.97,1.35	**1.45**	**1.01,2.08**
All Sites	**1.09**	**1.04,1.14**	**1.17**	**1.04,1.32**

[a] Adjusted for sex and age-at-diagnosis (continuous). *In situ* cases and those with unknown stage at diagnosis were excluded.

[b] Odds of non-localized (regional or distant) versus localized presentation. Odds ratios greater than 1 represent an excess of nonlocalized cases among peripheral residents.

[c] OR: odds ratio; 95% CL: 95% confidence limits

Table 5. Racial and Geographic Distribution of Cases and North Carolina Population, By Gender, All Sites & All Ages Combined, 1988.

	White		Nonwhite[c]	
	Central[a]	Peripheral	Central	Peripheral
All Incident Cancer Cases Reported to the Central Cancer Registry				
Men	2046 (44)	2619 (56)	461 (48)	504 (52)
Women	2257 (47)	2560 (53)	452 (45)	554 (55)
Total	9482 (83)		1971 (17)	
Incident Cancer Cases Diagnosed at the Reporting Facilities				
Men	1553 (47)	1772 (53)	345 (47)	388 (53)
Women	1732 (50)	1755 (50)	337 (47)	381 (53)
Total	6812 (82)		1451 (18)	
North Carolina Population, 1988[b]				
Men	749 102 (31)	1 639 386 (69)	355 805 (48)	377 989 (52)
Women	811 722 (32)	1 714 500 (68)	299 628 (36)	536 976 (64)
Total	4 917 710 (76)		1 570 398 (24)	

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[a] Central=the nine counties in North Carolina with either a comprehensive cancer center or a hospital with 3 or more oncologists. Peripheral=all other counties. Values given are number (percent).

[b] North Carolina Office of State Budget and Management, 1988.

[c] Figures are White/Nonwhite to compare with state population data. For the analyses, only Whites and Blacks were used. Of the cases diagnosed at the reporting hospital, 69--less than 1% of total cases and less than 5% of Nonwhite cases--were neither White nor Black.