PROSTATE CANCER INCIDENCE AND MORTALITY IN ARIZONA 1990-1997

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ARIZONA DEPARTMENT OF HEALTH SERVICES
BUREAU OF PUBLIC HEALTH STATISTICS

by
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Preface

American society at many levels is now seriously considering the implications of early detection of prostate cancer and its treatment. This report describes Arizona's statistics about prostate cancer from 1990-1997 in the context of current diagnosis, staging, and treatment. It is intended to inform cancer registrars, physicians and other health professionals, and the public about the status and progress being made in managing prostate cancer.

Executive Summary

Highlights of the Prostate Cancer Incidence and Mortality In Arizona, 1990-1997 report:

- More than any other cancer, prostate cancer increases in incidence with age. Approximately 99% of all Arizona prostate cancer cases in 1995-1997 occurred in men age 50 and older.

- In Arizona, the five most common cancers for men in 1990-1997 were prostate, lung, colorectal, bladder, and lymphoma. The prostate cancer age-adjusted incidence rate is 30-40% higher than the lung cancer incidence rate, and 75% higher than either bladder cancer or lymphoma.

- The highest incidence rates of prostate cancer in Arizona occurred among African American men and Caucasian men. Native American and Asian men had dramatically lower incidence rates of prostate cancer from 1990-1997.

- In 1995-1997 the highest annualized age-adjusted incidence rate of prostate cancer occurred in Navajo county(135 per 100,000), followed by Pima, Maricopa, Coconino, and Pinal counties.

- The overall Arizona age-adjusted incidence rate for prostate cancer over the three year period of 1995 to 1997 was 122 per 100,000.

- In 1990-1997, approximately 55-65% of all Arizona prostate cancer cases were diagnosed in the earliest or local stage. Only 4% were diagnosed in the distant or most metastasized stage.

- In Arizona, for 1995-1997, over 60% of prostate cancer cases among Caucasian and African American men were diagnosed in local stage. About 55% of cases among Asian men were diagnosed in local stage, and only 45% of cases among Native American men were diagnosed in local stage.

- In Arizona from 1995-1997 the most common types of treatment for all stages of prostate cancer were surgery alone, radiation alone, or no treatment.

- For patients diagnosed with local disease, the most common combination treatments were radiation/ hormonal therapy, surgery/ hormonal therapy, and surgery/ radiation. For patients with regional disease, the most common combination treatments were surgery/ hormonal therapy, and surgery/radiation. For patients with distant disease, the most common combination treatments were surgery/ hormonal therapy, and radiation/ hormonal therapy. Surgery alone was the fifth most common type of treatment chosen for these patients.

- The most common type of surgery performed for men diagnosed in either local or regional summary stage was a radical prostatectomy, whereas the most common type of surgery for late stage prostate cancer cases was trans-urethral resection of the prostate (TURP).

- Several known risk factors of prostate cancer include age, race, behavioral factors, and genetic factors such as a family history of the disease. A variety of dietary factors, including dietary fat and antioxidants, have also been proposed to either promote prostate cancer, or have an inverse association with prostate cancer.

- The Arizona Behavioral Risk Factor Survey suggests that in 1995 through 1997, Arizona men over age 50 were living relatively healthy lifestyles when risk factors related to an increased risk of prostate cancer were reviewed. These included daily intake of fruits and vegetables, physical activity and drinking habits.

- Men diagnosed with localized stage or regional stage prostate cancer in 1990-1995 had a 98% and 96% survival rate, respectively, after five years of diagnosis.

- Since 1990, the Arizona prostate cancer age-adjusted mortality rate is at an eight-year low, with a rate of 15/100,000 in 1997. The highest mortality rate in those eight years was in 1991 and 1995 with a rate of 17.2/100,000. Arizona's age-adjusted mortality rate of prostate cancer is consistently lower than the US rate that decreased to 22.5/100,000 in 1997, and was as high as 26.7/100,000 in 1991.

- The counties with the highest prostate cancer mortality rate for the period of 1995 to 1997 were Graham, Cochise, Santa Cruz, Coconino, and Pima counties.

Prostate Cancer in Arizona, 1990-1997

I. Introduction

Prostate cancer is the most commonly diagnosed cancer, other than skin cancer, among men in the United States and is second only to lung cancer as a cause of cancer-related death among men. From 1990 to 1997, the age-adjusted incidence rate of prostate cancer in Arizona was consistently lower than the U.S. national age-adjusted incidence rate generated by the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute. This report summarizes the incidence, mortality and behavioral risk factors associated with prostate cancer for men in Arizona during the 1990s, focusing primarily on the years 1995 to 1997.

The report is divided into eight sections. Section II discusses the incidence of prostate cancer in Arizona and nationwide, the demographic factors of prostate cancer such as age and race among men in Arizona, the incidence rates of prostate cancer versus the next five most common cancers for men in Arizona for 1990-1997, and prostate cancer incidence rates by county for 1995-1997. Section III discusses early detection and screening methods and the diagnosis of prostate cancer, including: clinical markers reported to the Arizona Cancer Registry (Prostate Specific Antigen (PSA) test and Prostatic Acid Phosphatase (PAP) test); the Gleason score; the histo-pathological grade; and the histology of prostate cancer cases in Arizona. The staging of prostate cancer is discussed in Section IV. Discussion includes both SEER summary staging and staging from the American Joint Committee on Cancer (AJCC). Current treatments for prostate cancer are discussed in Section V, including the types of treatment by SEER summary stage. Section VI describes the results of the Arizona Behavioral Risk Factor Survey in 1995-1997 that show behavioral risk factors associated with the incidence of prostate cancer, such as daily intake of fruits and vegetables, the amount of alcohol consumed, and the overall physical activity of men in Arizona. Section VII shows a five year relative survival curve from 1990-1995 for prostate cancer cases. Finally, Section VIII shows the age-adjusted mortality rates of prostate cancer in Arizona compared to the U.S. in 1990-1997, the prostate cancer mortality rates compared to the next four most common types of cancer causes of death for men in Arizona, and the age adjusted mortality rates for prostate cancer by county in 1995-1997.

II. Prostate Cancer Incidence

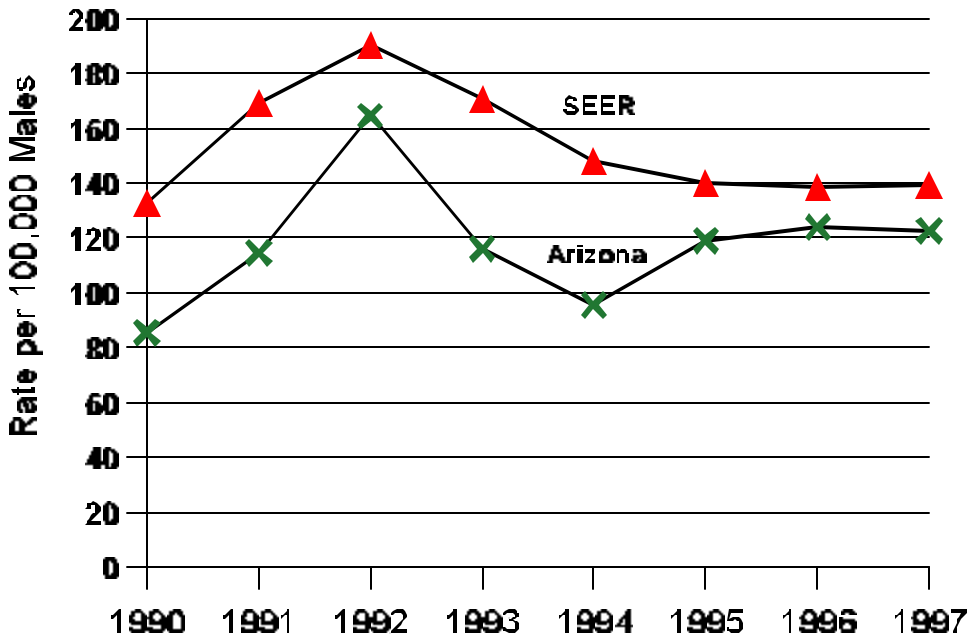
The American Cancer Society estimates that 180,400 new prostate cancer cases will be diagnosed in the U.S. and that approximately 31,900 men will die of the disease in 2000.[1] The known risk factors for prostate cancer include age, race, and family history. Other possible risk factors with less clear roles that are subject to much speculation and debate include animal fat content of the diet, phytochemicals, testosterone and its metabolism, and vasectomy.[2] More than any other cancer, prostate cancer increases in incidence with age. This cancer is most common among men age 65 years or older. About 80% of all men with clinically diagnosed cases of prostate cancer are in this age group. A number of populations at high risk for developing this cancer have been identified. The most striking difference is the significant racial variation in prostate cancer incidence and mortality. African-American men have the highest prostate cancer incidence and mortality rates, which are nearly double the rates observed in white men in the United States.[2] In contrast, the incidence and mortality of prostate cancer among Asian men are exceedingly low.[2]

Prostate cancer appears to exist in two forms: a latent or "dormant" form that can be identified in approximately 30% of men over the age of 50 and 60%-70% of men over the age of 80; and a clinically evident, or more "active" form, that will affect approximately 1 out of 5 American men in their lifetimes. [3] It is believed that the latent form of prostate cancer is a precursor to the clinically evident form, separated from each other by time and/or promotional events. However, this concept remains unproven.[3] The incidence of the latent form of prostate cancer is surprisingly constant among the different racial groups, despite the definitive racial variation in the overall incidence of clinical prostate cancer. This suggests that behavioral or genetic factors may play a role in promoting prostate cancer once initiating events have occurred (see the Risk Factors for Prostate Cancer section).[2]

Prostate Cancer Incidence Data

The Arizona Cancer Registry (ACR) is a population-based surveillance system for the collection, management, and analysis of information on incidence and survival for persons having been diagnosed with cancer. Reporting sources include hospitals, clinics, physicians, and pathology laboratories. A majority of cases are reported by hospitals in Arizona. Data from the Arizona Cancer Registry were examined to analyze the number of men diagnosed with prostate cancer in 1990-1997, emphasizing the years 1995 to 1997. The following sections show the results of these analyses. The age-adjusted incidence rate of prostate cancer in Arizona is consistently lower than the U.S. national incidence rate generated by the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute in the years 1990 to 1997 (See Figure 1).

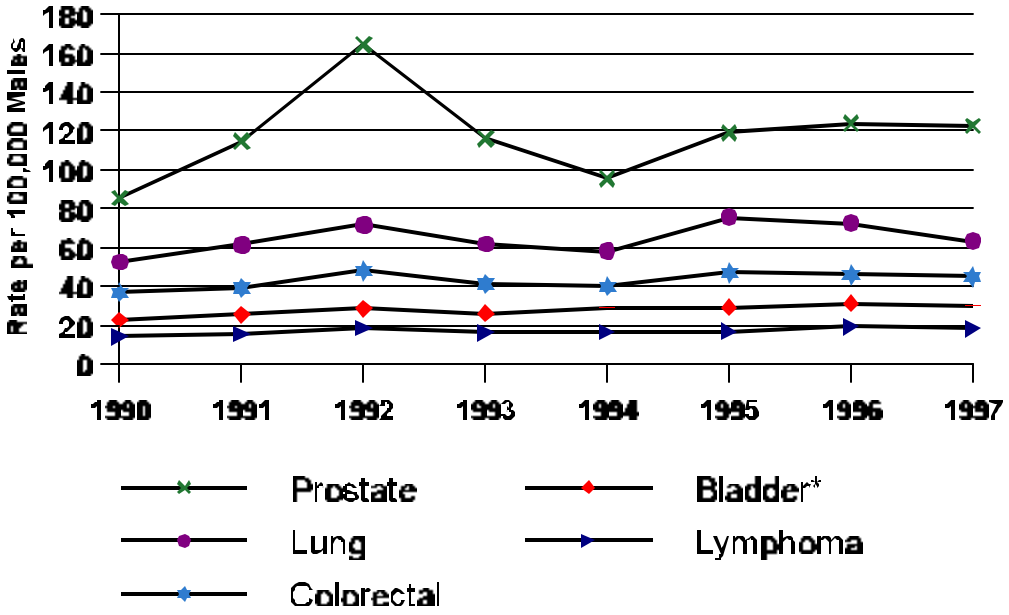
Figure 1. Age-Adjusted Incidence Rates of Prostate Cancer, Arizona vs. SEER, 1990-1997



Also, since 1992, the first year when the PSA blood test was used to screen for prostate cancer on a broad basis, the national rate has been declining. In Arizona, 1992 was the first year that mandatory reporting was required, which also contributed to the rise in the number of prostate cancer cases reported for that year. The age-adjusted rate rose again after 1994, which is probably attributable to an increased effort by the ACR to collect prostate cancer cases from the pathology laboratories in the state.

In Arizona, the five most common cancers for men in 1990-1997 were prostate, lung, colorectal, bladder, and lymphoma. The age-adjusted rates in Figure 2 indicate that prostate cancer is by far the most common. In fact, for this eight year time frame, the prostate cancer age-adjusted incidence rate is on average 30-40 percent higher than lung cancer, the next highest cancer incidence rate, and 75% higher than either bladder cancer or lymphoma, the fourth and fifth highest cancer incidence rates for Arizona men.

Figure 2. **Age-Adjusted Incidence Rates of the Five Most Common Cancers Among Arizona Males, 1990-1997**



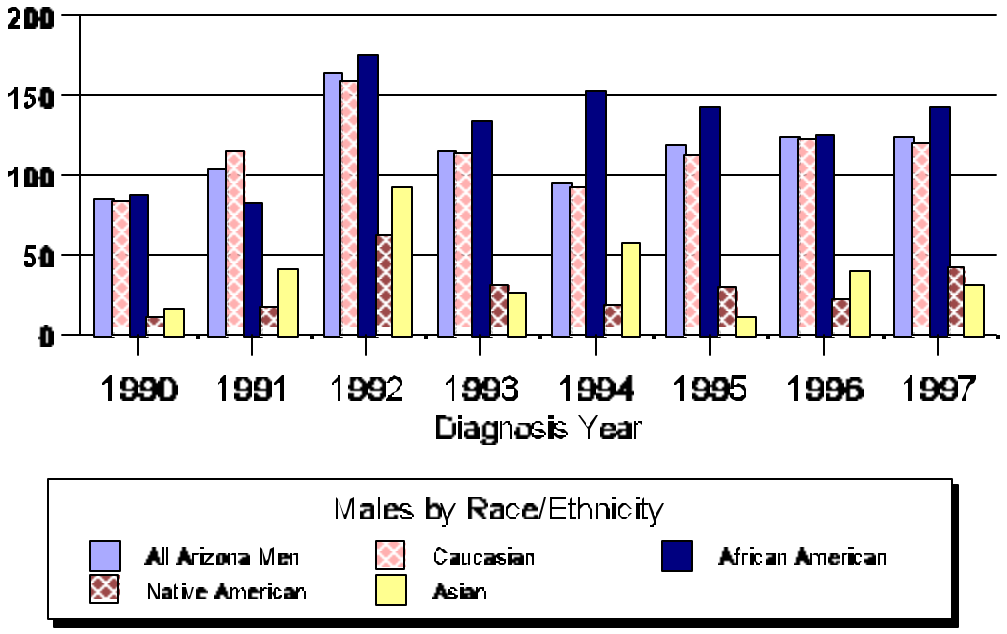
* Bladder cases include both invasive and in situ cases.

Age-Adjusted Incidence Rates for the Top 5 Cancers for Men

Primary Site	1990	1991	1992	1993	1994	1995	1996	1997
Prostate	85.33	114.60	164.49	116.06	95.53	119.09	123.82	122.67
Lung	52.41	61.47	71.56	61.68	57.81	75.48	72.23	63.19
Colorectal	36.79	39.16	48.03	41.20	39.88	47.02	46.00	44.78
Bladder	22.57	25.34	28.26	25.92	28.85	28.93	31.03	29.87
Lymphoma	14.16	15.52	18.48	16.17	16.45	16.67	19.20	18.31

For this same period of time, the incidence rates of prostate cancer were compared by race (see Figure 3). The highest age-adjusted incidence rate of prostate cancer occurred among African American men, followed by Caucasian men. Native American and Asian men have dramatically lower incidence rates of prostate cancer for the eight year period. In 1992, incidence rates for all races were higher because of the increased use of the PSA screening test.

Figure 3. Age-Adjusted Incidence Rates of Prostate Cancer By Race, 1990-1997



County Rates

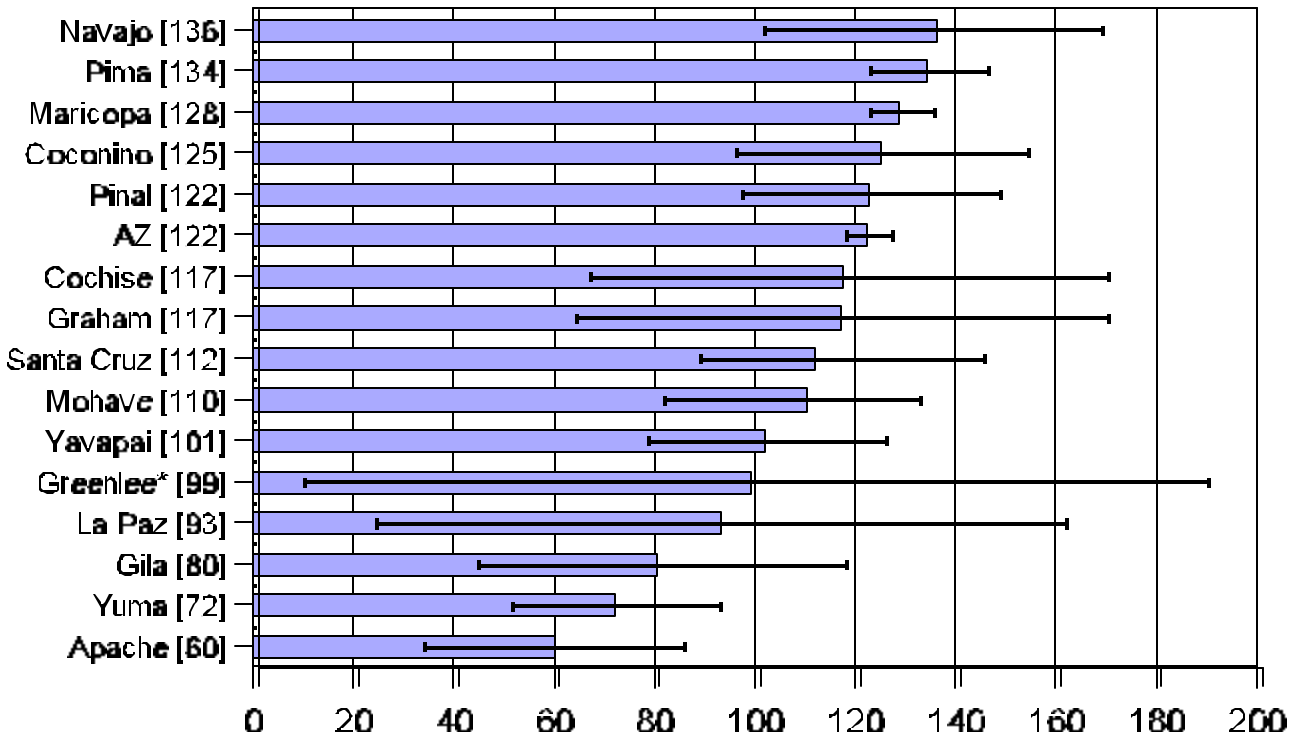
Age-adjusted incidence rates of prostate cancer were calculated by county for the diagnosis years 1995-1997. These are the years for which the ACR has complete reporting throughout the state. Table 1 shows the number of prostate cancer cases in 1995-1997 by county and age group. Most prostate cancer cases occur in men age 60 years and older, with 35% of cases occurring in men ages 60-69, and 39% of all cases occurring in men ages 70-79. Approximately 99% of all prostate cancer cases in Arizona in 1995-1997 occurred in men age 50 and older. Except for the most populous counties, Maricopa and Pima, the counties with the most prostate cancer cases were Mohave county (388 cases), Yavapai county (398 cases), and Pinal county (335 cases).

Table 1. Frequency of Prostate Cancer among Arizona Men in 1995-1997 by County and Age

	Age Group							
County	**0-39**	**40-49**	**50-59**	**60-69**	**70-79**	**80+**	**Unknown Age**	**Total**
Apache	0	0	3	17	16	2	0	**38**
Cochise	0	4	27	84	74	35	0	**224**
Coconino	0	3	15	42	44	15	0	**119**
Gila	0	1	6	39	38	12	0	**96**
Graham	0	0	4	21	24	6	0	**55**
Greenlee	0	0	0	4	8	1	0	**13**
La Paz	0	0	0	19	18	4	0	**41**
Maricopa	1	67	571	1724	1945	689	4	**5001**
Mohave	0	3	22	137	166	60	0	**388**
Navajo	0	1	16	48	61	23	0	**149**
Pima	0	16	199	599	655	231	4	**1704**
Pinal	1	1	29	131	140	33	0	**335**
Santa Cruz	0	0	7	10	33	7	0	**57**
Yavapai	0	2	40	152	159	45	0	**398**
Yuma	0	2	7	61	83	26	0	**179**
Total	**2**	**100**	**946**	**3088**	**3464**	**1189**	**8**	**8797**

Figure 4 shows the annualized age-adjusted incidence rates of prostate cancer for years 1995-1997 by county. The age-adjusted rates are shown next to the county name in brackets, and the 95% confidence interval was calculated for the rate. The age-adjusted incidence rates give a standard rate for comparison purposes. In 1995-1997 the highest annualized age-adjusted incidence rate of prostate cancer occurred in Navajo county (135 per 100,000), followed by Pima, Maricopa, Coconino, and Pinal counties. The overall state age-adjusted incidence rate for prostate cancer over the three year period was 122 new prostate cancer cases per 100,000 males annually.

Figure 4. Annualized Incidence Rates of Prostate Cancer By County, 1995-1997



Age-adjusted to the 1970 US census population with rates per 100,000 in [ ] and 95% CI

***** The age-adjusted rate for Greenlee County was calculated using a total of 13 cases for the three year period.

The counties with the lowest age-adjusted incidence rates are Gila county (80 per 100,000), Yuma county (72 per 100,000) and Apache county (59 per 100,000).

III. Screening/Diagnosis

There is currently debate about whether screening for prostate cancer reduces deaths or if treatment of disease at an early stage is effective in prolonging a man's life.[1] Professional medical organizations are divided on the issue of screening for prostate cancer. The U.S. Preventive Services Task Force (USPSTF) does not recommend routine screening but stresses the need for "informed decision making", acknowledging that men who request screening should be given objective information about early detection and the potential benefits and risks of treatments.[20] The Center for Disease Control and Prevention supports the USPSTF recommendations. The American Cancer Society (ACS) recommends that health care providers offer the prostate-specific antigen (PSA) measurement annually, beginning at age 50, to men who have at least a 10-year life expectancy and who choose to have early detection testing.[1] The ACS also

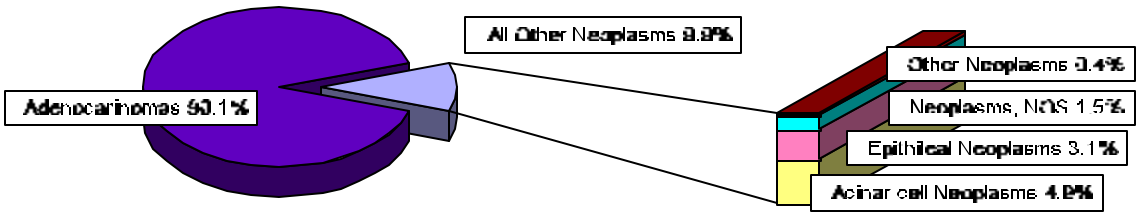
recommends that screening start at a younger age for men in higher-risk groups, such as men with two or more affected first-degree relatives (e.g., father and a brother, two brothers) or African American men.[1]

Two commonly used methods to assist in detecting prostate cancer are the digital rectal exam (DRE) and the prostate-specific antigen (PSA) blood test. DRE has been used for years as a screening for prostate cancer. However, its ability to detect prostate cancer is limited. Small tumors often form in areas of the prostate that cannot be reached by a DRE. Also, clinicians may have difficulty distinguishing between benign abnormalities and prostate cancer. PSA is an enzyme measured in the blood that may rise naturally as men age. It also rises in the presence of prostate abnormalities. The level of PSA in the serum can be used to gauge tumor response to treatment, detect the presence of persistent tumor, or indicate the recurrence of cancer or the development of new metastasis. However, the PSA test cannot definitely distinguish between prostate cancer, benign growth of the prostate and other conditions of the prostate, such as prostatitis. More recently, researchers have recognized that when the molecular forms of PSA are analyzed as the ratio of free-to-total PSA or the complex form of PSA, these forms are shown to be more specific indicators of the presence of malignancy.[21] Although the role of PSA in the screening process is still controversial, the positive predictive value of an elevated PSA compares favorably to the positive predictive value of a mammography that shows abnormalities.[2]

Clinicians utilize information about a patients' PSA level and Prostatic Acid Phosphatase (PAP) level because they are both considered tumor markers for prostate cancer. The PAP test is not as useful as PSA in the diagnosis of prostate cancer. However, elevated values at the time of diagnosis usually indicate metastatic disease, specifically to the lymph nodes. The diagnosis of prostate cancer generally begins with a DRE and/or a PSA determination. If either the DRE or the PSA is abnormal, an ultrasound may be done. The next step is a biopsy of the prostate. Prostate biopsy guided by transrectal ultrasound (TRUS) allows for sampling of multiple sites of the gland under direct vision. By using TRUS, the clinician can distinguish the zonal anatomy of the prostate.[2]

Most prostate cancers are histo-pathologically diagnosed as adenocarcinomas. The histology of Arizona prostate cancers diagnosed in 1990-1997 is illustrated in Figure 5. Ninety percent of all prostate cancer in Arizona were diagnosed as adenocarcinomas.

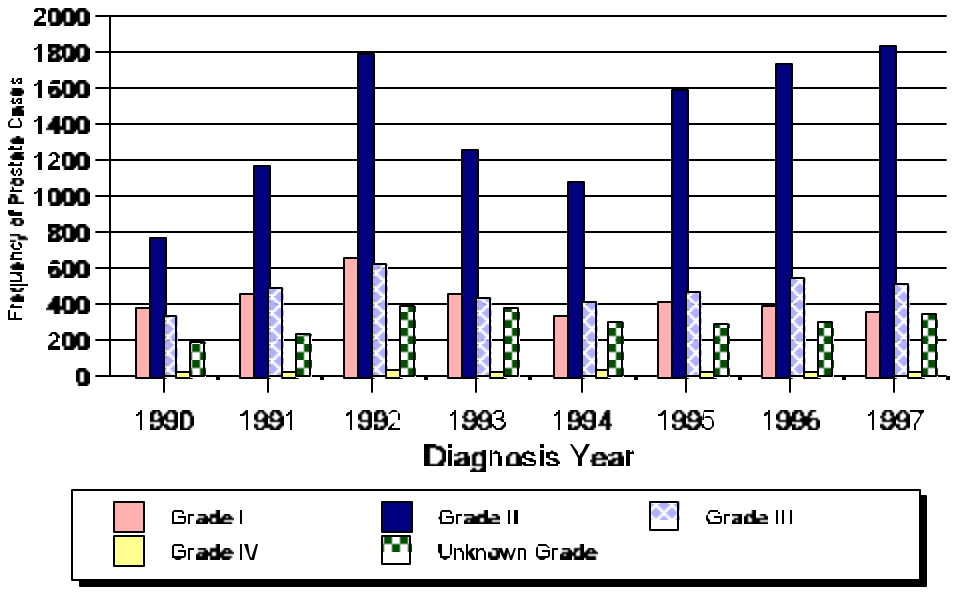
Figure 5. Histology of Prostate Cancer Cases, 1990-1997



Another important factor in the evaluation of prostate cancer is the Gleason grading system. This is the most commonly used grading system which is based on the tumor's glandular differentiation and growth pattern. Gleason designed a pattern of 1 to 5 that defines the degree of differentiation of the glandular tissue and the relationship of that tissue to the surrounding connective tissue. A well-differentiated tissue is assigned a Gleason score of 1 while very poorly differentiated prostate cancer is given a Gleason score of 5.[2] The most prominent and second most prominent glandular patterns are added to arrive at a Gleason score that can therefore range from 2 to 10. This score has been shown to be more predictive of outcome than either individual score or the score for the worst pattern alone.[2]

Another classification of the tumor for prostate cancer, in addition to the Gleason score is the histo-pathologic grade. Similar to the Gleason score, the grade defines the differentiation of the tumor. The ACR uses a hierarchy coding system for the grade. The histo-pathological grade is coded, and only if this information is missing, the Gleason score is coded. In Figure 6, the histo-pathologic grades are defined as the following: Grade 1 is well differentiated tissue, Grade II is moderately differentiated tissue, Grade III is poorly differentiated tissue, and Grade IV is undifferentiated, or anaplastic tissue. Either a histologic or a pattern type (Gleason) grade can be used to assess the differentiation pattern of the tumor. For the years 1990-1997, approximately 50% of all prostate cancers were diagnosed with a Grade II tumor. Also, approximately 10% of the tumors were assigned a grade of "unknown".

Figure 6. Frequency of Prostate Cancer Cases By Histopathologic Grade, 1990-1997



IV. Staging of Prostate Cancer

Researchers have not answered the question of whether there is a difference in the biology of prostate cancer between African American and Caucasian men. Some studies have suggested that prostate cancers among African American men seem to progress to become clinically evident carcinomas at a faster rate than for Caucasian men, suggesting that events that account for racial differences in prostate cancer incidence may occur very early in cell transformation. [3]

Specifically, we analyzed the stage of prostate cancer among Arizona's race groups. Table 2 shows the number of prostate cancer cases by SEER summary stage and race for diagnosis years 1995-1997. In Arizona, for 1995-1997, approximately 60% of prostate cancer cases among Caucasian and African American men were diagnosed in local stage.

Table 2. Prostate Cancer Cases by SEER Summary Stage and Race, 1995-1997

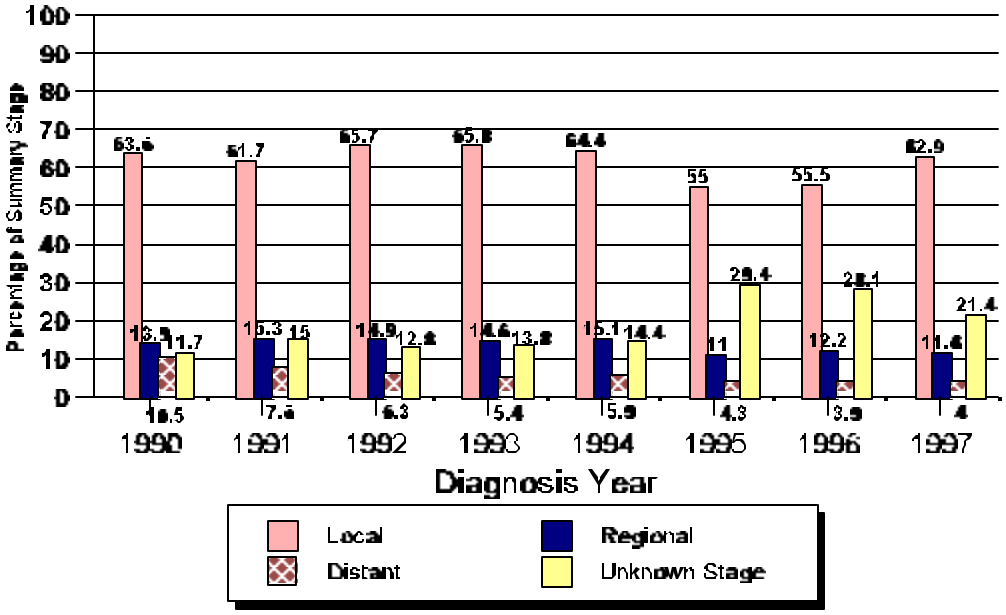
	Summary Stage				
Race	**Local**	**Regional**	**Distant**	**Unknown Stage**	**Total**
Caucasian	4811(60%)	981(12%)	329 (4%)	1917 (24%)	8038 (100%)
African American	104 (60%)	14 (8%)	17 (10%)	41 (22%)	176 (100%)
Native American	24 (44%)	7 (13%)	10 (18%)	14 (25%)	55 (100%)
Asian	10 (56%)	4 (22%)	0	4 (22%)	18 (100%)
Other	8 (50%)	2 (13%)	0	6 (37%)	16 (100%)
Unknown Race	149 (30%)	16 (3%)	3 (1%)	326 (66%)	494 (100%)
Total	**5106 (58%)**	**1024 (12%)**	**359 (4%)**	**2308 (26%)**	**8797 (100%)**

About 50% of cases among Asian men were diagnosed in local stage, and only 44% of cases among Native American men were diagnosed in local stage. Less than 10% of cases among both Caucasian and African American men were diagnosed in distant stage. Approximately 20% of cases among Native American men were diagnosed in distant stage.

The percentage of prostate cancers in local, regional, distant or unknown stage was examined for diagnosis years 1990 to 1997 (see Figure 7). For the eight year period, approximately 55-65% of all cases were diagnosed in local stage. A 10 percentage point increase in prostate cancers diagnosed in an unknown stage occurred in 1995 and continued through 1997. For the three year diagnosis period, approximately 25% of all prostate cases were classified as unknown stage. The ACR has identified this high rate of "unknown

stage" as a problem that needs attention. Many of these cases are identified when the ACR staff performs case-finding at pathology laboratories. These cases are generally only diagnosed and treated in a physician's office, and not in a hospital setting. Once the ACR identifies a laboratory case, the ACR sends a partially completed report form to the diagnosing physician with a request for completion of missing items. However, many of these reports are not sent back to the ACR, or are returned to the ACR lacking critical information such as stage. In 1995 the ACR initiated a program to review pathology reports and detected many cases for which the physicians did not submit information about the stage. This could explain the increased number of cases with unknown stage starting in 1995 (see Figure 7).

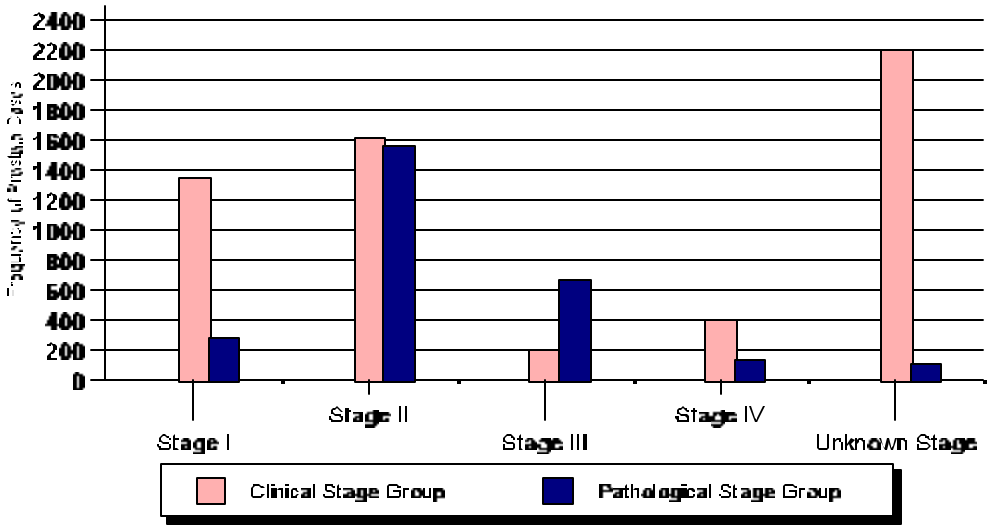
Figure 7. Percentage of Arizona Prostate Cancer Cases By SEER Summary Stage, 1990-1997



The American Joint Committee on Cancer (AJCC) defines two methods of staging prostate cancer: clinical or pathological. Prostate cancer cases are staged **clinically** when the primary tumor assessment includes a DRE of the prostate and histologic or cytologic confirmation of prostate carcinoma. All information available prior to first definitive treatment may be used for clinical staging. Imaging techniques, such as TRUS is used to determine the clinical stage. Cases are **pathologically** staged when a total prostato-seminalvesiculectomy, (including regional node specimen) and histologic confirmation are performed. Other independent prognostic factors for survival (in addition to pathologic stage) have been identified for prostate cancer. These include the age of the patient, co-morbid diseases, histologic grade, Gleason score, PSA level, surgical margin and ploidy.[19]

Over 65% of the prostate cancer cases in Arizona during 1995-1997 were staged clinically (see Figure 8), using detection methods such as DRE, PSA test and a prostate biopsy (TRUS), as defined by the AJCC. Figure 8 also illustrates that most cases were staged as Stage II for both clinical and pathological staging, which is defined as the tumor being clinically inapparent, not palpable, or not visible by imaging, or the tumor being confined within the prostate gland. [19] The number of prostate cases identified in the clinical staging as "unknown stage" is very high. The ACR has as much difficulty with the number of cases with "unknown stage" in the AJCC staging scheme as with the staging scheme because of the lack of cooperation of doctors who conduct prostate biopsies in the outpatient setting. Many of these cases are identified by the ACR by performing case-finding at pathology laboratories.

Figure 8. Frequency of Arizona Prostate Cancer Cases By Clinical or Pathologic AJCC Stage, 1995-1997



V. Treatment

Treatment options for prostate cancer are based on the stage of the cancer at the time of diagnosis. Patient outcomes and the quality of life after treatment are influenced by the persons' age, the presence of other medical conditions, side effects and complications related to treatment, and the aggressiveness of the tumor.[1] Health professionals are realizing that the question is not merely how a life can be saved, but also how quality of life can be preserved.

The management of prostate cancer has evolved rapidly during the past 20 years, especially in the fields of surgery and radiation. Improvements in techniques and technology of both specialities have markedly reduced the rate of complications and side effects. In addition, PSA measurement has altered the choice and timing of initial treatment and follow-up activities.

Clinicians may use a combination of Gleason score, PSA concentration and the clinical work-up to determine the most appropriate treatment for prostate cancer cases.[2] Treatments for men with early-stage prostate cancer that has not spread beyond the prostate include a radical prostatectomy, external-beam radiation therapy, or watchful waiting.[1] A radical prostatectomy, or complete removal of the prostate, is frequently used for men younger than 70 years who are otherwise in good health. If the male has a life expectancy of > 20 years, then this treatment is recommended.[2] If the life expectancy is between 10 and 20 years, and there is a high probability of organ-confined disease, then radiotherapy, prostatectomy, or withholding treatments until symptoms appear are all valid treatment options.[2] In general, treatment guidelines suggest that if the tumor is confined to the prostate and the life expectancy is < 10 years, then either watchful waiting or radiation therapy is recommended.[2] For a life expectancy of > 10 years, then either radiation therapy or a radical prostatectomy is recommended.[2] Complications of radical prostatectomies may be short or long-term; 5-19% of men become incontinent, and 24-62% become sexually impotent. The risk for these complications increase with age and with the amount of damage to nerve and blood supplies during the surgery. Radiation therapy is used for cancer that is confined to the prostate or surrounding tissue. [1] After radiation therapy, 25-44% of men experience some degree of sexual impotence, and 0.5-7% of men become incontinent.[1]

All first course treatment is required to be reported to the ACR. This includes any cancer -directed (i.e., chemotherapy, surgery, radiation, hormonal treatment, or other treatment) or non-cancer directed (i.e., biopsy, pallative procedure) treatment. First course treatment is defined as treatment that is planned at diagnosis and administered to the patient before disease progression. Subsequent (second course) treatment is not required to be reported to the ACR, although many reporting sources may collect this information.

Table 3 shows the types of first course treatment performed on prostate cancer cases diagnosed in 1995-1997 in Arizona. For all stages of prostate cancer, the most common types of treatment were radiation alone, surgery alone, or hormonal therapy alone. A variety of combination treatments were also used during this three year time period, as shown below in Table 3. The ACR computer program cannot distinguish between unknown treatment and no treatment because of the lack of first course treatment information. This is a limitation in the ACR data since no treatment is a valid treatment option for prostate cancer.

Table 3. Frequency of Prostate Cancer Cases by Treatment and SEER Summary Stage, 1995-1997

(Percentage of treatment within each stage)

1995-1997	Summary Stage				
Treatment	**Local**	**Regional**	**Distant**	**Unknown Stage**	**Total**
No Treatment/ Unknown Treatment^	702 (13.7%)	73 (7.1%)	103 (28.6%)	1460 (63.2%)	2338
Hormonal Therapy (H)	187 (3.6%)	34 (3.2%)	138 (38.4%)	215 (9.3%)	574
Radiation (R)	1186 (23.2%)	85 (8.2%)	11 (3.0%)	298 (12.9%)	1580
R H	178 (3.5%)	28 (2.6%)	22 (6.1%)	35 (1.5%)	263
Surgery	2583 (50.6%)	696 (67.8%)	19 (5.4%)	233 (10.2%)	3531
S H	155 (3.0%)	55 (5.2%)	45 (12.5%)	43 (1.9%)	298
S R	97 (2.0%)	47 (5.5%)	4 (1.2%)	13 (0.5%)	161
"Other" Treatment**	16 (0.4%)	7 (0.4%)	17 (4.8%)	12 (0.5%)	52
Total	**5104**	**1025**	**359**	**2309**	**8797**

**** The "Other treatment" category includes the following treatment combinations: Chemotherapy (C), CH, RC, RCH, SC, SRH, Other (O), SROH, HB, and RCHB.**

^These two categories cannot be separated in our data set.

Figure 9. Distribution of Types of Surgery for Prostate Cancer Cases By SEER Summary Stage, 1995-1997

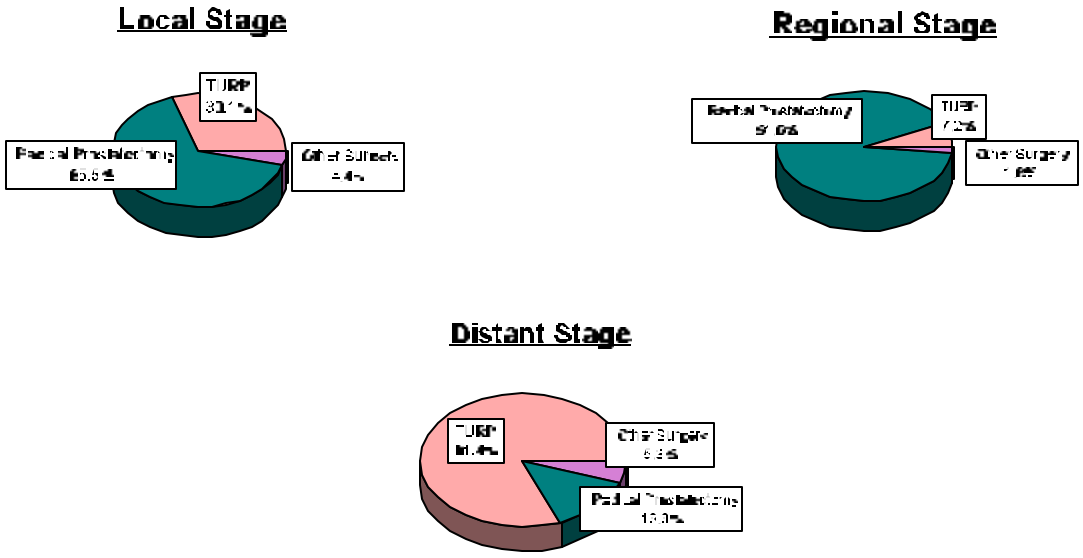


Figure 9 shows the distribution of the type of treatment performed if surgery was part of or the entire first course treatment for prostate cancer cases diagnosed in 1995-1997. The types of surgery shown are the most definitive treatments for these cases. The most common type of surgery performed for men diagnosed in either local stage (65.5%) or regional stage (91.0%) was a radical prostatectomy, whereas the most common type of surgery for late stage prostate cancer cases was trans-urethral resection of the prostate (TURP) (81.4%). This data coincides with the general treatment recommendations for prostate cancer when analyzed by SEER summary stage.

No immediate treatment, or watchful waiting, of prostate cancer is a treatment option because of the often slow progression of the disease. For example, some treatment guidelines suggest that for men with a life expectancy of < 5 years who have asymptomatic prostatic carcinoma, observation is the appropriate initial therapy.[2] Therefore, the goal of treatment for this subset of cases is to avoid the development of symptoms, as well as an excessive burden of therapy in patients without clinical symptoms.[2] If this option is chosen, the tumor is evaluated periodically for changes that suggest rapid growth.[1]

Patients with cancer that has spread beyond the prostate gland may receive radiation and hormonal therapies to inhibit further progression of the cancer, but most of these tumors eventually become resistant to hormonal therapy.[1] Patients with Stage III or Stage IV disease may opt for hormonal therapy or radiation therapy or a combination of both.[2] Some patients with advanced disease may choose to participate in clinical trials of experimental therapies.

VI. Risk Factors for Prostate Cancer

Epidemiologists have examined many factors, some of which appear related to prostate cancer. These factors include age, race, alcohol intake, dietary and hormonal factors, and genetic factors.[2,3,6-13] The differences in incidence and mortality of prostate cancer among races, and specifically between African-Americans and Caucasians have been attributed to screening, environmental, and biologic factors. A family history of prostate cancer is also a significant risk factor in evaluating the probability of developing the disease. Men with an affected first-degree relative are twice as likely to develop prostate cancer as those without such a family history. The hereditary form of prostate cancer accounts for 2% to 8% of all clinical cases.[2]

Arizona Behavioral Risk Factor Survey 1995-1997

The Behavior Risk Factor Survey (BRFS) is a telephone survey conducted by the Arizona Department of Health Services to monitor health behaviors, such as those related to prostate cancer, document health trends, and measure progress toward health goals in Arizona. The following tables show the results of those surveys conducted in 1995-1997 of Arizona men age 50 years and older, distributed by race/ethnicity. The data was chosen based on risk factors for prostate cancer such as age, race, drinking habits, overall physical activity (indicating general health), and protective factors such as fruit and vegetable daily intake that contain high levels of antioxidants and vitamins. The following tables show the percentages over the three year period 1995 to 1997. Each percentage shown is the percentage of men within each race who fit the various categories. Table 4 indicates the percentage of Arizona men who engage in physical activity on a regular basis. Table 5 shows the types of drinking habits (binge drinking, chronic drinking, or never drink) of Arizona men. Table 6 indicates the daily intake of fruit and vegetables for Arizona men.

Table 4. Proportion of Arizona Men age 50 and older by Type of Physical Activity, 1995-1997

Race/ Ethnicity	No Physical Activity^	Irregular Exercise^	Regular/ Not Intense^	Regular/ Intense^
White, Non-Hispanic	39%	22%	22%	17%
Hispanic	35%	14%	28%	23%
Black, Non-Hispanic*	—	—	—	—
Native American *	—	—	—	—
Asian*	—	—	—	—
Other, Non-Hispanic*	—	—	—	—
Unknown Race*	—	—	—	—

* Too few respondents for this analysis.

^ These terms are based on the Center for Disease Control and Prevention Year 2000 Objective 1.5: No Physical Activity = Physically Inactive; Irregular Exercise = Some activity, but <3 times/week or < 20 minutes/session; Regular/Not Intense = 3+ times/week, 20+ minutes/session, < 50 of capacity; Regular /Intense = 3+ times/week, 20+ minutes/session, 50+ of capacity.

Table 5. Pattern of Alcohol Consumption, Arizona Men age 50 and older, 1995-1997

Race/ Ethnicity	Never Drink	Binge Drink^	Chronic Drink^	Other Drink^
White, Non-Hispanic	45%	9%	5%	55%
Hispanic	57%	4%	1%	38%
Black, Non-Hispanic*	—	—	—	—
Native American *	—	—	—	—
Other, Non-Hispanic*	—	—	—	—
Unknown Race*	—	—	—	—

* Too few respondents for this analysis.
^ Binge Drink = having five or more drinks per occasion; Chronic Drink = having 60 or more drinks per month; Other Drink = drinkers who are not classified as binge or chronic drinkers.

Table 6. Proportion of Arizona Men age 50 and older by Fruit and Vegetable Consumption, 1995-1997

Race/ Ethnicity	<1/ day or never	1-<3/ day	3-<5/ day	5+/ day
White, Non-Hispanic	7%	22%	44%	27%
Hispanic	6%	23%	27%	44%
Black, Non-Hispanic*	—	—	—	—
Native American *	—	—	—	—
Asian*	—	—	—	—
Other, Non-Hispanic*	—	—	—	—
Unknown Race*	—	—	—	—

* Too few respondents for this analysis.

The BRFS had a very small number of respondents who were African American, Native American, and Asian. The results of these race categories are not shown in this report. According to the Arizona BRFS for 1995 to 1997, 30-40% of men over the age of 50, of all races are considered physically inactive. This might be a factor of their age, and their respective physical ability. Thirty to 40% of Hispanic and White Non-Hispanic men are considered physically inactive.

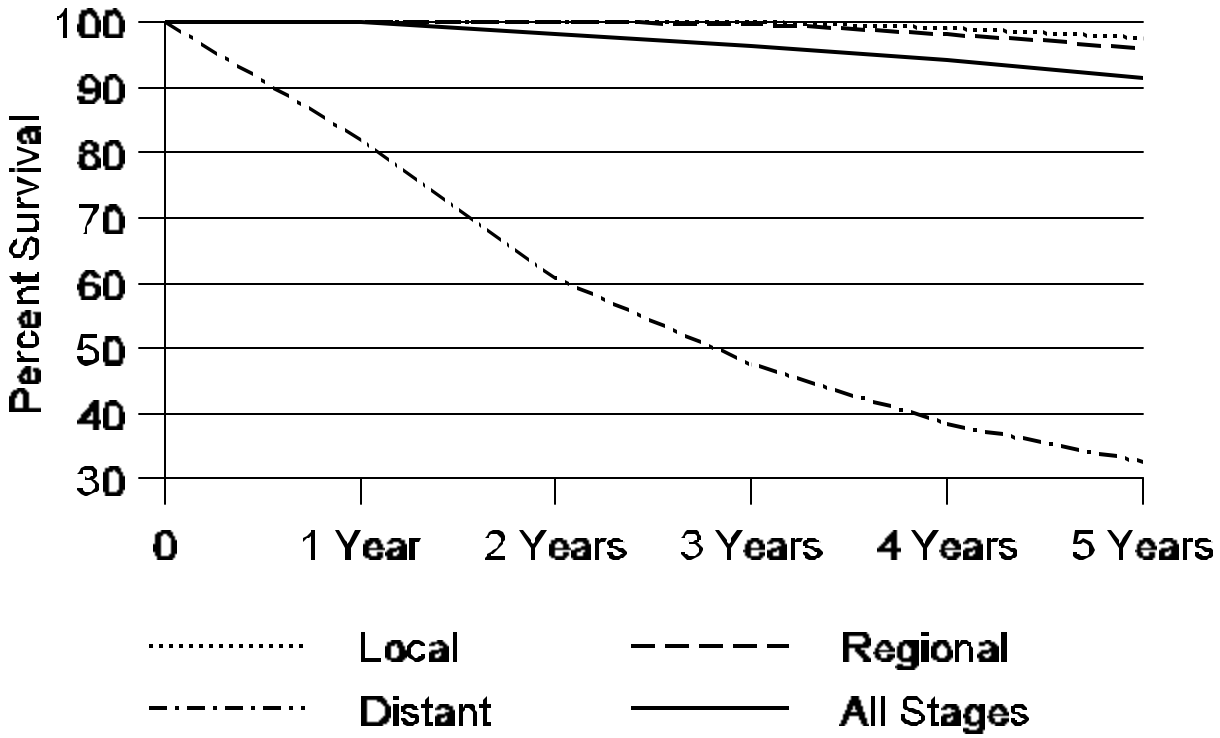
The survey results found that 44% of Hispanic men said that they consume 5 servings or more of fruits and vegetables per day. In contrast, only 27% of White Non-Hispanic men surveyed said they consume five or more servings of fruits and vegetables per day. When surveyed about monthly alcohol consumption, 45% and 57% of White Non-Hispanic and Hispanic men, respectively, said that they did not drink alcohol in the past month. Less than 10% of both White Non-Hispanic and Hispanic men surveyed were at risk for either binge drinking (defined as having 5 or more drinks per occasion) or chronic drinking (defined as having 60 or more drinks per month).

VII. Five Year Relative Survival of Prostate Cancer, 1990-1995

The national SEER Program of the National Cancer Institute has documented dramatically improved five-year survival rates of patients with local or regional prostate cancer. SEER has documented that 20 years ago, in 1977, the five- year survival (all stages combined) for men with prostate cancer was 70%. From 1989 to 1996, the five- year relative survival rate of men diagnosed with prostate cancer in local or regional stage was 100% (See Appendix B). Certainly, some of the increase in survival is attributable to a lead time bias associated with the use of the PSA tests. A relative survival curve is the observed survival rate that is adjusted by removing the other causes of death.

The contribution of the improved survival due to advances in treatment is a topic of debate. In Arizona, the 1, 2, 3, and 4 year survival rates for prostate cancer cases diagnosed with localized or regional disease is no less than 98%. The five- year relative survival (see Figure 10) for men diagnosed with prostate cancer in 1990-1995 indicates that men diagnosed with localized disease or regional disease have a 98% and 96% relative survival rate, respectively, after five years. Men diagnosed with distant disease have a dramatically different survival rate. The one-year relative survival rate for cases diagnosed with distant disease is 81%, dropping to 33% five years after diagnosis. The marked difference in survival rates for cases in distant stage indicates an especially strong need to diagnose prostate cancer in early stages in order to prolong survival for five years and beyond. The overall five- year survival rate (all stages) for prostate cancer is still an encouraging 92%. This extremely positive survival rate is encouraging for those diagnosed with prostate cancer

Figure 10. Five-Year Relative Survival Curve for Prostate Cancer Cases By SEER Summary Stage, 1990-1995



VIII. Prostate Cancer Mortality, 1990-1997

Prostate cancer is slow forming and tends to affect older men. Since the prevalence of comorbidity increases with advancing age, competing causes of death are important contributors to death rates among prostate cancer cases.[14] Consequently, accurately determining the cause of death in men dying with prostate cancer can be difficult. Typically, to determine the underlying cause of death, researchers rely on retrospective reviews of office and hospital medical records, death certificates or information concerning the underlying cause of death as determined by the National Center for Health Statistics (NCHS) using the International Classification of Diseases-9th Edition (ICD-9) coding system.[13] The Arizona Cancer Registry uses the death certificate file of the Office of Vital Records to assess the number of cancer related deaths. For this report prostate cancer deaths during 1990-1997 were examined. This time frame is parallel to the incidence reporting time frame for this report, plus, these years are of particular interest when examining prostate cancer deaths because of the introduction of the PSA screening test for prostate cancer in the early 1990's.

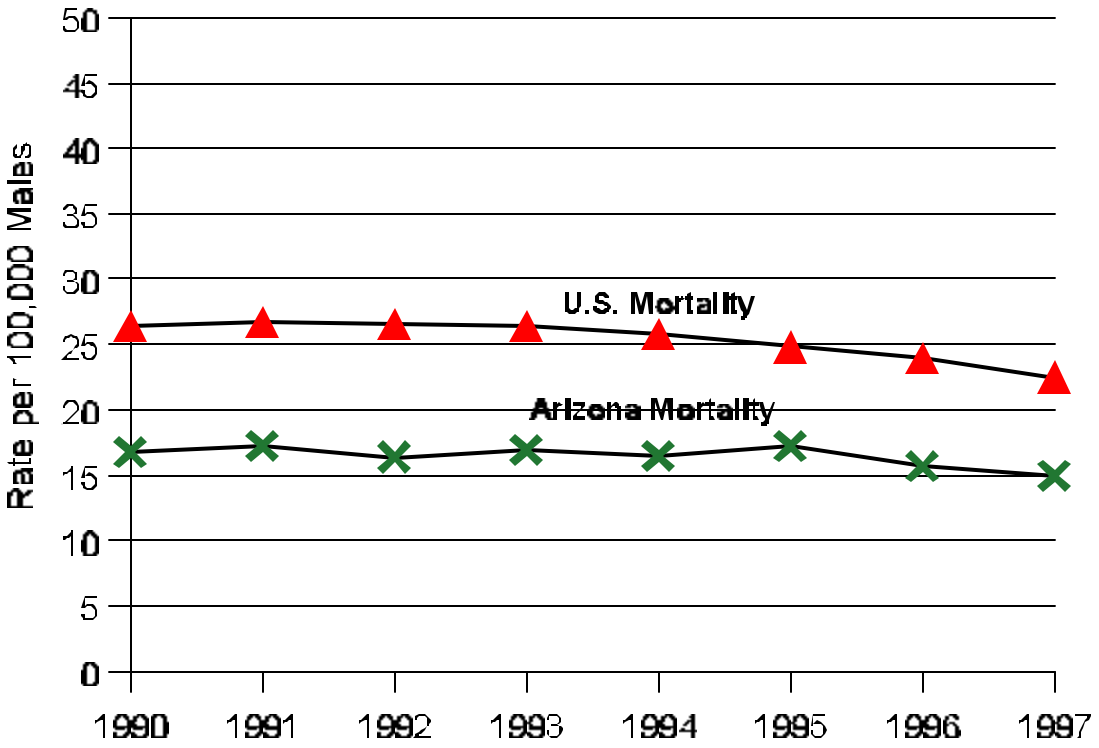
Because prostate cancer presents at an age when concurrent diseases are common, the underlying cause of death is frequently impacted by other medical hazards as much as it is by prostate cancer.[13] One study examined whether an attribution bias (an incorrect attribution of prostate cancer as the underlying cause of death) existed for men who died in 1996 following a diagnosis of prostate cancer in 1987 to 1989. The study showed several findings. Specifically, men diagnosed at older ages were at a decreased risk of dying of their disease compared to men diagnosed at younger ages. Men with multiple comorbidities had a decreased risk of dying of prostate cancer. Men with advanced-stage disease had a relatively large increase in the probability of death attributed to prostate cancer. Men undergoing aggressive treatment of prostate cancer had a higher odds ratio of dying of another cancer compared with the nonprostate cancer cohort. Finally, men who did not receive treatment of their prostate cancer had a lower odds ratio of dying of another cancer compared with the nonprostate cancer cohort. In summary, this study hypothesizes that healthcare providers completing death certificates for prostate cancer patients may be influenced by the treatments that patients receive. [15] According to the authors, this may only be a statistical artifact, however, they suggest that this type of reporting bias can yield important distortion when reporting cancer mortality.[15]

Another controversial issue surrounding prostate cancer mortality is the early diagnosis and treatment of prostate cancer influencing the mortality rate of the disease. Prostate cancer mortality is particularly susceptible to medical interventions, such as the PSA testing.[16] A large number of undiagnosed prostate cancer cases exists in the population, as indicated through autopsy studies.[17] In the late 1980s and early 1990s the PSA test was recognized as an effective screening method for prostate cancer. As a result, a large number of latent prostate cancers were diagnosed that would have never otherwise been detected clinically, and cases were detected earlier than they would have been clinically.[16] During this time, with the use of the PSA screening test, prostate cancer became the most frequently diagnosed cancer in the United States.[18]

Men with latent disease typically die of other causes while those with clinically evident disease should die at the same time as if screening had not been introduced, unless there is benefit from early detection and aggressive treatment, in which case the time of death is delayed.[16] Therefore, in theory, aggressive screening and treatment should at best lower, and at worst hold constant, prostate cancer mortality rates.[16] The decrease in both national and Arizona prostate cancer mortality rates since 1990 may cause an under-estimation of the gain from treatment, due in part to the PSA testing.

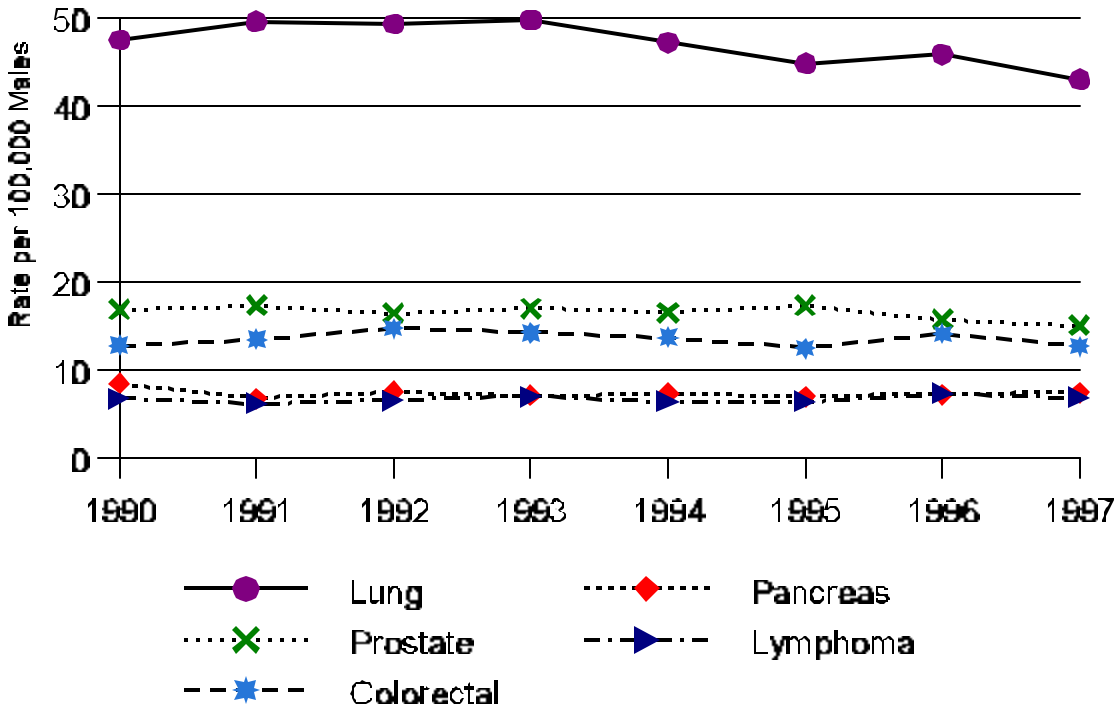
With these points noted, the age-adjusted 1990-1997 mortality rates of prostate cancer for Arizona were compared to the U.S. age-adjusted mortality rates from the NCHS public use tape (see figure 11). Since 1990, the Arizona prostate cancer mortality rate is at an eight-year low, with a rate of 15/100,000 males in 1997. The highest mortality rate in those eight years was in 1991 and 1995 with a rate of 17.2/100,000 males. Arizona's mortality rate of prostate cancer is consistently lower than the US rate that has decreased to 22.5/100,000 males in 1997 from 26.7/100,000 males in 1991.

Figure 11. Age-Adjusted Mortality Rates of Prostate Cancer
Arizona vs. U.S., 1990-1997



Arizona's prostate cancer mortality rate is compared to the other most common cancer causes of death for men in Arizona in Figure 12. The five most common cancer causes of death from 1990-1997 are shown. As expected, lung cancer has the highest mortality rate among Arizona men, followed by prostate cancer, and then colorectal cancer. The lung cancer mortality rate is almost three times as high as that of the prostate cancer mortality rate, which is the second most common cancer cause of death for men in Arizona. Colorectal cancer is the third most common cause of death, followed by pancreatic cancer, and lymphoma. These two cancers all have annual age-adjusted mortality rates of less than 10 cases/100,000 males. The actual number of cancer deaths by primary site in 1990-1997 is shown in Table 7.

Figure 12. **Age-Adjusted Mortality Rates of the Most Common Cancers in Arizona Males, 1990-1997**



Age-Adjusted Mortality Rates for the Top 5 Cancers for Men

Primary Site	1990	1991	1992	1993	1994	1995	1996	1997
Lung	47.41	49.57	49.24	49.69	47.11	44.77	45.78	42.92
Prostate	16.75	17.23	16.37	16.92	16.47	17.20	15.66	14.96
Colorectal	12.69	13.40	14.67	14.17	13.60	12.41	14.02	12.63
Pancreas	8.34	6.70	7.52	6.96	7.23	6.92	7.07	7.31
Lymphoma	6.68	6.09	6.39	6.91	6.38	6.29	7.27	6.84

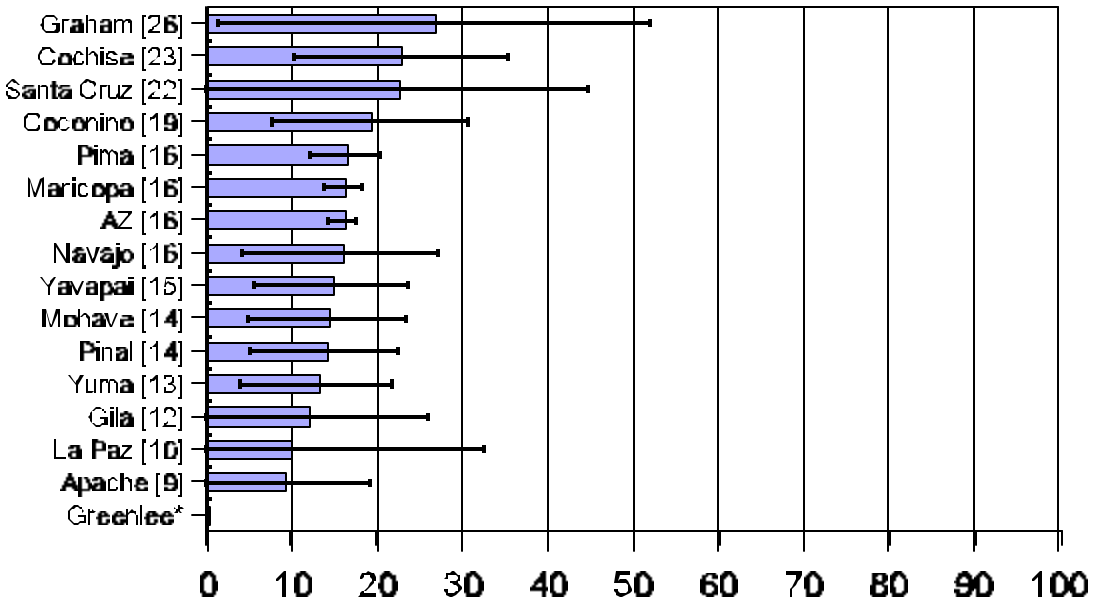
Table 7. Frequency of the Top Five Cancer Deaths Among Arizona Men, 1990-1997

Diagnosis Year	Primary Site				
	Lung	**Prostate**	**Colorectal**	**Pancreas**	**Lymphoma**
1990	1157	479	332	210	151
1991	1259	508	353	170	147
1992	1312	503	394	196	158
1993	1341	542	408	196	180
1994	1345	534	408	196	177
1995	1361	594	381	199	182
1996	1426	560	442	228	221
1997	1409	558	404	223	200
Total	**10,610**	**4278**	**3122**	**1422**	**1416**

A more detailed analysis of prostate cancer mortality rate was performed by comparing the age-adjusted mortality rate of prostate cancer by county for 1995 to 1997. The annualized age-adjusted mortality rate for prostate cancer by county is shown with the averaged mortality rate in brackets, and the 95% confidence interval (⊢⊣) in Figure 13.

The bracketed numbers show the annualized age-adjusted rate for each county. From the statistical standpoint, there was no difference in the mortality rates of the individual counties compared to the Arizona rate.

Figure 13. Annualized Mortality Rates of Prostate Cancer
By County, 1995-1997



Age-adjusted to 1940 US census population with rates per 100,000 in [ ] and 95% CI
* The number of prostate cancer deaths were less than 5 cases in the three year period

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APPENDIX A

For Contents of Appendix A,
please go to the website:
http://www.cdc.gov/cancer/prostate/prostate.htm

APPENDIX B

For contents of Appendix B,
please go to website:
http://www.seer.cancer.gov/
and click on SEER Cancer Statistics Review, 1973-1997,
Prostate Cancer