

# Chapter 22

## Cancer of the Prostate

Ann Hamilton and Lynn A. Gloeckler Ries

### INTRODUCTION

This study provides survival analyses for 275,280 histologically confirmed adult cases of prostate cancer diagnosed from 1988 through 2001. Cases were obtained from the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute (NCI). The SEER Program -- a sequel to two earlier NCI initiatives, the End Results Program and the Third National Cancer Survey -- has evolved in response to the National Cancer Act of 1971, which requires the collection, analysis, and dissemination of data relevant to the prevention, diagnosis, and treatment of cancer. This study analyzes the influence of clinical extent of disease, histologic grade, age at diagnosis, race/ethnicity, SEER registry, and type of therapy on prostate cancer survival.

### MATERIALS AND METHODS

The NCI contracts with medically oriented nonprofit institutions -- such as universities and state health departments -- to obtain data on all cancers diagnosed in residents of the SEER geographic areas. SEER collects data on all invasive and in situ cancers except basal cell and squamous cell carcinomas of the skin and in situ carcinoma of the uterine cervix.

SEER selects participating institutions on the basis of two criteria: their ability to operate and maintain a population-based cancer reporting system and the epidemiologic significance of their population subgroups. At times, registries will withdraw; at times, registries will be added. This analysis is based on data from 12 SEER geographic areas, which collectively contain about 14% of the total US population. The areas are the States of Connecticut, Iowa, New Mexico, Utah, and Hawaii; the metropolitan areas of Detroit, Atlanta, San Francisco, Seattle, San Jose, and Los Angeles; and 10 counties in rural Georgia. Los Angeles contributed data for diagnosis years 1992 to 2001, the others for 1988 to 2001

To ensure maximal ascertainment of cancer cases, each registry abstracts the records of all cancer patients in hospitals, laboratories, and all other health service units that provide diagnostic services. Data collected by SEER registries on each patient include patient demographics, primary tumor site, tumor morphology, diagnostic methods, extent of disease, and first course of cancer-directed therapy. A separate record is coded for each primary cancer. All patients are followed from diagnosis to death, allowing detailed survival analysis.

SEER has collected site-specific extent of disease (EOD) information on all cancers since the inception of the program in 1973. Major changes to EOD were made in 1988 to be compatible with the American Joint Committee on Cancer (AJCC) *Manual for Staging of Cancer*, third edition (1). For prostate cancer, this meant that the extension information was based mainly on results from transurethral resection of the prostate (TURP) and clinical information. In 1994, the prostate EOD schema underwent a major rewrite to attempt to capture both clinical and pathologic assessment of the extension of the tumor to be compatible with the AJCC 4th edition (2). The 4th edition introduced "T1c, tumor identified by a needle biopsy (e.g., because of elevated PSA)" (2). Since the 1994 EOD extension codes were so complicated, it was decided to split the extension information into two fields: one a clinical assessment and the other a pathologic assessment based only on prostatectomy results beginning with cases diagnosed in 1995. In 1998, the AJCC published the 5th edition of the AJCC staging manual (3). Even though there were changes between the 4th and 5th editions, the SEER EOD schemas had enough detail to be converted to either the 4th or 5th edition for cases diagnosed 1995 and forward. The prostate EOD codes can be translated to other staging schemes (AUS, AJCC) and a mapping for extension codes of the EOD is presented in Table 22.1. Therefore, for staging data comparable to AJCC 5th edition, the analyses was limited to only 1995-2001 but for tables/figures which did not contain AJCC 5th edition stage,

Table 22.1: SEER Prostate EOD codes for Clinical Stage, by Year of Diagnosis

SEER Description of Extent of Disease	Approximate correspondence to		SEER EOD Codes used for cases diagnosed during:		
	AUS	AJCC T category, 5th ed.	1988-93	1994	1995-2001
<b>Local Disease</b>					
Clinically inapparent tumor not palpable by imaging; incidentally found microscopic carcinoma in one or both lobes					
Number of foci or % of involved tumor not specified	A, NOS	T1x	10	10	10
≤3 microscopic foci	A1 focal		11	11	11
> 3 microscopic foci	A1 diffuse		12	12	12
Incidental histologic finding in 5% or less of tissue resected		T1a	--	13	13
Incidental histologic finding in more than 5% of tissue resected.		T1b	--	14	14
Tumor identified by needle bx, e.g. for elevated PSA		T1c	--	15	15
<b>Clinically/radiographically apparent</b>					
Involvement of one lobe, NOS	B	T2a	20	20,23	20
½ or less of one lobe involved	B	T2a		21,24	21
More than ½ of one lobe involved, not both lobes	B	T2b		22,26	22
More than one lobe involved	B2	T2b , T2c (6th edition)	25	25,28	23
Clinically apparent tumor confined to prostate, NOS	B,NOS	T2,NOS		27,29	24
Localized, Unknown if apparent or inapparent					
Localized, NOS confined to prostate (not stated if clinically apparent or inapparent)	A,B	T1,T2	30	30,31	30
Into capsule/apex, but still localized					
Into prostatic apex/ arising in apex				48,49	31,33
Extension into apex/arising elsewhere					34
Invasion into (but not beyond) prostatic capsule			40	40,41	32
<b>Regional Disease</b>					
Extension to periprostatic tissue, extracapsular extension (beyond prostatic capsule) NOS, Through capsule, NOS	C1	T3, NOS	50	50	41
Unilateral extracapsular extension		T3a	50	51	42
Bilateral extracapsular extension		T3b	50	52	43
Extraprostatic urethra			50	53	44
Extension to seminal vesicles	C2	T3c	55	55	45
Periprostatic extension , NOS			56	56	49
Extension to or fixation to adjacent structures other than seminal vesicles		T4, NOS	60	60	50
Extension to bladder neck		T4a		61	51
Extension to rectum, external sphincter of rectum		T4a		62	52
<b>Distant Disease</b>					
Extension to levator muscles, skeletal muscle		T4b		65	53
Extension to or fixation to pelvic wall or bone		T4b		70	60
Extension to of fixation to other skeletal muscle					61
Further extension to bone, soft tissue, or other organs	D2			80	70
Metastasis, NOS	D2		85	85	85
Unknown if extension or metastasis			99	99	90

Table 22.2: Cancer of the Prostate: Number of Cases and Exclusions by Reason, 12 SEER Areas, 1988-2001

Number Selected/Remaining	Number Excluded	Reason for Exclusion/Selection
318,776	0	Select 1988-2001 diagnosis (Los Angeles for 1992-2001 only)
290,881	27,895	Select first primary only
288,213	2,668	Exclude death certificate only or at autopsy
282,703	5,510	Exclude unknown race
282,412	291	Exclude alive with no survival time
282,392	20	Exclude children (Ages 0-19)
282,219	173	Exclude in situ cancers for all except breast & bladder cancer
275,327	6,892	Exclude no or unknown microscopic confirmation
275,280	47	Exclude sarcomas

the analyses used 1988-2001 data. For 1988-2001, the EOD data were converted to a more simplistic staging system of localized (confined to the prostate); regional (extension beyond the prostate by direct extension and/or involvement of regional nodes), and distant disease (metastasis). A comparison of the three sets of EOD codes and stage is shown in Table 22.1.

### Relative Survival

The survival analysis is based on relative survival rates calculated by the life-table method. The relative rate is used to estimate the effect of cancer on the survival of the cohort. Relative survival, defined as observed survival divided by expected survival, adjusts for the expected mortality that the cohort would experience from other causes of death. When the 5-year relative survival is 100%, for example, a patient has the same chance to live 5 more years as a cancer-free person of the same race, age and sex.

### Exclusions

The following cases were excluded from the analysis (as shown in Table 22.2): patients for whom prostate cancer was not the first primary, cases identified through autopsy or death certificate only, persons of unknown race, cases without active follow-up, patients less than 20 years old, in situ cases, cases without microscopic confirmation, and sarcomas. After the exclusions, there were 275,280 prostate cases for analysis.

## RESULTS

### Characteristics of Cases

During the 14-year period (1988-2001) during which these cases were diagnosed, 42% were aged 65-74 at diagnosis

compared to 29% 20-64 and 29% aged 75 or over (Table 22.3). Blacks had a higher proportion of cases in the youngest age group compared to whites. Eighty-eight percent of all cases were diagnosed with localized disease, 3% had regional disease, 4% had distant disease, and another 4% had unknown stage of disease. Blacks had a higher proportion with distant disease and unknown stage than did whites (Table 22.4). The majority of all cases (60%), had tumors that were graded as moderately differentiated (Gleason Score 5-7) (Table 22.3).

### Relative Survival by Stage of Disease

Stage of disease at diagnosis is a critical determinant of relative survival among prostate cancer cases. Among all cases, there is 100% relative survival rate at 1, 2, 3, 4, and 5 years after diagnosis (Table 22.4). Blacks fared slightly worse than whites after 3 years from diagnosis. The distribution of cases by stage at diagnosis, will affect the overall group's relative survival rate and blacks had a higher proportion of distant disease cases than whites (Table 22.3), which may contribute to their slightly lower survival. For localized disease, white males and black males had 100% survival through the first 5-years after diagnosis. A 100% relative survival rate does not mean that no men will die from prostate cancer but rather that they do not have excess mortality compared to comparably aged men of the same race. For regional disease, there is a 6 percentage point difference between whites (90%) and blacks (84%) at 5 years. Among those with distant disease, both groups did poorly, approximately 35% survived 5-years (Table 22.4). Figure 22.1 shows the continuous relative survival curve by stage of disease by race over the years after diagnosis.

Relative survival by stage of disease is shown by age at diagnosis in Table 22.5. Men diagnosed under 65 years of age tended to have worse survival for distant disease, than did those diagnosed between 65 and 74 years of age.

Table 22.3: Cancer of the Prostate: Number and Distribution of Cases by Age (20+), Clinical Stage, Grade, and Geographic Area by Race, 12 SEER Areas, 1988-2001

Characteristics	Total		Race			
			White		Black	
	Cases	Percent	Cases	Percent	Cases	Percent
<b>Total</b>	<b>275,280</b>	<b>100.0</b>	<b>227,239</b>	<b>100.0</b>	<b>33,010</b>	<b>100.0</b>
<b>Age (Years)</b>						
20-64	79,778	29.0	64,029	28.2	12,728	38.6
65-74	116,555	42.3	96,869	42.6	13,157	39.9
75+	78,947	28.7	66,341	29.2	7,125	21.6
<b>Clinical Stage of Disease (1995-2001)</b>						
All Stages 1995-2001	150,949	100.0	122,047	100.0	19,686	100.0
All Localized Disease	133,163	88.2	108,522	88.9	16,802	85.3
Clinically inapparent, detected by PSA (T1c)	44,371	29.4	35,781	29.3	6,008	30.5
Other clinically inapparent	8,733	5.8	7,299	6.0	946	4.8
Clinically apparent but confined to prostate	39,884	26.4	32,813	26.9	4,534	23.0
Localized but unknown if apparent or inapparent	17,187	11.4	14,753	12.1	1,939	9.8
Into capsule/apex, but still localized	22,988	15.2	17,876	14.6	3,375	17.1
Regional Disease	5,076	3.4	4,021	3.3	645	3.3
Distant Disease	6,660	4.4	4,864	4.0	1,162	5.9
Unknown Stage	6,050	4.0	4,640	3.8	1,077	5.5
<b>Grade</b>						
Well differentiated; Grade I	34,012	12.4	28,932	12.7	3,276	9.9
Moderately differentiated; Grade II	166,041	60.3	138,415	60.9	19,679	59.6
Poorly differentiated; Grade III	57,270	20.8	45,481	20.0	7,368	22.3
Undifferentiated; anaplastic; Grade IV	1,675	0.6	1,403	0.6	200	0.6
Unknown Grade	16,282	5.9	13,008	5.7	2,487	7.5
<b>Geographic Area</b>						
Atlanta and Rural Georgia	17,681	6.4	12,179	5.4	5,352	16.2
Atlanta (Metropolitan)	16,855	6.1	11,703	5.2	5,004	15.2
Rural Georgia	826	0.3	476	0.2	348	1.1
California						
Los Angeles	45,893	16.7	34,930	15.4	7,624	23.1
Greater Bay Area	44,628	16.2	36,158	15.9	4,418	13.4
San Francisco-Oakland SMSA	30,417	11.0	23,517	10.3	3,984	12.1
San Jose-Monterey	14,211	5.2	12,641	5.6	434	1.3
Connecticut	30,029	10.9	27,542	12.1	2,294	6.9
Detroit (Metropolitan)	42,550	15.5	30,917	13.6	11,401	34.5
Hawaii	8,469	3.1	2,690	1.2	94	0.3
Iowa	25,919	9.4	25,527	11.2	357	1.1
New Mexico	13,002	4.7	12,436	5.5	241	0.7
Seattle (Puget Sound)	32,812	11.9	30,764	13.5	1,151	3.5
Utah	14,297	5.2	14,096	6.2	78	0.2

Total includes other races in addition to White and Black; Based on year of diagnosis and EOD code as shown in Table 22.1

Table 22.4: Cancer of the Prostate: Number and Distribution of Cases and 1-, 2-, 3-, 4-, &amp; 5-Year Relative Survival Rates (%) by Clinical Stage and Race, Ages 20+, 12 SEER Areas, 1995-2001

Race/Stage	Cases	Percent	Relative Survival Rate (%)				
			1-Year	2-Year	3-Year	4-Year	5-Year
<b>All Races</b>	<b>150,949</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
All Localized Disease	133,163	88.2	100.0	100.0	100.0	100.0	100.0
Clinically inapparent, detected by PSA (T1c)	44,371	29.4	100.0	100.0	100.0	100.0	100.0
Other clinically inapparent	8,733	5.8	99.9	99.9	99.7	98.2	97.9
Clinically apparent by confined to prostate	39,884	26.4	100.0	100.0	100.0	100.0	100.0
Local but unknown if apparent or inapparent	17,187	11.4	100.0	100.0	100.0	100.0	100.0
Into capsule/apex, but still localized	22,988	15.2	100.0	100.0	100.0	100.0	100.0
Regional Disease	5,076	3.4	99.8	96.9	94.4	91.7	88.7
Distant Disease	6,660	4.4	81.7	61.5	50.1	42.5	36.5
Unknown	6,050	4.0	97.5	94.3	91.9	90.0	87.1
<b>White</b>	<b>122,047</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
All Localized Disease	108,522	88.9	100.0	100.0	100.0	100.0	100.0
Clinically inapparent, detected by PSA (T1c)	35,781	29.3	100.0	100.0	100.0	100.0	100.0
Other clinically inapparent	7,299	6.0	100.0	100.0	99.8	98.4	98.0
Clinically apparent by confined to prostate	32,813	26.9	100.0	100.0	100.0	100.0	100.0
Local but unknown if apparent or inapparent	14,753	12.1	100.0	100.0	100.0	100.0	100.0
Into capsule/apex, but still localized	17,876	14.6	100.0	100.0	100.0	100.0	100.0
Regional Disease	4,021	3.3	99.9	97.0	94.8	92.3	89.6
Distant Disease	4,864	4.0	81.2	61.1	49.6	42.2	35.5
Unknown	4,640	3.8	97.7	95.1	93.0	91.5	88.4
<b>Black</b>	<b>19,686</b>	<b>100.0</b>	<b>100.0</b>	<b>99.3</b>	<b>99.1</b>	<b>98.5</b>	<b>98.1</b>
All Localized Disease	16,802	85.3	100.0	100.0	100.0	100.0	100.0
Clinically inapparent, detected by PSA (T1c)	6,008	30.5	100.0	100.0	100.0	100.0	100.0
Other clinically inapparent	946	4.8	99.4	99.4	99.2	96.6	96.6
Clinically apparent by confined to prostate	4,534	23.0	100.0	100.0	100.0	100.0	100.0
Local but unknown if apparent or inapparent	1,939	9.8	100.0	100.0	100.0	100.0	100.0
Into capsule/apex, but still localized	3,375	17.1	100.0	100.0	100.0	100.0	100.0
Regional Disease	645	3.3	98.6	95.7	90.3	88.3	83.8
Distant Disease	1,162	5.9	80.5	58.9	46.7	38.4	35.1
Unknown	1,077	5.5	97.0	91.8	88.1	84.6	81.3

### Relative Survival by Geographic Area

The SEER Registries contributing over 15% of the cases each included Detroit and Los Angeles (which included cases from 1992-2001), followed by Seattle, San Francisco-Oakland SMSA, Connecticut, and Iowa contributing between 10-12% each, and then by Atlanta, Utah, San Jose-Monterey, and New Mexico with 5-6% each. In addition, 3% of the cases were from Hawaii and 0.3% from rural Georgia. The black cases were largely from 4 registries including Detroit, Los Angeles, Atlanta, and San Francisco-Oakland SMSA (Table 22.6). Table 22.6 shows relative survival by stage of disease by SEER Registry.

Survival differences by geographic area were minimal within each stage group (Table 22.6).

### Relative Survival by Tumor Grade

In addition to stage at diagnosis, tumor grade plays an important role in prostate cancer survival. Tumor grade reflects the cell differentiation and/or Gleason score. Grade I is well differentiated and/or Gleason scores of 2-4; grade II is moderately differentiated and/or Gleason scores of 5-7; grade III is poorly differentiated and/or Gleason scores of 8-10; and grade IV is undifferentiated or anaplastic. Figure 22.2 shows the relative survival

Table 22.5: Cancer of the Prostate: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8-, & 10-Year Relative Survival Rates (%) by Clinical Stage and Age (20+), 12 SEER Areas, 1988-2001

Stage/Age (Years)	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
<b>Localized Disease</b>	<b>214,858</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>99.5</b>
20-64	66,381	30.9	100.0	100.0	100.0	100.0	100.0	100.0
65-74	92,156	42.9	100.0	100.0	100.0	100.0	100.0	100.0
75+	56,321	26.2	100.0	100.0	100.0	100.0	100.0	98.2
<b>Regional Disease</b>	<b>21,448</b>	<b>100.0</b>	<b>100.0</b>	<b>99.6</b>	<b>98.4</b>	<b>96.0</b>	<b>93.5</b>	<b>92.1</b>
20-64	6,107	28.5	100.0	98.8	97.3	93.5	89.1	86.8
65-74	10,304	48.0	100.0	100.0	100.0	99.0	97.2	96.9
75+	5,037	23.5	99.5	97.3	94.9	91.7	88.4	85.8
<b>Distant Disease</b>	<b>17,374</b>	<b>100.0</b>	<b>82.8</b>	<b>62.5</b>	<b>49.9</b>	<b>35.4</b>	<b>23.4</b>	<b>19.0</b>
20-64	3,623	20.9	85.4	62.0	47.7	31.9	20.4	16.6
65-74	6,318	36.4	85.5	64.8	51.6	36.6	25.1	20.9
75+	7,433	42.8	79.1	60.6	49.5	36.8	24.7	20.4
<b>Unknown</b>	<b>21,600</b>	<b>100.0</b>	<b>99.0</b>	<b>97.0</b>	<b>94.8</b>	<b>90.5</b>	<b>83.7</b>	<b>79.7</b>
20-64	3,667	17.0	98.8	96.1	93.5	89.5	84.8	81.4
65-74	7,777	36.0	98.8	97.0	94.9	91.8	85.9	83.1
75+	10,156	47.0	99.2	97.4	95.4	90.0	81.3	76.0

by tumor grade for up to 10 years after diagnosis. There was 100% relative survival rate at 10 years for grade I (with Gleason scores of 2-4). Those with grade II tumors (Gleason scores 5-7) did well through 10 years with a 10 year survival rate of 99%. (Note: the Grade II survival curve is on top of the Grade I curve in Figure 22.2). The largest declines in survival with increasing time after

diagnosis are seen for those with poorly differentiated, undifferentiated, or unknown tumor grade. By 10 years after diagnosis, relative survival was 73% for those with unknown tumor grade, 69% for those with grade IV (Gleason scores of 8-10) and 50% for those with undifferentiated or anaplastic tumors.

Figure 22.1: Cancer of the Prostate: Relative Survival Rates (%) by Clinical Stage and Race, Ages 20+, 12 SEER Areas, 1988-2001

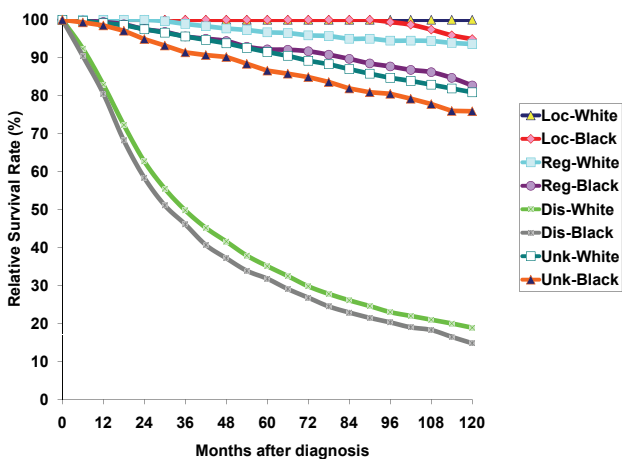


Figure 22.2: Cancer of the Prostate: Relative Survival Rates (%) by Grade, Ages 20+, 12 SEER Areas, 1988-2001

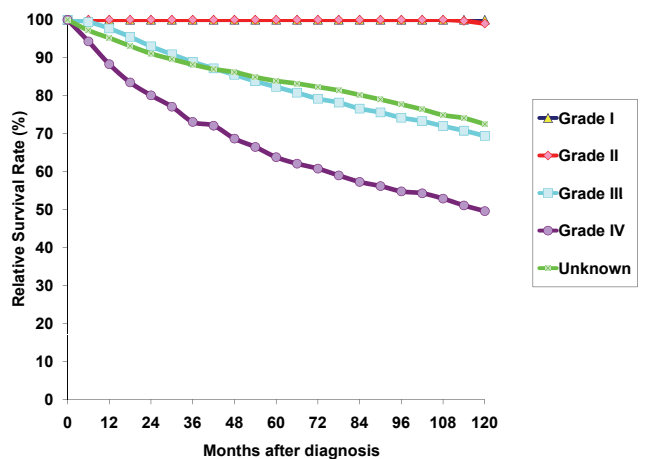




Table 22.6: Cancer of the Prostate: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8- & 10-Year Relative Survival Rates (%) by Clinical Stage and SEER Geographic Area, Ages 20+, 12 SEER Areas, 1988-2001

Stage/Geographic Area	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
<b>All Stages</b>	<b>275,280</b>	<b>100.0</b>	<b>100.0</b>	<b>99.5</b>	<b>98.9</b>	<b>97.6</b>	<b>94.5</b>	<b>91.7</b>
Atlanta and Rural Georgia	17,681	6.4	99.7	99.0	98.1	96.5	93.1	90.2
Atlanta (Metropolitan)	16,855	6.1	99.9	99.1	98.4	97.0	94.0	91.1
Rural Georgia	826	0.3	97.0	95.9	91.8	86.4	72.9	68.6
California								
Los Angeles	45,893	16.7	100.0	100.0	100.0	99.6	97.1	95.1
Greater Bay Area	44,628	16.2	100.0	99.4	98.8	97.3	94.1	91.4
San Francisco-Oakland SMSA	30,417	11.0	100.0	99.1	98.4	96.9	93.7	90.5
San Jose-Monterey	14,211	5.2	100.0	100.0	99.6	98.2	95.0	93.2
Connecticut	30,029	10.9	99.9	98.9	97.7	96.2	92.3	87.4
Detroit (Metropolitan)	42,550	15.5	99.7	99.0	98.3	96.5	93.1	90.3
Hawaii	8,469	3.1	99.4	98.1	96.7	94.8	89.9	85.4
Iowa	25,919	9.4	99.9	99.0	97.9	95.6	92.0	88.7
New Mexico	13,002	4.7	99.9	99.3	98.3	97.3	94.2	91.9
Seattle (Puget Sound)	32,812	11.9	100.0	100.0	100.0	100.0	97.8	96.4
Utah	14,297	5.2	100.0	100.0	100.0	99.4	98.9	97.7
<b>Localized Disease</b>	<b>214,858</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>99.5</b>
Atlanta and Rural Georgia	13,057	6.1	100.0	100.0	100.0	100.0	100.0	98.2
Atlanta (Metropolitan)	12,509	5.8	100.0	100.0	100.0	100.0	100.0	98.9
Rural Georgia	548	0.3	99.8	99.8	98.9	95.4	84.6	79.7
California								
Los Angeles	36,067	16.8	100.0	100.0	100.0	100.0	100.0	100.0
Greater Bay Area	33,957	15.8	100.0	100.0	100.0	100.0	100.0	100.0
San Francisco-Oakland SMSA	23,141	10.8	100.0	100.0	100.0	100.0	100.0	100.0
San Jose-Monterey	10,816	5.0	100.0	100.0	100.0	100.0	100.0	100.0
Connecticut	24,213	11.3	100.0	100.0	100.0	100.0	99.4	94.2
Detroit (Metropolitan)	33,968	15.8	100.0	100.0	100.0	100.0	99.8	97.1
Hawaii	6,599	3.1	100.0	100.0	100.0	100.0	98.0	93.9
Iowa	19,204	8.9	100.0	100.0	100.0	100.0	100.0	97.2
New Mexico	11,004	5.1	100.0	100.0	100.0	100.0	99.8	96.9
Seattle (Puget Sound)	25,691	12.0	100.0	100.0	100.0	100.0	100.0	100.0
Utah	11,098	5.2	100.0	100.0	100.0	100.0	100.0	100.0

Note: table continued on next page

Relative survival rates for blacks were lower than for whites for each tumor grade category, except for grade I where the differences were on the order of only 0.2% (Figure 22.3). (Note: The survival curves for grade I and II for whites and grade I for blacks were so similar that only the line for grade II for whites is visible in Figure 22.3).

### Relative Survival by Stage of Disease and Tumor Grade

With both stage at diagnosis and tumor grade affecting relative survival, Figures 22.4-22.7 show relative survival rates

for each of the four stages of disease (localized, regional, distant, and unknown) separately by tumor grade. For both localized and regional disease (Figures 22.4 and 22.5) there is little difference in relative survival rates between those with well differentiated (grade I) and moderately differentiated tumors (grade II). (Note: For Figures 22.4 and 22.5, the survival curve for grade I is hidden by the survival curve for grade II). Those with poorly differentiated (grade III) and undifferentiated/anaplastic (grade IV) tumors showed marked declines in relative survival over time, with the latter group declining to 72% for those with localized disease and to 51% in those with regional disease

Table 22.6 (continued): Cancer of the Prostate: Number and Distribution of Cases and 1-, 2-, 3-, 5-, 8- &amp; 10-Year Relative Survival Rates (%) by Clinical Stage and SEER Geographic Area, Ages 20+, 12 SEER Areas, 1988-2001

Stage/Geographic Area	Cases	Percent	Relative Survival Rate (%)					
			1-Year	2-Year	3-Year	5-Year	8-Year	10-Year
<b>Regional Disease</b>	<b>21,448</b>	<b>100.0</b>	<b>100.0</b>	<b>99.6</b>	<b>98.4</b>	<b>96.0</b>	<b>93.5</b>	<b>92.1</b>
Atlanta and Rural Georgia	1,052	4.9	99.9	99.6	96.5	94.5	93.3	88.5
Atlanta (Metropolitan)	1,004	4.7	99.7	99.4	96.5	94.4	93.1	88.5
Rural Georgia	48	0.2	100.0	100.0	96.3	93.9	87.9	81.6
<b>California</b>								
Los Angeles	3,316	15.5	100.0	99.8	99.3	98.8	97.1	97.1
Greater Bay Area	4,537	21.2	100.0	99.8	99.2	96.6	94.3	92.3
San Francisco-Oakland SMSA	3,182	14.8	100.0	99.8	99.0	96.8	93.6	90.5
San Jose-Monterey	1,355	6.3	100.0	99.9	99.7	96.0	94.8	94.8
Connecticut	1,587	7.4	99.4	97.3	96.2	92.7	89.8	86.5
Detroit (Metropolitan)	2,307	10.8	99.4	97.8	94.4	91.5	88.8	87.6
Hawaii	753	3.5	99.9	98.6	96.8	92.6	85.7	83.3
Iowa	2,516	11.7	100.0	99.9	98.7	95.9	93.4	91.7
New Mexico	918	4.3	100.0	100.0	98.9	96.0	94.7	94.6
Seattle (Puget Sound)	3,244	15.1	100.0	100.0	100.0	97.0	92.9	91.6
Utah	1,218	5.7	99.8	99.8	99.8	99.3	98.0	96.6
<b>Distant Disease</b>	<b>17,374</b>	<b>100.0</b>	<b>82.8</b>	<b>62.5</b>	<b>49.9</b>	<b>35.4</b>	<b>23.4</b>	<b>19.0</b>
Atlanta and Rural Georgia	993	5.7	79.3	58.6	47.3	32.6	22.5	16.9
Atlanta (Metropolitan)	914	5.3	80.1	59.2	47.7	33.7	23.4	18.2
Rural Georgia	79	0.5	70.1	51.5	42.6	19.9	11.0	3.4
<b>California</b>								
Los Angeles	2,619	15.1	82.7	63.2	52.6	38.6	25.6	20.0
Greater Bay Area	3,314	19.1	84.5	63.4	49.2	36.0	23.5	19.4
San Francisco-Oakland SMSA	2,345	13.5	84.1	63.2	48.8	35.7	23.2	18.2
San Jose-Monterey	969	5.6	85.4	63.9	50.1	36.4	24.4	22.4
Connecticut	1,930	11.1	81.1	60.4	46.5	32.0	20.3	16.8
Detroit (Metropolitan)	2,489	14.3	76.1	56.0	45.7	32.2	21.6	17.6
Hawaii	796	4.6	87.7	71.2	60.5	45.8	35.3	28.5
Iowa	2,106	12.1	86.2	65.7	51.3	34.5	22.4	18.3
New Mexico	721	4.1	81.0	60.3	47.6	31.6	16.6	11.8
Seattle (Puget Sound)	1,620	9.3	86.9	65.5	51.1	35.7	21.8	17.6
Utah	786	4.5	85.9	66.1	53.2	39.3	29.4	24.6

at 10 years after diagnosis. For those with distant disease (Figure 22.6), even those with grade I tumors had only a 45% relative survival rate by 10 years after diagnosis while those with grade IV tumors experienced a relative survival rate of 3% at 10 years. Cases with unknown stage (Figure 22.7) displayed a pattern that appeared to be intermediate between those with regional disease and distant disease. For unknown stage (Figure 22.7), those with grade I tumors did well, with a relative survival of 100% by 10 years, but those with grade II experienced a decline to 89% by 10 years, unlike cases with comparable tumor grade who had regional disease. For unknown stage, the survival rates for

grade III and grade IV were similar. While men with grade III regional disease had a relative survival rate of 51% at 10 years, the comparable figure was 58% for those with unknown stage. The difference in relative survival for the grade IV was the most extreme between those diagnosed with localized disease and those with distant disease. Among the former, the relative survival was 72% at 10 years compared to 3% among the latter. Thus, the importance of diagnosing aggressive tumors at an early stage is critical.



Figure 22.3: Cancer of the Prostate: Relative Survival Rates (%) by Grade and Race, Ages 20+, 12 SEER Areas, 1988-2001

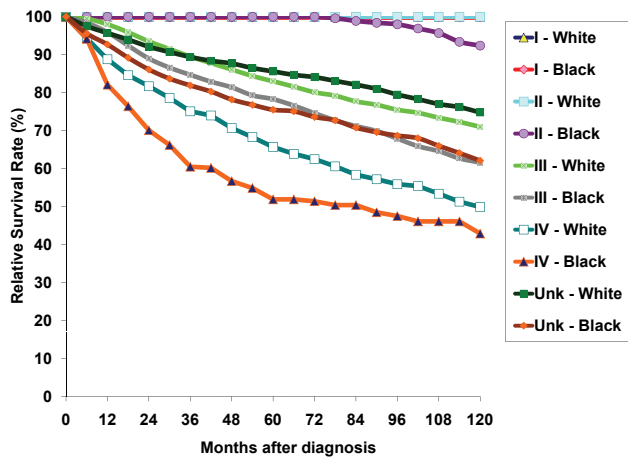
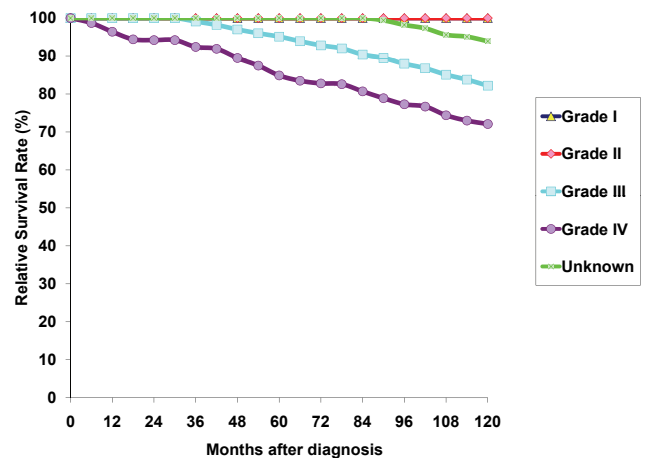


Figure 22.4: Localized Cancer of the Prostate: Relative Survival Rates (%) by Grade, Ages 20+, 12 SEER Areas, 1988-2001



Relative Survival by Year of Diagnosis

During this time period there have been major changes in the treatment and diagnosis of prostate cancer, including the use of anti-androgens in the late 1980's, the advent of PSA testing and screening beginning in 1986, and the increasing use of surgery to treat the disease (4). Figure 22.8 shows the dramatic improvement in survival that occurred from 1988-89 to 1990-91 and then again from 1990-91 to 1992-93. Since that time survival has remained relatively constant at a very high level. (Note: the survival rates are so similar after 1996, that it is hard to distinguish the curves in Figures 22.8 and 22.9). Similar trends are seen for whites (Figure 22.9) and blacks (Figure 22.10), although improvement for blacks has continued to be seen from 1992-93, 1994-95 and in 1996-97. This continuation of the survival increase for black men has had the result of putting their survival on par with those of white men. This is in contrast to the

large survival gap that existed in 1988-89 when the 10-year relative survival rate for white men was 81% compared to only 62% for black men.

DISCUSSION

Overall, relative survival for prostate cancer has continued to improve over time (5). In 1986, for example, 5- and 10-year relative survival rates were 78% and 68%, respectively, whereas they hover near 100% at 5 years since 1994. Prognosis is excellent for those with early stage disease and especially for those with well differentiated (grade I) tumors.

Many of the survival rates were 100% or close to 100%. The survival is being measured relative to the general population matched on race and age. These high rates do not mean that the men don't have any deaths due to prostate

Figure 22.5: Regional Cancer of the Prostate: Relative Survival Rates (%) by Grade, Ages 20+, 12 SEER Areas, 1988-2001

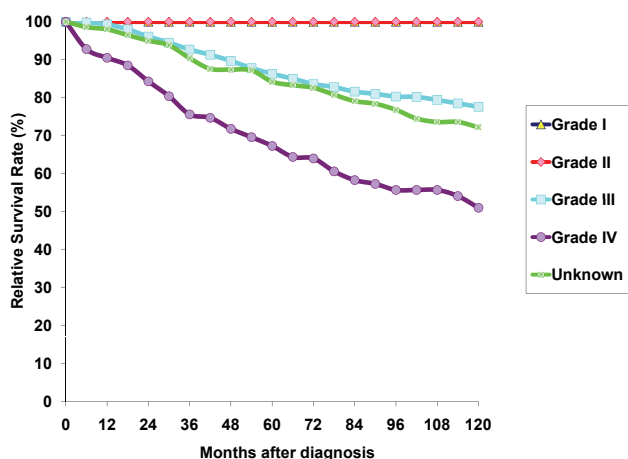
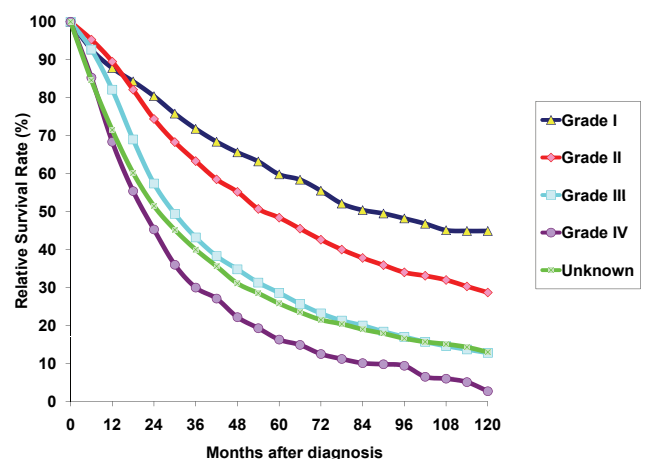
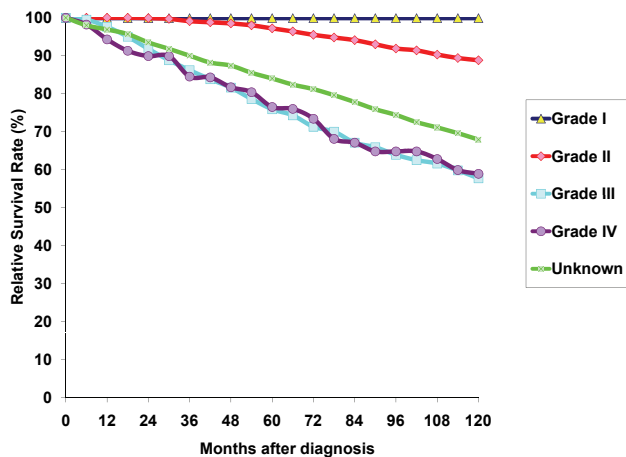


Figure 22.6: Distant Cancer of the Prostate: Relative Survival Rates (%) by Grade, Ages 20+, 12 SEER Areas, 1988-2001



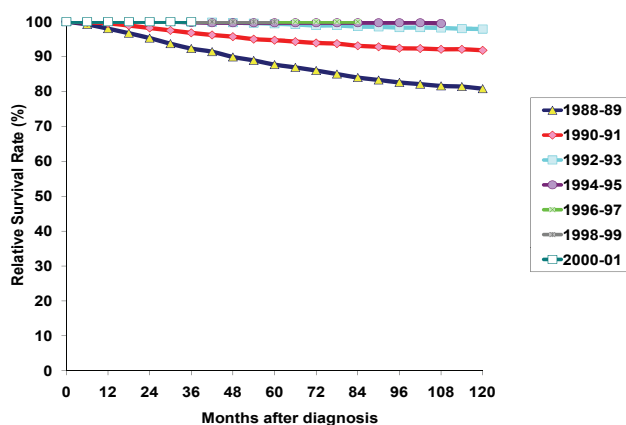
**Figure 22.7: Cancer of the Prostate with Unknown Stage: Relative Survival Rates (%) by Grade, Ages 20+, 12 SEER Areas, 1988-2001**



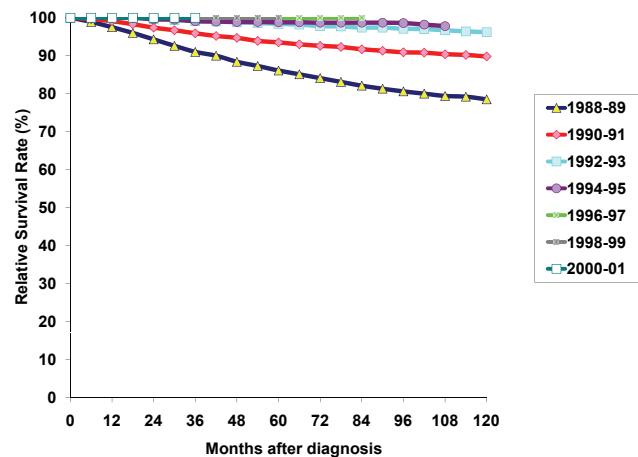
cancer but rather when their cancer and non-cancer deaths are taken together, their survival profile was similar to the general population. They may be under more medical surveillance than the general population and therefore, have a better overall survival from non-cancer causes than the general population which offsets the excess prostate cancer mortality.

Survival for those diagnosed with distant disease and with poorly and undifferentiated tumors is poor, pointing to the benefit of earlier diagnosis. Even within stage, grade was an important prognostic factor. Relative survival is poorer for blacks than whites, even within stage and tumor grade categories. Since survival has continued to improve among blacks and there have only been slight additional incremental improvements in relative survival among whites, the survival gap between white men and black men has lessened considerably.

**Figure 22.9: Cancer of the Prostate: Relative Survival Rates (%) for Whites by Year of Diagnosis, Ages 20+, 12 SEER Areas, 1988-2001**



**Figure 22.8: Cancer of the Prostate: Relative Survival Rates (%) for All Races by Year of Diagnosis, Ages 20+, 12 SEER Areas, 1988-2001**



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**Figure 22.10: Cancer of the Prostate: Relative Survival Rates (%) for Blacks by Year of Diagnosis, Ages 20+, 12 SEER Areas, 1988-2001**

