

Prostate Cancer in Ohio, 2011-2015



Incidence and Mortality

Prostate cancer is the most common cancer diagnosed among men in Ohio and the United States. Cancers of the prostate made up 22.9 percent of newly diagnosed (incidence) cancer cases among men reported to the Ohio Cancer Incidence Surveillance System (OCISS) from 2011 to 2015. An average of 7,334 cases of prostate cancer were diagnosed annually in Ohio during this time period (Table 1). The average annual age-adjusted prostate cancer incidence rate in Ohio was 108.0 per 100,000 males, compared to the national (SEER) incidence rate of 112.6 per 100,000 males. In Ohio in 2011-2015, the prostate cancer incidence rate was highest among blacks (165.9 per 100,000 males) and lowest among Asians/Pacific Islanders (51.2 per 100,000 males). In Ohio, prostate cancer incidence rates were 12 times higher for males 65 and older than those less than 65.

An average of 1,093 deaths from prostate cancer occurred each year in Ohio in 2011-2015 (Table 1). Ohio's average annual age-adjusted prostate cancer mortality rate was 19.4 per 100,000 males, compared to the U.S. mortality rate of 19.5 per 100,000 males. Similar to incidence, the mortality rate was higher for blacks (38.1 per 100,000 males) than whites (17.9 per 100,000 males) and Asians/Pacific Islanders (8.5 per 100,000 males) in Ohio during this time period. Prostate cancer deaths are rare for men less than 65—mortality rates were 89 times higher for men 65 and older than those less than 65 in Ohio.

Key Findings and Populations at High Risk

- An average of 7,334 cases of prostate cancer were diagnosed each year in Ohio in 2011-2015.
- The prostate cancer incidence rate in Ohio was 108.0 per 100,000 males, compared to the national rate of 112.6 per 100,000 males in 2011-2015.
- In both Ohio and the United States, blacks had the highest incidence and mortality rates of prostate cancer, while Asians/Pacific Islanders had the lowest rates.
- Prostate cancer was most frequently diagnosed among Ohio men aged 65 to 69.
- From 1996 to 2015, incidence rates of prostate cancer in Ohio decreased 29 percent for whites and 24 percent for blacks. Mortality rates decreased 50 percent and 55 percent among whites and blacks, respectively.
- Incidence rates tended to be higher in counties with or close to major urban areas in the state.
- Most prostate cancers in Ohio (73 percent) were diagnosed at a local stage, where the five-year relative survival probability is 100 percent.
- The proportion of local stage diagnoses increased from 1996 to 2006, then decreased in Ohio through 2015.

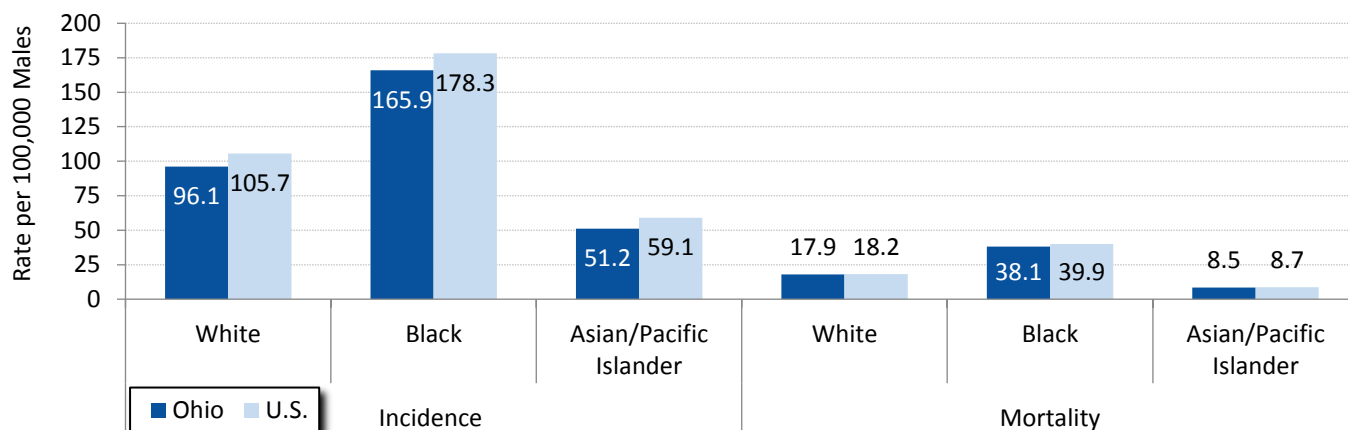
Table 1. Prostate Cancer: Average Annual Number of Invasive Cancer Cases and Deaths and Age-adjusted Incidence and Mortality Rates per 100,000 Males by Race and Age Group, Ohio and the United States, 2011-2015

		Incidence			Mortality		
		Ohio Cases	Ohio Rate	U.S. Rate	Ohio Deaths	Ohio Rate	U.S. Rate
Total		7,334	108.0	112.6	1,093	19.4	19.5
Race	White	5,834	96.1	105.7	910	17.9	18.2
	Black	1,059	165.9	178.3	175	38.1	39.9
	Asian/Pacific Islander	41	51.2	59.1	4	8.5	8.7
Age Group	<65	3,160	45.0	44.9	118	1.6	1.7
	65+	4,174	543.6	580.7	974	142.3	142.9

Sources: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018; Bureau of Vital Statistics, Ohio Department of Health, 2018; Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2018.

Incidence and Mortality by Race

Figure 1. Prostate Cancer: Average Annual Age-adjusted Incidence and Mortality Rates per 100,000 Males by Race, Ohio and the United States, 2011-2015

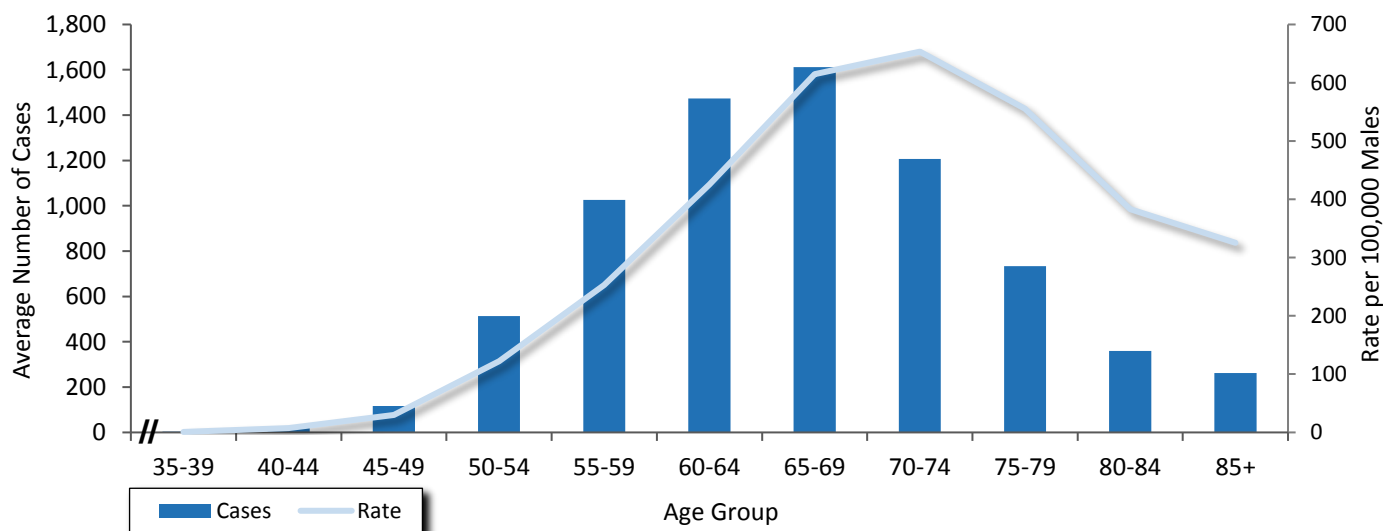


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018; Bureau of Vital Statistics, Ohio Department of Health, 2018; Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2018.

Figure 1 shows that the 2011-2015 prostate cancer age-adjusted incidence rate for blacks was 73 percent higher than the rate for whites in Ohio. Prostate cancer incidence rates in Ohio were lower than rates in the United States for each race. The mortality rate for black men was more than two times higher than for white men. Mortality rates in Ohio were similar to U.S. rates for each race.

Incidence by Age Group

Figure 2. Prostate Cancer: Average Annual Number and Age-specific Incidence Rates per 100,000 Males by Age Group, Ohio, 2011-2015

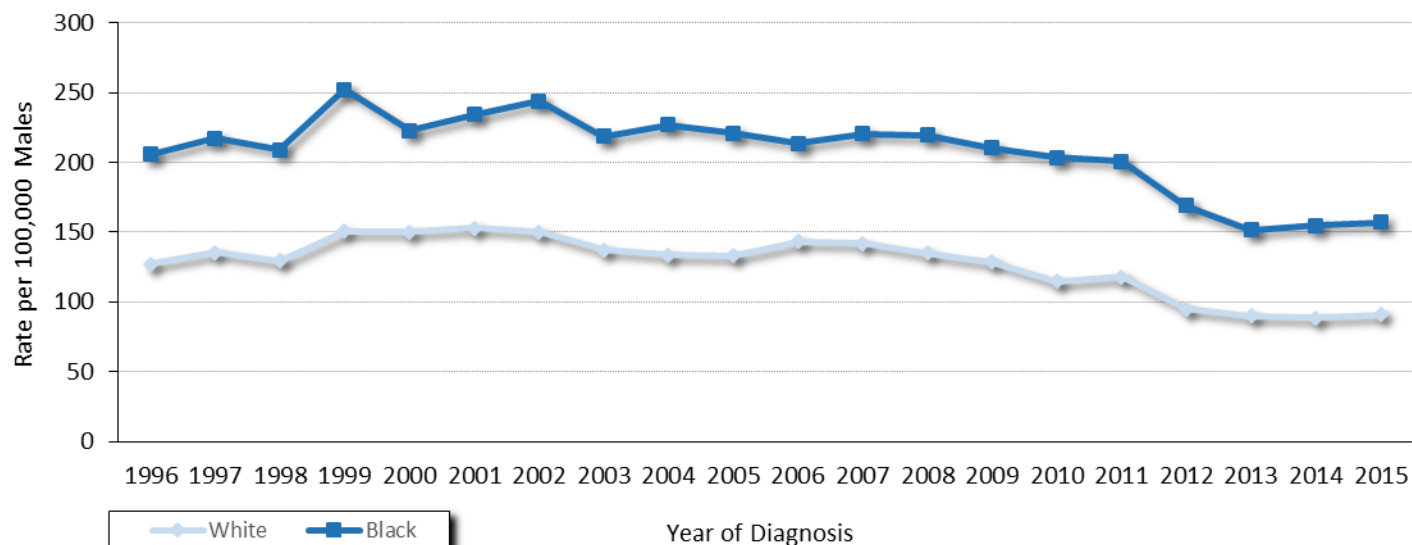


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.

Figure 2 shows that prostate cancer was most frequently diagnosed among men in the 65-69 age group in Ohio during 2011-2015. Prostate cancer age-specific incidence rates increased with advancing age group from ages 35-39 years to 70-74 years, followed by a decline for those age 75 and older.

Trends in Incidence and Mortality

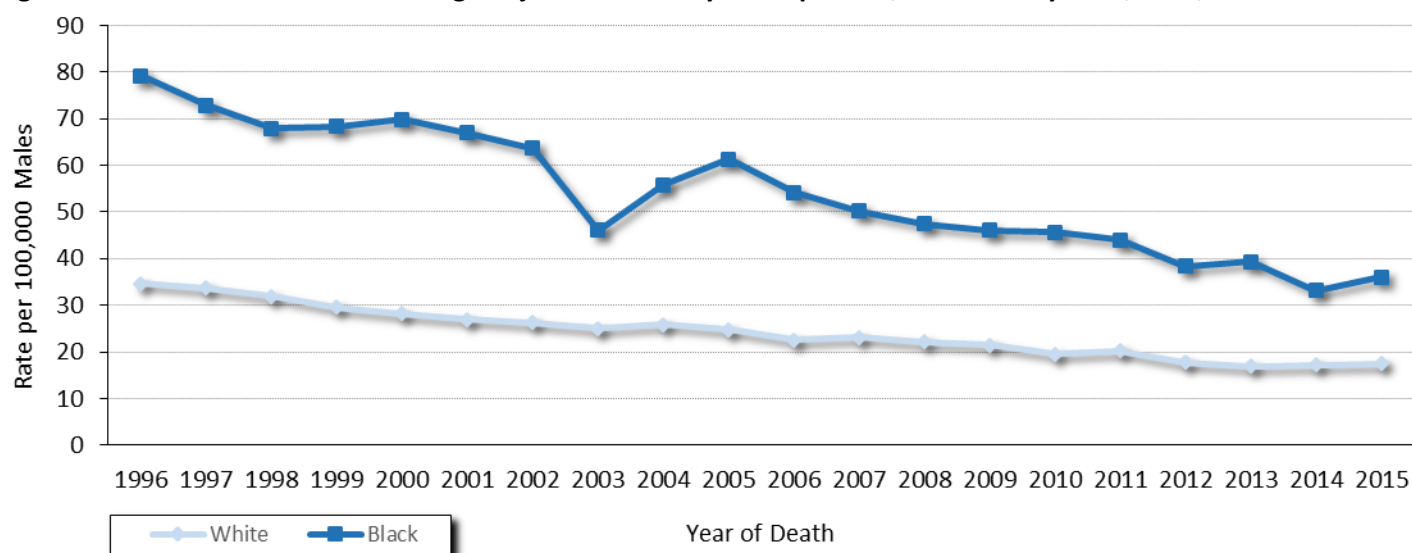
Figure 3. Prostate Cancer: Trends in Age-adjusted Incidence Rates per 100,000 Males by Race, Ohio, 1996-2015



Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.

Figure 3 shows incidence rates of prostate cancer in Ohio according to year of diagnosis (1996 to 2015) by race. Over this 20-year period, prostate cancer incidence rates decreased 29 percent among white men and 24 percent among black men. Part of the decline in prostate cancer diagnoses since 2011 may be due to changes in screening guidelines, which recommended against screening using the PSA (prostate-specific antigen) test, the main screening tool for prostate cancer for many years.

Figure 4. Prostate Cancer: Trends in Age-adjusted Mortality Rates per 100,000 Males by Race, Ohio, 1996-2015



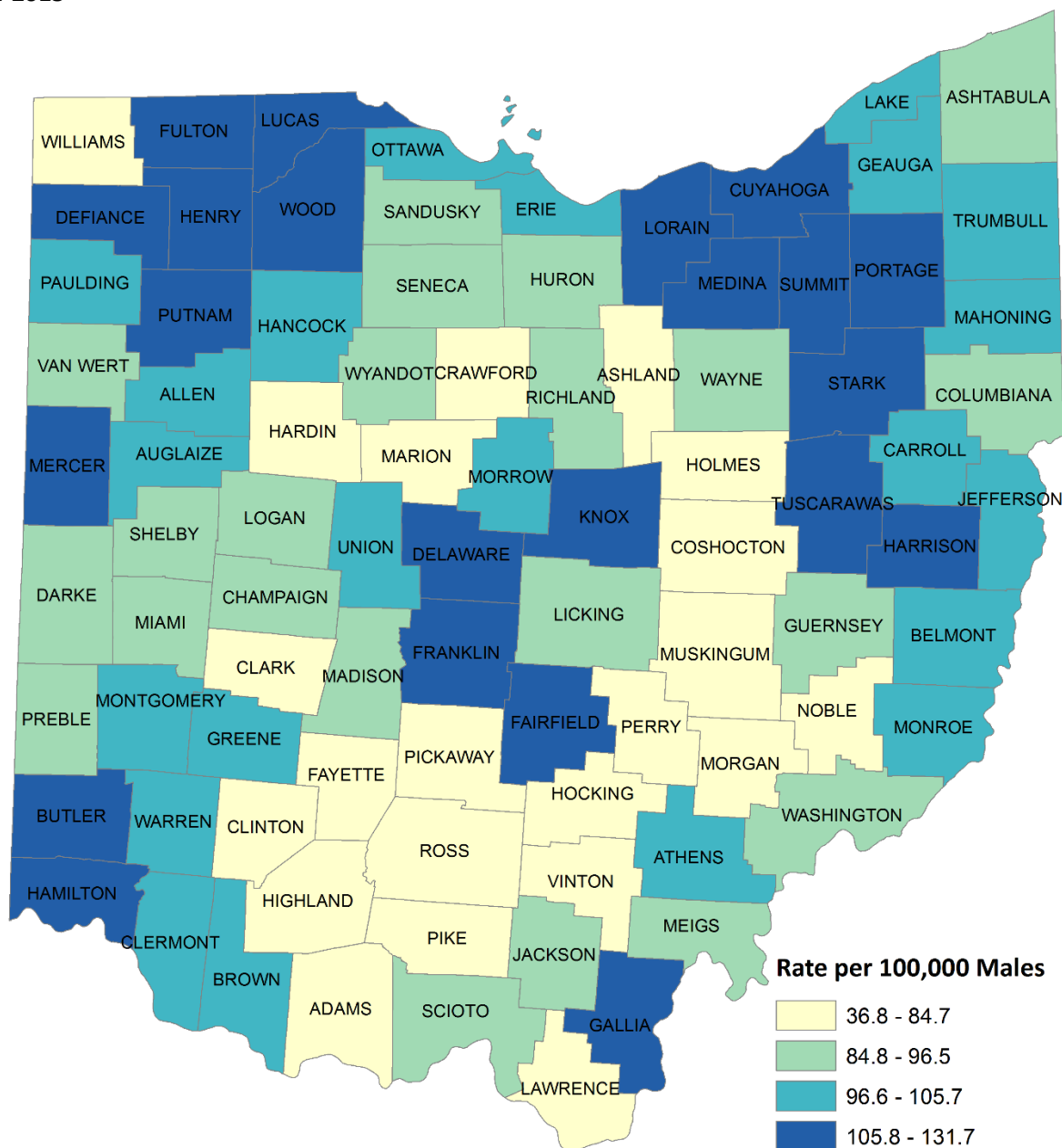
Source: Bureau of Vital Statistics, Ohio Department of Health, 2018.

Figure 4 shows trends in mortality rates of prostate cancer according to year of death (1996 to 2015) by race. From 1996 to 2015, the prostate cancer mortality rate decreased by about half among both whites and blacks in Ohio.

Incidence by County

Figure 5 shows 2011-2015 average annual age-adjusted prostate cancer incidence rates by county of residence. County-specific prostate cancer incidence rates in Ohio ranged from 36.8 to 131.7 per 100,000 male residents, compared with Ohio's rate of 108.0 per 100,000 males. The geographic pattern of incidence rates by county indicate a tendency for higher rates around major urban areas of the state. The following six counties, in decreasing order, had the highest incidence rates for this time period: Cuyahoga, Knox, Tuscarawas, Mercer, Medina and Franklin.

Figure 5. Prostate Cancer: Average Annual Age-adjusted Incidence Rates per 100,000 Males by County of Residence, Ohio, 2011-2015

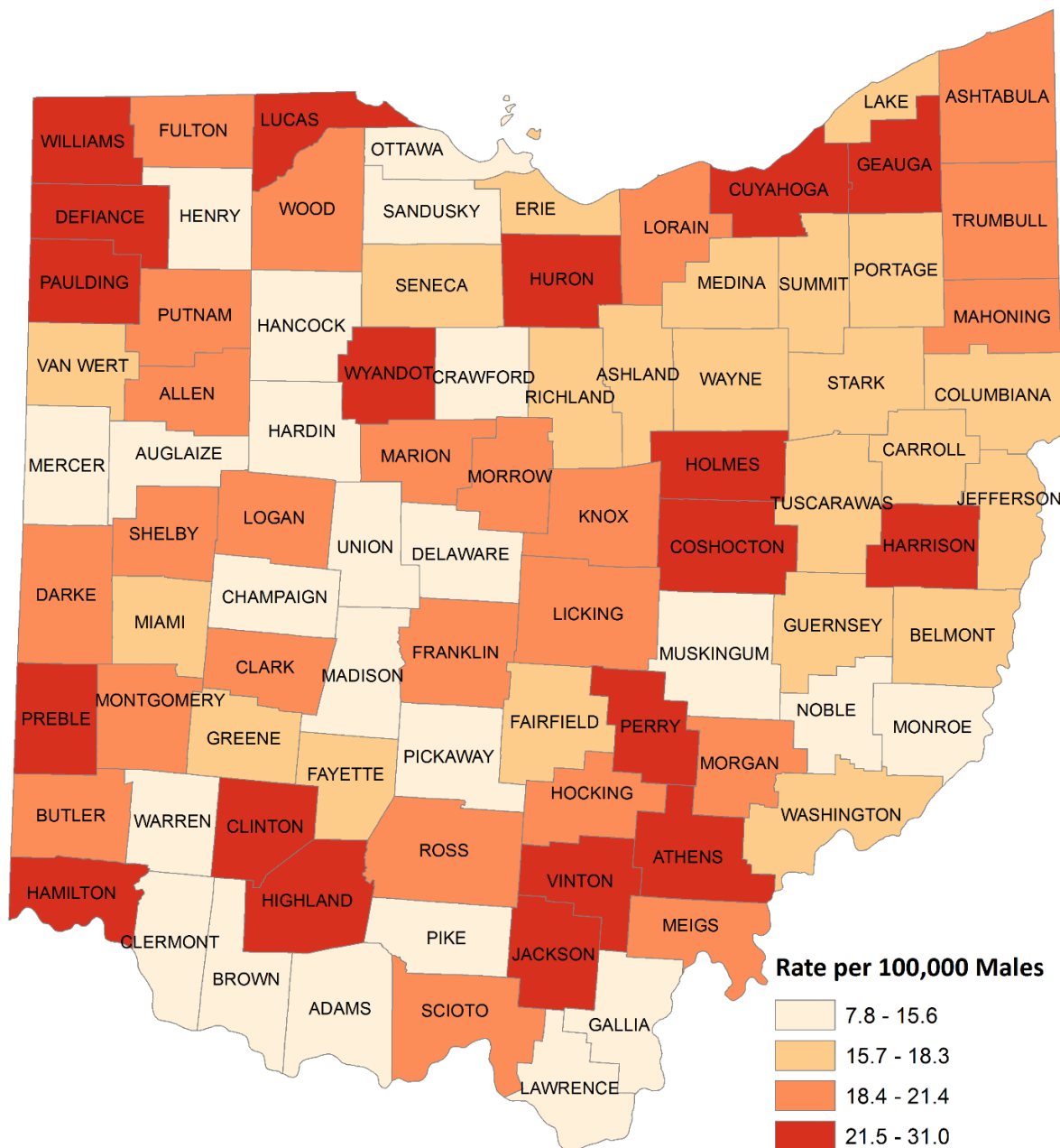


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.
Each category represents approximately 25 percent of the 88 Ohio counties.

Mortality by County

Figure 6 shows 2011-2015 average annual age-adjusted prostate cancer mortality rates by county of residence. County-specific prostate cancer mortality rates in Ohio ranged from 7.8 to 31.0 per 100,000 male residents, compared with Ohio's rate of 19.4 per 100,000 males. Prostate cancer mortality rates were variable across the state. The following six counties, in decreasing order, had the highest mortality rates for this time period: Huron, Holmes, Vinton, Clinton, Williams and Highland.

Figure 6. Prostate Cancer: Average Annual Age-adjusted Mortality Rates per 100,000 Males by County of Residence, Ohio, 2011-2015

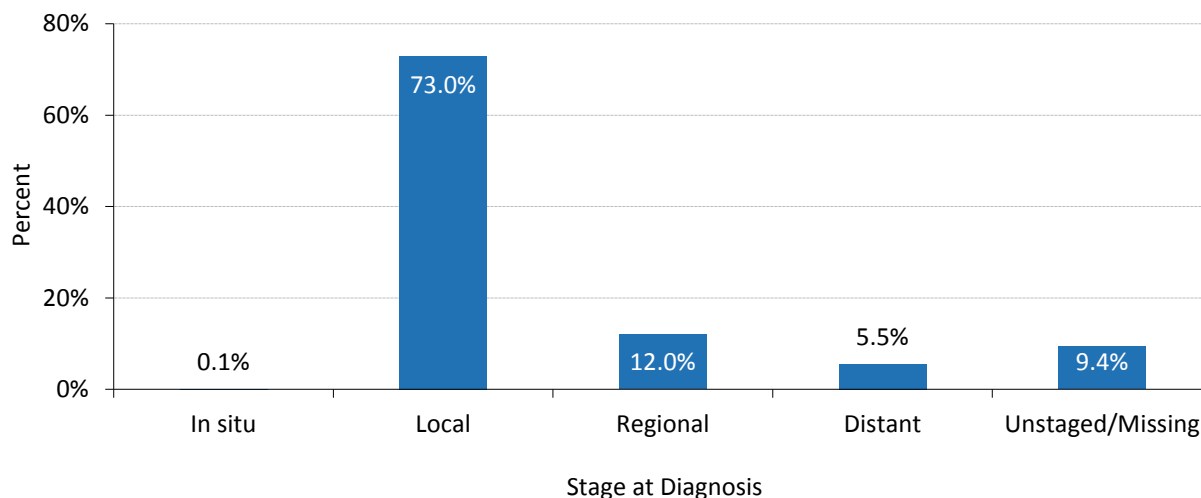


Source: Bureau of Vital Statistics, Ohio Department of Health, 2018.
Each category represents approximately 25 percent of the 88 Ohio counties.

Stage at Diagnosis

Cancer stage at diagnosis, which refers to the extent or spread of a cancer in the body, is used to select appropriate treatment and is an important determinant of survival. The 2011-2015 Ohio data presented in Figure 7 show that the majority of prostate cancers (73.0 percent) were diagnosed at the local stage, where the five-year relative survival probability for prostate cancer is 100 percent.

Figure 7. Prostate Cancer: Proportion of Cases (%) by Stage at Diagnosis, Ohio, 2011-2015

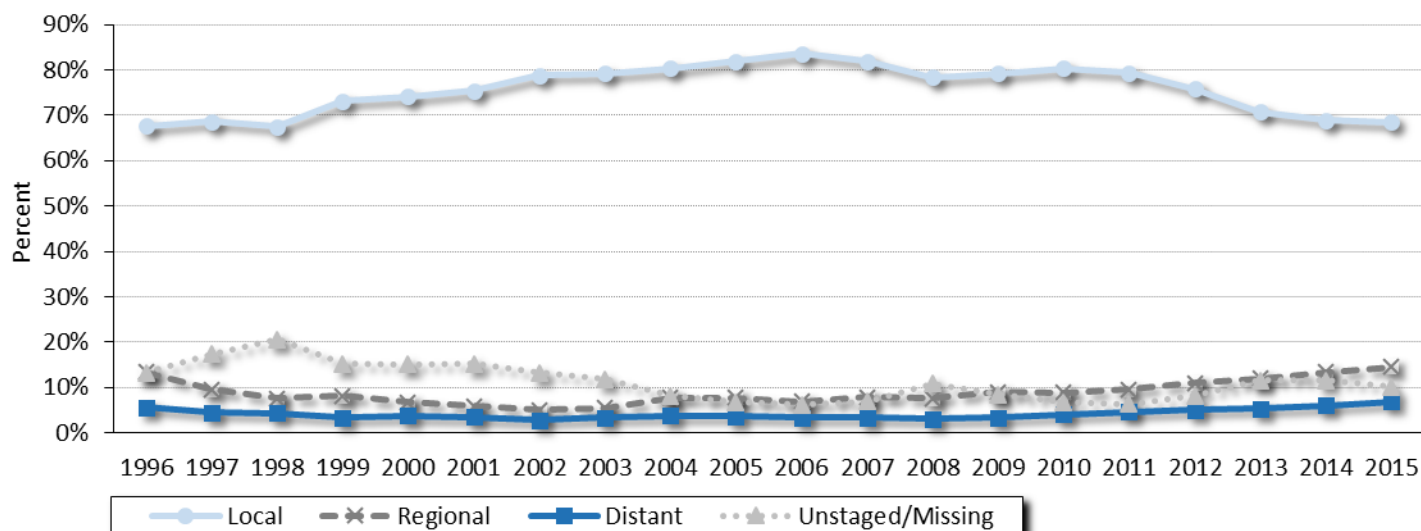


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.

Trends in Stage at Diagnosis

Figure 8 shows the distribution of stage at diagnosis of prostate cancer according to year of diagnosis from 1996 to 2015. The proportion of local stage diagnoses in Ohio increased from 1996 to 2006, then decreased from 2006 to 2015. The proportion of distant stage diagnoses increased by 23 percent in Ohio during this 20-year period, while tumors diagnosed as unstaged/missing decreased 23 percent.

Figure 8. Prostate Cancer: Trends in the Proportion of Cases (%) by Stage at Diagnosis and Year, Ohio, 1996-2015



Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.

Survival

Relative survival probability is the percentage of people who are alive at a designated time period (usually five years) after a diagnosis divided by the percentage expected to be alive in the absence of a diagnosis based on normal life expectancy. Table 2 shows the U.S. (SEER) five-year relative survival probability for prostate cancer in 2008-2014 is 98.2 percent for all stages combined. Five-year relative survival probabilities are 100 percent at the local and regional stages and only 30.0 percent for distant-stage tumors. The five-year relative survival probability for all stages combined is higher for whites (98.3 percent) compared to blacks (96.1 percent). The overall five-year relative survival probability for men less than 65 years of age is 98.6 percent compared to 97.9 percent for those 65 and older.

Table 2: Prostate Cancer: Five-year Relative Survival Probability (%) by Stage at Diagnosis, Race and Age Group in the United States, 2008-2014

	All Races			White			Black		
	All	<65	65+	All	<65	65+	All	<65	65+
All Stages	98.2%	98.6%	97.9%	98.3%	98.8%	98.0%	96.1%	97.6%	94.1%
Local	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Regional	100.0%	100.0%	100.0%	100.0%	99.8%	100.0%	100.0%	100.0%	99.3%
Distant	30.0%	33.6%	28.3%	29.1%	32.7%	27.6%	30.0%	33.3%	27.3%
Unstaged/Missing	80.9%	91.1%	77.5%	73.8%	88.0%	69.6%	68.7%	84.8%	60.7%

Source: Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2018.

Prostate Cancer by Grade

Table 3: Prostate Cancer: Proportion of Cases (%) by Grade, Ohio and the United States (SEER), 2011-2015

Grade	Ohio	U.S.
	Percent	Percent
Well differentiated; Grade I	14.1%	12.2%
Moderately differentiated; Grade II	35.9%	38.3%
Poorly differentiated; Grade III	35.8%	41.5%
Undifferentiated; anaplastic; Grade IV	0.3%	0.1%
Unknown	13.9%	7.9%

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018; Surveillance, Epidemiology and End Results Program (SEER), National Cancer Institute, 2018, SEER*Stat version 8.3.5, SEER 18 areas.

Table 3 shows the distribution of prostate cancer in Ohio and the United States by grade. Grade is used to describe how abnormal or aggressive the prostate cancer cells appear and is of benefit in predicting potential responses to treatment and prognosis. The least abnormal and least aggressive tumors have cells that are well differentiated (Grade I) or moderately differentiated (Grade II), meaning the cells have maintained usual characteristics of prostate cells. The most abnormal and most aggressive tumors are described as poorly differentiated (Grade III) or undifferentiated (Grade IV).

In 2011-2015, the majority of males in Ohio and the United States were diagnosed with tumors that were moderately differentiated (Grade II) or poorly differentiated (Grade III).

Risk Factors

A specific cause of prostate cancer is unknown, and according to the National Cancer Institute there are no potentially modifiable risk factors for prostate cancer at this time. However, several non-modifiable risk factors may contribute to the development of prostate cancer.

Age: Approximately 57 percent of all prostate cancers are diagnosed in men older than 65 and 99 percent are diagnosed in men at least 45 years of age.

Race/ethnicity: Black men are more likely to be diagnosed with prostate cancer than white men and often at a more advanced stage. The death rate for black men is more than two times higher than for white men. Prostate cancer is less common among Asian-American and Hispanic/Latino men compared to non-Hispanic white men.

Family history: Having a father or brother with prostate cancer more than doubles a man's risk of developing this disease. Risk is even higher for men with several affected relatives, particularly if their relatives were young at the time of diagnosis.

Genetic changes: Men with genetic changes in one or more specific regions of certain chromosomes have increased risk. Risk increases with the number of genetic changes. In addition, changes in the BRCA1 and BRCA2 genes increase risk. Men with Lynch syndrome also have an increased risk.

Signs and Symptoms

Although men with early stages of prostate cancer do not usually experience symptoms, those with a more advanced stage of the disease may experience:

- Weak or interrupted urine flow
- Inability to urinate or start or stop urine flow
- Need to urinate more frequently especially at night
- Blood in urine
- Pain or burning with urination
- Difficulty having an erection (erectile dysfunction)
- Pain in hips, spine, ribs or other areas from cancer that has spread to bones
- Weakness or numbness in legs or feet
- Loss of bladder or bowel control

Any of these signs/symptoms may be caused by cancer or by other, less serious health problems. If you have any of these signs/symptoms, see your healthcare provider.

Prostate Cancer Screening

No organizations presently endorse routine prostate cancer screening for men at average risk because of concerns about the high rate of overdiagnosis (detecting disease that would never have caused symptoms), along with the significant potential for serious side effects associated with prostate cancer treatment.

The American Cancer Society (ACS) recommends that men have a chance to make an informed decision with their healthcare provider about whether to be screened for prostate cancer. The decision should be made after getting information about the uncertainties, risks, and potential benefits of prostate cancer screening. Men should not be screened unless they have received this information. The discussion about screening should take place at:

- **Age 50 for men who are at average risk** of prostate cancer and are expected to live at least 10 more years.
- **Age 45 for men at high risk** of developing prostate cancer. This includes black men and men who have a first-degree relative (father, brother or son) diagnosed with prostate cancer at an early age (younger than age 65).
- **Age 40 for men at even higher risk** (those with more than one first-degree relative who had prostate cancer at an early age).

After this discussion, men who want to be screened should be tested with the PSA blood test. The digital rectal exam (DRE) may also be done as a part of screening.

The U.S. Preventive Services Task Force (USPSTF) recently reviewed the evidence on PSA-based screening for prostate cancer and published its final recommendation in 2018. The USPSTF recommends the following:

- **Men aged 55 to 69** should make an individual decision about prostate cancer screening with their clinician.
- No routine screening for men **age 70 and older**.

Did You Know?

The **Gleason scoring** system is used to grade prostate cancer. The Gleason score is based on biopsy samples taken from the prostate. The pathologist checks the samples to see how similar the tumor tissue looks to normal prostate tissue. Both a primary and a secondary pattern of tissue organization are identified. The primary pattern represents the most common tissue pattern seen in the tumor, and the secondary pattern represents the next most common pattern. For example, if the Gleason score is written as 3 + 4, it means most of the tumor is grade 3 and less is grade 4. The two grades are then added to give a Gleason score. The American Joint Committee on Cancer recommends grouping Gleason scores into the following categories:

- Gleason 2–6: The tumor tissue is well differentiated
- Gleason 7: The tumor tissue is moderately differentiated
- Gleason 8–10: The tumor tissue is poorly differentiated or undifferentiated

In recent years, doctors have developed Grade Groups, ranging from 1 (most favorable) to 5 (least favorable):

- Grade Group 1 = Gleason 6 (or less)
- Grade Group 2 = Gleason 3+4=7
- Grade Group 3 = Gleason 4+3=7
- Grade Group 4 = Gleason 8
- Grade Group 5 = Gleason 9-10

Although eventually the Grade Group system may replace the Gleason system, the two systems are currently reported side-by-side.

Technical Notes

Age-Adjusted Rate: A summary rate that is a weighted average of age-specific rates, where the weights represent the age distribution of a standard population (direct adjustment). The incidence and mortality rates presented in this report were standardized to the age distribution of the 2000 U.S. Standard Population. Under the direct method, the population was first divided into 19 five-year age groups, i.e., <1, 1-4, 5-9, 10-14, 15-19...85+, and the age-specific rate was calculated for each age group. Each age-specific rate was then multiplied by the standard population proportion for the respective age group.

Average Annual Number: The number of cases or deaths diagnosed per year, on average, for the time period of interest (e.g., 2011-2015). Average annual numbers are calculated by summing the number of cases or deaths for a given time period, dividing by the number of years that comprise the time period and rounding to the nearest whole number.

Census Data: The 1996-2015 rates were calculated using population estimates from the U.S. Census Bureau and National Center for Health Statistics. Population data were compiled from bridged-race intercensal population estimates for July 1, 1990-July 1, 1999; revised bridged-race intercensal population estimates for July 1, 2000-July 1, 2004 (released 10/26/2012); revised bridged-race intercensal population estimates for July 1, 2005-July 1, 2009 (released 6/26/2014) and vintage 2016 bridged-race postcensal population estimates for July 1, 2010-July 1, 2016 (released 6/26/2017).

Incidence: The number of cases diagnosed during a specified time period (e.g., 2011-2015). Prostate cancer cases were defined as follows: International Classification of Diseases for Oncology, Third Edition (ICD-O-3), code C619.

Invasive Cancer: A malignant tumor that has infiltrated the organ in which the tumor originated. Invasive cancers consist of those diagnosed at the local, regional, distant and unstaged/missing stages. Only invasive cancers were included in the calculation of incidence rates in this document.

Mortality: The number of deaths during a specified time period (e.g., 2011-2015). Prostate cancer deaths were defined as follows: International Statistical Classification of Diseases and Related Health Problems, Ninth Edition (ICD-9), code 185 for 1996-1998 and International Statistical Classification of Diseases and Related Health Problems, Tenth Edition (ICD-10), codes C610-C619 for 1999-2015.

Rate: The number of cases or deaths per unit of population (e.g., per 100,000 persons) during a specified time period (e.g., 2011-2015). Rates may be unstable and are not presented when the count is less than five.

Relative Survival Probability: The percentage of people who are alive at a designated time period (usually five years) after a cancer diagnosis divided by the percentage expected to be alive in the absence of cancer based on normal life expectancy. It does not distinguish between patients who have no evidence of cancer and those who have relapsed or are still in treatment.

Stage at Diagnosis: The degree to which a tumor has spread from its site of origin at the time of diagnosis. Cancer stage is often related to survival and is used to select appropriate treatment. Patients with early stage disease often have better long-term survival, and detecting cancers at an early stage may lead to a reduction in mortality. The stages of cancer, in the order of increasing spread, are *in situ*, local, regional and distant. *In situ* and localized tumors are referred to as early stage tumors, and regional and distant tumors are termed late stage. Cancers diagnosed at the local, regional, distant and unstaged/missing stages are categorized as invasive.

in situ—Noninvasive cancer that has not penetrated surrounding tissue.

Local—A malignant tumor confined entirely to the organ of origin.

Regional—A malignant tumor that has extended beyond the organ of origin directly into surrounding organs or tissues or into regional lymph nodes.

Distant—A malignant tumor that has spread to parts of the body (distant organs, tissues and/or lymph nodes) remote from the primary tumor.

Unstaged/Missing—Insufficient information is available to determine the stage or extent of the disease at diagnosis.

Table 4. Prostate Cancer: Average Annual Number and Age-adjusted Rates of Cases and Deaths per 100,000 Males by County of Residence, Ohio and the United States, 2011-2015

	Incidence		Mortality			Incidence		Mortality	
	Cases	Rate	Deaths	Rate		Cases	Rate	Deaths	Rate
Ohio	7,334	108.0	1,093	19.4	Lawrence	33	84.1	4	10.8
U.S.		112.6		19.5	Licking	90	87.0	16	21.4
Adams	14	73.7	1	9.6	Logan	26	87.6	5	21.4
Allen	66	103.2	10	18.8	Lorain	228	122.6	30	19.6
Ashland	27	77.0	5	16.1	Lucas	287	117.9	43	22.0
Ashtabula	57	85.4	10	18.7	Madison	22	88.1	3	15.6
Athens	30	101.5	5	22.1	Mahoning	155	98.4	29	19.7
Auglaize	29	103.6	3	11.1	Marion	33	79.3	7	20.5
Belmont	48	101.3	7	17.4	Medina	135	124.5	15	18.2
Brown	29	97.9	3	11.4	Meigs	14	86.1	2	21.1
Butler	206	105.8	29	18.8	Mercer	33	125.2	4	14.9
Carroll	22	102.8	3	17.2	Miami	64	95.3	9	15.8
Champaign	24	95.2	2	11.0	Monroe	11	96.9	1	10.2
Clark	73	80.8	15	19.7	Montgomery	328	103.2	58	20.9
Clermont	113	98.1	11	12.9	Morgan	8	69.1	2	19.7
Clinton	20	84.7	5	26.7	Morrow	21	97.2	3	19.7
Columbiana	67	89.7	11	17.5	Muskingum	42	78.8	7	14.9
Coshocton	17	65.9	4	22.0	Noble	7	36.8	2	12.9
Crawford	24	80.9	3	11.1	Ottawa	35	101.0	3	11.8
Cuyahoga	976	131.7	163	24.3	Paulding	12	100.8	2	22.0
Darke	32	92.4	7	21.4	Perry	18	80.9	3	25.6
Defiance	30	122.2	5	23.3	Pickaway	28	83.0	4	15.6
Delaware	114	120.9	8	14.0	Pike	13	75.2	2	14.9
Erie	54	97.0	9	18.3	Portage	105	113.1	13	16.6
Fairfield	98	115.1	11	16.1	Preble	26	92.1	5	24.2
Fayette	14	76.7	2	15.8	Putnam	23	111.8	3	19.1
Franklin	654	123.1	80	19.9	Richland	73	92.0	13	18.1
Fulton	31	117.5	5	20.9	Ross	31	66.0	7	20.8
Gallia	22	111.4	2	14.8	Sandusky	34	85.4	4	13.3
Geauga	66	99.2	12	22.8	Scioto	45	93.9	7	18.4
Greene	99	100.4	14	17.3	Seneca	33	94.8	5	16.1
Guernsey	23	87.0	3	17.3	Shelby	26	93.0	5	21.1
Hamilton	509	119.7	84	23.6	Stark	292	121.8	38	17.5
Hancock	46	101.5	6	15.4	Summit	367	111.8	49	17.5
Hardin	13	70.3	2	14.3	Trumbull	148	103.6	24	19.4
Harrison	13	110.5	2	23.6	Tuscarawas	76	125.8	9	15.8
Henry	19	107.2	2	15.2	Union	27	105.7	2	7.8
Highland	22	82.5	6	26.0	Van Wert	18	96.5	3	16.5
Hocking	15	74.5	3	20.9	Vinton	6	69.9	1	27.7
Holmes	17	82.7	5	29.1	Warren	120	104.0	11	13.5
Huron	33	94.9	9	31.0	Washington	38	88.3	6	16.7
Jackson	17	88.5	4	24.1	Wayne	67	93.3	10	17.9
Jefferson	47	96.7	7	16.7	Williams	17	68.1	5	26.1
Knox	48	129.5	6	21.0	Wood	78	113.0	10	18.4
Lake	151	100.9	22	17.1	Wyandot	14	94.8	3	23.8

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018; Bureau of Vital Statistics, Ohio Department of Health, 2018; Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2018.

Sources of Data and Additional Information

National Cancer Institute:

<https://www.cancer.gov/types/prostate>

American Cancer Society:

<https://www.cancer.org/cancer/prostate-cancer.html>

To address comments and information requests:

Ohio Cancer Incidence Surveillance System (OCISS)
Ohio Department of Health
246 North High Street
Columbus, OH 43215
Phone: (614) 752-2689
Fax: (614) 644-8028
E-mail: ociss@odh.ohio.gov

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John Kollman, M.S.; Holly L. Sobotka, M.S.
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