CANCER IN OHIO **2020**

Ohio Department of Health

Advancing the health and well-being of all Ohioans.

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Basic Cancer Facts

What Is Cancer?

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells.[1] If the spread is not controlled, it can result in death.[1] Not all irregular growths of abnormal cells are cancerous. A tumor can be either benign (noncancerous) or malignant (cancerous). Benign tumors do not metastasize (spread) to other parts of the body and, with very rare exceptions, are not life threatening.

Who Is At Risk of Developing Cancer?

Cancer usually develops in older people; 80% of all cancers in the United States are diagnosed in people 55 years of age or older.[1] Certain behaviors also increase risk, such as smoking, having excess body weight and drinking alcohol.[1] Lifetime cancer risk refers to the probability that an individual will develop or die from cancer over the course of a lifetime. In the United States, the lifetime risk of developing cancer is 35.6% (1 in 3) in men and 33.7% (1 in 3) in women (Table 1).[2] These probabilities are estimated based on the overall experience of the general population and may overestimate or underestimate individual risk because of differences in exposures (*e.g.*, smoking), family history and/or genetic susceptibility.

Can Cancer Be Prevented?

A cancer risk factor is anything that increases a person's risk of developing cancer. Cancer risk factors include age, sex, race, ethnicity, genetics (*e.g.*, genetic mutations, family history), health behaviors and lifestyle factors (*e.g.*, tobacco and alcohol use, obesity), socioeconomic status and environmental factors (*e.g.*, radiation, infectious agents, workplace exposures). It is often not just one risk factor that increases a person's risk of developing cancer; rather, cancer most often results from a complex interaction of multiple factors, sometimes over long periods of time.

TABLE 1 Lifetime Risk of Being Diagnosed With Invasive Cancer for Selected Sites/Types in the United States, 2014-2016[1,2,3]

PRIMARY CANCER SITE/TYPE	SEX	APPROXIMATE RISK FROM BIRTH TO DEATH
All Sites/Types*	Male	1 in 3 (35.6%)
	Female	1 in 3 (33.7%)
Bladder	Male	1 in 33 (3.0%)
	Female	1 in 112 (0.9%)
Breast	Female	1 in 9 (11.7%)
Cervix	Female	1 in 167 (0.6%)
Colon & Rectum	Male	1 in 27 (3.7%)
	Female	1 in 31 (3.2%)
Hodgkin Lymphoma	Male	1 in 435 (0.2%)
	Female	1 in 526 (0.2%)
Kidney & Renal Pelvis	Male	1 in 51 (2.0%)
	Female	1 in 93 (1.1%)
Leukemia	Male	1 in 65 (1.6%)
	Female	1 in 97 (1.0%)
Liver & Intrahepatic Bile Duct	Male	1 in 76 (1.3%)
	Female	1 in 192 (0.5%)
Lung & Bronchus	Male	1 in 17 (5.7%)
	Female	1 in 20 (5.1%)
Melanoma of the Skin	Male	1 in 43 (2.4%)
	Female	1 in 65 (1.6%)
Non-Hodgkin Lymphoma	Male	1 in 48 (2.1%)
	Female	1 in 62 (1.6%)
Oral Cavity & Pharynx	Male	1 in 67 (1.5%)
	Female	1 in 167 (0.6%)
Pancreas	Male	1 in 72 (1.4%)
	Female	1 in 81 (1.2%)
Prostate	Male	1 in 9 (10.7%)
Uterine Corpus & Uterine NOS**	Female	1 in 35 (2.9%)

1 Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.7; Statistical Methodology and Applications Branch, Division of Cancer Control and Population Sciences, National Cancer Institute, 2019.

2 Risk for those free of cancer at birth and living to age 85, based on cancer cases diagnosed during 2014-2016.

3 Numbers are rounded to the nearest whole person.

* Excludes basal and squamous cell skin cancer and *in situ* carcinomas except bladder.

** Not Otherwise Specified

A substantial proportion of cancers could be prevented, including all cancers caused by tobacco use and other unhealthy behaviors.[1] According to a recent study by American Cancer Society (ACS) researchers, at least 42% of newly diagnosed cancers in the United States, about 740,000 cases in 2019, are potentially avoidable, including the 19% of all cancers that are caused by smoking and the 18% that are caused by a combination of excess body weight, physical inactivity, excess alcohol consumption and poor nutrition.[1] Certain cancers caused by infectious agents, such as human papillomavirus (HPV), hepatitis B virus (HBV), hepatitis C virus (HCV) and *Helicobacter pylori (H. pylori),* could be prevented through behavioral changes, vaccination to avoid the infection or treatment of the infection.[1] Many of the more than 5 million skin cancer cases that are diagnosed annually could be prevented by protecting skin from excessive sun exposure and not using indoor tanning devices.[1]

Screening can help prevent colon and rectum and cervical cancers by detecting precancerous lesions that can be removed.[1] It can also detect some cancers early, when treatment is more often successful.[1] Screening is known to help reduce mortality for cancers of the breast, colon, rectum, cervix, prostate and lung (among current or former heavy smokers).[1] In addition, a heightened awareness of changes in certain parts of the body, such as the breast, skin, mouth, eyes or genitalia, may also result in the early detection of cancer.[1]

How is Cancer Staged?

Staging describes the extent or spread of cancer at the time of diagnosis.[1] Proper staging is essential for determining therapy and assessing prognosis.[1] For most cancers, stage is based on the size or extent of the primary (initial) tumor and whether the cancer has spread to nearby lymph nodes or other areas of the body.[1] Several staging systems are used to classify cancer.[1] A system of summary staging is typically used for descriptive and statistical analysis of population-based tumor registry data and is particularly useful for looking at trends over time.[1] According to this system, if cancer cells are present only in the layer of cells where they developed and have not spread, the stage is *in situ*.[1] If cancer cells have penetrated beyond the original layer of tissue, the cancer has become invasive and is categorized as local, regional or distant based on the extent of spread.[1]

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 Stage – Insufficient information is available to determine the stage or extent of the disease at diagnosis.

* Early stage includes tumors diagnosed at the *in situ* and local stages, and late stage includes tumors diagnosed at the regional and distant stages.

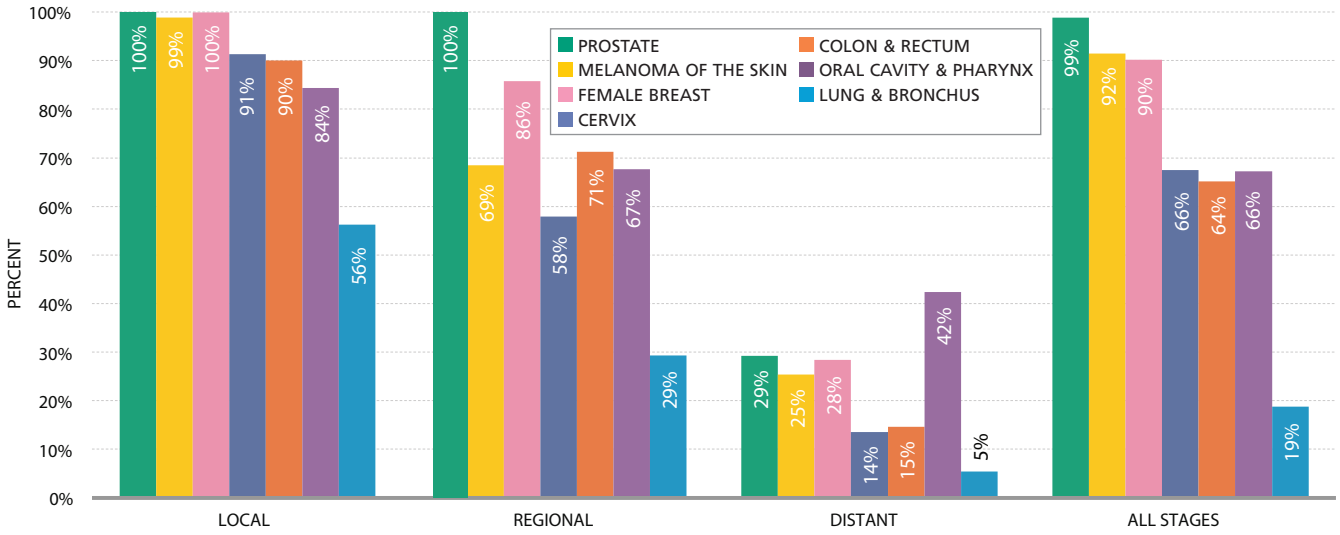
How Many People Develop and Die from Cancer?

More than 15.5 million Americans with a history of cancer were alive on January 1, 2016, most of whom were diagnosed many years ago and have no current evidence of cancer.[1] More than 1.7 million new cancer cases were expected to be diagnosed in 2019. About 606,880 Americans were expected to die of cancer in 2019.[1] Cancer is the second most common cause of death in the United States, exceeded only by heart disease.

What Percentage of People Survive Cancer?

Relative survival is the proportion of people who are alive for a designated time (usually five years) after a cancer diagnosis divided by the proportion of people of similar age, race, etc. expected to be alive in the absence of cancer based on normal life expectancy.[1] Relative survival does not distinguish between patients who have no evidence of cancer and those who have relapsed or are still in treatment; nor does it represent the proportion of people who are cured, because cancer death can occur beyond five years after diagnosis.[1]

FIGURE 1 **Ohio Five-year Relative Survival by Selected Cancer Sites/Types and Stage at Diagnosis, 2009-2015[1,2]**



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Percentages are adjusted for normal life expectancy and are based on cases diagnosed in OCISS from 2009-2015, followed into 2016.

The five-year relative survival for all cancers combined has increased substantially since the early 1960s, from 39% to 70% among whites and from 27% to 63% among blacks.[1] Improvements in survival reflect advances in treatment, as well as earlier diagnosis for some cancers.[1]

In Ohio, the five-year relative survival for all cancers combined from 2009 to 2015 was 66%, compared to 67% in the United States.[3,4] Survival varies greatly by cancer type and stage at diagnosis (Figure 1). For example, in Ohio, the overall five-year relative survival for colon and rectum cancer is 64%.[3] If all of these cancers were diagnosed at a local stage through regular cancer screenings, the five-year relative survival would increase to 90% (Figure 1).[3]

Although relative survival rates provide some indication about the average experience of cancer patients, they should be interpreted with caution for several reasons. For example, five-year relative survival does not reflect the most recent advances in detection and treatment because they are based on patients who were diagnosed at least several years in the past. In addition, they do not account for many factors that influence individual survival, such as access to treatment, other illnesses, and biological or behavioral differences.

What are the Costs of Cancer?

The Agency for Healthcare Research and Quality estimates that the direct medical costs (total of all healthcare expenditures) for cancer in the United States in 2015 were $80.2 billion.[1] Fifty-two percent of those costs were for hospital outpatient or office-based provider visits, and 38% were for inpatient hospital stays.[1] These estimates are based on a set of large-scale surveys of individuals and their medical providers called the Medical Expenditure Panel Survey, the most complete, nationally representative data on health care and expenditures.[1]

What is a Cancer Cluster?

A cancer cluster is a greater than expected number of cancer cases among a group of people in a geographic area over a defined period of time.[5] Cancer clusters may be suspected when people learn about multiple family members, friends, neighbors or coworkers who have been diagnosed with or died from cancer. Unfortunately, about one in three males and one in three females in the United States will develop cancer in their lifetime; thus, it is not unusual to see multiple cases of cancer in a community or workplace. True cancer clusters often involve multiple cases of one type of cancer or related cancers, unusual types of cancer in a particular population, an unusual geographic or time distribution, and/or a known exposure pathway to a cancer causing agent.[5] In addition, cancer clusters are often not the result of environmental pollution; rather, clusters may occur due to shared behaviors and lifestyle factors such as high rates of tobacco use, lack of access to preventive health care, increased rates of screening (which may identify previously undiagnosed cases), low socioeconomic status and chance, among other reasons.

Cancer Incidence and Mortality

Understanding Incidence and Mortality Rates

The cancer rates in this document represent the number of new invasive cancer cases (incidence) or cancer deaths (mortality) per 100,000 population during a specific time period (typically per year). In accordance with the methods used by the National Cancer Institute's (NCI) Surveillance, Epidemiology and End Results (SEER) Program, incidence rates are calculated using invasive cancers only, with the addition of *in situ* bladder cancers.

The number of cancers diagnosed in a demographic subgroup or geographic area can be determined from a rate if the population is known. For example, if a county's average annual lung and bronchus cancer incidence rate is 80.0 per 100,000, this means an average of 80 new cases of lung and bronchus cancer were diagnosed in the county per year for every 100,000 people. If the county's population is 25,000, then an average of 20 new cases of lung and bronchus cancer were diagnosed in the county per year:

$$\frac{\text{80 new cases per year}}{\text{100,000 population}} = \frac{\text{20 new cases per year}}{\text{25,000 population}}$$

Rates provide a useful way to measure the cancer burden irrespective of the actual population size. Rates can be used to compare sexes (*e.g.*, males have higher colon and rectum cancer rates than females), race/ethnic groups (*e.g.*, black males have higher prostate cancer rates than white males) or geographic areas (*e.g.*, Ohio has a higher lung and bronchus cancer incidence rate than California).

A statistical method called "age adjustment" is used to compare rates among groups of people with different age compositions. Age adjustment removes the impact of different age distributions between populations. It also allows for comparisons within a single population over time. This is especially important when examining cancer rates because cancer is generally a disease of older people. Rates in this document are age-adjusted to the 2000 U.S. Standard Population.[6]

Ohio Cancer Incidence Surveillance System

Cancer incidence data for Ohio were provided by the Ohio Cancer Incidence Surveillance System (OCISS) at the Ohio Department of Health (ODH). OCISS, the central cancer registry for Ohio, collects and analyzes cancer incidence data for all Ohio residents. All Ohio medical providers who diagnose or treat patients with cancer are required, by law, to report each newly diagnosed and/or treated case of cancer to OCISS within six months of diagnosis or first contact for cancer treatment. A reportable cancer is any primary malignancy, with the exception of basal and squamous cell carcinoma of the skin and carcinoma *in situ* of the cervix. Benign brain tumors are also reportable. Information on reporting Ohio cancer incidence data is available at: https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/ohio-cancer-incidence-surveillance-system/Reporting-Ohio-Cancer-Incidence-Data/.

Due to the complexity of the cancer data collection and quality control process, there is a delay between the time a new cancer is diagnosed and the time the data are ready for analysis. The typical delay is about 24 months after the end of the calendar year of diagnosis. Incidence data presented in this report are for cancer cases diagnosed through December 31, 2016.

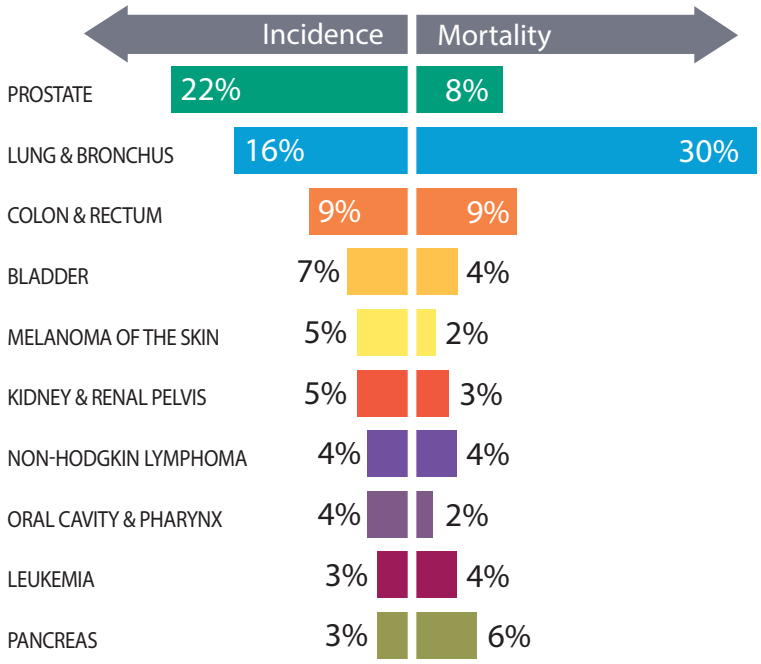
OCISS data quality, completeness and timeliness are evaluated annually by CDC's National Program of Cancer Registries (NPCR) and the North American Association of Central Cancer Registries (NAACCR). The data included in this report met CDC's National Data Quality Standard and NAACCR's Gold Standard for Registry Certification; these are the highest data quality standards set by each of these organizations for 24-month data. However, completeness may be higher or lower for specific cancer sites/types, geographic areas and demographic subgroups, which can influence the incidence rate observed. Estimated completeness of reporting by cancer site/type is presented in Appendix A-1 and completeness by county is presented in Appendix A-2.

Incidence (New Cases)

Figures 2 and 3 display selected cancer sites/types in Ohio by percentage of new invasive cancer cases and cancer deaths for males and females, respectively. Prostate cancer is the most frequently diagnosed cancer in men.[3] Prostate cancer represented 22% of all cancers diagnosed in male Ohioans between 2012 and 2016 (Figure 2).[3] Breast cancer remains the most frequently diagnosed cancer in Ohio women, representing 29% of cancer diagnoses (Figure 3).[3]

FIGURE 2

Selected Cancer Sites/Types: Average Annual Number and Percentage of New Invasive Cancer Cases and Cancer Deaths in Males in Ohio, 2012-2016[1,2]

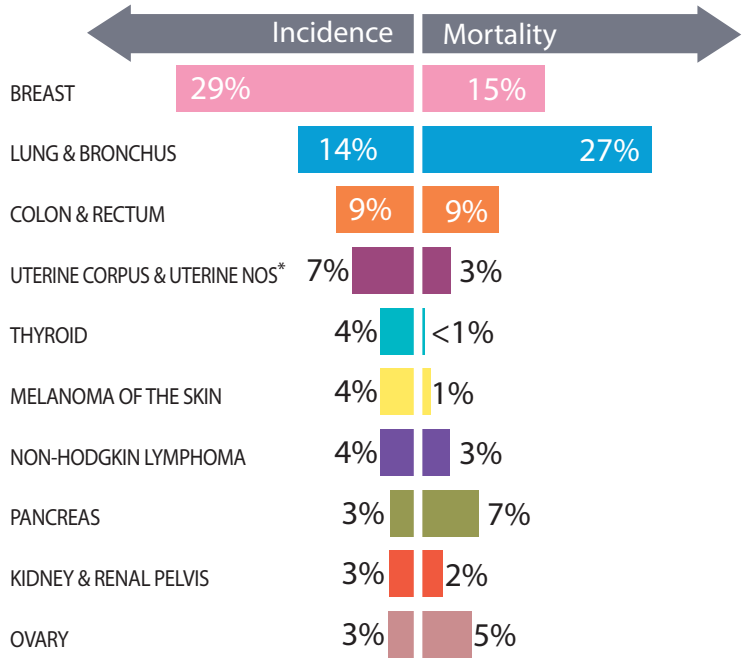


PRIMARY CANCER SITE/TYPE	NEW CASES AVERAGE ANNUAL	DEATHS AVERAGE ANNUAL
Prostate	7,158	1,094
Lung & Bronchus	5,218	3,968
Colon & Rectum	3,011	1,160
Bladder	2,384	523
Melanoma of the Skin	1,737	249
Kidney & Renal Pelvis	1,471	359
Non-Hodgkin Lymphoma	1,450	478
Oral Cavity & Pharynx	1,206	278
Leukemia	962	547
Pancreas	918	832
Liver & Intrahepatic Bile Duct	723	577
Esophagus	604	588
Stomach	571	220
Brain & Other CNS*	514	365
Multiple Myeloma	481	270
Larynx	456	140
Thyroid	438	29
Testis	308	17
Hodgkin Lymphoma	185	25

[1] Source: Ohio Cancer Incidence Surveillance System, Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Figure 2 presents the top cancer sites/types among males according to incidence.
* Central Nervous System

FIGURE 3

Selected Cancer Sites/Types: Average Annual Number and Percentage of New Invasive Cancer Cases and Cancer Deaths in Females in Ohio, 2012-2016[1,2]



PRIMARY CANCER SITE/TYPE	NEW CASES AVERAGE ANNUAL	DEATHS AVERAGE ANNUAL
Breast	9,359	1,755
Lung & Bronchus	4,640	3,265
Colon & Rectum	2,809	1,074
Uterine Corpus & Uterine NOS*	2,297	407
Thyroid	1,405	37
Melanoma of the Skin	1,332	138
Non-Hodgkin Lymphoma	1,192	390
Pancreas	931	843
Kidney & Renal Pelvis	916	204
Ovary	815	584
Bladder	757	199
Leukemia	693	414
Oral Cavity & Pharynx	490	111
Cervix	467	158
Brain & Other CNS**	399	269
Multiple Myeloma	378	239
Stomach	329	156
Liver & Intrahepatic Bile Duct	314	291
Esophagus	158	141
Hodgkin Lymphoma	138	18
Larynx	136	45

[1] Source: Ohio Cancer Incidence Surveillance System, Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Figure 3 presents the top cancer sites/types among females according to incidence.
* Not Otherwise Specified
** Central Nervous System

Table 2 provides 2012-2016 average annual numbers of new invasive cancer cases and age-adjusted incidence rates for 23 common cancer sites/types by sex with national comparisons. For all cancer sites/types combined, the incidence rate in Ohio (461.9 per 100,000) was 5% higher than the national rate (442.0 per 100,000).[3,4] The lung and bronchus cancer incidence rate was 81.1 per 100,000 for Ohio males, which was 29% higher than the national rate of 63.0 per 100,000.[3,4] Similarly, the Ohio female lung and bronchus cancer incidence rate (59.1 per 100,000) was 21% higher than the national rate of 48.9 per 100,000.[3,4]

Figure 4 presents a visual comparison of Ohio and U.S. 2012-2016 incidence rates by cancer site/type. Sites/types where the Ohio cancer incidence rates were higher than the national cancer incidence rates were, in descending order: larynx, lung and bronchus, esophagus, brain and other central nervous system (CNS), bladder, uterine corpus and uterine not otherwise specified (NOS), colon and rectum, kidney and renal pelvis, all sites/types combined, oral cavity and pharynx, cervix, Hodgkin lymphoma and melanoma of the skin.[3,4] Ohio incidence rates were lower than the U.S. rates for some specific cancers; however, this may be due, in part, to delayed or incomplete reporting of some cancer sites/types during 2012-2016.

Table A-3 shows 2012-2016 average annual numbers of new invasive cancer cases and age-adjusted incidence rates by sex for each county in Ohio for all cancer sites/types combined and cancers of the female breast, colon and rectum, lung and bronchus, and prostate. Please note that low county numbers and rates may reflect delayed or incomplete reporting for that county.

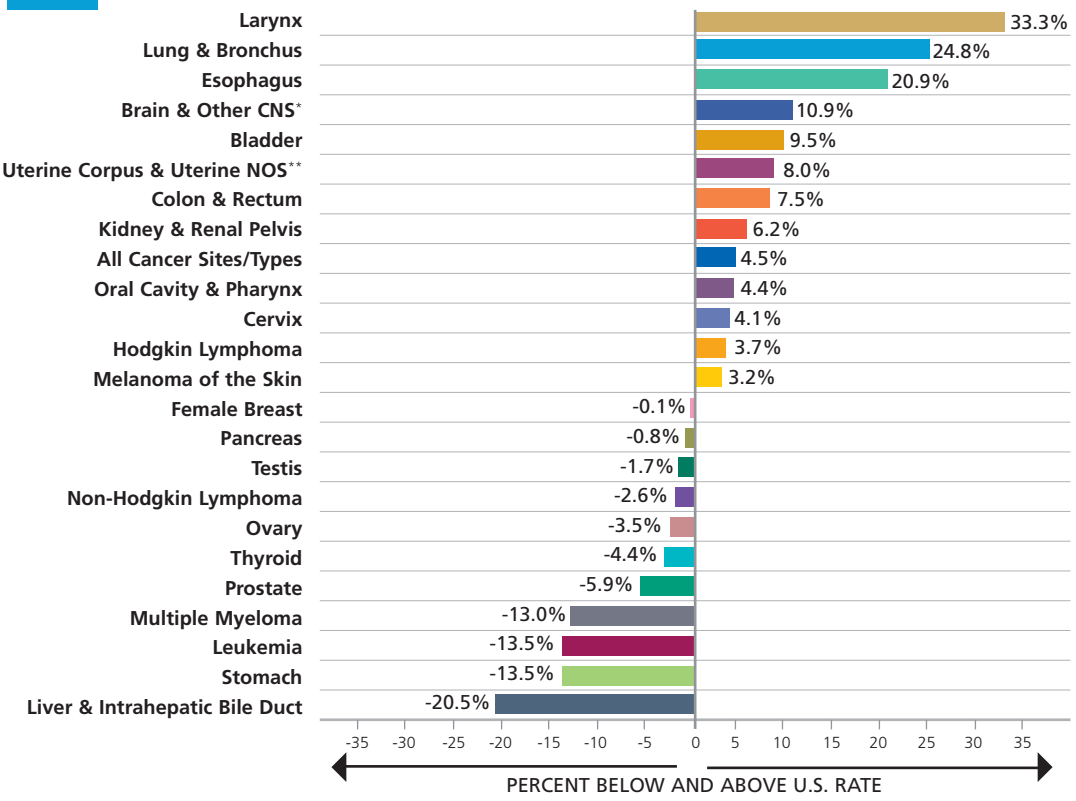
Mortality (Deaths)

The 2012-2016 cancer mortality rate in Ohio for all sites/types combined was 10% higher than the U.S. rate (176.8 per 100,000 and 161.0 per 100,000, respectively).[4,7] Lung and bronchus cancer remains the leading cause of cancer death in Ohio for males, females and both sexes combined, with a yearly (2012-2016) average of 3,968 males and 3,265 females dying from the disease (Table 3).[7] Colon and rectum cancer is the second leading cause of cancer death for men in Ohio (1,160 deaths per year) followed closely by prostate cancer (1,094 deaths per year), accounting for about 9% and 8% of male cancer deaths, respectively (Figure 2).[7] Breast cancer is the second leading cause of cancer death for females with a yearly average of 1,755 deaths, accounting for 15% of female cancer deaths, followed by colon and rectum cancer (1,074 deaths, 9%) (Figure 3).[7]

Figure 5 presents a visual comparison of Ohio and U.S. 2012-2016 mortality rates by cancer site/type. Ohio cancer mortality rates were higher than the national cancer mortality rates during 2012-2016 for 16 of the 23 sites/types of cancer presented.[4,7] The top ten cancer sites/types where the Ohio cancer mortality rate was higher than the U.S. cancer mortality rate were, in descending order: larynx, esophagus, lung and bronchus, bladder, melanoma of the skin, non-Hodgkin lymphoma, colon and rectum, all sites/types combined, multiple myeloma and female breast.[4,7] Ohio cancer mortality rates were lower than the U.S. rates for cancers of the prostate, liver and intrahepatic bile duct, and stomach.

Table A-4 displays 2012-2016 average annual numbers of cancer deaths and age-adjusted mortality rates by sex for each county in Ohio. Data are provided for all cancer sites/types combined and cancers of the female breast, colon and rectum, lung and bronchus, and prostate.

FIGURE 4 Comparison of Ohio and U.S. Average Annual Age-adjusted Incidence Rates by Cancer Site/Type, 2012-2016[1]

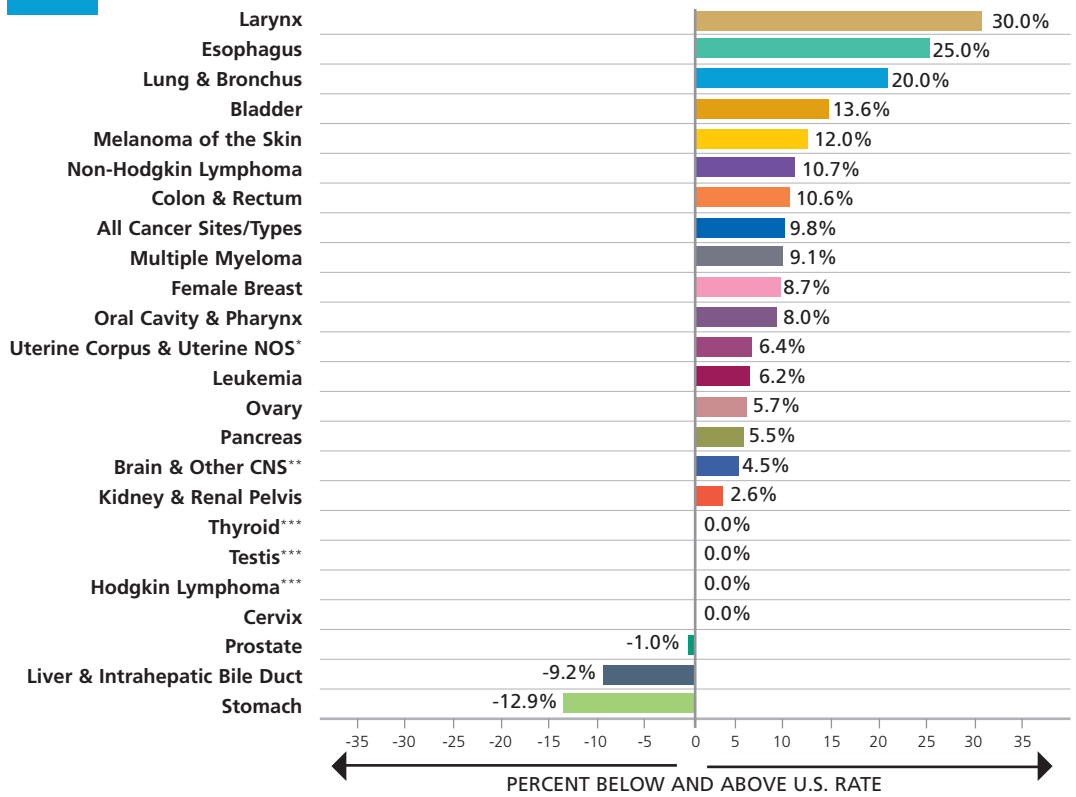


1 Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019; Surveillance, Epidemiology and End Results (SEER) Program, *SEER Cancer Statistics Review 1975-2016,* National Cancer Institute, 2019.

* Central Nervous System

** Not Otherwise Specified

FIGURE 5 Comparison of Ohio and U.S. Average Annual Age-adjusted Mortality Rates by Cancer Site/Type, 2012-2016[1]



1 Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019; National Center for Health Statistics Public Use Mortality Data published in *SEER Cancer Statistics Review 1975-2016,* National Cancer Institute, 2019.

* Central Nervous System

** Not Otherwise Specified

*** The comparison should be interpreted with caution due to small numbers.

TABLE 2 Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by Cancer Site/Type and Sex in Ohio and the United States, 2012-2016[1,2]

Primary Cancer Site/Type	MALE			FEMALE			TOTAL		
	Ohio Cases	Ohio Rate	National Rate	Ohio Cases	Ohio Rate	National Rate	Ohio Cases	Ohio Rate	National Rate
All Sites/Types	32,328	500.7	481.0	32,530	437.5	417.1	64,858	461.9	442.0
Bladder	2,384	38.6	35.2	757	9.5	8.7	3,141	22.0	20.1
Brain & Other CNS**	514	8.4	7.5	399	5.9	5.4	913	7.1	6.4
Breast	75	1.2	1.2	9,359	127.4	127.5	9,433	68.5	68.4
Cervix	*	*	*	467	7.6	7.3	*	*	*
Colon & Rectum	3,011	47.6	44.2	2,809	36.5	33.9	5,820	41.5	38.6
Esophagus	604	9.2	7.3	158	2.0	1.8	762	5.2	4.3
Hodgkin Lymphoma	185	3.2	3.0	138	2.3	2.3	324	2.8	2.7
Kidney & Renal Pelvis	1,471	22.7	22.1	916	12.4	10.9	2,387	17.1	16.1
Larynx	456	6.8	5.2	136	1.8	1.1	592	4.0	3.0
Leukemia	962	15.7	18.1	693	9.5	10.9	1,655	12.2	14.1
Liver & Intrahepatic Bile Duct	723	10.4	13.6	314	4.0	4.7	1,038	7.0	8.8
Lung & Bronchus	5,218	81.1	63.0	4,640	59.1	48.9	9,858	68.5	54.9
Melanoma of the Skin	1,737	27.9	28.8	1,332	19.6	17.5	3,068	22.9	22.2
Multiple Myeloma	481	7.5	8.7	378	4.8	5.6	859	6.0	6.9
Non-Hodgkin Lymphoma	1,450	23.3	23.9	1,192	15.7	16.2	2,643	19.1	19.6
Oral Cavity & Pharynx	1,206	17.8	17.0	490	6.5	6.4	1,696	11.8	11.3
Ovary	*	*	*	815	11.0	11.4	*	*	*
Pancreas	918	14.3	14.6	931	11.6	11.5	1,849	12.8	12.9
Prostate	7,158	103.0	109.5	*	*	*	*	*	*
Stomach	571	9.0	10.0	329	4.2	5.3	900	6.4	7.4
Testis	308	5.8	5.9	*	*	*	*	*	*
Thyroid	438	7.2	8.0	1,405	22.8	23.3	1,844	15.1	15.8
Uterine Corpus & Uterine NOS***	*	*	*	2,297	29.7	27.5	*	*	*

[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019; Surveillance, Epidemiology, and End Results (SEER) Program, *SEER Cancer Statistics Review 1975-2016*, National Cancer Institute, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
* Not Applicable
** Central Nervous System
*** Not Otherwise Specified

TABLE 3

Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by Cancer Site/Type and Sex in Ohio and the United States, 2012-2016[1,2]

Primary Cancer Site/Type	MALE			FEMALE			TOTAL		
	Ohio Deaths	Ohio Rate	National Rate	Ohio Deaths	Ohio Rate	National Rate	Ohio Deaths	Ohio Rate	National Rate
All Sites/Types	13,182	212.5	193.1	12,090	151.5	137.7	25,272	176.8	161.0
Bladder	523	8.9	7.6	199	2.4	2.1	722	5.0	4.4
Brain & Other CNS**	365	5.8	5.4	269	3.6	3.6	634	4.6	4.4
Breast	16	0.3	0.3	1,755	22.4	20.6	1,771	12.5	11.4
Cervix	*	*	*	158	2.3	2.3	*	*	*
Colon & Rectum	1,160	18.8	16.9	1,074	13.2	11.9	2,234	15.7	14.2
Esophagus	588	9.1	7.1	141	1.7	1.5	729	5.0	4.0
Hodgkin Lymphoma	25	0.4	0.4	18	0.2	0.2	43	0.3	0.3
Kidney & Renal Pelvis	359	5.6	5.5	204	2.5	2.3	563	3.9	3.8
Larynx	140	2.1	1.8	45	0.6	0.4	184	1.3	1.0
Leukemia	547	9.3	8.8	414	5.2	4.9	961	6.9	6.5
Liver & Intrahepatic Bile Duct	577	8.5	9.6	291	3.6	3.9	868	5.9	6.5
Lung & Bronchus	3,968	62.6	51.6	3,265	41.0	34.4	7,234	50.3	41.9
Melanoma of the Skin	249	4.1	3.7	138	1.8	1.5	387	2.8	2.5
Multiple Myeloma	270	4.5	4.2	239	2.9	2.7	508	3.6	3.3
Non-Hodgkin Lymphoma	478	8.0	7.3	390	4.8	4.4	868	6.2	5.6
Oral Cavity & Pharynx	278	4.2	3.9	111	1.4	1.3	389	2.7	2.5
Ovary	*	*	*	584	7.4	7.0	*	*	*
Pancreas	832	13.2	12.6	843	10.3	9.6	1,675	11.6	11.0
Prostate	1,094	19.0	19.2	*	*	*	*	*	*
Stomach	220	3.6	4.2	156	1.9	2.3	376	2.7	3.1
Testis	17	0.3	0.3	*	*	*	*	*	*
Thyroid	29	0.5	0.5	37	0.4	0.5	66	0.5	0.5
Uterine Corpus & Uterine NOS***	*	*	*	407	5.0	4.7	*	*	*

[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019; National Center for Health Statistics Public Use Mortality Data published in *SEER Cancer Statistics Review 1975-2016*, National Cancer Institute, 2019.

[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

* Not applicable

** Central Nervous System

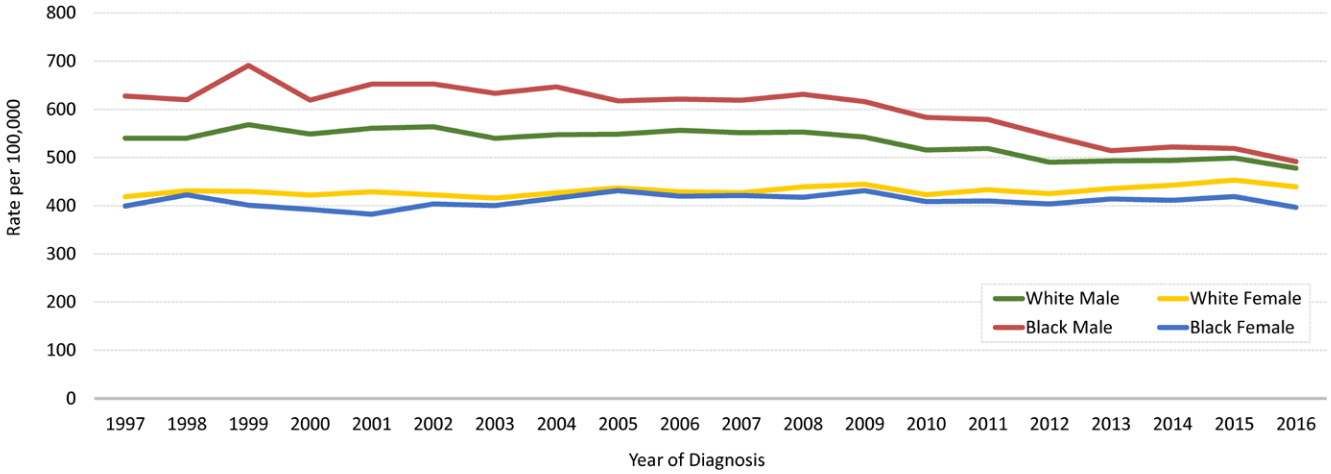
*** Not Otherwise Specified

Trends in Ohio Cancer Incidence and Mortality Rates

Trends in Ohio Cancer Incidence Rates

Trend analyses of age-adjusted incidence rates in Ohio show that incidence rates for all cancer sites/types combined decreased 3% from 1997 to 2016.[3] Cancer incidence rates decreased among males (12%), whites (3%) and blacks (11%), but increased 5% among females.[3] The greatest reduction (22%) in the 20-year time period was observed for black males; although, black males had the highest incidence rates each year during the time period (Figure 6).[3]

FIGURE 6 **Trends in Age-adjusted Incidence Rates for All Cancer Sites/Types Combined by Sex and Race in Ohio, 1997-2016**[1,2]

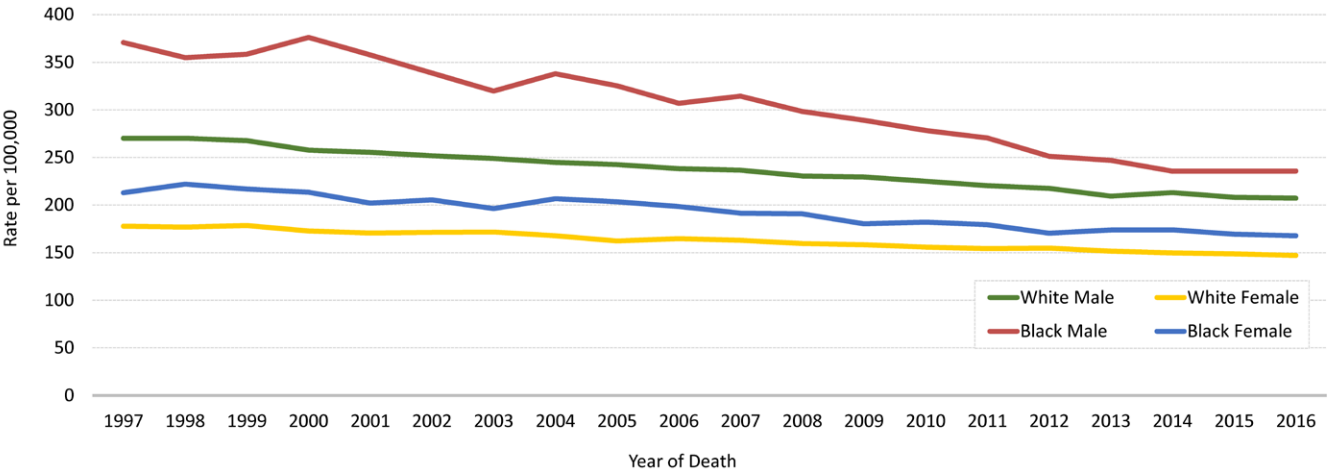


[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Trends in Ohio Cancer Mortality Rates

Age-adjusted mortality rates in Ohio for all cancer sites/types combined declined 20% from 1997 to 2016.[7] The percent decline in cancer mortality rates in Ohio was higher among males (25%) compared to females (18%) and blacks (29%) compared to whites (19%) during this time period.[7] Similar to Ohio, the U.S. cancer mortality rate dropped 27% from 1991 to 2016 due to reductions in smoking and improvements in early detection and treatment.[1] Black males in Ohio had the greatest decrease in cancer mortality rates (36%) during the time period (Figure 7).[7]

FIGURE 7 **Trends in Age-adjusted Mortality Rates for All Cancer Sites/Types Combined by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Cancer Health Disparities in Specific Populations

NCI defines cancer health disparities as adverse differences in cancer incidence, prevalence, mortality, survivorship and burden of cancer and related adverse health conditions that exist among specific population groups in the United States.[8] These population groups are often defined by demographics such as race, ethnicity, sex, age, socioeconomic status and geographic area. However, there are a number of factors associated with specific population groups that play a role in the risk of developing cancer and receiving access to appropriate care to detect and treat cancer. These factors include, but are not limited to, education, income, employment, insurance status, genetics, cultural beliefs, religious beliefs, language and literacy level. It is crucial to ensure that these factors are addressed in cancer education, prevention, early detection and treatment programs so that no population is disproportionately affected by cancer.

Disparities in Cancer Incidence Rates by Race

Ohio's population is approximately 82% white, 13% black, 3% Asian and less than 1% American Indian or Alaskan Native.[9] Figure 8 displays 2012-2016 average annual cancer incidence rates by race for the leading sites/types of cancer in Ohio. The average annual cancer incidence rate among blacks (452.7 per 100,000) was lower than whites (458.1 per 100,000) for all sites/types combined.[3] However, blacks had higher incidence rates compared to whites for the following cancers: breast, colon and rectum, Hodgkin lymphoma, kidney and renal pelvis, larynx, liver and intrahepatic bile duct, lung and bronchus, multiple myeloma, pancreas, prostate and stomach (Table 4).[3] Among blacks, the incidence rate for multiple myeloma was more than double the rate for whites (Table 4).[3]

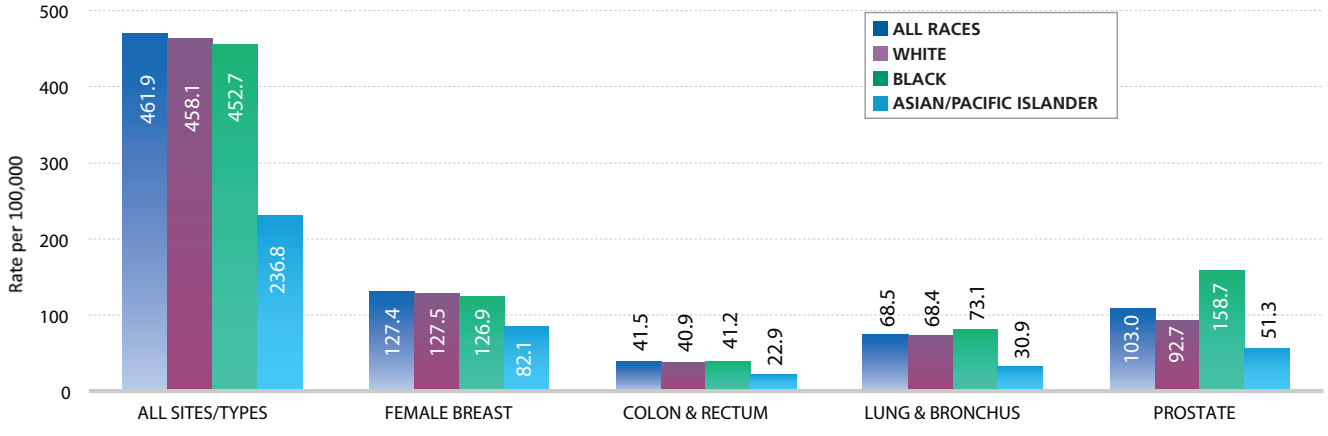
Asians/Pacific Islanders of both sexes in Ohio had lower incidence rates than other races for most cancer sites/types (Table 4).[3] However, this population had a higher incidence of melanoma of the skin and cancers of the ovary and thyroid compared to blacks and a higher incidence of cancers of the liver and intrahepatic bile duct and stomach compared to whites.[3]

Disparities in Cancer Mortality Rates by Race

In 2012-2016, blacks had the highest mortality rate of any racial group in Ohio for all sites/types of cancer combined (197.8 per 100,000). Black males had 14% higher cancer mortality rates compared to white males, and black females had 14% higher cancer mortality rates compared to white females (Table 5).[7]

In 2012-2016, Asians/Pacific Islanders had the lowest mortality rate of any racial group in Ohio for all sites/types of cancer combined (86.3 per 100,000), with Asian/Pacific Islander males and females having 55% lower and 47% lower cancer mortality rates compared to white males and females, respectively (Table 5).[7]

FIGURE 8 **Average Annual Age-adjusted Incidence Rates for Selected Cancer Sites/Types by Race in Ohio, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the U.S. 2000 standard population.

Additional Factors Associated with Cancer Health Disparities

GENETICS

Some cancer health disparities can be attributed to genetics. For instance, women of Ashkenazi Jewish descent have an increased frequency of mutations in the BRCA1 and BRCA2 genes, which increases their risk of breast and ovarian cancers.[1] Genetic factors may also play a role in the elevated risk of prostate cancer among black men and the incidence of more aggressive forms of breast cancer in black women.[1] However, genetic differences are thought to make only a minor contribution to the disparate cancer burden between specific population groups, which means the factors underlying disparate cancer health outcomes are not always clear.

TABLE 4 Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by Sex and Race in Ohio, 2012-2016[1,2,3]

Primary Cancer Site/Type	All Races						White					
	MALE		FEMALE		TOTAL		MALE		FEMALE		TOTAL	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
All Sites/Types	32,328	500.7	32,530	437.5	64,858	461.9	28,097	490.7	28,525	438.9	56,622	458.1
Bladder	2,384	38.6	757	9.5	3,141	22.0	2,215	39.9	683	9.6	2,897	22.8
Brain & Other CNS**	514	8.4	399	5.9	913	7.1	464	8.7	360	6.1	824	7.3
Breast	75	1.2	9,359	127.4	9,433	68.5	65	1.1	8,179	127.5	8,244	68.1
Cervix	*	*	467	7.6	*	*	*	*	398	7.7	*	*
Colon & Rectum	3,011	47.6	2,809	36.5	5,820	41.5	2,621	46.8	2,444	36.0	5,066	40.9
Esophagus	604	9.2	158	2.0	762	5.2	565	9.6	138	1.9	703	5.5
Hodgkin Lymphoma	185	3.2	138	2.3	324	2.8	157	3.2	115	2.3	272	2.7
Kidney & Renal Pelvis	1,471	22.7	916	12.4	2,387	17.1	1,282	22.4	801	12.4	2,083	17.0
Larynx	456	6.8	136	1.8	592	4.0	398	6.7	118	1.7	516	4.0
Leukemia	962	15.7	693	9.5	1,655	12.2	851	15.8	608	9.5	1,459	12.3
Liver & Intrahepatic Bile Duct	723	10.4	314	4.0	1,038	7.0	567	9.3	256	3.7	823	6.3
Lung & Bronchus	5,218	81.1	4,640	59.1	9,858	68.5	4,639	80.6	4,100	59.3	8,739	68.4
Melanoma of the Skin	1,737	27.9	1,332	19.6	3,068	22.9	1,599	29.0	1,190	20.3	2,789	23.8
Multiple Myeloma	481	7.5	378	4.8	859	6.0	386	6.8	289	4.1	675	5.3
Non-Hodgkin Lymphoma	1,450	23.3	1,192	15.7	2,643	19.1	1,314	23.7	1,076	16.1	2,390	19.5
Oral Cavity & Pharynx	1,206	17.8	490	6.5	1,696	11.8	1,101	18.4	437	6.6	1,538	12.2
Ovary	*	*	815	11.0	*	*	*	*	735	11.3	*	*
Pancreas	918	14.3	931	11.6	1,849	12.8	808	14.1	803	11.3	1,611	12.6
Prostate	7,158	103.0	*	*	*	*	5,743	92.7	*	*	*	*
Stomach	571	9.0	329	4.2	900	6.4	477	8.4	255	3.7	731	5.8
Testis	308	5.8	*	*	*	*	290	6.5	*	*	*	*
Thyroid	438	7.2	1,405	22.8	1,844	15.1	399	7.5	1,227	23.5	1,626	15.6
Uterine Corpus & Uterine NOS***	*	*	2,297	29.7	*	*	*	*	2,051	30.4	*	*

1 Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
2 Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
3 Asian/Pacific Islander case counts are small. Interpret data with caution.
* Not Applicable
** Central Nervous System
*** Not Otherwise Specified
**** Rate not calculated when the case count for 2012-2016 is less than five (*i.e.*, the average annual count is less than one).

POVERTY

Poverty is related to employment, disability status, educational attainment, type of household (*e.g.*, female-headed household with children less than 18), age, sex, race, geography and other factors. Poverty is also associated with some risk factors for cancer, such as tobacco use and obesity, as well as community-level factors like lack of access to cancer screening and treatment, higher prevalence of cancer-causing infections, harmful exposures in the workplace, and limited access to fresh fruits and vegetables.[1] The national poverty rate was 11.8% in 2018 with an estimated 38.1 million people in poverty.[10] An estimated 1,583,000 people in Ohio, or 14% of the population, were poor in 2017 according to the 2017 American Community Survey.[11] In Ohio, 29% of blacks, 14% of Asians/Pacific Islanders and 11% of non-Hispanic whites were considered poor by federal standards.[11] Also, 27% of Ohio's Hispanic/Latino community was considered poor. The four poorest counties in Ohio were located in the 32-county Appalachian region of the state. From 2013-2017, Appalachia Ohio had a 17% poverty rate compared to an average of 14% for counties in the remainder of the state.[11]

TABLE 4 cont.

Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by Sex and Race in Ohio, 2012-2016[1,2,3]

Primary Cancer Site/Type	Black						Asian/Pacific Islander					
	MALE		FEMALE		TOTAL		MALE		FEMALE		TOTAL	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
All Sites/Types	3,244	517.8	3,279	408.6	6,523	452.7	198	234.7	267	242.1	465	236.8
Bladder	116	20.9	57	7.1	173	12.6	7	11.3	2	2.7	9	6.3
Brain & Other CNS**	36	5.2	29	3.7	66	4.4	4	3.9	2	2.2	6	3.0
Breast	8	1.5	1,014	126.9	1,022	72.0	<1	****	96	82.1	96	44.7
Cervix	*	*	56	7.3	*	*	*	*	4	3.0	*	*
Colon & Rectum	290	47.5	297	37.0	587	41.2	25	29.8	18	17.6	43	22.9
Esophagus	33	5.1	19	2.3	52	3.5	3	3.9	1	0.8	4	2.1
Hodgkin Lymphoma	23	3.3	19	2.4	42	2.8	2	1.2	1	1.1	3	1.1
Kidney & Renal Pelvis	171	26.6	105	13.3	277	19.1	6	7.6	3	2.0	9	4.4
Larynx	52	8.3	17	2.1	69	4.7	2	2.1	1	1.0	2	1.4
Leukemia	71	11.8	65	7.9	136	9.5	11	10.3	6	5.2	17	7.5
Liver & Intrahepatic Bile Duct	131	18.5	51	5.9	183	11.5	11	11.8	4	4.2	15	7.7
Lung & Bronchus	532	90.3	497	61.2	1,029	73.1	24	32.7	28	30.3	51	30.9
Melanoma of the Skin	4	0.7	6	0.7	10	0.7	1	1.4	1	1.1	2	1.2
Multiple Myeloma	84	14.4	81	10.2	166	11.9	3	4.3	1	1.4	4	2.6
Non-Hodgkin Lymphoma	103	16.6	89	11.0	192	13.5	11	11.9	9	8.9	19	10.4
Oral Cavity & Pharynx	85	12.9	40	4.9	126	8.4	7	7.6	5	4.0	12	5.6
Ovary	*	*	62	7.7	*	*	*	*	11	9.5	*	*
Pancreas	96	16.0	116	14.4	211	15.2	7	8.4	7	7.4	13	8.0
Prostate	1,050	158.7	*	*	*	*	42	51.3	*	*	*	*
Stomach	80	13.8	62	8.0	141	10.4	7	8.2	6	5.9	13	7.0
Testis	10	1.5	*	*	*	*	2	1.4	*	*	*	*
Thyroid	26	3.9	130	17.1	157	11.0	7	6.5	25	18.6	32	12.8
Uterine Corpus & Uterine NOS***	*	*	204	24.6	*	*	*	*	18	14.9	*	*

[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
[3] Asian/Pacific Islander case counts are small. Interpret data with caution.
* Not Applicable
** Central Nervous System
*** Not Otherwise Specified
**** Rate not calculated when the case count for 2012-2016 is less than five (*i.e.*, the average annual count is less than one).

HEALTH INSURANCE STATUS

In addition to poverty, health insurance status plays a role in cancer health disparities. Those who are uninsured/underinsured are less likely to receive adequate cancer treatment and care. Furthermore, unequal access to screening may lead to a later stage of disease at diagnosis and a lower chance of survival. According to 2016 data, 9% of Ohioans were uninsured.[12]

CULTURAL BELIEFS AND PRACTICES

Culturally-appropriate behaviors may also contribute to cancer health disparities by increasing or decreasing cancer rates within a specific population. For example, women from cultures where early marriage and child-bearing is encouraged often have a lower risk of breast cancer.[1] Similarly, individuals who do not use tobacco or who maintain a vegetarian diet, which is often associated with cultural or religious beliefs, experience a lower risk of many cancers.[1]

TABLE 5 Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by Site/Type, Sex and Race in Ohio, 2012-2016[1,2,3]

Primary Cancer Site/Type	All Races						White					
	MALE		FEMALE		TOTAL		MALE		FEMALE		TOTAL	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
All Sites/Types	13,182	212.5	12,090	151.5	25,272	176.8	11,716	210.9	10,620	150.2	22,336	175.5
Bladder	523	8.9	199	2.4	722	5.0	489	9.2	179	2.4	668	5.2
Brain & Other CNS**	365	5.8	269	3.6	634	4.6	340	6.1	249	3.8	589	4.8
Breast	16	0.3	1,755	22.4	1,771	12.5	15	0.3	1,499	21.6	1,514	12.0
Cervix	*	*	158	2.3	*	*	*	*	133	2.3	*	*
Colon & Rectum	1,160	18.8	1,074	13.2	2,234	15.7	1,022	18.6	941	13.0	1,963	15.4
Esophagus	588	9.1	141	1.7	729	5.0	552	9.6	125	1.7	677	5.3
Hodgkin Lymphoma	25	0.4	18	0.2	43	0.3	23	0.4	16	0.2	39	0.3
Kidney & Renal Pelvis	359	5.6	204	2.5	563	3.9	324	5.7	180	2.5	505	3.9
Larynx	140	2.1	45	0.6	184	1.3	120	2.1	38	0.5	158	1.2
Leukemia	547	9.3	414	5.2	961	6.9	504	9.5	374	5.2	878	7.1
Liver & Intrahepatic Bile Duct	577	8.5	291	3.6	868	5.9	467	7.9	245	3.4	711	5.4
Lung & Bronchus	3,968	62.6	3,265	41.0	7,234	50.3	3,534	62.2	2,887	41.0	6,421	50.1
Melanoma of the Skin	249	4.1	138	1.8	387	2.8	246	4.5	136	2.0	382	3.1
Multiple Myeloma	270	4.5	239	2.9	508	3.6	229	4.2	199	2.7	427	3.4
Non-Hodgkin Lymphoma	478	8.0	390	4.8	868	6.2	445	8.3	363	5.0	808	6.4
Oral Cavity & Pharynx	278	4.2	111	1.4	389	2.7	248	4.2	102	1.4	350	2.7
Ovary	*	*	584	7.4	*	*	*	*	534	7.6	*	*
Pancreas	832	13.2	843	10.3	1,675	11.6	736	13.0	724	10.0	1,461	11.4
Prostate	1,094	19.0	*	*	*	*	913	17.5	*	*	*	*
Stomach	220	3.6	156	1.9	376	2.7	173	3.1	122	1.7	295	2.3
Testis	17	0.3	*	*	*	*	15	0.3	*	*	*	*
Thyroid	29	0.5	37	0.4	66	0.5	26	0.5	33	0.5	59	0.5
Uterine Corpus & Uterine NOS***	*	*	407	5.0	*	*	*	*	345	4.8	*	*

1 Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
2 Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
3 Asian/Pacific Islander case counts are small. Interpret data with caution.
* Not applicable
** Central Nervous System
*** Not Otherwise Specified
**** Rate not calculated when the case count for 2012-2016 is less than five (*i.e.*, the average annual count is less than one).

Summary of Cancer Health Disparities

Given the interconnectedness of genetics, race and ethnicity, poverty, health insurance status and culture, it is extremely challenging to pinpoint exactly why a specific population group has a higher burden of cancer. Despite this difficulty, it is important to have an understanding of the ways in which these and other factors jointly and independently contribute to cancer health disparities. This knowledge is needed to inform cancer education, prevention, early detection and treatment programs so that no population is disproportionately affected by cancer.

TABLE 5 cont.

Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by Site/Type, Sex and Race in Ohio, 2012-2016[1,2,3]

Primary Cancer Site/Type	Black						Asian/Pacific Islander					
	MALE		FEMALE		TOTAL		MALE		FEMALE		TOTAL	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
All Sites/Types	1,349	241.0	1,367	170.9	2,716	197.8	69	95.4	75	79.3	144	86.3
Bladder	30	6.0	19	2.5	49	3.8	2	3.3	1	1.2	3	2.1
Brain & Other CNS**	22	3.3	17	2.1	39	2.7	1	1.4	2	1.8	3	1.6
Breast	1	0.2	240	30.0	241	17.4	0	****	11	10.8	11	6.0
Cervix	*	*	24	3.0	*	*	*	*	1	0.8	*	*
Colon & Rectum	128	23.0	125	15.6	253	18.5	6	7.5	7	7.1	13	7.4
Esophagus	32	5.4	15	1.8	47	3.3	2	2.8	<1	****	3	1.7
Hodgkin Lymphoma	2	0.2	2	0.2	3	0.2	<1	****	0	****	<1	****
Kidney & Renal Pelvis	33	5.5	23	3.0	56	4.1	1	1.8	<1	****	1	0.9
Larynx	18	3.0	6	0.8	24	1.7	<1	****	<1	****	1	0.5
Leukemia	37	6.7	36	4.6	74	5.4	4	5.4	2	1.8	6	3.4
Liver & Intrahepatic Bile Duct	95	13.8	41	5.0	136	8.9	9	9.8	4	5.2	13	7.3
Lung & Bronchus	405	71.6	356	44.4	761	55.4	17	25.6	18	19.8	35	22.1
Melanoma of the Skin	2	0.4	2	0.2	4	0.3	<1	****	<1	****	1	0.5
Multiple Myeloma	39	7.5	39	4.9	78	5.9	2	2.7	1	1.1	3	1.7
Non-Hodgkin Lymphoma	30	5.1	25	3.1	54	3.9	2	3.7	2	2.4	4	3.0
Oral Cavity & Pharynx	26	4.2	9	1.1	35	2.4	2	2.3	1	1.1	3	1.7
Ovary	*	*	46	5.7	*	*	*	*	4	3.6	*	*
Pancreas	88	15.3	109	13.7	197	14.5	5	6.2	7	7.7	12	7.2
Prostate	174	36.2	*	*	*	*	5	9.0	*	*	*	*
Stomach	43	7.9	29	3.7	72	5.4	3	3.1	4	3.7	6	3.6
Testis	2	0.3	*	*	*	*	0	****	*	*	*	*
Thyroid	4	0.8	4	0.5	8	0.6	0	****	0	****	0	****
Uterine Corpus & Uterine NOS***	*	*	59	7.2	*	*	*	*	2	2.4	*	*

[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
[3] Asian/Pacific Islander case counts are small. Interpret data with caution.
* Not applicable
** Central Nervous System
*** Not Otherwise Specified
**** Rate not calculated when the case count for 2012-2016 is less than five (*i.e.*, the average annual count is less than one).

Bladder Cancer

New Cases

An estimated 80,470 new cases of bladder cancer were expected to be diagnosed in 2019 in the United States.[1] Incidence rates are about four times higher in men than in women and are almost two times higher in white men than in black men.[1]

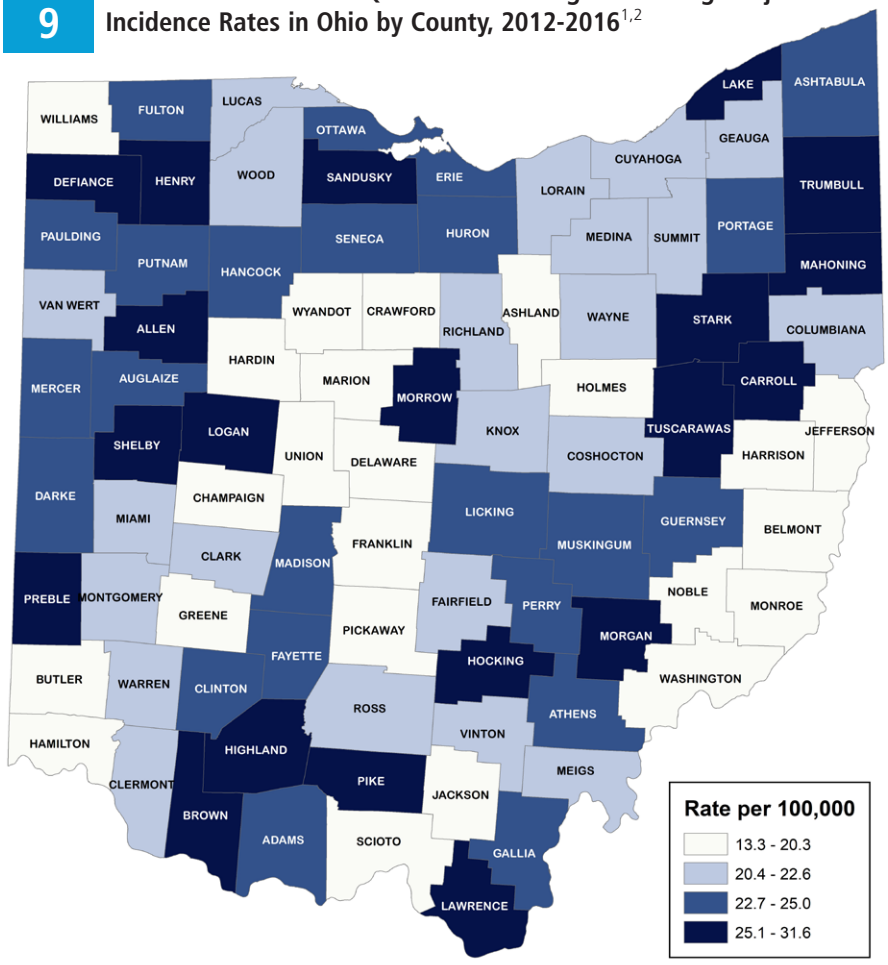
An average of 3,141 new cases (2,384 men and 757 women) of bladder cancer were diagnosed annually in Ohio in 2012-2016, with a corresponding rate of 22.0 per 100,000 compared to the U.S. rate of 20.1 per 100,000 (Table 2).[3,4] White and black men had higher incidence rates of bladder cancer compared to white and black women in Ohio in 2012-2016, with white men having the highest incidence rate (39.9 per 100,000) among all sex/race groups (Table 4).[3] Average annual age-adjusted incidence rates of bladder cancer by Ohio county are shown in Figure 9.

Currently, a man living in the United States has a 1 in 33 lifetime risk of developing bladder cancer and a woman has a 1 in 112 lifetime risk of developing bladder cancer.[2]

Deaths

An estimated 17,670 deaths from bladder cancer were expected to occur in 2019 in the United States.[1] An average of 722 deaths (523 men and 199 women) due to bladder cancer occurred annually in Ohio from 2012 to 2016, with a corresponding rate of 5.0 per 100,000 compared to the U.S. rate of 4.4 per 100,000 (Table 3).[4,7] Similar to incidence, the bladder cancer mortality rate in Ohio was highest among white males (9.2 per 100,000) (Table 5).[7]

FIGURE 9 **Cancer of the Bladder: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



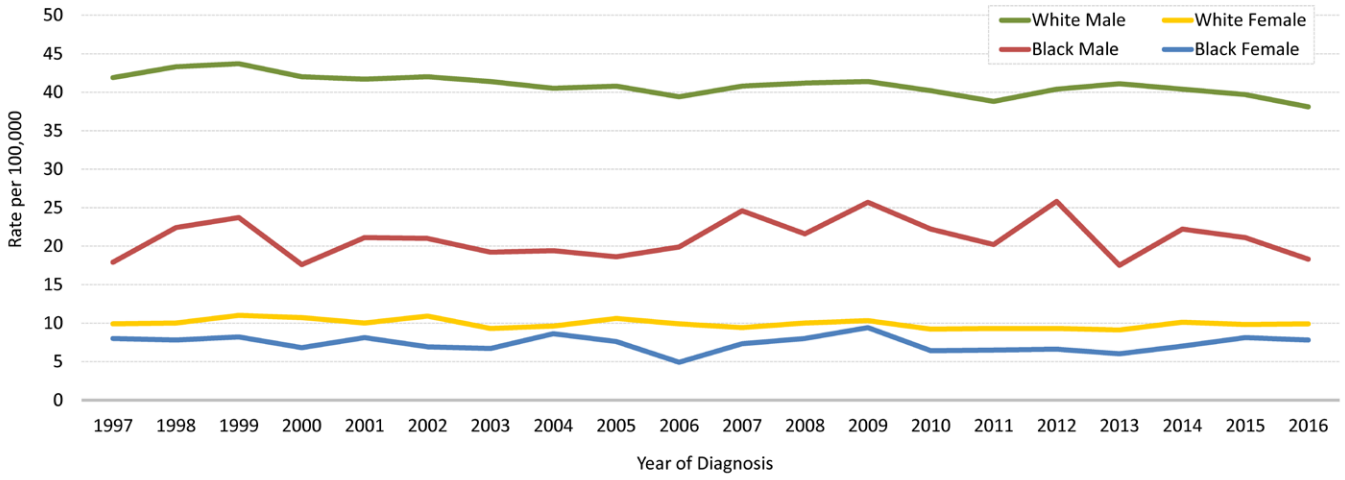
[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Trends

After decades of slowly increasing incidence rates, bladder cancer rates declined in the United States from 2006 to 2015 by about 1% per year in both men and women.[1] Figure 10 displays bladder cancer incidence trends in Ohio. From 1997 to 2016, the bladder cancer incidence rates in Ohio were relatively stable for all races and sexes combined.[3] Incidence rates were relatively stable among white males and females in Ohio, whereas rates were more variable among black males and females during this time period.[3]

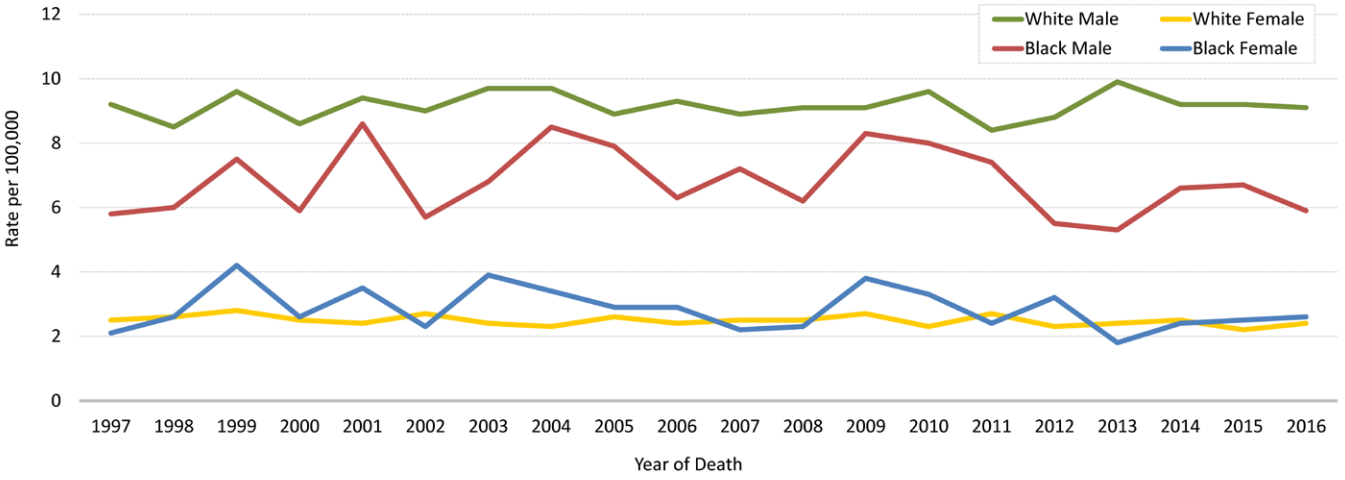
The U.S. mortality rate for bladder cancer from 2007 to 2016 was stable in men and decreased by 0.4% per year in women.[1] Figure 11 displays bladder cancer mortality trends in Ohio. From 1997 to 2016, bladder cancer mortality rates in Ohio remained relatively stable for white females but were variable for the other sex/race groups.[7]

FIGURE 10 **Trends in Age-adjusted Incidence Rates for Cancer of the Bladder by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 11 **Trends in Age-adjusted Mortality Rates for Cancer of the Bladder by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Early Detection

There is currently no screening method recommended for people at average risk of bladder cancer. People at increased risk may be screened by examination of the bladder wall with a cystoscope (a slender tube fitted with a lens and light that is inserted through the urethra), microscopic examination of cells from urine or bladder tissue, or other tests.[1]

Treatment

Surgery, alone or in combination with other treatments, is used in more than 90% of cases.[1] Timely follow-up care is extremely important because of the high rate of bladder cancer recurrence.[1] Early stage cancers may be treated by removing the tumor and then administering immunotherapy or chemotherapy drugs directly into the bladder.[1] More advanced cancers may require removal of the entire bladder (cystectomy).[1] Patient outcomes are improved with the use of chemotherapy, alone or with radiation, before cystectomy.[1] Intravenous immunotherapy (immune checkpoint inhibitors) is a newer option if chemotherapy cannot be used or is no longer working.[1]

Survival

For all stages combined, the five-year relative survival for bladder cancer in Ohio and the United States during 2009-2015 was 77%.[3] About half of all Ohio bladder cancer patients were diagnosed while the tumor was *in situ*, for which the five-year relative survival was 97%.[3] If the tumor was diagnosed at the distant stage, the five-year relative survival was only 6%.[3]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Smoking: Tobacco smoking is the most important risk factor for bladder cancer. Tobacco smoking causes about half of all bladder cancer 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: Exposures 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.

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

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.

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 OF BLADDER CANCER

- 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.

Breast Cancer

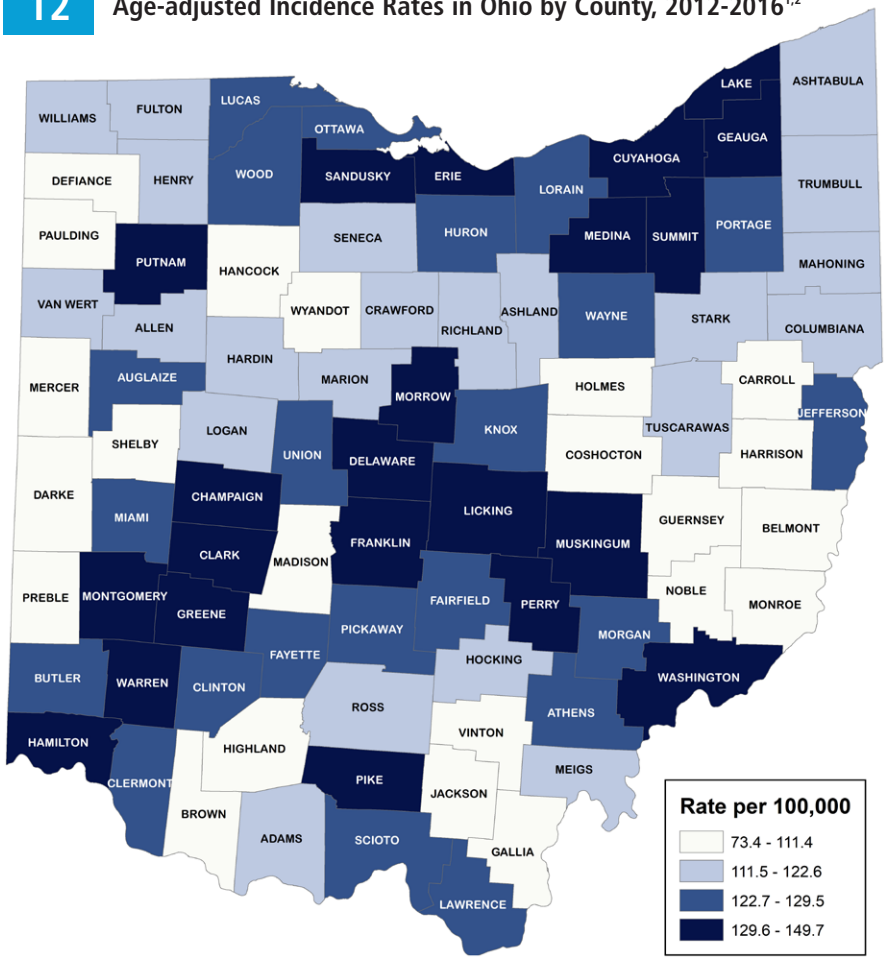
New Cases

An estimated 268,600 new cases of invasive breast cancer were expected to occur among women in the United States during 2019.[1] It is the most frequently diagnosed cancer in women. In addition to the number of female breast cancers, about 2,670 new cases of invasive breast cancer were expected to occur among males in 2019.[1]

An estimated 62,930 new cases of *in situ* breast cancer were expected to occur nationally among women during 2019.[1] Of these, the majority will be ductal carcinoma *in situ* (DCIS), which is noninvasive cancer cells in the milk ducts.[1] *In situ* breast cancer incidence rates have stabilized since 2000 among women 50 and older; whereas, there has been a slight decrease since 2013 among younger women.[1]

Currently, a woman living in the United States has a 1 in 9 lifetime risk of developing invasive breast cancer.[2]

FIGURE 12 **Cancer of the Female Breast: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Breast cancer is the most common reportable cancer among women in Ohio, regardless of race, accounting for 29% of all cancers diagnosed in women.[3] An average of 9,359 new cases of female breast cancer were diagnosed annually between 2012 and 2016 in Ohio with a corresponding rate of 127.4 per 100,000 compared to the U.S. rate of 127.5 per 100,000 (Table 2).[3,4] Average annual incidence rates of female breast cancer by Ohio county of residence are shown in Figure 12.

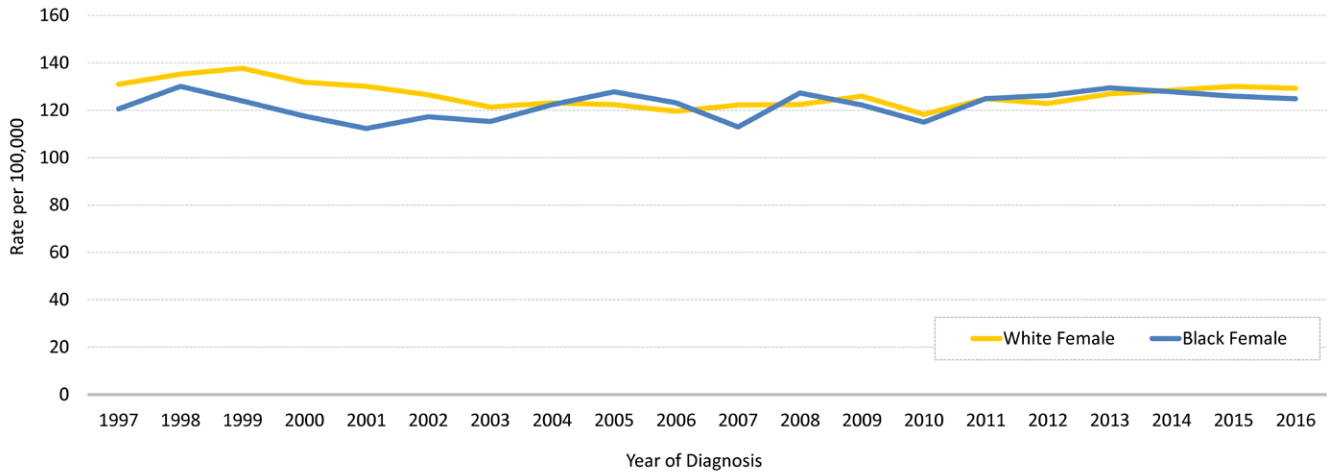
The risk of developing breast cancer increases with age. In Ohio from 2012 to 2016, approximately 96% of women who developed breast cancer were 40 and older.[3]

An average of 75 men were diagnosed with breast cancer each year in Ohio from 2012 to 2016 with a corresponding rate of 1.2 per 100,000, which is the same as the U.S. rate (Table 2).[3,4] Clinically, breast cancer in men is very similar to breast cancer in women, but the prognosis is often poorer for men because they tend to be diagnosed at a later stage than women.[13]

Deaths

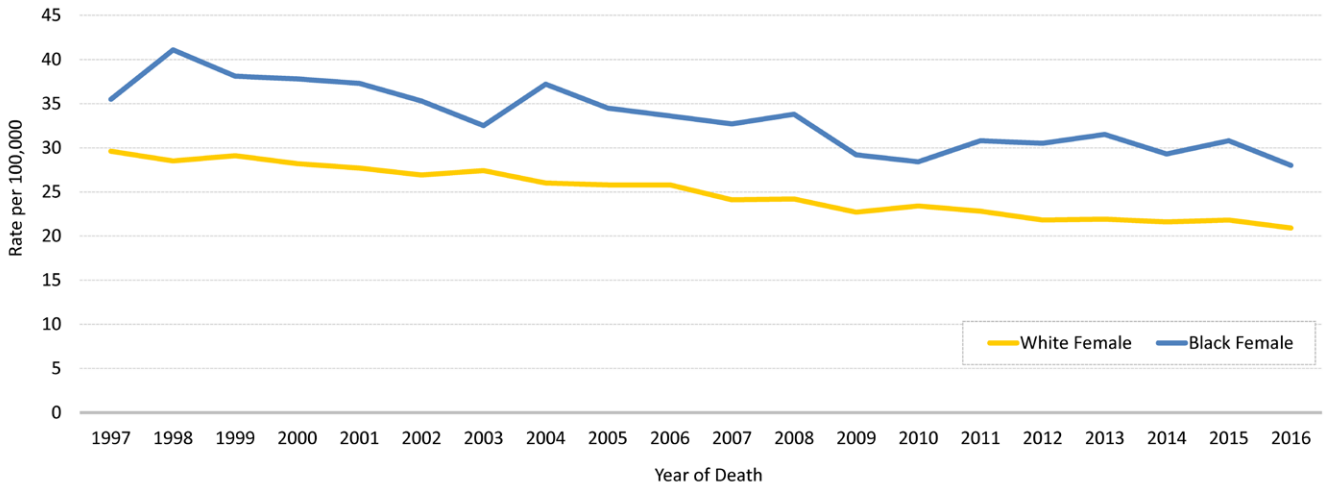
An estimated 42,260 deaths (41,760 women, 500 men) were anticipated from breast cancer in 2019 nationally.[1] Breast cancer ranks second in cancer deaths among women after lung and bronchus cancer.[1] Improved mammography screening to detect breast cancer early, along with better treatment options and increased awareness, have made breast cancer a more curable disease. In Ohio from 2012-2016, 98% of breast cancer deaths occurred in women 40 and older.[7] The 2012-2016 average annual mortality rate for breast cancer in Ohio females was 22.4 per 100,000 compared to the U.S. rate of 20.6 per 100,000.[4,7] This represents 1,755 average annual deaths in Ohio from female breast cancer during this time period (Table 3).[7]

FIGURE 13 **Trends in Age-adjusted Incidence Rates for Cancer of the Female Breast by Race in Ohio, 1997-2016[1,2]**



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 14 **Trends in Age-adjusted Mortality Rates for Cancer of the Female Breast by Race in Ohio, 1997-2016[1,2]**



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Trends

From 2006 to 2015, U.S. breast cancer incidence rates increased slightly (by 0.4% per year).[1] Figure 13 displays female breast cancer incidence trends in Ohio by race. Between 1997 and 2016, breast cancer incidence rates among white Ohio females decreased 1%, from a rate of 130.9 per 100,000 in 1997 to a rate of 129.2 per 100,000 in 2016.[3] During the same 20-year time period, the breast cancer incidence rate for black females in Ohio increased 4%, from 120.5 per 100,000 in 1997 to 124.8 per 100,000 in 2016.[3]

U.S. mortality rates declined 40% in women from 1989 to 2016.[1] Figure 14 displays female breast cancer mortality trends in Ohio by race. Between 1997 and 2016, white Ohio females experienced a 29% decrease in breast cancer mortality rates, from a rate of 29.6 per 100,000 in 1997 to a rate of 20.9 per 100,000 in 2016.[7] The breast cancer mortality rate for black Ohio females decreased 21%, from 35.5 per 100,000 in 1997 to 28.0 per 100,000 in 2016.[7]

SIGNS AND SYMPTOMS OF BREAST CANCER

- Lump or swelling in the breast or underarm area
- Persistent changes in the breast, such as skin irritation, dimpling, thickening, swelling, distortion or tenderness
- Nipple ulceration or retraction (turning inward)
- Redness or scaliness of the nipple or breast skin
- Nipple discharge (other than breast milk)
- Pain in any part of the breast, including the nipple

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

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Having children after 30 or not having children: Women who have had no children or who had their first child after age 30 have a slightly higher breast cancer risk.

Oral contraceptive use: Women who currently or recently used oral contraceptives have a slightly increased risk compared with women who stopped using them more than 10 years ago or never used them.

Use of menopausal hormone therapy: Women who use combined estrogen and progesterone menopausal hormone therapy for two or more years are at increased risk. This increased risk goes away within five years of nonuse.

Not breastfeeding: Women who have never nursed have a slightly increased risk compared to women who nursed.

Overweight and obesity: Women who are overweight or obese after menopause have an increased risk of breast cancer.

Not being physically active: Women who are not physically active have a higher risk compared to women who are.

Alcohol: The more alcohol a woman drinks, the greater her risk of breast cancer.

Previous breast/chest radiation: Women who had radiation therapy to the chest area before age 40 as treatment for another cancer or other medical conditions have increased risk.

NON-MODIFIABLE RISK FACTORS

Age: Risk of developing breast cancer increases with age. Most breast cancers are found in women age 55 and older.

Sex: Breast cancer is about 100 times more common among women than men.

Race and ethnicity: Nationally, white women are slightly more likely to develop breast cancer than black women. However, in women under the age of 45, breast cancer is more common in black women. At any age, black women are more likely to die from breast cancer. Asian, Hispanic and Native American women have a lower risk of developing and dying from breast cancer.

Genetic alterations: About 5-10% of cases are hereditary and result from gene mutations, most commonly mutations of the BRCA1 and BRCA2 genes. Ashkenazi Jews are at increased risk due to increased prevalence of BRCA1 and BRCA2 mutations.

High breast density: Women with high breast tissue density (the amount of glandular tissue relative to fatty tissue measured on a mammogram) have a higher risk of breast cancer.

Family history: Risk is higher if a first-degree relative has had breast cancer, especially if the family member was diagnosed before age 50.

Personal history: Women who have had breast cancer have an increased risk of developing a new breast cancer (either in the other breast or a different part of the same breast). In addition, women with DCIS, lobular carcinoma *in situ* (LCIS), or proliferative lesions with or without cell abnormalities (*e.g.*, hyperplasia) are at increased risk.

Long menstrual history: Women who started menstruating before age 12 or who went through menopause after age 55 have a higher risk.

Diethylstilbestrol (DES): Women who were given DES during pregnancy and women whose mother took DES while pregnant have slightly increased risk.

Early Detection

Numerous studies have shown that early detection of breast cancer saves lives and increases treatment options.[1] Mammography is especially valuable as an early detection tool because it can often identify breast cancer at an early stage, usually before physical symptoms develop. Mammography will detect most, but not all, breast cancers in women without symptoms.[1] However, the sensitivity of the test is lower for women with dense breasts.

According to the 2018 Ohio Behavioral Risk Factor Surveillance System (BRFSS), 77% of Ohio women aged 50-64 and 80% of Ohio women aged 65-74 reported having had a mammogram in the past two years.[14] Also according to the 2018 BRFSS, more blacks (85%) than whites (77%) reported having had a mammogram in the past two years.[14] The percentage of respondents who received a mammogram was lowest for those with less than a high school education (69%) and those with the lowest income (less than $25,000 per year) (69%), and highest for college graduates (85%) and those with the highest income ($50,000 or more per year) (84%) (Table 6).[14]

In 2015, the ACS changed their guidelines for breast cancer screening.[15] The ACS recommends that women with an average risk of breast cancer should undergo regular screening mammography starting at age 45 years.[15] Women aged 45 to 54 years should be screened annually.[15] Women 55 years and older should transition to biennial screening or have the opportunity to continue screening annually.[15] Women should have the opportunity to begin annual screening between the ages of 40 and 44 years.[15] Women should continue screening mammography as long as their overall health is good and they have a life expectancy of 10 years or longer.[15] The ACS does not recommend clinical breast examination for breast cancer screening among average-risk women at any age.[15]

The U.S. Preventive Services Task Force (USPSTF) recommends mammography every two years beginning at age 50 among asymptomatic women at average risk of developing breast cancer.[16] The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening mammography in women aged 75 years or older.[16]

1 in 10 women who are screened have an abnormal mammogram; however, only about 5% of women with an abnormal mammogram have breast cancer.

Treatment

Patients should discuss possible options for the best management of their breast cancer with their physicians. Taking into account the tumor size, stage and other characteristics, as well as the patient's preferences, treatment may involve one or more of the following: breast-conserving surgery (surgical removal of the tumor and surrounding tissue), mastectomy (surgical removal of the breast), removal of the lymph nodes under the arm, radiation therapy, chemotherapy, hormone therapy or targeted therapy.[1] Numerous studies have shown that, for early stage disease, the long-term survival probability after breast-conserving surgery plus radiation therapy is similar to the survival probability after mastectomy.[1]

Survival

In Ohio and the United States during 2009-2015, the overall five-year relative survival for breast cancer was 90%.[3,4] In Ohio, 70% of breast cancers were diagnosed while the tumor was *in situ* or at a local stage, for which the five-year relative survival was 100%.[3] After the cancer has spread regionally to involve adjacent organs or lymph nodes (23% of breast cancers in Ohio), the five-year relative survival was 86%.[3] For the 5% of Ohio women who were diagnosed with breast cancer at the distant stage, the five-year relative survival dropped to 28% (Figure 1).[3]

TABLE 6 **Prevalence of Women 50-74 Who Reported Having Had a Mammogram in the Past Two Years by Demographics in Ohio, 2018**[1,2]

	Had a Mammogram in the Past Two Years
AGE	
50-64	76.5%
65-74	80.0%
RACE	
White	76.8%
Black	84.8%
EDUCATION	
Less Than High School	69.4%
High School or GED*	76.2%
Some College	76.5%
College Graduate	85.1%
ANNUAL HOUSEHOLD INCOME	
<$25,000	69.3%
$25,000-$49,999	76.8%
$50,000+	84.0%
Total (Women 50-74)	77.6%

1 Source: 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019.
2 "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.
* General Educational Development

Cervical Cancer

New Cases

Nationally, an estimated 13,170 new cases of invasive cervical cancer were expected to occur in 2019.[1] An average of 467 new cases of invasive cervical cancer were diagnosed annually in Ohio in 2012-2016 with a corresponding rate of 7.6 per 100,000, compared to the U.S. rate of 7.3 per 100,000 (Table 2).[3,4] Nearly half of the women diagnosed with cervical cancer in Ohio from 2012 to 2016 were younger than 50 years.[3] Average annual age-adjusted incidence rates of cervical cancer by Ohio county of residence are shown in Figure 15.

Currently, a woman living in the United States has a 1 in 167 lifetime risk of developing invasive cervical cancer.[2]

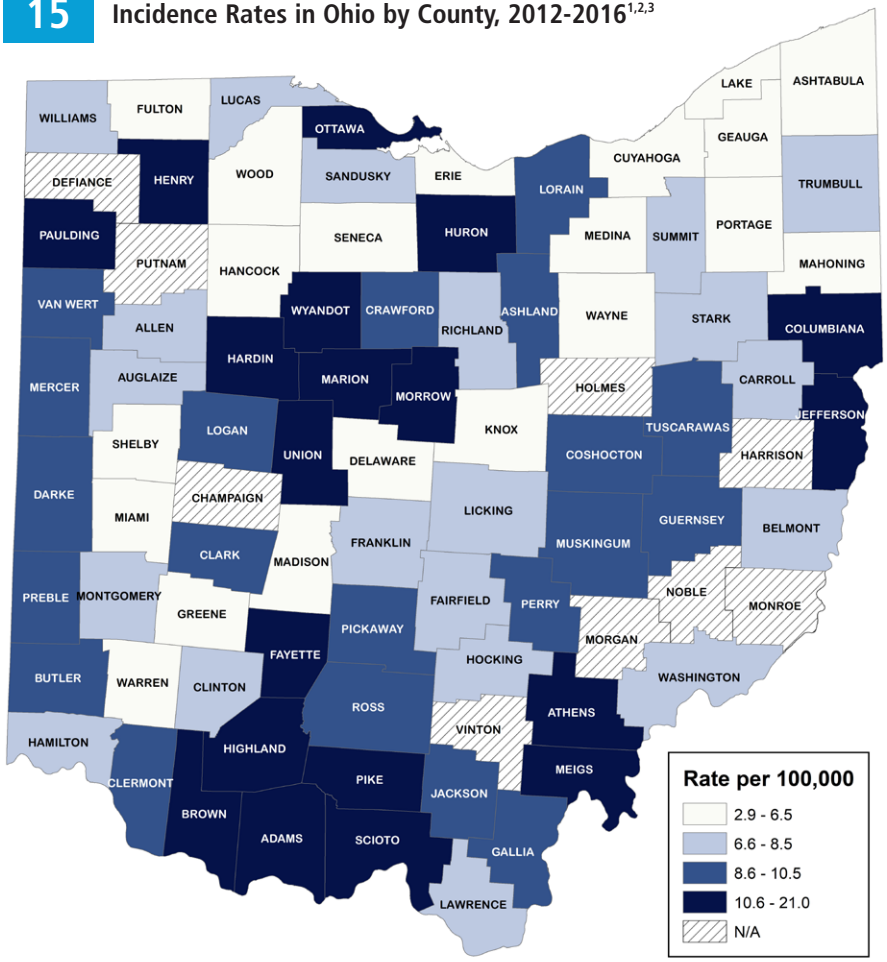
Deaths

In the United States, an estimated 4,250 cervical cancer deaths were expected to occur in 2019.[1] The average annual mortality rate for cervical cancer in Ohio from 2012 to 2016 was 2.3 per 100,000.[7] This represents an annual average of 158 deaths in Ohio from cervical cancer over the time period (Table 3).[7]

Trends

The cervical cancer incidence rate declined by more than half between 1975 (14.8 per 100,000) and 2015 (6.8 per 100,000) in the United States due to the widespread uptake of screening with the Papanicolaou (Pap) test and removal of precancerous lesions.[1] However, declines have slowed in recent years, especially among women younger than age 50, and overall incidence from 2006 to 2015 was stable.[1]

FIGURE 15 **Cancer of the Cervix: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2,3]



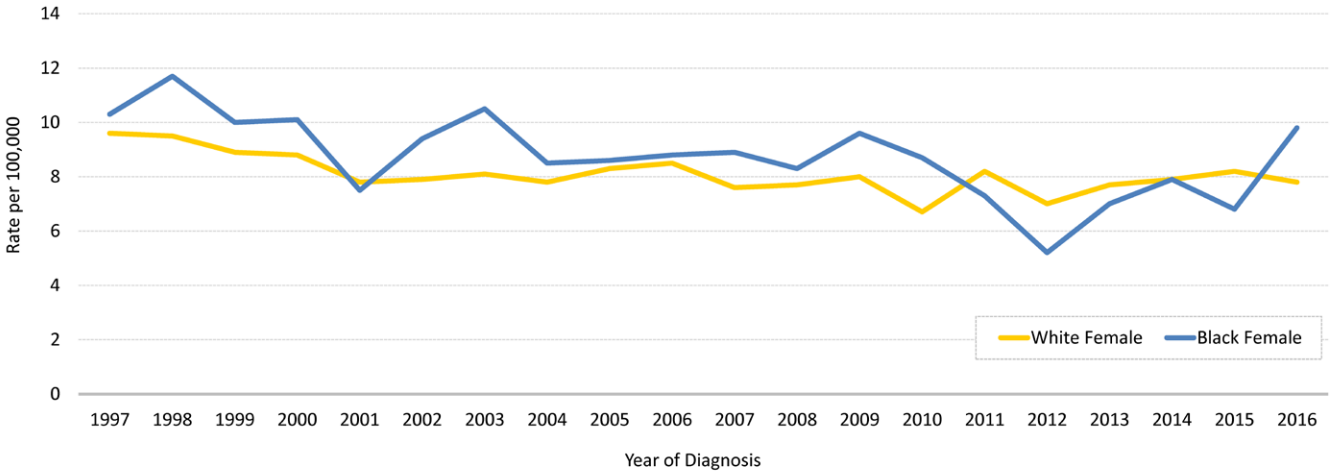
[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

In Ohio, incidence rates of cervical cancer decreased 15% from 1997 to 2016 (9.5 per 100,000 and 8.1 per 100,000, respectively).[3] The decline in cervical cancer incidence rates was higher for white females (19%) compared to black females (5%) in Ohio during this time period (Figure 16).[3]

The national cervical cancer death rate in 2016 (2.2 per 100,000) was less than half that in 1975 (5.6 per 100,000) due to the decline in incidence and the increase in early detection of cancer with the Pap test.[1] However, the pace of the decline has slowed in recent years.[1] From 2007 to 2016, the death rate decreased by about 1% per year in women ages 50 and older, but was stable in those younger than 50.[1]

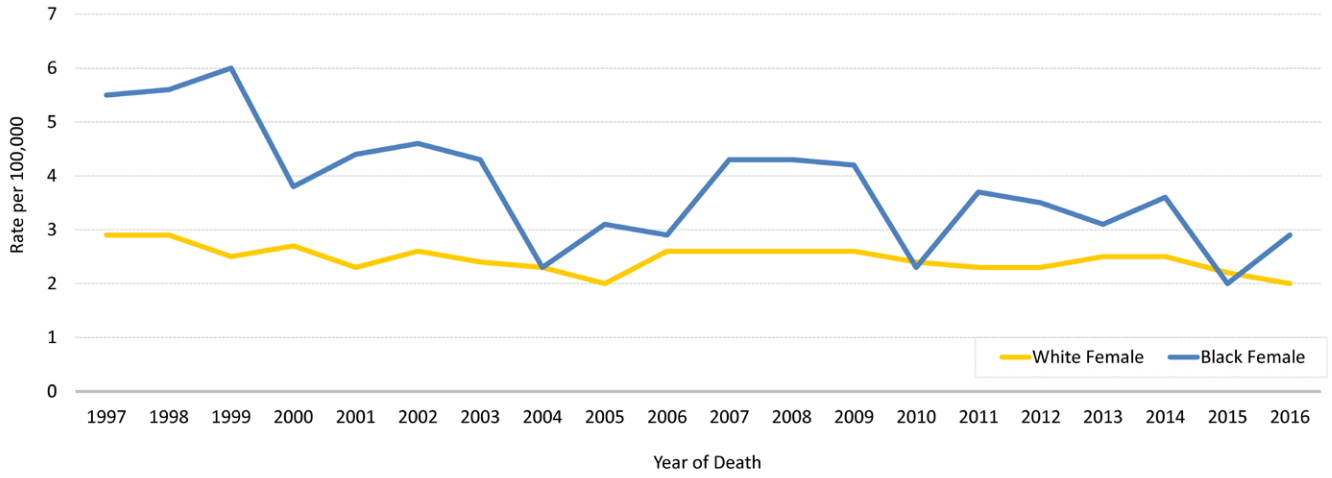
Cervical cancer mortality rates in Ohio declined 32% from 1997 (3.1 per 100,000) to 2016 (2.1 per 100,000).[7] Mortality rates of cervical cancer among black females were variable from year to year but decreased 47% from 1997 to 2016, compared to a decrease of 31% among white females during this time period (Figure 17).[7]

FIGURE 16 **Trends in Age-adjusted Incidence Rates for Cancer of the Cervix by Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 17 **Trends in Age-adjusted Mortality Rates for Cancer of the Cervix by Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

RISK FACTORS AND POPULATIONS WITH HIGH RATES

Infection of the cervix with human papillomavirus (HPV) spread through sexual contact is almost always the cause of cervical cancer. Factors that increase the risk of becoming infected with HPV include being sexually active at a young age, having many sexual partners and having a weakened immune system caused by immunosuppression. Most women with HPV infection, however, will not develop cervical cancer.[17] Women who do not regularly have tests to detect HPV or abnormal cells in the cervix are at increased risk of cervical cancer. The vaccine Gardasil 9 helps to prevent diseases cause by certain types of HPV, including cervical cancer, in adolescents and young adults.[17]

POTENTIALLY MODIFIABLE RISK FACTORS

Among women who are infected with HPV, the following factors further increase risk:

Smoking: Women who smoke are about twice as likely as nonsmokers to develop cervical cancer.

Oral contraceptives: Long-term use of oral contraceptives increases risk of cervical cancer.

Giving birth to many children: Risk of cervical is higher among women who have a high number of childbirths (estimated seven or more).

NON-MODIFIABLE RISK FACTORS

Age: Women between the ages of 45 and 60 are at the highest risk for cervical cancer.[18]

Race and ethnicity: More black and Hispanic women are diagnosed with cervical cancer than women of other races and ethnicities.[19]

DES: Being exposed to DES while in the mother's womb increases the risk of cervical dysplasia and clear cell adenocarcinoma of the cervix.

Early Detection

The ACS recommends the following for the early detection of cervical cancer in average risk women: for women 21 to 29, a Pap test every three years; and for women 30 to 65, Pap test plus an HPV test (called "co-testing") every five years (preferred) or a Pap test alone every three years (acceptable).[15] The ACS also recommends that women over 65 who have had three or more consecutive negative Pap tests or two or more consecutive negative HPV and Pap tests within the past 10 years, with the most recent test occurring in the past five years, should stop cervical cancer screening.[15] A woman who has had a total hysterectomy should stop cervical cancer screening.[15] A woman who has been vaccinated against HPV should still follow the screening recommendations for her age group.[15]

The USPSTF recommends the following for the early detection of cervical cancer: for women 21 to 65, a Pap test every three years; and for women 30 to 65 who want to lengthen the screening interval, screening with a combination of Pap and high-risk HPV testing, or high-risk HPV testing alone, every five years.[21] Screening after a hysterectomy with removal of the cervix among women who do not have a history of high-grade precancerous lesions (*i.e.*, cervical intraepithelial neoplasia (CIN) grade 2 or 3) or cervical cancer is not recommended.[21] Women older than 65 who have had adequate prior screenings and are not otherwise at high risk of cervical cancer should not be tested.[21] Table A-6 on page 87 shows the ACS and USPSTF recommendations for the early detection of cervical cancer in average risk, asymptomatic women by age.

SIGNS AND SYMPTOMS OF CERVICAL CANCER

Signs and symptoms usually do not appear until abnormal cervical cells become cancerous and invade nearby tissue.

- Abnormal vaginal bleeding (including bleeding after sexual intercourse)
- Unusual vaginal discharge
- Pain during intercourse
- Pelvic pain

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

Vaccines are the best way to protect against some of the most common types of HPV, including types 16 and 18, which have been linked to cancer in both men and women. The HPV vaccine, Gardasil 9, is safe and effective. It protects against cancers and genital warts caused by HPV infections. Although the series can be initiated as early as age 9, HPV vaccination is recommended for all boys and girls at age 11 or 12. The body develops better protection against HPV at this age than in the late teens and early 20s. Adolescents vaccinated before their 15th birthday need two doses of the HPV vaccine given 6 to 12 months apart. Teens and young adults who start the series at ages 15-26 years need three doses of HPV vaccine to protect against cancer-causing HPV infections. National survey data indicate that 58% of Ohio adolescents received the recommended doses of the HPV vaccine in 2018 compared to 51% in the United States.[20]

According to the 2018 BRFSS, 80% of female Ohioans ages 21 to 40 and 79% of female Ohioans ages 41 to 65 reported having had a Pap test within the last three years (Table 7).[14] The percentage of Pap testing was lowest for those with less than a high school education (61%) and those with the lowest household income (less than $25,000 per year) (76%), and highest for college graduates (86%) and those with the highest household income ($50,000 or more per year) (85%).[14]

Treatment

For pre-invasive lesions, preferred treatment includes: loop electrosurgical excision procedure (LEEP) (removal of abnormal tissue with a wire loop heated by electric current), cryotherapy (destruction of cells by extreme cold), laser ablation (destruction of cells by laser) or conization (removal of a cone-shaped piece of tissue containing the abnormal tissue).[1] Invasive cervical cancers generally are treated with surgery or radiation combined with chemotherapy.[1]

Survival

In Ohio and the United States during 2009-2015, the overall five-year relative survival for cervical cancer was 66%.[3,4] In Ohio, the five-year relative survival was 91% when diagnosed at a local stage (44% of cases); 58% when diagnosed at a regional stage (37% of cases); and dropped to 14% for the 14% of women with distant metastases (Figure 1).

TABLE 7 **Prevalence of Women 21-65 Who Reported Having Had a Pap Test in the Past Three Years by Demographics in Ohio, 2018**[1,2]

	Had a Pap Test in the Past Three Years
AGE	
21-40	79.7%
41-65	78.7%
RACE	
White	79.3%
Black	83.3%
EDUCATION	
Less Than High School	61.2%
High School or GED*	75.8%
Some College	79.2%
College Graduate	85.9%
ANNUAL HOUSEHOLD INCOME	
<$25,000	75.6%
$25,000-$49,999	76.7%
$50,000+	84.6%
Total (Women 21-65)	79.2%

1 Source: 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019.

2 "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.

* General Educational Development

Colon and Rectum Cancer

New Cases

Nationally, an estimated 101,420 colon and 44,180 rectum cancer cases were expected to occur in 2019.[1] Colon and rectum cancer is the third most common invasive cancer in both men and women. An average of 5,820 (3,011 men and 2,809 women) new cases of colon and rectum cancer were diagnosed annually between 2012 and 2016 in Ohio, corresponding to an average annual rate of 41.5 per 100,000 (Table 2).[3] Average annual incidence rates of colon and rectum cancer by Ohio county of residence are shown in Figure 18.

The risk of developing colon and rectum cancer increases with age. In Ohio, between 2012 and 2016, approximately 90% of individuals who developed colon and rectum cancer were 50 and older.[3]

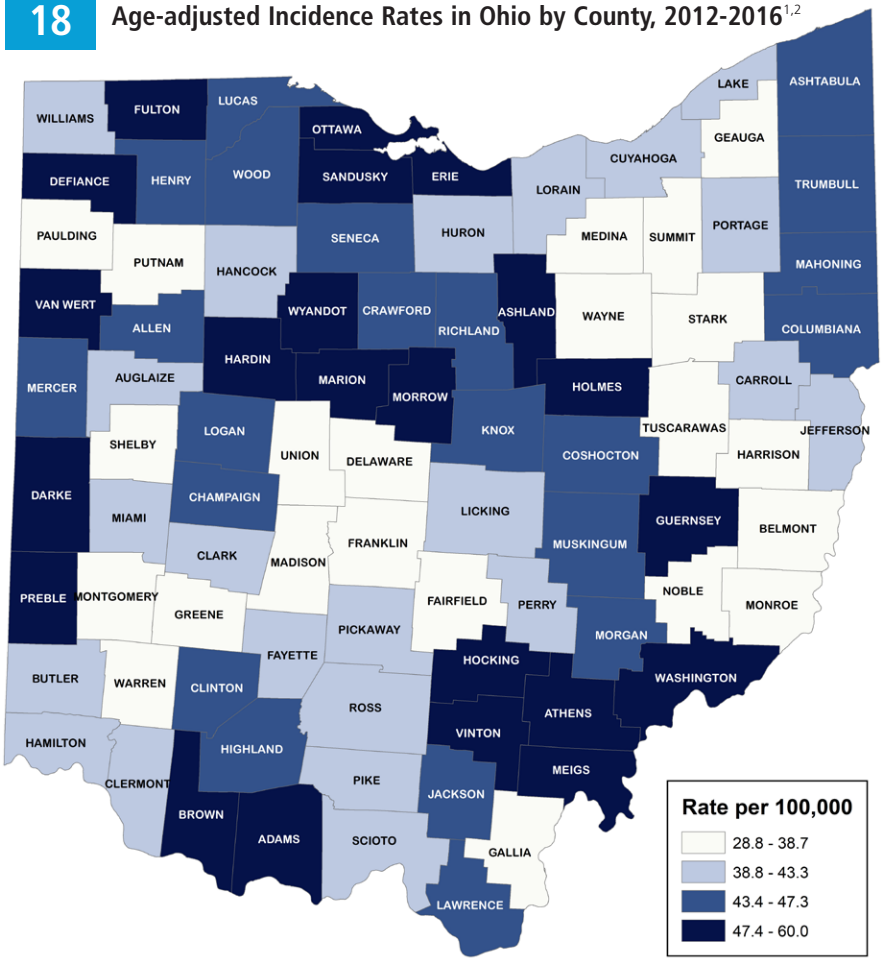
Currently, a man living in the United States has a 1 in 27 lifetime risk of developing invasive colon and rectum cancer, and a woman has a 1 in 31 lifetime risk of developing invasive colon and rectum cancer.[3]

Deaths

An estimated 51,020 colon and rectum cancer deaths were expected to occur in 2019 nationally, accounting for 9% of cancer deaths for males and 8% for females.[1]

The average annual mortality rate for colon and rectum cancer in Ohio from 2012-2016 was 15.7 per 100,000.[7] This represents 2,234 average annual deaths in Ohio from colon and rectum cancer during this time period (Table 3).[1] Although colon and rectum cancer mortality rates are decreasing, black men in Ohio die from colon and rectum cancer at a higher rate compared to white men, white women and black women (Table 4).[7]

FIGURE 18 **Cancer of the Colon & Rectum: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

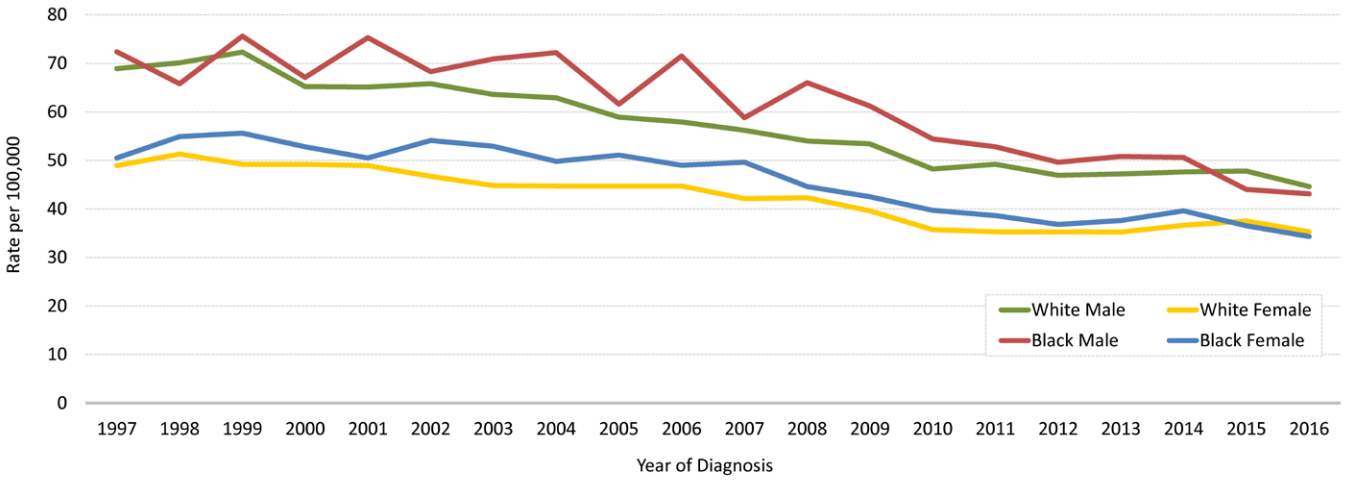
Trends

Colon and rectum cancer incidence rates have been decreasing for most of the past two decades, which has largely been attributed to both changes in risk factors (*e.g.*, decreased smoking, increased use of nonsteroidal anti-inflammatory drugs) and increases in use of colon and rectum screening tests that allow for detection and removal of colon and rectum polyps before they progress to cancer.[1] However, this trend is driven by older adults and masks the increasing incidence in younger age groups.[1] From 2006-2015, incidence rates declined 3.7% annually among adults 55 years of age and older, but increased by 1.8% annually among those younger than 55.[1]

Similar to the U.S., colon and rectum cancer incidence rates in Ohio declined from 1997 to 2016 for all sex/race groups.[3] The largest decline (41%) was in black males (72.4 per 100,000 in 1997 to 43.1 per 100,000 in 2016), followed by white males (35%), black females (32%) and white females (28%) (Figure 19).[3]

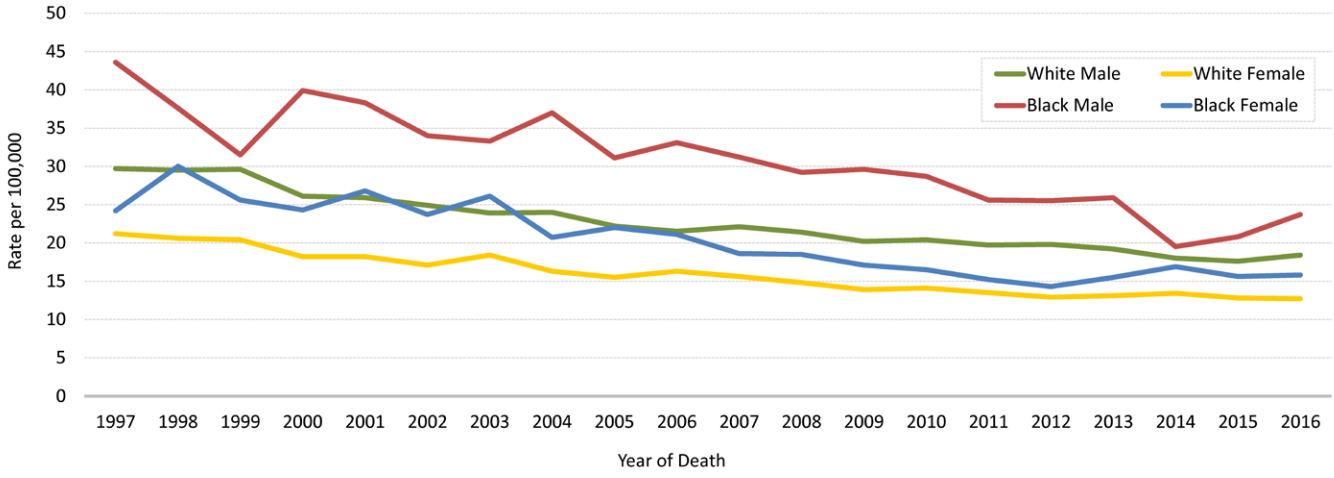
From 2007 to 2016, the U.S. mortality rate declined by 2.7% per year among individuals ages 55 and older and increased by 1% per year among adults younger than 55.[1] Colon and rectum cancer mortality rates in Ohio declined by 35% or more from 1997 to 2016 for each sex/race group.[7] The largest decline (46%) was in black males (43.6 per 100,000 in 1997 to 23.7 per 100,000 in 2016) (Figure 20).[7]

FIGURE 19 **Trends in Age-adjusted Incidence Rates for Cancer of the Colon & Rectum by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 20 **Trends in Age-adjusted Mortality Rates for Cancer of the Colon & Rectum by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Excessive alcohol use: Having three or more drinks of alcohol per day increases risk.

Obesity: Obesity is linked to an increased risk.

Smoking: Cigarette smoking increases the risk of colon and rectum cancer.

NON-MODIFIABLE RISK FACTORS

Age: Risk of colon and rectum cancer increases with age. Younger adults can get it, but it's much more common after age 50.

Sex: Males have a higher incidence rate of colon and rectum cancer compared to females.

Race: Blacks have the highest incidence rates of colon and rectum cancer.

Ethnicity: Ashkenazi Jews are at increased risk of colon and rectum cancer.

Colon and rectum polyps: Polyps, growths on the inner wall of the colon or rectum, are common in people older than 50. Most polyps are benign, but some polyps (high-risk adenomas) can continue to grow and become cancerous.

Family history of colon and rectum cancer or adenomatous polyps: Having a parent, sibling or offspring who has had colon and rectum cancer or adenomatous polyps increases risk, especially if more than one has been diagnosed or the relative was diagnosed at a young age.

Genetic alterations: Lynch syndrome, also known as hereditary nonpolyposis colon cancer (HNPCC), is an inherited condition that increases colon and rectum cancer risk. Familial adenomatous polyposis (FAP), caused by a change in a gene called adenomatous polyposis coli (APC), is a rare, inherited condition in which hundreds of polyps form in the colon and rectum, which increases colon and rectum cancer risk.

Personal history of certain cancers or adenomatous polyps: A person who has already had colon and rectum cancer may develop colon and rectum cancer a second time. Also, women with a history of cancer of the ovary are at higher risk. A person with a history of adenomatous polyps has an increased risk of colon and rectum cancer, especially if the polyps were numerous or large.

Ulcerative colitis or Crohn's disease: A person who has had a condition that causes inflammatory bowel disease (such as ulcerative colitis or Crohn's disease) for many years is at increased risk of developing colon and rectum cancer.

SIGNS AND SYMPTOMS OF COLON AND RECTUM CANCER

Early stage colon and rectum cancer usually does not have any signs and symptoms. Signs and symptoms of advanced disease may include the following:[22]

- Change in bowel habits such as diarrhea, constipation or narrowing of the stool that lasts for more than a few days
- Rectal bleeding, blood in the stool or blood in the toilet after having a bowel movement
- Dark or black stools
- Feeling that the bowel does not empty completely
- Cramping or steady lower abdominal (stomach area) pain
- Weakness and excessive fatigue
- Decreased appetite and unintentional weight loss

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

Early Detection

Screening can prevent colon and rectum cancer through the detection and removal of precancerous growths, as well as detect cancer at an early stage, when treatment is usually less extensive and more successful. Regular adherence to either of the two types of testing (stool or visual exams) results in a similar reduction in premature death from colon and rectum cancer. New guidelines from the ACS recommend that men and women at average risk for colon and rectum cancer begin screening at 45 years of age and continue up to age 75 depending on health status/life expectancy, with more individualized decision making from ages 76 to 85 based on a patient's overall health and prior screening history.[15]

The tests that are designed to find both early cancer and polyps are preferred if these tests are available and the individual is willing to have one of the following more invasive tests: flexible sigmoidoscopy every five years; colonoscopy every 10 years; or computed tomography (CT) colonography (virtual colonoscopy) every five years.[15] Tests that primarily find cancer include Guaiac-based fecal occult blood test (gFOBT) every year, fecal immunochemical test (FIT) every year, or multi-targeted stool DNA test (MT-sDNA) every three years.[15] The take-home multiple-sample method should be used for either gFOBT or FIT. If either of these tests is positive, it should be followed up with a colonoscopy.[15]

The USPSTF recommends screening for colon and rectum cancer starting at age 50 years and continuing through age 75 years.[23] There are several different methods to accurately detect early-stage colon and rectum cancer and adenomatous polyps, and the frequency of testing depends on the test performed.[23] The decision to screen for colon and rectum cancer in adults 76 to 85 years should be an individual one, taking into account the patient's overall health and prior screening history.[23] Adults in this age group who have never been screened for colon and rectum cancer are more likely to benefit. Screening would be most appropriate among adults who 1) are healthy enough to undergo treatment if colon and rectum cancer is detected and 2) do not have comorbid conditions that would significantly limit their life expectancy.[23]

COLON AND RECTUM CANCER SCREENING TESTS[24]

Colonoscopy: A colonoscope, a slender, flexible, hollow, lighted tube about the thickness of a finger, is inserted through the rectum and into the colon to visually examine the inside of the entire colon. If a polyp is found, the physician may remove it by laser or by passing a wire loop through the colonoscope to cut the polyp from the wall of the colon using an electric current.

Computed Tomography (CT) Colonography (Also referred to as Virtual Colonoscopy): A CT scan of the colon and rectum is an x-ray test that produces detailed cross-sectional images to allow a doctor to look for polyps or cancer. If polyps or other suspicious areas are detected, this test should be followed up by a colonoscopy.

Fecal Immunochemical Test (FIT): This test, also called an immunochemical fecal occult (hidden) blood test (iFOBT), is used to detect hidden blood in the stool. This test reacts to part of the hemoglobin molecule, which is found on red blood cells. If results are positive, a colonoscopy is required to investigate further.

Flexible Sigmoidoscopy: A sigmoidoscope, an instrument similar to a colonoscope but shorter, is inserted through the rectum and into the colon to view the inside of the rectum and the lower portion of the colon. If a polyp is present, the patient is referred for a colonoscopy so that the colon can be examined further.

Guaiac-based Fecal Occult Blood Test (gFOBT): The gFOBT detects occult blood in the stool through a chemical reaction, in a different way than a FIT. But like the FIT, this test can't tell if the blood is from the colon or from other parts of the digestive tract (such as the stomach). The ACS recommends the more modern, highly sensitive versions of this test for screening. This test must be done every year, unlike some other tests (like the visual tests described above). This test is done with a kit that you can use in the privacy of your own home that allows you to check more than one stool sample. A gFOBT done during a digital rectal exam in the doctor's office (which only checks one stool sample) is not enough for proper screening, as it is likely to miss most colon and rectum cancers. If the test results are positive (that is, if hidden blood is detected), a colonoscopy will be needed to find the reason for the bleeding.

Multi-targeted stool DNA (MT-sDNA): This test is referred to as "multi-targeted" because it not only detects blood in the stool, but also certain genetic mutations in the DNA of cells that are shed into the stool by large adenomas and colon and rectum cancers. Patients with a positive test result are referred for a colonoscopy. Cologuard®, the only MT-sDNA test currently available, tests for both DNA changes and blood in the stool. It has been shown to detect cancer and precancerous lesions more often than FIT, but also results in more false-positive tests, which can lead to unnecessary colonoscopies.[25] In addition, because it is new, the benefits and harms of this test are less well established than for other tests. Although it is recognized as an acceptable screening option by the USPSTF and is covered by Medicare, some private insurance companies may not cover this test.[26]

Table A-6 on page 87 shows the ACS and USPSTF recommendations for the early detection of colon and rectum cancer in average risk, asymptomatic people by age and sex.

Table 8 displays the prevalence of having a recommended colon and rectum cancer screening test by demographics.[14] The percentage of adults 50-75 receiving a recommended test was lower for those with less than a high school education (56%) compared to college graduates (75%), those with an annual household income less than $25,000 (63%) compared to those earning $50,000 or more (70%) and blacks (66%) compared to whites (68%).[14]

Treatment

Surgery is the most common form of treatment for colon and rectum cancers that have not spread.[1] Chemotherapy alone or in combination with radiation is given before (neoadjuvant) or after (adjuvant) surgery to most patients whose cancer has deeply penetrated the bowel wall or has spread to the lymph nodes.[1] For colon and rectum cancer that has spread to other parts of the body, treatments typically include chemotherapy and/or targeted therapy.[1]

Survival

According to 2009-2015 data, the five-year relative survival for patients with colon and rectum cancer was 64% in the United States and Ohio.[3,4] When colon and rectum cancers were detected at local stage, the five-year relative survival in Ohio was 90%; however, only 33% of colon and rectum cancers were diagnosed at a local stage.[3] After the cancer has spread regionally to involve adjacent organs or lymph nodes (34% of colon and rectum cancers in Ohio), the five-year relative survival in Ohio dropped to 71%, and for persons with distant metastases (20% of Ohio colon and rectum cases), the five-year relative survival was only 15% (Figure 1).[3]

TABLE 8 **Prevalence of Adults 50-75 Who Reported Having Had a Recommended Colon & Rectum Cancer Screening Test by Demographics in Ohio, 2018**[1,2]

	Meets Colon and Rectum Cancer Screening Guidelines
SEX	
Male	65.3%
Female	69.1%
AGE	
50-64	61.9%
65-75	77.4%
RACE	
White	67.6%
Black	66.4%
EDUCATION	
Less Than High School	56.3%
High School or GED*	63.2%
Some College	69.6%
College Graduate	75.1%
ANNUAL HOUSEHOLD INCOME	
<$25,000	63.1%
$25,000-$49,999	64.7%
$50,000+	70.3%
Total (Adults 50-75)	67.2%

1 Source: 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019.

2 "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.

3 Recommended screening tests include a screening colonoscopy every 10 years, or sigmoidoscopy every five years with high-sensitivity Fecal Occult Blood Test (FOBT) every three years, or screening with high-sensitivity FOBT every year.

* General Educational Development

Kidney and Renal Pelvis Cancer

New Cases

Nationally, 73,820 kidney and renal pelvis cancer cases were estimated to occur in 2019.[1] These are primarily renal cell carcinomas (RCC), which occur in the body of the kidney, but also include cancers of the renal pelvis (5%), which behave more like bladder cancer, and Wilms tumor (1%), a childhood cancer that usually develops before the age of five.[1] Men are twice as likely as women to be diagnosed with kidney and renal pelvis cancer.[1]

An average of 2,387 (1,471 men and 916 women) new cases of kidney and renal pelvis cancer were diagnosed annually between 2012 and 2016 in Ohio, corresponding to an average annual rate of 17.1 per 100,000 (Table 2).[3] Black males had the highest kidney and renal pelvis cancer incidence rate (26.6 per 100,000), compared to white males, white females and black females during this time period (Table 4).[3] Average annual incidence rates of kidney and renal pelvis cancer by Ohio county of residence are shown in Figure 21.

The risk of developing kidney and renal pelvis cancer increases with age. In Ohio, between 2012 and 2016, approximately 86% of individuals who developed kidney and renal pelvis cancer were 50 and older.[3]

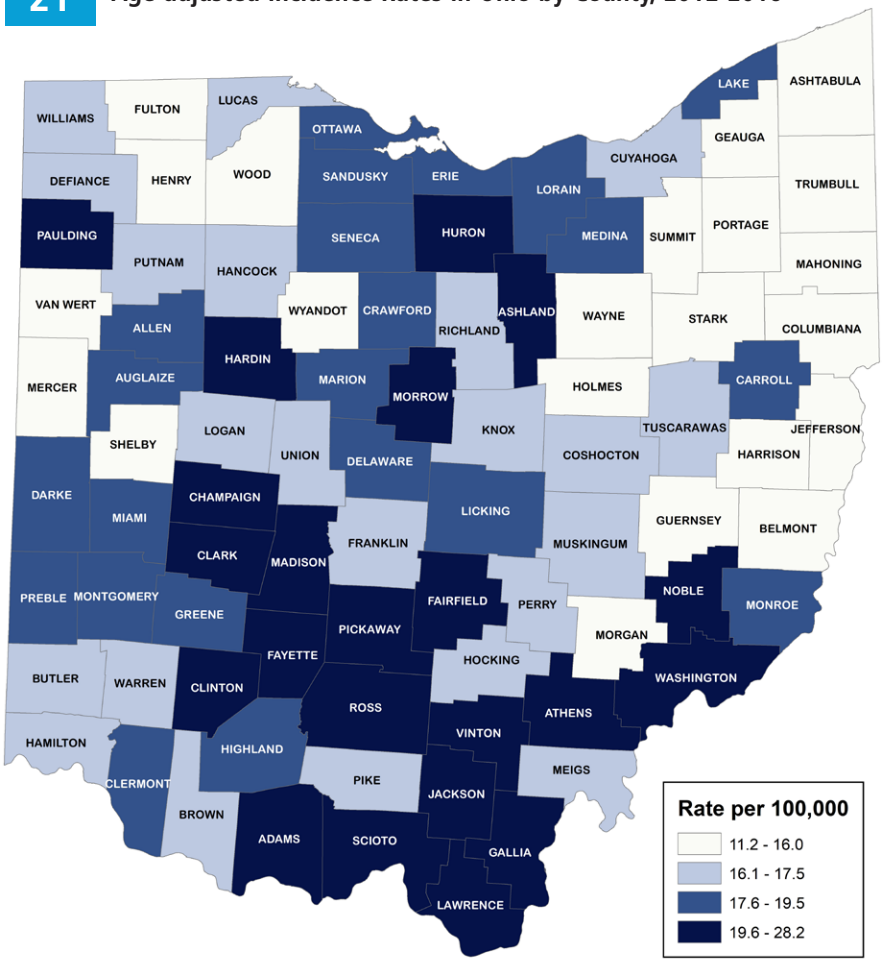
Currently, a man living in the United States has a 1 in 51 lifetime risk of developing invasive kidney and renal pelvis cancer and a woman has a 1 in 93 lifetime risk of developing invasive kidney and renal pelvis cancer.[2]

Deaths

An estimated 14,770 kidney and renal pelvis cancer deaths were expected to occur in 2019 nationally.[1]

The average annual mortality rate for kidney and renal pelvis cancer in Ohio from 2012-2016 was 3.9 per 100,000 compared to 3.8 per 100,000 nationally.[4,7] This represents 563 average annual deaths in Ohio from kidney and renal pelvis cancer during the time period (Table 3).[7] In contrast to incidence, white men in Ohio die from kidney and renal pelvis cancer at a higher rate (5.7 per 100,000), compared to black men, black women and white women (Table 5).[7]

FIGURE 21 **Cancer of the Kidney & Renal Pelvis: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

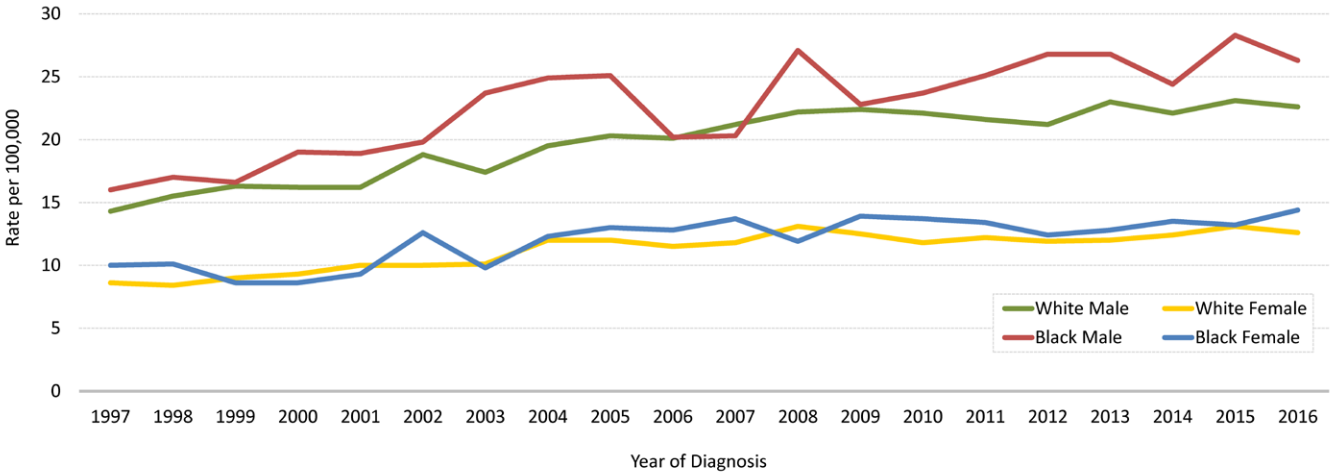
Trends

Kidney and renal pelvis cancer incidence rates have been increasing in the United States for most of the past several decades. The rise, mostly due to localized stage diagnoses, is partly attributed to incidental detection of asymptomatic tumors because of the increased use of medical imaging. From 2006 to 2015, the rate increased by about 1% per year.[1]

Kidney and renal pelvis cancer incidence rates in Ohio increased 55% from 1997 to 2016 for all sex/race groups combined.[3] Black males and white males had the greatest increases in rates of kidney and renal pelvis cancer (64% and 58%, respectively) during this time period (Figure 22).[3]

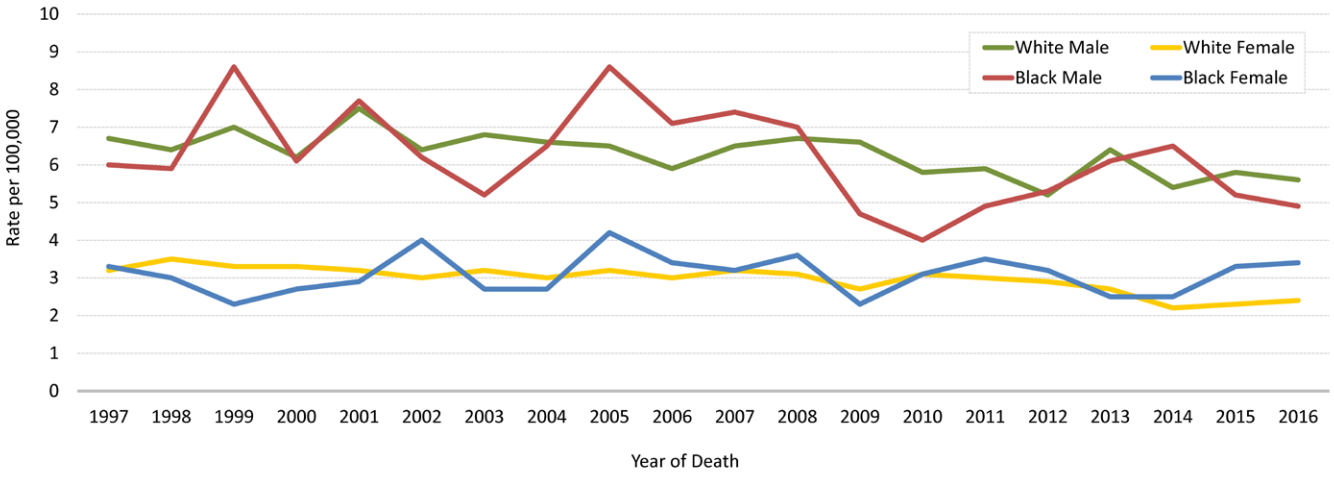
The U.S. mortality rate for kidney and renal pelvis cancer has been decreasing since 1995; from 2007 to 2016, the decrease was about 1% per year.[1] Kidney and renal pelvis cancer mortality rates in Ohio decreased 17% from 1997 to 2016 for all sex-race groups combined.[7] Mortality rates by sex/race group in Ohio were variable during the 20-year time period (Figure 23).[7]

FIGURE 22 **Trends in Age-adjusted Incidence Rates for Cancer of the Kidney & Renal Pelvis by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 23 **Trends in Age-adjusted Mortality Rates for Cancer of the Kidney & Renal Pelvis by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Smoking: Smoking approximately doubles the risk of developing kidney and renal pelvis cancer.

Obesity: People who are overweight have a higher risk of RCC, possibly due to changes in certain hormones.

Workplace exposures: Workplace exposure to certain substances (cadmium, some herbicides and organic solvents, particularly trichloroethylene) increases the risk for kidney and renal pelvis cancer.

Overuse of certain medications: Diuretics and analgesic pain pills, such as aspirin, acetaminophen and ibuprofen have been linked to kidney and renal pelvis cancer.

High blood pressure: High blood pressure, or the medicines used to treat high blood pressure, increases risk.

NON-MODIFIABLE RISK FACTORS

Age: Kidney and renal pelvis cancer is usually diagnosed in adults between the ages of 50 to 70 years.

Sex: Kidney and renal pelvis cancer is two to three times more common in men than in women.

Race: Blacks and American Indians/Alaskan Natives have higher rates of kidney and renal pelvis cancer than do whites.

Family history: People with a strong family history of kidney and renal pelvis cancer have a higher chance of developing this cancer. This risk is highest in brothers or sisters of those with kidney and renal pelvis cancer.

Advanced kidney disease: People with advanced kidney disease, especially those needing dialysis, have a higher risk of kidney and renal pelvis cancer.

Rare inherited conditions: People who have been diagnosed with von-Hippel-Lindau disease, hereditary papillary RCC, hereditary leiomyoma-RCC, Birt-Hogg-Dube syndrome and familial renal cancer have increased risk of kidney and renal pelvis cancer.

SIGNS AND SYMPTOMS OF KIDNEY AND RENAL PELVIS CANCER

Early stage kidney and renal pelvis cancer usually has no symptoms. As the tumor progresses, possible signs and symptoms include:

- Blood in the urine
- Low back pain on one side (not caused by injury)
- A pain or lump on the side or lower back
- Fatigue
- Loss of appetite
- Weight loss not caused by dieting
- Fever that is not caused by an infection and that does not go away

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 are no recommended screening tests for the early detection of kidney and renal pelvis cancer among people at average risk.

Treatment

Surgery is the primary treatment for most kidney cancers, although active surveillance may be an option for some patients with small tumors.[1] Patients who are not surgical candidates may be offered ablation therapy, a procedure that uses heat or cold to destroy the tumor.[1] Adjuvant treatment has not been shown to be helpful after surgery, although several targeted therapies are being studied.[1] For metastatic disease, targeted therapies are typically the main treatment, sometimes along with kidney removal.[1]

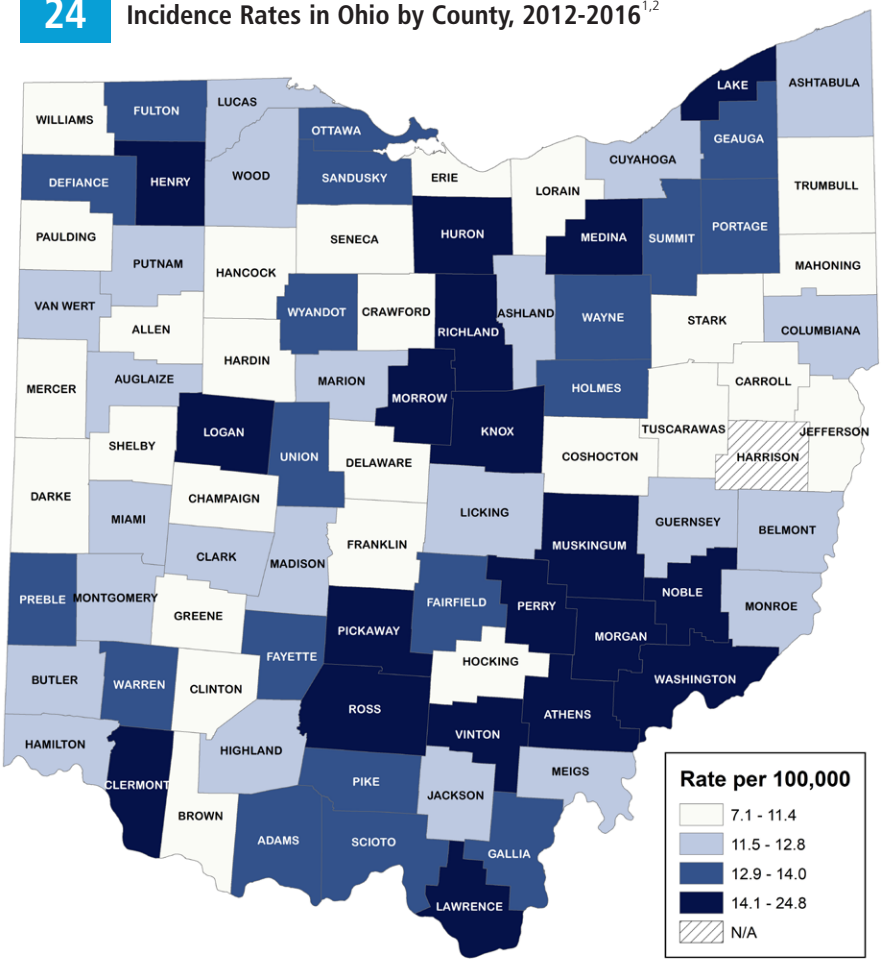
Survival

According to 2009-2015 data, the five-year relative survival for kidney and renal pelvis cancer was 77% in Ohio and 75% in the United States.[3,4] Almost two-thirds (63%) of Ohioans with kidney and renal pelvis cancer were diagnosed at the local stage, for which the five-year relative survival was 94%.[3] Five-year relative survival, however, dropped to 15% for Ohioans diagnosed at the distant stage (14% of kidney and renal pelvis cancer cases).[3]

Leukemia

Leukemia is a type of cancer that originates in the bone marrow and causes the production of abnormal blood cells, particularly white blood cells. Most people diagnosed with leukemia (92%) are adults 20 years of age and older, although it is the most common cancer among children.[4] Leukemia is categorized by whether it is acute (the number of leukemia cells increases rapidly and the disease worsens quickly) or chronic (the number of leukemia cells increases slowly and the disease worsens slowly), and by the type of blood cells that are affected (lymphoid cells or myeloid cells).[27] The four primary types of leukemia are acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL) and chronic myeloid leukemia (CML). ALL accounts for approximately 75% of the leukemia cases among young children and teens, while CLL is the most common type of leukemia among adults.[4]

FIGURE 24 **Leukemia: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

New Cases

An estimated 61,780 new cases of leukemia were expected to occur in 2019 in the United States.[1] The most common type of leukemia in the United States is AML, with an estimated 21,450 cases (35%) expected to occur in 2019, followed by CLL (20,720 cases; 34%), CML (8,990 cases; 15%) and ALL (5,930; 10%).[1] As shown in Table 2, an average of 1,655 cases of leukemia were diagnosed among Ohio residents each year from 2012-2016.[3] The leukemia incidence rate in Ohio (12.2 per 100,000) was 13% lower than the U.S. rate of 14.1 per 100,000.[3,4] However, this is likely due to delayed or incomplete reporting, as the estimated completeness of case reporting of leukemia in Ohio is 82%. Similar to the United States, the most common type of leukemia in Ohio was AML, with an average of 544 cases per year in 2012-2016; although, the incidence rate of AML in Ohio (4.0 per 100,000) was lower than that in the United States (4.3 per 100,000).[3,4] Rates of CLL (3.5 per 100,000), CML (1.6 per 100,000) and ALL (1.5 per 100,000) were 29%, 16% and 12% lower in Ohio compared to the United States, respectively (Table 9).[3,4] Incidence rates of leukemia in Ohio were higher among males compared to females and whites compared to blacks in 2012-2016.[3] Incidence was highest among white males in Ohio (15.8 per 100,000) compared to all other sex/race groups (Table 4).[3] Average annual age-adjusted incidence rates of leukemia by Ohio county of residence are shown in Figure 24.

Currently, a man living in the United States has a 1 in 65 lifetime risk of developing leukemia, and a woman has a 1 in 97 lifetime risk of developing leukemia.[2]

TABLE 9

Average Annual Number of New Leukemia Cases and Age-adjusted Incidence Rates and Average Annual Number of Leukemia Deaths and Age-adjusted Mortality Rates by Histology Type in Ohio and the United States, 2012-2016[1,2]

Histology Type	INCIDENCE			MORTALITY		
	Ohio Cases	Ohio Rate	National Rate	Ohio Deaths	Ohio Rate	National Rate
All Leukemias*	1,655	12.2	14.1	961	6.9	6.5
Acute Lymphocytic Leukemia (ALL)	168	1.5	1.7	51	0.4	0.4
Acute Myeloid Leukemia (AML)	544	4.0	4.3	412	3.0	2.8
Chronic Lymphocytic Leukemia (CLL)	511	3.5	4.9	187	1.3	1.2
Chronic Myeloid Leukemia (CML)	208	1.6	1.9	46	0.3	0.3

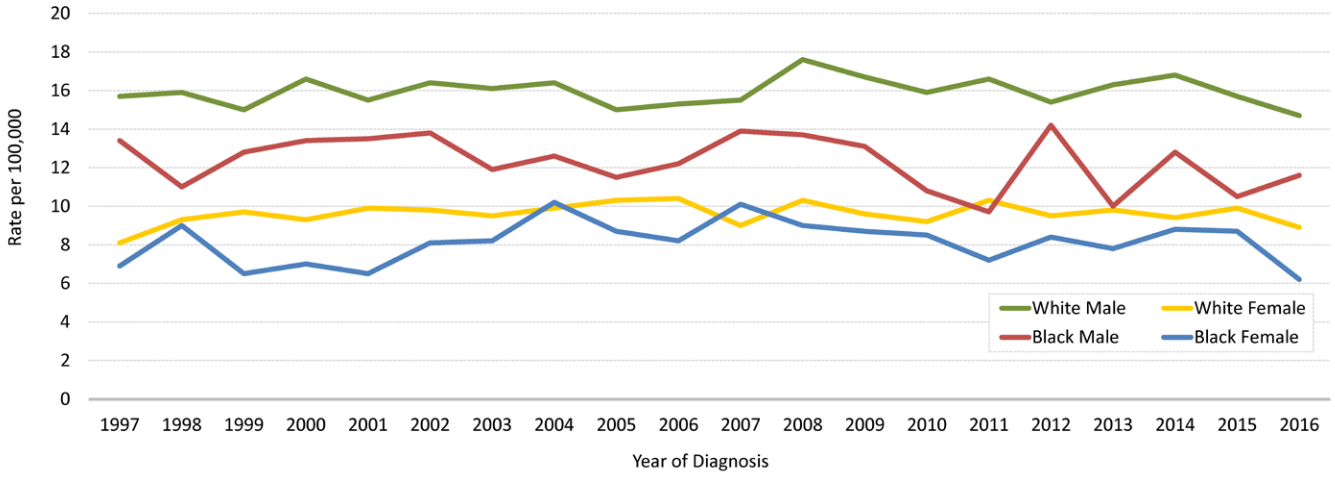
[1] Source: Ohio Cancer Incidence Surveillance System; Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019; Surveillance, Epidemiology, and End Results (SEER) Program, *SEER Cancer Statistics Review* 1975-2016, National Cancer Institute, 2019.

[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

* Along with the four primary histology types (ALL, AML, CLL and CML), average annual incidence counts for "All Leukemias"include the following histology types: Other Lymphocytic (53 cases); Acute Monocytic (26 cases); Other Myeloid/Monocytic (31 cases); Other Acute (42 cases); and Aleukemic, Subleukemic and Not Otherwise Specified (71 cases). In addition, these histology types accounted for 258 leukemia deaths per year.

FIGURE 25

Trends in Age-adjusted Incidence Rates for Leukemia by Sex and Race in Ohio, 1997-2016[1,2]

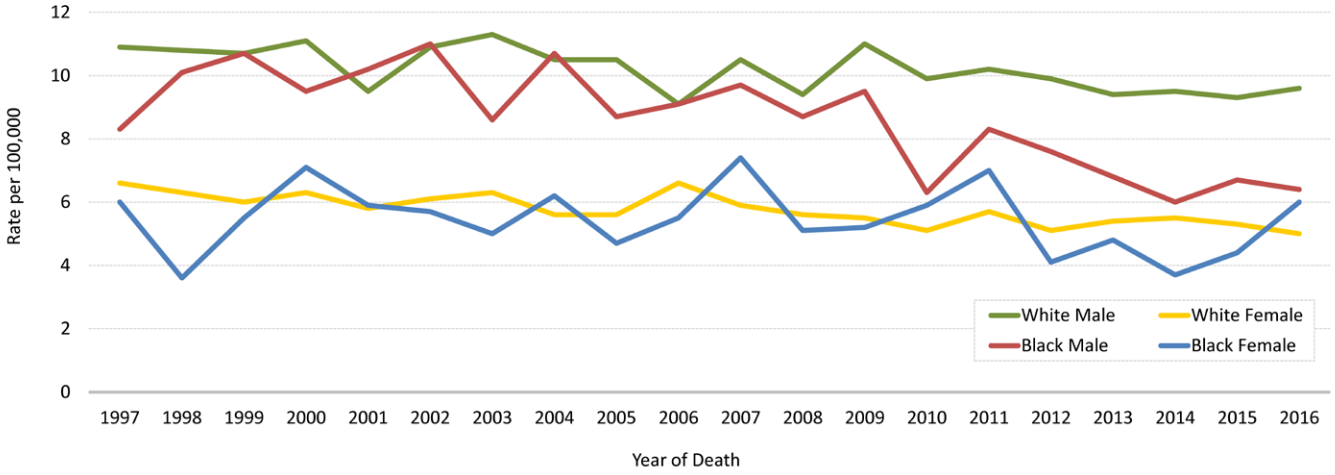


[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 26

Trends in Age-adjusted Mortality Rates for Leukemia by Sex and Race in Ohio, 1997-2016[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.

[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Deaths

An estimated 22,840 leukemia deaths were expected to occur in 2019 in the United States.[1] The average annual mortality rate for leukemia in Ohio in 2012-2016 was 6.9 per 100,000, which is 6% higher than the U.S. rate (6.5 per 100,000) (Table 3).[7] This represents 961 average annual deaths in Ohio from leukemia over the time period.[7] Similar to incidence, white males in Ohio had the highest mortality rate for leukemia (9.5 per 100,000) compared to all other sex/race categories (Table 5).[7] Average annual mortality rates of ALL (0.4 per 100,000) and CML (0.3 per 100,000) are identical to the U.S. rates, while mortality rates of AML (3.0 per 100,000) and CLL (1.3 per 100,000) were slightly higher than those in the United States (Table 9).[4,7]

Trends

From 2006 to 2015, the U.S. CLL incidence rate was stable and increased by 0.7% per year for ALL, 1.8% for CML and 3.7% for AML.[1] Figure 25 displays the trend in leukemia incidence among males and females by race in Ohio from 1997-2016.[3] For each year, white males had the highest incidence rate.[3] From 1997 to 2016, there was no clear trend in leukemia incidence rates in Ohio by sex/race category.[3]

Nationally, the leukemia death rate for AML was stable from 2007 to 2016 and decreased by approximately 1% per year for ALL and CML and by approximately 3% per year for CLL.[1] Figure 26 shows the trend in leukemia mortality rates among Ohio males and females by race from 1997-2016.[7] For most years, white males had the highest mortality rate.[7] Mortality rates declined from 1997-2016 for white males, black males and white females; a trend was less evident for black females.[7]

Early Detection

There are no recommended screening tests for the detection of leukemia. However, it is sometimes diagnosed early because of abnormal results on blood tests performed for other indications.

Treatment

Chemotherapy, either single agents or agents in combination, is used to treat most types of leukemia.[1] Several targeted drugs are effective for treating CML because they attack cells with the Philadelphia chromosome, the genetic abnormality that is the hallmark of CML.[1] Some of these drugs are also used to treat a type of ALL involving a similar genetic defect.[1] People diagnosed with CLL that is not progressing or causing symptoms may not require treatment.[1] For those who do require treatment, CLL-targeted drugs are effective for some patients, even when other treatments are no longer working.[1] Certain types of leukemia may be treated with high-dose chemotherapy followed by stem cell transplantation under appropriate conditions.[1] Newer experimental treatments that boost the body's immune system, like CAR (chimeric antigen receptor) T-cell therapy, have shown much promise, even against some hard-to-treat leukemias.[1]

Survival

Based on cases diagnosed during 2009-2015, the five-year relative survival for leukemia in Ohio (57%) is lower than that for the United States (63%).[3,4] Five-year relative survival for leukemia varies largely by type and ranges from 27% for AML to 83% for CLL in Ohio.[3] Due in large part to advances in treatment, survival probabilities for most types of leukemia greatly increased during the past 40 years.[1]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Radiation: People exposed to very high levels of radiation are much more likely than others to get AML, CML or ALL. Radiation exposure resulting from medical treatment for cancer and other conditions can increase risk.

Benzene: Exposure to benzene in the workplace can cause AML. It may also cause CML and ALL. Benzene is found in the chemical industry, cigarette smoke and gasoline.

Chemotherapy: Cancer patients treated with certain types of cancer treatment drugs sometimes later get AML or ALL.

Smoking: Smoking cigarettes increases risk of AML.

Human T-cell leukemia virus type I (HTLV-I): People with HTLV-I infection are at increased risk of a rare type of leukemia known as adult T-cell leukemia.

NON-MODIFIABLE RISK FACTORS

Age: ALL is most commonly diagnosed among children, whereas AML, CLL and CML occur mainly in adults.

Sex: Leukemia is more common among men than women.

Race: Whites have higher rates of leukemia compared to blacks.

Family history: While it is rare for more than one person in a family to have leukemia, family history does increase risk of CLL.

Down syndrome and other inherited diseases: Down syndrome and certain other inherited diseases increase risk of developing acute leukemia (ALL and AML).

Myelodysplastic syndrome and certain other blood disorders: People with certain blood disorders are at increased risk of AML.

SIGNS AND SYMPTOMS OF LEUKEMIA

In acute leukemia, signs may appear suddenly, while chronic leukemia typically progresses slowly with few symptoms and is often diagnosed during routine blood tests.[1]

Symptoms may include:

- Fatigue
- Paleness
- Weight loss
- Repeated infections
- Fever
- Bleeding or bruising easily
- Bone or joint pain
- Swelling in the lymph nodes or abdomen

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.

Liver and Intrahepatic Bile Duct Cancer

New Cases

An estimated 42,030 new cases of liver and intrahepatic bile duct (IBD) cancer were expected to occur in the United States during 2019, accounting for 2% of all cancer diagnoses.[1] An average of 1,038 new cases of liver and IBD cancer (723 men and 314 women) were diagnosed annually between 2012 and 2016 in Ohio with a corresponding rate of 7.0 per 100,000.[3] The liver and IBD incidence rate was 20% lower in Ohio compared to the United States (8.8 per 100,000).[3,4] In Ohio males, the average annual incidence rate was 10.4 per 100,000 compared to a rate of 4.0 per 100,000 among Ohio females (Table 2).[3] Average annual incidence rates of liver and IBD cancer by Ohio county of residence are shown in Figure 27.

Currently, a man living in the United States has a 1 in 76 lifetime risk of developing invasive liver and IBD cancer, and a woman has a 1 in 192 lifetime risk of developing invasive liver and IBD cancer.[2]

Deaths

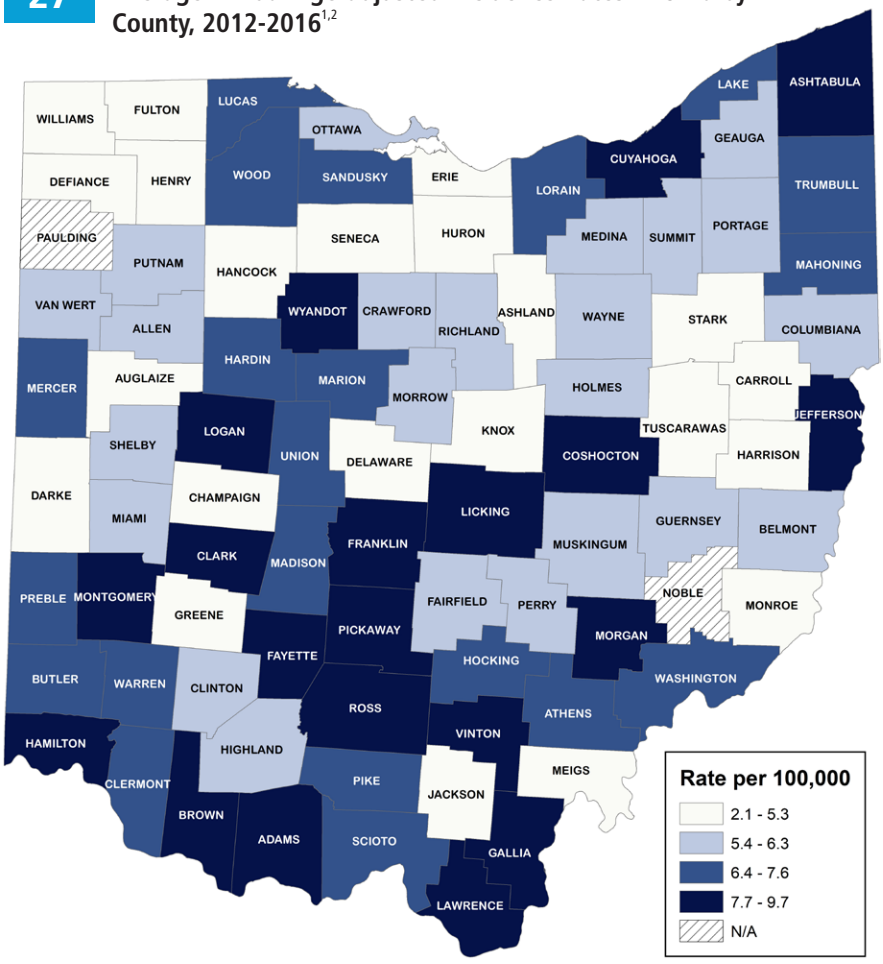
An estimated 31,780 liver and IBD cancer deaths were expected to occur in the United States in 2019, accounting for 5% of cancer deaths.[1] An average of 868 deaths occurred annually from liver and IBD cancer among Ohio residents from 2012-2016.[7] The average annual mortality rate was 5.9 per 100,000 (8.5 per 100,000 for males and 3.6 per 100,000 for females) (Table 3).[7]

Trends

Nationally, liver cancer is the most rapidly increasing cancer in both men and women.[1] Figure 28 displays the trend in liver and IBD cancer incidence rates among males and females by race in Ohio from 1997-2016.[3] For each year, black males had the highest incidence rate.[3] Overall, liver and IBD cancer incidence rates in Ohio nearly doubled during this 20-year period, from 3.7 per 100,000 to 7.1 per 100,000.[3] This increase in incidence is consistent with what has been observed in the United States.

Figure 29 shows liver and IBD cancer mortality rates by year of death (1997 through 2016) and sex/race group. For each year, black males had the highest mortality rate. Liver and IBD cancer mortality rates increased about 53% from 1997 to 2016 for all sex/race groups combined in Ohio, from 5.2 per 100,000 to 7.9 per 100,000.[3] Mortality rates increased considerably from 1997 to 2016 for each sex/race group.[7]

FIGURE 27 **Cancer of the Liver & Intrahepatic Bile Duct: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

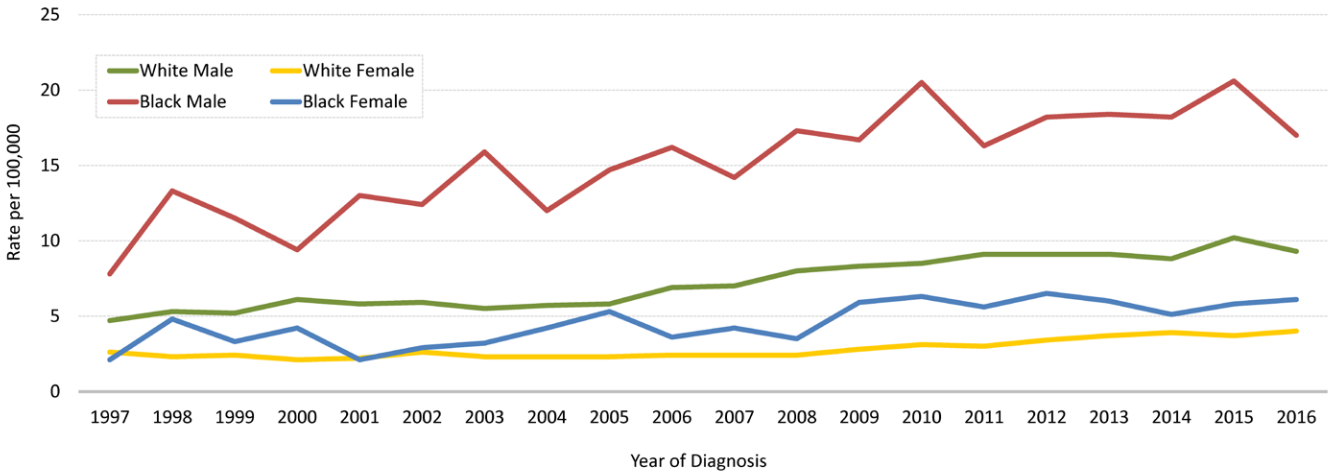
Early Detection

Although screening for liver cancer has not been shown to reduce mortality, many healthcare providers in the United States test individuals at high risk (*e.g.*, those with cirrhosis) with ultrasound or blood tests.[1]

Treatment

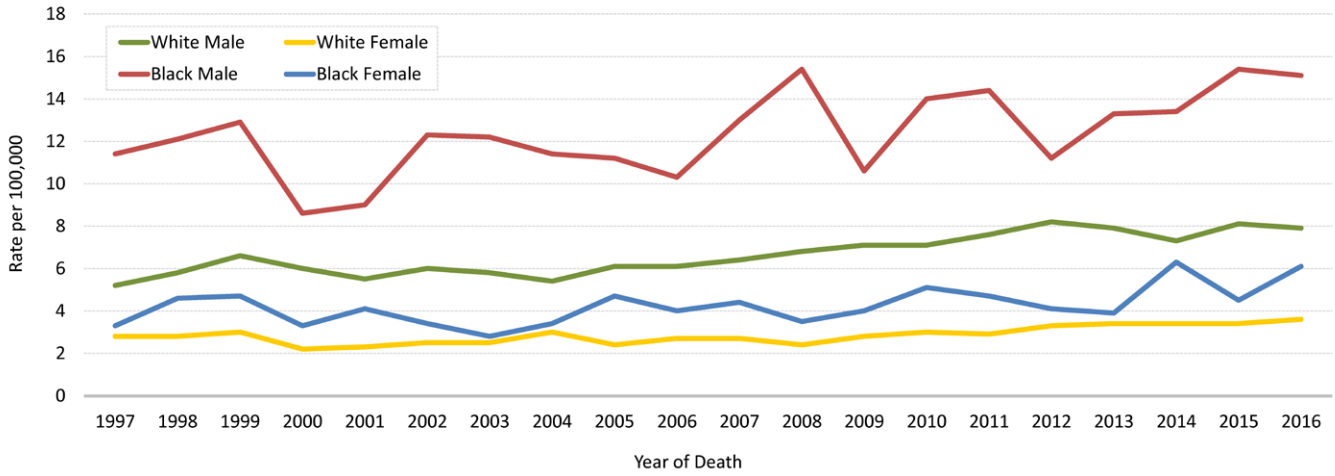
Early-stage liver cancer can sometimes be treated successfully with surgery to remove part of the liver (few patients have sufficient healthy liver tissue for this option) or liver transplantation.[1] Other treatment options include tumor ablation (destruction) or embolization (blocking blood flow).[1] Patients diagnosed at an advanced stage may be offered targeted therapies, immunotherapy or chemotherapy.[1]

FIGURE 28 **Trends in Age-adjusted Incidence Rates for Cancer of the Liver & Intrahepatic Bile Duct by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 29 **Trends in Age-adjusted Mortality Rates for Cancer of the Liver & Intrahepatic Bile Duct by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Survival

The five-year relative survival for liver and IBD cancer for all stages combined was 17% in Ohio and 18% in the United States, based on cases diagnosed in 2009-2015.[3,4] In Ohio, five-year relative survival was 33% when the disease was diagnosed at a local stage (36% of cases in Ohio).[3] The five-year relative survival was 12% for those diagnosed at regional stage and only 4% when diagnosed at the distant stage, which accounted for 26% and 17% of cases in Ohio, respectively.[3]

SIGNS AND SYMPTOMS OF LIVER AND IBD CANCER

Signs and symptoms of liver and IBD cancer are often not apparent in the early stages of the disease. For individuals at high risk, the National Comprehensive Cancer Center recommends alpha-fetoprotein blood tests and ultrasounds every six to 12 months. Some of the more common symptoms of liver and IBD cancer include:

- Unexplained weight loss
- Loss of appetite or feeling full after a small meal
- Nausea or vomiting
- Ongoing weakness or fatigue
- Fever not caused by other conditions
- Pain on the right side of the abdomen or near the right shoulder blade
- Enlarged liver, felt as a mass under the ribs on the right side
- Enlarged spleen, felt as a mass under the ribs on the left side
- Abdominal swelling or bloating
- Itching
- Jaundice (yellowing of the skin and eyes)
- Light-colored stools or dark urine

In addition, liver tumors can make hormones that may cause:

- High blood calcium levels
- Low blood sugar levels
- High red blood cell counts
- High cholesterol levels
- In males, gynecomastia (breast enlargement) and/or shrinkage of the testicles

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.

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Cirrhosis: Individuals with cirrhosis, a disease where liver cells are damaged and replaced with scar tissue, are at increased risk for liver cancer. Most people who develop liver cancer have cirrhosis. Cirrhosis is often caused by alcohol abuse, chronic HBV infection, chronic HCV infection or obesity. Primary biliary cirrhosis, an autoimmune disease, can also cause cirrhosis.

Obesity/overweight: Excess body weight accounts for approximately one-third of liver cancers in the United States. Liver cancer risk increases by 26% per 5 kg/m^2 increase in body mass index (BMI). People with non-alcoholic fatty liver disease, a condition common in obese people, can develop cirrhosis and are therefore more likely to develop liver cancer.

Chronic infection with HBV or HCV: Chronic HCV infection is a leading cause of liver cancer in the United States, accounting for about 25% of liver cancers. While HBV infection is the most common cause of liver cancer worldwide, it accounts for approximately 5% of liver cancers in the United States. Hepatitis is transmitted through sharing contaminated needles, unprotected sex or childbirth.

Smoking: Smoking increases the risk of liver cancer by about 50%.

Heavy alcohol use: Heavy alcohol use increases the risk of liver cancer.

Type 2 diabetes: Individuals with type 2 diabetes are at increased risk of liver cancer.

Anabolic steroids: There is a slight increased risk of liver cancer for long-term anabolic steroid users.

Exposure to chemicals: Exposure to vinyl chloride, a heavily regulated chemical used in making some plastics, increases risk of liver cancer. Thorium dioxide (Thorotrast) exposure, used in the past in certain x-ray tests, also increases risk.

Arsenic: Drinking water from wells contaminated with naturally occurring arsenic over a long period of time increases liver cancer risk.

Aflatoxins: While more common in tropical climates, long-term exposure to grains or nuts contaminated with aflatoxins (a cancer-causing substance produced by a fungus) increases risk of liver cancer. Food in the United States is tested for aflatoxins.

Infection with parasites: Infection with the parasite that causes schistosomiasis increases liver cancer risk. While this parasite is not found in the United States, infection can occur in Asia, Africa and South America.

NON-MODIFIABLE RISK FACTORS

Age: Most liver cancers occur in people who are 60 years of age or older.

Sex: Liver cancer is more than twice as common in men as women.

Race and ethnicity: In the United States, Asians/Pacific Islanders, American Indians/Alaskan Natives and Hispanics have the highest rates of liver cancer, followed by blacks. Whites have the lowest rates of liver cancer.

Inherited metabolic diseases: Diseases such as hemochromatosis (a disease in which too much iron is absorbed from food) increase liver cancer risk. Other rare diseases that increase the risk of liver cancer include: tyrosinemia, alpha1-antitrypsin deficiency, porphyria cutanea tarda, glycogen storage diseases and Wilson's disease.

Inflammatory bowel disease: People with ulcerative colitis and Crohn's disease are at increased risk for bile duct cancer.

Chronic inflammation of the bile ducts: Risk for bile duct cancer increases for individuals who have chronic inflammation of the bile ducts.

Lung and Bronchus Cancer

New Cases

An estimated 228,150 new cases of lung and bronchus cancer were expected to occur in the United States during 2019, accounting for about 13% of all cancer diagnoses.[1]

An average of 9,858 new cases of lung and bronchus cancer (5,218 men and 4,640 women) were diagnosed annually between 2012 and 2016 in Ohio with a corresponding rate of 68.5 per 100,000.[3] The lung and bronchus cancer incidence rate was about 25% higher in Ohio compared to the United States (54.9 per 100,000).[3,4] The average annual age-adjusted incidence rate among Ohio males was 81.1 per 100,000 compared to a rate of 59.1 per 100,000 among Ohio females (Table 2).[3] Average annual incidence rates of lung and bronchus cancer by Ohio county of residence are shown in Figure 30.

Currently, a man living in the United States has a 1 in 17 lifetime risk of developing invasive lung and bronchus cancer, and a woman has a 1 in 20 lifetime risk of developing invasive lung and bronchus cancer.[2]

Deaths

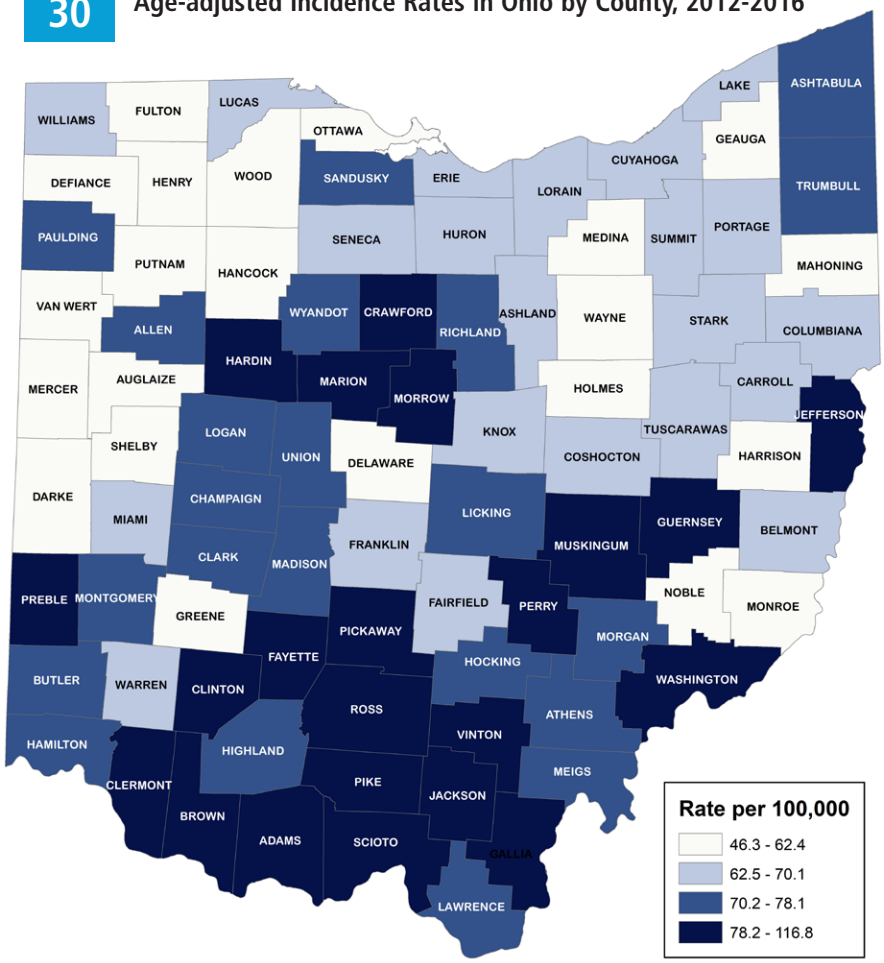
Lung and bronchus cancer is the leading cause of cancer-related death in both men and women. It causes more deaths every year than colon and rectum, breast and prostate cancers combined. An estimated 142,670 deaths were expected to occur in the United States in 2019, accounting for about one in four cancer deaths.[1]

An average of 7,234 deaths occurred annually from lung and bronchus cancer among Ohio residents from 2012-2016.[7] The average annual mortality rate was 50.3 per 100,000 (62.6 per 100,000 for males and 41.0 per 100,000 for females) (Table 3).[7]

Trends

Nationally, the lung and bronchus cancer incidence rate has been declining since the mid-1980s in men, but only since the mid-2000s in women.[1] Figure 31 displays the trend in lung and bronchus cancer incidence among males and females by race in Ohio from 1997-2016.[3] For each year, black males had the highest incidence rate.[3] Incidence rates decreased considerably from 1997 to 2016 for black males (34%) and white males (27%), while incidence rates among black females and white females remained relatively unchanged.[3]

FIGURE 30 **Cancer of the Lung & Bronchus: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]

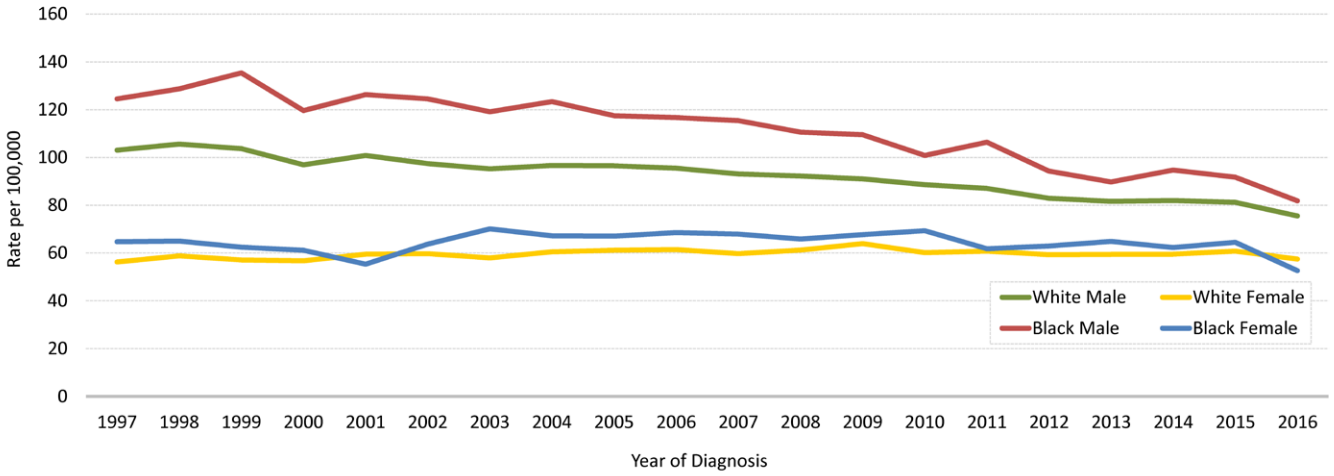


[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Most lung and bronchus cancers could be prevented if cigarette smoking and other tobacco use were eliminated.[1] People who smoke are about 25 times more likely to develop lung cancer than those who do not smoke.[1] In 2018, an estimated 21% of Ohio adults were current cigarette smokers compared to 16% of U.S. adults.[14,34] Until tobacco use ends, lung and bronchus cancer will likely remain the number one cause of cancer death in the United States and Ohio.[1]

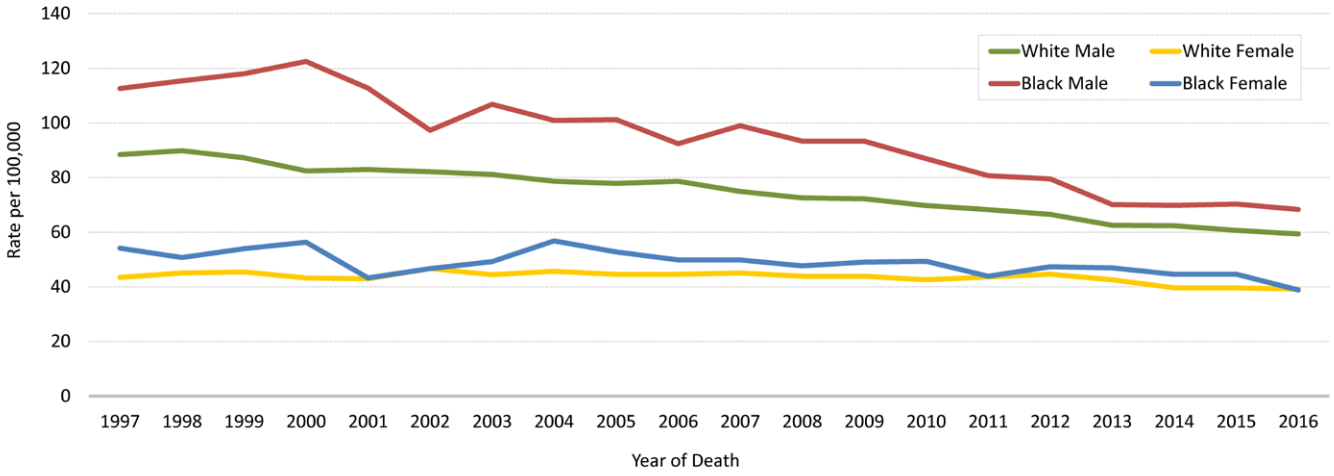
In the United States, lung and bronchus cancer death rates have declined by 48% since 1990 in men and by 23% since 2002 in women due to reductions in smoking, with the pace accelerating in recent years consistent with incidence trends.[1] Figure 32 displays the trend in lung and bronchus cancer mortality rates among Ohio males and females by race from 1997-2016.[7] For each year, black males had the highest mortality rate.[7] Mortality rates in Ohio declined considerably from 1997-2016 for black males (39%), white males (33%) and black females (28%), but were relatively stable for white females.[7]

FIGURE 31 **Trends in Age-adjusted Incidence Rates for Cancer of the Lung & Bronchus by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 32 **Trends in Age-adjusted Mortality Rates for Cancer of the Lung & Bronchus by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Early Detection

Screening with low-dose spiral CT has been shown to reduce lung cancer mortality by 20% compared to standard chest x-rays among current or former (quit within 15 years) heavy smokers.[1]

ACS recommends annual lung cancer screening with low-dose CT among patients who are 55-74 years of age in good health who:

- Currently smoke or have quit within the past 15 years; and
- Have at least a 30 pack-year smoking history; and
- Receive evidence-based smoking cessation counseling, if they are current smokers; and
- Have undergone a process of informed/shared decision making that included information about the potential benefits, limitations and harms of screening with low-dose CT; and
- Have access to a high-volume, high-quality lung cancer screening and treatment center.[15]

USPSTF recommends annual screening for lung cancer with low-dose CT in adults aged 55-80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years.[28] Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.[28]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Smoking: Tobacco smoking is the most important risk factor for lung cancer. Cigarette, cigar and pipe smoking all increase the risk of lung cancer. Tobacco smoking causes about nine out of 10 cases of lung cancer in men and about eight out of 10 cases of lung cancer in women. Risk increases with the amount and duration of use.

Secondhand smoke: Exposure to secondhand (environmental) tobacco smoke increases risk. Nonsmokers exposed to secondhand smoke have approximately 20% increased risk of lung and bronchus cancer.

Radon: Radon is a cancer-causing gas and is the second leading cause of lung cancer.

Radiation: Exposure to radiation is a risk factor for lung cancer. Sources include radiation therapy and imaging tests.

Occupational exposure: Workplace exposure to asbestos, arsenic, crystalline silica dust, beryllium, cadmium, nickel compounds, chromium (VI) compounds, tar and soot, mustard gas, chloromethyl ethers and diesel exhaust increase risk.

Air pollution: Exposure to outdoor air pollution, specifically small particles, increases risk.

NON-MODIFIABLE RISK FACTORS

Age: About two out of three people diagnosed with lung and bronchus cancer are older than 65.

Sex: Lung and bronchus cancer is more common among men compared to women.

Race: In the United States, lung and bronchus cancer is more common among whites and blacks than in Asians or Pacific Islanders.

Table A-6 on page 87 shows the ACS and USPSTF recommendations for the early detection of lung and bronchus cancer by age and sex.

Treatment

Appropriate treatment for lung and bronchus cancer is based on whether the tumor is small cell (13%) or non-small cell (84%), as well as the stage and molecular characteristics.[1] For early-stage non-small cell lung cancer, surgery is the usual treatment, sometimes with chemotherapy, alone or in combination with radiation therapy.[1] Advanced-stage non-small cell lung cancer is usually treated with chemotherapy, targeted drugs (or a combination of the two) or immunotherapy.[1] Small cell lung cancer is usually treated with chemotherapy, alone or combined with radiation; a large percentage of patients on this regimen briefly experience remission, although the cancer often returns.[1]

SIGNS AND SYMPTOMS OF LUNG AND BRONCHUS CANCER

Signs and symptoms usually do not occur until the cancer is advanced and may include:

- Persistent cough
- Chest discomfort or pain
- Trouble breathing, wheezing or hoarseness
- Bloody sputum (mucus coughed up from the lungs)
- Loss of appetite or weight loss
- Trouble swallowing
- Recurring pneumonia or bronchitis

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

Survival

Based on cases diagnosed during 2009-2015, the five-year relative survival for lung and bronchus cancer for all stages combined was 19% in both Ohio and the United States.[3,4] When lung and bronchus cancers were diagnosed at the local stage, the five-year relative survival was 56%; however, only 20% of lung and bronchus cancers were diagnosed at the local stage in Ohio.[3] After the cancer has spread regionally to involve adjacent organs or lymph nodes (23% of lung and bronchus cancers in Ohio), the five-year relative survival was 29% and only 5% for persons with distant metastases (48% of Ohio lung and bronchus cancer cases) (Figure 1).[3]

Lymphoma

Lymphoma is cancer that results from the abnormal growth and accumulation of cells in the lymphoid tissue of the lymphatic system, which is responsible for filtering germs, cancer cells and fluids from the extremities and internal organs. Lymphoid tissue is found in many places throughout the body, including the lymph nodes, thymus, spleen, tonsils and adenoids, and bone marrow. Hodgkin lymphoma (HL), also known as Hodgkin disease, is a specialized type of lymphoma in which the cancer cells are mostly Reed-Sternberg cells. All other lymphomas are called non-Hodgkin lymphoma (NHL).

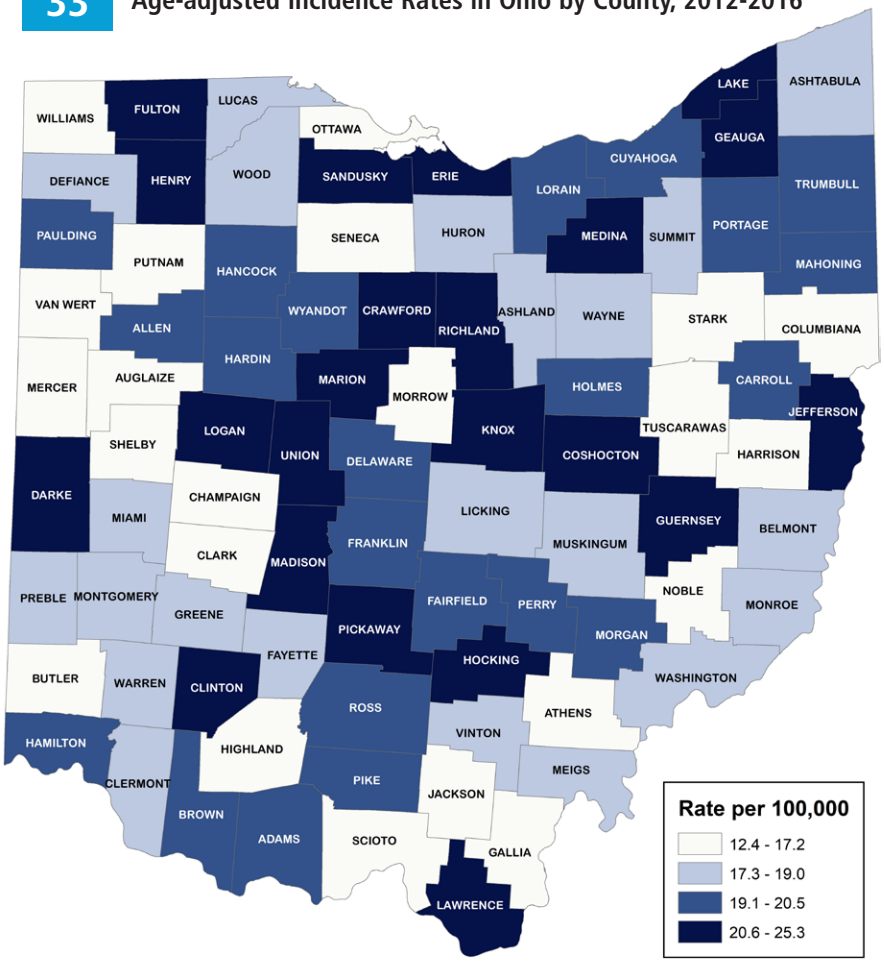
Currently, a man living in the United States has a 1 in 48 lifetime risk of developing NHL and a woman has a 1 in 62 lifetime risk of NHL. The lifetime risk of developing HL is much lower – approximately 1 in 435 for males and 1 in 526 for females.[2]

New Cases

ACS estimated that 82,310 new cases of lymphoma would be diagnosed in the United States in 2019, including 8,110 cases of HL and 74,200 cases of NHL.[1] In Ohio in 2012-2016, an average of 324 cases of HL and 2,643 cases of NHL were diagnosed per year.[3] The incidence rate of HL in Ohio (2.8 per 100,000) was similar to the United States (2.7 per 100,000); whereas, the incidence rate of NHL was slightly lower in Ohio compared to the United States (19.1 and 19.6 per 100,000, respectively) (Table 2).[3,4]

Incidence rates of both HL and NHL were higher among males compared to females in Ohio in 2012-2016.[3] Incidence rates for black males and white males were similar for HL (3.3 and 3.2 per 100,000, respectively), as were those for black females and white females (2.4 and 2.3 per 100,000, respectively).[3] Incidence rates for NHL were higher among white males (23.7 compared to black males (16.6 per 100,000) and among white females (16.1 per 100,000) compared to black females (11.0 per 100,000) (Table 4).[3] Average annual incidence rates of NHL by Ohio county of residence are shown in Figure 33.

FIGURE 33 **Non-Hodgkin Lymphoma: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

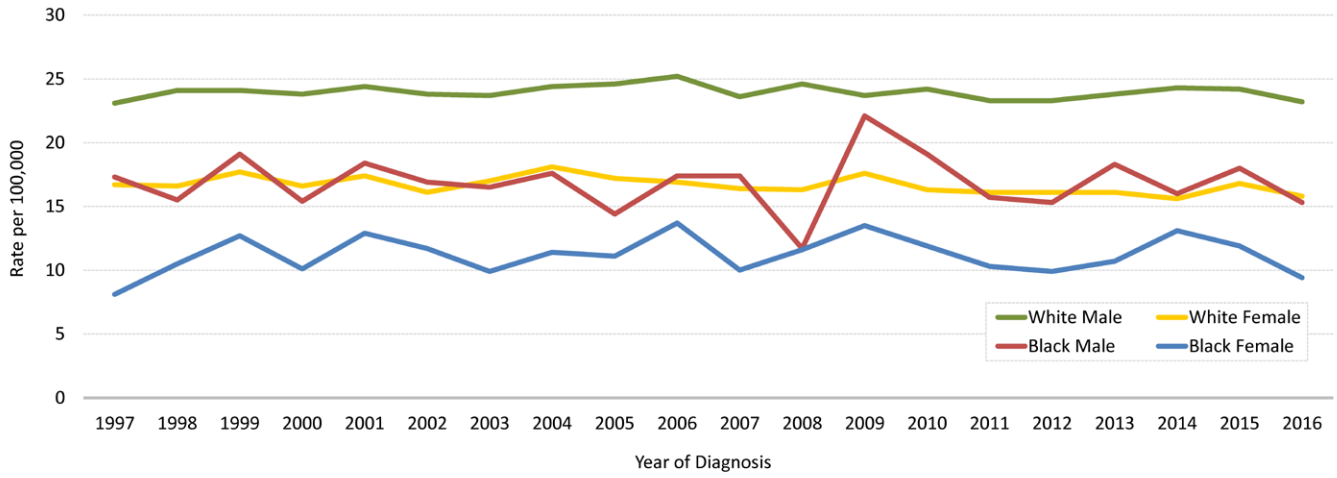
Deaths

In 2019, there was an estimated 1,000 deaths from HL and 19,970 deaths from NHL.[1] In Ohio, an average of 43 deaths from HL and 868 deaths from NHL occurred each year from 2012-2016.[7] Mortality rates of HL and NHL were highest among white males compared to the other sex/race categories (Table 5).[7]

Trends

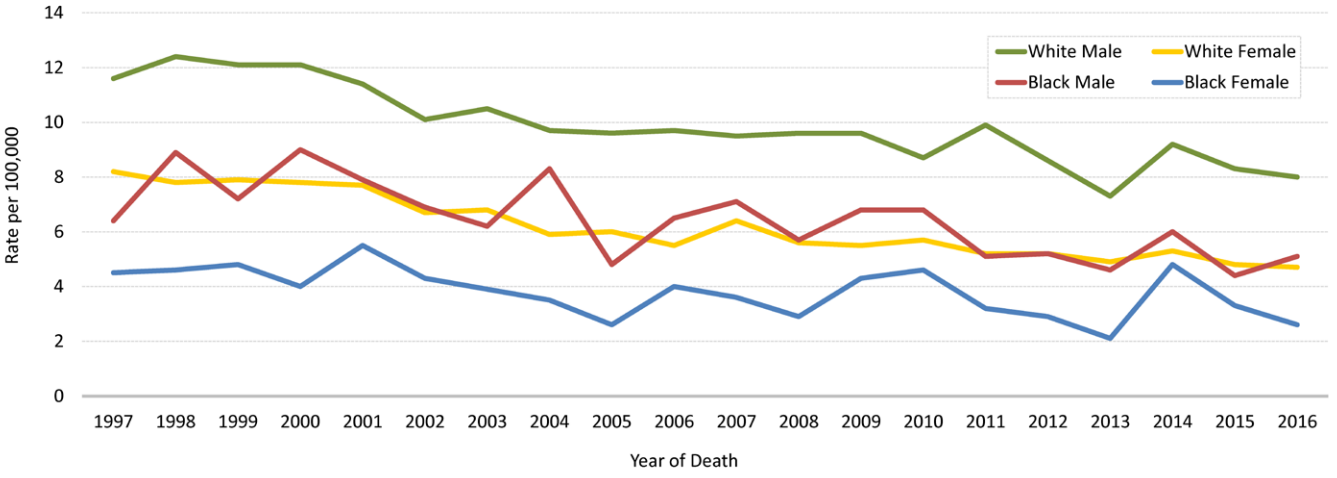
Nationally, incidence trends for HL vary by sex. Rates in men have been decreasing gradually (by 0.4% per year) since at least 1975, while rates in women increased slowly until the mid-2000s, then declined by 1.7% per year from 2006 to 2015.[1] In contrast, NHL incidence trends are similar in men and women, with a slow decline in recent years (by 0.6% per year from 2011 to 2015) following decades of increase.[1] In Ohio, the NHL incidence rate was relatively stable from 1997 to 2016 (18.9 per 100,000 to 18.6 per 100,000) for all sex and race groups combined.[3] For each year, white males had the highest incidence rate. (Figure 34).[3]

FIGURE 34 **Trends in Age-Adjusted Incidence Rates for Non-Hodgkin Lymphoma by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 35 **Trends in Age-Adjusted Mortality Rates for Non-Hodgkin Lymphoma by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Nationally, due mainly to improvements in treatment, the mortality rate has been declining in both men and women since at least 1975 for HL and since 1997 for NHL.[1] For NHL, reductions in incidence and improvements in survival for human immunodeficiency virus (HIV)-associated subtypes have also contributed to the mortality decline.[1] From 2007 to 2016, the death rate decreased by 4% per year for HL and about 2% per year for NHL.[1] NHL mortality rates decreased 37% in Ohio from 1997 (9.3 per 100,000) to 2016 (5.9 per 100,000) for all sex/race groups combined.[7] For each year, white males had the highest mortality rate.[7] The greatest percent reductions in mortality rates were observed for white females (43%) and black females (42%) (Figure 35).[7]

Early Detection

At present, there are no screening tests available for lymphoma to detect the disease early. The best strategy for early diagnosis is prompt attention to signs and symptoms.

Treatment

NHL patients are usually treated with chemotherapy; radiation, alone or in combination with chemotherapy, is also sometimes used.[1] Targeted or immunotherapy drugs directed at lymphoma cells are used for some NHL subtypes.[1] If NHL persists or recurs after standard treatment, stem cell transplantation may be an option.[1] Newer therapies that boost the body's immune system (*e.g.*, CAR T-cell therapy) have shown promising results for some hard-to-treat lymphomas.[1]

Survival

Based on cases diagnosed during 2009-2015, the five-year relative survival for HL was 87% in both Ohio and the United States, and the five-year relative survival for NHL in Ohio (73%) was similar to the United States (72%).[3,4] For both types of lymphoma, five-year relative survival in Ohio was higher for females compared to males and for whites compared to blacks.[3]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Certain viruses: Having an infection with the Epstein-Barr virus (EBV), HIV, *H. pylori*, human herpesvirus-8 (HHV8) or human T-cell leukemia/lymphoma type I (HTLV-1) increases risk of developing NHL.

Certain chemicals: Chemicals such as benzene and certain herbicides and insecticides (weed- and insect-killing substances) are linked with an increased risk of NHL.

Radiation: Studies of survivors of atomic bombs and nuclear reactor accidents have shown they have an increased risk of developing NHL. Patients treated with radiation therapy for some other cancers, such as Hodgkin disease, have a slightly higher risk of developing NHL later in life.

Breast implants: Although it is rare, some women develop anaplastic large cell lymphoma in the scar tissue around their breast implants.

NON-MODIFIABLE RISK FACTORS

Age: Risk of NHL increases with advancing age; whereas, risk of HL is highest among persons 15-30 and 55 and older.

Sex: Overall, the risk of NHL is higher in men compared to women, but there are certain types of NHL that are more common in women.

Race: Whites are more likely to develop NHL than blacks or Asians/Pacific Islanders.

Family history: Brothers and sisters of young people with this disease have a higher risk for HL. The risk is very high for an identical twin of a person with HL.

Weakened immune system: The risk of developing NHL is increased by having a weakened immune system (such as from an inherited condition or certain drugs used after an organ transplant).

SIGNS AND SYMPTOMS OF LYMPHOMA

In general, symptoms of HL and NHL are non-specific and may include the following:

- Painless swelling of the lymph nodes in the neck, underarm or groin
- Unexplained fever
- Night sweats
- Itchy skin
- Unexplained weight loss
- Coughing, trouble breathing and chest pain
- Weakness or tiredness that will not go away

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

Melanoma/Skin Cancer

New Cases

Basal cell and squamous cell (nonmelanoma) skin cancers are the most common types of skin cancer. An estimated 5.4 million cases of basal and squamous cell skin cancer were diagnosed in the United States in 2012.[1] However, the actual number of cases of these types is difficult to estimate because the cases are not required to be reported to cancer registries.[1] Most, but not all, of these forms of skin cancer are highly curable.

Melanoma of the skin (hereafter, referred to as melanoma) is the most common serious form of skin cancer and was expected to be diagnosed in about 96,480 persons in the United States in 2019.[1] Melanoma is rare among blacks; the lifetime risk of developing melanoma is 25 times higher among whites than blacks.[1]

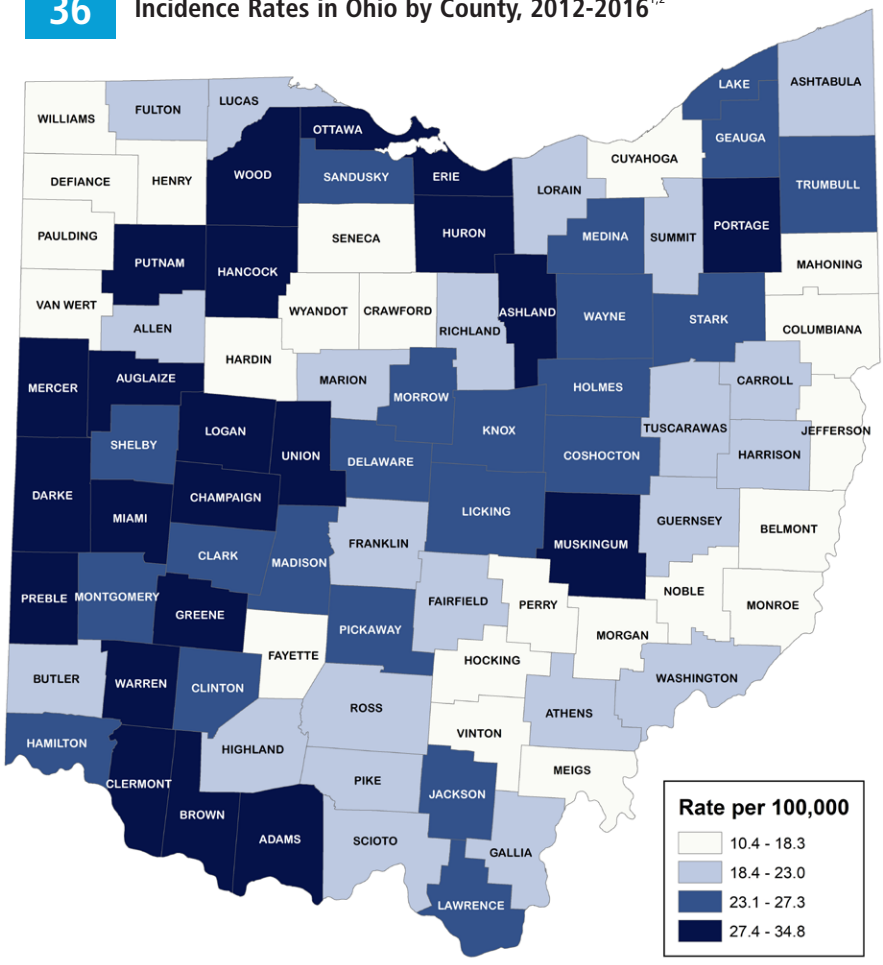
Currently, a man living in the United States has a 1 in 43 lifetime risk of developing invasive melanoma of the skin, and a woman has a 1 in 65 lifetime risk of invasive melanoma of the skin.[2]

In Ohio between 2012 and 2016, approximately 79% of individuals who developed melanoma were 50 and older.[3] An average of 3,068 new cases of melanoma were diagnosed annually between 2012 and 2016 in Ohio with a corresponding rate of 22.9 per 100,000 compared to the U.S. rate of 22.2 per 100,000.[3,4] The rate among Ohio males (27.9 per 100,000) was 42% higher than the rate among females (19.6 per 100,000) during this time period (Table 2).[3] Average annual age-adjusted incidence rates of melanoma by Ohio county of residence are presented in Figure 36.

Deaths

An estimated 7,230 deaths from melanoma were expected to occur in 2019 nationally.[1] An average of 387 deaths from melanoma occurred each year in Ohio from 2012-2016.[7] The average annual melanoma mortality rate in Ohio was 2.8 per 100,000 and was 2.3 times higher among males (4.1 per 100,000) compared to females (1.8 per 100,000) during this time period (Table 3).[7]

FIGURE 36 **Melanoma of the Skin: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Trends

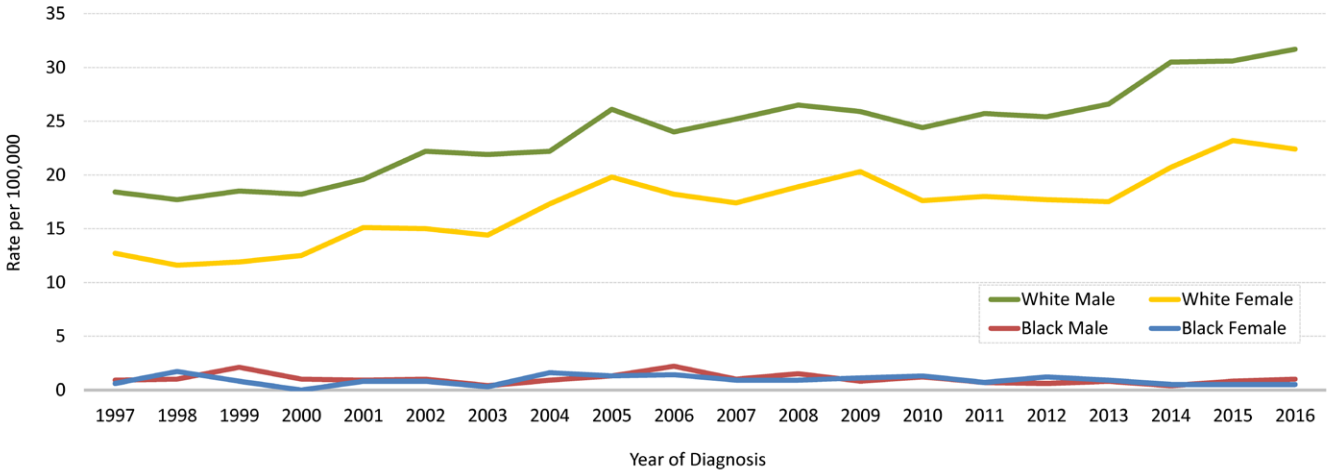
Melanoma incidence rates have increased rapidly over the past 30 years in the United States; however, in the past nine years, rates have increased by 3% per year among those 50 and older, but have been stable among those younger than 50.[1]

Melanoma incidence rates increased 89% in Ohio from 1997 (13.9 per 100,000) to 2016 (26.2 per 100,000).[3] Among whites, melanoma incidence rates increased 75%, but the increase was slightly higher among white females (76%) compared to white males (72%).[3] Incidence rates among black males and females in Ohio were stable during the time period (Figure 37).[3]

From 2007-2016 in the United States, the mortality rate for melanoma declined by 2% per year in adults 50 years and older and by 4% per year in those younger than 50.[1]

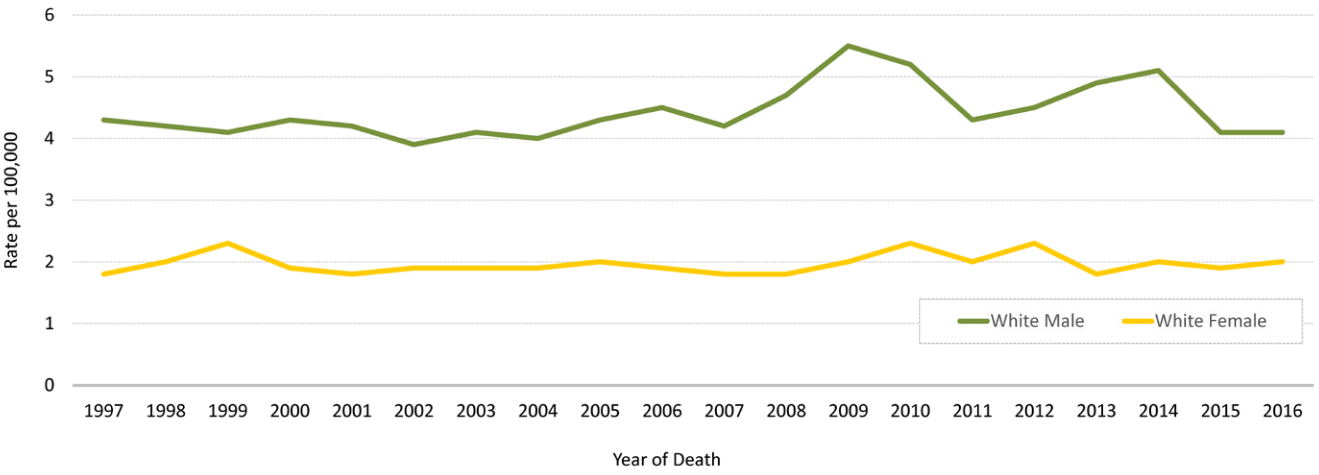
From 1997 to 2016, melanoma mortality rates in Ohio were variable among white males, while melanoma mortality rates were relatively stable among white females (Figure 38).[7] The melanoma mortality rates for black males and females are not presented because the number of deaths per year was typically less than five.

FIGURE 37 **Trends in Age-adjusted Incidence Rates for Melanoma of the Skin by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 38 **Trends in Age-adjusted Mortality Rates for Melanoma of the Skin by Sex among Whites in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
* Black melanoma deaths were typically less than five per year; therefore, no trends are presented for black males and females.

RISK FACTORS AND POPULATIONS WITH HIGH RATES

RISK FACTORS FOR BOTH MELANOMA AND NONMELANOMA SKIN CANCERS

POTENTIALLY MODIFIABLE RISK FACTORS

Ultraviolet (UV) radiation: High lifetime exposure to UV radiation is a major risk factor for most skin cancers. UV exposure primarily comes from the following sources:

- **Sunlight:** Sunlight is the main source of UV radiation.
- **Sunlamps and tanning booths/beds:** These artificial sources of UV radiation can cause skin damage and skin cancer.

NON-MODIFIABLE RISK FACTORS

Race: Melanoma and nonmelanoma are much more common among whites than other races.

Certain physical characteristics: Having fair (pale) skin that burns in the sun easily, blue or green eyes, red or blond hair, or many freckles increases the risk of skin cancer.

ADDITIONAL MELANOMA RISK FACTORS

POTENTIALLY MODIFIABLE RISK FACTORS

Blistering sunburns: People who have a history of many blistering sunburns, especially as a child or teenager, are at increased risk of melanoma.

NON-MODIFIABLE RISK FACTORS

Age: Melanoma is more likely to occur in older people, but it is also found in younger people. In fact, melanoma is one of the most common cancers in people younger than 30 (especially younger women). Melanoma that runs in families may occur at a younger age.

Sex: Nationally, men have a higher rate of melanoma than women, although this varies by age. Before age 50, the risk is higher for women; after age 50 the risk is higher in men.

Dysplastic nevi: A dysplastic nevus is a type of mole that looks similar to a common mole, but is often bigger and has an abnormal shape or color. Dysplastic nevi often run in families and may develop into melanomas.

Many moles: Usually, a common mole is smaller than a pea, has an even color (pink, tan or brown), and is round or oval with a smooth surface. Having many common moles increases melanoma risk.

Family history: People with a family history of melanoma (particularly in one or more first-degree relatives) have an increased risk of developing melanoma.

Personal history: People who have had melanoma have an increased risk of developing other melanomas.

ADDITIONAL NONMELANOMA SKIN CANCER RISK FACTORS

POTENTIALLY MODIFIABLE RISK FACTORS

Radiation treatment: People who have had radiation treatment have a higher risk of developing nonmelanoma skin cancer in the area where treatment was received. This is particularly a concern in children who have had radiation treatment for cancer.

Actinic keratosis: Actinic keratosis is a type of flat, scaly growth on the skin. It is most often found on areas exposed to the sun, especially the face and the backs of the hands. The growth may appear as a rough red or brown patch on the skin. Without treatment, this scaly growth may turn into nonmelanoma skin cancer.

Weakened immune system: People with weakened immune systems, such as from previous organ transplants, corticosteroid drugs or HPV infection, have increased risk of nonmelanoma skin cancer.

Arsenic: Arsenic exposure such as from well water, pesticides and herbicides can increase risk of nonmelanoma skin cancer.

NON-MODIFIABLE RISK FACTORS

Age: The risk of getting basal and squamous cell skin cancers rises as people get older, likely due to the buildup of sun exposure over time. However, these cancers are becoming more common in younger people as well, probably because they are spending more time in the sun with their skin exposed.

Sex: Men are more likely than women to get basal and squamous cell cancers of the skin. This is thought to be due mainly to getting more sun exposure.

SIGNS AND SYMPTOMS OF MELANOMA/SKIN CANCER

A simple ABCDE rule outlines the warning signs of the most common type of melanoma:

A is for asymmetry. One half of the mole does not match the other half.

B is for border irregularity. The edges are irregular, ragged, notched or blurred.

C is for color. The pigmentation is not uniform, with variable degrees of tan, brown or black, or sometimes with patches of red, pink, white or blue.

D is for diameter greater than 6 millimeters (about ¼ inch). 6mm
Although, some melanomas may be smaller than this.

E is for evolving. The mole has changed in size, shape or color.

ADDITIONAL KEY WARNING SIGNS OF MELANOMA/SKIN CANCER ARE AS FOLLOWS:

Melanoma:

- Sore that does not heal
- Spread of pigment from the border into surrounding skin
- Redness or a new swelling beyond the border
- Change in sensation (itchiness, tenderness, pain)
- Change in surface of mole (scaliness, oozing, bleeding, appearance of bump or nodule)

Basal Cell Carcinoma:

- Flat, firm, pale or yellow areas, similar to a scar
- Raised reddish patches that might be itchy
- Small, pink or red, translucent, shiny, pearly bumps which might have blue, brown or black areas
- Pink growths with raised edges and a lower area in their center
- Open sores (which may have oozing or crusted areas) that do not heal, or that heal and then come back

Squamous Cell Carcinoma:

- Rough or scaly red patches, which might crust or bleed
- Raised growths or lumps, sometimes with a lower area in the center
- Open sores (which may have oozing or crusted areas) that do not heal, or that heal and then come back
- Wart-like growths

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.

ACS RECOMMENDS THE FOLLOWING FOR THE PREVENTION OF SKIN CANCER:[1]

- Minimize skin exposure to intense UV radiation by seeking shade
- When outdoors, wear protective clothing (*e.g.*, long sleeves, long pants or skirts, tightly woven fabrics and a wide-brimmed hat)
- Wear sunglasses that block UV rays
- Apply a broad-spectrum sunscreen with a sun protection factor (SPF) of 30 or higher
- Avoid indoor tanning booths and sun lamps, which are additional sources of UV radiation

Early Detection

Recognition of changes in skin growths or the appearance of new growths is the best way to find early skin cancer. All major areas of the skin should be examined regularly. Any new or suspicious lesions or a sudden or progressive change in a lesion's appearance should be evaluated promptly by a physician.[1]

Treatment

Most early-stage basal and squamous cell skin cancers can be treated in most cases by surgical excision, electrodessication and curettage (tissue destruction by electric current and removal by scraping with a curette) or cryosurgery (tissue destruction by freezing).[1] Radiation therapy and certain topical medications may be used in some cases.[1] For melanoma, the primary growth and surrounding normal tissue must be adequately removed, and in some cases, it may be necessary to remove one or more nearby lymph nodes.[1] Melanomas with deep invasion or that have spread to lymph nodes may be treated with surgery, immunotherapy, chemotherapy and/or radiation therapy.[1] In recent years, the Food and Drug Administration has approved several new immunotherapy drugs for the treatment of advanced melanoma.[1]

Survival

Most basal cell and squamous cell skin cancers are highly curable if detected and treated early.[1] Melanoma is more likely than nonmelanoma to spread to other parts of the body, but is highly curable when detected and treated at its earliest stages.[1] In Ohio and the United States, the five-year relative survival for patients with melanoma was 92% based on cases diagnosed from 2009-2015.[3,4] For localized melanoma, the Ohio five-year relative survival was 99%; whereas, survival at the regional stage was 69% and survival at the distant stage was only 25% (Figure 1).[3] In Ohio, 83% of melanomas in 2012-2016 were diagnosed at the *in situ* or local stages.[3]

Oral Cavity and Pharynx Cancer

Oral cavity and pharynx cancers are usually grouped together and examined as one site/type of cancer by the NCI. The oral cavity includes the following anatomic sites: lip, tongue, salivary gland, floor of mouth, gum and other areas of the mouth. The pharynx includes the oropharynx, hypopharynx, nasopharynx and tonsil.

New Cases

An estimated 53,000 new cases of cancer of the oral cavity and pharynx were expected to be diagnosed in 2019 in the United States.[1] The estimated number of cases is more than twice as high in men (38,140) as in women (14,860).[1]

In Ohio, 42% of those diagnosed with oral cavity and pharynx cancer from 2012 to 2016 were younger than 60 years.[3] An average of 1,696 new cases of oral cavity and pharynx cancer were diagnosed annually in Ohio during this time period with a corresponding rate of 11.8 per 100,000 compared to the U.S. rate of 11.3 per 100,000 (Table 2).[3,4] White and black men had higher incidence rates of this cancer site/type compared to white and black women in Ohio in 2012-2016 (Table 4).[3] Average annual age-adjusted incidence rates of oral cavity and pharynx cancer by Ohio county are shown in Figure 39.

Currently, a man living in the United States has a 1 in 67 lifetime risk of developing invasive oral cavity and pharynx cancer, and a woman has a 1 in 167 lifetime risk of invasive oral cavity and pharynx cancer.[2]

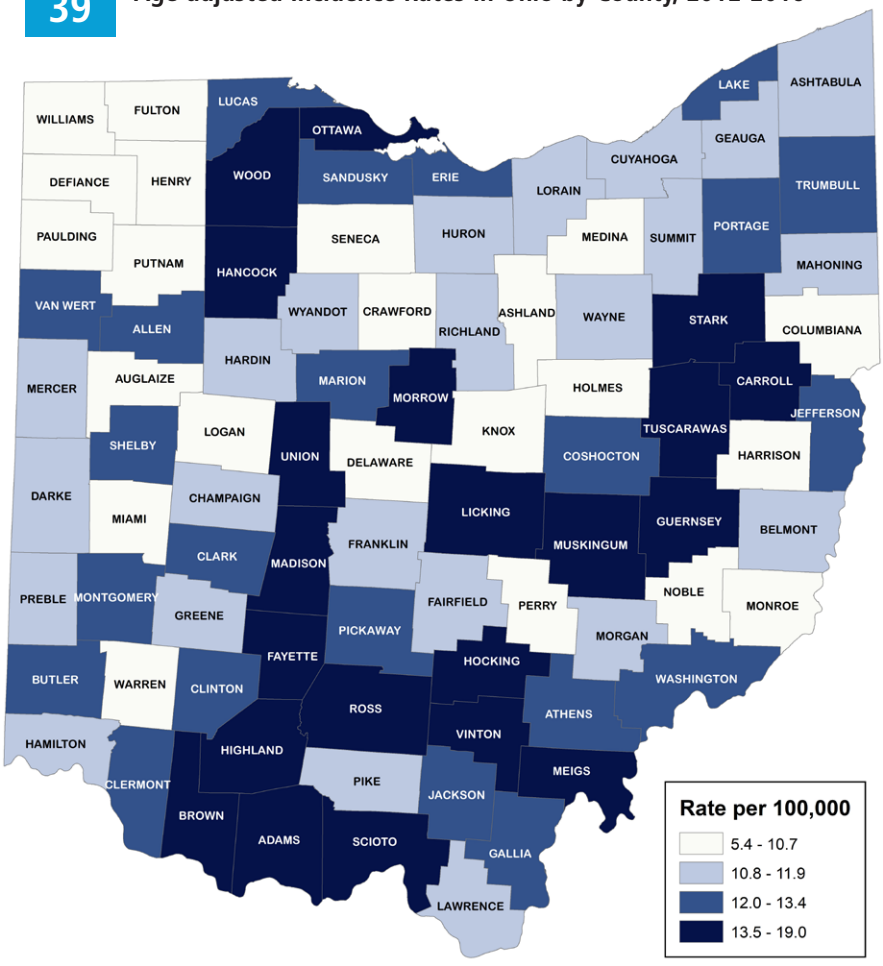
Deaths

An estimated 10,860 deaths from oral cavity and pharynx cancer were expected to occur in 2019 in the United States.[1] The average annual mortality rate for oral cavity and pharynx cancer in Ohio from 2012-2016 was 2.7 per 100,000 compared to the national rate of 2.5 per 100,000.[7] This represents 389 average annual deaths in Ohio from oral cavity and pharynx cancer during the time period (Table 3).[7] Similar to incidence, white and black men had higher mortality rates compared to white and black women in Ohio in 2012-2016 (Table 5).[7]

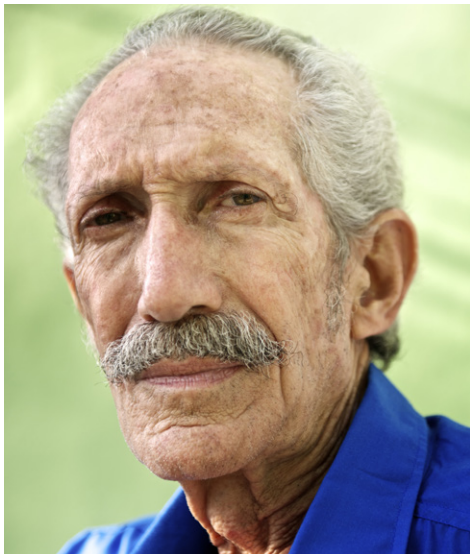
Trends

From 2006 to 2015 in the United States, incidence rates among whites increased by 1% per year, while rates among blacks declined by 2% per year.[1] The increase among whites is mainly due to the increase in cancers of the oropharynx that are associated with HPV infection.[1]

FIGURE 39 **Cancer of the Oral Cavity & Pharynx: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

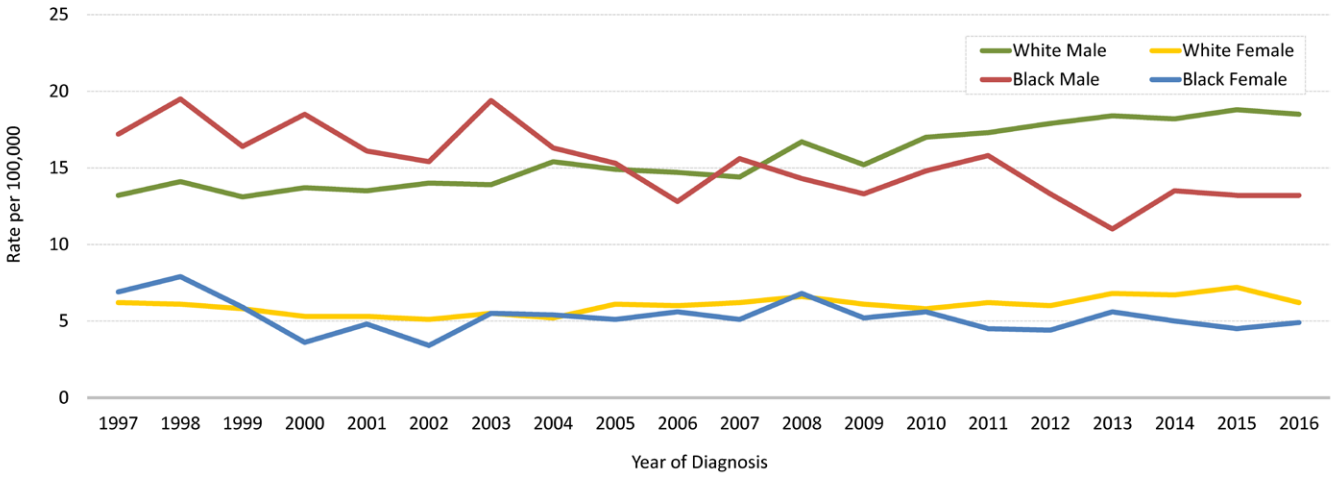


The oral cavity and pharynx cancer incidence rate in Ohio increased 22% for all races and sexes combined from 1997 to 2016.[3] Oral cavity and pharynx cancer incidence rates increased for white males (40%), stayed stable for white females, but decreased for black males (23%) and black females (29%) during this time period.[3] From 1997 to 2005, the incidence rate was higher in black males compared to white males, but in recent years, incidence rates were much higher in white males compared to black males.[3] Incidence rates have remained fairly similar among white and black females (Figure 40).[3]

After years of decreasing mortality rates, oral cancer mortality rates in the United States have increased by almost 1% per year from 2012 to 2016.[1]

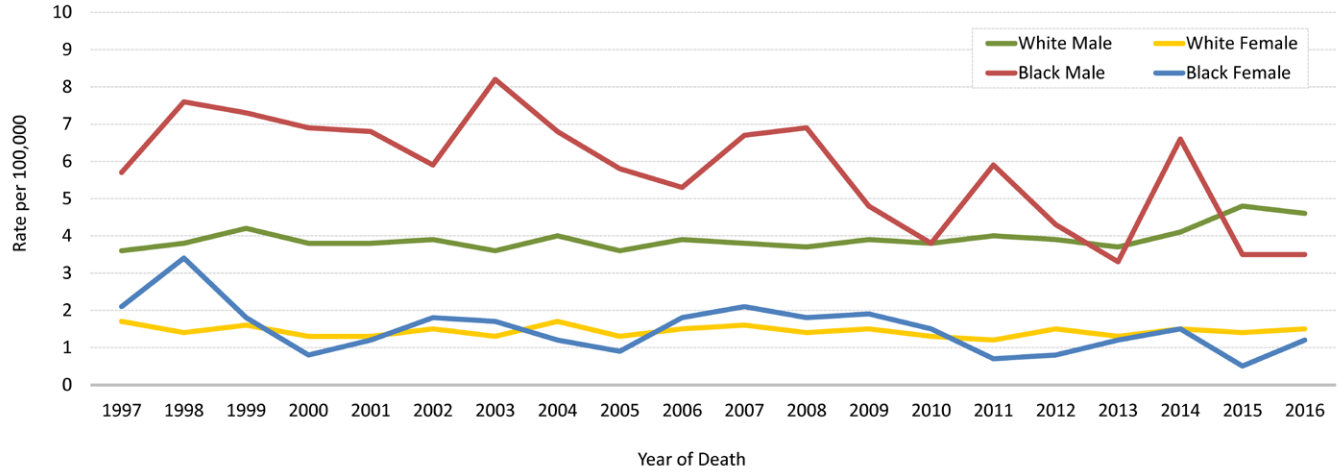
Figure 41 displays oral cavity and pharynx cancer mortality trends in Ohio. From 1997 to 2016, the oral cavity and pharynx cancer mortality rate in Ohio increased by 12% for all sex/race groups combined.[7] This overall increase in mortality is driven by a sharp increase in oral cancer death rates among white males (28%). Mortality rates for black males and black and white females have all decreased from 1997 to 2016.[7]

FIGURE 40 **Trends in Age-adjusted Incidence Rates for Cancer of the Oral Cavity & Pharynx by Sex and Race in Ohio, 1997-2016[1,2]**



1 Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
2 Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 41 **Trends in Age-adjusted Mortality Rates for Cancer of the Oral Cavity & Pharynx by Sex and Race in Ohio, 1997-2016[1,2]**



1 Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
2 Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Treatment

Radiation therapy and/or surgery are standard treatments; chemotherapy is often added for high-risk or advanced disease.[1] Chemotherapy or targeted therapy may be combined with radiation as initial treatment in some cases.[1] Immunotherapy is a newer option for advanced or recurrent cancer.[1]

Survival

Overall, the five-year relative survival for oral cavity and pharynx cancer was 66% in Ohio and 65% in the United States, based on cases diagnosed during 2009-2015.[3,4] Oral cavity and pharynx cancer is usually successfully treated if detected at an early stage, with a five-year relative survival of 84% for Ohio patients with local stage tumors (Figure 1).[3] In 2012-2016, approximately 28% of oral cavity and pharynx cancers in Ohio were diagnosed at a local stage, 49% at a regional stage and 16% were diagnosed at a distant stage.[3] Five-year relative survival for patients with oral cavity and pharynx cancer was 84% at the local stage in both Ohio and the United States, and was similar for both Ohio and the United States at the regional stage (67% and 65%, respectively) and distant stage (42% and 39%, respectively).[3,4] Survival is higher for HPV-related oral cancers than oral cancers not associated with HPV.[1]

Early Detection

Cancer can affect any part of the oral cavity, including the lip, tongue, mouth and throat. Through visual inspection, dentists and physicians can often detect premalignant abnormalities and cancer at an early stage, when treatment is both less extensive and more successful.[1]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Tobacco: Smoking cigarettes, cigars or pipes causes oral cavity and pharynx cancer, and using smokeless tobacco (such as snuff and chewing tobacco) causes oral cavity cancer. For cigarette smokers, risk increases with the number of cigarettes smoked per day. The risk is greater for people who use both tobacco and alcohol than for those who use either tobacco or alcohol.

Heavy alcohol use: People who are heavy drinkers are more likely to develop oral cavity cancer than people who do not drink alcohol. The risk increases with the amount of alcohol that a person drinks.

HPV infection: Some members of the HPV family of viruses can infect the mouth and throat. Cancer at the base of the tongue, at the back of the throat, in the tonsils or in the soft palate is linked with HPV infection. HPV DNA is found in approximately two-thirds of oropharyngeal cancers and may be associated with an increase in oral sex.[29]

Sun: Cancer of the lip can be caused by exposure to the sun. The risk of cancer of the lip increases if the person also smokes.

Betel nut use: Most common in Asia, chewing betel nut (a type of palm seed wrapped with a betel leaf and sometimes mixed with spices, sweeteners and tobacco) causes oral cancer. The risk increases even more if the person also drinks alcohol and uses tobacco.

Weakened immune system: Oral cavity and pharynx cancers are more common in people who have a weak immune system.

Graft-versus-host disease: Graft-versus-host disease (GVHD) is a condition that sometimes occurs after a stem cell transplant. GVHD can affect many tissues of the body, including those in the mouth, which increases the risk of oral cancer.

NON-MODIFIABLE RISK FACTORS

Age: Most patients with oral cavity and pharynx cancers are older than 55.

Sex: Oral cavity and pharynx cancers are about twice as common in men as in women.

Race: Oral cavity and pharynx cancer incidence rates among whites are approximately 50% higher than blacks and more than double those of Asians/Pacific Islanders.

Personal history: People who have had oral cavity and pharynx cancers are at increased risk of developing another oral cavity and pharynx cancer.

Genetics: People with certain genetic conditions (*e.g.*, Fanconi anemia, dyskeratosis congenita) have a very high risk of oral cavity and pharynx cancer.

SIGNS AND SYMPTOMS OF ORAL CAVITY AND PHARYNX CANCER

- Patches inside the mouth or on the lips:
  - White patches are the most common.
  - Mixed red and white patches are more likely than white patches to become malignant.
  - Red patches are brightly colored, smooth areas that often become malignant.
- A sore on the lip or in the mouth that does not heal
- Bleeding in the mouth
- Loose teeth
- Difficulty or pain when swallowing
- Difficulty wearing dentures
- A lump in the neck
- An earache that does not go away
- Numbness of lower lip and chin

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 or dentist.

Pancreatic Cancer

New Cases

Nationally, an estimated 56,770 pancreatic cancer cases were expected to occur in 2019.[1] Most (93%) will be cancers of the exocrine pancreas, which produces enzymes to digest food.[1] Much rarer are neuroendocrine tumors (NETs) (7%), which are usually diagnosed at a younger age but have a better prognosis.[1]

An average of 1,849 (918 men and 931 women) new cases of pancreatic cancer were diagnosed annually between 2012 and 2016 in Ohio corresponding to an average annual rate of 12.8 per 100,000, which was similar to the U.S. incidence rate of 12.9 per 100,000 during this time period (Table 2).[3,4] Black males and females had higher incidence rates of pancreatic cancer than white males and females in Ohio in 2012-2016 (Table 4).[1] The risk of developing pancreatic cancer increases with age. In Ohio, between 2012 and 2016, approximately 95% of individuals who developed pancreatic cancer were 50 and older.[3] Average annual incidence rates of pancreatic cancer by Ohio county of residence are shown in Figure 42.

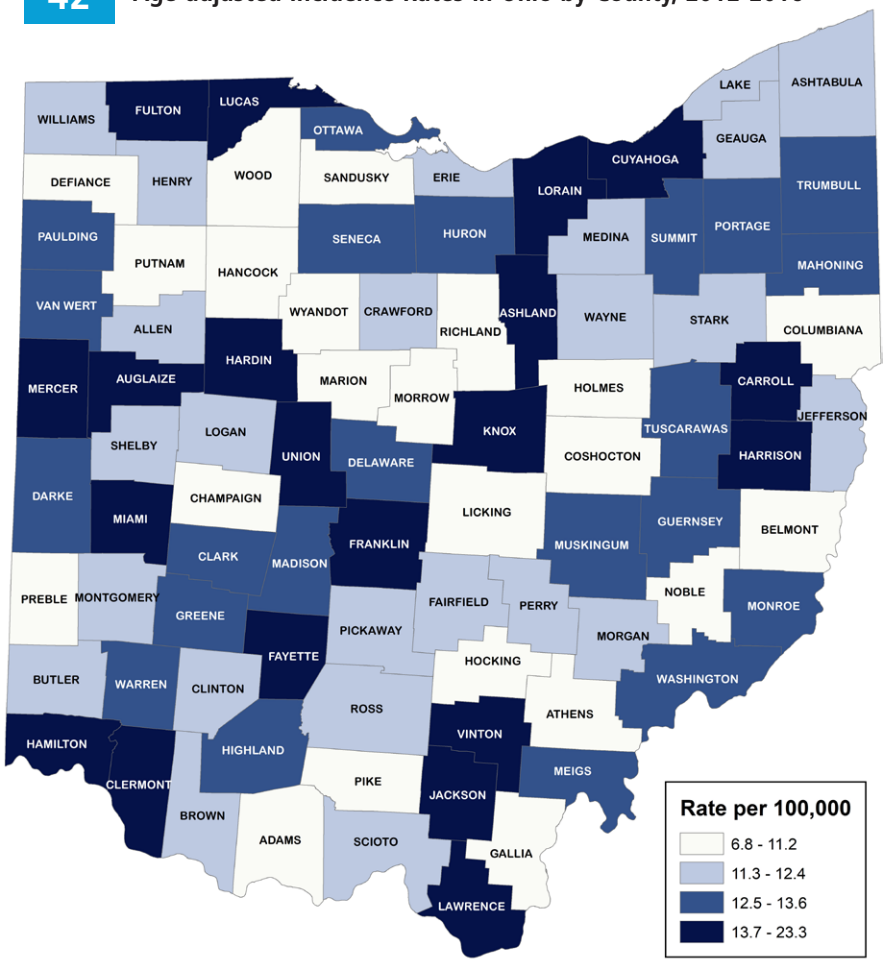
Currently, a man living in the United States has a 1 in 72 lifetime risk of developing invasive pancreatic cancer and a woman has a 1 in 81 lifetime risk of developing invasive pancreatic cancer.[2]

Deaths

An estimated 45,750 pancreatic cancer deaths were expected to occur in 2019 nationally, with similar numbers in men (23,800) and women (21,950).[1]

The average annual mortality rate for pancreatic cancer in Ohio from 2012 to 2016 was 11.6 per 100,000 compared to 11.0 per 100,000 nationally.[4,7] This represents 1,675 average annual deaths in Ohio from pancreatic cancer during the time period (Table 3).[7] Table 5 shows that black men and women in Ohio die from pancreatic cancer at a higher rate compared to white men and women.[7]

FIGURE 42 **Cancer of the Pancreas: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Trends

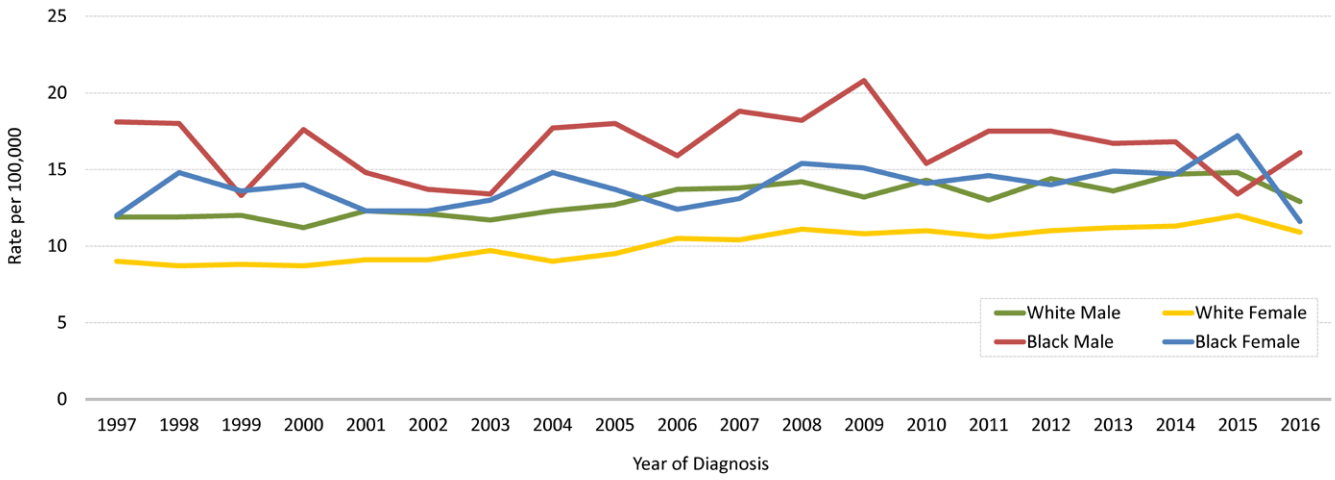
U.S. incidence rates of pancreatic cancer increased about 1% per year from 2006 to 2015.[1]

The pancreatic cancer incidence rate for all races and sexes combined in Ohio increased 12% from 1997 to 2016.[3] White females in Ohio had the greatest increase in pancreatic cancer incidence rates from 1997 to 2016 (21%), followed by white males (8%) (Figure 43).[3] Incidence rates decreased for black males (11%) and black females (3%) in Ohio during this time period.[3]

The U.S. mortality rate increased slightly (0.3% per year) from 2007 to 2016.[1]

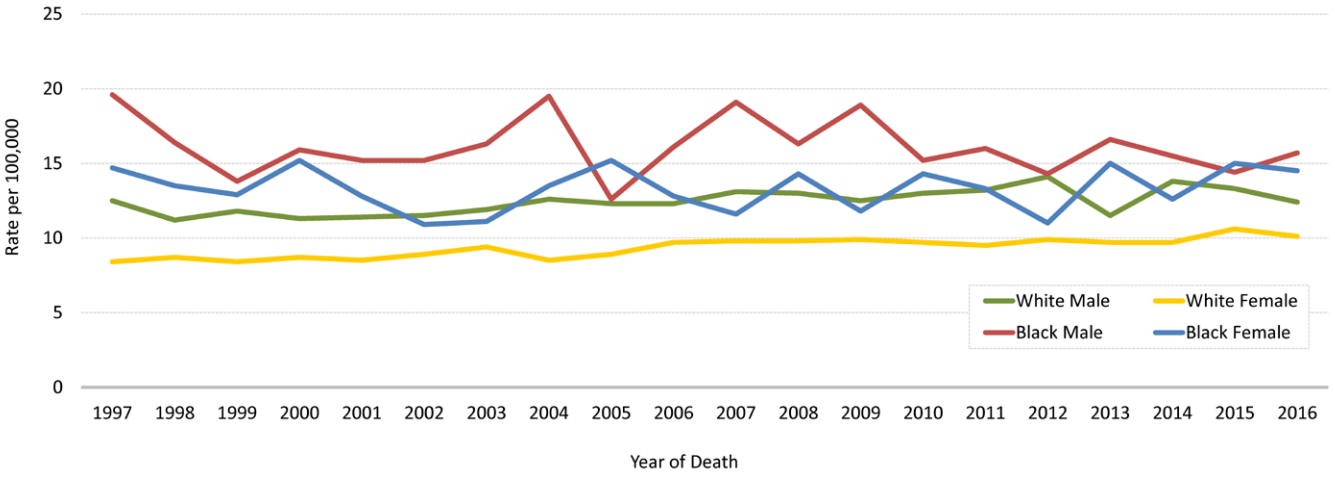
In Ohio, the pancreatic cancer mortality rate for all races and sexes combined increased by 7% from 1997 to 2016 (Figure 44).[7] Although the largest increase was seen in white females (20.2%), white females had the lowest mortality rate of all sex/race groups.[7] Mortality rates decreased in all other sex/race groups, with the largest decrease occurring among black males (20%).[7]

FIGURE 43 **Trends in Age-adjusted Incidence Rates for Cancer of the Pancreas by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 44 **Trends in Age-adjusted Mortality Rates for Cancer of the Pancreas by Sex and Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Early Detection

There is currently no reliable method for the early detection of pancreatic cancer.[1]

Treatment

Surgery, radiation therapy and chemotherapy are treatment options that may extend survival and/or relieve symptoms, but seldom are curative.[1] Less than 20% of patients are candidates for surgery because pancreatic cancer is usually detected after it has spread beyond the pancreas.[1] Adjuvant treatment with chemotherapy (and sometimes radiation) may lower the risk of recurrence among those who undergo surgery.[1] For advanced disease, chemotherapy (sometimes with a targeted therapy drug) may lengthen survival.[1] Clinical trials are testing several new targeted agents and immunotherapies.[1]

Survival

For all stages combined, the five-year relative survival for pancreatic cancer in 2009-2015 was only 9% in both Ohio and the United States.[3,4] In Ohio, the five-year relative survival was 38% among those diagnosed at a local stage; however, only 10% of people were diagnosed at this early stage.[3] In Ohio, nearly half (44%) of patients were diagnosed at the distant stage, for which the five-year relative survival was only 3%.[3]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Tobacco: The risk of getting pancreatic cancer is about twice as high among smokers compared to those who have never smoked. Use of smokeless tobacco products also increases risk.

Overweight and obesity: Being overweight is a risk factor for pancreatic cancer. People who are obese are about 20% more likely to develop pancreatic cancer.

Diabetes: Pancreatic cancer is more common in people with type 2 diabetes.

NON-MODIFIABLE RISK FACTORS

Age: The risk of developing pancreatic cancer increases as people age. About two-thirds of people with pancreatic cancer are 65 or older.

Sex: Men are slightly more likely to develop pancreatic cancer than women.

Race: Blacks are slightly more likely to develop pancreatic cancer than whites.

Family history: Pancreatic cancer seems to run in some families, possibly due to an inherited genetic syndrome (explained below).

Inherited genetic syndromes: Inherited gene changes can be passed from parent to child. Examples of genetic syndromes that can cause exocrine pancreatic cancer include: hereditary breast and ovarian cancer syndrome, familial atypical multiple mole melanoma (FAMM) syndrome, Lynch syndrome, Peutz-Jeghers syndrome, Von Hippel-Lindau syndrome, neurofibromatosis type 1, multiple endocrine neoplasia type 1 (MEN1), and BRCA1 and BRCA2.

Chronic pancreatitis: Chronic pancreatitis, a long-term inflammation of the pancreas, increases the risk of pancreatic cancer.

SIGNS AND SYMPTOMS OF PANCREATIC CANCER

Symptoms of pancreatic cancer usually do not appear until the disease has progressed. Some symptoms include:

- Jaundice (yellowing of skin or eyes) due to tumor development near the bile duct
- Belly or back pain
- Weight loss and poor appetite
- Nausea and vomiting
- Development of diabetes

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

New Cases

In 2019, an estimated 174,650 new cases of prostate cancer were expected to occur among men in the United States.[1] An average of 7,158 new cancer cases of prostate cancer were diagnosed among men in Ohio each year during 2012-2016, accounting for 22% of all new invasive cancer cases among men.[3] The average annual prostate cancer incidence rate in Ohio (103.0 per 100,000) was about 6% lower than the U.S. rate (109.5 per 100,000) during this time period (Figure 2 and Table 2).[3,4]

In the United States and Ohio, incidence rates of prostate cancer are significantly higher (60% and 71%, respectively) among black men than in white men, but the reasons for the difference are not well understood.[1,3] Average annual incidence rates of prostate cancer by Ohio county are shown in Figure 45.

Currently, a male living in the United States has a 1 in 9 lifetime risk of developing invasive prostate cancer.[2]

Deaths

In the United States, an estimated 31,620 deaths were expected to occur in 2019 due to prostate cancer, the second leading cause of cancer death in men.[1]

In Ohio, 1,094 average annual deaths from prostate cancer occurred between 2012 and 2016.[7] The mortality rate for prostate cancer in Ohio was 19.0 per 100,000 during this time period compared to 19.2 per 100,000 nationally (Table 3).[4,7] In Ohio, the mortality rate of prostate cancer was more than two times higher among black men (36.2 per 100,000) than white men (17.5 per 100,000) (Table 5).[7]

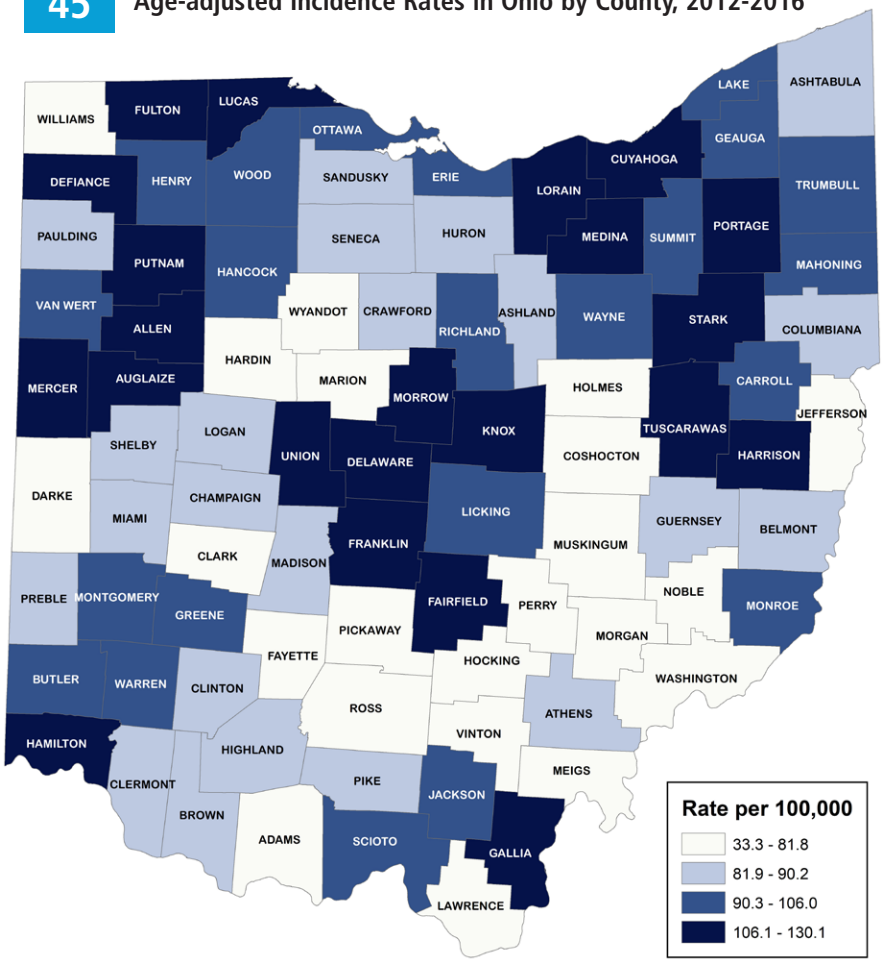
Trends

In the late 1980s and early 1990s, incidence rates for prostate cancer spiked dramatically, in large part because of a surge in screening with the prostate-specific antigen (PSA) blood test.[1] The decline in incidence rates since around 2000 has accelerated in recent years, likely due to reduced PSA screening.[1] From 2011 to 2015, the prostate cancer incidence rate decreased by about 7% per year in the United States.[1]

There was a 30% overall decline in the prostate cancer incidence rate in Ohio from 1997 (144.0 per 100,000) to 2016 (100.7 per 100,000).[3] The decline was similar among white males (32%) compared to black males (30%) during the time period (Figure 46).[3]

Nationally, the prostate cancer death rate declined 51% from 1993 to 2016, although it appears to have stabilized in recent years.[1] There was a 46% overall decline in the prostate cancer mortality rate in Ohio from 1997 (36.6 per 100,000) to 2016 (19.7 per 100,000).[7] The decline was slightly lower among white males (45%) compared to black males (52%) during this time period (Figure 47).[7]

FIGURE 45 **Cancer of the Prostate: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2]



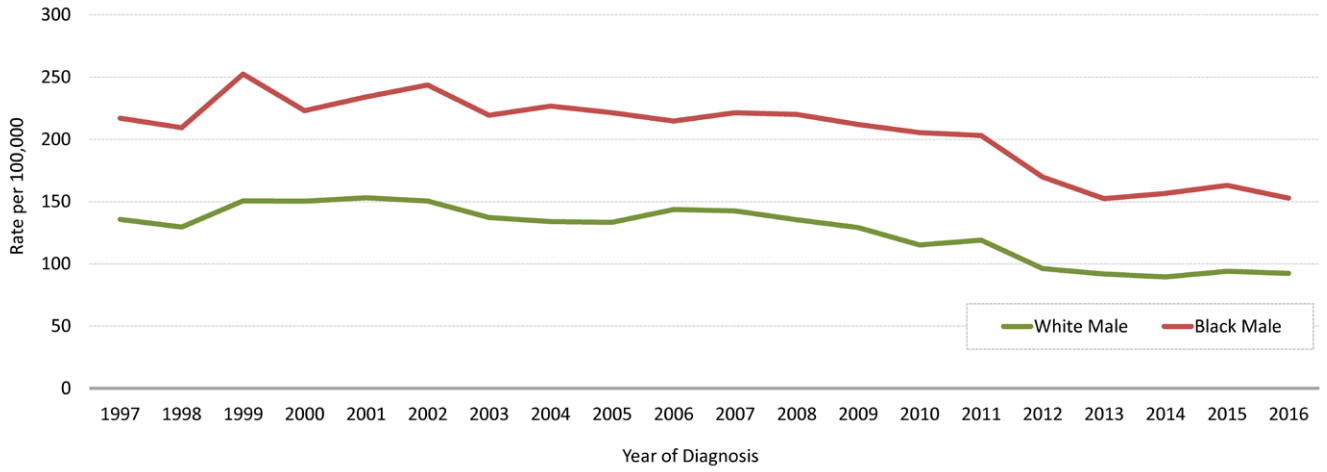
[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Early Detection

The ACS recommends that asymptomatic men who have at least a 10-year life expectancy talk to their healthcare providers to understand the risks and benefits of undergoing tests to detect prostate cancer early, such as a digital rectal exam (DRE) and prostate-specific antigen (PSA) test, so they can make informed healthcare decisions.[15] Men at average risk should have this conversation about screening with their healthcare provider beginning at age 50, whereas men at higher risk, such as black men and men with a first-degree relative (father, brother or son) diagnosed with prostate cancer before 65, should begin this conversation at age 45.[15] Men at appreciably higher risk (multiple family members diagnosed with prostate cancer before age 65) should have this conversation beginning at age 40.[15] However, ACS recommends that asymptomatic men who have less than a 10-year life expectancy based on age and health status should not be offered prostate cancer screening.[15]

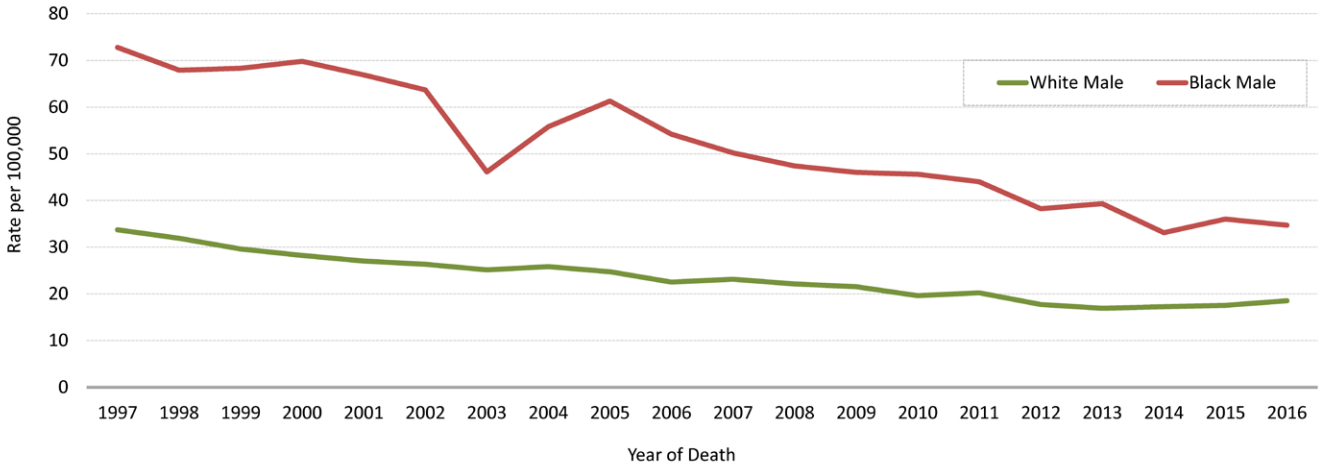
The USPSTF recommends that for men aged 55 to 69 years, the decision to receive PSA-based screening should be an individual one.[30] Before deciding whether to be screened, men should have an opportunity to discuss the potential benefits and harms of screening with their healthcare provider and to incorporate their values and preferences in the decision.[30] Screening offers a small potential benefit of reducing the chance of death from prostate cancer in some men. However, many men will experience potential harms of screening, including false-positive results that require additional testing and possible prostate biopsy; overdiagnosis and overtreatment; and treatment complications, such as incontinence and erectile dysfunction.[30] In determining whether this service is appropriate in individual cases, patients and clinicians should consider the balance of benefits and harms on the basis of family history, race/ethnicity, comorbid medical conditions, patient values about the benefits and harms of screening and treatment-specific outcomes, and other health needs.[30] Clinicians should not screen men who do not express a preference for screening.[30]

FIGURE 46 **Trends in Age-adjusted Incidence Rates for Cancer of the Prostate by Race in Ohio, 1997-2016**[1,2]



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

FIGURE 47 **Trends in Age-adjusted Mortality Rates for Cancer of the Prostate by Race in Ohio, 1997-2016**[1,2]



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE 10 **Prevalence of Men 50 and Older who Reported Having Had a Prostate-specific Antigen (PSA) Test in the Past Year by Demographics in Ohio, 2018**[1,2]

	Had a PSA Test in the Past Year
AGE	
50-64	28.3%
65+	42.2%
RACE	
White	34.4%
Black	35.4%
EDUCATION	
Less Than High School	18.2%
High School or GED*	31.7%
Some College	34.4%
College Graduate	45.9%
ANNUAL HOUSEHOLD INCOME	
<$25,000	25.5%
$25,000-$49,999	31.6%
$50,000+	39.3%
Total (Men 50+)	34.3%

[1] Source: 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019.
[2] "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.
*General Educational Development

Table A-6 on page 87 shows the ACS and USPSTF recommendations for the early detection of prostate cancer in average risk, asymptomatic men by age.

Table 10 displays the prevalence of PSA screening for men 50 and older.[14] The prevalence of PSA screening was higher among men 65 and older (42%) compared to men aged 50-64 (28%).[14] The percentage of respondents who received a PSA test was lowest for those with less than a high school education (18%) and those with the lowest income (less than $25,000 per year) (26%), highest for college graduates (46%) and those with the highest income ($50,000 or more per year) (39%), and similar among blacks (35%) and whites (34%).[14]

Treatment

Treatment decisions should be based on clinician recommendations and patient values and preferences.[1] Careful observation (called active surveillance) in place of immediate treatment is appropriate for many patients, particularly men diagnosed at an early stage or with less aggressive tumors and for older men.[1] Surgery, external beam radiation and/or radioactive seed implants (brachytherapy) may be used to treat early-stage disease.[1] Treatment often impacts a man's quality of life due to side effects or complications, such as urinary and erectile difficulties, which may be temporary or long term.

More advanced stages of disease are commonly treated by using hormonal therapy along with surgery or radiation.[1] Hormone treatment has the potential to control prostate cancer for an extended period of time by shrinking the size or limiting the growth of the tumor, which in turn may relieve pain and other symptoms.[1] Chemotherapy is often used if hormone treatments are no longer effective.[1] An option for some men with advanced prostate cancer that is no longer responding to hormones is a cancer vaccine designed to stimulate the patient's immune system to specifically attack prostate cancer cells.[1]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

NON-MODIFIABLE RISK FACTORS

Age: Approximately 57% of all prostate cancers are diagnosed in men older than 65 years, and 99% 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. 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 OF PROSTATE CANCER

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 getting 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.

Survival

In Ohio and the United States, the five-year relative survival for patients whose prostate tumors were diagnosed at the local and regional stages was 100% based on cases diagnosed from 2009-2015.[3,4] For men in Ohio whose cancer had spread to distant parts of the body, the survival was only 29% (Figure 1).[3] In 2012-2016, approximately 71% of all prostate cancers in Ohio were diagnosed at a local stage, 13% at a regional stage and 6% were diagnosed at a distant stage.[3] The five-year relative survival for all stages combined in Ohio was slightly higher for whites (99%) compared to blacks (96%).[3]

Uterine Cancer

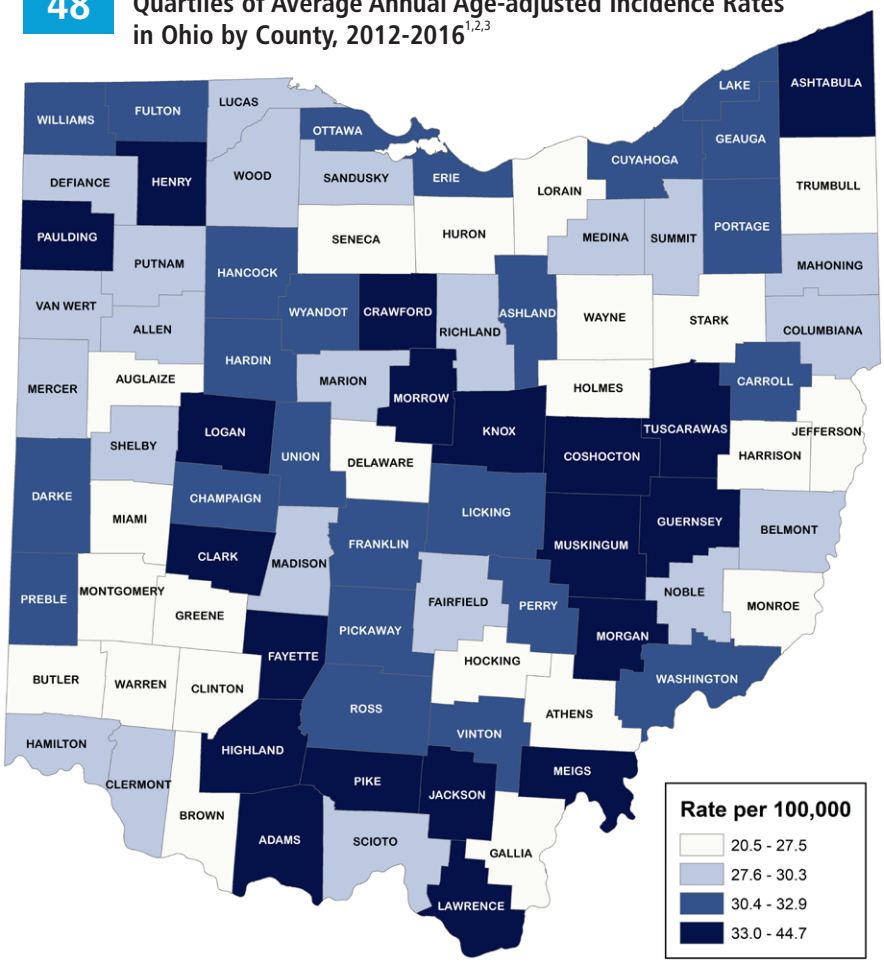
New Cases

Uterine cancers include cancers of the uterine corpus and cancers classified as uterus NOS. The vast majority (approximately 97%) of uterine cancers are cancers of the uterine corpus. Nationally, an estimated 61,880 new cases of invasive cancer of the uterine corpus were expected to occur in 2019.[1] (Note that this estimate does not include cancers of the uterus NOS.) Uterine cancer is often referred to as endometrial cancer because more than 90% of cases occur in the endometrium (lining of the uterus).

An average of 2,297 new cases of invasive uterine cancer were diagnosed annually in Ohio in 2012-2016 with a corresponding rate of 29.7 per 100,000, which is higher than the U.S. rate of 27.5 per 100,000 (Table 2).[3,4] The incidence rate in Ohio was higher among white women (30.4 per 100,000) compared to black (24.6 per 100,000) and Asian/Pacific Islander (14.9 per 100,000) women (Table 4).[3] Average annual age-adjusted incidence rates of uterine cancer by Ohio county of residence are shown in Figure 48.

Currently, a woman living in the United States has a 1 in 35 lifetime risk of developing invasive uterine cancer.[2]

FIGURE 48 **Cancer of the Uterine Corpus and Uterus NOS: Quartiles of Average Annual Age-adjusted Incidence Rates in Ohio by County, 2012-2016**[1,2,3]



Deaths

In the United States, an estimated 12,160 deaths from cancers of the uterine corpus were expected to occur in 2019.[1] (Note that this estimate does not include cancers of the uterus NOS.) The average annual mortality rate for uterine cancer in Ohio from 2012 to 2016 was 5.0 per 100,000, which is slightly higher than the U.S. mortality rate (4.7 per 100,000).[4,7] The Ohio mortality rate represents an annual average of 407 deaths in Ohio from uterine cancer over the time period (Table 3).[7] The mortality rate was considerably higher among black women in Ohio (7.2 per 100,000) compared to white (4.8 per 100,000) and Asian/Pacific Islander (2.4 per 100,000) women (Table 5).[7]

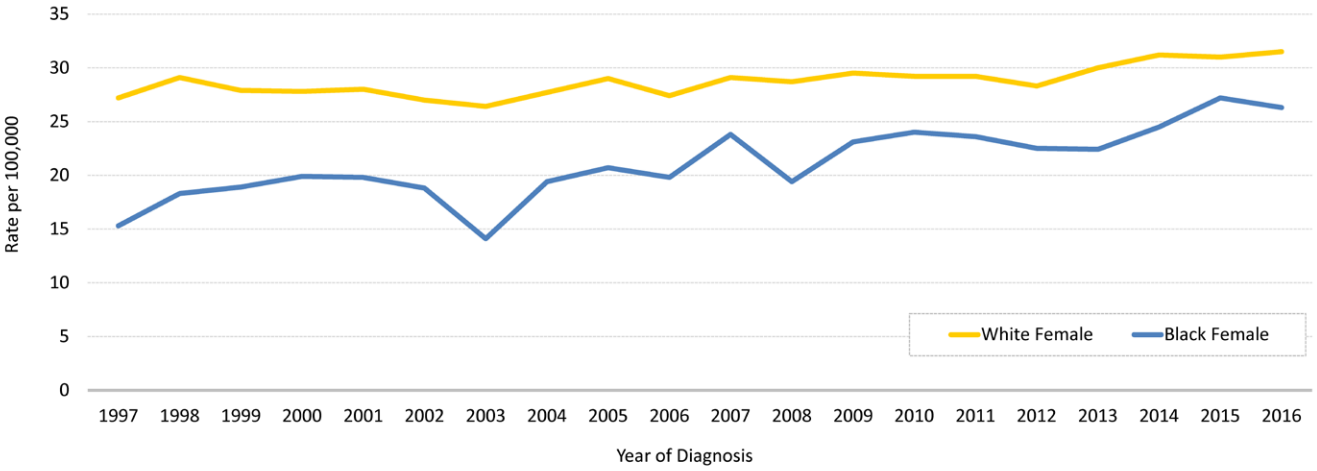
1 Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
2 Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

Trends

In the United States, from 2006 to 2015, the uterine cancer incidence rate increased by about 1% per year among white women and by about 2% per year among black women.[1] In Ohio, incidence rates from 1997 to 2016 increased 72% among black women compared to only 16% among white women (Figure 49).[3]

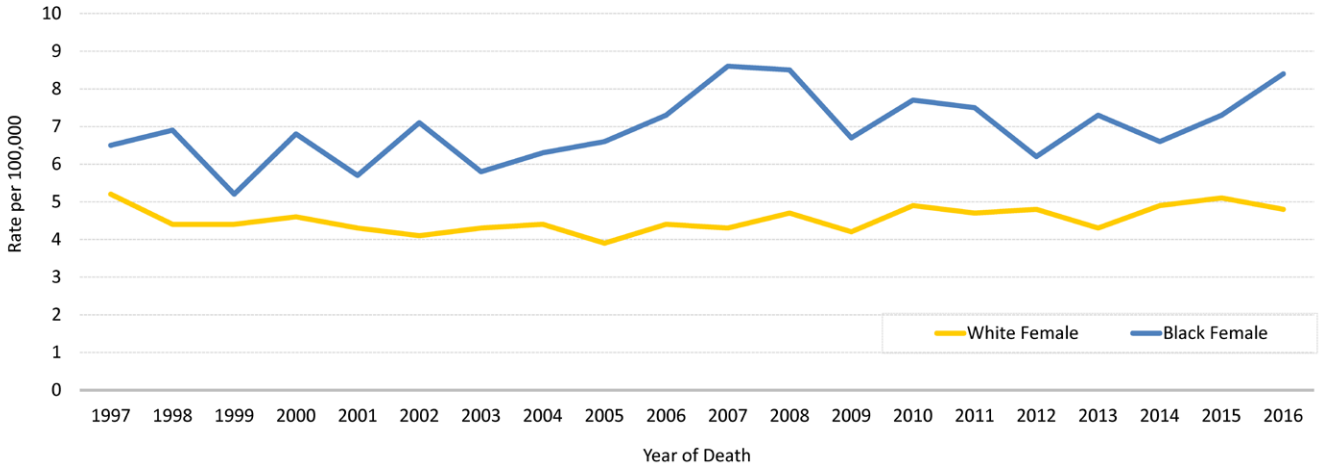
In the United States, from 2007 to 2016, the uterine cancer death rate increased by about 2% per year among both white and black women.[1] In Ohio, mortality rates from 1997 to 2016 increased 29% among black women and decreased 8% among white women (Figure 50).[3]

FIGURE 49 **Trends in Age-adjusted Incidence Rates for Cancer of the Uterine Corpus and Uterus NOS* by Race in Ohio, 1997-2016[1,2]**



[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
* Not Otherwise Specified

FIGURE 50 **Trends in Age-adjusted Mortality Rates for Cancer of the Uterine Corpus and Uterus NOS* by Race in Ohio, 1997-2016[1,2]**



[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.
* Not Otherwise Specified

Early Detection

There is no recommended screening test for uterine cancer for women at average risk; however, most cases (67%) are diagnosed at an early stage because of postmenopausal bleeding.[1] Women are encouraged to report any unexpected bleeding or spotting to their physicians.[1] The ACS recommends that women with known or suspected Lynch syndrome be offered annual screening with endometrial biopsy and/or transvaginal ultrasound beginning at age 35.[1]

Treatment

Uterine cancers are usually treated with surgery, radiation, hormones and/or chemotherapy, depending on the stage of disease.[1]

Survival

Based on cases diagnosed during 2009-2015, the five-year relative survival for uterine cancer in Ohio (84%) is slightly higher than that for the United States (81%).[3,4] The five-year relative survival is considerably lower for black women (64%) compared to white women (85%) in Ohio.[3] Five-year relative survival for uterine cancer in Ohio varies by stage at diagnosis (96% for women diagnosed local stage, 69% for those diagnosed regional stage and 19% for those diagnosed distant stage).[3] From 2012-2016, the majority of women in Ohio were diagnosed at the local stage (69%), while 19% were diagnosed at the regional stage and 8% were diagnosed at the distant stage.[3]

RISK FACTORS AND POPULATIONS WITH HIGH RATES

POTENTIALLY MODIFIABLE RISK FACTORS

Obesity, weight gain and physical inactivity: An estimated 70% of uterine cancers are attributable to excess body weight and insufficient physical activity. Obesity and abdominal fatness likely increase the amount of circulating estrogen, which is a strong risk factor.

Postmenopausal estrogen: Use of estrogen after menopause, but not estrogen plus progestin, increases risk.

Not having children and low duration of lactation: Not having children and no or low lactation increases risk as a result of prolonged endogenous estrogen exposure.

Tamoxifen: Taking the drug Tamoxifen, used to prevent breast cancer, for two or more years increases risk slightly because it has estrogen-like effects on the uterus.

NON-MODIFIABLE RISK FACTORS

Age: The average age at diagnosis of uterine cancer is 60 years. Women ages 55 to 84 years have higher risk than women less than 55 and women 85 years and older.

Race: White women are at greater risk of being diagnosed with uterine cancer; however, black women are at greater risk of dying from uterine cancer.

History of endometrial hyperplasia and breast and ovarian cancer: Women diagnosed with endometrial hyperplasia, an increased growth of the endometrium, or with breast or ovarian cancer are at greater risk.

Genetic predisposition/Inherited syndromes: Women diagnosed with Lynch syndrome, Cowden syndrome or polycystic ovary syndrome have a higher risk of uterine cancer.

Family history: Women with at least one first-degree relative with uterine cancer are at greater risk.

Late menopause: Women who go through menopause after age 55 years have increased risk.

SIGNS AND SYMPTOMS OF UTERINE CANCER

- Abnormal uterine bleeding or spotting, especially in postmenopausal women
- Pain during urination, intercourse or in the pelvic area
- Non-bloody vaginal discharge

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

Tobacco Use

Tobacco use remains the most preventable cause of death in the United States. Despite decades of declines in cigarette smoking prevalence, about 30% of all cancer deaths are still caused by smoking. Cigarette smoking increases the risk of at least 12 cancers: lung and bronchus, larynx, esophagus, oral cavity and pharynx, bladder, liver and intrahepatic bile duct, cervix, stomach, kidney and renal pelvis, acute myeloid leukemia, pancreas, and colon and rectum.[1]

According to the U.S. Surgeon General, smoking leads to disease and disability and harms nearly every organ of the body.[31] In addition to causing cancer, smoking causes heart disease, stroke, lung diseases, type 2 diabetes and rheumatoid arthritis.[32] Health consequences increase with both the duration of smoking and number of cigarettes smoked.[1]

In Ohio, an estimated 7,500 cancer deaths each year are attributed to smoking, including 6,100 deaths from lung and bronchus cancer.[7]

If smoking continues at the current rate among youth, 5.6 million of today's Americans younger than 18 (1 in 13) will die early from a smoking-related illness.[33]

Smoking Prevalence

The prevalence of current smoking among adults in the United States was 16.1% in 2018, down from 17.1% in 2016.[34] In Ohio, 20.5% of adults were current cigarette smokers in 2018.[14] Table 11 displays 2018 smoking prevalence in Ohio adults by sex, age group, race, education and annual household income. In general, smoking prevalence in Ohio was highest among the 35-49 year age group, those with less than a high school education and those with an annual household income less than $25,000.[14]

Nationally, 6% of high school students in grades 9-12 were current smokers in 2019.[35] In Ohio in 2019, high school students in the 9th (8%) and 10th grades (5%) were more likely to smoke compared to students in the 11th (3%) and 12th grades (4%).[36] Male high school students in Ohio (11%) were more likely than female students (4%) to be current smokers.[36]

RISK FACTORS AND POPULATIONS WITH HIGH RATES[32,33]

Sex: Men are more likely to smoke than women.

Race: The prevalence of smoking is highest among American Indian/Alaskan Native men and women.

Age: Nearly nine out of 10 adult smokers tried their first cigarette by age 18; 99% started by age 26.

Lower income: Adults with a low household income are more likely to smoke than those with higher incomes.

Lower education: Smoking is more prevalent among those with lower levels of education.

Certain Populations: The prevalence of smoking is higher among lesbians, gays and bisexuals, military service members and veterans, uninsured adults or adults with Medicaid, people living with HIV, people with mental health conditions and adults with disabilities.

SMOKING-RELATED HEALTH EFFECTS[34]

Cigarette smoking causes the following:

- Cardiovascular disease
- Cancer (lung and bronchus, larynx, esophagus, oral cavity and pharynx, bladder, liver and intrahepatic bile duct, cervix, stomach, kidney and renal pelvis, acute myeloid leukemia, pancreas, and colon and rectum)
- Respiratory disease
- Type 2 diabetes
- Rheumatoid arthritis
- Reduced fertility

Smoking during pregnancy is associated with the following:

- Premature births
- Low birth weight
- Stillbirth
- Sudden infant death syndrome (SIDS)
- Ectopic pregnancy
- Orofacial clefts in infants

Smoking is associated with the following adverse health effects:

- Postmenopausal women who smoke have lower bone density than women who never smoked.
- Women who smoke have an increased risk for bone fracture than women who never smoked.
- Smoking affects the health of teeth and gums and can cause tooth loss.
- Smoking can increase the risk of cataracts and age-related macular degeneration.
- Smoking increases the risk of developing type 2 diabetes and can make it harder to control.
- Smoking causes general adverse effects on the body including inflammation and decreased immune function.

TABLE 11 **Prevalence of Current Cigarette Smoking Among Adults 18 and Older by Demographics in Ohio, 2018**[1,2]

	Current Cigarette Smokers
SEX	
Men	22.1%
Women	19.0%
AGE	
18-34	21.5%
35-49	26.1%
50-64	23.5%
65+	10.7%
RACE	
White	20.1%
Black	23.4%
EDUCATION	
Less Than High School	39.8%
High School or GED*	23.8%
Some College	20.6%
College Graduate	7.9%
ANNUAL HOUSEHOLD INCOME	
<$25,000	33.4%
$25,000-$49,999	23.4%
$50,000+	12.9%
Total (Adults 18 and Over)	20.5%

1 Source: 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019.

2 "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.

* General Educational Development

Secondhand Smoke

Involuntary smoking or passive smoking refers to the involuntary inhalation of tobacco smoke by nonsmokers. The smoke inhaled is called secondhand smoke or environmental tobacco smoke.[39]

Secondhand smoke is a mixture of two forms of smoke that come from burning tobacco:[40]

- Mainstream smoke: The smoke exhaled by a smoker.
- Sidestream smoke: Smoke from the lighted end of a cigarette, pipe, cigar or tobacco burning in a hookah. This type of smoke has higher concentrations of cancer-causing chemicals and is more toxic than mainstream smoke.

Secondhand smoke contains more than 7,000 chemicals, including at least 70 chemicals that can cause cancer.[40] In 2006, the U.S. Surgeon General's report on the health consequences of involuntary exposure to tobacco smoke concluded that the evidence is sufficient to infer a causal relationship between secondhand smoke exposure and lung cancer among lifetime nonsmokers.[39] In the United States, secondhand smoke causes more than 7,300 lung cancer deaths among nonsmokers each year.[41] There is also some evidence suggesting that secondhand smoke may increase the risk of breast cancer, nasal sinus cavity cancer and nasopharyngeal cancer in adults and the risk of leukemia, lymphoma and brain tumors in children.[39]

People are exposed to secondhand smoke primarily at home and in the workplace, but exposures also occur in vehicles and in public places.[39] Making homes and cars smoke-free and visiting smoke-free venues offer the best protection against secondhand smoke. There is no risk-free level of exposure to secondhand smoke.[41]

E-cigarettes

Electronic cigarettes are battery-operated devices that heat a solution of liquid that typically contains nicotine, flavorings and other chemicals to create a vapor that is inhaled. E-cigarettes are known by many different names including: e-cigs, e-hookahs, mods, vape pens, vapes, tank systems and electronic nicotine delivery systems (ENDS).[42] The following are some important facts about e-cigarettes:

- E-cigarettes are not safe for youth, young adults, pregnant women or adults who do not currently use tobacco products.
- Most e-cigarettes contain nicotine, which is harmful to adolescents and fetuses, as well as heavy metals like lead, volatile organic compounds and cancer-causing agents.
- There is insufficient evidence to recommend e-cigarettes for smoking cessation in adults.[43]
- E-cigarettes are the most commonly used tobacco products among middle and high school students; 28% of high school students and 12% of middle school students in the United States used e-cigarettes in 2019, compared to 29% of high school students and 11% of middle school students in Ohio.[33,36]

INTERVENTION STRATEGIES

Evidence-based, statewide tobacco control programs that are comprehensive, sustained and accountable have been associated with reductions in smoking rates and tobacco product consumption, as well as increased quitting.[45]

Funding at CDC-recommended levels could improve progress toward reducing the heath and economic burden of tobacco-related diseases. However, during fiscal year 2019, Ohio spent only 11% of the CDC-recommended level of funding on tobacco control.[46] States that have made larger investments in comprehensive tobacco control efforts have seen larger declines in cigarette sales and larger decreases in smoking prevalence among adults and youth.[45]

Evidence-based interventions that are key components of a comprehensive tobacco prevention and control effort include the following:[45]

- Mass-reach communications campaigns
- Increasing the price of tobacco products
- Comprehensive smoke-free policies

Recent tobacco-related changes to state and federal laws may positively impact the health of Ohioans:

- A United States Department of Housing and Urban Development (HUD) rule required public housing to be 100% smoke-free by July 31, 2018.
- In October 2019, Ohio raised its minimum age for tobacco sales, including electronic cigarettes, from 18 to 21.
- As of October 2019, vaping products are taxed as tobacco products in Ohio.

Smokeless Tobacco

In 1986, the U.S. Surgeon General concluded that the use of smokeless tobacco is not a safe substitute for smoking cigarettes or cigars, as these products cause various cancers and noncancerous oral conditions, and can lead to nicotine addiction.[44]

- Smokeless tobacco use among adults in the United States has remained stable since 2003.[1]
- In 2018, 4.1% of adults in the United States were current users of smokeless tobacco products.[34]
- In Ohio in 2018, 4.3% of adults used smokeless tobacco every day or some days.[14]
- Nationally, an estimated 5% of high school students (8% male, 2% female) were current users of smokeless tobacco in 2019.[35]
- In 2019, 10% of Ohio high school students (13% male, 7% female) reported being current users of smokeless tobacco.[36]

Smoking Cessation

- The Ohio Tobacco Quit Line (1-800-QUIT-NOW) provides personal quit coaching and telephone counseling free of charge to all Ohioans.
- Smokers who quit, regardless of age, increase their longevity, with those who quit by age 30 living an average of 10 years longer than if they had continued to smoke.[1]
- Quitting smoking cuts cardiovascular risks. Just one year after quitting smoking, the risk for a heart attack drops sharply.[32]
- Within two to five years after quitting smoking, the risk for stroke could fall to about the same as a nonsmoker.[32]
- Quitting smoking decreases the risk for cancers of the mouth, throat, esophagus and bladder by half within five years.[32]
- After quitting smoking for 10 years, the risk for lung cancer drops by half.[32]
- Among adults 18 and older in Ohio, 2018 data showed that about 55% of current smokers in Ohio had stopped smoking at least one day in the preceding 12 months because they were trying to quit.[14]

Nutrition, Physical Activity, and Overweight and Obesity

Poor nutrition, physical inactivity and obesity are major risk factors for cancer, second only to tobacco use. An estimated 18% of cancer cases are attributable to the combined effects of excess body weight, alcohol consumption, physical inactivity and an unhealthy diet.[1] ACS's nutrition and physical activity guidelines (most recently updated in 2012) emphasize the importance of weight control, physical activity, healthy dietary patterns and limited, if any, alcohol consumption in reducing cancer risk and helping people stay healthy. ACS's guidelines also include recommendations for community action because of the large influence that physical and social environments have on food and activity behaviors.[47]

Nutrition, Physical Activity, and Overweight and Obesity among Adults

NUTRITION

The 2015-2020 Dietary Guidelines for Americans focus on healthy eating patterns as a whole and the variety of what people eat and drink, not just on individual nutrients or foods in isolation. Healthy eating patterns include a variety of nutritious foods like vegetables, fruits, grains, low-fat and fat-free dairy, lean meats and other protein sources, and oils while limiting saturated fats, trans fats, added sugars and sodium. A healthy eating pattern can be adapted to a person's taste preferences, traditions, culture and budget. In addition to the home, schools, workplaces, communities and food retail outlets can all contribute to supporting healthy and nutritious food options.[48]

GUIDELINES ON NUTRITION AND PHYSICAL ACTIVITY FOR CANCER PREVENTION[1]

RECOMMENDATIONS FOR INDIVIDUAL CHOICES

Achieve and maintain a healthy weight throughout life.

- Be as lean as possible throughout life without being underweight.
- Avoid excess weight gain at all ages. For those who are currently overweight or obese, losing even a small amount of weight has health benefits and is a good place to start.
- Engage in regular physical activity and limit consumption of high-calorie foods and beverages as key strategies for maintaining a healthy weight.

Adopt a physically active lifestyle.

- Adults should engage in at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity activity each week, or an equivalent combination, preferably spread throughout the week.
- Children and adolescents should engage in at least 1 hour of moderate or vigorous intensity activity each day, with vigorous activity occurring at least 3 days each week.
- Limit sedentary behavior such as sitting, lying down, watching television or other forms of screen-based environments.
- Doing some physical activity above usual activities, no matter what one's level of activity, can have many health benefits.

Consume a healthy diet, with an emphasis on plant sources.

- Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
- Limit consumption of processed meat and red meat.
- Eat at least 2.5 cups of vegetables and fruits each day.
- Choose whole grains instead of refined grain products.

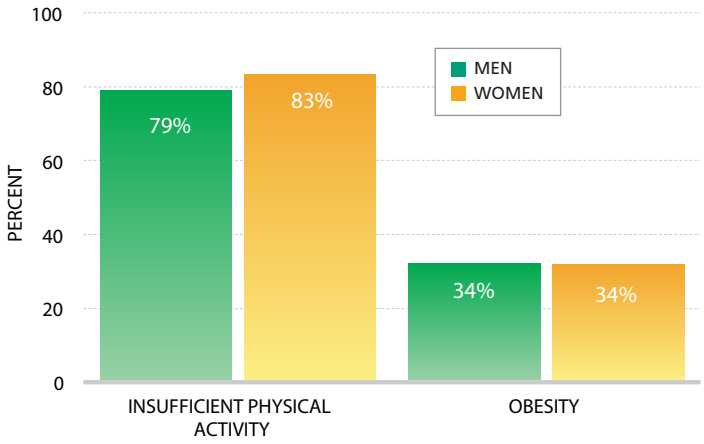
If you drink alcoholic beverages, limit consumption.

- Drink no more than 1 drink per day for women or 2 per day for men.

RECOMMENDATIONS FOR COMMUNITY ACTION

- Increase access to affordable, healthy foods.
- Provide safe, enjoyable and accessible environments for physical activity.

FIGURE 51 **Prevalence of Insufficient Physical Activity and Obesity Among Adults 18 and Older by Sex in Ohio, 2017 and 2018**[1,2,3,4]



1 Source: 2017 and 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019. Physical activity data are from 2017, and obesity data are from 2018.

2 "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.

3 "Insufficient Physical Activity" is defined as failure to meet recommended guidelines for physical activity, which are defined as at least 150 minutes of moderate-intensity physical activity per week and muscle strengthening activities two or more days per week.

4 "Obesity" is defined as body mass index (BMI) 30.0+.

PHYSICAL ACTIVITY

Guidelines for recommended levels of physical activity state that adults should get at least 150 minutes a week of moderate intensity aerobic activity such as brisk walking, or 75 minutes a week of vigorous intensity aerobic activity such as jogging, or a combination of both. The guidelines also recommend that adults do muscle-strengthening activities, such as push-ups, sit-ups, or activities using resistance bands or weights. These activities should involve all major muscle groups and be done on two or more days per week.[49] The health benefits of regular physical activity for the prevention of chronic diseases including heart disease, diabetes and some types of cancer are well documented. However, in 2017, 80% of Americans did not meet the guidelines for both aerobic and muscle-strengthening activities.[34] Similarly, 82% of adult Ohioans did not meet the aerobic and muscle-strengthening guidelines in 2017.[14]

In 2017 in Ohio, the proportion of insufficient physical activity was higher among females (84%) compared to males (80%), similar among whites and blacks (82% and 81%, respectively) and increased as age increased (Figures 51-53).[14] Higher levels of education and household income were associated with lower proportions of insufficient physical activity (Figures 54 and 55).[14]

OVERWEIGHT AND OBESITY

High caloric intake combined with inadequate physical activity leads to weight gain and subsequent development of being overweight and obese among children and adults. The NCI has identified the following cancer sites/types as being associated with overweight and obesity: endometrium, esophagus, stomach, liver and intrahepatic bile duct, kidney and renal pelvis, multiple myeloma, meningioma, pancreas, colon and rectum, gallbladder, breast, ovary and thyroid.[50]

Data from the National Health and Nutrition Examination Survey (NHANES) indicated that the percentage of obese adults in the United States increased from 31% in 1999-2000 to nearly 40% in 2015-2016.[51] In 2018, the percentage of adults in Ohio classified as overweight was 34% and an additional 34% were obese.[14]

Thirty-four percent of Ohio men and women were obese in 2018 (Figure 51).[14] A greater proportion of blacks (36%) in Ohio were obese compared to whites (34%) (Figure 52).[14] Obesity levels were highest among the 35-49 age group (40%) and the 50-64 age group (39%) (Figure 53).[14] Ohioans with the highest level of education (college graduate) reported the lowest percentage of obesity (29%) (Figure 54).[14] Ohioans with household incomes less than $25,000 reported the highest percentage of obesity (38%) (Figure 55).[14]

FIGURE 52

Prevalence of Insufficient Physical Activity and Obesity Among Adults 18 and Older by Race in Ohio, 2017 and 2018[1,2,3,4]

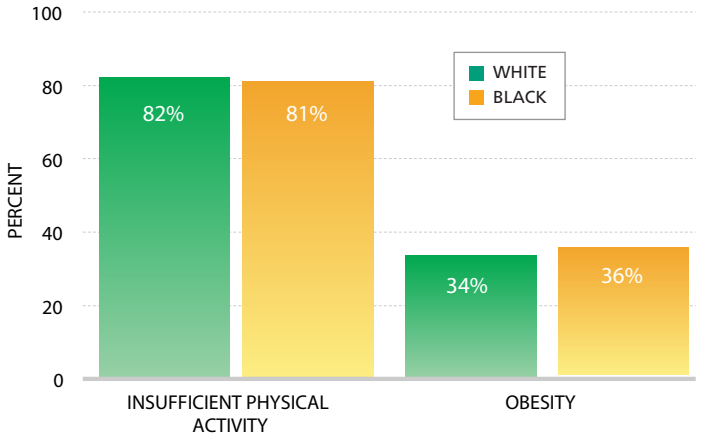


FIGURE 53

Prevalence of Insufficient Physical Activity and Obesity Among Adults 18 and Older by Age Group in Ohio, 2017 and 2018[1,2,3,4]

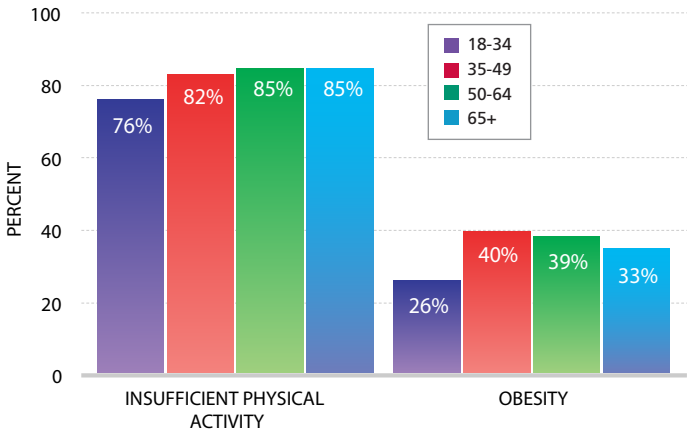


FIGURE 54

Prevalence of Insufficient Physical Activity and Obesity Among Adults 18 and Older by Level of Education in Ohio, 2017 and 2018[1,2,3,4]

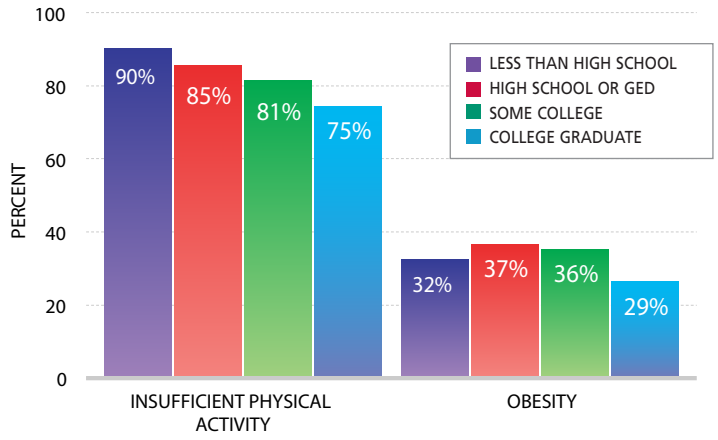
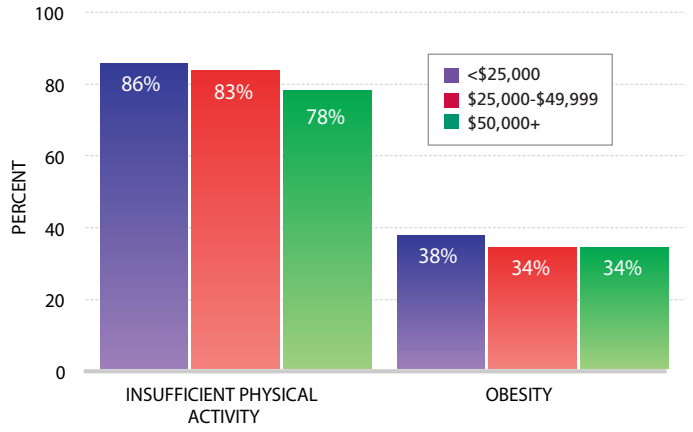


FIGURE 55

Prevalence of Insufficient Physical Activity and Obesity Among Adults 18 and Older by Household Income in Ohio, 2017 and 2018[1,2,3,4]



FOOTNOTES FOR FIGURES 52-55

1 Source: 2017 and 2018 Ohio Behavioral Risk Factor Surveillance System, Ohio Department of Health, 2019. Physical activity data are from 2017, and obesity data are from 2018.

2 "Don't Know" and "Refused" were excluded from the denominator. This can cause an artificially high percentage.

3 "Insufficient Physical Activity" is defined as failure to meet recommended guidelines for physical activity, which are defined as at least 150 minutes of moderate-intensity physical activity per week and muscle-strengthening activities two or more days per week.

4 "Obesity" is defined as body mass index (BMI) 30.0+.

Body mass index (BMI) is used in children to screen for excess weight and for those at risk of becoming overweight. Because the amount of body fat changes with age and differs between boys and girls, the CDC developed BMI-for-age growth charts to show the entire distribution of height and weight by gender and age.[57] Definitions of overweight and obese among children are as follows:

- Overweight: 85th to 94th percentile for BMI
- Obese: 95th or higher percentile for BMI

Nutrition, Physical Activity, and Overweight and Obesity among Youths

NUTRITION

Healthy eating in adolescence promotes optimal growth, development, cognitive functioning, attendance and mood, and reduces the risk for many harmful illnesses and diseases. The Dietary Guidelines for Americans recommend a diet rich in fruits and vegetables, whole grains, and fat-free and low-fat dairy products for persons aged two years and older. The guidelines also recommend that children, adolescents and adults limit intake of solid fats, cholesterol, sodium, added sugars and refined grains.[48] Unfortunately, most young people are not following the recommendations set forth in the Dietary Guidelines for Americans. Data from the Ohio Youth Risk Behavior Survey (YRBS)/Youth Tobacco Survey (YTS) in 2019 showed that about one-fifth (23%) of Ohio high school students ate fruit (including 100% fruit juice) two or more times per day and only 11% ate vegetables three or more times per day.[36] In addition, 35% of Ohio high school students consumed one or more cans, bottles or glasses of soda or pop every day during the last seven days.[36]

Schools are in a unique position to promote healthy eating and help ensure appropriate food and nutrient intake among students. Schools provide students with opportunities to consume a wide variety of foods and beverages during the school day and enable students to learn about and practice healthy eating behaviors. Schools should ensure that only nutritious and appealing foods and beverages are provided in school cafeterias, vending machines, snack bars, school stores and other venues that offer food and beverages to students. In addition, nutrition education should be part of a comprehensive school health education curriculum.[52]

PHYSICAL ACTIVITY

Regular physical activity can help children and adolescents improve cardiorespiratory fitness, build strong bones and muscles, control weight, reduce symptoms of anxiety and depression and reduce the risk of developing health conditions such as heart disease, cancer, type 2 diabetes, high blood pressure, osteoporosis and obesity.[53] In Ohio in 2019, only 21% of high school students and 29% of middle school students reported engaging in at least 60 minutes or more of physical activity during each day in the past seven days.[36]

Schools can help promote physical activity by taking a whole-school approach where students are provided access in the school environment to at least 60 minutes per day of vigorous or moderate intensity physical activity. Opportunities for physical activity include physical education, recess, dedicated classroom physical activity time and before and after school activities.[54]

OVERWEIGHT AND OBESITY

Youth who are obese are more likely to become adults who are obese. Obese youth are more likely to have high blood pressure, high cholesterol, increased risk of impaired glucose tolerance, insulin resistance and type 2 diabetes, and breathing problems including asthma and sleep apnea.[55] Recent national data showed that the percentage of obese youth (ages 2-19) in the United States increased from 14% in 1999-2000 to 19% in 2015-2016.[51] Nationally in 2017, 15% of high school students were considered overweight and 16% were obese.[56] In 2019 in Ohio, 12% of high school students were overweight and an additional 17% were obese.[36]

ACRONYMS

ACRONYM	FULL TERM
ACS	American Cancer Society
ALL	Acute lymphocytic leukemia
AML	Acute myeloid leukemia
APC	Adenomatous polyposis coli
BMI	Body mass index
BRCA	Breast cancer susceptibility gene
BRFSS	Behavioral Risk Factor Surveillance System
CAR	Chimeric antigen receptor
CDC	Centers for Disease Control and Prevention
CIN	Cervical intraepithelial neoplasia
CLL	Chronic lymphocytic leukemia
CML	Chronic myeloid leukemia
CNS	Central nervous system
CT	Computed tomography
DCIS	Ductal carcinoma in situ
DES	Diethylstilbestrol
DRE	Digital rectal exam
EBV	Epstein-Barr virus
EGFR	Epidermal growth factor receptor
FAMM	Familial atypical multiple mole melanoma
FAP	Familial adenomatous polyposis
FDA	Food and Drug Administration
FIT	Fecal immunochemical test
FOBT	Fecal occult blood test
H. pylori	Helicobacter pylori
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HHV8	Human herpesvirus-8
HIV	Human immunodeficiency virus
HL	Hodgkin lymphoma
HNPCC	Hereditary nonpolyposis colon cancer
HPV	Human papillomavirus
HTLV-I	Human T-cell leukemia virus type I
iFOBT	Immunochemical fecal occult blood test
LCIS	Lobular carcinoma in situ
MEN1	Multiple endocrine neoplasia type 1
MRI	Magnetic resonance imaging
NAACCR	North American Association of Central Cancer Registries
NCI	National Cancer Institute
NETS	Neuroendocrine tumors
NHANES	National Health and Nutrition Examination Survey
OCISS	Ohio Cancer Incidence Surveillance System
PSA	Prostate-specific antigen
RCC	Renal cell carcinoma
SEER	Surveillance, Epidemiology, and End Results
SIDS	Sudden infant death syndrome
SPF	Sun Protection Factor
USPSTF	U.S. Preventive Services Task Force
UV	Ultraviolet
VEGF	Vascular endothelial growth factor
YRBS	Youth Risk Behavior Survey

APPENDICES

TABLE A-1

Estimated Completeness of Reporting by Cancer Site/Type in Ohio, 2012-2016[1,2]

Site/Type	% Complete
All Sites/Types	95%
Bladder	96%
Brain & Other CNS**	106%
Breast	92%
Cervix	104%
Colon & Rectum	97%
Esophagus	97%
Hodgkin Lymphoma	104%
Kidney & Renal Pelvis	103%
Larynx	103%
Leukemia	82%
Liver & Intrahepatic Bile Duct	88%
Lung & Bronchus	104%
Melanoma of the Skin	92%
Multiple Myeloma	80%
Non-Hodgkin Lymphoma	89%
Oral Cavity & Pharynx	97%
Ovary	91%
Pancreas	94%
Prostate	95%
Stomach	99%
Testis	98%
Thyroid	96%
Uterine Corpus & Uterine NOS***	102%

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

[2] Ohio mortality and SEER incidence and mortality rates were used to calculate an expected Ohio incidence rate for each cancer site/type. The observed Ohio incidence rate for each site/type was then divided by the corresponding expected Ohio incidence rate to determine the percent completeness.

* Central Nervous System

** Not Otherwise Specified

Note: Completeness may exceed 100 percent if the observed number of cases exceeds the number expected based on the Surveillance, Epidemiology and End Results (SEER) Program incidence to mortality rate ratio and Ohio mortality rates.

TABLE A-2 Table A-2. Estimated Completeness of Reporting by County in Ohio, 2012-2016[1,2]

	% Complete
Ohio	95%
Adams	85%
Allen	92%
Ashland	98%
Ashtabula	87%
Athens	95%
Auglaize	94%
Belmont	79%
Brown	81%
Butler	93%
Carroll	101%
Champaign	92%
Clark	91%
Clermont	100%
Clinton	90%
Columbiana	92%
Coshocton	90%
Crawford	86%
Cuyahoga	97%
Darke	88%
Defiance	91%
Delaware	115%
Erie	101%
Fairfield	103%
Fayette	86%
Franklin	99%
Fulton	90%
Gallia	78%
Geauga	112%

	% Complete
Ohio	95%
Greene	102%
Guernsey	84%
Hamilton	96%
Hancock	92%
Hardin	84%
Harrison	69%
Henry	108%
Highland	89%
Hocking	84%
Holmes	83%
Huron	90%
Jackson	89%
Jefferson	90%
Knox	107%
Lake	99%
Lawrence	81%
Licking	95%
Logan	88%
Lorain	97%
Lucas	90%
Madison	87%
Mahoning	89%
Marion	88%
Medina	112%
Meigs	84%
Mercer	91%
Miami	91%
Monroe	93%
Montgomery	95%
Morgan	86%

	% Complete
Ohio	95%
Morrow	106%
Muskingum	92%
Noble	102%
Ottawa	96%
Paulding	89%
Perry	86%
Pickaway	90%
Pike	101%
Portage	97%
Preble	93%
Putnam	115%
Richland	94%
Ross	88%
Sandusky	91%
Scioto	92%
Seneca	92%
Shelby	79%
Stark	97%
Summit	95%
Trumbull	96%
Tuscarawas	96%
Union	105%
Van Wert	89%
Vinton	100%
Warren	103%
Washington	100%
Wayne	97%
Williams	81%
Wood	97%
Wyandot	88%

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

2 Ohio mortality and SEER incidence and mortality rates were used to calculate an expected Ohio incidence rate for each county. The observed Ohio incidence rate for each county was then divided by the corresponding expected Ohio incidence rate to determine the percent completeness.

Note: Completeness may exceed 100 percent if the observed number of cases exceeds the number expected based on the SEER incidence to mortality rate ratio and Ohio mortality rates.

TABLE A-3

Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by County and Sex in Ohio, 2012-2016[1,2]

	All Sites/Types						Colon & Rectum					
	Male		Female		Total		Male		Female		Total	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Ohio	32,328	500.7	32,530	437.5	64,858	461.9	3,011	47.6	2,809	36.5	5,820	41.5
Adams	92	538.8	83	468.5	175	497.9	12	73.2	8	40.8	19	55.2
Allen	322	538.7	283	430.3	606	475.5	30	51.8	27	41.4	58	45.8
Ashland	155	483.6	159	452.4	314	464.2	18	58.7	18	43.6	36	50.3
Ashtabula	306	494.7	277	419.9	583	449.9	31	51.2	27	39.3	58	44.5
Athens	141	499.6	134	422.1	275	453.9	15	52.5	14	42.4	29	48.2
Auglaize	132	482.8	130	432.4	262	449.6	13	47.8	12	33.6	24	39.9
Belmont	192	423.8	186	369.2	378	388.1	20	44.4	18	32.9	38	38.6
Brown	145	530.9	124	430.9	269	475.5	16	60.4	11	37.7	28	48.7
Butler	886	477.1	935	434.2	1,821	449.5	88	47.2	84	38.4	172	42.6
Carroll	101	511.5	79	407.3	179	452.0	10	55.2	7	32.4	17	42.6
Champaign	116	498.6	118	465.6	234	474.3	14	63.1	9	35.4	23	47.3
Clark	393	473.7	453	485.7	845	476.4	38	47.6	38	37.3	76	42.4
Clermont	544	498.8	561	452.8	1,104	470.0	50	47.1	48	38.0	97	42.0
Clinton	119	519.0	115	430.1	234	466.7	12	55.5	10	35.3	21	43.5
Columbiana	324	468.6	313	430.2	637	441.9	34	51.1	31	42.6	65	46.3
Coshocton	112	487.5	113	452.7	225	466.0	10	44.2	13	48.7	22	46.5
Crawford	134	485.9	136	440.2	270	456.7	12	46.1	13	42.3	26	44.0
Cuyahoga	3,758	525.3	3,920	444.6	7,678	476.3	356	50.1	347	37.6	703	43.1
Darke	164	506.0	148	419.2	313	453.1	19	55.7	16	43.3	35	48.7
Defiance	103	449.4	109	433.6	212	436.3	10	45.5	13	50.2	23	47.9
Delaware	438	486.7	428	419.4	865	447.8	35	41.7	31	31.3	66	35.8
Erie	266	515.3	267	485.8	533	497.3	31	58.9	26	44.2	57	51.1
Fairfield	401	496.1	385	427.1	786	454.6	34	42.5	26	29.0	60	35.2
Fayette	82	491.4	90	470.7	173	476.1	7	48.6	7	38.6	15	41.5
Franklin	2,655	505.8	2,866	441.7	5,521	465.0	232	45.0	214	33.2	447	38.2
Fulton	123	496.8	111	411.7	234	446.5	15	64.3	10	34.5	25	48.3
Gallia	100	533.1	80	386.1	180	453.0	6	28.8	8	36.9	13	33.8
Geauga	278	458.4	275	423.3	553	436.7	25	44.4	23	33.9	48	38.5
Greene	419	459.1	446	430.4	866	440.3	36	39.3	34	33.0	70	36.0
Guernsey	136	547.9	117	434.8	253	485.1	16	68.4	15	51.7	31	60.0
Hamilton	2,059	501.7	2,262	451.0	4,320	469.1	180	44.3	188	36.4	368	39.7
Hancock	213	500.6	199	419.4	412	451.3	20	48.1	16	32.2	36	39.3
Hardin	85	508.2	86	469.0	171	482.5	12	67.2	7	37.2	19	52.3
Harrison	47	428.0	41	349.8	88	383.5	5	49.4	3	25.2	8	36.5
Henry	85	512.3	77	421.2	162	459.4	9	55.8	8	37.8	17	46.8
Highland	127	503.3	121	430.8	247	459.2	13	52.1	12	41.4	24	46.2
Hocking	83	457.6	86	453.0	169	453.6	7	44.4	10	54.0	18	50.1
Holmes	84	412.2	77	345.3	160	374.8	10	51.6	11	51.6	21	50.6
Huron	166	508.5	159	444.4	325	468.2	14	44.8	14	38.5	29	40.9
Jackson	102	563.7	90	432.4	192	487.9	10	55.4	8	36.7	17	45.0
Jefferson	219	476.1	227	463.4	446	464.5	21	49.3	18	34.4	39	40.7
Knox	182	511.3	182	468.4	364	483.9	16	44.9	18	44.5	33	45.0
Lake	712	504.8	759	465.0	1,471	477.1	74	53.8	61	35.1	135	43.3

[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-3 cont.

Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by County and Sex in Ohio, 2012-2016[1,2]

	Lung & Bronchus						Breast		Prostate	
	Male		Female		Total		Female		Male	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Ohio	5,218	81.1	4,640	59.1	9,858	68.5	9,359	127.4	7,158	103.0
Adams	22	126.3	13	68.1	35	94.4	19	112.3	14	76.3
Allen	56	94.4	41	57.3	96	73.7	74	113.4	69	106.9
Ashland	23	67.0	22	60.7	45	63.6	43	120.0	32	88.5
Ashtabula	57	92.0	43	60.6	100	74.3	79	119.7	57	83.9
Athens	26	88.5	20	61.1	46	73.7	39	124.0	27	87.4
Auglaize	17	63.2	19	58.5	36	60.4	37	126.1	31	106.6
Belmont	34	75.2	29	54.3	63	63.4	52	104.1	43	87.1
Brown	32	113.1	28	90.4	60	101.4	28	100.3	25	85.5
Butler	145	79.8	143	65.5	288	71.4	273	126.2	191	95.5
Carroll	19	92.8	10	49.8	29	70.1	22	110.5	20	91.7
Champaign	19	80.9	18	67.3	37	73.1	35	136.0	23	90.2
Clark	74	88.2	71	70.4	145	77.6	137	149.7	66	72.1
Clermont	93	84.4	95	74.2	189	78.8	158	128.2	100	83.0
Clinton	25	105.0	19	67.4	44	83.9	33	125.2	21	89.8
Columbiana	60	84.7	46	57.4	106	68.6	85	116.1	66	88.3
Coshocton	21	88.5	14	52.3	36	69.1	27	111.4	19	73.8
Crawford	27	96.5	23	69.5	50	81.2	35	116.0	25	82.1
Cuyahoga	527	73.5	533	56.9	1,060	63.8	1,139	132.5	945	124.4
Darke	26	80.5	18	47.5	44	61.5	40	110.9	29	81.4
Defiance	15	69.5	15	53.2	30	60.1	27	110.3	26	107.0
Delaware	53	63.5	43	44.2	96	52.6	144	136.5	123	125.7
Erie	38	72.5	33	55.5	72	63.3	75	138.8	52	91.4
Fairfield	63	79.8	55	57.0	118	66.8	115	128.2	96	108.4
Fayette	18	103.6	14	68.9	32	84.1	25	127.9	14	74.1
Franklin	393	79.9	381	59.2	774	67.7	852	132.0	661	119.9
Fulton	18	72.9	12	44.1	31	56.7	32	120.7	29	110.2
Gallia	21	112.3	14	60.5	35	83.8	17	83.0	22	106.1
Geauga	35	55.6	29	40.9	64	47.7	90	139.3	68	99.1
Greene	56	62.5	59	53.3	115	56.9	135	131.0	96	96.4
Guernsey	28	106.7	19	63.6	46	83.8	23	82.5	24	90.1
Hamilton	337	82.9	336	64.7	673	72.3	677	137.1	475	108.9
Hancock	34	80.0	23	44.4	57	60.0	51	108.2	43	94.1
Hardin	17	104.3	14	69.0	31	84.9	22	122.4	15	81.5
Harrison	9	76.0	6	49.0	15	60.8	11	95.2	13	106.3
Henry	12	72.5	10	51.0	22	60.5	22	119.6	18	105.1
Highland	23	91.2	17	58.8	41	72.8	30	109.8	22	86.4
Hocking	17	92.2	11	53.1	28	70.9	23	119.7	15	71.0
Holmes	11	54.0	9	39.3	20	46.3	17	73.4	17	81.1
Huron	25	78.6	22	56.2	47	65.6	44	126.7	32	90.0
Jackson	22	117.6	17	80.1	39	96.7	21	101.0	18	90.8
Jefferson	44	95.6	37	66.7	81	79.6	61	127.9	42	81.6
Knox	31	86.0	23	56.3	54	68.8	49	129.1	44	115.0
Lake	104	73.4	113	63.7	216	67.2	217	135.0	143	92.8

[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-3 cont.

Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by County and Sex in Ohio, 2012-2016[1,2]

	All Sites/Types						Colon & Rectum					
	Male		Female		Total		Male		Female		Total	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Ohio	32,328	500.7	32,530	437.5	64,858	461.9	3,011	47.6	2,809	36.5	5,820	41.5
Lawrence	195	526.9	192	466.0	388	491.0	19	52.4	17	41.1	36	46.3
Licking	485	513.9	485	452.3	970	476.3	43	48.1	39	36.2	82	41.9
Logan	143	520.9	140	474.5	282	492.9	15	57.7	12	37.8	27	47.2
Lorain	913	515.7	864	430.4	1,777	464.8	88	49.7	67	31.7	155	40.0
Lucas	1,208	522.9	1,168	430.1	2,375	467.6	122	55.2	100	35.3	222	43.8
Madison	123	510.2	104	414.7	226	451.2	10	42.3	8	30.6	18	36.3
Mahoning	708	478.3	716	406.7	1,424	434.5	72	50.4	78	41.7	150	45.5
Marion	194	488.8	191	471.6	385	467.6	25	64.4	21	47.7	46	55.4
Medina	520	511.6	502	448.6	1,022	474.6	42	42.7	40	35.2	82	38.4
Meigs	74	487.3	73	467.4	147	471.6	8	56.9	7	38.6	15	47.5
Mercer	127	512.4	109	416.4	236	457.6	11	47.9	12	44.5	24	45.6
Miami	281	451.5	304	439.5	585	440.2	27	43.8	27	37.2	53	40.2
Monroe	51	471.9	37	358.2	88	413.8	4	39.9	3	28.0	7	34.3
Montgomery	1,501	498.1	1,614	446.1	3,115	466.0	125	42.0	136	35.5	261	38.5
Morgan	46	453.5	46	442.8	92	443.6	6	55.8	4	34.1	10	44.6
Morrow	114	550.4	105	472.3	218	505.0	10	49.6	10	45.4	21	48.3
Muskingum	267	540.4	280	492.0	547	509.6	24	50.1	23	39.6	47	44.3
Noble	38	293.9	36	410.5	74	332.5	4	24.3	4	33.7	8	28.8
Ottawa	165	520.8	148	457.6	313	486.3	16	49.9	18	50.7	34	51.0
Paulding	59	503.5	48	400.1	107	445.0	5	44.8	4	29.1	9	36.2
Perry	101	495.8	99	455.4	200	471.1	10	51.9	8	36.0	18	43.3
Pickaway	158	500.4	155	464.6	313	474.2	13	42.8	14	39.7	27	40.9
Pike	90	533.5	89	489.0	179	506.3	7	46.2	7	37.0	14	40.3
Portage	454	512.4	429	443.7	882	473.4	37	44.1	37	37.7	75	40.7
Preble	132	525.9	121	433.8	254	473.7	15	60.2	11	38.7	26	48.6
Putnam	92	466.0	87	410.8	179	431.3	10	48.2	7	29.8	16	38.7
Richland	389	512.8	363	431.1	751	461.8	40	56.0	34	38.3	74	46.3
Ross	235	519.8	218	456.8	453	478.2	21	48.7	17	35.9	38	41.6
Sandusky	187	516.6	181	445.7	368	474.7	21	59.4	18	41.0	39	49.9
Scioto	243	539.2	234	460.6	478	490.7	21	47.9	19	33.5	40	39.8
Seneca	161	490.2	147	408.2	308	440.7	18	52.7	16	41.2	34	47.1
Shelby	123	450.4	115	385.2	239	411.6	10	38.0	12	36.9	22	37.4
Stark	1,152	504.3	1,082	414.8	2,234	451.1	91	40.9	82	30.5	173	35.2
Summit	1,514	486.2	1,553	427.3	3,068	449.9	120	38.8	128	33.2	248	35.7
Trumbull	688	518.5	638	419.1	1,326	459.5	65	50.9	65	40.3	129	44.8
Tuscarawas	287	499.2	257	402.1	544	442.1	25	42.4	22	34.2	47	38.0
Union	128	523.7	136	467.1	264	490.9	9	42.8	9	30.0	18	35.4
Van Wert	86	500.1	81	415.1	167	449.7	11	65.6	11	54.1	22	58.9
Vinton	48	615.5	43	506.2	91	555.5	5	65.6	3	35.2	8	48.3
Warren	532	479.8	549	435.8	1,081	450.6	44	40.1	39	30.6	83	35.0
Washington	217	540.4	210	473.8	427	500.4	22	55.2	20	44.1	41	49.3
Wayne	308	457.1	305	419.7	613	434.0	28	41.4	27	35.6	55	38.6
Williams	103	447.9	94	368.5	197	402.3	12	51.7	8	31.5	20	40.7
Wood	322	496.0	311	417.3	633	451.1	35	56.5	29	37.7	64	46.7
Wyandot	67	484.8	65	424.7	131	450.2	7	49.7	9	55.4	16	53.3

[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-3 cont.

Average Annual Number of New Invasive Cancer Cases and Age-adjusted Incidence Rates by County and Sex in Ohio, 2012-2016[1,2]

	Lung & Bronchus						Breast		Prostate	
	Male		Female		Total		Female		Male	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Ohio	5,218	81.1	4,640	59.1	9,858	68.5	9,359	127.4	7,158	103.0
Lawrence	37	94.6	29	62.7	66	77.1	50	123.3	31	77.5
Licking	85	92.5	69	60.4	154	73.9	142	132.6	100	96.2
Logan	24	89.1	20	59.9	43	72.6	36	119.7	27	88.4
Lorain	138	78.6	128	60.6	266	68.2	251	127.1	219	113.7
Lucas	180	79.4	168	59.8	348	68.0	338	125.8	284	114.0
Madison	21	88.6	17	66.1	38	76.5	25	97.7	22	86.5
Mahoning	116	78.9	94	50.8	210	62.4	207	120.4	151	93.6
Marion	41	102.0	28	62.7	69	80.4	46	116.0	31	72.5
Medina	70	69.8	60	51.8	130	59.6	147	131.8	137	122.6
Meigs	14	89.8	12	71.0	25	78.1	18	118.0	13	79.9
Mercer	19	77.7	13	46.5	32	60.5	28	108.2	34	130.1
Miami	45	71.4	43	58.3	88	63.3	87	126.4	58	84.7
Monroe	8	72.6	6	50.3	14	61.5	9	90.4	12	103.3
Montgomery	259	85.2	251	65.2	509	73.9	476	134.5	317	98.4
Morgan	8	79.9	8	72.1	16	75.6	12	126.1	8	70.5
Morrow	24	115.1	17	72.6	40	91.9	30	133.5	23	106.9
Muskingum	53	107.1	46	73.8	99	88.3	77	134.5	44	81.8
Noble	8	53.1	6	63.0	14	53.5	8	97.2	6	33.3
Ottawa	22	67.4	20	56.5	42	61.5	42	124.2	36	100.0
Paulding	13	109.6	6	46.7	20	77.2	13	109.4	12	90.0
Perry	24	117.1	15	64.8	39	87.8	29	130.4	17	71.2
Pickaway	29	91.4	25	71.7	54	80.6	44	129.5	27	80.2
Pike	20	115.4	15	76.1	35	94.6	25	138.1	16	84.0
Portage	66	73.4	63	61.4	129	67.0	120	124.4	101	106.1
Preble	23	89.9	22	72.8	45	80.4	29	105.0	24	87.7
Putnam	14	73.3	7	32.5	21	50.1	29	133.0	24	111.6
Richland	67	86.9	53	58.8	120	70.7	100	119.3	78	96.5
Ross	53	119.3	34	65.5	87	89.3	60	122.3	37	79.8
Sandusky	31	83.7	25	58.2	56	70.2	56	136.5	36	88.7
Scioto	54	117.4	34	62.9	88	86.7	64	124.7	46	94.5
Seneca	27	84.1	22	56.4	49	68.6	43	122.6	29	81.9
Shelby	21	73.9	16	50.2	37	62.0	30	98.2	25	86.4
Stark	189	80.5	161	57.0	350	67.2	312	121.3	276	113.1
Summit	228	74.1	215	55.8	443	63.4	466	130.2	359	106.0
Trumbull	125	93.2	101	62.7	226	75.8	171	113.7	147	102.2
Tuscarawas	47	80.9	36	51.0	83	63.9	74	114.8	72	118.5
Union	20	86.3	17	61.5	37	72.3	37	125.7	28	106.3
Van Wert	14	79.5	9	45.4	23	59.9	23	120.2	18	100.2
Vinton	10	123.9	10	113.1	20	116.8	9	105.3	7	81.8
Warren	79	75.6	72	56.6	151	64.7	178	138.8	116	96.6
Washington	43	100.0	34	71.4	77	84.2	58	135.2	34	80.2
Wayne	42	63.3	37	48.0	79	54.6	88	123.8	70	95.6
Williams	19	82.5	15	55.0	34	67.5	30	117.6	17	68.7
Wood	44	68.2	36	46.6	80	56.2	90	124.3	70	99.3
Wyandot	14	98.3	8	51.3	22	72.7	16	102.9	12	77.2

[1] Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-4

Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by County and Sex in Ohio, 2012-2016[1,2]

	All Sites/Types						Colon & Rectum					
	Male		Female		Total		Male		Female		Total	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Ohio	13,182	212.5	12,090	151.5	25,272	176.8	1,160	18.8	1,074	13.2	2,234	15.7
Adams	42	261.4	34	176.3	76	212.3	6	37.0	4	20.1	9	27.3
Allen	135	229.9	117	159.0	251	189.0	8	13.8	10	14.5	18	13.9
Ashland	65	206.9	56	145.0	121	171.7	8	25.9	7	18.2	15	21.3
Ashtabula	141	236.9	109	153.4	250	189.2	15	24.7	8	10.6	23	17.0
Athens	53	203.5	50	155.2	104	174.4	5	22.2	6	18.7	12	20.5
Auglaize	55	197.9	51	155.4	106	174.1	5	17.7	6	15.6	11	17.1
Belmont	96	217.9	86	152.6	181	179.3	9	20.7	9	14.9	18	17.4
Brown	67	248.2	54	184.1	121	214.0	6	23.3	6	22.0	12	22.8
Butler	366	209.0	340	154.1	706	176.9	32	18.0	26	11.7	58	14.6
Carroll	41	208.2	26	123.5	67	162.8	4	22.1	2	8.7	6	15.4
Champaign	50	222.5	43	161.6	93	187.6	5	24.8	4	13.7	9	18.6
Clark	176	215.2	174	172.2	350	190.6	14	17.6	18	16.9	32	17.3
Clermont	204	197.6	192	151.5	395	171.5	17	15.6	12	9.7	29	12.5
Clinton	54	243.5	43	150.7	97	189.9	4	17.1	4	13.6	7	15.4
Columbiana	136	202.6	126	157.1	263	175.3	10	15.7	12	15.1	23	15.2
Coshocton	48	215.4	44	166.0	92	188.1	5	20.1	4	18.1	9	19.1
Crawford	63	228.8	58	166.0	121	193.9	5	18.5	8	21.9	13	20.7
Cuyahoga	1,518	216.1	1,504	154.6	3,023	179.0	128	18.1	132	13.0	259	15.2
Darke	73	226.2	62	158.7	135	187.2	6	18.1	8	20.5	13	19.4
Defiance	42	187.3	44	167.4	87	175.0	3	13.7	5	20.0	9	17.3
Delaware	131	168.7	122	122.3	252	141.7	12	14.8	11	10.3	23	12.2
Erie	110	215.0	90	150.5	200	180.1	11	21.5	10	16.5	21	19.0
Fairfield	146	193.5	130	138.1	276	161.4	14	18.4	12	12.8	25	15.3
Fayette	40	246.5	34	167.5	74	202.1	4	23.0	3	13.5	6	17.2
Franklin	971	202.0	968	149.5	1,939	170.6	87	18.0	77	11.9	165	14.4
Fulton	51	213.8	46	155.5	96	179.8	6	26.2	5	16.9	11	20.8
Gallia	49	277.5	34	162.2	84	212.5	4	20.4	3	14.1	7	17.0
Geauga	96	167.8	88	122.0	184	141.6	8	14.5	6	8.0	14	11.0
Greene	155	176.9	158	144.0	314	157.7	14	14.6	15	13.3	29	14.3
Guernsey	64	258.8	51	170.5	115	210.2	6	24.8	6	20.8	12	22.2
Hamilton	836	213.1	825	154.5	1,661	177.8	77	19.7	73	13.4	150	16.0
Hancock	88	211.0	81	154.3	168	179.2	8	20.0	7	13.5	15	16.7
Hardin	40	255.1	36	174.7	75	208.1	4	22.8	3	13.6	7	18.4
Harrison	26	249.0	22	166.8	48	201.4	2	17.2	2	15.3	4	15.5
Henry	32	194.8	26	125.4	59	155.1	3	19.5	3	15.1	6	17.3
Highland	58	233.7	45	152.3	104	186.9	5	22.8	4	12.7	9	17.0
Hocking	43	245.2	32	156.7	74	196.7	3	17.1	4	20.0	7	18.7
Holmes	36	185.8	34	146.9	69	163.8	5	26.0	3	14.1	8	19.3
Huron	73	233.1	61	158.1	134	189.7	7	22.6	5	14.2	12	18.2
Jackson	46	269.6	34	150.9	81	200.5	4	25.2	2	7.3	6	14.8
Jefferson	103	229.2	91	158.3	194	188.1	11	26.6	7	11.5	18	18.0
Knox	69	198.0	61	141.2	129	164.3	5	15.5	7	17.5	13	16.7
Lake	299	218.6	267	147.1	566	175.8	29	21.4	22	11.9	51	15.9

[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-4 cont.

Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by County and Sex in Ohio, 2012-2016[1,2]

	Lung & Bronchus						Breast		Prostate	
	Male		Female		Total		Female		Male	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Ohio	3,968	62.6	3,265	41.0	7,234	50.3	1,755	22.4	1,094	19.0
Adams	16	96.8	10	49.3	26	69.9	5	25.2	2	11.9
Allen	45	74.4	31	41.3	76	56.2	20	28.4	11	20.4
Ashland	19	56.9	14	39.4	33	47.4	8	22.4	4	15.0
Ashtabula	44	72.3	33	45.8	77	57.1	14	20.6	11	19.3
Athens	18	63.4	14	42.2	32	51.3	8	24.3	4	16.8
Auglaize	16	55.8	12	38.8	28	46.2	9	25.7	4	14.7
Belmont	27	59.7	24	42.6	51	49.9	12	23.7	7	17.6
Brown	25	91.4	18	58.3	43	73.9	5	20.0	3	12.4
Butler	114	63.8	103	46.9	217	54.0	48	21.6	30	19.2
Carroll	14	71.2	6	25.9	20	47.4	3	15.1	2	13.6
Champaign	16	67.9	12	44.2	27	55.1	7	27.0	2	9.2
Clark	53	63.9	48	46.7	102	54.2	26	25.9	13	17.4
Clermont	66	61.3	66	51.9	132	56.0	27	21.6	11	12.0
Clinton	17	73.4	14	47.4	31	58.4	5	18.0	5	23.7
Columbiana	47	67.0	33	40.2	79	51.6	16	20.3	11	16.4
Coshocton	14	60.1	12	43.4	26	51.4	4	15.7	3	14.9
Crawford	21	75.5	16	47.9	38	59.5	7	20.3	4	14.0
Cuyahoga	416	58.3	374	39.0	789	47.0	237	25.1	160	23.5
Darke	22	69.5	15	37.5	37	51.5	8	20.4	6	20.3
Defiance	13	59.6	12	44.6	26	51.1	6	23.5	5	22.0
Delaware	39	49.4	28	29.0	67	37.7	22	21.3	10	15.1
Erie	32	62.0	23	37.6	56	49.0	14	24.2	9	17.5
Fairfield	45	58.3	36	38.2	82	47.1	21	22.3	10	15.3
Fayette	17	98.9	9	43.4	25	68.1	6	29.2	1	10.9
Franklin	280	58.1	261	40.9	541	48.2	152	23.6	85	19.9
Fulton	13	54.0	9	29.2	22	39.9	5	17.0	5	21.7
Gallia	19	103.8	9	38.3	28	67.1	4	18.6	2	13.4
Geauga	23	37.0	19	26.1	42	30.9	15	19.8	12	23.0
Greene	40	44.1	43	38.6	83	41.0	23	21.2	14	17.8
Guernsey	23	88.0	15	49.1	37	67.4	5	18.1	3	16.4
Hamilton	246	61.4	228	43.3	474	50.9	129	24.3	81	22.4
Hancock	25	57.8	19	36.8	43	46.1	13	24.8	7	18.2
Hardin	14	87.9	10	47.5	24	63.9	5	26.6	2	10.8
Harrison	9	81.1	6	44.9	15	60.3	4	29.9	2	18.3
Henry	10	58.2	7	36.3	17	46.1	3	13.2	2	13.4
Highland	19	76.0	14	47.4	33	59.6	7	25.0	5	23.0
Hocking	15	85.4	9	45.5	24	63.1	4	19.4	4	23.7
Holmes	6	33.3	7	31.4	13	32.3	6	24.3	5	28.1
Huron	21	65.4	18	47.1	39	54.8	6	17.0	8	26.6
Jackson	17	95.9	11	49.9	28	69.4	4	19.3	3	22.2
Jefferson	32	70.7	27	46.9	59	57.4	10	17.5	6	14.1
Knox	25	67.6	15	36.3	40	50.4	9	19.8	7	21.9
Lake	87	63.0	75	40.9	162	49.8	43	24.8	22	16.6

[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-4 cont.

Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by County and Sex in Ohio, 2012-2016[1,2]

	All Sites/Types						Colon & Rectum					
	Male		Female		Total		Male		Female		Total	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Ohio	13,182	212.5	12,090	151.5	25,272	176.8	1,160	18.8	1,074	13.2	2,234	15.7
Lawrence	95	265.7	82	184.0	177	220.6	10	27.5	6	13.3	16	19.8
Licking	192	221.1	172	155.4	364	182.0	15	17.5	14	13.0	29	14.9
Logan	67	260.3	50	158.8	117	204.4	6	24.7	4	12.0	10	17.7
Lorain	358	212.9	319	148.1	678	173.9	34	20.6	27	12.0	61	15.7
Lucas	506	229.5	466	161.2	972	189.6	49	22.3	48	16.3	96	18.8
Madison	48	212.4	44	169.5	92	188.3	5	19.3	3	14.0	8	16.5
Mahoning	324	218.5	300	150.4	624	178.2	29	19.6	28	13.6	57	16.1
Marion	85	225.1	77	171.4	162	193.8	7	19.4	6	13.0	13	15.9
Medina	171	180.7	156	134.5	328	153.8	15	14.7	12	10.2	27	12.5
Meigs	35	237.8	30	177.6	65	204.3	2	15.2	4	22.8	6	19.2
Mercer	52	214.9	45	156.7	97	183.3	6	23.0	4	14.0	10	17.9
Miami	119	199.3	118	159.5	237	175.4	8	13.4	10	13.6	19	13.6
Monroe	20	189.3	17	141.3	36	162.9	1	11.1	2	11.6	3	11.7
Montgomery	634	214.8	606	153.3	1,240	178.8	52	17.7	46	10.9	99	13.9
Morgan	20	205.9	20	176.9	41	187.7	1	14.0	2	20.2	4	16.9
Morrow	42	215.4	32	139.1	74	173.6	4	21.3	2	10.3	7	15.9
Muskingum	119	250.0	103	167.7	222	201.3	9	19.8	7	11.1	17	14.9
Noble	18	137.8	12	119.0	30	118.7	1	10.1	<1	*	2	7.2
Ottawa	65	215.3	55	154.8	120	183.7	5	16.5	7	18.3	12	17.8
Paulding	25	220.1	21	149.7	46	182.9	2	14.2	2	12.0	3	13.5
Perry	46	238.9	38	169.0	85	198.5	4	21.2	3	14.3	7	17.5
Pickaway	72	239.9	54	154.1	126	192.2	5	16.7	4	12.0	9	14.2
Pike	36	219.8	30	154.8	67	182.6	3	19.9	2	9.7	5	14.7
Portage	176	208.0	154	153.9	330	177.9	16	19.9	15	15.7	31	17.4
Preble	54	224.7	47	158.2	101	186.2	6	23.8	4	11.9	9	17.2
Putnam	31	161.6	28	118.7	59	136.5	3	15.3	3	13.3	6	14.3
Richland	167	222.5	136	146.6	303	178.4	12	16.1	10	10.4	22	13.2
Ross	102	240.0	82	166.2	184	197.0	8	17.7	7	14.5	15	15.9
Sandusky	78	224.2	72	165.2	150	190.0	8	23.3	7	15.5	15	18.9
Scioto	112	251.0	86	153.8	197	195.2	11	24.9	7	12.0	18	17.7
Seneca	68	213.7	60	147.2	128	175.0	6	19.9	9	20.5	15	19.8
Shelby	61	235.3	48	151.7	109	188.7	5	19.3	6	19.1	11	19.4
Stark	458	204.3	420	145.2	878	169.6	39	17.4	34	11.7	73	14.2
Summit	631	209.5	576	146.4	1,207	172.4	58	19.2	49	11.9	106	15.0
Trumbull	283	215.0	246	147.3	529	175.2	24	18.7	24	14.2	48	16.0
Tuscarawas	116	206.1	101	141.4	217	168.4	9	15.5	13	16.9	21	16.3
Union	45	205.3	40	145.8	85	171.0	4	19.3	3	12.1	7	14.9
Van Wert	36	208.6	36	165.9	72	183.2	4	22.6	3	15.3	7	18.7
Vinton	18	232.3	15	175.8	33	202.2	<1	*	1	17.0	2	12.5
Warren	193	191.2	176	138.0	369	160.0	12	11.6	11	8.9	23	10.1
Washington	84	211.4	78	160.8	163	181.7	8	20.5	8	17.8	16	18.6
Wayne	119	184.9	117	146.8	236	162.7	9	14.2	13	15.8	22	15.0
Williams	53	238.1	39	140.4	92	181.7	6	28.5	3	9.1	9	17.5
Wood	128	208.1	111	140.0	238	169.3	15	25.6	11	14.3	27	19.3
Wyandot	32	240.9	25	149.4	57	187.4	3	23.9	3	14.0	6	18.2

[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-4 cont.

Average Annual Number of Cancer Deaths and Age-adjusted Mortality Rates by County and Sex in Ohio, 2012-2016[1,2]

	Lung & Bronchus						Breast		Prostate	
	Male		Female		Total		Female		Male	
	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
Ohio	3,968	62.6	3,265	41.0	7,234	50.3	1,755	22.4	1,094	19.0
Lawrence	30	82.3	24	52.3	55	65.7	12	28.8	5	16.2
Licking	59	65.2	53	46.9	112	54.5	24	21.4	16	20.9
Logan	21	78.7	15	47.5	36	62.0	7	24.1	4	14.7
Lorain	112	65.0	94	44.3	206	53.0	41	19.5	31	19.6
Lucas	136	60.8	127	44.0	263	51.2	61	21.4	44	21.7
Madison	15	64.7	12	44.7	27	54.3	6	24.7	3	17.1
Mahoning	100	67.4	72	38.0	172	50.1	43	21.4	26	17.6
Marion	31	76.6	21	46.3	52	60.0	9	21.2	7	21.1
Medina	47	47.6	37	31.6	84	38.4	22	18.7	16	18.5
Meigs	12	78.0	8	49.1	20	61.2	4	25.1	3	21.4
Mercer	14	55.7	9	31.5	23	42.1	6	21.1	5	18.8
Miami	35	57.3	35	46.8	70	50.6	15	21.7	10	18.0
Monroe	5	51.5	4	33.5	9	41.4	3	22.4	1	9.9
Montgomery	190	63.5	166	42.5	356	51.6	91	23.8	57	20.2
Morgan	6	54.3	6	50.4	11	52.9	3	21.9	1	13.5
Morrow	17	86.6	9	37.9	27	60.6	4	19.5	3	20.9
Muskingum	42	86.8	34	55.0	76	68.7	12	18.5	7	15.8
Noble	6	43.7	4	44.8	10	39.0	1	10.2	2	14.5
Ottawa	19	60.9	14	38.8	33	49.5	8	24.3	3	9.5
Paulding	8	71.5	5	37.8	14	53.7	3	23.8	1	13.0
Perry	18	91.7	11	45.8	29	65.5	4	15.7	2	17.9
Pickaway	25	79.4	18	48.3	43	63.0	7	18.9	3	13.2
Pike	13	72.1	10	49.8	22	60.0	4	20.4	2	11.1
Portage	50	57.1	44	43.3	94	49.5	22	21.8	12	15.3
Preble	16	59.9	14	46.0	29	52.0	7	24.9	4	20.7
Putnam	9	47.3	5	22.0	14	32.9	5	20.5	3	14.6
Richland	52	67.3	37	40.3	89	51.8	18	20.1	15	20.4
Ross	36	83.6	22	43.8	58	60.6	10	20.6	6	18.1
Sandusky	23	63.3	18	42.0	41	51.8	13	30.2	5	14.4
Scioto	40	87.7	27	48.0	66	65.1	10	19.5	7	16.8
Seneca	22	68.5	15	38.1	37	51.6	8	21.3	5	16.6
Shelby	18	64.9	14	43.5	32	54.0	7	23.4	5	23.3
Stark	139	60.0	112	38.6	251	47.9	57	20.3	38	17.4
Summit	177	58.3	147	37.9	325	46.5	81	20.9	52	18.1
Trumbull	93	68.9	65	39.2	158	51.9	33	20.1	24	19.2
Tuscarawas	40	72.0	24	33.6	64	50.2	18	25.9	9	16.3
Union	14	58.6	11	38.7	25	47.9	6	21.9	3	17.7
Van Wert	11	61.5	7	34.1	18	45.8	7	27.1	3	20.0
Vinton	6	72.2	6	64.9	12	68.3	2	18.6	<1	*
Warren	58	57.6	54	42.2	111	48.5	28	22.0	14	16.8
Washington	29	69.2	24	49.2	53	58.1	11	24.8	4	12.1
Wayne	33	48.5	28	34.6	60	40.6	14	18.3	11	17.8
Williams	14	63.3	10	36.1	24	47.8	5	15.7	5	24.4
Wood	37	58.6	25	31.3	62	43.0	15	19.9	10	17.0
Wyandot	11	83.0	5	27.9	16	52.0	4	26.9	3	21.0

[1] Source: Chronic Disease Epidemiology and Evaluation Section and the Bureau of Vital Statistics, Ohio Department of Health, 2019.
[2] Average annual rate per 100,000, age-adjusted to the 2000 U.S. standard population.

TABLE A-5

Percentage of New Cancer Cases by Site/Type and Stage at Diagnosis in Ohio, 2012-2016

Site/Type	*In Situ* Stage	Local Stage	Regional Stage	Distant Stage	Unstaged/ Missing
All Sites/Types	9%	40%	20%	22%	10%
Bladder	46%	35%	8%	5%	7%
Brain & Other CNS*	0%	69%	9%	2%	20%
Breast (Female)	18%	52%	23%	5%	2%
Cervix	0%	44%	37%	14%	5%
Colon & Rectum	4%	33%	34%	20%	10%
Esophagus	2%	16%	32%	35%	15%
Hodgkin Lymphoma	0%	11%	38%	47%	5%
Kidney & Renal Pelvis	2%	63%	17%	14%	5%
Larynx	6%	47%	28%	14%	6%
Leukemia	0%	0%	0%	96%	4%
Liver & Intrahepatic Bile Duct	0%	36%	26%	17%	22%
Lung & Bronchus	0%	20%	23%	48%	9%
Melanoma of the Skin	41%	42%	6%	3%	9%
Multiple Myeloma	0%	5%	0%	91%	4%
Non-Hodgkin Lymphoma	0%	23%	14%	52%	11%
Oral Cavity & Pharynx	2%	28%	49%	16%	5%
Ovary	1%	16%	22%	53%	8%
Pancreas	1%	10%	29%	44%	16%
Prostate	0%	71%	13%	6%	10%
Stomach	1%	28%	25%	30%	16%
Testis	0%	66%	19%	12%	3%
Thyroid	0%	74%	21%	3%	2%
Uterine Corpus & Uterine NOS**	0%	69%	19%	8%	4%

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

* Central Nervous System

** Not Otherwise Specified

TABLE A-6 American Cancer Society (ACS) and U.S. Preventive Services Task Force (USPSTF) Recommendations for the Early Detection of Cancer in Average Risk, Asymptomatic People*

		AMERICAN CANCER SOCIETY		U.S. PREVENTIVE SERVICES TASK FORCE	
Sex	Primary Site/Type	Age	Test or Procedure	Age	Test or Procedure
Female	Breast	40-44[1]	Women at average risk for breast cancer have a choice to start annual mammograms if they wish to do so.	40-49[2]	Women who place a higher value on the potential benefits than the potential harms may choose to begin screening mammography every 2 years.
		45-54[1]	Mammogram every year	50-74	Mammogram every 2 years
		55+[1]	Mammogram every 2 years or continue yearly screening	75+	Evidence is insufficient to assess the benefits and harms of screening.
	Cervix	21-29[3]	Pap test every 3 years. Human papillomavirus (HPV) testing should not be used in this age group unless it is needed after an abnormal Pap test result.	21-65[3,4]	Pap test every 3 years
		30-65[5]	Pap test and HPV test (called "co-testing") every 5 years, or Pap test alone every 3 years	30-65[4,6]	Pap test alone every 3 years, high-risk HPV testing alone every 5 years, or a combination of Pap and high-risk HPV testing every 5 years
Male	Prostate	50+[7]	Begin periodic discussions about prostate cancer screening with a healthcare provider.	55-69[7]	The decision to receive PSA-based screening should be an individual one.
Female and Male	Colon & Rectum	45-75[8]	**VISUAL EXAMS**[9] • Colonoscopy every 10 years • Computed tomography (CT) colonography (virtual colonoscopy) every 5 years • Flexible sigmoidoscopy every 5 years **STOOL-BASED TESTS** • Fecal immunochemical test (FIT) every year[10] • Guaiac-based fecal occult blood test (gFOBT) every year[10] • Multi-targeted stool DNA test (MT-sDNA) every 3 years	50-75[8]	Several different tests may be used to detect early stage colon and rectum cancer. Screening frequency depends on the test performed.
Female and Male	Lung & Bronchus (Note that those recommendations are for those at high risk).	55-74	Annual lung cancer screening with low-dose computed tomography (LDCT) in patients who are in good health, have at least a 30 pack-year smoking history and currently smoke or have quit within the past 15 years[11]	55-80	Annual screening with LDCT in patients who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years[12]

Source: Ohio Department of Health and The Ohio State University, 2019.

1 Women who are at high risk for breast cancer based on certain factors should be screened with magnetic resonance imaging (MRI) and a mammogram every year. Women at high risk include those with a personal history of breast cancer, a family history of breast cancer, a genetic mutation known to increase risk of breast cancer (such as BRCA) and those who had radiation therapy to the chest before 30.

2 The decision to start regular, biennial screening mammograms before 50 should be an individual one and should take into account the patient's values regarding the benefits and harms. Women with a parent, sibling or child with breast cancer are at higher risk for breast cancer and thus may benefit more from biennial screenings than average-risk women.

3 Screening should begin at 21.

4 Screening after a hysterectomy with removal of the cervix is not recommended among women who do not have a history of a high-grade precancerous lesion (*i.e.*, cervical intraepithelial neoplasia (CIN) grade 2 or 3) or cervical cancer.

5 Screening should no longver be performed in women older than 65 years who have had at least three consecutive Pap smears with negative results or at least two consecutive HPV tests with negative results and Pap smears within the past 10 years, with the most recent test being performed in the past five years. Screening should no longer be performed in women who have had a total hysterectomy.

6 Women older than 65 who have had adequate prior screenings and are not otherwise at high risk of cervical cancer should not be tested.

7 ACS recommends that men who have at least a 10-year life expectancy should have an opportunity to make an informed decision with their healthcare provider about whether to be screened for prostate cancer after receiving information about the potential benefits, risks and uncertainties associated with prostate cancer screening; prostate cancer screening should not occur without an informed decision-making process. Before deciding whether to be screened, the USPSTF recommends that men should have an opportunity to discuss the potential benefits and harms of screening and to incorporate their values and preferences in the decision.

8 The decision to screen for colon and rectum cancer in adults aged 76 to 85 years should be an individual one, taking into account the patient's overall health and prior screening history. Adults in this age group who have never been screened for colon and rectum cancer are more likely to benefit. Screening would be most appropriate among adults who 1) are healthy enough to undergo treatment if colon and rectum cancer is detected and 2) do not have comorbid conditions that would significantly limit their life expectancy. These recommendations don't apply to individuals with specific inherited syndromes (Lynch syndrome or familial adenomatous polyposis) or those with inflammatory bowel disease.

9 The tests that are designed to find both early cancer and polyps are preferred.

10 For FOBT or FIT to be a screening test, the take-home multiple-sample method should be used.

11 The patient should also meet the following conditions: Received counseling to quit smoking (if they are current smokers); have been told by their doctor about the possible benefits, limits and harms of screening with LDCT scans; and have a facility where they can go that has experience in lung cancer screening and treatment.

12 Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.

* This summary of recommendations is based on information available at: ACS website http://www.cancer.org/healthy/findcancerearly/cancerscreeningguidelines/american-cancer-society-guidelines-for-the-early-detection-of-cancer and USPSTF website http://www.uspreventiveservicestaskforce.org as of June 2019.

GLOSSARY

Age adjustment - A statistical method used to compare rates among groups of people with different age compositions. This method applies a standard age composition to the groups being compared to remove the effect of age. Rates in this publication are age-adjusted to the 2000 U.S. standard population.

Benign - Noncancerous. A condition categorized by abnormal cell division that has not invaded or metastasized and, in most cases, has not recurred.

Body Mass Index (BMI) - A number calculated from a person's weight and height that is an indicator of body fatness and is used to screen for weight categories that may lead to health problems. BMI is calculated the same way for children and adults, however, the criteria used to interpret the meaning of BMI are different. For children and teens, the CDC BMI-for-age growth charts account for changes in body fat with age and differences between girls and boys, and allow translation of BMI into a percentile for a child's sex and age. For adults, BMI categories are not dependent on sex or age.

Burden - Overall impact of cancer in a community.

Cancer - Uncontrolled abnormal cell growth, which may lead to invasion of surrounding tissues and spread to other parts of the body.

Carcinogen - Anything – chemical, physical, or viral – that causes cancer.

Carcinoma - A malignant tumor that begins in the lining layer of organs. At least 80% of all cancers are carcinomas.

Ethnicity - The heritage, nationality group, lineage, or country of birth of a person or his parents or ancestors before their arrival in the United States. People who identify their origin as Spanish, Hispanic or Latino may be of any race.

Incidence rate - The number of new cases of a disease that occur in a defined population per 100,000 during a specified period of time.

Invasive cancer - Cancer that has spread beyond the layer of cells where it first developed to involve adjacent tissues.

Lifetime risk - The probability that an individual, over the course of a lifetime, will develop or die from cancer.

Malignant - Cancerous. A condition characterized by abnormal cell division with the ability to invade, metastasize and recur.

Metastasis - The spread of cancer cells to other parts of the body through the lymph system or blood.

Morbidity - The number of people who have a disease.

Mortality rate - The number of deaths that occur in a defined population per 100,000 during a specified period of time.

Oncology - The branch of medicine concerned with the diagnosis and treatment of cancer.

Prevalence - The proportion of people with a certain disease or characteristic at a given time.

Primary cancer site - The tissue or organ where the cancer originated.

Rate - The frequency of an event in a defined population during a given period of time, often expressed per 100,000 people.

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.

Risk factor - Anything that increases a person's probability of getting a disease such as cancer. Risk factors can be lifestyle related, environmental, genetic (inherited) or a combination of these factors.

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.

Targeted therapy - Therapy that works by targeting the cancer's specific genes, proteins or the tissue environment that contributes to cancer growth and survival. These genes and proteins are found in cancer cells or in cells related to cancer growth, like blood vessel cells.

Tumor - An abnormal lump or mass of tissue. Tumors can be benign (noncancerous) or malignant (cancerous).

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DATA SOURCES

Estimated New Cancer Cases and Deaths, 2019

The national home office of the ACS publishes estimates of new cancer cases at the national level, which are projected using a spatio-temporal model and time series projection based on 2001-2015 incidence rates from 48 states and the District of Columbia that provided consent and met the quality standards of the North American Association of Central Cancer Registries (NAACCR). The method considers geography, sociodemographics, lifestyle factors, medical settings, cancer screening behaviors and expected delays in case reporting in the prediction model. The estimated numbers of U.S. and state-level cancer deaths are calculated by fitting 2002-2016 deaths from the National Center for Health Statistics (NCHS) to a statistical model and then using the most recent trend to forecast the number of deaths expected to occur in 2019.

Cancer Incidence and Mortality

Ohio cancer incidence data are from OCISS at ODH. Ohio cancer mortality data are from the Bureau of Vital Statistics at ODH and are based on the underlying cause of death. Incidence and mortality rates for the United States were published in the *SEER Cancer Statistics Review, 1975-2016*. Incidence rates in this publication are age-adjusted to the 2000 U.S. standard population to allow for comparisons across populations that have different age distributions.

Relative Survival

Five-year relative survival data presented in this report are from the SEER 18 areas for 2009-2015 based on follow-up of patients into 2016. Ohio five-year relative survival data were calculated using SEER*Stat software version 8.3.5 for Ohio cases diagnosed in 2009-2015 with a follow-up cut-off of December 2016.

Behavioral Risk Factor Surveillance System (BRFSS)

ODH, in conjunction with CDC, annually conducts the BRFSS through landline and cell phone interviews of randomly selected adults 18 and older to collect data regarding diseases/conditions, risk factors and health practices among Ohioans. To ensure that prevalence estimates are representative of Ohio's population, data from 2011-present were weighted by age, sex, race/ethnicity, geography, marital status, education, home ownership and telephone source using an iterative proportional fitting (raking) method. Data prior to 2011 were weighted by age and sex using a post-stratification method. Thus, BRFSS data for 2011-present should not be compared to data prior to 2011. Respondents who answered "don't know/not sure" or refused the question were excluded from the analyses for that question.

Ohio Youth Risk Behavior Survey (YRBS)/Youth Tobacco Survey

The Ohio YRBS/YTS, which was conducted by ODH under the direction of CDC, is a population-based survey of students in grades six through 12. The Ohio YRBS/YTS provides information on risk behaviors among young people to more effectively target and improve health programs.

Probability of Developing Cancer

Probabilities of developing cancer are calculated using DevCan (Probability of Developing Cancer Software) developed by NCI. These probabilities reflect the average experience of people in the United States (born free of cancer and living to 85) and do not take into account individual behaviors and risk factors. For example, the estimate of 1 man in 17 developing invasive lung and bronchus cancer in his lifetime underestimates the risk for smokers and overestimates the risk for nonsmokers. These probabilities are based on invasive cancers only and do not take into account *in situ* or non-reportable cancers.

Risk Factors and Populations with High Rates

The primary sources of risk factor information presented in this document were NCI (http://www.cancer.gov) and ACS (http://www.cancer.org).

The National Health and Nutrition Examination Survey (NHANES)

The NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States. The survey is unique in that it combines interviews and physical examinations. NHANES is a major program of the NCHS at CDC and has the responsibility for producing vital and health statistics for the nation.

Screening and Early Detection

The primary sources of screening and early detection information presented in this document were the ACS (http://www.cancer.org/healthy/findcancerearly/cancerscreeningguidelines/american-cancer-society-guidelines-for-the-early-detection-of-cancer) and the USPSTF (http://www.uspreventiveservicestaskforce.org/).

ADDITIONAL INFORMATION

More information on the methods used to generate the statistics for this report can be found at the following:

A. Zhu L, Pickle LW, Naishadham D, et al. Predicting U.S. and state-level cancer counts for the current calendar year: part II – evaluation of spatio-temporal projection methods for incidence. Cancer 2012; 118(4): 1100-9.

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C. Howlader N, Noone AM, Krapcho M, Miller D, Brest A, Yu M, Ruhl J, Tatalovich Z, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). *SEER Cancer Statistics Review, 1975-2016*, National Cancer Institute. Bethesda, MD, https://seer.cancer.gov/csr/1975_2016/, based on November 2018 SEER data submission, posted to the SEER web site, April 2019.

D. Chen HS, Portier K, Ghosh K, et al. Predicting U.S. and state-level counts for the current calendar year: part I – evaluation of temporal projection methods for mortality. *Cancer* 2012;118(4):1091-9.

E. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence — SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2017 Sub (1973-2015 varying) — Linked To County Attributes — Total U.S., 1969-2016 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2018, based on the November 2017 submission.

F. DevCan: Probability of Developing and Dying of Cancer Software, Version 6.7.6; Surveillance Research Program, Statistical Methodology and Applications, National Cancer Institute, 2018. http://surveillance.cancer.gov/devcan/.

Ohio Department of Health

The James
The Ohio State University
Comprehensive Cancer Center

Ohio Cancer Incidence Surveillance System

Ohio Partners for Cancer Control