Ethnic Variation in Prostate Cancer Survival in New Mexico[1]

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Abstract

Prostate cancer survival varies markedly by ethnicity. American Indians and blacks have the lowest 5-year relative survival among ethnic groups in the U.S. In New Mexico, relative survival for prostate cancer is lower for ethnic minority groups than for non-Hispanic whites. To examine factors underlying ethnic differences in prostate cancer survival in New Mexico, we analyzed Surveillance, Epidemiology, and End Results Program data collected by the New Mexico Tumor Registry from 1983 to 1992. Unadjusted relative risk (RR) of death after prostate cancer diagnosis was greater for Hispanics [RR = 1.1; 95% confidence interval (CI), 1.0, 1.2], American Indians (RR = 1.4; 95% CI, 1.2, 1.5), and blacks (RR = 1.5; 95% CI, 1.2, 1.7) than for non-Hispanic whites. After adjusting for age, stage, histological grade, year of diagnosis, and initial treatment, the risk for Hispanics (RR = 1.0; 95% CI, 0.9, 1.1), American Indians (RR = 1.0; 95% CI, 0.9, 1.1), and non-Hispanic whites was comparable. Although based on small numbers, adjusted risk ratios among blacks remained elevated (RR = 1.2; 95% CI, 0.9, 1.6), due in part to lower survival during the first 12 months after diagnosis (RR = 2.0; 95% CI, 1.2, 3.3) and poorer survival following radical prostatectomy (RR = 4.2; 95% CI, 1.3, 13). These findings suggest that poorer survival for Hispanics and American Indians may be explained by delayed detection and differences in treatment.

Introduction

Prostate cancer is a significant health problem for men around the world (1–3). The American Cancer Society estimates that more than 244,000 cases of prostate cancer will have been diagnosed and 40,000 men in the U.S. will have died from prostate cancer during 1995 (4). Although prostate cancers cause substantial mortality among men of all groups, the burden is disproportionately shared by a number of ethnic minorities. In the United States, blacks have the highest mortality rates (3). Hispanics have had lower mortality rates, but their rates are now rising (5). Among southwestern American Indians, prostate cancer is the most frequently diagnosed cancer, and mortality is disproportionately high (5–7).

Disparities in prostate cancer mortality among ethnic minorities are reflected in marked ethnic variation in prostate cancer survival (3, 4, 7–13). American Indians and blacks have the lowest 5-year relative survival rate among ethnic groups in the United States. In contrast, Asians/Pacific Islanders have better survival rates than United States whites. Studies of ethnic differences for survival are needed to determine the potential for secondary prevention strategies to reduce disparities in prostate cancer mortality.

Determinants for ethnic differences in prostate cancer survival have not been extensively studied, but are best characterized for black men. The poorer prognosis for blacks than for other ethnic groups is, in part, a result of differences in the distribution of stage at diagnosis, blacks having a more advanced stage of disease (3, 9). However, because blacks have a lower survival rate at each stage of disease, other factors, including age at diagnosis and treatment, may affect survival (3, 9, 14). Data for Hispanics and American Indians are limited, but suggest that diagnosis at an advanced stage may explain their lower survival rates (5, 10).

New Mexico offers an excellent opportunity to study ethnic variations in prostate cancer survival because it has an ethnically diverse population that has been covered by the NMTR,[3] a cancer registry with nearly complete vital status follow-up, for 25 years. As in other regions of the United States, Hispanics, American Indians, and blacks in New Mexico have lower survival rates than non-Hispanic whites (5, 10). To further examine factors underlying differences in survival for ethnic minorities, we analyzed prostate cancer data collected for cases diagnosed during the period 1983–1992 in New Mexico and followed through 1993. We calculated proportional hazard models to estimate risk of death associated with ethnicity adjusted for age, stage, grade, calendar period, and initial treatment.

Materials and Methods

NMTR is a member of the SEER Program of the National Cancer Institute, and has recorded population-based cancer incidence in New Mexico since 1969 (15). Cancer cases are identified through active surveillance of hospital records, outpatient clinic records, pathology and autopsy reports, and radiation therapy records. NMTR conducts active follow-up of cases for survival with greater than 95% ascertainment of vital status within the last year of reporting. As a part of the active

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[3] The abbreviations used are: NMTR, New Mexico Tumor Registry; SEER, Surveillance, Epidemiology, and End Results; RR, relative risk; CI, confidence interval; SES, socioeconomic status.

Table 1 Prostate cancer case characteristics (New Mexico, 1983–1992)

	Ethnicity									
	Non-Hispanic white		Hispanic		Black		American Indian		Other/unknown	
	No.	%	No.	%	No.	%	No.	%	No.	%
Period of diagnosis										
1983–1984	739	13.2	228	14.7	10	9.8	39	14.0	15	51.7
1985–1986	824	14.7	233	15.0	15	14.7	51	18.3	4	13.8
1987–1988	838	15.0	295	19.0	23	22.5	50	18.0	1	3.4
1989–1990	1245	22.2	316	20.4	17	16.7	69	24.8	5	17.2
1991–1992	1956	34.9	480	30.9	37	36.3	69	24.8	4	13.8
Age (years)										
<65	1016	18.1	317	20.4	19	18.6	41	14.7	9	31.0
65–74	2591	46.3	640	41.2	43	42.2	108	38.8	11	37.9
≥75	1995	35.6	595	38.3	40	39.2	129	46.4	9	31.0
Stage										
Local/*in situ*	4173	74.5	1155	74.4	69	67.6	188	67.6	23	79.3
Regional	719	12.8	191	12.3	9	8.8	26	9.4	3	10.3
Distant	542	9.7	182	11.7	20	19.6	60	21.6	2	6.9
Unknown	168	3.0	24	1.5	4	3.9	4	1.4	1	3.4
Histological grade										
Well differentiated	1772	31.6	512	33.0	27	26.5	76	27.3	12	41.4
Moderate	2289	40.9	609	39.2	49	48.0	94	33.8	13	44.8
Poorly or undifferentiated	1215	21.7	366	23.6	20	19.6	78	28.1	4	13.8
Unknown	326	5.8	65	4.2	6	5.9	30	10.8	0	0.0
Initial therapy										
Radical prostatectomy	1297	23.2	288	18.6	15	14.7	14	5.0	7	24.1
No surgical treatment	1883	33.6	466	30.0	46	45.1	104	37.4	4	13.8
Received radiation therapy	1587	28.3	380	24.5	23	22.5	57	20.5	4	13.8
Received hormonal therapy	948	16.9	298	19.2	21	20.6	97	34.9	2	6.9

follow-up, we obtain International Classification of Diseases coded death certificate data from the New Mexico Bureau of Vital Statistics.

Ethnicity of cancer patients ascertained by NMTR was defined using multiple sources including self-report, medical records, Indian Health Service records, Spanish surname lists, and the GUESS program, which uses lists of New Mexico surnames and surnames collected by the United States census to assign ethnicity (16, 17). Validity of racial and ethnic classification in New Mexico has been examined and reported previously (6, 16–18). Assignment of ethnicity by NMTR closely matches self-reported ethnicity for both Hispanics and American Indians. Misclassification of American Indians was estimated to be less than 1%.

Stage of disease was classified using SEER definitions for extent of disease and summary stages (19–21). We could not use other, more detailed staging categories because the necessary information was not available for many cases. For example, cases treated with observation or radiation staging are generally staged using clinical criteria only. Because we wanted to compare survival for all men with prostate cancer, we used summary stages of local, regional, distant, and unknown. Local cancers were defined as those confined to the prostate. Regional cancers involved local structures and local lymph nodes. Distant cancers extended beyond periprostatic tissue and local nodes or were metastatic. Cancers were assigned to the unknown category if information was not sufficient to assign a stage or if staging occurred more than 4 months after histological diagnosis. Cases with unknown stage were reviewed by the staff and staged when possible. Histological grade was assigned using International Classification of Diseases O-2 categories (22). Grade was categorized as well differentiated, moderately differentiated, and poorly differentiated or undifferentiated based on pathology reports. Gleason's grades were not used because they were not consistently available from pathology reports during the period of study. Treatment modalities were ascertained for primary treatment only. No data were available for subsequent courses of treatment. We categorized surgical treatment as radical prostatectomy, other surgery, or no surgery. Radiation and hormonal therapies were categorized as given or not given.

RR and 95% CIs for deaths from all causes were estimated using proportional hazard models (23, 24). We calculated regression models and estimated relative risk associated with ethnicity, which we adjusted for age, time period of diagnosis, stage at diagnosis, tumor grade, and initial treatment. We estimated risk associated with ethnicity in models restricted to local and regional stage to reduce the effect of differential staging by treatment, particularly the significant upstaging associated with radical prostatectomy. To assess heterogeneity in risk among ethnic groups, we estimated the risk associated with covariates in models stratified by ethnicity and in models with interaction terms for ethnicity with the covariates. All analyses were conducted using SAS (24).

Results

Between 1983 and 1992 in New Mexico, 7563 histologically confirmed first primary prostate cancers were diagnosed (Table 1). Of these cases, 5602 (74.1%) were non-Hispanic whites, 1552 (20.5%) were Hispanics, 278 (3.7%) were American Indians, 102 (1.3%) were blacks, and 29 (0.4%) were of other or unknown ethnicity. American Indians were the oldest group at diagnosis and, along with blacks, were more likely to be diagnosed with distant-stage disease. Treatment for prostate cancer varied by ethnicity. Non-Hispanic whites were most

Table 2 Prostate cancer relative death risks and 95% CIs (New Mexico, 1983–1992)

	All stages RR (95% CI)	Local and regional stage RR (95% CI)
Unadjusted		
Non-Hispanic white	1.0	1.0
Hispanic	1.1 (1.0, 1.2)	1.1 (1.0, 1.2)
Black	1.4 (1.2, 1.8)	1.3 (0.9, 1.9)
American Indian	1.4 (1.2, 1.7)	1.4 (1.2, 1.8)
Other/unknown	0.3 (0.1, 0.6)	0.2 (0.1, 0.6)
Adjusted[a]		
Non-Hispanic white	1.0	1.0
Hispanic	1.0 (0.9, 1.1)	1.0 (0.9, 1.1)
Black	1.2 (0.9, 1.6)	1.2 (0.8, 1.8)
American Indian	1.0 (0.8, 1.2)	1.0 (0.8, 1.3)
Other/unknown	0.3 (0.1, 0.7)	0.2 (0.1, 0.6)

[a] Adjusted for age, stage, year of diagnosis, histological grade, and initial treatment.

Table 3 Prostate cancer relative death risks, local- and regional-stage cases by treatment (New Mexico, 1983–1992)

Ethnicity	All patients (n = 6556)	Radical prostatectomy (n = 1595)
Non-Hispanic white	1.0	1.0
Hispanic	1.0 (0.9, 1.1)	1.2 (0.8, 1.8)
Black	1.2 (0.8, 1.8)	4.2 (1.3, 13)
American Indian	1.0 (0.8, 1.3)	0.8 (0.1, 5.5)
Other/unknown	0.2 (0.1, 0.6)	[b]

[a] Adjusted for age, year of diagnosis, histological grade, and initial treatment.
[b] Insufficient cases.

likely to be treated with radical prostatectomy (23.3%) and least likely to receive initial hormone therapy (16.9%). In contrast, American Indians were least likely to be treated with radical prostatectomy (5.0%) and most likely to receive initial hormone therapy (34.9%).

RRs of death among New Mexico men diagnosed between 1983 and 1992 varied by race and ethnicity. Unadjusted RR of death for prostate cancer diagnosed at all stages was significantly greater for Hispanics (RR = 1.1; 95% CI, 1.0, 1.2), American Indians (RR = 1.4; 95% CI, 1.2, 1.7), and blacks (RR = 1.4, 95% CI 1.1, 1.8) than for non-Hispanic whites (Table 2). RRs were similar when cases were restricted to local and regional stage at diagnosis. After adjusting for age, time period, stage at diagnosis, histological grade, and treatment, risks for Hispanics and American Indians were no longer elevated compared with non-Hispanic whites. Although analysis was limited by small numbers, risk of death among blacks remained elevated when cases diagnosed at all stages were included in the analysis (RR = 1.2; 95% CI, 0.9, 1.6) and when the analysis was restricted to local- and regional-stage cases (RR = 1.2; 95% CI, 0.8, 1.8).

Poorer survival for blacks was in part the result of higher risk of death after radical prostatectomy for local- and regional-stage cases. In models stratified by treatment, blacks with local or regional disease were at substantially higher risk of death (RR = 4.2; 95% CI, 1.3, 13) when treated with radical prostatectomy than non-Hispanic whites (Table 3).

To further investigate increased risk associated with prostatectomy, we examined the variation of risk by time since diagnosis. Risks were estimated for death within the first 12 months postdiagnosis and greater than 12 months postdiagnosis (Table 4). We found the increased risk for blacks was restricted to the first 12 months postdiagnosis. Risk of death was also higher in the first 12 months after diagnosis for Hispanics and American Indians than for non-Hispanic whites. After 12 months, the risks were approximately equal in these groups. Because the black survival disadvantage was concentrated in the first 12 months postdiagnosis and in cases undergoing radical prostatectomy, we attempted to examine differences in comorbidities. Unfortunately, medical records were not available for many of these men. We were able to examine causes of death as coded on death certificates by ethnicity and survival time and found no substantial differences in cause of death for blacks compared with non-Hispanic whites and Hispanics (data not shown).

Table 4 Prostate cancer relative death risks and 95% CIs by time since diagnosis (New Mexico, 1983–1992)

	First 12 months RR (95% CI)	After 12 months RR (95% CI)
Unadjusted		
Non-Hispanic white	1.0	1.0
Hispanic	1.3 (1.1, 1.5)	1.0 (0.9, 1.2)
Black	2.3 (1.4, 3.7)	1.1 (0.7, 1.6)
American Indian	1.7 (1.2, 2.4)	1.4 (1.1, 1.7)
Other/unknown	0.9 (0.2, 3.5)	0.2 (0.1, 0.5)
Adjusted[a]		
Non-Hispanic white	1.0	1.0
Hispanic	1.2 (1.0, 1.4)	1.0 (0.9, 1.1)
Black	2.0 (1.2, 3.3)	1.0 (0.7, 1.4)
American Indian	1.2 (0.8, 1.6)	0.9 (0.8, 1.2)
Other/unknown	1.0 (0.3, 4.0)	0.2 (0.1, 0.6)

[a] Adjusted for age, stage, year of diagnosis, histological grade, and initial treatment.

Our proportional hazard analyses were based on the assumption that the effect of ethnicity did not vary with age, stage, or other covariates. To assess the validity of these assumptions, we calculated two sets of models: a set stratified by ethnicity and a set that included an interaction term of the covariate and ethnicity. Within the limits of sample size, we did not find consistent evidence for significant modification of the effect of ethnicity on survival.

Discussion

Using population-based data to examine ethnic variations in prostate cancer survival, we have demonstrated that poorer survival for American Indians and Hispanics, compared with non-Hispanic whites, may be explained by differences in stage at diagnosis, histological grade, and initial treatment. In contrast, these factors do not account for the survival disadvantage for blacks. Our findings suggest that the explanation for ethnic contrasts in prostate cancer survival may differ among ethnic groups (10, 11).

Most available prostate cancer survival data in the United States for ethnic groups other than blacks has been collected by the SEER Program (7, 10, 12). For SEER areas, survival rates for Hispanics are similar to those for non-Hispanic whites. American Indians residing in SEER areas have the lowest relative survival rate reported for any ethnic group in the United States (11). However, a 1978 study of data for New Mexico found that survival for American Indians varied by age and that older American Indians had a higher survival than older non-Hispanic whites (10). We were unable to confirm this finding in cases diagnosed during the 1983–1992 period. We are not

aware of any studies of prostate cancer survival that consider stage at diagnosis, histological grade, and treatment for American Indians or for Hispanics other than those based on SEER data (7, 10, 12).

Our findings are consistent with those of other investigations of prostate cancer survival in minority populations, which consistently report lower survival for blacks than for non-Hispanic whites (3, 4, 9, 11, 12, 25–27). The poorer prognosis is, in part, a result of differences in the distribution of stage at diagnosis, blacks having more advanced stages of disease (3, 9). However, factors in addition to stage at diagnosis are operative because blacks have decreased survival at each stage of disease (3, 9). An analysis of SEER data from the San Francisco and Oakland Metropolitan area by Ragland *et al.* (14) suggested that black-white differences in survival may result from an age-dependent effect of stage as a prognostic factor. We found little evidence for such a relationship in New Mexico data. However, this difference in findings may result from considering tumor grade in our analyses as indicated by a recent study of Swedish patients in which adjusting for tumor grade eliminated differences in age-specific relative survival (28).

Interpretation of our data may be subject to a number of limitations. Use of population-based data and uniform data collection procedures for all ethnic groups excludes selection bias, which might have been present if cases from particular institutions were studied. Because overall life expectancy at the ages during which prostate cancer occurs is comparable among ethnic groups in New Mexico, lower overall survival in some ethnic groups cannot explain any differences in prostate cancer survival (29). We evaluated the potential for follow-up bias during the 1983–1993 period and found that follow-up of cases did not vary significantly among ethnic groups.

Data were not available for a number of factors that may contribute to ethnic contrasts in prostate survival, including SES, cultural determinants of prostate cancer knowledge and attitudes, access to and utilization of medical care including early detection by screening, biological factors, and follow-up treatment (8, 14, 30–35). Although SES may be an explanation of ethnic differences in prostate cancer survival, our analyses did not include surrogate variables for SES because that information is not routinely collected by NMTR, and geocoding methods using ZIP code or Census information are not useful for assigning SES for residents of rural New Mexico. Hispanics, American Indians, and blacks generally have a lower SES than non-Hispanic whites (36). However, the heterogeneity in prognostic factors among low- and high-SES groups in New Mexico suggests that determinants of survival other than SES are important. Survival for American Indians, the group with the lowest SES, was comparable with that for non-Hispanic whites after adjusting for age, stage at diagnosis, grade, and initial treatment. In contrast, adjustment for these factors did not eliminate the survival disadvantage for blacks. Data on the differences in distribution of other prognostic factors, such as environmental exposures, social and dietary habits, biological variables, or other factors, are necessary to explain these patterns in survival (1, 34, 37, 38).

Unmeasured cultural differences may explain a portion of the ethnic heterogeneity in prostate cancer survival. Cultural influences can produce different perceptions of and responses to illnesses, which affect prognosis for a cancer (39). For example, among blacks and Hispanics, delay in seeking medical care and, therefore, later stage at diagnosis may be partly due to fear of the diagnostic label "cancer," a lower awareness of cancer symptoms and cancer screening tests, and certain perceptions of the health-care system. Reliance on traditional health-care providers among American Indians and Hispanics may also reduce the opportunity for early detection and effective conventional treatment (40). In addition, poverty and lower levels of education can lead to less timely access to and less appropriate utilization of the health care system and lower compliance with therapy (41, 42). Additional studies are needed to examine the role of cultural and economic differences in prostate cancer survival.

Our data suggest that blacks undergoing radical prostatectomy for local or regional stage prostate cancer were at a 4-fold higher risk for death than non-Hispanic whites and that the increased risk of death for blacks was confined to the first 12 months after diagnosis. Because blacks have a higher prevalence of serious comorbid conditions such as cardiovascular and pulmonary disease than whites, blacks may suffer a greater postsurgical mortality. Although numbers were limited, we found no ethnic differences in cause of death, suggesting that differences in comorbid conditions were not a major contributor to ethnic variation in survival.

Other biological factors appear to play a role in cancer survival (34, 41, 43–45). The fact that blacks have more aneuploid, less-differentiated tumors, high serum PSA levels, and other biomarkers associated with poor prognosis suggests that biological factors may explain some of their survival discrepancy (34, 41, 43–45). Further studies to understand the biology of prostate cancer are needed to improve prognosis for all ethnic groups.

In summary, the findings of this study have implications for efforts directed toward reducing morbidity and mortality for prostate cancer, the most frequently diagnosed cancer in Hispanic, American Indian, black, and non-Hispanic white men (3, 13). The poorer survival for Hispanics and American Indians is associated with more advanced stage and might be improved by earlier detection and effective treatment. Studies are needed to describe differences in type and response to treatment, to identify the biological determinants of prognosis, and to develop culturally competent cancer control programs.

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