CERVICAL CANCER

IN TEXAS, 2010

TEXAS Department of State Health Services

Texas Cancer Registry

CPRIT CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

A SPECIAL THANKS TO THE DEDICATION AND HARD WORK OF TEXAS'S CANCER REGISTRARS AND OTHERS RESPONSIBLE FOR DATA COLLECTION ACROSS THIS STATE.

The Texas Department of State Health Services and Cancer Prevention and Research Institute work collaboratively in support of the Texas Cancer Registry and the fight against cancer.

ABOUT THE TEXAS CANCER REGISTRY

The Texas Cancer Registry (TCR), Texas Department of State Health Services is a statewide population-based registry that serves as the foundation for measuring the Texas cancer burden, comprehensive cancer control efforts, health disparities, progress in prevention, diagnosis, treatment, and survivorship, as well as supports a wide variety of cancer-related research. These priorities cannot be adequately addressed in public health, academic institutions, or the private sector without timely, complete, and accurate cancer data.

ABOUT THE CANCER PREVENTION RESEARCH INSTITUTE OF TEXAS

The Cancer Prevention and Research Institute of Texas (CPRIT) is the state agency established to: create and expedite innovation in the area of cancer research and to enhance the potential for a medical or scientific breakthrough in the prevention of cancer and cures for cancer; attract, create, or expand research capabilities of public or private institutions of higher education and other public or private entities that will promote a substantial increase in cancer research and in the creation of high-quality new jobs in this state; and develop and implement the Texas Cancer Plan.

RECOGNITION OF FUNDING SOURCES

Maintaining a statewide cancer registry that meets both National Program of Cancer Registries Centers for Disease Control and Prevention (CDC) high quality data standards and North American Association of Central Cancer Registries (NAACCR) gold certification is accomplished through collaborative funding efforts.

In 2005, the Texas Legislature provided additional funding for the Texas Cancer Registry to achieve and maintain national high quality data standards and certification. With this new funding, the TCR attained both CDC high quality data standards and gold certification from NAACCR for the first time. These standards have been maintained through funding from the Texas Department of State Health Services, the Higher Education Coordinating Board, and now through the Cancer Prevention and Research Institute of Texas.

The TCR also acknowledges the CDC for its financial support under Cooperative Agreement #5U58DP000824. The contents of this report are solely the responsibility of the authors and do not necessarily represent the official views of the CDC.

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CERVICAL CANCER IN TEXAS, 2010

DESPITE BEING VIRTUALLY PREVENTABLE, CERVICAL CANCER WILL KILL ALMOST 400 TEXAS WOMEN IN 2010.

EXECUTIVE SUMMARY

Cervical Cancer in Texas, 2010, is just one of the steps taken by the Texas Cancer Registry, Texas Department of State Health Services and the Cancer Prevention Research Institute of Texas to describe and better understand the impact of cervical cancer on the residents of our state. Each number and statistic presented represents not only a cancer patient but also the family, friends, and countless others affected by this disease. Information provided in this report can be used to better plan cancer control activities, target and evaluate interventions, and ultimately save lives. Of all cancers, cervical cancer is one of the most preventable and detectable through regular screening. Yet, cervical cancer remains a serious threat to the lives of Texas women.

- In 2010 an estimated 1,219 Texas women will be diagnosed with invasive cervical cancer and 378 women will die of the disease.
- The rates of women being diagnosed with and dying from cervical cancer in Texas are higher than those of the United States overall.
- The estimated direct cost of invasive cervical cancer in Texas for 2007 was $77.4 million.
- Hispanic women have the highest incidence rate of cervical cancer, followed by blacks, non-Hispanic whites, and Asian/Pacific Islanders.
- Blacks have the highest age-adjusted cervical cancer mortality rate, followed by Hispanics, non-Hispanic whites and Asian/Pacific Islanders.
- Hispanic women in the Texas-Mexico border counties have a slightly higher cervical cancer mortality rate than Hispanics in non-border counties.
- Incidence and mortality rates of cervical cancer are higher in rural counties than in urban counties.
- Eighty percent of women reported having had a Pap test within the past three years. The lowest prevalence of having had a recent Pap test was among women with less than a high school education and women living along the Texas-Mexico border.

“Each case of cervical cancer represents a missed opportunity for prevention.”

CERVICAL CANCER IN TEXAS, 2010

Of all cancers, cervical cancer is one of the most preventable and detectable through regular screening. Yet, cervical cancer remains a serious threat to the lives of Texas women. In 2010 an estimated 1,219 Texas women will be newly diagnosed with invasive cervical cancer, and 378 women will die of the disease. The rates of women being diagnosed with and dying from cervical cancer in Texas are higher than those of the United States overall. Cervical cancer is also costly to the state of Texas. The estimated direct cost of invasive cervical cancer in Texas for 2007 was $77.4 million.

WHAT IS CERVICAL CANCER?

Cancer begins when cells in a part of the body change and grow abnormally. Most cancers are named for the part of the body where they start. Cervical cancer begins in the lining of the cervix. The cervix is the lower part of the uterus and connects the uterus to the vagina.

Cancer does not form suddenly; it can take many years to develop. In the early stages of cervical cancer, some cells begin to change and become abnormal. These precancerous changes are not true cancer but have the potential to develop into cancer if left untreated. It is very important for cervical cancer to be detected and treated during these early precancerous changes. The earlier abnormal cells are detected, the greater the chance of successful treatment and prevention of developing cancer.

Most precancerous conditions can be detected through routine pelvic exams and Pap tests (or Pap smears). Since precancerous changes rarely cause any symptoms, regular examinations are critical for cervical cancer detection and prevention. Recent guidelines by the American College of Obstetricians and Gynecologists recommend that women begin having regular Pap tests beginning at 21 years of age.[1]

The major cause of cervical cancer is infection by the human papillomavirus (HPV). In the United States, HPV is the most common sexually transmitted infection, with approximately 20 million people currently infected. When HPV lingers in the body, it can cause cells to become precancerous and potentially cancerous over time if not detected. Condom use, sexual abstinence, and mutually faithful relationships can lower the risk of HPV infection.[2] There is also an HPV vaccine available, which was approved in 2006. It is currently recommended for adolescent girls and young women and could potentially prevent approximately 70 percent of cervical cancers caused by HPV infection.[3]

STAGE OF DISEASE AT DIAGNOSIS

Stage denotes the physical characteristics of malignant tumors, particularly the size and degree of growth and spread. While many different kinds of detailed staging systems have been developed for different kinds of cancer, the basic classifications are very similar. Invasive cervical cancer tumors can be classified into the following three stage categories:

Localized – Tumor is entirely confined to the cervix.

Regional – Tumor has extended directly to adjacent organs, tissues, or lymph nodes.

Distant – Tumor has spread to distant organs or lymph nodes, a process known as metastasis.

As with most cancers, the stage of diagnosis for cervical cancer determines treatment options as well as the prognosis for survival: The earlier the stage in which a tumor is detected, the better the patient's chance of survival. Relative to the general population, the five-year survival rate among Texas women with localized cervical cancer is almost 90 percent. However, the rate is less than 20 percent for women with distant disease (Figure 1).

For comparison purposes, this report combines the three invasive stages of cancer into two more general categories. "Early" cervical cancer is limited to the localized stage only, while "late" includes both regional and distant stages. Some caution must be used when evaluating differences in cervical cancer stage at diagnosis, due to the large number of cases with unknown stage.

FIGURE 1. Five-Year Stage-Specific Relative Survial Rates, Cervical Cancer in Texas, 1995–2007

Rates are age-specific rates per 100,000 population. Source: Texas Department of State Health Services, Texas Cancer Registry, 1995-2007, SEERStat incidence file cutoff 11/19/2009.

HOW MANY WOMEN ARE DIAGNOSED WITH AND DIE FROM CERVICAL CANCER IN TEXAS?

- From 2003–2007, a total of 5,397 cases of invasive cervical cancer were newly diagnosed in Texas women, with an average of 1,079 cases per year.
  - The age-adjusted incidence rate in Texas was 9.7 per 100,000 women. In comparison, the rate from the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program was 8.1 per 100,000 (Figure 2).[4]

- Despite being virtually preventable, cervical cancer killed an average of 340 women in Texas annually from 2002–2006.*
  - The age-adjusted mortality rate in Texas was 3.1 deaths per 100,000 women compared to 2.5 per 100,000 women in SEER.

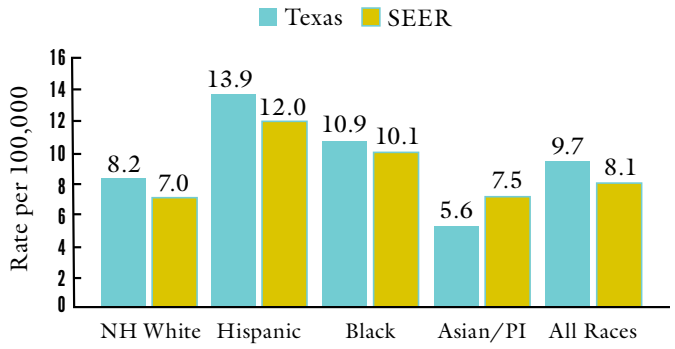
RATES BY RACE AND ETHNICITY

- Texas' cervical cancer incidence and mortality rates were higher than SEER's for each race and ethnic group. The only exception was the incidence rate among Asian/Pacific Islanders (Figures 2 and 3).

- Hispanic women in Texas had the highest incidence rate of cervical cancer (13.9 per 100,000), followed by blacks (10.9 per 100,000), non-Hispanic whites (8.2 per 100,000), and Asian/Pacific Islanders (5.6 per 100,000) (Figure 2).

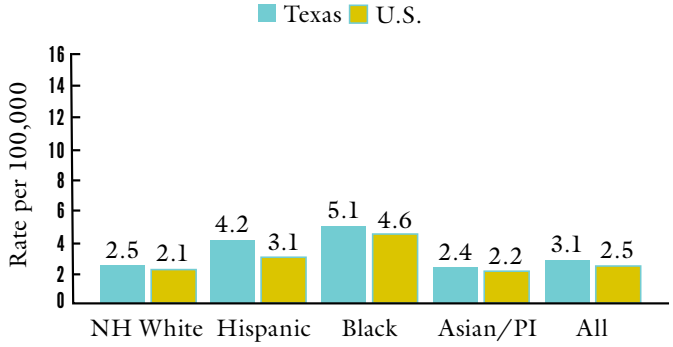
- Blacks had the highest age-adjusted cervical cancer mortality rate (5.1 per 100,000), followed by Hispanics (4.2 per 100,000), non-Hispanic whites (2.5 per 100,000) and Asian/Pacific Islanders (2.4 per 100,000) (Figure 3).

FIGURE 2. Cervical Cancer Incidence Rates Compared with SEER by Race and Ethnicity, 2003–2007



Rates are average annual rates per 100,000, age–adjusted to the 2000 U.S. Standard Population. Sources: Texas Cancer Registry, 1995–2007 SeerStat incidence file cutoff 11/19/2009; SEER Cancer Statistics Review, 1975–2007.

FIGURE 3. Cervical Cancer Mortality Rates Compared with U.S. by Race and Ethnicity, 2002–2006

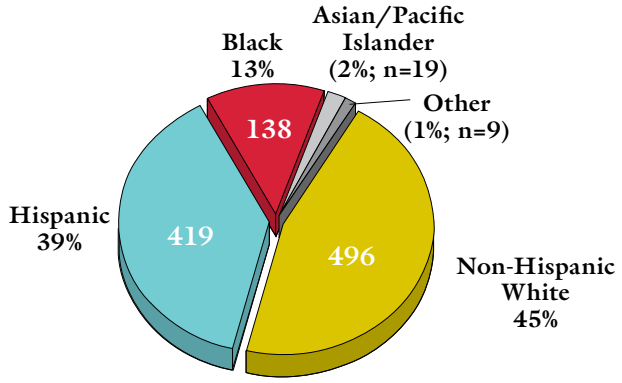


Rates are average annual rates per 100,000, age-adjusted to the 2000 U.S. Standard Population. Source: Texas Department of State Health Services, Center for Health Statistics, 1990-2006, SEERStat mortality file created 03/31/2009.

*2007 statistical mortality data were not available from the DSHS Center for Health Statistics at the time of publication.

- By average annual numbers of new cervical cancer diagnoses from 2003–2007, non-Hispanic whites accounted for 45 percent of the diagnoses (n=496), followed by Hispanic (39 percent; n=419), black (13 percent; n=138) and Asian/Pacific Islander women (2 percent; n=19) (Figure 4).

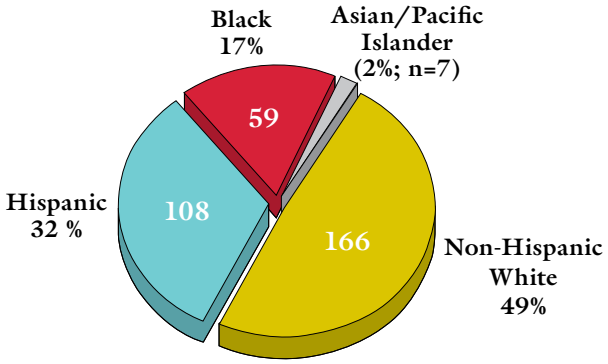
FIGURE 4. Average Annual Number of Cervical Cancer Cases by Race and Ethnicity, Texas, 2003–2007



Source: Texas Department of State Health Services, Texas Cancer Registry, 1995-2007, SEERStat incidence file cutoff 11/19/2009.

- The distribution is similar for deaths from 2002–2006. There were 166 average annual cervical cancer deaths among non-Hispanic whites (49 percent), followed by Hispanic (32 percent; n=108), black (17 percent; n=59), and Asian/Pacific Islander women (2 percent; n=7) (Figure 5).

FIGURE 5. Average Annual Number of Cervical Cancer Deaths by Race and Ethnicity, Texas, 2002-2006



Source: Texas Department of State Health Services, Center for Health Statistics, 1990-2006, SEERStat mortality file created 03/31/2009.

RATES BY AGE

- Of the 1,079 average annual cases of cervical cancer diagnosed among Texas women from 2003–2007, 69 percent were diagnosed in women younger than age 55 (Table 1). Importantly, women who are diagnosed with cervical cancer at later ages are more likely to have advanced-stage disease.[5]

TABLE 1. Average Annual Cervical Cancer Cases and Percentage of Total New Cancers by Age at Diagnosis, Texas, 2003-2007

Age	Cases	% Total New Cases
0–34	187	17.3
35–44	297	27.5
45–54	257	23.8
55–64	149	13.8
65–74	100	9.2
75–84	67	6.2
85+	22	2.1

Average annual incidence counts are rounded to the nearest whole. Percentages are based on unrounded counts and total. Cases included invasive cancer only.
Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

- Of the 340 average annual cervical cancer deaths among Texas women from 2002–2006, 51 percent were among women younger than age 55 (Table 2).

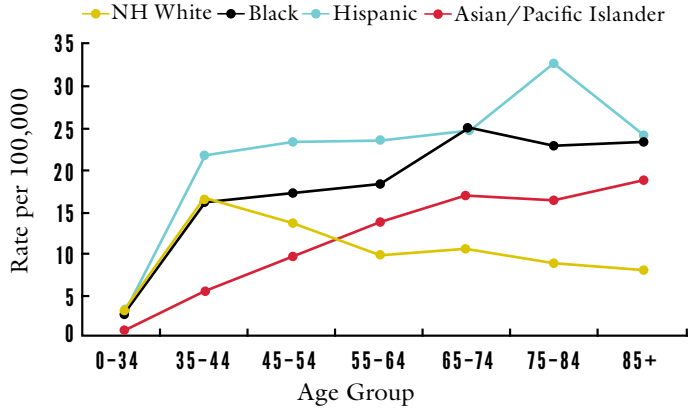
TABLE 2. Average Annual Cervical Cancer Deaths and Percentage of Total Cancer Deaths by Age at Death, Texas, 2002-2006

Age	Deaths	% Total Deaths
0–34	21	6.2
35–44	64	18.9
45–54	88	25.7
55–64	63	18.6
65–74	46	13.6
75–84	41	11.9
85+	17	5.1

Average annual mortality counts are rounded to the nearest whole. Percentages are based on unrounded counts and total. Source: Texas Department of State Health Services, Center for Health Statistics, 1990-2006, SEERStat mortality file created 03/31/2009.

- Age-specific rates differ substantially by race and ethnicity (Figure 6).
  - Among non-Hispanic whites, the highest incidence rate of cervical cancer is among women aged 35–44 years (16.5 per 100,000). However, the highest age-specific incidence rates of cervical cancer among Hispanics, blacks, and Asian/Pacific Islanders occur after age 64.
  - Hispanics aged 75–84 years have the highest incidence rates of all women in Texas (31.9 per 100,000).

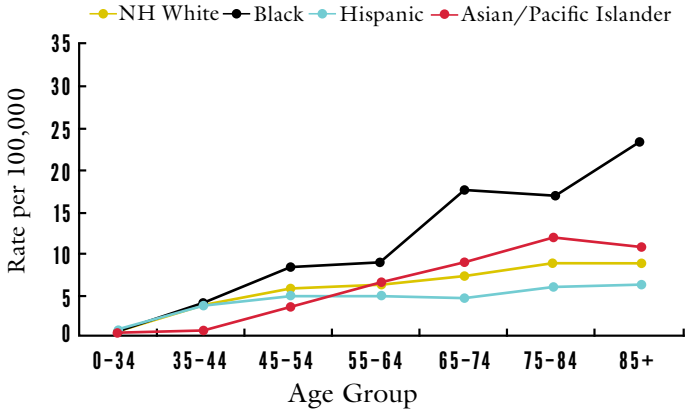
FIGURE 6. Age-Specific Cervical Cancer Incidence Rates by Race and Ethnicity, Texas, 2003-2007



Rates are age-specific rates per 100,000 population. Source: Texas Department of State Health Services, Texas Cancer Registry, 1995-2007, SEERStat incidence file cutoff 11/19/2009.

- In all four race and ethnic groups examined, cervical cancer mortality was almost nonexistent until age 35. Rates generally increased with each subsequent decade, with the exception of Asian/Pacific Islanders, who had rates that began to increase after age 44 (Figure 7).
  - The highest rate of cervical cancer deaths occurred among blacks in every age group.

FIGURE 7. Age-Specific Cervical Cancer Mortality Rates by Race and Ethnicity, Texas, 2002-2006



Rates are age-specific rates per 100,000 population.
Source: Texas Department of State Health Services, Center for Health Statistics, 1990-2006, SEERStat mortality file created 03/31/2009.

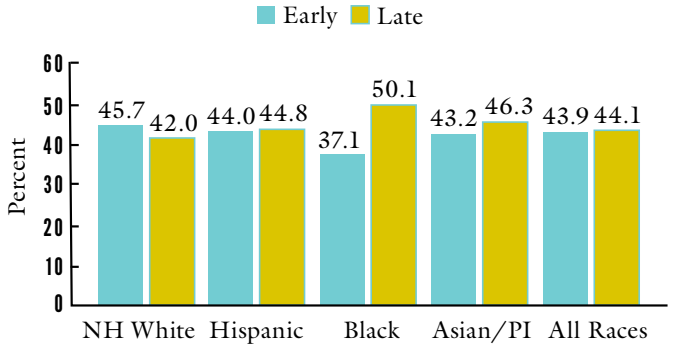
DISTRIBUTION BY STAGE AT DIAGNOSIS

- From 2003–2007, 44 percent of all cervical cancer cases were diagnosed at the early stage and 44 percent were diagnosed at the late stage (Figure 8). Twelve percent of cases during that time period had an unknown or unspecified stage at diagnosis.

- The highest percentage of early stage cervical cancer diagnoses was found among non-Hispanic whites (46 percent), followed by Hispanics (44 percent), Asian/Pacific Islanders (43 percent), and blacks (37 percent) (Figure 8).

- Blacks had the highest percentage of cases diagnosed at the late stage (50 percent) compared to non-Hispanic whites (42 percent), Hispanics (45 percent), and Asian/Pacific Islanders (46 percent) (Figure 8).

FIGURE 8. Percent Distribution of Cervical Cancer Stage at Diagnosis by Race and Ethnicity, Texas, 2003-2007



Note: Early does not include in situ cases. Late = regional + distant stages.
Percent of cervical cancer cases within each race/ethnic group.
Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

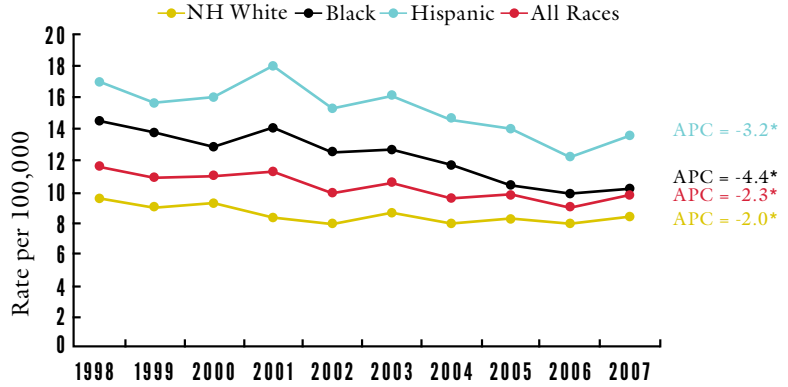
TRENDS BY RACE AND ETHNICITY

Figure 9 presents trends in cervical cancer incidence rates by race and ethnicity over the ten-year period of 1998–2007.

- Since 1998, cervical cancer incidence rates have decreased for all race and ethnic groups, ranging from -2.0 percent per year [Estimated Annual Percent Change (APC)] for non-Hispanic whites to -4.4 percent per year for blacks. The trend is statistically significant for all the race and ethnicity groups displayed.

- Incidence rates for Hispanic women were the highest across all years.

FIGURE 9. Trends in Age-Adjusted Cervical Cancer Incidence Rates by Race and Ethnicity, Texas, 1998-2007



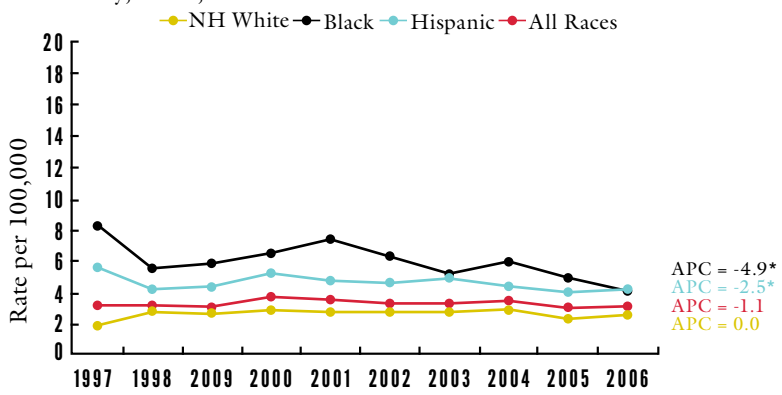
*Estimated annual percent change (APC) is statistically significant at $p < 0.05$.
Rates are per 100,000 and age adjusted to the 2000 U.S. Standard Population.
Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

Figure 10 presents trends in cervical cancer mortality rates by race and ethnicity over the ten-year period of 1997–2006.

- Since 1997, cervical cancer mortality rates have decreased or were stable for all race and ethnic groups, ranging from 0 percent per year for non-Hispanic whites to -4.9 percent per year for blacks. The declining trend is statistically significant for blacks and Hispanics (-2.5 percent) only.

- Mortality rates for blacks were the highest for all years until 2006, when rates among black and Hispanic women were the same.

FIGURE 10. Trends in Age-Adjusted Cervical Cancer Mortality Rates by Race and Ethnicity, Texas, 1997-2006



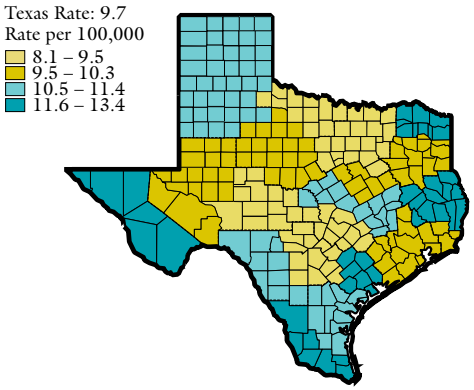
*Estimated annual percent change (APC) is statistically significant at $p < 0.05$.
Rates are per 100,000 and age adjusted to the 2000 U.S. Standard Population.
Source: Texas Cancer Registry, 1990-2006 SeerStat mortality file.

GEOGRAPHIC VARIATION OF CERVICAL CANCER IN TEXAS

Cancer incidence and mortality rates vary substantially by geographic region. The reasons for this are not always clear, but explanations for the differences in rates include regional variations in risk factors such as smoking, and population demographics such as age, racial/ethnic makeup, and socioeconomic status. In addition, the Texas-Mexico border and large rural portions of our state make Texas unique and present distinct challenges for cancer prevention and control.

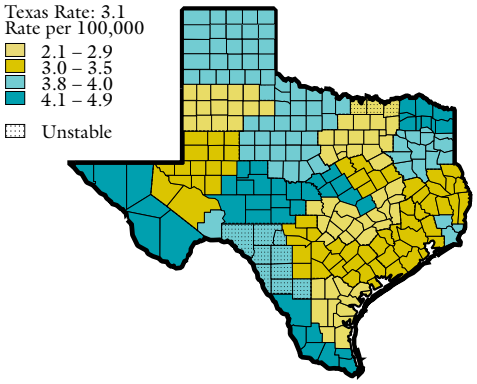
Regional maps of cancer incidence and mortality are presented by county groupings based on Texas Regional Councils of Government and are shown in Figures 11 and 12. The highest incidence rates of cervical cancer are found primarily along the Texas-Mexico border and in regions of East Texas. The highest mortality rates are also found along the Texas-Mexico border and regions in Central and East Texas. However, it should be noted that the regions with the highest rates are not necessarily the regions with the highest absolute number of cases and deaths.

FIGURE 11. Distribution of Cervical Cancer Incidence Rates by Texas Regional Councils of Government County Groupings, Texas 2003–2007



*Age-Adjusted to the 2,000 U.S. Standard Population.
Source: Texas Department of State Health Services, Texas Cancer Registry, 1995-2007, SEERStat incidence file cutoff 11/19/2009.

FIGURE 12. Distribution of Cervical Cancer Mortality Rates by Texas Regional Councils of Government County Groupings, Texas 2002–2006



*Age-Adjusted to the 2,000 U.S. Standard Population.
Source: Texas Department of State Health Services, Center for Health Statistics, 1990-2006, SEERStat mortality file created 03/31/2009.

TEXAS–MEXICO BORDER

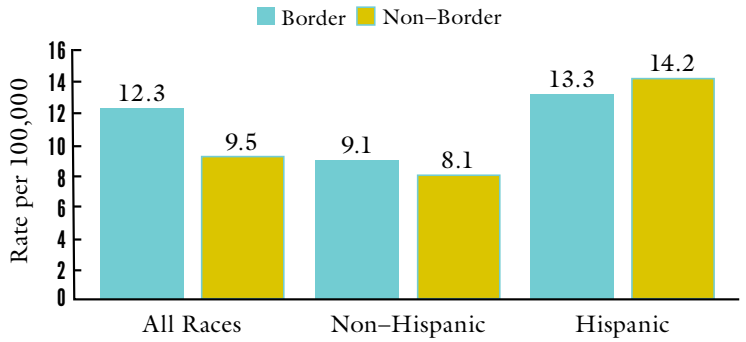
The Texas-Mexico border is defined by the La Paz Agreement as the 32 Texas counties that are within 100 kilometers of the Mexican border (Table 3). These counties are among the poorest in the United States and have numerous barriers to health education and health care access. Because many health conditions are found to be worse in the border region than in the rest of the state, special attention is given to monitoring disparities along the border. Border counties have an extremely small population of blacks and Asian/Pacific Islanders, and thus very few cervical cancer cases or deaths in those populations. As a result, black and Asian/Pacific Islanders living along the Texas-Mexico border were not included in the border county analyses.

TABLE 3. Texas-Mexico Border Counties

Brewster	Hudspeth	Reeves
Brooks	Jeff Davis	Starr
Cameron	Jim Hogg	Sutton
Crockett	Kenedy	Terrell
Culberson	Kinney	Uvalde
Dimmit	La Salle	Val Verde
Duval	Maverick	Webb
Edwards	McMullen	Willacy
El Paso	Pecos	Zapata
Frio	Presidio	Zavala
Hidalgo	Real	

- Overall, women in the Texas-Mexico border counties (12.3 per 100,000) experienced higher cervical cancer incidence rates when compared to women in non-border counties (9.5 per 100,000) (Figure 13).
    - Non-Hispanic white women in the border counties (9.1 per 100,000) experienced slightly higher cervical cancer incidence rates when compared to non-Hispanic whites in non-border counties (8.1 per 100,000).
    - Hispanic women in the non-border counties, on the other hand, experienced slightly higher cervical cancer incidence rates (14.2 per 100,000) than Hispanics in the border counties (13.3 per 100,000).

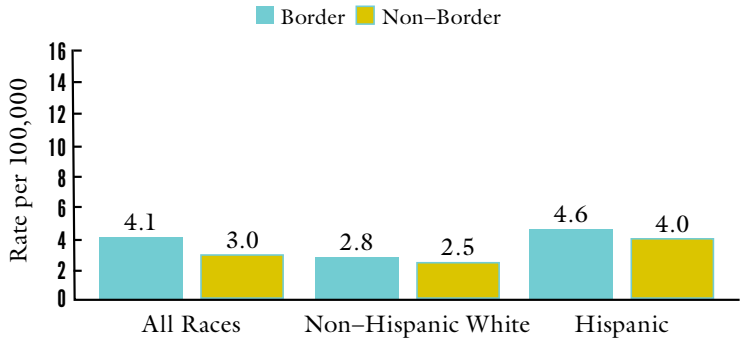
FIGURE 13. Cervical Cancer Incidence Rates Compared by Texas-Mexico Border and Non-Border Counties, Texas, 2003-2007



Rates are average annual rates per 100,000, age-adjusted to the 2000 U.S. Standard Population. Border counties are the 32 Texas counties defined by the Office of Border Health, Texas Department of State Health Services. Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

- Women in border counties experienced higher cervical cancer mortality rates (4.1 per 100,000) overall than women in non-border counties (3.0 per 100,000) (Figure 14).
  - Hispanic women in border counties had a slightly higher cervical cancer mortality rate (4.6 per 100,000) than Hispanics in non-border counties (4.0 per 100,000). The cervical cancer mortality rate of non-Hispanic whites along the border (2.8 per 100,000) was similar to that of non-border counties (2.5 per 100,000).

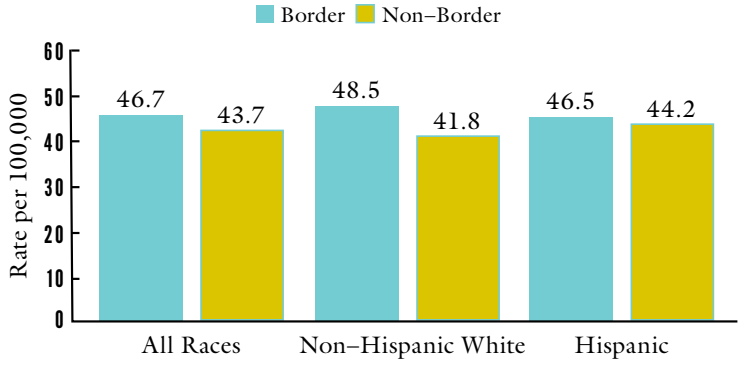
FIGURE 14. Cervical Cancer Mortality Rates Compared by Texas-Mexico Border and Non-Border Counties, Texas, 2002-2006



Rates are average annual rates per 100,000, age-adjusted to the 2000 U.S. Standard Population. Border counties are the 32 counties as defined by the Office of Border Health, Texas Department of State Health Services. Source: Texas Cancer Registry, 1990-2006 SeerStat mortality file.

- Late-stage (regional and distant) cervical cancers can reasonably be considered a marker for missed screening opportunities. When comparing the overall distribution of late-stage cancers by border region, 46.7 percent of women living along the border were diagnosed with late-stage cervical cancer, compared to 43.7 percent of women in non-border counties (Figure 15).
  - When examined by race and ethnicity, the biggest difference in stage was among non-Hispanic whites, where 48.5 percent of border residents had a late-stage diagnosis, compared to 41.8 percent in non-border counties. However, there were only 68 total cases.

FIGURE 15. Percent Distribution of Late Cervical Cancer Stage at Diagnosis by Race and Ethnicity, Texas-Mexico Border and Non-Border Counties, Texas, 2003-2007



Note: Percent of regional and distant staged cervical cancer cases within each race/ethnic group. Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

URBAN AND RURAL COUNTIES

Texas counties were categorized by degree of urbanization and population size based on the Rural-Urban Continuum Codes, which are designated by the U.S. Office of Management and Budget (http://www.ers.usda.gov/briefing/rurality/ruralurbcon). In this report, comparisons are made between counties in metropolitan areas (urban) and non-metropolitan counties (rural). Counties classified as urban (metropolitan) are presented in Table 4. There was an extremely small number of Asian/Pacific Islanders living in rural counties, and thus very few cervical cancer cases or deaths among that population. As a result, comparisons between Asian/Pacific Islanders living in rural and urban counties were not examined in the analysis.

TABLE 4. Urban or Metro Counties*

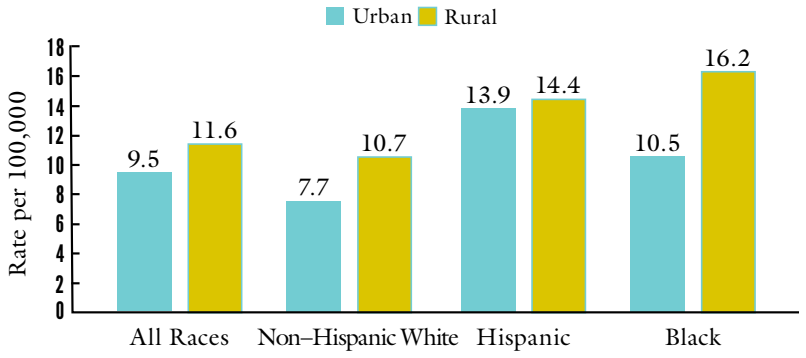
Aransas	Cameron	Goliad	Liberty	Smith
Archer	Carson	Grayson	Lubbock	Tarrant
Armstrong	Chambers	Gregg	McLennan	Taylor
Atascosa	Clay	Guadalupe	Medina	Tom Green
Austin	Collin	Hardin	Midland	Travis
Bandera	Comal	Harris	Montgomery	Upshur
Bastrop	Coryell	Hays	Nueces	Victoria
Bell	Crosby	Hidalgo	Orange	Waller
Bexar	Dallas	Hunt	Parker	Webb
Bowie	Delta	Irion	Potter	Wichita
Brazoria	Denton	Jefferson	Randall	Williamson
Brazos	Ector	Johnson	Robertson	Wilson
Burleson	Ellis	Jones	Rockwall	Wise
Caldwell	El Paso	Kaufman	Rusk	
Calhoun	Fort Bend	Kendall	San Jacinto	
Callahan	Galveston	Lampasas	San Patricio	

Urban/rural designations by the U.S. Office of Management and Budget, 2003.
*Rural county designations are all other counties not listed here.

- Overall, the incidence rate of cervical cancer was higher in rural counties (11.6 per 100,000) compared to urban counties (9.5 per 100,000) (Figure 16).

- By race and ethnicity, non-Hispanic whites and blacks had higher cervical cancer incidence rates in rural counties (10.7 per 100,000 and 16.2 per 100,000, respectively) than in urban counties (7.7 per 100,000 and 10.5 per 100,000, respectively). Rates were slightly higher for Hispanic women living in rural counties (14.4 per 100,000) compared to urban counties (13.9 per 100,000) (Figure 16).

FIGURE 16. Cervical Cancer Incidence Rates Compared by Urban and Rural Counties, Texas, 2003-2007

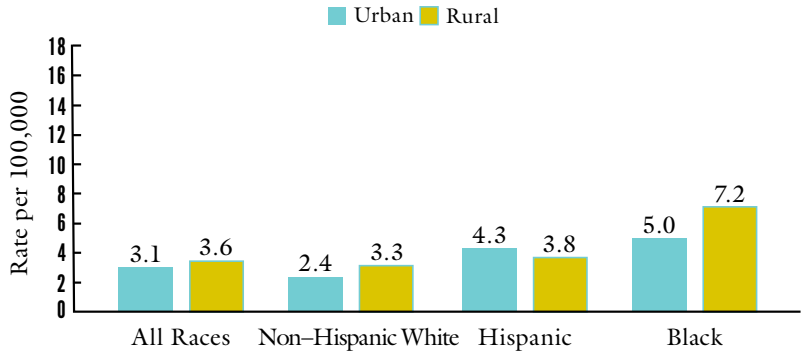


Rates are average annual rates per 100,000, age-adjusted to the 2000 U.S. Standard Population.
Urban/rural designations by the U.S. Office of Management and Budget, 2003.
Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

- The overall mortality rate for cervical cancer was higher in rural counties (3.6 per 100,000) compared to urban counties (3.1 per 100,000) (Figure 17).

- By race and ethnicity, non-Hispanic whites and blacks had higher mortality rates in rural counties (3.3 per 100,000 and 7.2 per 100,000, respectively) than in urban counties (2.4 per 100,000 and 5.0 per 100,000, respectively) (Figure 17). However, among Hispanics, mortality rates were higher in urban counties (4.3 per 100,000) compared to rural counties (3.8 per 100,000).

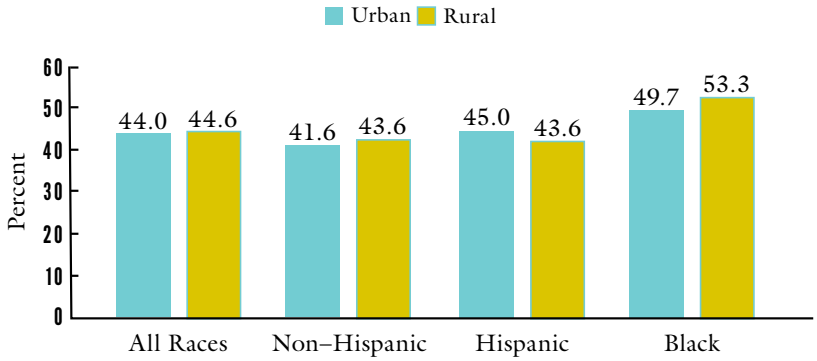
FIGURE 17. Cervical Cancer Mortality Rates Compared by Urban and Rural Counties, Texas, 2002-2006



Rates are average annual rates per 100,000, age-adjusted to the 2000 U.S. Standard Population.
Urban/rural designations by the U.S. Office of Management and Budget, 2003.
Source: Texas Department of State Health Services, Center for Health Statistics, 1990-2006, SEERStat mortality file created 03/31/2009.

- Again, using late-stage cervical cancer as a marker for missed screening opportunities, there was very little difference overall in stage between urban and rural counties. The largest urban/rural difference was among black women who had a slightly higher percentage of late-stage cancer in rural counties (53.3 percent) compared to urban counties (49.7 percent) (Figure 18).

FIGURE 18. Percent Distribution of Late Cervical Cancer Stage at Diagnosis by Race and Ethnicity, Urban and Rural Counties, Texas, 2003-2007



Note: Percent of regional and distant staged cervical cancer cases within each race/ethnic group.
Source: Texas Cancer Registry, 1995-2007 SeerStat incidence file cutoff 11/19/2009.

In 2000 the United States Department of Health and Human Services published their objectives for improving health across the country in Healthy People 2010. One of the objectives was to increase the proportion of women aged 18 years and older who have received a Pap test within the previous three years to 90 percent.[7]

The DSHS Behavioral Risk Factor Surveillance System (BRFSS) Program conducts an ongoing survey that collects data on lifestyle risk factors. In 2008 the survey included a Pap test screening question for Texas women aged 18 years and older.[8]

TABLE 5. Percentages of Women 18 and Older Who Have Had Recent Pap Test, Texas, 2008

Pap Smear Within Past 3 Years	Percentage
18 years and older	82
18-29 years old	79
30-44 years old	86
45-64 years old	83
65 years and older	66
Non-Hispanic White	82
Hispanic	82
Black	84
Low Education*	76
Rural Counties	80
Urban Counties	82
Border Counties	80
Non-Border Counties	82

Source: Texas Behavioral Risk Factor Surveillance System, Statewide BRFSS Survey, 2008. Border counties are the 32 Texas counties defined by the Office of Border Health, Texas Department of State Health Services. Rural counties defined by the U.S. Office of Management & Budget, 2003.
*Women 40 years and older with less than a high school education.

- Of the women surveyed, 81.5 percent reported having had a Pap test within the past three years (Table 5).

- The lowest prevalence of having had a recent Pap test was among women with less than a high school education (76.3 percent) and women living along the Texas-Mexico border (80.1 percent). Although the prevalence of Pap tests is lower among women aged 65 years and older (66 percent), according to screening guidelines, it is not necessary for all women over 65 to continue having Pap tests.[1]

In addition to BRFSS, a recent study found that Hispanic women, particularly those who live in counties along the United States-Mexico border, are less likely than non-Hispanic whites to receive routine screenings for breast and cervical cancers.[9] Lack of access to health care in the border region and the need for culturally sensitive preventive health care may partly account for these low screening rates among Hispanic women.

RISK FACTORS FOR CERVICAL CANCER

While the causes of cervical cancer are not yet completely understood, researchers have identified several risk factors that are consistently associated with the disease. A risk factor is something that puts a person at an increased risk of developing the disease. Some risk factors can be controlled (e.g. smoking or diet), and some cannot (e.g. age or genetics). Through studies of women all over the world, researchers have identified the following risk factors for cervical cancer:[10-12]

Human Papillomavirus (HPV): Infection with HPV has been identified as the most important risk factor for cervical cancer. Some sexually transmitted HPVs may promote the growth of abnormal cells in the cervix. Infection with HPV types 16 and 18, which can be prevented by HPV vaccine, account for approximately 70 percent of cervical cancers.[13,14]

Human Immunodeficiency Virus (HIV): Many studies have shown that women whose immune systems are weakened are more likely to develop cervical cancer.

Sexual Activity: Women who begin having sexual intercourse before the age of 18 are at increased risk, as well as women who have had many sexual partners (or have sex with men who have had many partners). This is due in part to the increased risk of contracting a sexually transmitted virus, such as HPV or HIV.

Multiple Full-Term Pregnancies: Women who have had three or more full-term pregnancies have been found to be at increased risk of developing cervical cancer.

Smoking: Tobacco smoke contains chemicals absorbed in the blood that may damage the cellular structure of the cervix and make cancer more likely to develop. Some studies have shown that women who smoke are about twice as likely as nonsmokers to get cervical cancer. The risk appears to increase with both frequency and longevity of smoking.

Diet: Poor nutrition has been identified as a risk factor for cervical cancer. A poor diet weakens the immune system and increases the risk for infections and cancer. Diets low in fruits and vegetables have been associated with an increased risk of cervical cancer and several other cancers.

Oral Contraceptives: Long-term use of oral contraceptives has been identified as a possible risk of cervical cancer. However, studies have indicated that risk decreases over time after stopping.

Low Socioeconomic Status (SES): SES represents a combination of income, wealth, education, and occupation and is commonly used as an indicator of underlying, and sometimes immeasurable, characteristics that tend to be associated with many external exposures, individual health behaviors, and access to health care. Low SES is a risk factor for cervical cancer. Women with low SES may not receive adequate health care, including pelvic exams and Pap tests, and poor nutrition might also be a factor.

Age: Cervical cancer differs from most cancers that tend to occur more often as people get older. While the average age of diagnosis for cervical cancer is 50–55 years, young women in their teens and early twenties are more commonly affected than with other cancers.

Family History: As with some other cancers, research has shown that women whose mother or sister has been diagnosed with cervical cancer are more likely to develop the disease themselves.

Race and Ethnicity: Cervical cancer occurs more often in Hispanics and blacks than in non-Hispanic whites and Asian/Pacific Islanders.

It is important to remember that having one of the above risk factors, or even several, does not mean that a person will get cervical cancer. Risk factors do, however, increase the chance of developing the disease. Rarely do women without any of the above risk factors develop cervical cancer.

In addition, it is important for public health considerations to focus on risk factors that can be changed or avoided (such as smoking and sexual behaviors) rather than those that cannot (such as age and family history). However, understanding risk factors that cannot be changed is still important, as this can help determine the appropriate cervical cancer screening protocol for the individual.

TECHNICAL NOTES

SOURCES OF DATA

The Texas Cancer Registry (TCR) collects incident reports of neoplasms occurring among state residents, including certain benign tumors and borderline malignancies. The incidence rates in this report are for primary malignant neoplasms.

The TCR is a population-based reporting system. Texas hospitals and cancer treatment centers are the primary sources of case reporting. Additionally, the TCR seeks information for Texas residents who are diagnosed and treated at facilities outside of Texas. The incidence data used in this report are primarily abstracted from medical records and pathology reports.

The completeness of the 2003–2007 data was evaluated by applying California's age, sex, and race and ethnic-specific cancer incidence rates to the Texas population in order to generate expected numbers of cases. California rates were used because of more complete California Cancer Registry case ascertainment as well as similarity between Texas and California populations. Based on these calculations, the 2003–2007 data presented here are estimated to be 98.3 percent complete. The incidence file used a cutoff date of November 19, 2009.

Cancer mortality data were extracted from electronic files provided by the Texas Department of State Health Services, Center for Health Statistics. These files contained demographic and cause-of-death information for all deaths occurring among Texas residents between 2002 and 2006. Cancer mortality data were not available for 2007 at the time of publication.

CONFIDENTIALITY

Maintaining the confidentiality of persons whose cancers are reported to the TCR is mandated by law and is the highest priority of the Registry in all aspects of operations. The data presented in this report are not intended to identify individuals who have been diagnosed with cancer.

PRIMARY SITE CODES

Primary site and histologic type were coded for each cancer incident case using the International Classification of Diseases for Oncology (ICD-O, version 2 & 3).[15,16] The ICD-O codes corresponding to the cervical cancer site category in this report are C530–C539 excluding morphologic types 9050: 9055, 9140, 9590: 9989.

For 1996–1998 cancer mortality data, the cervical cancer site presented in this report corresponds to site grouping (180) for the 9th Revision of the International Classification of Diseases (ICD-9).[17] For 1999–2006 cancer mortality data, the cervical cancer site presented corresponds to site grouping (C53) from the 10th Revision of the International Classification of Diseases (ICD-10).[18]

DATA MANAGEMENT

Data on incident cancers are reported to the TCR in accordance with the Texas Cancer Incidence Reporting Act (Chapter 82, Health and Safety Code). Standard data items are requested on the Confidential Cancer Incidence Reporting Form or in electronic format. These data are entered into a cancer incident database after being checked for completeness and quality. Multiple reports for the same individual are consolidated to assure the most complete and correct information possible.

RACE AND ETHNICITY OF CANCER CASES

Race and ethnicity information for cancer cases is based primarily on information contained in the patient's medical record. This information may be supplied directly by the patient, may be determined by admissions staff or other medical personnel, or may be based on last name, race/ethnicity, birthplace, or maiden name of a patient. The reporting of race and ethnicity may be influenced by the racial/ethnic distribution of the local population, by local interpretation of data collection guidelines, and other factors. Race/ethnicity information for cancer deaths is based on the information coded on the death certificate. This information is provided by the informant, who may be next-of-kin, friend, medical examiner, funeral director, attending physician, justice of the peace, or other source. This method is consistent with the classification schema used by other state programs. It is possible that some differences in race/ethnicity-specific rates reflect differences in classification rather than differences in actual risk.

The race and ethnicity of each cancer patient and death is classified according to the categories defined in the NAACCR coding manual.[19] Incidence data for Hispanics are based on NAACCR Hispanic Identification Algorithm (NHIA). The race/ethnic groups used in this report for incidence and mortality data include the following categories: non-Hispanic white, black, Hispanic, and Asian/Pacific Islander. Hispanic is not mutually exclusive from whites, blacks, Asian/Pacific Islanders, and American Indians/Alaska Natives. Hispanics can therefore be of any race, but from 2003 to 2007, 97.4 percent of cervical cancers in Hispanics were of the white race. From 1997 to 2006, 98.4 percent of cervical cancer deaths in Hispanics were of the white race.

POPULATION DATA

Estimates of the population used for the calculation of rates were obtained from the SEER program of the NCI, instead of the Texas State Data Center, as has been used in the past. This new data source and information about the derivation of these population data can be found at the following link: http://seer.cancer.gov/popdata/. For 2003–2007, the largest group is the non-Hispanic white population, with 50.4 percent of the state population. Texas Hispanics compose 34.0 percent of the total population, blacks 12.4 percent, and Asian/Pacific Islanders 3.5 percent. For 1997–2006, non-Hispanic whites represent 52.0 percent of the state population, Hispanics 33.0 percent, blacks 12.0 percent, and Asian/Pacific Islanders 3.2 percent. These groups are not mutually exclusive and do not include American Indian/Alaska Natives, and therefore will not add up to 100 percent.

CANCER INCIDENCE DATA QUALITY

Numerous quality assurance procedures were applied to the data based on the SEER Program procedures and NAACCR standards. The quality control procedures include both internal and external processes to ensure the reliability, completeness, consistency, and comparability of TCR data. The internal process included a review of the hard copy abstract for multiple primaries, duplicate records, and valid codes for all fields.

Both hard copy and computerized data were scrutinized for identification of: 1) possible duplicates of existing records, 2) unacceptable codes for any field, or inter-field inconsistencies, and 3) invalid or unusual site/sex, age/site, age/morphology or site/morphology combinations. Inconsistencies in date of birth, race, ethnicity, sex, county of residence, date of diagnosis, site, and histologic type were rectified. Multiple primaries for an individual were identified among the various reports during the editing process. Information on the same primary from duplicate reports was consolidated and checked for consistency and legitimate codes.

External procedures included hospital training, on-site case-finding studies, re-abstracting studies, and death clearance. Cancer death certificate files were matched against reported incident cases for an additional check of reporting completeness.

To identify any cancer cases not reported to the TCR, information on all death certificates with the underlying cause of death due to malignant neoplasm was obtained from the Bureau of Vital Statistics, Texas Department of State Health Services. Institutions listed on the death certificates as place of death were queried for additional cancer case information. Missed cases not identified from any institution were added to the cancer database. Cases for which the only available information is the death certificate, classified as "death certificate only" cases, were included in this report. The date of death was considered to be the date of diagnosis for these cases. From 2003–2007, 0.9 percent of cervical cancer cases were death certificate only cases.

The percentage of cases microscopically confirmed measures the quality of the diagnostic information on which the assignment of primary site is based. A case is microscopically confirmed if the diagnosis is based on autopsy, histology, cytology, or hematology findings. Of the total 2003 to 2007 cervical cancer cases, 96.0 percent were microscopically confirmed.

DATA ANALYSIS

In this report, average annual incidence and mortality rates were age adjusted using the direct method. Age adjustment eliminates the effects of differences in the age structure between populations and allows direct comparison of incidence and mortality rates for these populations. Direct standardization weights the age-specific rates for a given sex, race, and ethnicity or geographic area by the age distribution of the standard population. The 2000 United States standard million population was used as the standard for all calculations.[20]

The incidence and mortality rates and frequencies used in this report were calculated using SEER*Stat software (version 6.4.4). This software was developed by SEER to analyze population-based cancer registry data and provides the age-adjusted incidence and mortality rates for the standard set of cancer sites and site groups recognized by the SEER program. Information regarding availability and use of this software can be found on the SEER website: **http://seer.cancer.gov/seerstat.**

TREND ANALYSIS

The Annual Percent Change (APC) represents the average percent increase or decrease in cancer rates per year over a specified period of time. The APC is calculated by fitting a linear regression to the natural logarithm of the annual rates, using calendar year as a predictor variable (formula: $\ln(r) = m(\text{year}) + b$). From the slope of the regression line, m, APC is calculated as: $APC = 100 \times (e^m - 1)$.

Testing the hypothesis that the APC is equal to zero is equivalent to testing the hypothesis that the slope of the line in the regression is equal to zero. Statistical significance was set at alpha = 0.05, thus a trend in rates was considered statistically significant if there was less than a five percent chance that the difference was the result of random variation. The APC assumes that the cancer rate is changing at a constant rate over the interval examined.[21]

Asterisks indicate that the change is statistically significant at the $p < 0.05$ level. Trends should be interpreted with caution because of the relatively short time period for which data are available.

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