

Bladder Cancer in Ohio, 2012-2016

Incidence and Mortality

Bladder cancer is cancer that forms in the tissues of the bladder (the organ that stores urine). Bladder cancer made up 4.8 percent of newly diagnosed (incidence) cancer cases in Ohio reported to the Ohio Cancer Incidence Surveillance System (OCISS) from 2012 to 2016. An average of 3,141 cases of bladder cancer were diagnosed annually in Ohio during this time period (Table 1). Between 2012 and 2016, the average annual age-adjusted incidence rate for bladder cancer in Ohio was 22.0 per 100,000, compared to the national incidence rate of 20.1 per 100,000. The incidence rate among males diagnosed with bladder cancer (38.6 per 100,000) was four times higher than the rate among females (9.5 per 100,000), and the incidence rate was higher among whites (22.8 per 100,000) compared to blacks (12.6 per 100,000) and Asians/Pacific Islanders (6.3 per 100,000) in Ohio in 2012-2016.

Bladder cancer made up 2.9 percent of all cancer deaths in Ohio during 2012-2016, where an average of 723 deaths occurred each year (Table 1). The average annual age-adjusted mortality rate for bladder cancer in Ohio was 5.0 per 100,000, compared to the U.S. mortality rate of 4.4 per 100,000. The mortality rate was 3.7 times higher among males (8.9 per 100,000) than females (2.4 per 100,000) and higher among whites (5.2 per 100,000) compared to blacks (3.8 per 100,000) and Asians/Pacific Islanders (2.1 per 100,000) in Ohio in 2012-2016.

Key Findings and Populations at High Risk

- An average of 3,141 cases of bladder cancer were diagnosed and 723 deaths occurred each year in Ohio during 2012-2016.
- The bladder cancer incidence rate in Ohio was 22.0 per 100,000, which was 9 percent higher than the national rate of 20.1 per 100,000 in 2012-2016.
- Bladder cancer occurs four times more often in males than in females.
- Whites have higher incidence and mortality rates of bladder cancer than blacks and Asians/Pacific Islanders both in Ohio and the United States.
- Bladder cancer was most frequently diagnosed among Ohio males ages 70 to 74 in 2012-2016.
- There were no clear trends in bladder cancer incidence or mortality rates in Ohio from 1996 to 2016.
- There was no clear geographic pattern of bladder cancer incidence rates by county in Ohio during 2012-2016.
- The five-year relative survival for bladder cancer was 77.4 percent for all stages combined, based on Ohio data from 2009-2015.
- Tobacco smoking is the most common modifiable risk factor for bladder cancer, accounting for about half of all cases.

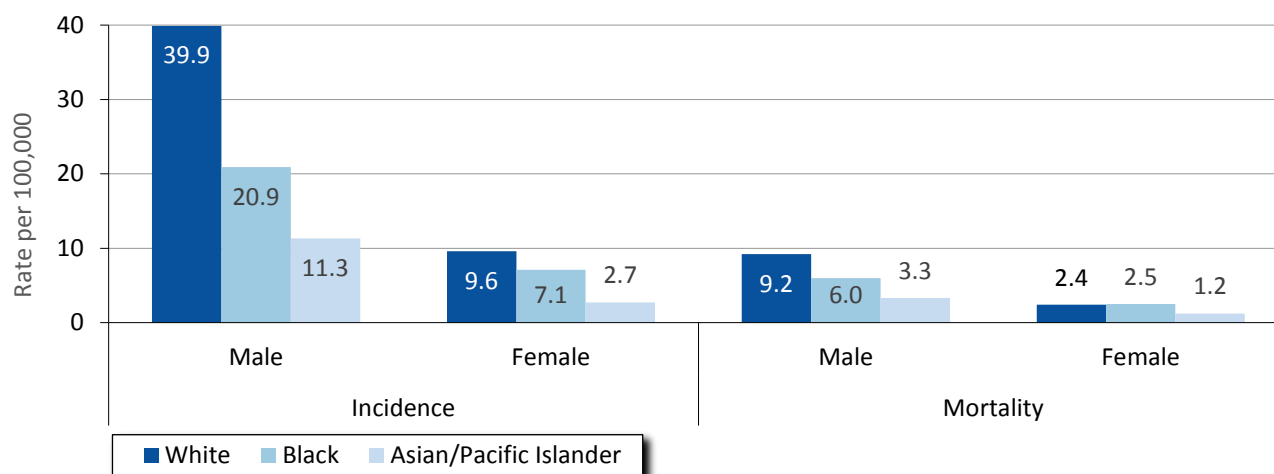
Table 1. Bladder Cancer: Average Annual Number and Age-adjusted Rates of Cases and Deaths per 100,000 Persons by Sex, Race and Age Group, Ohio and the United States, 2012-2016

		Incidence			Mortality		
		Ohio Cases	Ohio Rate	U.S. Rate	Ohio Deaths	Ohio Rate	U.S. Rate
Total		3,141	22.0	20.1	723	5.0	4.4
Sex	Male	2,384	38.6	35.2	523	8.9	7.6
	Female	757	9.5	8.7	200	2.4	2.1
Race	White	2,897	22.8	22.2	668	5.2	4.6
	Black	173	12.6	11.8	50	3.8	3.5
	Asian/Pacific Islander	9	6.3	8.8	3	2.1	1.7
Age Group	<65	846	6.3	5.2	111	0.8	0.7
	65+	2,295	131.0	123.2	612	34.5	30.0

Sources: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019; Bureau of Vital Statistics, Ohio Department of Health, 2019; Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2019.

Incidence and Mortality by Sex and Race

Figure 1. Bladder Cancer: Average Annual Age-adjusted Incidence and Mortality Rates per 100,000 Persons by Sex and Race, Ohio, 2012-2016

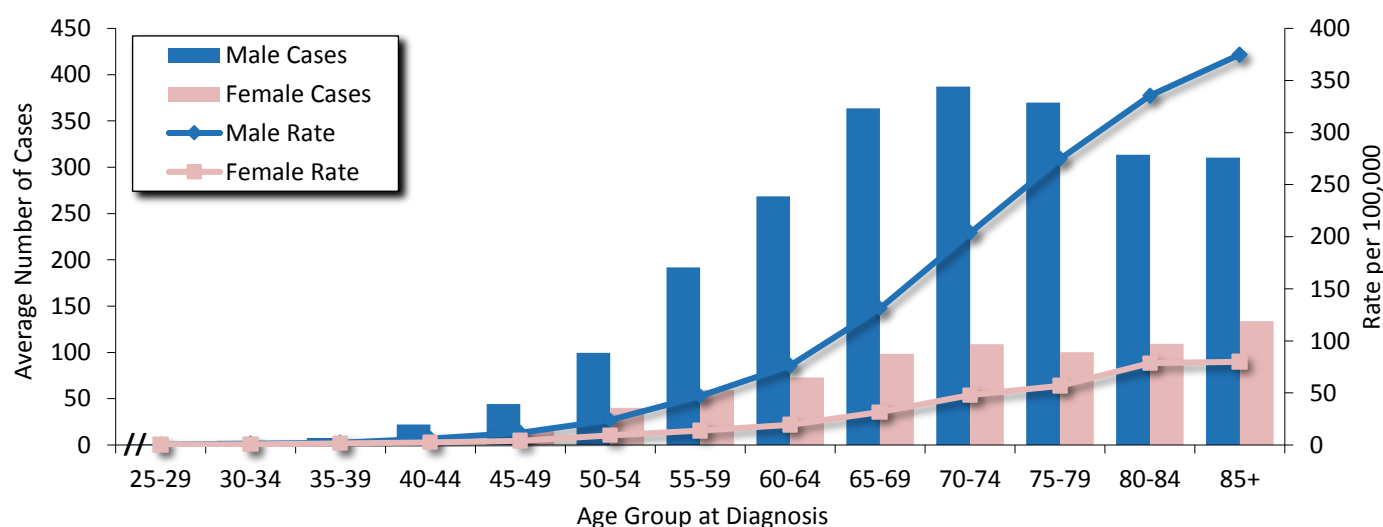


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019; Bureau of Vital Statistics, Ohio Department of Health, 2019.

White males had the highest incidence (39.9 per 100,000) and mortality (9.2 per 100,000) rates of bladder cancer in Ohio, based on data from 2012 to 2016 (Figure 1). In Ohio, Asian/Pacific Islander males and females had lower incidence and mortality rates of bladder cancer compared to both black and white males and females in 2012-2016.

Incidence by Age Group and Sex

Figure 2. Bladder Cancer: Average Annual Number and Age-specific Incidence Rates per 100,000 Persons by Age Group and Sex, Ohio, 2012-2016



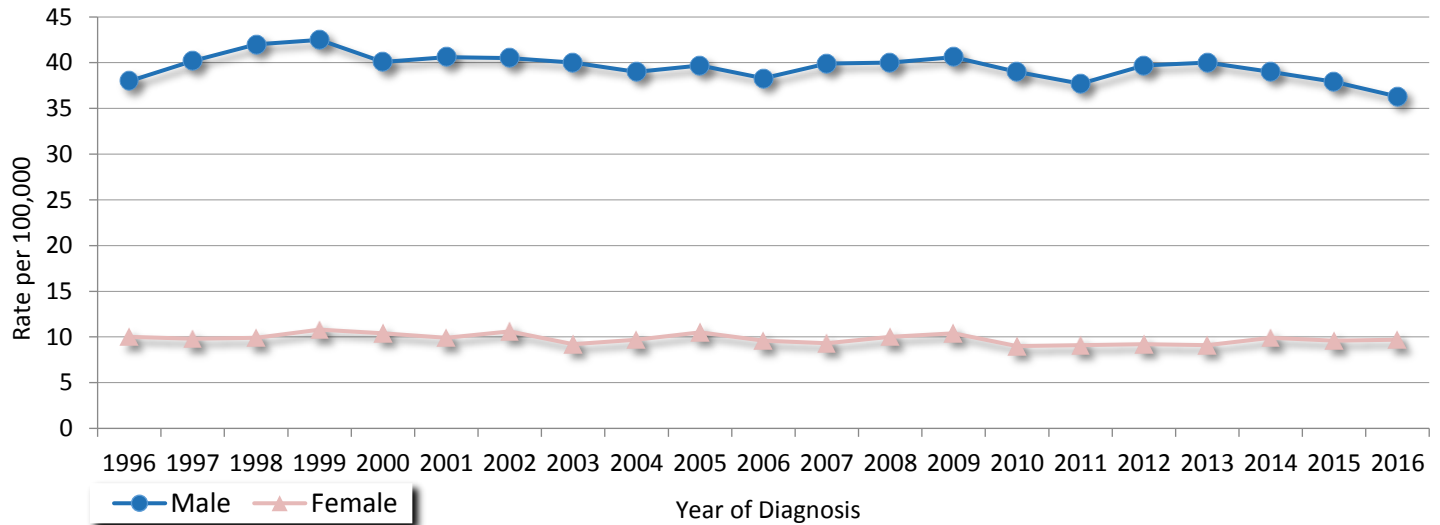
Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

In Ohio between 2012 and 2016, bladder cancer was most frequently diagnosed among men ages 70 to 74 and among women ages 85 and older (Figure 2). Incidence rates increased with advancing age, reaching a peak among those ages 85 and older for both men and women.

Trends in Incidence and Mortality

Figure 3 shows incidence rates of bladder cancer according to year of diagnosis (1996 through 2016) for males and females in Ohio. For each year, the incidence rate was higher among Ohio males compared to females. Incidence rates were relatively stable among both men and women in Ohio during this time period.

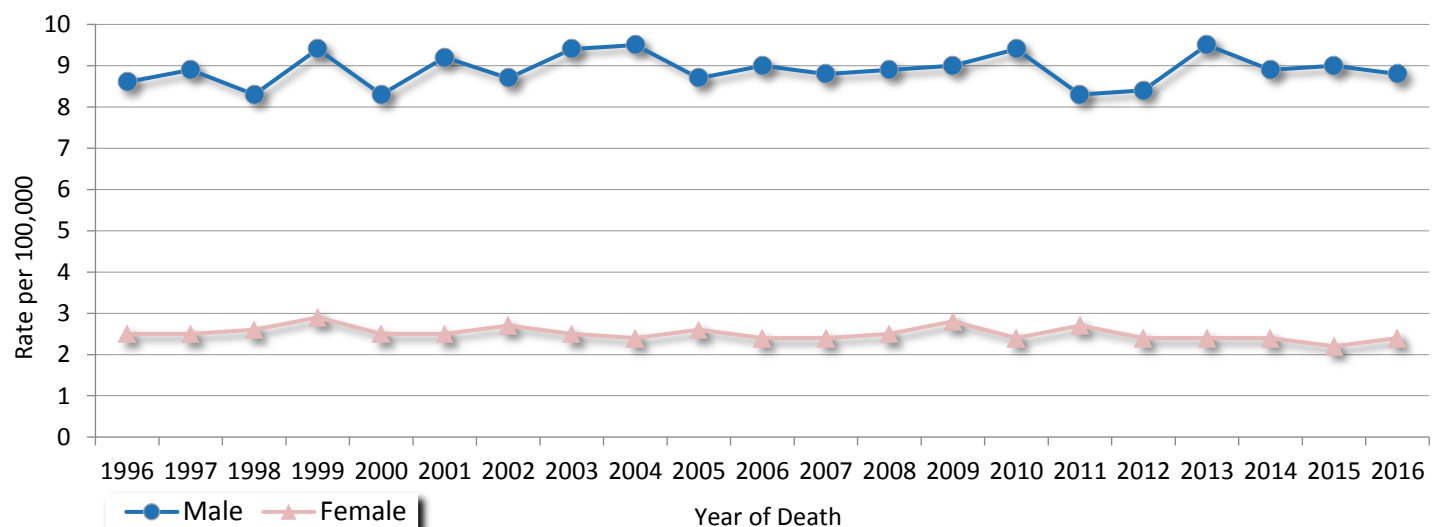
Figure 3. Bladder Cancer: Trends in Age-adjusted Incidence Rates per 100,000 Persons by Sex, Ohio, 1996-2016



Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Figure 4 shows bladder cancer mortality rates in Ohio according to year of death (1996 through 2016) for males and females. For each year, bladder cancer mortality rates were higher among males compared to females in Ohio. From 1996 to 2016, there were no clear trends in bladder cancer mortality rates in Ohio among both men and women.

Figure 4. Bladder Cancer: Trends in Age-adjusted Mortality Rates per 100,000 Persons by Sex, Ohio, 1996-2016

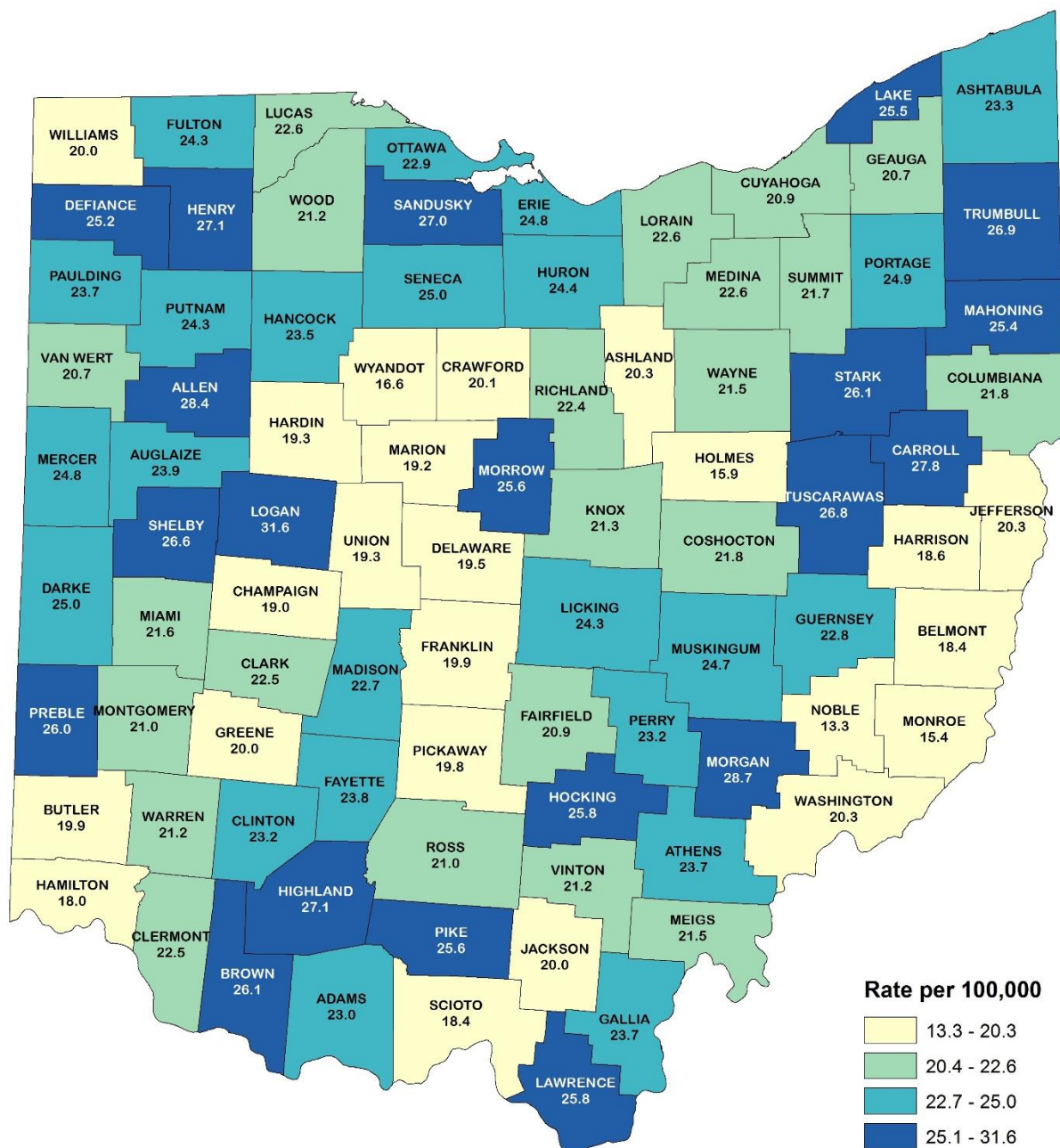


Source: Bureau of Vital Statistics, Ohio Department of Health, 2019.

Incidence by County

Figure 5 shows 2012-2016 average annual age-adjusted bladder cancer incidence rates by county of residence. County-specific bladder cancer incidence rates in Ohio ranged from 13.3 to 31.6 per 100,000 persons, compared with Ohio's rate of 22.0 per 100,000. There was no clear geographic pattern of bladder cancer incidence rates by county during 2012-2016. The following counties had the highest incidence rates, in decreasing order, for this time period: Logan, Morgan, Allen, Carroll, Henry and Highland.

Figure 5. Bladder Cancer: Average Annual Age-adjusted Incidence Rates per 100,000 Persons by County of Residence, Ohio, 2012-2016



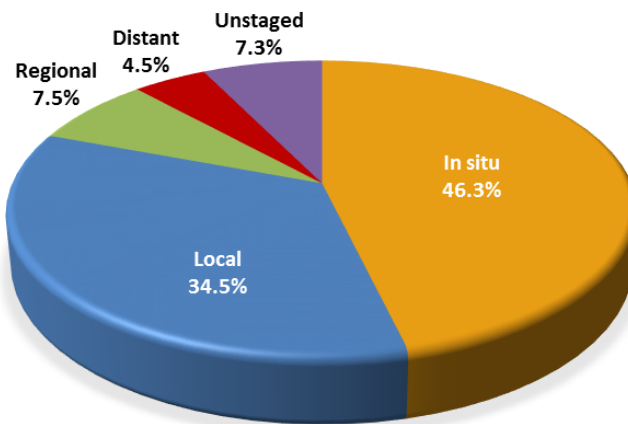
Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

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 stages of cancer, in order of increasing spread, are *in situ*, local, regional and distant. The 2012-2016 Ohio data presented in Figure 6 show that most (80.8 percent) bladder cancer cases were diagnosed at an early stage (46.3 percent *in situ* and 34.5 percent local stage).

Figure 6. Bladder Cancer: Proportion of Cases (%) by Stage at Diagnosis, Ohio, 2012-2016

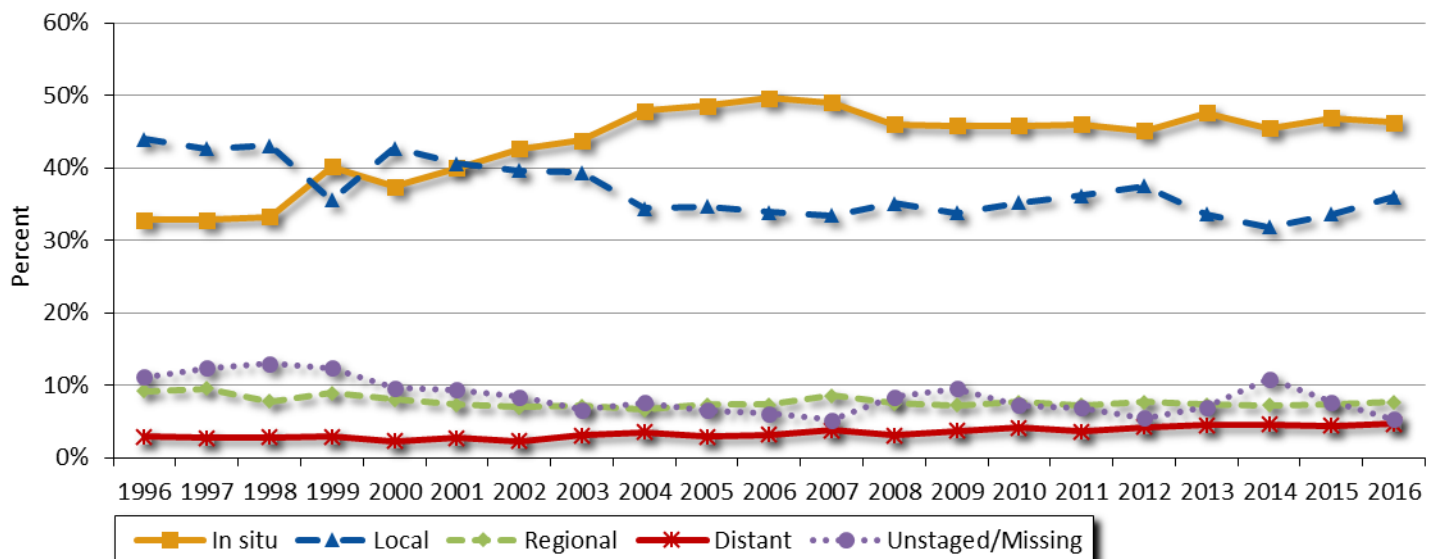


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Trends in Stage at Diagnosis

Figure 7 shows the distribution of stage at diagnosis of bladder cancer according to year of diagnosis from 1996 to 2016. The proportion of *in situ* and distant stage cases increased in Ohio, while the proportions of local stage diagnoses decreased during this time period. Proportions of regional stage and unstaged/missing diagnoses also showed a downward trend but were variable.

Figure 7. Bladder Cancer: Trends in the Proportion of Cases (%) by Stage at Diagnosis and Year, Ohio, 1996-2016



Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Types of Bladder Cancer

There are three types of bladder cancer that begin in cells in the lining of the bladder. These cancers are named for the type of cells that become malignant (cancerous):

- **Transitional cell carcinoma**, also known as urothelial carcinoma, begins in cells in the innermost tissue layer of the bladder. These cells are able to stretch when the bladder is full and shrink when it is emptied. Most bladder cancers (93.9 percent) begin in the transitional cells (Table 2).
- **Squamous cell carcinoma** begins in squamous cells (thin, flat cells lining the inside of the bladder). Cancer may form after long-term infection or irritation.
- **Adenocarcinoma** begins in glandular cells that are found in the lining of the bladder. Glandular cells in the bladder make substances such as mucus. This is a very rare type of bladder cancer.

Other types of bladder cancer include **small cell carcinoma**, which starts in nerve-like cells called neuroendocrine cells and **sarcoma**, which starts in the muscle cells of the bladder and is very rare.

Table 2. Bladder Cancer: Average Annual Number and Proportion of Cases (%) by Histology, Ohio, 2012-2016

Histology	Cases	Percent
Transitional cell carcinoma	2,949	93.9%
Squamous cell carcinoma	44	1.4%
Adenocarcinoma	19	0.6%
Small cell carcinoma	26	0.8%
Sarcoma	3	0.1%
Other types	99	3.1%

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Survival

Relative survival 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 3 shows that the five-year relative survival for bladder cancer in Ohio during 2009-2015 was 77.4 percent for all stages combined. The five-year relative survival probabilities were 70.1 percent at the localized stage, 35.8 percent at the regional stage and only 5.9 percent for distant-stage tumors. For each stage, the five-year relative survival was higher among males compared to females.

Table 3. Bladder Cancer: Five-year Relative Survival (%) by Stage at Diagnosis, Ohio, 2009-2015

	Total	Male	Female
All Stages	77.4%	79.0%	72.4%
In Situ	96.6%	96.8%	95.8%
Local	70.1%	72.6%	61.5%
Regional	35.8%	37.8%	30.4%
Distant	5.9%	7.6%	1.7%
Unstaged/Missing	64.0%	65.5%	60.2%

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Risk Factors

Anything that increases the chance of getting a disease is called a risk factor. Having a risk factor does not mean that a person will get cancer; not having risk factors doesn't mean that a person will not get cancer. The following is a list of risk factors for bladder cancer:

Potentially Modifiable Risk Factors

Smoking: Tobacco smoking is the most common modifiable risk factor for bladder cancer, accounting for approximately 50 percent of all cases.

Workplace exposures: Certain industrial chemicals have been linked with bladder cancer. Painters and workers in the dye, rubber, leather and aluminum industries have an increased risk.

Arsenic: Arsenic, including that in drinking water, has been linked with a higher risk of bladder cancer in some parts of the world.

Certain by-products in treated water: Exposure to chlorinated aliphatic hydrocarbons and chlorination by-products in treated water increase bladder cancer risk.

Aristolochic acid: Aristolochic acid, a Chinese herb, increases bladder cancer risk.

Chemotherapy: Taking the chemotherapy drug cyclophosphamide or ifosfamide increases the risk of bladder cancer.

Radiation therapy: People who are treated with radiation to the pelvis are more likely to develop bladder cancer.

Non-modifiable Risk Factors

Age: The risk of bladder cancer increases with age. About nine out of 10 people with bladder cancer are older than 55.

Race and ethnicity: Whites are about twice as likely to develop bladder cancer as blacks. Non-Hispanics are twice as likely to develop bladder cancer as Hispanics.

Sex: Bladder cancer is much more common in men than in women.

Chronic bladder irritation and infections: Urinary infections, kidney and bladder stones, bladder catheters left in place for a long time and other causes of chronic bladder irritation have been linked with bladder cancer.

Family history: People who have family members with bladder cancer have a higher risk of getting it themselves. The increased risk among family members may be due to exposure to the same cancer-causing chemicals (such as those in tobacco smoke).

Genetics: People with specific genetic characteristics have a higher bladder cancer risk. These include *HRAS* mutation (Costello Syndrome, Facio-Cutaneous-Skeletal Syndrome), *Rb1* mutation, *PTEN/MMAC1* mutation (Cowden Syndrome), *NAT2* slow acetylator phenotype and *GSTM1* null phenotype.

Signs and Symptoms

- Blood in the urine
- Changes in bladder habits or symptoms of irritation:
 - Having to urinate more often than usual
 - Pain or burning during urination
 - Need to urinate right away, even when the bladder is not full
 - Having trouble urinating or having a weak urine stream

Bladder cancers that have grown large enough or have spread to other parts of the body can sometimes cause other symptoms, such as:

- Being unable to urinate
- Lower back pain on one side
- Loss of appetite and weight loss
- Feeling tired or weak
- Swelling in the feet
- Bone pain

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.

Early Detection

There is currently no screening method recommended for people at average risk of bladder cancer. Bladder cancer is diagnosed by microscopic examination of cells from urine or bladder tissue and examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that is inserted through the urethra. These and other tests may be used to screen people at increased risk, as well as during follow-up after bladder cancer treatment to detect recurrent or new tumors.

Did You Know?

Smokers are more than twice as likely to get bladder cancer as nonsmokers. When cigarette smoke is inhaled, many of the toxins it contains are absorbed into the bloodstream, filtered by the kidneys and excreted into the urine. As a result, the bladder lining is subject to prolonged contact with carcinogens.

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., 2012-2016). 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 1996-2016 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 2017 bridged-race postcensal population estimates for July 1, 2010-July 1, 2017 (released 6/27/2018).

Incidence: The number of cases diagnosed during a specified time period (e.g., 2012-2016). Bladder cancer cases were defined by the International Classification of Diseases for Oncology, Third Edition (ICD-O-3), and categorized by site codes C670-C679 in accordance with the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute.

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., 2012-2016). Bladder cancer deaths were defined by the International Statistical Classification of Diseases and Related Health Problems, Ninth Edition (ICD-9), code 188 for 1996-1998 and the International Statistical Classification of Diseases and Related Health Problems, Tenth Edition (ICD-10), codes C670-C679 for 1999-2016, in accordance with the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute.

Rate: The number of cases or deaths per unit of population (e.g., per 100,000 persons) during a specified time period (e.g., 2012-2016). Rates may be unstable and are not presented when the count is less than five.

Relative Survival: 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 extent or spread of the disease from the site of origin, often classified into the following stages:

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. Bladder Cancer: Average Annual Number and Age-adjusted Rates of Cases and Deaths per 100,000 Persons by County of Residence, Ohio and the United States, 2012-2016

	Incidence		Mortality			Incidence		Mortality	
	Cases	Rate	Deaths	Rate		Cases	Rate	Deaths	Rate
Ohio	3,141	22.0	723	5.0	Lawrence	21	25.8	4	5.2
U.S.		20.1		4.4	Licking	48	24.3	13	6.9
Adams	8	23.0	1	4.4	Logan	18	31.6	3	5.7
Allen	37	28.4	7	5.5	Lorain	89	22.6	21	5.3
Ashland	14	20.3	3	4.7	Lucas	114	22.6	27	5.2
Ashtabula	32	23.3	6	4.6	Madison	11	22.7	1	2.6
Athens	14	23.7	5	8.5	Mahoning	88	25.4	19	5.1
Auglaize	14	23.9	3	5.0	Marion	16	19.2	4	5.1
Belmont	19	18.4	5	5.2	Medina	48	22.6	10	5.1
Brown	15	26.1	3	5.5	Meigs	7	21.5	2	5.5
Butler	79	19.9	21	5.3	Mercer	13	24.8	3	6.3
Carroll	11	27.8	2	4.2	Miami	30	21.6	6	4.3
Champaign	10	19.0	3	7.0	Monroe	3	15.4	1	*
Clark	43	22.5	9	4.6	Montgomery	146	21.0	33	4.6
Clermont	50	22.5	11	5.3	Morgan	6	28.7	2	8.4
Clinton	11	23.2	4	7.2	Morrow	11	25.6	2	4.6
Columbiana	34	21.8	8	5.1	Muskingum	28	24.7	5	4.5
Coshocton	11	21.8	2	4.5	Noble	4	13.3	1	*
Crawford	12	20.1	4	6.8	Ottawa	15	22.9	2	3.8
Cuyahoga	350	20.9	88	5.1	Paulding	6	23.7	1	5.8
Darke	18	25.0	3	4.6	Perry	9	23.2	3	6.8
Defiance	12	25.2	4	6.7	Pickaway	13	19.8	3	5.5
Delaware	35	19.5	7	4.7	Pike	9	25.6	2	5.9
Erie	28	24.8	6	5.6	Portage	46	24.9	11	5.9
Fairfield	35	20.9	7	4.6	Preble	14	26.0	3	6.0
Fayette	9	23.8	3	7.6	Putnam	10	24.3	1	*
Franklin	221	19.9	44	4.0	Richland	38	22.4	11	6.4
Fulton	13	24.3	3	4.3	Ross	21	21.0	4	4.6
Gallia	10	23.7	2	4.0	Sandusky	21	27.0	5	6.5
Geauga	28	20.7	7	5.5	Scioto	18	18.4	6	6.4
Greene	41	20.0	8	4.4	Seneca	18	25.0	5	6.5
Guernsey	12	22.8	4	6.4	Shelby	15	26.6	3	6.1
Hamilton	168	18.0	45	4.8	Stark	135	26.1	30	5.8
Hancock	22	23.5	4	4.7	Summit	150	21.7	36	5.0
Hardin	7	19.3	1	2.5	Trumbull	83	26.9	18	5.5
Harrison	4	18.6	2	6.8	Tuscarawas	35	26.8	4	2.7
Henry	10	27.1	2	3.9	Union	10	19.3	2	4.5
Highland	15	27.1	2	4.4	Van Wert	8	20.7	2	5.1
Hocking	10	25.8	2	5.2	Vinton	4	21.2	1	*
Holmes	7	15.9	2	4.2	Warren	48	21.2	10	4.8
Huron	18	24.4	5	6.5	Washington	19	20.3	5	5.3
Jackson	8	20.0	2	3.8	Wayne	32	21.5	7	4.4
Jefferson	22	20.3	6	5.8	Williams	10	20.0	2	4.6
Knox	17	21.3	3	4.3	Wood	30	21.2	5	3.5
Lake	82	25.5	22	6.5	Wyandot	5	16.6	1	3.0

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019; Bureau of Vital Statistics, Ohio Department of Health, 2019; Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2019.

* Rate not calculated when the count for 2012-2016 is less than five.

Sources of Data and Additional Information

Ohio Cancer Incidence Surveillance System:

<https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/ohio-cancer-incidence-surveillance-system/welcome-to>

National Cancer Institute:

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

American Cancer Society:

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

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Acknowledgements

The following individuals contributed to this report:

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Sincere appreciation to the OCISS, cancer registrars, medical records technicians and other health professionals who improve the collection and quality of cancer data in Ohio.

Suggested Citation

Bladder Cancer in Ohio, 2012-2016. Ohio Cancer Incidence Surveillance System, Ohio Department of Health, April 2019.

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The OCISS is supported in part by the State of Ohio and the Centers for Disease Control and Prevention (CDC), National Program of Cancer Registries, cooperative agreement number NU58DP006284. The contents are the sole responsibility of the authors and do not necessarily represent the official views of the CDC.