

Incidence and Mortality

Cancers of the ovary (also known as ovarian cancer) made up 1.3 percent of newly diagnosed (incidence) cancer cases in Ohio reported to the Ohio Cancer Incidence Surveillance System (OCISS) from 2011 to 2015. An average of 834 cases of ovarian cancer were diagnosed annually in Ohio during this time period (Table 1). The average annual age-adjusted ovarian cancer incidence rate in Ohio was 11.4 cases per 100,000 females, compared to the national (SEER) incidence rate of 11.6 per 100,000 females. In Ohio in 2011-2015, the ovarian cancer incidence rate was highest among whites (11.7 per 100,000 females) and lowest among blacks (7.9 per 100,000 females). In Ohio and the United States, ovarian cancer incidence rates were more than five times higher for females 65 and older than those less than 65.

An average of 568 deaths from ovarian cancer occurred each year in Ohio in 2011-2015 (Table 1). Ohio's average annual age-adjusted ovarian cancer mortality rate was 7.3 per 100,000 females, compared to the U.S. mortality rate of 7.2 per 100,000 females. Similar to incidence, the mortality rate was higher for whites (7.5 deaths per 100,000 females) than blacks (5.4 per 100,000 females) and Asians/Pacific Islanders (3.5 per 100,000 females) in Ohio during this time period. Ovarian cancer mortality rates were about 13 times higher for females 65 and older than those less than 65 in both Ohio and the United States.

Key Findings and Populations at High Risk

- An average of 834 cases of ovarian cancer were diagnosed each year in Ohio in 2011-2015.
- The ovarian cancer incidence rate in Ohio was 11.4 per 100,000 females, compared to the national rate of 11.6 per 100,000 females in 2011-2015.
- In both Ohio and the United States, whites had the highest mortality rates of ovarian cancer, while Asians/Pacific Islanders had the lowest rates.
- Ovarian cancer was most frequently diagnosed among Ohio women aged 60 to 64.
- From 1996 to 2015, incidence rates of ovarian cancer in Ohio decreased 19 percent for whites and were variable for blacks. Mortality rates decreased 27 and 52 percent among whites and blacks, respectively.
- There was no clear geographic pattern of incidence rates of ovarian cancer by county in Ohio.
- Most ovarian cancers in Ohio (55.3 percent) were diagnosed at a distant stage, where the five-year relative survival probability for ovarian cancer is low (29.2 percent).
- The proportion of local stage diagnoses decreased in Ohio from 1996 to 2015, while the proportion of distant stage diagnoses increased 42 percent.

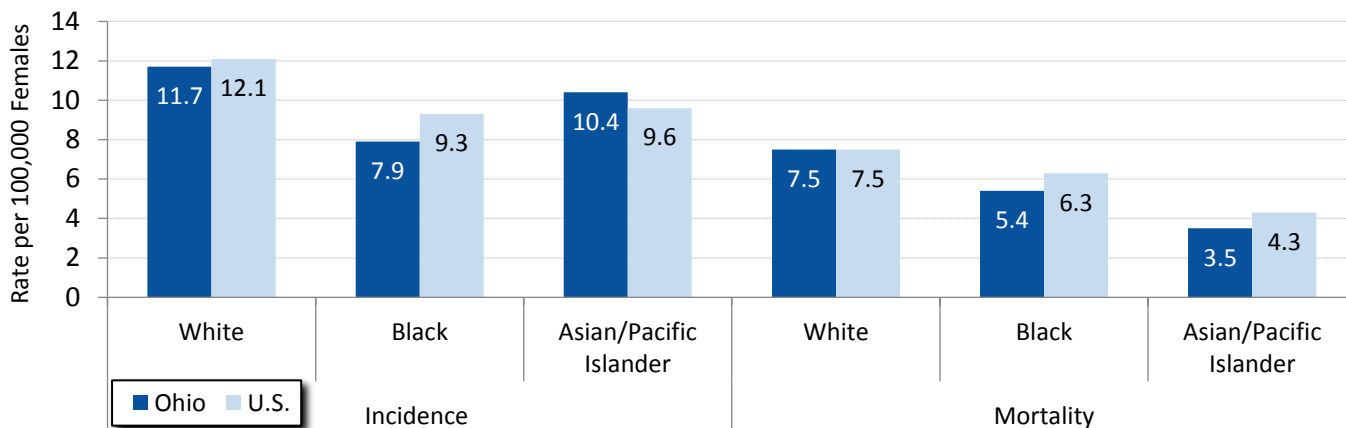
Table 1. Ovarian Cancer: Average Annual Number of Invasive Cancer Cases and Deaths and Age-adjusted Incidence and Mortality Rates per 100,000 Females by Race and Age Group, Ohio and the United States, 2011-2015

		Incidence			Mortality		
		Ohio Cases	Ohio Rate	U.S. Rate	Ohio Deaths	Ohio Rate	U.S. Rate
Total		834	11.4	11.6	568	7.3	7.2
Race	White	753	11.7	12.1	521	7.5	7.5
	Black	62	7.9	9.3	43	5.4	6.3
	Asian/Pacific Islander	11	10.4	9.6	4	3.5	4.3
Age Group	<65	443	7.3	7.3	197	2.9	2.8
	65+	391	39.6	41.0	371	37.1	37.4

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

Incidence and Mortality by Race

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

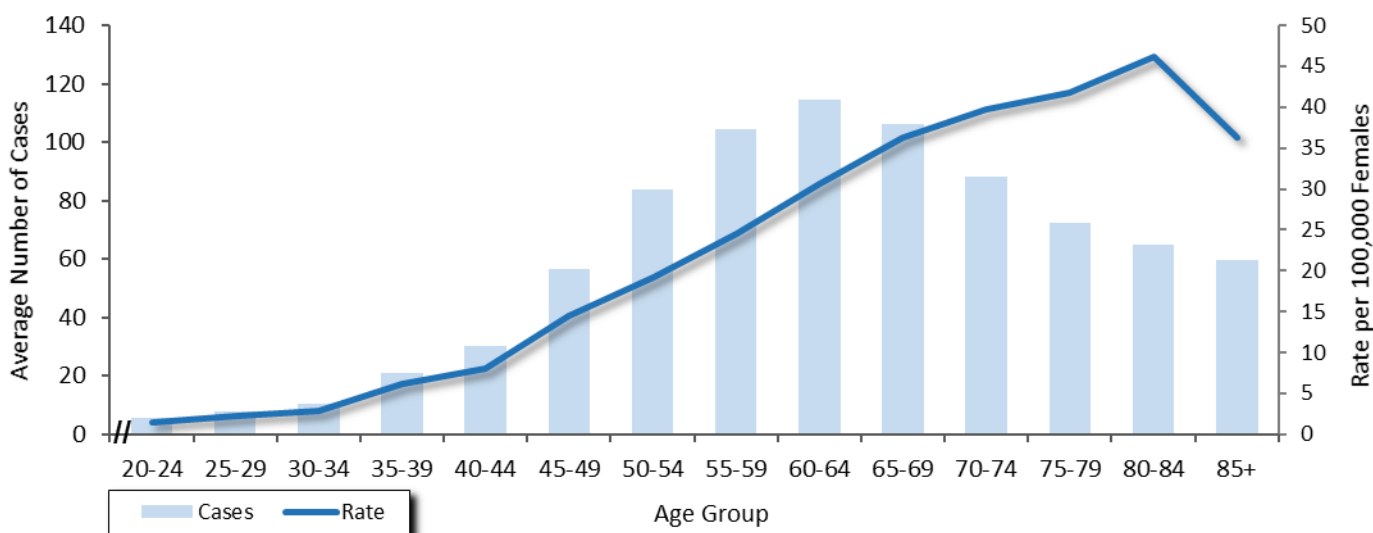


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018; Bureau of Vital Statistics, Ohio Department of Health, 2018; Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute, 2018.

Figure 1 shows that the 2011-2015 ovarian cancer age-adjusted incidence rate for whites was considerably higher than the rate for blacks and Asians/Pacific Islanders in both Ohio and the United States. The ovarian cancer age-adjusted mortality rate for whites was also higher than those of blacks and Asians/Pacific Islanders in both Ohio and the United States. The exact causes of racial disparities in ovarian cancer remain unclear.

Incidence by Age Group

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

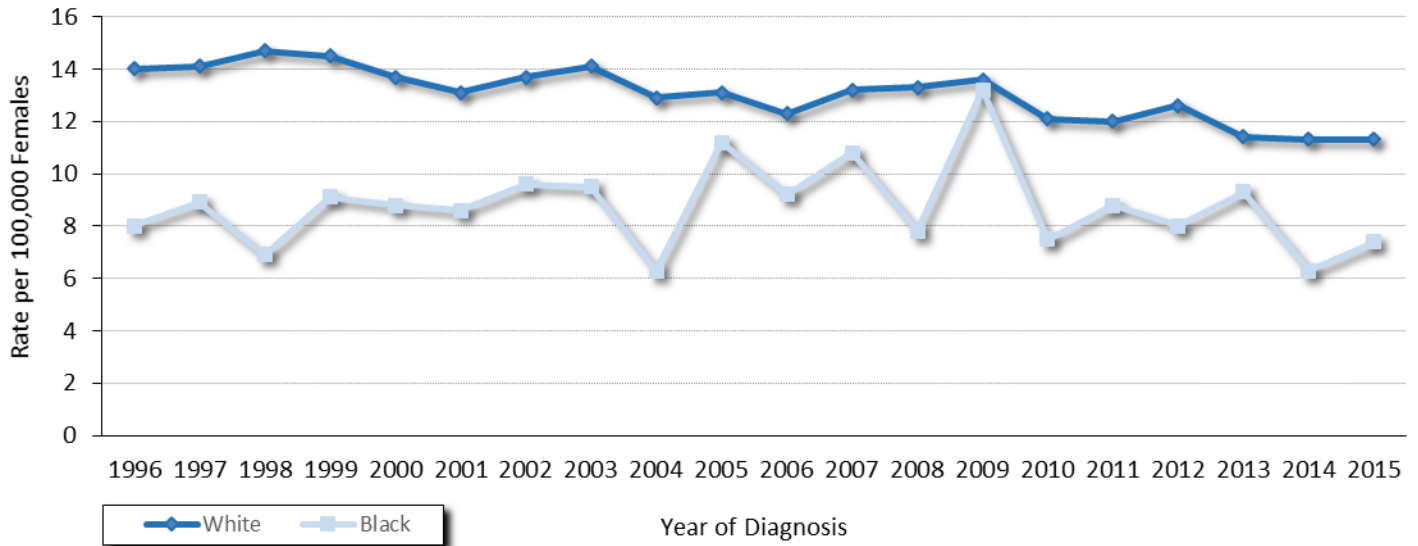


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.

Figure 2 shows that ovarian cancer was most frequently diagnosed among women in the 60-64 age group in Ohio during 2011-2015. Ovarian cancer age-specific incidence rates increased with advancing age group from ages 20-24 years to 80-84 years, followed by a decline for those age 85 and older.

Trends in Incidence and Mortality

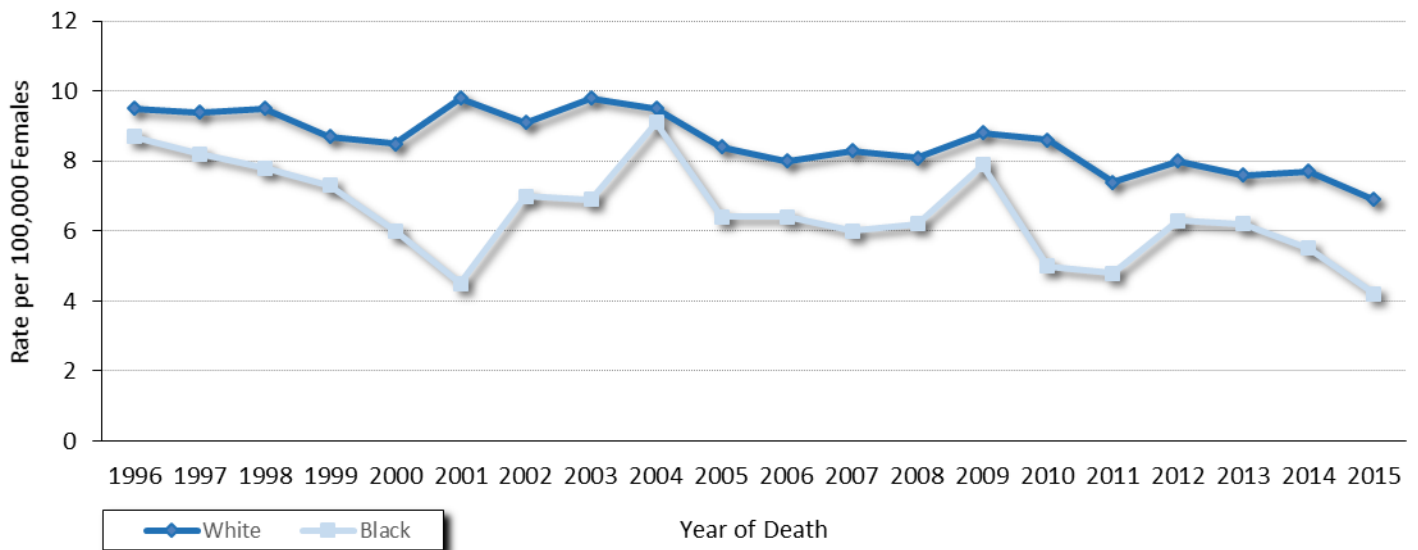
Figure 3. Ovarian Cancer: Trends in Age-adjusted Incidence Rates per 100,000 Females by Race, Ohio, 1996-2015



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

Figure 3 shows incidence rates of ovarian cancer in Ohio according to year of diagnosis (1996 to 2015) by race. Incidence rates among whites were greater than those of blacks for each year. From 1996 to 2015, ovarian cancer incidence rates decreased 19 percent among white women, but were variable over time among black women.

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



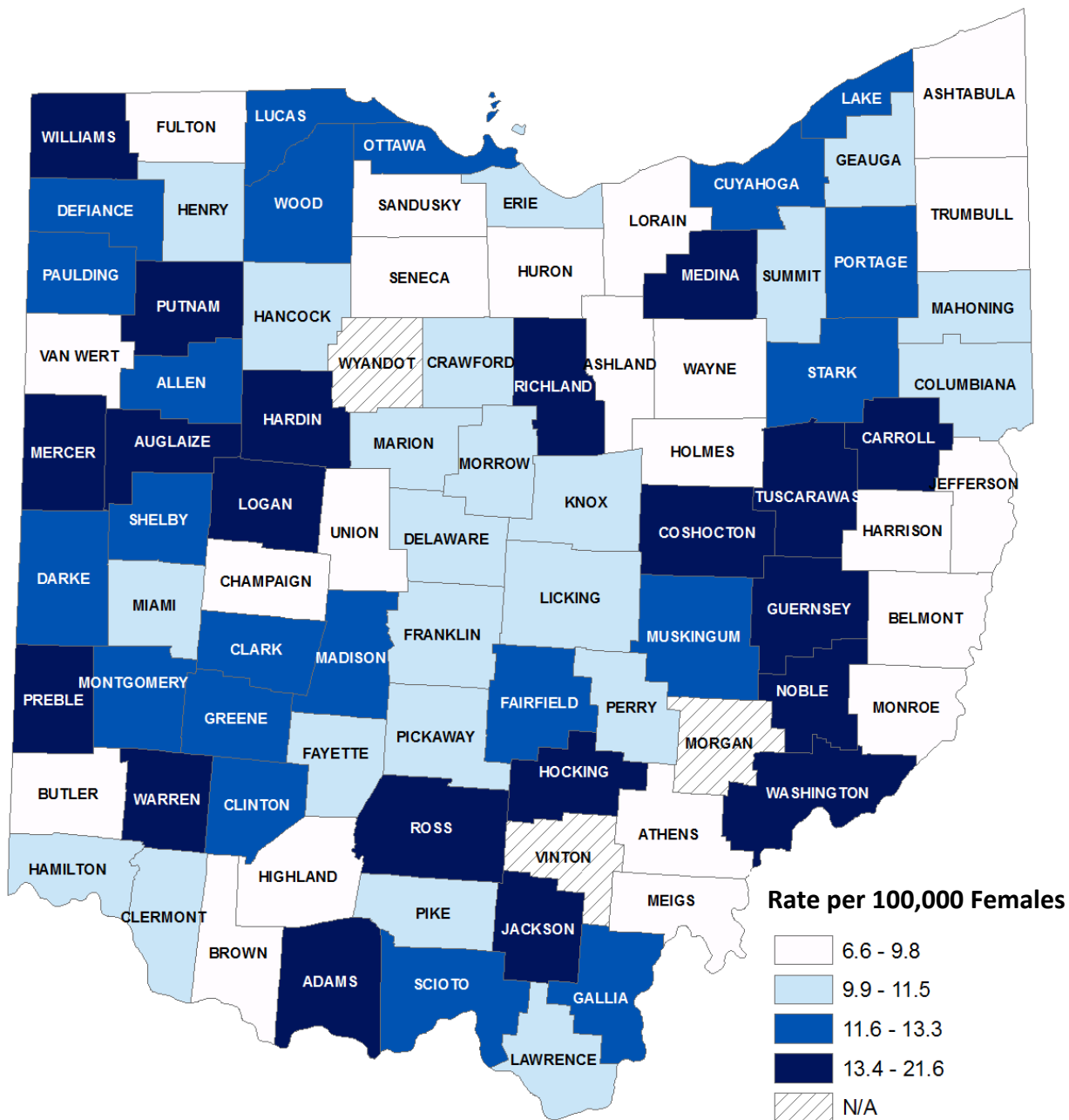
Source: Bureau of Vital Statistics, Ohio Department of Health, 2018.

Figure 4 shows trends in mortality rates of ovarian cancer according to year of death (1996 to 2015) by race. For each year of comparison, the rate for whites was greater than the rate for blacks. Comparing 1996 to 2015, the ovarian cancer mortality rate decreased 27 and 52 percent among whites and blacks, respectively, although the rates were variable among blacks during the time period.

Incidence by County

Figure 5 shows 2011-2015 average annual age-adjusted ovarian cancer incidence rates by county of residence. County-specific ovarian cancer incidence rates in Ohio ranged from 6.6 to 21.6 per 100,000 female residents, compared with Ohio's rate of 11.4 per 100,000 females. There was no clear geographic pattern of mortality rates by county. The following five counties, in decreasing order, had the highest incidence rates for this time period: Hardin, Hocking, Logan, Carroll and Noble.

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

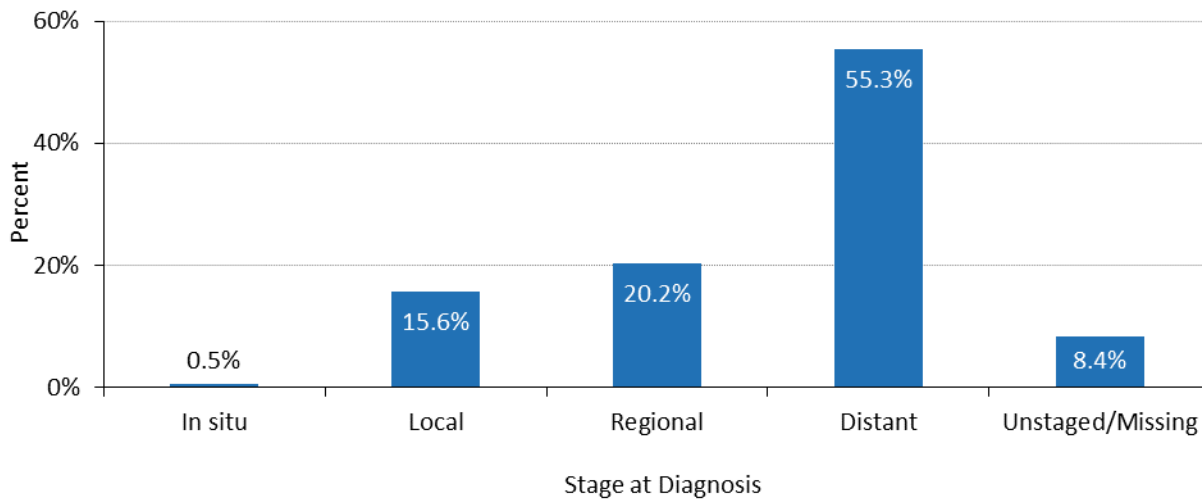


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.
 Each category represents approximately 25 percent of the 85 Ohio counties for which rates were calculated.
 N/A: Rate not calculated when the case count for 2011-2015 is less than five.

Stage at Diagnosis

Cancer stage at diagnosis, which refers to the extent or spread of a cancer in the body, is used to select appropriate treatment and is an important determinant of survival. The 2011-2015 Ohio data presented in Figure 6 show that the majority of ovarian cancers (55.3 percent) were diagnosed at a distant stage, where the five-year relative survival probability for ovarian cancer is only 29.2 percent.

Figure 6. Ovarian Cancer: Proportion of Cases (%) by Stage at Diagnosis, Ohio, 2011-2015

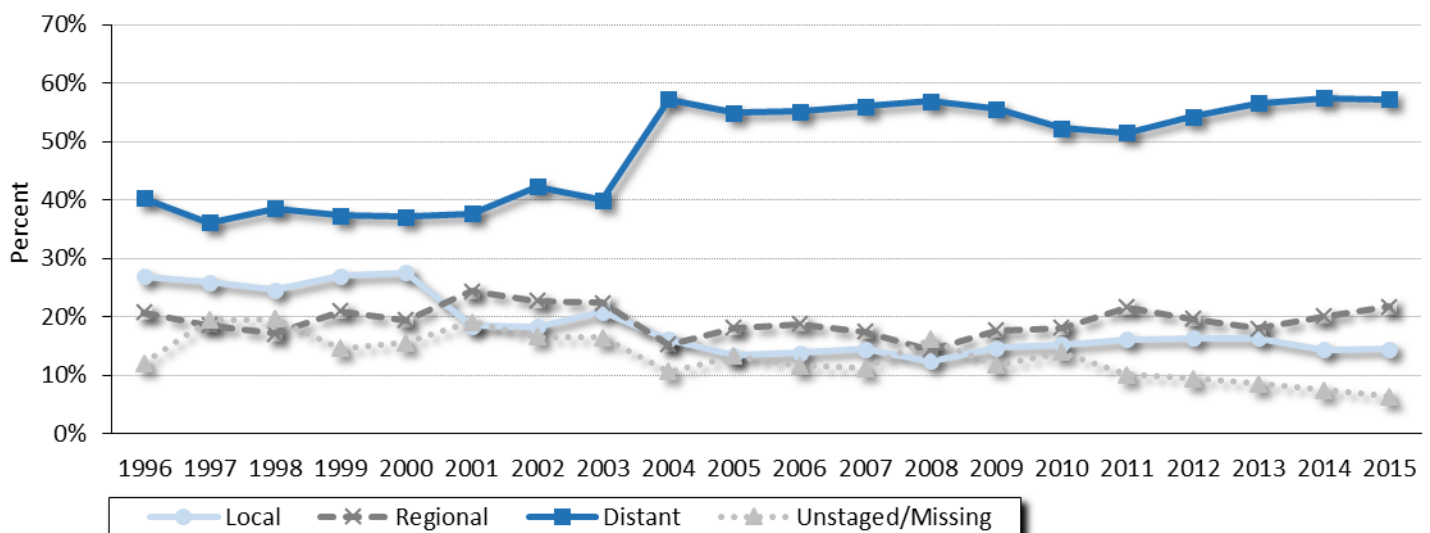


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2018.

Trends in Stage at Diagnosis

Figure 7 shows the distribution of stage at diagnosis of ovarian cancer according to year of diagnosis from 1996 to 2015. The proportion of local stage diagnoses decreased 46 percent in Ohio, from 26.9 percent in 1996 to 14.5 percent in 2015, while the proportion of distant stage diagnoses increased by 42 percent in Ohio during this 20-year period. The increase in distant stage tumors may be due to the 48 percent decrease in unstaged/missing stage tumors during this time period.

Figure 7. Ovarian Cancer: Trends in the Proportion of Cases (%) by Stage at Diagnosis and Year, Ohio, 1996-2015



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

Survival

Relative survival probability is the percentage of people who are alive at a designated time period (usually five years) after a diagnosis divided by the percentage expected to be alive in the absence of a diagnosis based on normal life expectancy. Table 2 shows the U.S. (SEER) five-year relative survival probability for ovarian cancer in 2008-2014 is 47.4 percent for all stages combined. Five-year relative survival probabilities are 92.3 percent at the local stage, 74.5 percent at the regional stage and 29.2 percent for distant-stage tumors. The five-year relative survival probability for all stages combined is higher for whites (47.4 percent) compared to blacks (38.5 percent). The overall five-year relative survival probability for women less than 65 years of age is 60.1 percent compared to 30.2 percent for those 65 and older.

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

	All Races			White			Black		
	All	<65	65+	All	<65	65+	All	<65	65+
All Stages	47.4%	60.1%	30.2%	47.4%	60.6%	31.0%	38.5%	50.0%	20.4%
Local	92.3%	94.0%	86.3%	93.2%	94.9%	87.3%	85.2%	88.3%	72.1%
Regional	74.5%	81.2%	59.1%	74.9%	82.0%	60.2%	63.0%	71.3%	41.1%
Distant	29.2%	37.6%	20.7%	29.6%	38.4%	21.3%	22.3%	29.3%	13.4%
Unstaged/Missing	24.8%	52.8%	10.8%	22.6%	49.7%	10.8%	31.6%	60.3%	9.3%

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

Types of Ovarian Cancer

Table 3: Ovarian Cancer: Average Annual Number and Proportion of Cases (%) by Histology, Ohio, 2011-2015

Histological Type	Ohio	
	Cases	Percent
Epithelial Ovarian Cancer	738	88.6%
Serous	383	46.0%
Endometrioid	70	8.4%
Mucinous	45	5.4%
Clear cell	42	5.0%
Other epithelial	198	23.8%
Non-epithelial Ovarian Cancer	42	5.1%
Germ cell	18	2.2%
Sex cord-stromal	23	2.7%
Other non-epithelial	1	0.1%
Unspecified	53	6.4%

Table 3 shows the distribution of ovarian cancer in Ohio by histologic grouping (type). Ovarian epithelial cancer is a disease in which malignant (cancer) cells form in the tissue covering the ovary. In Ohio, about 89 percent of ovarian cancers were epithelial tumors. The most common type of epithelial ovarian cancer is serous, followed by endometrioid, mucinous and clear cell tumors. Serous tumors are mostly high-grade serous carcinomas, which are characterized by involvement of both ovaries, aggressive behavior, late-stage diagnosis and low survival.

The two main types of non-epithelial ovarian cancer include germ cell tumors (2.2 percent), which form in the germ (egg) cells of the ovary, and sex cord-stromal tumors (2.7 percent), which form in the supportive tissue of the ovaries.

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

Excludes borderline tumors or histologies 8442, 8451, 8462, 8472 and 8473.

Risk Factors

Anything that increases your risk of getting a disease is called a risk factor. Having a risk factor does not mean that you will get cancer; not having risk factors doesn't mean that you will not get cancer. The following is a list of confirmed ovarian cancer risk factors:

- **Family History:** Women who have one first-degree relative (mother, daughter or sister) with a history of ovarian cancer have an increased risk of ovarian cancer. This risk is higher in women who have one first-degree relative and one second-degree relative (grandmother or aunt) with a history of ovarian cancer. Women who have two or more first-degree relatives with a history of ovarian cancer have an even greater risk. Women with a family history of breast cancer also have an increased risk of ovarian cancer.
- **Genetic Predisposition:** Inherited mutations, the majority from *BRCA1* and *BRCA2*, cause an increased lifetime risk of ovarian cancer. Hereditary ovarian cancer makes up about 20 percent of all cases of ovarian cancer. There are three hereditary patterns: ovarian cancer alone, ovarian and breast cancers, and ovarian and colon cancers.
- **Personal History of Cancer:** Women who have a personal history of breast cancer have a higher risk of ovarian cancer than women without this history.
- **Age:** Ovarian cancer risk increases with age. Approximately half of all ovarian cancers are diagnosed in women over the age of 65.
- **Menopausal Hormone Therapy:** Women who ever used estrogen by itself or estrogen combined with progesterone have an increased risk of ovarian cancer compared to never-users.
- **Never Pregnant:** Older women who have never been pregnant have an increased risk of ovarian cancer.

Signs and Symptoms

Ovarian cancer may not cause early signs or symptoms. When signs or symptoms do appear, the cancer is often advanced. Signs and symptoms may include the following:

- Pain, swelling, or a feeling of pressure in the abdomen or pelvis.
- Vaginal bleeding that is heavy or irregular, especially after menopause.
- Vaginal discharge that is clear, white, or colored with blood.
- A lump in the pelvic area.
- Gastrointestinal problems, such as gas, bloating, or constipation.

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.

Ovarian Cancer Screening

Currently, there is no recommended screening test for the early detection of ovarian cancer in average-risk women. Tests that examine the ovaries, pelvic area, blood and ovarian tissue are used to detect and diagnose ovarian tumors.

Technical Notes

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

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

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

Incidence: The number of cases diagnosed during a specified time period (e.g., 2011-2015). Ovarian cancer cases were defined as follows: International Classification of Diseases for Oncology, Third Edition (ICD-O-3), code C569.

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

Mortality: The number of deaths during a specified time period (e.g., 2011-2015). Ovarian cancer deaths were defined as follows: International Statistical Classification of Diseases and Related Health Problems, Ninth Edition (ICD-9), code 183 for 1996-1998 and International Statistical Classification of Diseases and Related Health Problems, Tenth Edition (ICD-10), codes C560-C569 for 1999-2015.

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

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

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

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

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

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

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

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

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

	Incidence		Mortality			Incidence		Mortality	
	Cases	Rate	Deaths	Rate		Cases	Rate	Deaths	Rate
Ohio	834	11.4	568	7.3	Lawrence	4	10.1	3	7.2
U.S.		11.6		7.2	Licking	11	10.2	8	7.6
Adams	2	13.5	1	7.1	Logan	5	18.5	2	7.0
Allen	8	11.7	5	7.3	Lorain	17	8.2	14	6.5
Ashland	3	7.5	4	10.2	Lucas	31	11.6	21	7.2
Ashtabula	6	9.3	5	7.3	Madison	3	12.2	2	6.8
Athens	3	9.1	3	9.7	Mahoning	19	11.2	16	8.1
Auglaize	4	15.6	2	6.3	Marion	5	10.0	4	8.8
Belmont	5	9.4	3	5.9	Medina	15	13.5	8	7.5
Brown	3	9.3	2	7.5	Meigs	1	6.9	<1	*
Butler	21	9.7	16	7.4	Mercer	4	15.3	3	9.7
Carroll	2	16.7	1	5.3	Miami	7	10.8	6	8.6
Champaign	2	9.0	1	4.1	Monroe	1	8.4	<1	*
Clark	11	12.0	7	6.6	Montgomery	46	12.8	31	8.1
Clermont	12	10.0	9	8.1	Morgan	<1	*	<1	*
Clinton	3	12.6	2	9.3	Morrow	3	10.6	1	5.7
Columbiana	9	11.5	6	7.8	Muskingum	6	11.9	6	9.2
Coshocton	4	16.3	3	11.6	Noble	1	16.5	<1	*
Crawford	3	10.8	2	4.9	Ottawa	4	12.2	3	10.2
Cuyahoga	106	12.2	70	7.3	Paulding	1	13.2	1	9.1
Darke	4	12.2	2	6.1	Perry	2	10.3	3	12.2
Defiance	3	12.7	2	8.5	Pickaway	4	10.9	2	4.3
Delaware	10	10.5	8	8.0	Pike	2	10.8	1	6.5
Erie	6	10.7	4	6.1	Portage	13	13.2	7	6.5
Fairfield	12	13.3	5	5.0	Preble	4	14.5	3	9.3
Fayette	2	10.2	1	5.9	Putnam	3	15.4	3	11.7
Franklin	66	10.3	42	6.6	Richland	13	16.3	8	8.3
Fulton	2	6.7	2	8.5	Ross	7	15.2	3	6.6
Gallia	2	12.2	1	5.2	Sandusky	3	7.5	4	8.7
Geauga	8	11.1	4	6.2	Scioto	7	13.0	6	10.7
Greene	13	11.8	9	8.1	Seneca	3	8.3	2	4.5
Guernsey	3	14.3	3	10.4	Shelby	4	13.2	3	10.1
Hamilton	53	10.8	36	6.8	Stark	30	11.8	21	7.3
Hancock	5	11.0	4	6.6	Summit	38	10.6	24	6.2
Hardin	4	21.6	3	13.6	Trumbull	14	9.2	11	6.3
Harrison	1	7.6	<1	*	Tuscarawas	8	13.4	6	8.4
Henry	2	11.5	<1	*	Union	3	9.8	1	4.0
Highland	2	6.6	1	3.4	Van Wert	2	9.1	2	6.5
Hocking	3	18.7	1	6.4	Vinton	<1	*	<1	*
Holmes	2	9.7	2	6.5	Warren	17	13.8	11	8.2
Huron	3	8.7	2	6.8	Washington	6	14.3	3	5.4
Jackson	3	14.1	3	12.0	Wayne	7	9.8	6	8.3
Jefferson	4	8.7	4	6.9	Williams	3	13.6	2	9.3
Knox	4	11.5	3	9.2	Wood	8	12.0	5	6.8
Lake	21	13.1	14	8.3	Wyandot	<1	*	<1	*

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

*Rate not presented when the count for 2011-2015 is less than five (*i.e.*, the average annual count is less than one).

Sources of Data and Additional Information

National Cancer Institute:

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

American Cancer Society:

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

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