CURRENT STATUS OF PROSTATE CANCER IN NORTH AMERICAN BLACK MALES

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The National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program is used to examine the most recent data available to draw inferences about black and white males in the United States with prostate cancer. Findings include a continuing rise in the incidence of prostate cancer which, as of 1985 SEER data, is 50% higher in the black male population than in white males. With the exception of minor fluctuations over the last 17 years, the mortality rate for black males demonstrates an upward trend. Combining all stages and ages, the survival rate for black males is 10% poorer than for white males.

These data provide a glimpse into the problem of prostatic carcinoma in the United States today. To develop preventive strategies and cancer control interventions, a fuller understanding of the nature of the disease and its biologic course is necessary. Epidemiologic questions concerning socioeconomic status among and within racial groups, lifestyles, and behaviors that affect health seeking and diagnosis and treatment of prostatic cancer must be answered. By examining SEER data for prostatic cancer, we update the current status of this disease in North American blacks and infer possible directions for future epidemiologic surveys and cancer control intervention research.

Key words • prostatic cancer • epidemiologic research • black males

In this article, we examine the literature on prostate cancer in blacks from a historic perspective and compare this perspective with current population-based data from four registries in the Surveillance, Epidemiology, and End Results (SEER) program that have significant black populations. We do not attempt to determine why there are black-white differences. However, we do illustrate the seriousness of the problem.

We believe that epidemiologic studies can be used to make statistical inferences about the parameters of populations and the effect of chronic diseases, such as prostate cancer, on these populations. Such inferences may illustrate the extent of the problem on the macro-or population-based level. Studies of the black-white differences can be accomplished on the micro-level; investigating the biochemical and genetic components of cellular responses which manifest in clinical differences among individuals and populations. Such investigations are beyond the scope of this article. Here, it is our intent to measure the prostatic cancer incidence, survival, and mortality rates using four registries from SEER. These rates will be compared with baseline

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SEER data for whites from the same areas. This analysis can then be used to evaluate the seriousness of the problem of prostate cancer among US blacks and will provide an update on the current status of prostate cancer in North American blacks.

Prostate cancer is the third leading cause of cancer death in males, following lung cancer which is first and colorectal cancer which is second. Prostate cancer was directly responsible for some 27 000 deaths in 1987. In that same year, carcinoma of the prostate was diagnosed in 96 000 males.[1] The incidence rates for all races combined increased between 1950 and 1985 at an average rate of 1.8% per year, from a rate of 45.3 per 100 000 males to a rate of 76.4 per 100 000 males.

The incidence data comparing black and white populations reported by Bang et al[2] reveals an increase in the incidence rates for all cancer sites combined between 1969 and 1981 of 17% for blacks and 13% for whites. In the same report, the 1969–1981 prostate cancer incidence rates for both black and white males was found to have risen by 17.9%. The incidence rates in 1985 for blacks was 124.7 cases per 100 000 men and for whites 83.4 per 100 000. Thus, the difference in cancer burden for this period was approximately 50% higher for blacks than whites.[3]

Cancer mortality data, when comparing black males to white males, have historically presented a grim picture for blacks. Wynder[4] reported that between 1930 and 1974 the mortality rate from cancer increased 34% among white males, whereas the rate among nonwhites (90% of whom are blacks) increased 322%. Mortality in the US population due to prostate cancer increased only slightly between 1973 and 1985. Among white males in 1973 a mortality rate of 20.3 per 100 000 was reported compared with 21.5 per 100 000 in 1985, an increase of about 6%.[3] Among black males, the mortality rate increased by 16% from 39.2 per 100 000 in 1973 to 45.8 in 1985.

Survival rates among white males with cancer of the prostate have been reported to be on the rise since the 1950s.[3] Several factors may have contributed to the increasing survival rates. Although there have been increases in the incidence rates of prostate cancer, the mortality rates have been relatively steady; this may be the result of early detection efforts. Significant strides in surgical and hormonal treatment and radiotherapy may also have contributed to improved survival rates from prostate cancer.

As is true of 12 of 24 cancer sites analyzed for black and white survival differences in the 1987 Annual Cancer Statistics Review, blacks continue to have a significantly poorer 5-year relative survival from cancer of the prostate (60.2%) compared with whites (72.6%).

Given the historically grim picture of prostate cancer in blacks, it is important that we now examine these data in a descriptive epidemiologic fashion.[5-12] We propose to answer the question: What are the current differences in the incidence, survival, and mortality rates of black and white males? Following this assessment of the current status of prostate cancer in blacks, questions can be raised addressing why these differences have not changed during the past 20 years. Finally, this assessment may provide direction for developing preventive strategies and for designing prevention and control intervention studies.

METHODS

The incidence and survival data used in this investigation are from the National Cancer Institute's SEER program,[13] which was begun in 1973 and is used to collect annual data on every case of cancer diagnosed among residents of participating areas. Because we are reporting black-white differences in prostatic cancer incidence and survival, we have used SEER data from the state of Connecticut and the metropolitan areas of Atlanta, Detroit, and San Francisco where large numbers of blacks are included in the data sets. These areas were used because they are the only SEER areas with large enough numbers of blacks to provide for meaningful analyses, and as the white comparison rates are for the same geographic areas, the effect of geographic confounding is minimized. According to the 1980 Census, these four SEER areas contain about 7.4% of the total black population in the United States and 5% of the whites. (The most recent SEER data available at the time of this study was for the year 1985.)

Data similar to that reported in SEER are available for the years 1969 through 1971 from the Third National Cancer Survey (TNCS). The TNCS includes data from San Francisco, Atlanta, and Detroit. Connecticut has had an operational tumor registry since 1935[13-16] and, therefore, although not a part of the TNCS, data from the registry can be combined with the TNCS data. This enables us to examine trends for the four regions back to 1969.

Although mortality data are reportable by law to the National Center for Health Statistics (NCHS) and are available for the entire country, only mortality data which were geographically compatible with the SEER incidence data were used in this study. This was done by selecting mortality by county for each of the four areas; NCHS annually makes these data available on

TABLE 1. AGE-ADJUSTED (1970 US STANDARD) CANCER INCIDENCE RATES FOR ALL CANCER SITES COMBINED AND PROSTATIC CANCER FOR WHITE AND BLACK MALES

Cancer Site	Black Males	White Males
All sites combined	512.2	422.4
Prostate gland	127.6	84.9

Incidence rates are per 100 000 of the specified population. From the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program, 1985.

user tapes. Mortality data for the years of SEER incidence (1969–1985) are reported.

Population estimates used as denominators in the calculation of both incidence and mortality rates were obtained from the United States Census Bureau. These estimates are for white and total non-white races only. The proportions of black to total non-whites from the 1970 and 1980 censuses by age and sex, and the trends in these proportions, were used to produce annual estimates of the black population from 1969 through 1985.

The incidence and mortality rates in this article have been age-adjusted to the age distribution of the United States in 1970 by the direct method. Age-adjusting is a statistical technique that eliminates age confounding on the comparison of rates between populations which may have different age distributions.

Cancer survival rates are calculated by the actuarial method from the date of diagnosis to the time of death from the cancer of interest. Cancer patients die of causes other than their cancer, and when that occurs the individuals are usually withdrawn from the analysis at the time of their death. In the management of large population-based data sets such as SEER, frequently specific information, such as cause of death is not readily available or there may be coding problems with some data items. To address issues of this type, the relative survival rate is used. The relative survival rate is a statistical correction for causes of death other than the cancer of interest.[17,18] The result of this correction is a survival rate which estimates the cause-specific survival rate which would be obtained if the exact causes of death were known.

To use 5-year survival rates for analysis, 5 full years of survival data is required from some patients. Actuarial survival rates on the other hand, do not require 5 years of follow-up, but the accuracy of the survival rate is dependent, in part, on the proportion of

TABLE 2. TEMPORAL TRENDS IN THE AGE-ADJUSTED (1970 US STANDARD) INCIDENCE RATES OF PROSTATIC CANCER FOR WHITE AND BLACK MALES: FOUR AREAS 1969–1985

Year	Black Males	White Males
1969	99.4	58.9
1970	95.2	57.6
1971	91.6	55.7
1974	83.0	57.2
1975	111.9	62.4
1976	110.1	69.1
1977	121.0	71.4
1978	116.7	68.9
1979	123.9	71.4
1980	126.0	68.9
1981	127.7	75.3
1982	127.3	73.1
1983	134.3	78.0
1984	138.8	75.8
1985	127.4	75.9

Incidence rates are per 100 000 of the specified population. The four areas are: San Francisco-Oakland, Detroit, Atlanta, and Connecticut.

patients who are either followed, or in the case of those who die, eligible to be followed for a full 5 years. The data used for this analysis included patients diagnosed during 1978 through 1981 who had a full 5 years of follow-up, as well as 1982 cases in which 4 years of follow-up data were available. The accuracy of the 5-year survival rates used in this study will not be adversely affected unless for some reason the 1982 cases have a drastically different survivorship than the 1978–1981 cases. There is no indication, based on the analysis of the survivorship for years 1 through 4, that the fifth year for the 1982 diagnoses cases would be drastically different; thus, the advantage of including additional cases outweighs the disadvantage of having only 4 years of data on these cases.

RESULTS

Incidence

Table 1 includes both the 1985 all cancer sites combined and the prostate cancer incidence rates for black and white males. The all sites combined incidence rate for black males is 512.2 per 100 000 and the rate for white males is 422.4 per 100 000. Black males have a 21% higher incidence rate for all cancer sites combined. For prostate cancer, the rates are 127.6 per 100 000 black males and 84.9 per 100 000 white males. Thus, prostate cancer incidence is approximately 50% higher in black males than in whites for the

TABLE 3. AGE-ADJUSTED (1970 US STANDARD) CANCER MORTALITY RATES FOR ALL CANCER SITES COMBINED AND PROSTATIC CANCER FOR WHITE AND BLACK MALES: UNITED STATES 1985

Cancer Site	Black Males	White Males
All sites combined	297.9	212.5
Prostatic cancer	46.5	21.5

Mortality rates are per 100 000 of the specified population.

latest available data year from SEER, 1985. Table 2 shows an apparent increase in the incidence rates for both white and black males between 1969 and 1985. Although prostate cancer incidence rates have continued to increase for males of both races between 1969 and 1985, the black-white ratios have been constant (1.68 in 1969; and 1.67 in 1985).

Mortality

In 1985, for all cancer sites combined, the age-adjusted cancer mortality rate for white males was 212.5 per 100 000 and 297.9 per 100 000 for black males. The age-adjusted prostate cancer mortality rate in the four geographic regions studied was 21.9 per 100 000 for white males compared with 45.8 for black males (Table 3). These data indicate that the mortality rate from prostate cancer in black males is over twice that of white males, a worse ratio than was evident for incidence.

In 1985, for the entire United States, the prostate cancer mortality rate for black males was 46.5 per 100 000 and 21.5 per 100 000 for white males. Although minor fluctuations occurred during the 17-year period 1969 to 1985, the general trend in prostatic cancer mortality is upward.

Table 4 reports the mortality rates for the four geographic regions included in this study. In 1969, the prostate cancer mortality rate for white males was 21.6 per 100 000 and 33.6 per 100 000 for black males. In 1985, the mortality rate for white males was 21.9 per 100 000 and for black males 45.8 per 100 000. The mortality rates for white males remained fairly consistent between 1969 and 1985. Over the same period, the mortality rate for black males increased overall by 36%.

Survival

Five-year relative survival rates were available from SEER for cases diagnosed during 1978 through 1982

TABLE 4. TEMPORAL TRENDS IN THE AGE-ADJUSTED (1970 US STANDARD) MORTALITY RATES OF PROSTATIC CANCER FOR WHITE AND BLACK MALES: FOUR AREAS 1969-1985

Year	Black Males	White Males
1969	33.6	21.6
1970	38.2	21.1
1971	37.9	20.1
1974	38.6	20.6
1975	42.2	21.4
1976	39.3	22.7
1977	42.6	21.6
1978	48.8	23.3
1979	44.9	23.5
1980	42.4	23.5
1981	44.4	21.6
1982	40.5	22.2
1983	49.3	23.1
1984	49.8	21.8
1985	45.8	21.9

Mortality rates are per 100 000 of the specified population. The four areas are: San Francisco-Oakland, Detroit, Atlanta, and Connecticut.

for black and white males by age and stage of disease for prostate cancer. Based on the data in Table 5, there are generally only minor differences in survival rates between black and white males for localized, regional, and distant stages. Several of the differences, however, are worth discussing.

For localized prostate cancer at age 85 plus, there is a black-white ratio of 1.7. For distant disease at ages 75–79, the ratio is .66 black males surviving for every white male. For all stages and all ages combined, the survival rate for black male is 10% poorer than that for white males (63.3 and 69.2%, respectively).

Stage

For stage of disease 1974 through 1985 SEER data from the four regions is reported. Overall, when examining the data for localized and regional disease there are minimal changes across time for both blacks and whites (Table 6). However, for distant disease, the rate among black males is approximately 50% greater than the rate among white males. The age by disease data (Table 7) indicate that blacks are .65 to 2.0 times as likely to have local disease. The ratio of black to white males ranges from 1.3 to 1.5 for regional disease. The distant disease ratio of black to white is 2.2 to 3.3.

DISCUSSION

The primary question to be addressed in this article is:

TABLE 5. FIVE-YEAR RELATIVE SURVIVAL RATES* (PERCENT) FOR CANCER OF THE PROSTATE GLAND FOR BLACKS AND WHITES BY STAGE OF DISEASE: FOUR AREAS 1978–1982 DIAGNOSES

	Stage of Disease							
	Localized		Regional		Distant		All Stages	
Age	Black	White	Black	White	Black	White	Black	White
50–59	86.8	90.2	74.1	68.2	19.4	20.4	65.6	72.1
60–64	85.9	89.7	70.0	71.5	21.8	26.2	65.7	74.6
65–69	88.0	87.0	72.2	73.4	30.3	32.7	70.1	74.4
70–74	80.8	85.6	66.5	71.5	25.1	28.4	62.8	71.8
75–79	67.9	76.8	52.9	58.3	21.1	31.7	51.9	65.4
80–84	69.9	72.7	—	49.9	25.2	23.1	58.1	59.5
85+	96.2	56.5	—	66.9	17.0	19.2	59.9	47.0
All ages	82.0	82.9	66.4	66.9	24.5	27.4	63.3	69.2

*Indicates that there was not a sufficiently large enough number of cases to produce a reliable rate. The four areas are: San Francisco-Oakland, Detroit, Atlanta, and Connecticut.

TABLE 6. DISTRIBUTION OF STAGE OF DISEASE OF PROSTATIC CANCER FOR BLACKS AND WHITES BY YEAR OF DIAGNOSIS: FOUR AREAS

	Stage of Disease					
	Localized (%)		Regional (%)		Distant (%)	
Year	Black	White	Black	White	Black	White
1974	52.2	56.9	9.2	10.4	28.9	19.5
1975	54.8	56.5	10.0	13.0	27.5	20.0
1976	54.5	58.5	8.6	12.5	27.4	20.1
1977	59.3	59.4	9.6	12.9	24.5	19.3
1978	58.3	58.8	8.2	12.0	28.1	20.8
1979	58.3	61.1	8.6	12.2	29.5	20.1
1980	59.2	64.4	9.4	11.3	29.2	18.7
1981	60.3	65.6	9.3	10.4	27.7	18.9
1982	60.0	64.5	10.0	10.1	26.8	18.8
1983	53.0	60.6	9.1	11.6	28.5	19.3
1984	52.4	60.7	10.4	10.0	25.4	19.2
1985	52.2	59.2	12.0	11.9	26.0	18.9

The four areas are: San Francisco-Oakland, Detroit, Atlanta, and Connecticut.

What are the differences in incidence, survival, and mortality between black and white males who have prostate cancer? Based on the answers to this question, we may ask the more important question: Why have there been no significant changes in these differences in the last 20 years? Furthermore, what have we learned from revisiting prostate cancer[5-11] through repeated epidemiologic analyses that will help to direct the course of biologic research, clinical screening, and early detection of this disease in the US population?[5-11,19-22]

What clues can we gain from the longevity of risk factors for the disease process? A short review of proposed factors in the disease yields the following:

- A hormonal mechanism[19-21] has been postulated because of the prostate gland's dependence on testosterone for growth and functioning. This has led some to believe that levels of testosterone alone or in concordance with other hormones—estradiol or prolactin during phases of pubertal development or in adulthood—is responsible.[21]
- Others believe that behavioral factors—coital frequency, number of sexual partners, use of contraceptive agents[22,23] or dietary factors[24]—affecting testosterone may lead to increased risk of developing cancer of the prostate.
- Another theory is that occupational exposure or factors related to urban living play a role in the development of the cancer. Cadmium exposure (during welding, electroplating, and production of alkaline batteries) has been implicated.

TABLE 7. INCIDENCE RATES OF PROSTATIC CANCER BY AGE AND STAGE OF DISEASE FOR BLACK AND WHITE MALES: FOUR AREAS 1981–1985

	Stage of Disease					
	Localized		Regional		Distant	
Age	Black	White	Black	White	Black	White
40–44	0.9	0.1	0.9	0.1	0.9	0.7
45–49	6.7	0.8	2.1	1.0	5.1	1.0
50–54	24.4	2.6	5.7	4.1	11.4	5.1
55–59	96.2	41.9	18.1	8.3	45.4	12.9
60–64	206.5	106.0	30.7	21.9	95.4	30.7
65–69	348.0	204.3	65.3	41.1	159.8	57.9
70–74	580.7	341.6	72.8	56.8	280.4	107.5
75–79	710.5	485.4	108.0	85.5	369.3	152.3
80–84	820.4	590.9	111.2	78.0	412.5	198.1
85+	613.9	597.2	101.1	100.1	447.8	225.0

Incidence rates are per 100 000 of the specified population. The four areas are: San Francisco-Oakland, Detroit, Atlanta, and Connecticut.

- A dietary role independent of hormone fluctuations has been implicated.[24-25] Specific nutrients such as serum zinc[23] and vitamin A have also been implicated.

The outcome of etiologic studies, however, remains equivocal. Until such studies are enacted in a systematic and exacting manner, the answers to the questions of why such differences in incidence exist and how we may influence the nature of this disease through prevention can not be fully answered.

Survival after the onset of prostate cancer is related to the aggressiveness of the tumor, the stage at which the tumor is detected, the timing and type of treatment, as well as the willingness of the patient to follow the regimen prescribed.

Overall, black males have a poorer survival rate than white males for prostate cancer. To shed some light on why survival for blacks is different than survival for whites, one must look at stage of disease. If we assume that for prostatic cancer, the earlier the disease is caught the better the chances for survival, this would point to behavioral factors, such as delay in seeking treatment, that might influence poorer outcomes. There is limited information in the literature concerning delay in seeking treatment for cancer of the prostate primarily because this cancer is largely asymptomatic in its early stages. Furthermore, many studies indicate that histologic differentiation and clinical stage are highly associated and together are a stronger predictor of outcome than stage at diagnosis alone, as affected by delay in seeking treatment.

Mortality is linked to survival. The number of persons who survive prostate cancer changes the death rate dramatically on a year-by-year basis. Poorer survival outcome means higher mortality rates. These higher mortality rates are reflected in the data analyzed here. Yet in the instance of relatively steady survival rates, stage-for-stage for black and white males, why is there still a 10% poorer overall survival outcome for black males with prostate cancer and why does the trend in mortality continue to rise? The answer remains elusive. To understand the nature of the problem, prostate cancer research may need to focus on the biology of individuals at risk for prostate cancer. Questions concerning pathogenesis, manifestation of tumor burden on bodily systems and differing levels of immunity, as well as biologic aspects of the process are yet to be fully addressed. Aggressiveness of treatment protocol in light of coexistent chronic disease or acute pathology may be an unresolved issue of the differences between black and white males.

Future epidemiologic surveys may focus on socioeconomic differences within as well as among racial groups as a factor affecting health-seeking behavior and eventual outcomes. Occupational risks and lifestyle differences deserve further assessment. These risks and differences can then be evaluated as initiators or cofactors in latent manifestations of prostate cancer. Answers to questions assessing variables such as occupational exposures, intra- and intergroup socioeconomic status, lifestyle, and behavior may provide channels for targeting and directing cancer control interventions in populations at risk for prostate cancer. Admittedly, the exploration of differences in incidence, mortality, and survival from prostate cancer through the examination of SEER data for four regions with

relevant black populations provides a look at only the tip of the iceberg. However, this view provides a glimpse into the nature of the problem in the United States today and sheds additional light on a subject of continuing concern; one that merits further investigation and investment of resources.

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