December 2019

Multiple Myeloma in Ohio, 2012-2016

Multiple myeloma is a cancer of the plasma cells, a type of white blood cell that produces antibodies. Abnormal plasma cells (myeloma cells) build up in the bone marrow, crowding out normal cells in the bone marrow that make red blood cells, platelets and other white blood cells that help fight infection. Multiple myeloma cells form tumors in many bones of the body and can weaken and cause damage to the bones. Myeloma cells also produce abnormal antibodies called M proteins, which can cause complications and damage to organs, such as the kidneys. In 2016, there were an estimated 131,392 people living with myeloma in the United States.

Key Findings

- An average of 859 new cases of multiple myeloma were diagnosed and an average of 508 deaths from multiple myeloma occurred each year in Ohio during 2012-2016.
- The multiple myeloma incidence rate in Ohio was 6.0 per 100,000, compared to the national rate of 6.9 per 100,000 in 2012-2016.
- Men have higher rates of multiple myeloma than women in Ohio and the United States.
- Blacks are more than twice as likely to be diagnosed with multiple myeloma as whites.
- Multiple myeloma was most frequently diagnosed among men and women ages 65 to 69 in Ohio in 2012-2016. There were no cases reported in Ohio among persons younger than 20 years of age during that time period.
- Incidence rates of multiple myeloma increased, while mortality rates decreased in Ohio from 1996 to 2016.
- Ninety-one percent of multiple myelomas in Ohio were diagnosed at a distant stage (the latest stage) in Ohio in 2012-2016.
- Overall, about 51 percent of Ohioans diagnosed with multiple myeloma survive five years after diagnosis.

New Cases and Deaths

Multiple myeloma made up 1.3 percent of newly diagnosed (incidence) cancer cases in Ohio reported to the Ohio Cancer Incidence Surveillance System (OCISS) from 2012 through 2016. An average of 859 cases of multiple myeloma were diagnosed annually in Ohio during this time period (Table 1). The average annual age-adjusted incidence rate for multiple myeloma in Ohio was 6.0 per 100,000, which was lower than the national incidence rate of 6.9 per 100,000. The incidence rate among males diagnosed with multiple myeloma (7.5 per 100,000) was 56 percent higher than the rate among females (4.8 per 100,000) in Ohio. The myeloma incidence rate among blacks (11.9 per 100,000) was more than two times the rate among whites (5.3 per 100,000). Asians/Pacific Islanders had the lowest myeloma rate (2.6 per 100,000) in Ohio in 2012-2016.

An average of 508 deaths from multiple myeloma occurred each year in Ohio in 2012-2016 (Table 1). The average annual age-adjusted mortality rate for multiple myeloma in Ohio was 3.6 per 100,000, compared to the U.S. mortality rate of 3.3 per 100,000. The mortality rate was higher for males (4.5 per 100,000) than females (2.9 per 100,000) in Ohio during this time period. As shown in Table 1, in both Ohio and the United States, myeloma mortality rates were greater for males, blacks and those 65 years of age and older.

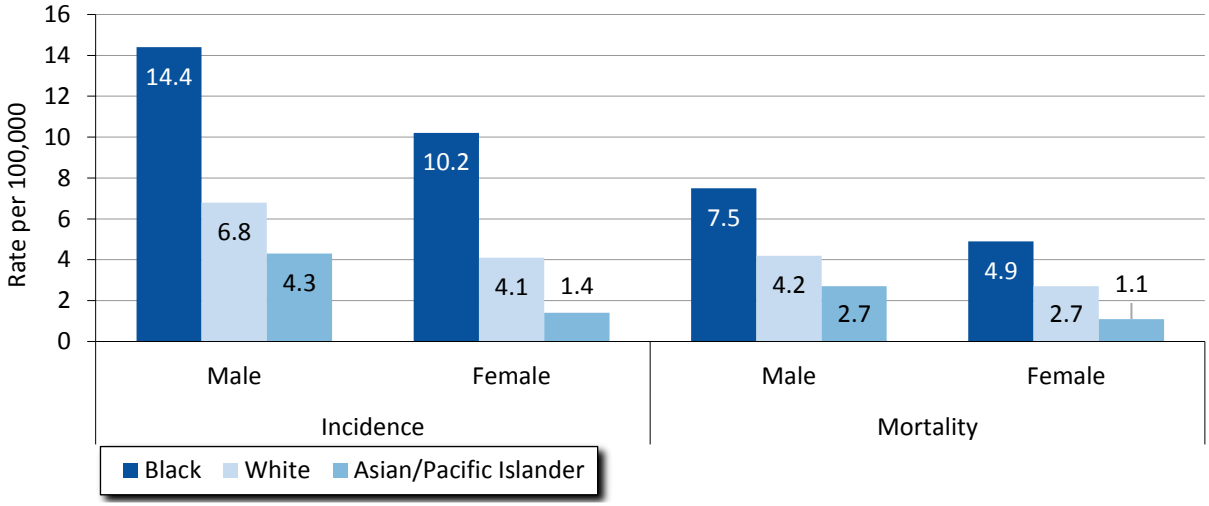
Table 1. Average Annual Number and Age-adjusted Rates of Multiple Myeloma Cases and Deaths per 100,000 Persons by Sex, Race and Age Group, Ohio and the United States, 2012-2016

		Incidence			Mortality		
		Ohio Cases	Ohio Rate	U.S. Rate	Ohio Deaths	Ohio Rate	U.S. Rate
Total		859	6.0	6.9	508	3.6	3.3
Sex	Male	481	7.5	8.7	270	4.5	4.2
	Female	378	4.8	5.6	239	2.9	2.7
Race	White	675	5.3	6.3	427	3.4	3.1
	Black	166	11.9	13.7	78	5.9	6.2
	Asian/Pacific Islander	4	2.6	3.8	3	1.7	1.6
Age Group	<65	319	2.4	2.7	108	0.8	0.7
	65+	540	30.7	36.3	401	22.8	21.3

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

Incidence and Mortality by Sex and Race

Figure 1. Average Annual Age-adjusted Incidence and Mortality Rates of Multiple Myeloma per 100,000 Persons by Sex and Race, Ohio, 2012-2016

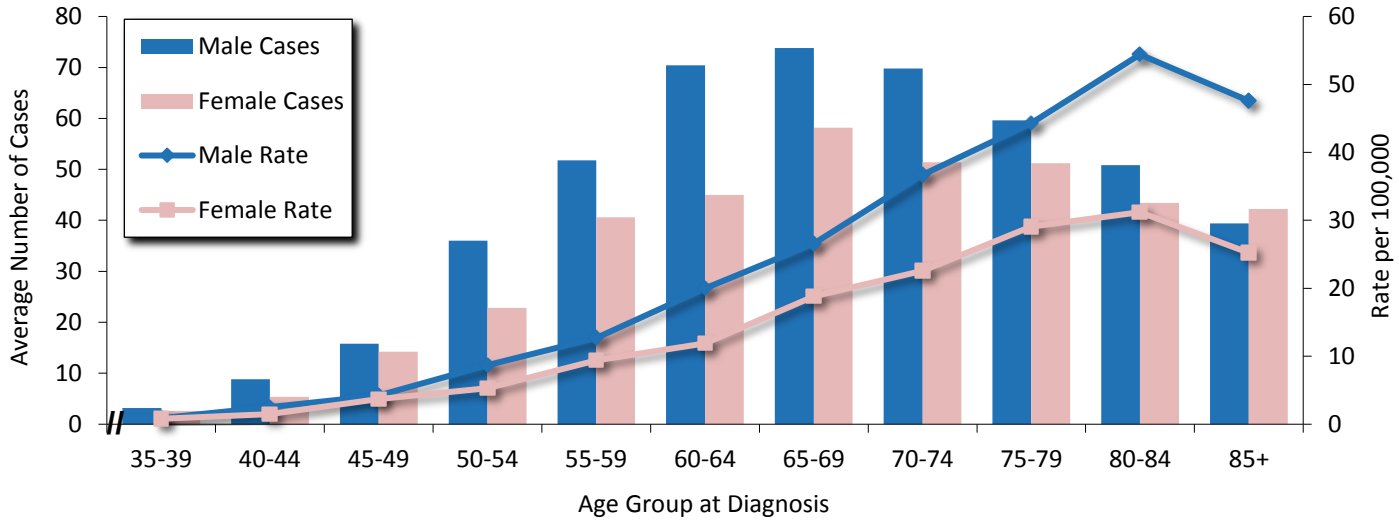


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019; Bureau of Vital Statistics, Ohio Department of Health, 2019.

Black males had the highest multiple myeloma incidence and mortality rates in Ohio, based on data from 2012 to 2016 (Figure 1). Black men were more than twice as likely as white men and three times as likely as Asian/Pacific Islander men to be diagnosed with multiple myeloma. Asian/Pacific Islander females had the lowest incidence and mortality rates for multiple myeloma in Ohio in 2012-2016. The reasons for the racial disparities in multiple myeloma are largely unknown.

Incidence by Age Group and Sex

Figure 2. Average Annual Number and Age-specific Incidence Rates of Multiple Myeloma per 100,000 Persons by Age Group and Sex, Ohio, 2012-2016



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

In Ohio, multiple myeloma was most frequently diagnosed among men and women ages 65 to 69 (Figure 2). Incidence rates for men and women increased with advancing age through ages 80-84 and then declined. There were no cases of multiple myeloma among persons less than 20 years of age in Ohio in 2012-2016.

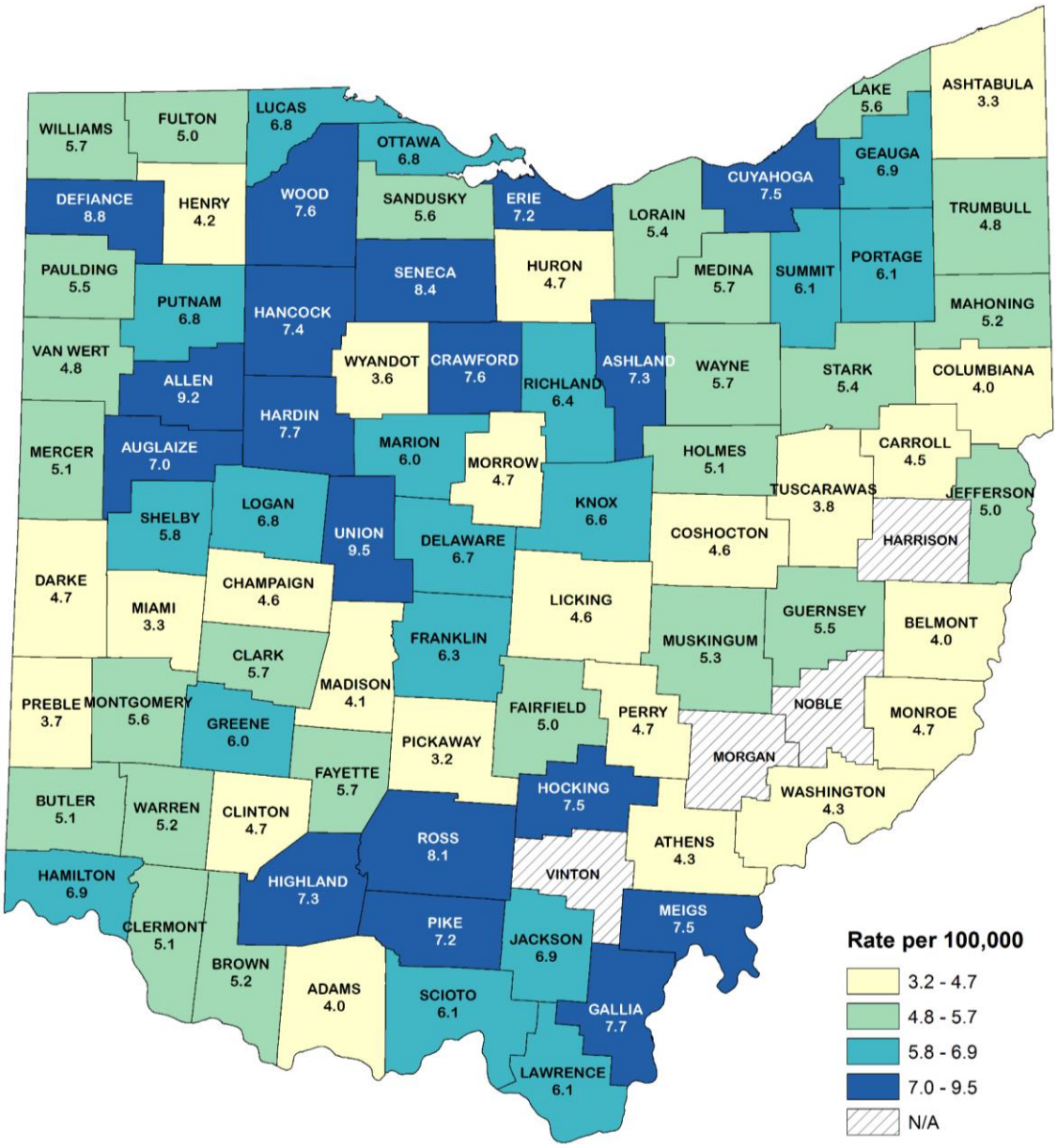
Lifetime Risk

Currently, a man living in the United States has a 1 in 106 (0.94 percent) lifetime risk of developing multiple myeloma, and a woman has a 1 in 141 (0.71 percent) lifetime risk of developing multiple myeloma.

Incidence by County

Figure 3 shows 2012-2016 average annual age-adjusted multiple myeloma incidence rates by county of residence. County-specific myeloma incidence rates in Ohio ranged from 3.2 to 9.5 per 100,000 persons, compared with Ohio's rate of 6.0 per 100,000. Counties with the highest incidence rates of multiple myeloma were mostly located in northwest and southern Ohio during 2012-2016. The following counties had the highest incidence rates, in decreasing order, for this time period: Union, Allen, Defiance, Seneca and Ross.

Figure 3. Average Annual Age-adjusted Incidence Rates of Multiple Myeloma per 100,000 Persons by County of Residence, Ohio, 2012-2016



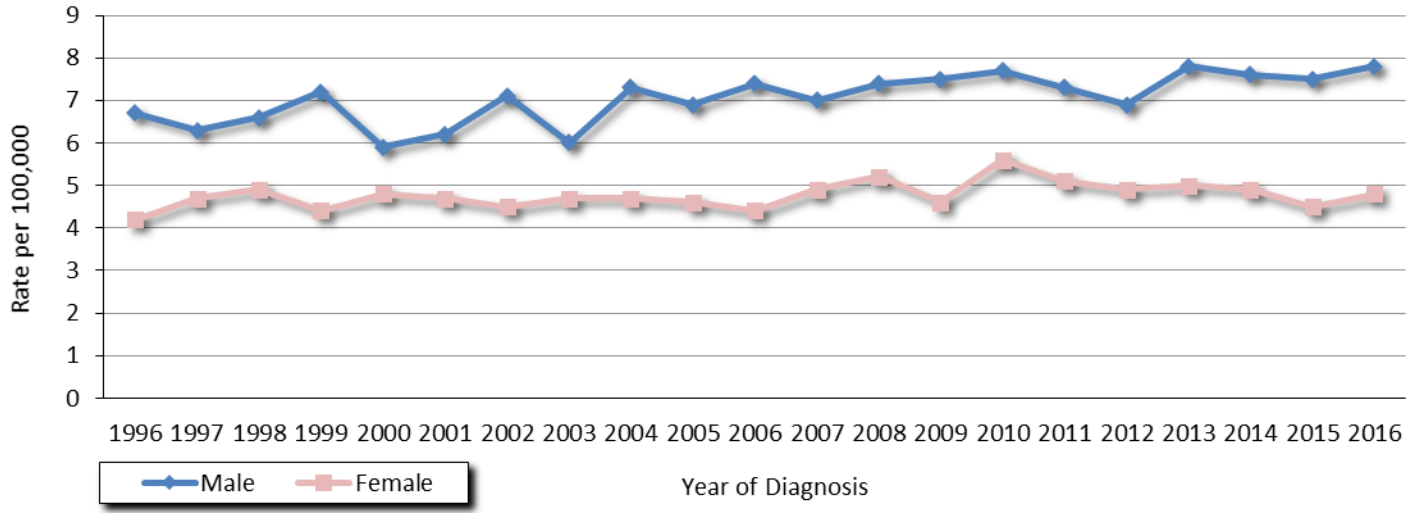
Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Each category represents approximately 25 percent of the 88 Ohio counties.

N/A: Rate not calculated when the case count for 2012-2016 is less than five.

Trends in Incidence

Figure 4. Trends in Age-adjusted Incidence Rates of Myeloma per 100,000 Persons by Sex, Ohio, 1996-2016

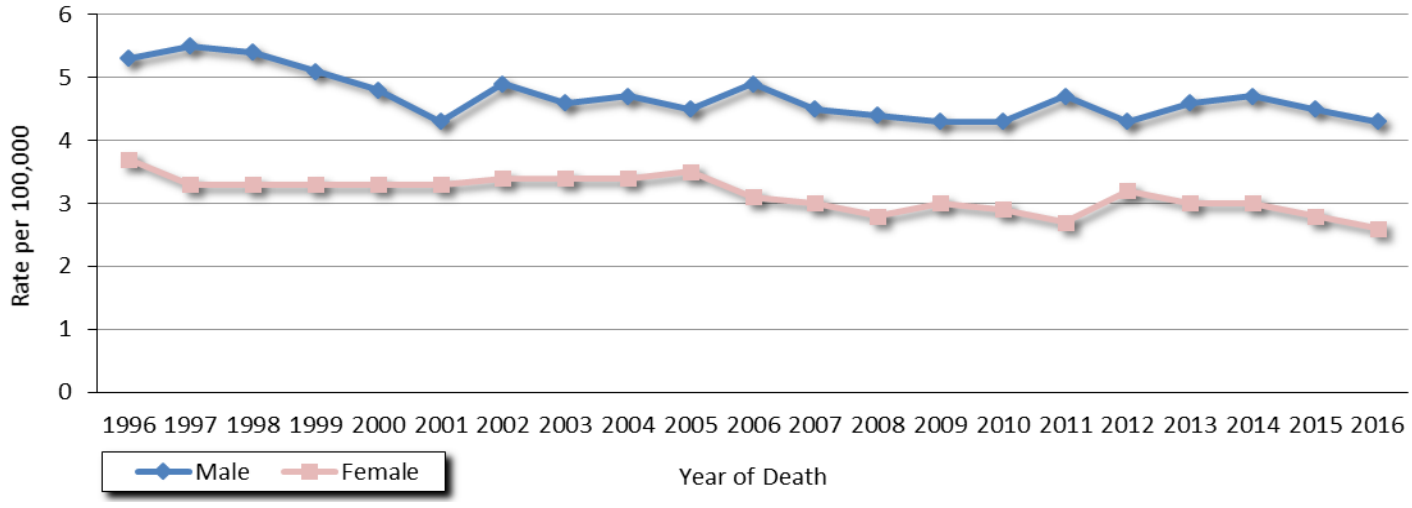


Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2019.

Figure 4 shows incidence rates of multiple myeloma according to year of diagnosis (1996 through 2016) for males and females in Ohio. For each year, the incidence rate was higher among Ohio males compared to females. Overall, multiple myeloma incidence rates increased 15 percent in Ohio from 1996 to 2016. Incidence rates increased 16 percent for males and 14 percent for females during this time period.

Trends in Mortality

Figure 5. Trends in Age-adjusted Mortality Rates of Myeloma per 100,000 Persons by Sex, Ohio, 1996-2016

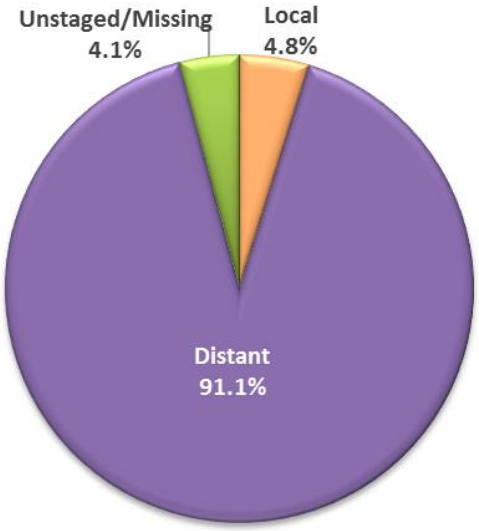


Source: Bureau of Vital Statistics, Ohio Department of Health, 2019.

Figure 5 shows multiple myeloma mortality rates in Ohio according to year of death (1996 through 2016) for males and females. For each year, multiple myeloma mortality rates were higher among males compared to females in Ohio. Overall, multiple myeloma mortality rates decreased 23 percent from 1996 to 2016. Mortality rates decreased 19 percent for males and 30 percent for females during this time period.

Stage at Diagnosis

Figure 6. Proportion of Multiple Myeloma Cases (%) by Stage at Diagnosis, Ohio, 2012-2016



Cancer stage at diagnosis, which refers to the extent or spread of a cancer in the body, is typically categorized as *in situ*, local, regional or distant based on the extent of spread.*

In Ohio, about 5 percent of multiple myeloma cases were diagnosed at a local stage, 91 percent were diagnosed at a distant stage and 4 percent were unstaged or of unknown stage in 2012-2016 (Figure 6).

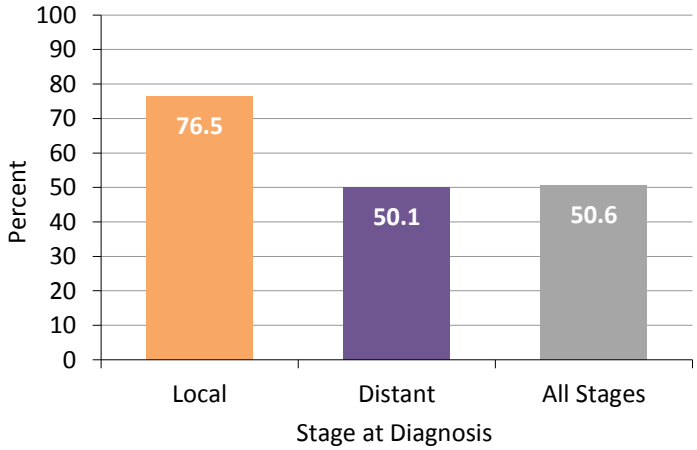
* However, multiple myeloma is typically staged as local or distant only.

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

Survival

Relative survival is the percentage of people who are alive at a designated time period (usually five years) after a diagnosis divided by the percentage expected to be alive in the absence of a diagnosis based on normal life expectancy. The overall five-year relative survival in Ohio was 50.6 percent for those diagnosed with multiple myeloma from 2009 to 2015. Five-year relative survival was 76.5 percent when myeloma was diagnosed at the local stage and 50.1 percent when myeloma was diagnosed at the distant stage (Figure 7).

Figure 7. Five-Year Relative Survival (%) for Multiple Myeloma by Stage at Diagnosis, Ohio, 2009-2015



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

Risk Factors and Populations at High Risk

Anything that increases the chance 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 risk factors for multiple myeloma.

Age: Multiple myeloma is an age-dependent cancer—Most people diagnosed with this cancer are at least 65 years old. Less than 1 percent of cases are diagnosed in people younger than 35.

Sex: Men are more likely to develop multiple myeloma than women.

Race: Blacks are more than twice as likely to develop multiple myeloma than whites.

Having other plasma cell diseases: People with monoclonal gammopathy of undetermined significance (MGUS) or plasmacytoma are at higher risk of developing multiple myeloma than people who do not have these diseases.

Being exposed to radiation or certain chemicals: Multiple myeloma has been linked to ionizing radiation exposure. Organic solvent exposure in painters has been associated with multiple myeloma. Exposure to unspecified pesticides among applicators, manufacturers and agricultural workers has been associated with multiple myeloma.

Multiple Myeloma Signs and Symptoms

Sometimes multiple myeloma does not cause any signs or symptoms. The following signs and symptoms may be caused by multiple myeloma or other conditions.

- Bone pain, especially in the back or ribs
- Bones that break easily
- Fever for no known reason or frequent infections
- Easy bruising or bleeding
- Trouble breathing
- Weakness of the arms or legs
- Feeling very tired

Hypercalcemia: Multiple myeloma can damage the bone and cause hypercalcemia (too much calcium in the blood). This can affect many organs in the body, including the kidneys, nerves, heart, muscles and digestive tract, and cause serious health problems. Hypercalcemia may cause signs and symptoms, such as: loss of appetite, nausea or vomiting, feeling thirsty, frequent urination, constipation, feeling very tired, muscle weakness, restlessness, confusion or trouble thinking.

Amyloidosis: In rare cases, multiple myeloma can cause peripheral nerves (nerves that are not in the brain or spinal cord) and organs to fail. This may be caused by a condition called amyloidosis. Antibody proteins build up and stick together in peripheral nerves and organs, such as the kidney and heart. This can cause the nerves and organs to become stiff and unable to work the way they should. Amyloidosis may cause the following signs and symptoms: feeling very tired, purple spots on the skin, enlarged tongue, diarrhea, swelling caused by fluid in body tissues, tingling or numbness in legs and feet.

It is possible that one or more of these signs and symptoms may be the result of other health problems. If you have any of these symptoms, you should consult with your health care provider.

Technical Notes

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

Average Annual Number: The number of cases or deaths diagnosed per year, on average, for the time period of interest (e.g., 2012-2016). Average annual numbers are calculated by summing the number of cases or deaths for a given time period, dividing by the number of years that comprise the time period and rounding to the nearest whole number.

Census Data: The 1996-2016 rates were calculated using population estimates from the U.S. Census Bureau and National Center for Health Statistics. Population data were compiled from bridged-race intercensal population estimates for July 1, 1990-July 1, 1999 (released 7/26/2004); revised bridged-race intercensal population estimates for July 1, 2000-July 1, 2004 (released 10/26/2012); revised bridged-race intercensal population estimates for July 1, 2005-July 1, 2009 (released 6/26/2014) and vintage 2017 bridged-race postcensal population estimates for July 1, 2010-July 1, 2017 (released 6/27/2018).

Incidence: The number of cases diagnosed during a specified time period (e.g., 2012-2016). Multiple myeloma cases were defined by International Classification of Diseases for Oncology, Third Edition (ICD-O-3), and categorized by histology codes 9731-9732 and 9734, in accordance with the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute.

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

Mortality: The number of deaths during a specified time period (e.g., 2012-2016). Multiple myeloma deaths were defined by International Statistical Classification of Diseases and Related Health Problems, Tenth Edition (ICD-10), codes C900 and C902.

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

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

Stage at Diagnosis: The degree to which a tumor has spread from its site of origin at the time of diagnosis. A system of summary staging is often used to group cases into the following stages:

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

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

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

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

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

Table 2. Average Annual Number of Invasive Multiple Myeloma Cases and Age-adjusted Incidence Rates per 100,000 Persons by County of Residence and Sex, Ohio and the United States, 2012-2016

	Male		Female		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
Ohio	**481**	**7.5**	**378**	**4.8**	**859**	**6.0**
U.S.		**8.7**		**5.6**		**6.9**
Adams	1	5.3	<1	*	2	4.0
Allen	7	12.3	4	6.4	11	9.2
Ashland	2	6.9	3	7.7	5	7.3
Ashtabula	2	2.7	3	3.8	4	3.3
Athens	2	6.8	<1	*	2	4.3
Auglaize	2	7.9	2	6.6	4	7.0
Belmont	2	4.7	2	3.7	4	4.0
Brown	1	3.8	2	6.5	3	5.2
Butler	12	6.6	9	3.8	21	5.1
Carroll	1	5.8	<1	*	2	4.5
Champaign	2	7.5	<1	*	2	4.6
Clark	8	9.0	3	2.9	11	5.7
Clermont	7	6.5	5	4.0	12	5.1
Clinton	1	5.1	1	4.4	2	4.7
Columbiana	4	5.7	2	2.3	6	4.0
Coshocton	1	6.5	1	3.5	2	4.6
Crawford	3	11.6	1	4.2	5	7.6
Cuyahoga	65	9.2	58	6.2	123	7.5
Darke	2	6.1	1	3.4	3	4.7
Defiance	3	12.1	2	6.4	5	8.8
Delaware	7	8.0	6	5.8	12	6.7
Erie	5	9.1	4	5.6	8	7.2
Fairfield	6	6.6	3	3.8	9	5.0
Fayette	1	5.7	1	5.8	2	5.7
Franklin	39	7.7	35	5.3	74	6.3
Fulton	1	5.0	1	4.9	3	5.0
Gallia	2	12.1	1	4.4	3	7.7
Geauga	6	10.0	3	4.2	9	6.9
Greene	6	6.6	6	5.5	12	6.0
Guernsey	2	7.0	1	4.0	3	5.5
Hamilton	36	8.8	28	5.5	63	6.9
Hancock	4	9.5	3	5.9	7	7.4
Hardin	1	6.9	2	8.5	3	7.7
Harrison	<1	*	<1	*	<1	*
Henry	1	7.0	<1	*	2	4.2
Highland	2	6.8	2	7.5	4	7.3
Hocking	<1	*	2	9.7	3	7.5
Holmes	2	7.6	<1	*	2	5.1
Huron	2	5.7	1	3.7	3	4.7
Jackson	2	9.2	1	4.9	3	6.9
Jefferson	2	4.7	3	4.9	5	5.0
Knox	3	9.4	2	4.1	5	6.6
Lake	9	6.6	9	4.8	18	5.6
Lawrence	4	10.2	1	2.8	5	6.1
Licking	5	5.5	4	4.0	9	4.6
Logan	2	7.5	2	6.1	4	6.8
Lorain	13	7.5	8	3.8	21	5.4
Lucas	19	8.6	15	5.4	35	6.8
Madison	<1	*	1	5.5	2	4.1
Mahoning	9	6.0	8	4.5	17	5.2
Marion	3	8.0	2	4.5	5	6.0
Medina	8	7.3	5	4.4	14	5.7
Meigs	1	6.2	1	8.2	3	7.5
Mercer	2	8.4	<1	*	3	5.1
Miami	2	2.6	3	3.9	5	3.3
Monroe	<1	*	<1	*	1	4.7
Montgomery	19	6.4	20	5.0	39	5.6
Morgan	<1	*	<1	*	<1	*
Morrow	1	6.4	<1	*	2	4.7
Muskingum	4	8.1	2	3.5	6	5.3
Noble	<1	*	<1	*	<1	*
Ottawa	3	10.3	2	4.5	5	6.8
Paulding	<1	*	<1	*	1	5.5
Perry	1	4.4	1	4.2	2	4.7
Pickaway	1	3.4	1	2.8	2	3.2
Pike	<1	*	2	10.0	3	7.2
Portage	8	8.9	4	3.8	12	6.1
Preble	<1	*	1	4.4	2	3.7
Putnam	1	6.3	2	7.4	3	6.8
Richland	7	9.0	4	4.2	11	6.4
Ross	5	10.8	3	6.1	7	8.1
Sandusky	3	8.4	2	3.4	4	5.6
Scioto	4	9.5	2	3.1	6	6.1
Seneca	3	9.9	3	7.1	6	8.4
Shelby	2	8.1	1	4.0	3	5.8
Stark	18	7.7	10	3.6	28	5.4
Summit	24	8.1	18	4.6	42	6.1
Trumbull	7	5.3	7	4.6	14	4.8
Tuscarawas	3	5.7	2	2.3	5	3.8
Union	3	14.5	2	5.5	5	9.5
Van Wert	1	6.7	<1	*	2	4.8
Vinton	<1	*	<1	*	<1	*
Warren	7	6.6	6	4.3	13	5.2
Washington	2	6.1	1	2.7	4	4.3
Wayne	4	6.0	4	5.4	8	5.7
Williams	2	7.8	1	4.2	3	5.7
Wood	7	10.3	4	5.3	11	7.6
Wyandot	<1	*	<1	*	1	3.6

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

* Rate not calculated when the total count for 2012-2016 is less than five (*i.e.*, the average annual count is less than one).

Note: Due to rounding, annual numbers for males and females may not add up to the totals indicated in the table.

Sources of Data and Additional Information

Ohio Cancer Incidence Surveillance System:
https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/ohio-cancer-incidence-surveillance-system/welcome-to

National Cancer Institute:
https://www.cancer.gov/types/myeloma

American Cancer Society:
http://www.cancer.org/cancer/multiple-myeloma.html

To address comments and information requests:

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

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