

# Cancer Incidence and Mortality in Massachusetts 2014-2018

## Statewide Report

Massachusetts Cancer Registry

Office of Data Management and Outcomes Assessment

Office of Population Health

Massachusetts Department of Public Health

*February 2023*



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## Statewide Report

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*February 2023*

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## Table of Contents

<b>Preface.....</b>	<b>1</b>
<b>Basic Cancer Facts .....</b>	<b>2</b>
<b>Executive Summary .....</b>	<b>4</b>
<b>Cancer Incidence (New cases) .....</b>	<b>8</b>
Table 1. New Cancer Cases by Sex for Leading Sites, Massachusetts, 2014-2018.....	8
Figure 1. Top 10 Cancers Among Females in Massachusetts, 2014-2018.....	9
Figure 2. Top 10 Cancers Among Males in Massachusetts, 2014-2018.....	9
Figure 3. Percent of All Cancer Cases by Age Group in Massachusetts Males, 2014-2018 .....	9
Figure 4. Percent of All Cancer Cases by Age Group in Massachusetts Females, 2014-2018 .....	9
Figure 5. Comparison of Massachusetts and US Males Average Annual Age-adjusted Incidence by Cancer Site/Type.....	10
Figure 6. Comparison of Massachusetts and US Females Average Annual Age-adjusted Incidence by Cancer Site/Type.....	11
Figure 7. Trends in Total Number of Massachusetts Cancer Cases and Incidence Rates, 2000-2018..	12
Figure 8. Trends in Massachusetts Incidence Rates for All Cancers Combined by Sex, 2014 - 2018 ...	12
<b>Cancer Mortality .....</b>	<b>13</b>
Table 2. Cancer Deaths by Sex for Leading Cancer Sites in Massachusetts, 2014-2018 .....	13
Figure 9. Top 10 Causes of Cancer Deaths Among Females in Massachusetts, 2014-2018.....	14
Figure 10. Top 10 Causes of Cancer Deaths Among Males in Massachusetts, 2014-2018.....	14
Figure 11. Percent of All Cancer Deaths by Age Group in Massachusetts Males, 2014-2018.....	15
Figure 12. Percent of All Cancer Deaths by Age Group in Massachusetts Females, 2014-2018.....	15
Figure 13. Trends in Total Number of Massachusetts Cancer Deaths and Death Rates, 2000-2018....	15
Figure 14. Trends in Massachusetts Mortality Rates for All Cancers Combined by Sex, 2014-2018 ....	16
<b>Stage at Diagnosis for Selected Cancers.....</b>	<b>17</b>
Figure 15. Breast Cancer Stage at Diagnosis in Massachusetts, 2014-2018.....	17
Figure 16. Prostate Cancer Stage at Diagnosis in Massachusetts, 2014-2018 .....	17
Figure 17. Colon and Rectum Cancer Stage at Diagnosis in Massachusetts, 2014-2018 .....	18
Figure 18. Lung and bronchus Cancer Stage at Diagnosis in Massachusetts, 2014-2018.....	18
<b>Cancer Incidence and Mortality in Massachusetts by County .....</b>	<b>19</b>
Figure 19. Incidence Rates for all Cancer Sites in Massachusetts by County, 2014-2018.....	19
Figure 20. Mortality Rates for all Cancer Sites in Massachusetts by County, 2014-2018.....	19
<b>Cancer Disparities and Health Equity.....</b>	<b>20</b>
Figure 21. Age-Adjusted Cancer Incidence Rates in Massachusetts by Sex and Race/Ethnicity, 2014-2018.....	20
Figure 22. Age-Adjusted Cancer Mortality Rates in Massachusetts by Sex and Race/Ethnicity, 2014-2018.....	20
Figure 23. Cancer Incidence Rates in Massachusetts Males by Race/Ethnicity, 2014-2018, Five Most Common Cancers .....	21
Figure 24. Cancer Incidence Rates in Massachusetts Females by Race/Ethnicity, 2014-2018, Five Most Common Cancers .....	22

Figure 25. Cancer Incidence in Massachusetts Females by Year at Diagnosis and Race/Ethnicity, 2014-2018.....	22
Figure 26. Cancer Incidence in Massachusetts Males by Year at Diagnosis and Race/Ethnicity, 2014-2018.....	22
Figure 27. Cancer Mortality in Massachusetts Females by Year of Death and Race/Ethnicity, 2014-2018.....	23
Figure 28. Cancer Mortality in Massachusetts Males by Year of Death and Race/Ethnicity, 2014-2018.....	23
Table 3: Ten Most Common Causes of Cancer Deaths Among Massachusetts Females by Race/Ethnicity, 2014-2018.....	24
Table 4: Ten Most Common Causes of Cancer Deaths Among Massachusetts Males by Race/Ethnicity, 2014-2018.....	25
<b>Data sources and Online Visualization Tools .....</b>	<b>26</b>
<b>Appendices .....</b>	<b>27</b>
Appendix I. New Cancer Cases and Incidence Rates by Cancer Site and Sex, Massachusetts, 2014 - 2018.....	27
Appendix II. Number of Cancer Deaths and Death Rates by Cancer Site and Sex, Massachusetts, 2014-2018.....	28
Appendix III. Technical Notes .....	29
Appendix IV. DPH Cancer Programs Health Equity Initiatives.....	32
<b>References .....</b>	<b>36</b>

## Preface

The Massachusetts Cancer Registry (MCR) Incidence and Mortality Statewide Report 2014-2018 presents a summary of cancer incidence (new cases) and mortality (deaths) for the Commonwealth of Massachusetts. The main objective of the report is to provide cancer data by age, sex, race/ethnicity, stage at diagnosis, and county, as well as to highlight trends in Massachusetts cancer rates for 2014-2018. The report also compares Massachusetts incidence and mortality to US rates. The collection and analysis of population-based cancer data help determine the burden of cancer in Massachusetts. These data can be used by public health professionals, cancer control programs, policy makers, researchers, and others to develop, implement, and evaluate cancer prevention and control activities, to support cancer-related research, and to describe the burden of cancer in Massachusetts.

The MCR collects reports of newly diagnosed cases of cancer and routinely compiles summaries of cancer incidence and mortality data. All Massachusetts health care facilities and providers who diagnose or treat patients with cancer are required, by law,<sup>1</sup> to report each case of cancer malignant disease and benign brain-related tumor disease to the MCR within six months of diagnosis or first contact, except for basal and squamous cell skin cancer and *in situ* (non-invasive) cervical cancer. 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. This report, *Cancer Incidence and Mortality in Massachusetts, 2014-2018: Statewide Report* is produced annually with the most recently available statewide data. Compared to previous reports, this report will focus on the leading causes of new cancers and cancer deaths in men and women in Massachusetts. Each table or chart will be accompanied by text to explain the data. This report will also include new sections such as preface, basic cancer facts, stage at diagnosis, cancer incidence and mortality by county, and cancer disparities and health equity.

Another report, *Cancer Incidence in Massachusetts: City and Town Supplement*, is also produced periodically by the MCR and contains information for the 351 cities and towns in Massachusetts.

MCR data quality, completeness and timeliness are evaluated annually by the Centers for Disease Control and Prevention / National Program of Cancer Registries (CDC/NPCR), the National Cancer Institute/Surveillance, Epidemiology, and End Results Program (NCI/SEER) and the North American Association of Central Cancer Registries (NAACCR) and routinely meet national data quality standards. However, completeness may be higher or lower for specific cancer types, geographic areas, or demographic subgroups. Also, it is not unusual for the number of cancer cases and incidence rates to vary from year to year, especially for smaller geographic areas and demographic subgroups.

Massachusetts cancer death data were provided by the Registry of Vital Records and Statistics (RVRS) at Massachusetts Department of Public Health (MDPH). RVRS receives certificates of death from local vital statistics offices and from other states when a Massachusetts resident dies outside of the state. Cancer death data in this report were categorized by the underlying cause of death.

Electronic versions of this and other reports may be found online at [www.mass.gov/dph/mcr](http://www.mass.gov/dph/mcr).

## **Basic Cancer Facts**

Cancer is the name given to a collection of related diseases that are usually named after tissues or organs where the cancers form. For instance, breast cancer that starts in the breast is still called breast cancer even if it spreads (metastasizes) to other parts of the body.<sup>2</sup> Cancer is not a single disease but a collection of diseases including for example, lung and bronchus, prostate, breast, colon and rectum, and brain. Cancer occurs when some of the body's cells begin to divide without stopping and spread into surrounding tissues. Screening can help prevent cancer deaths and morbidity and when caught early some cancers can be prevented.<sup>3</sup>

### **Who is at risk of Developing Cancer?**

One of the major risk factors of cancer is older age. Eight in ten of cancers in the United States are diagnosed in people over 55 years of age or older and 57% are 65 years or older. In addition to age, the risk of cancer is increased by certain behaviors including cigarette smoking, excess body weight, drinking alcohol, and poor or unhealthy diet. In the United States, the lifetime risk of developing cancer is 40 out of 100 in men and 39 out of 100 in women.<sup>4</sup> It is important to note that 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 such as smoking, family history, and/or genetic susceptibility.

### **What are Cancer Risk Factors?**

A cancer risk factor is anything that increases a person's chance of developing cancer and a protective factor is anything that decreases a person's chance of developing cancer. Risk factors are categorized into two main groups, those that are known to increase the risk of cancer and those that may affect the risk of cancer. Examples of known cancer risk factors include cigarette smoking and tobacco use, infections, radiation, and immunosuppressive medicines after organ transplant. Factors that may affect the risk of cancer include diet, drinking alcohol, physical activity, obesity, diabetes, being exposed to chemicals and other substances in the environment, and ultraviolet (UV) radiation. A person's risk of developing cancer often does not increase due to one risk factor but usually results from a complex interaction of several factors, sometimes over long periods of time.<sup>5</sup>

### **Can Cancer be Prevented?**

Some cancer risk factors can be avoided while many others cannot. For example, both smoking and inheriting certain genes are risk factors for some types of cancers, but only smoking can be avoided. According to the American Cancer Society (ACS) at least 42% of newly diagnosed cancers in the United States, about 805,600 cases in 2022, are potentially avoidable. These cancers include 19% of all cancers that are caused by smoking and 18% that are caused by a combination of excess body weight, excess alcohol consumption, poor nutrition, and lack of physical activity. Some cancers that are caused by infection agents can be prevented through behavioral changes to avoid infection or through vaccination or by treating the infection. In addition, screening can help reduce mortality for cancers including colon and rectum, breast, cervical, prostate, and lung and bronchus. Screening can also detect some cancers early when treatment is often more successful.<sup>6</sup>

## How is Cancer Staged?

Staging describes the extent or spread of cancer at the time of diagnosis and guides decisions about treatment. For most cancers, stage is based on the size or extent of the primary tumor and whether the cancer has spread to nearby lymph nodes or other parts of the body.<sup>7</sup> Cancer staging is categorized into five main groups: In situ, local, regional, distant, and unknown.<sup>8</sup> Relative survival is an estimate of the percentage of patients who would be expected to survive the effects of their cancer, and it excludes the risk of dying from other causes. The earlier a cancer is diagnosed, the better chance a person has of surviving. For example, between 2011 and 2017 the five-year survival for colon and rectum cancer diagnosed at the localized stage in the United States was 90.6%, whereas, when the cancer was diagnosed at the distant stage, the five-year relative survival was only 14.7%.<sup>9</sup>

<b>In situ:</b>	Cancer is confined to the layer of cells where it began growing and has not spread
<b>Local:</b>	Cancer is limited to the place where it started, with no sign that it has spread
<b>Regional:</b>	Cancer has spread to nearby lymph nodes, tissues, or organs
<b>Distant:</b>	Cancer has spread to distant parts of the body
<b>Unknown:</b>	Insufficient information is available to determine the stage or extent of the disease

## What are the Costs of Cancer?

The cost of cancer can be measured in several ways including direct medical costs (total of all health care expenditures), as well as indirect costs (such as lost earnings due to missed work from illness or premature death). In addition, cancer care costs and lost income due to time away from work during treatment and recovery can lead to medical financial hardship for cancer patients and their families. Many cancer survivors report financial hardship associated with cancer. These include difficulties paying medical bills, distress and worry about medical bills, or delaying or forgoing medical care due to cost. Lack of health insurance is strongly associated with medical financial hardship and prevents many Americans from receiving optimal cancer prevention, early detection, and treatment. According to the National Cancer Institute, cancer-related direct medical costs in the US were estimated to be \$183 billion in 2015 and are projected to increase to \$246 billion by 2030, a 34% increase based only on population growth and aging.<sup>10</sup>



## Executive Summary

*Cancer Incidence and Mortality in Massachusetts, 2014-2018: Statewide Report* presents cancer incidence and mortality data for the Commonwealth from 2014 through 2018. The report includes numbers and rates for 24 types of cancer, information on age-specific patterns, an examination of patterns by race/ethnicity, and a comparison of Massachusetts and national cancer rates. Data are provided on invasive cancers only with the exceptions of urinary bladder (which includes in situ and invasive cancers combined) and in situ breast cancer.

### All Cancers Combined Incidence (New cases)

- Between 2014 and 2018, there were 191,977 new cancer cases in Massachusetts, an average of 38,395 cases per year
- During this period there were:
  - 93,246 cancer cases among males
  - 98,704 cancer cases among females
- The age-adjusted incidence rate for all cancers combined was:
  - 489.3 per 100,000 in males
  - 442.7 per 100,000 in females

### All Cancers Combined Mortality (Deaths)

- Cancer is the most common cause of death in Massachusetts and the United States, accounting for nearly one of every four deaths
- Between 2014 and 2018, there were 63,801 cancer deaths in Massachusetts, an average of 12,760 deaths per year
- During this period there were:
  - 32,603 cancer deaths among males
  - 31,198 cancer deaths among females
- The age-adjusted mortality rate for all cancer deaths combined was:
  - 179.0 per 100,000 in males
  - 129.7 per 100,000 in females

### Cancer Incidence

Breast cancer was the leading cancer among Massachusetts females between 2014 and 2018, followed by lung and bronchus, colon and rectum, corpus uteri & uterus, and thyroid cancers. Among males, prostate cancer was the leading cancer, followed by lung and bronchus, colon and rectum, urinary bladder, and melanoma cancers. Nationally, breast cancer was also the leading cancer among females and prostate cancer was the leading cancer among males. In Massachusetts, the age-adjusted cancer incidence rate for all cancer sites combined decreased in both males and females between 2014 and 2018. However, this decrease was not statistically significant.

### Cancer Mortality

Lung and bronchus cancer was the leading cause of cancer deaths among Massachusetts females between 2014 and 2018, followed by breast, colon and rectum, and pancreas cancers. Among males, lung and bronchus cancer was also the leading cause of cancer deaths, followed by prostate, and colon

and rectum, and pancreatic cancers. Nationally, lung and bronchus cancer was also the leading cause of cancer deaths among both males and females. In Massachusetts, the age-adjusted cancer mortality rate for all cancer sites combined significantly decreased by 1.7% in males between 2014 and 2018. There was no significant decrease in the mortality rate for all cancer sites combined for females.

## Cancer Trends 2014-2018

### Statistically Significant Incidence Trends – Males

Cancer	Trend	% Decrease Per Year
Lung and bronchus cancer	Falling ↓	3.0%
Colon and rectum cancer	Falling ↓	3.4%
Kidney cancer	Falling ↓	2.9%
Laryngeal cancer	Falling ↓	4.9%
Non-Hodgkin Lymphoma	Falling ↓	1.2%
Thyroid cancer	Falling ↓	5.7%

### Statistically Significant Mortality Trends – Males

Cancer	Trend	% Decrease Per Year
All invasive cancers	Falling ↓	1.7%
Lung and bronchus cancer	Falling ↓	5.3%
Kidney cancer	Falling ↓	9.9%

### Statistically Significant Incidence Trends – Females

Cancer	Trend	% Decrease Per Year
In situ breast cancer	Falling ↓	3.5%
Colon and rectum cancer	Falling ↓	4.2%
Ovary	Falling ↓	4.7%
Thyroid	Falling ↓	5.9%
Urinary Bladder	Falling ↓	3.2%

### Statistically Significant Mortality Trends – Females

Cancer	Trend	% Decrease Per Year
Colon and rectum cancer	Falling ↓	4.7%
Cervix	Falling ↓	7.1%

## Cancer Disparities and Health Equity

Although cancer can affect all groups in Massachusetts, the burden of the disease is greater in certain groups compared to others. Black non-Hispanic communities and other populations disproportionately impacted by cancer experience greater obstacles to cancer prevention, detection, treatment, and survival, including systemic racial disparities that are usually not connected with cancer. These include structural racism, poverty, lack of access to affordable healthy foods, jobs with inadequate pay, low quality education and housing, and unsafe environments.<sup>11</sup> Cancer disparities are defined as differences in cancer measures including incidence, mortality, stage at diagnosis and cancer screening rates. Typically, these cancer disparities are considered by race or ethnic group. However, there are other factors that characterize cancer disparities including disability status, gender, income, education, sexual orientation, and other characteristics.<sup>12</sup> According to the CDC, health equity is defined as the state in which everyone has a fair and just opportunity to attain their highest level of health.<sup>13</sup> Health inequities

can be reduced through focused and ongoing efforts by everyone to address historical and current injustices, overcome economic, social, and other obstacles to health and healthcare, and eliminate preventable health disparities.<sup>14</sup> Appendix IV presents several programs at the MDPH aimed at implementing initiatives to address cancer disparities and health inequities in Massachusetts.

Racial and ethnic disparities in the cancer burden generally reflect long-standing inequities in socioeconomic status (SES) and access to high-quality health care, due in part to historical and persistent structural racism in the US experienced by all people of color.<sup>15</sup> According to the US Census Bureau 10% of the Massachusetts population lived below the federal poverty line in 2018. However, major differences emerge when poverty rates were stratified by race/ethnicity. Nearly one in five (17.9%) of Black non-Hispanics and 23.6% of Hispanics in Massachusetts lived below the poverty line in 2018, compared to 6.7% of White non-Hispanics and 11.4% of Asian non-Hispanics.<sup>16</sup> Consequently, cancer mortality rates are also generally higher among people with lower SES compared to people with higher SES. According to the ACS lung cancer deaths were 4.6 times higher among US men with 12 or fewer years of education than among men with 4-year college degrees in 2016, in part due to a higher prevalence of cancer risk factors such as tobacco smoking, poor diet, and lack of physical activity in people with lower SES.<sup>17</sup> For example, in 2018 the tobacco smoking rate was 24.8% among US adults with less than a high school education compared to 6.4% among those who attended college or technical school.<sup>18</sup> Similarly, a greater proportion of Massachusetts adults with less than high school education were cigarette smokers in 2018.<sup>19</sup> One possible explanation for the increased smoking among those from lower SES or low education status is because of targeted marketing of tobacco products to people in low-income neighborhoods by tobacco companies.<sup>20</sup>

People with fewer resources also have less access to high-quality health care because of inadequate health insurance, and lack of adequate health care providers in low-income neighborhoods, financial, structural, and personal obstacles, low health literacy, and delays in the dissemination of advances in early detection and treatment to low-income areas.<sup>21</sup> In addition, people of lower SES are more likely to live and work in areas with limited opportunities for physical activity and availability of fresh fruits and vegetables, have a higher risk of exposure to cancer-causing infections and harmful exposures.<sup>22</sup> As a result, people of lower SES have a higher likelihood of developing cancer, being diagnosed at a late stage, less likely to receive the standard of care, and are more likely to have lower survival.<sup>23</sup>

Within SES groups, disparities by race and ethnicity persist as people of color are more likely to receive lower-quality health care than White people even when health insurance status, age, severity of disease, and health status are comparable. In addition, social inequalities, such as language barriers and provider bias, can affect interactions between patients and physicians and contribute to miscommunication and receipt of substandard care. Racial and ethnic disparities also reflect cultural influences on cancer risk factor behaviors. For example, lung cancer rates in the US are lower among Hispanic or Asians than in other racial/ethnic groups because Hispanics and Asians as a whole, are historically less likely to smoke. On the other hand, because a relatively large proportion of Hispanics or Asians are recent immigrants in US, they generally have higher rates of cancer related to infectious agents such as stomach cancer, reflecting higher infection prevalence such as *Helicobacter pylori* in their native countries.<sup>24</sup>

Although there are many contributing factors to racial/ethnic disparities in cancer burden, this report will focus on disparities in incidence and mortality by race/ethnicity, sex, age, stage at diagnosis, and geographic location in Massachusetts.

### **Females Incidence**

- White non-Hispanic females had significantly higher age-adjusted incidence rates of all cancers combined than Black non-Hispanic, Asian non-Hispanic and Hispanic females.
- Asian non-Hispanic females had the lowest age-adjusted incidence rate for all cancers combined than other racial/ethnic groups.

### **Males Incidence**

- Among males, Black non-Hispanics and White non-Hispanics had significantly higher age-adjusted incidence rates for all cancers combined than Asian non-Hispanic and Hispanic males.
- There was no significant difference in the incidence rates for all cancers combined between White non-Hispanic and Black non-Hispanic males.
- Asian non-Hispanic males had the lowest age-adjusted incidence rate for all cancers combined than other racial/ethnic groups.

### **Females Mortality**

- White non-Hispanic females had the highest all cancers combined mortality rates, significantly higher than for Asian non-Hispanic, Black non-Hispanic and Hispanic females.
- Asian non-Hispanic females had the lowest age-adjusted mortality rate for all cancers combined than other racial/ethnic groups.

### **Males Mortality**

- Black non-Hispanic and White non-Hispanic males had significantly higher mortality rate for all cancers combined than Asian non-Hispanics and Hispanic males.
- There was no significant difference in the incidence rates for all cancers combined between White non-Hispanic and Black non-Hispanic males.
- Asian non-Hispanic males had the lowest age-adjusted mortality rate for all cancers combined compared with other racial/ethnic groups.

## **Massachusetts vs. National Rates**

### **Incidence**

- The overall age-adjusted incidence rate for all cancers combined in Massachusetts were significantly lower than national rates among males.
- However, among females, incidence rates for all cancers combined were significantly higher in Massachusetts than national rates.

### **Mortality**

- The overall age-adjusted mortality rates for all cancers combined in Massachusetts were significantly lower than national rates for both males and females.

## Cancer Incidence (New Cancer Cases)

Table 1. New Cancer Cases by Sex for Leading Sites, Massachusetts, 2014-2018

### FEMALES

CANCER SITE	NUMBER OF NEW CASES	% OF ALL CANCER CASES
Breast	29,920	30.3
Lung and Bronchus	13,890	14.1
Colon and rectum	7,002	7.1
Corpus Uteri & Uterus, NOS	6,838	6.9
Thyroid	5,169	5.2
Melanoma of the Skin	3,979	4.0
Non-Hodgkin Lymphoma	3,565	3.6
Pancreas	2,865	2.9
Urinary Bladder	2,484	2.5
Kidney	2,384	2.4
All others	20,608	21.0
<b>TOTAL</b>	<b>98,704</b>	

### MALES

CANCER SITE	NUMBER OF NEW CASES	% OF ALL CANCER CASES
Prostate	22,432	24.1
Lung and Bronchus	12,198	13.1
Colon and rectum	7,311	7.8
Urinary Bladder	6,932	7.4
Melanoma of Skin	4,934	5.3
Non-Hodgkin Lymphoma	4,367	4.7
Kidney & Renal Pelvis	4,298	4.6
Oral Cavity & Pharynx	3,585	3.8
Leukemia	2,971	3.2
Pancreas	2,909	3.1
All others	21,309	22.9
<b>TOTAL</b>	<b>93,246</b>	

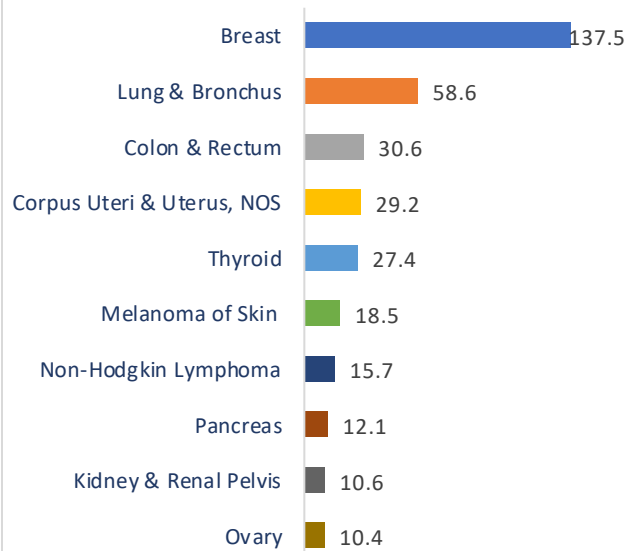
Source: Massachusetts Cancer Registry

For more information, visit the Massachusetts Cancer Registry Web Query at: <https://www.cancer-rates.info/ma/>

- Almost one third (30.3%) of all new cancers among females in Massachusetts between 2014 and 2018 were breast cancers, followed by lung and bronchus (14.1%), colon and rectum (7.1%), corpus uteri & uterus (6.9%), and thyroid cancers (5.2%).
- Nationally, breast cancer was also the leading cause of cancer among females.
- Among males, prostate cancer was the leading cause of cancer, with nearly a quarter (24.1%) of all new cancers in males, followed by lung and bronchus (13.1%), colon and rectum (7.8%), urinary bladder (7.4%), and melanoma of the skin (5.3%) cancers.
- Nationally, prostate cancer was also the leading cause of cancer among males.

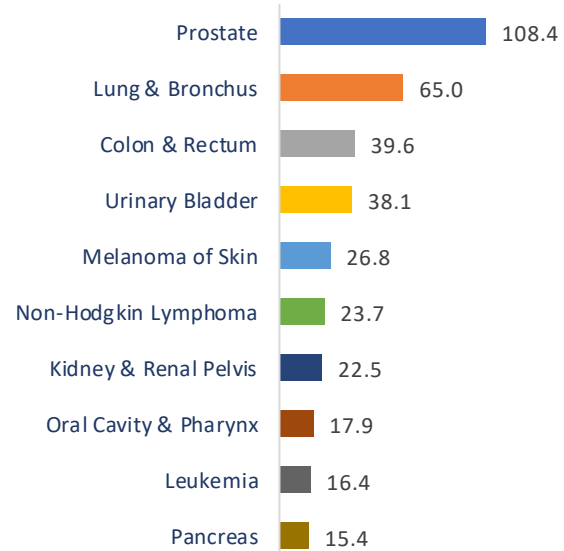
**Figure 1. Top 10 Cancers Among Females in Massachusetts, 2014-2018**

Age-Adjusted Incidence Rates Per 100,000



**Figure 2. Top 10 Cancers Among Males in Massachusetts, 2014-2018**

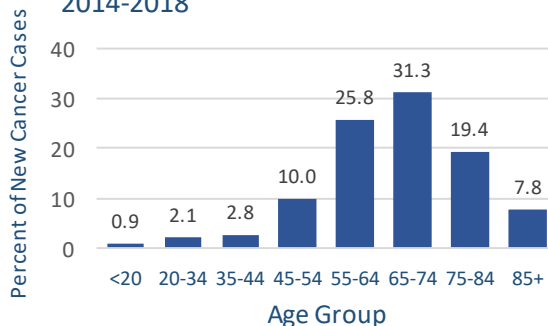
Age-Adjusted Incidence Rates Per 100,000



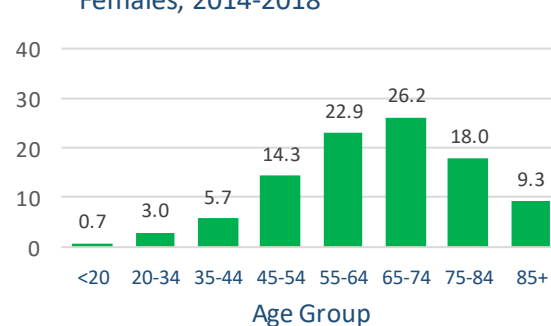
Source: Massachusetts Cancer Registry

- Between 2014 and 2018 breast cancer was the leading cause of new cancers in Massachusetts females, with an age-adjusted incidence rate of 137.5 per 100,000.
- Among males, prostate cancer was the leading cause of new cancers, with an age-adjusted incidence rate of 108.4 per 100,000 during this period.

**Figure 3. Percent of All Cancer Cases by Age Group in Massachusetts Males, 2014-2018**



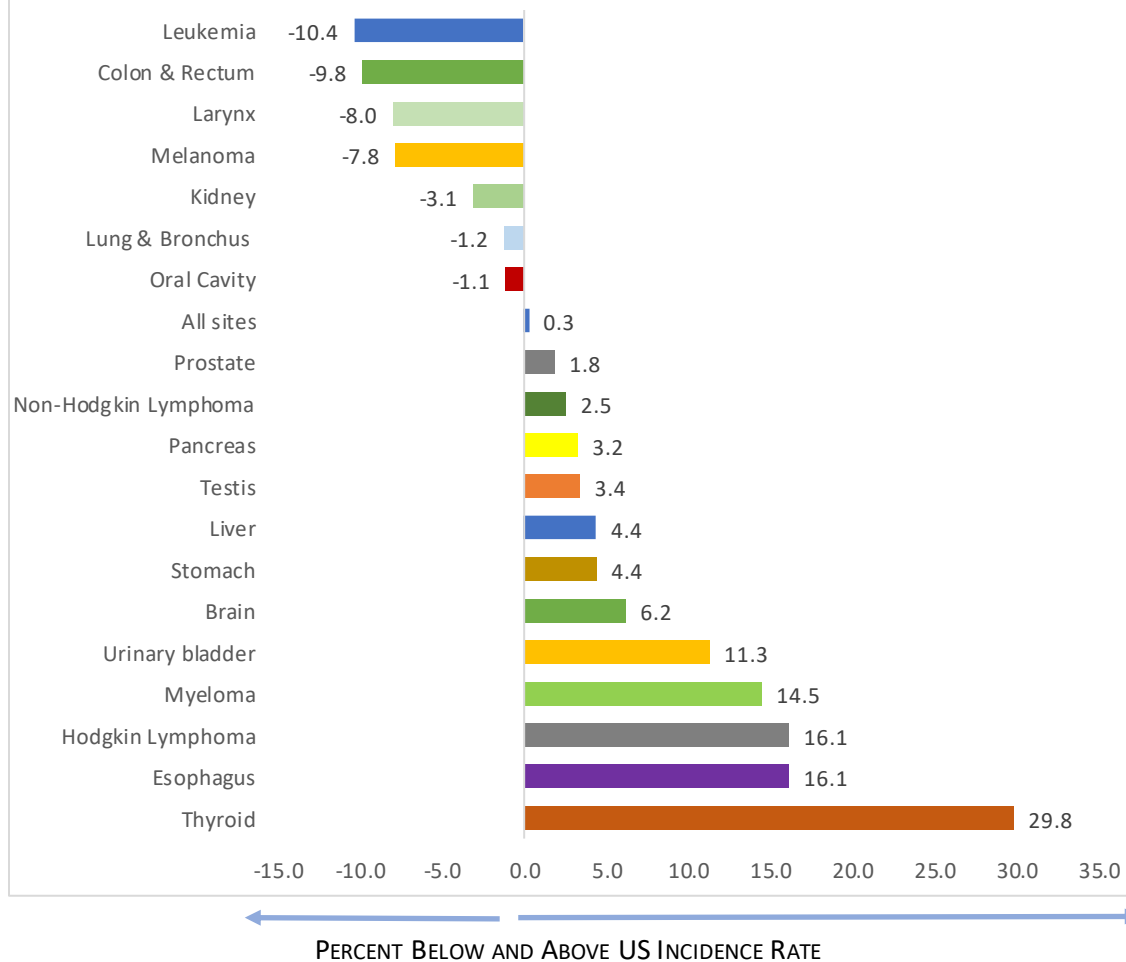
**Figure 4. Percent of All Cancer Cases by Age Group in Massachusetts Females, 2014-2018**



Source: Massachusetts Cancer Registry, Surveillance Epidemiology and End Results (SEER\*Stat)

- Cancer for all sites combined was most frequently diagnosed among Massachusetts males and females aged 55-64 and 65-74-years age groups.
- Less than one percent of all cancers were diagnosed among Massachusetts males and females younger than 20 years of age.

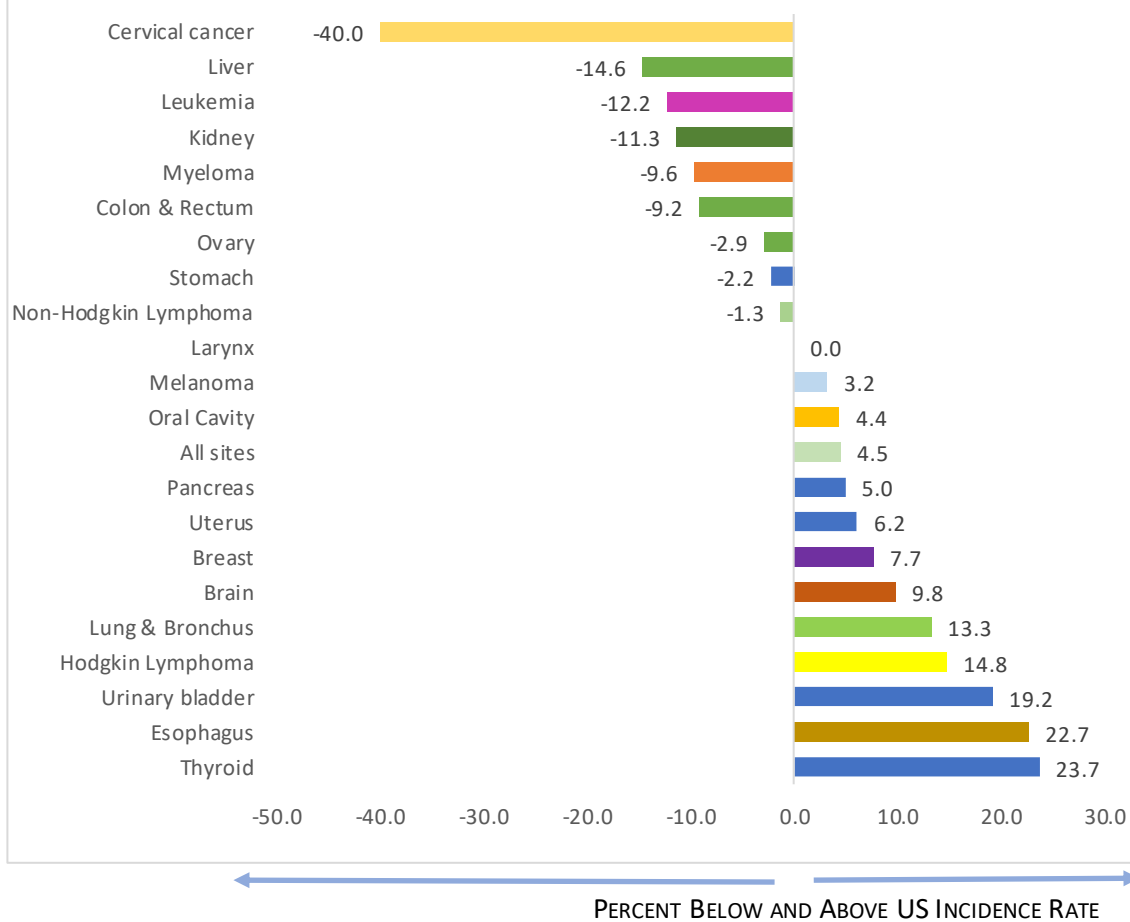
**Figure 5. Comparison of Massachusetts and US Males Average Annual Age-adjusted Incidence by Cancer Site/Type, 2014-2018**



Source: Massachusetts Cancer Registry and CiNA Explorer: An interactive tool for quick access to key NAACCR cancer statistics based on the Cancer in North America (CiNA) dataset from the North American Association of Central Cancer Registries Available from (<https://apps.naaccr.org/explorer>)  
Rates are age-adjusted to the 2000 U.S. Standard Population

- Among males, there were several cancers with statistically significant lower or higher incidence rates in Massachusetts than in US between 2014 and 2018. Only those with statistically significant differences are presented in the next two bullets:
  - Cancers with significantly lower incidence rates in Massachusetts than national rates included leukemia, colon and rectum, and melanoma of the skin.
  - Cancers with significantly higher incidence rates in Massachusetts than national rates included thyroid, esophagus, urinary bladder, liver, and prostate.

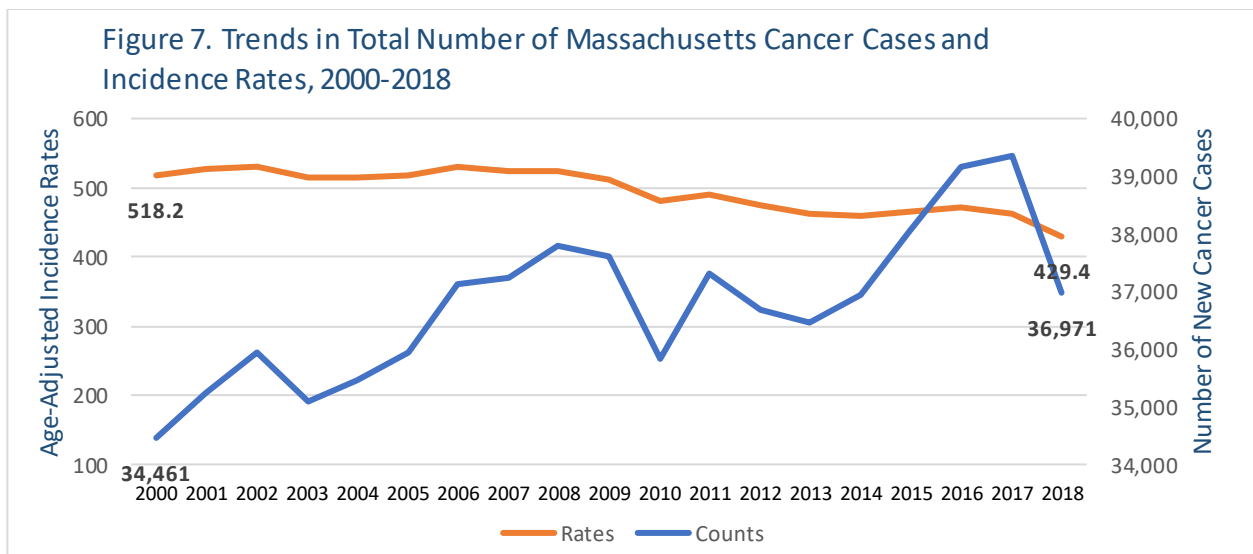
**Figure 6. Comparison of Massachusetts and US Females Average Annual Age-adjusted Incidence by Cancer Site/Type, 2014-2018**



Source: Massachusetts Cancer Registry and CiNA Explorer: An interactive tool for quick access to key NAACCR cancer statistics based on the Cancer in North America (CiNA) dataset from the North American Association of Central Cancer Registries Available from (<https://apps.naaccr.org/explorer>)  
Rates are age-adjusted to the 2000 U.S. Standard Population

- Among females, several cancers had statistically significant lower or higher incidence rates in Massachusetts than in US between 2014 and 2018. Only those with statistically significant differences are presented in the next two bullets:
  - Cancers with significantly lower incidence rates included leukemia, cervical cancer, kidney, liver, and colon and rectum.
  - Cancers with significantly higher incidence rates included all cancers combined, thyroid, esophagus, urinary bladder, lung and bronchus, brain, breast, and uterus.



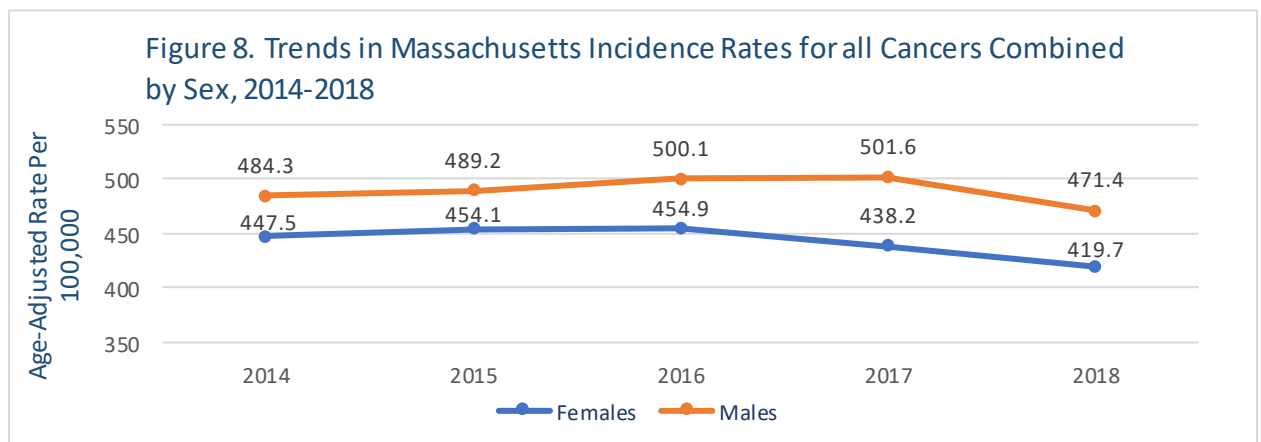


Source: Massachusetts Cancer Registry, SEER\*Stat

Rates are age-adjusted to the 2000 U.S. Standard Population

The drop in the number of cases for 2018 is due to the MCR's transition to a new database system, the SEER Data Management System (SEER\*DMS), and to data reporting delays due to the COVID19 pandemic.

- In general cancer incidence rates have decreased in Massachusetts between 2000 and 2018 while the total number of cancers (cancer counts) have increased during this period.
- Incidence rates for all cancers combined decreased from 518.2 per 100,000 in 2000 to 429.4 per 100,000 in 2018 while the number of cancer cases increased from 34,461 to 36,971.
- The rise in new cancer cases is mostly due to an aging and growing Massachusetts population.<sup>25</sup>



Source: Massachusetts Cancer Registry

- Between 2014 and 2018 cancer incidence rates in Massachusetts have decreased for males and females.
- Cancer incidence rates were significantly lower in females than in males. For instance, in 2014 the overall cancer incidence rate was 447.5 per 100,000 among females and 484.3 per 100,000 among males.
- In 2018 the incidence rates had decreased to 419.7 per 100,000 and 471.4 per 100,000 for females and males, respectively.

## Cancer Mortality

Table 2. Cancer Deaths by Sex for Leading Sites in Massachusetts, 2014-2018

### FEMALES

CANCER SITE	NUMBER OF DEATHS	% OF ALL CANCER DEATHS
Lung and Bronchus	7,961	25.5
Breast	4,077	13.1
Colon and Rectum	2,460	7.9
Pancreas	2,436	7.8
Ovary	1,591	5.1
Corpus Uteri & Uterus, NOS	1,131	3.6
Leukemia	1,076	3.5
Non-Hodgkin Lymphoma	1,032	3.3
Liver & intrahepatic Bile Ducts	861	2.8
Brain & Other Nervous System	849	2.7
All others	7,724	24.8
<b>TOTAL</b>	<b>31,198</b>	

### MALES

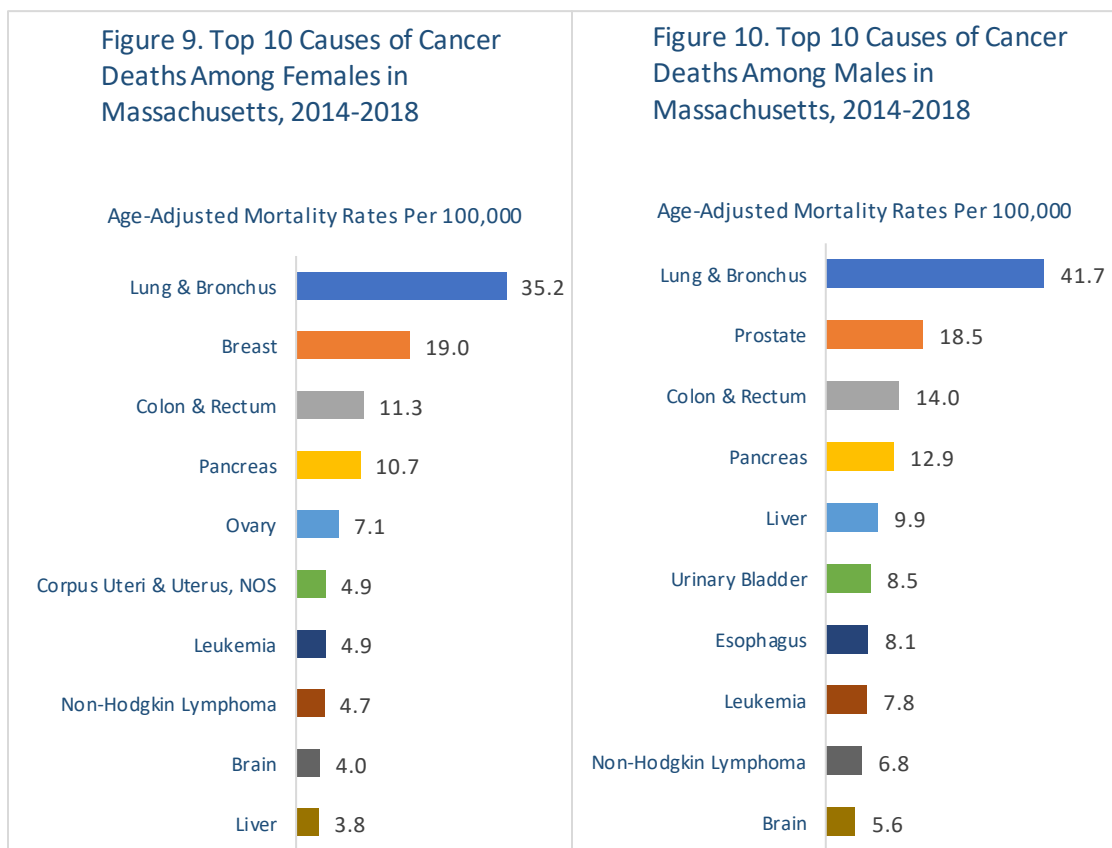
CANCER SITE	NUMBER OF DEATHS	% OF ALL CANCER DEATHS
Lung and Bronchus	7,809	24.0
Prostate	3,135	9.6
Colon and Rectum	2,480	7.6
Pancreas	2,406	7.4
Liver & intrahepatic Bile Ducts	1,924	5.9
Esophagus	1,539	4.7
Urinary Bladder	1,460	4.5
Leukemia	1,366	4.2
Non-Hodgkin Lymphoma	1,181	3.6
Brain & Other Nervous System	1,047	3.2
All others	8,256	25.3
<b>TOTAL</b>	<b>32,603</b>	

Source: Massachusetts Registry of Vital Records and Statistics

For more information, visit the Massachusetts Cancer Registry Web Query at: <https://www.cancer-rates.info/ma/>

- Lung and bronchus cancer was leading causes of cancer deaths in Massachusetts females, accounting for a quarter (25.5%) of all cancer deaths between 2014 and 2018.
- Other leading causes of cancer deaths in females included breast (13.1%), colon and rectum (7.9%), pancreas (7.8%), and ovary (5.1%).

- Among males, lung and bronchus cancer was also the leading cause of cancer deaths, with nearly one in four (24.0%) of all cancer deaths, followed by prostate (9.6%), colon and rectum (7.6%), pancreas (7.4%), and liver and intrahepatic bile duct (5.9%) cancers.



Source: Massachusetts Registry of Vital Records and Statistics

- Between 2014 and 2018 lung and bronchus cancer was the leading cause of cancer deaths in both Massachusetts females and males, with age-adjusted mortality rates of 35.2 per 100,000 and 41.7 per 100,000, respectively.
- In addition, breast, colon and rectum, pancreatic, and ovarian cancers were among the top cancers in females while prostate, colon and rectum, pancreatic, and liver cancers were among the leading causes of cancer deaths in males.

Figure 11. Percent of all Cancer Deaths by Age Group in Massachusetts Males, 2014-2018

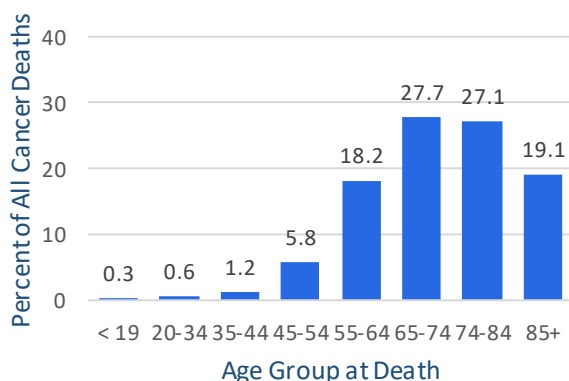
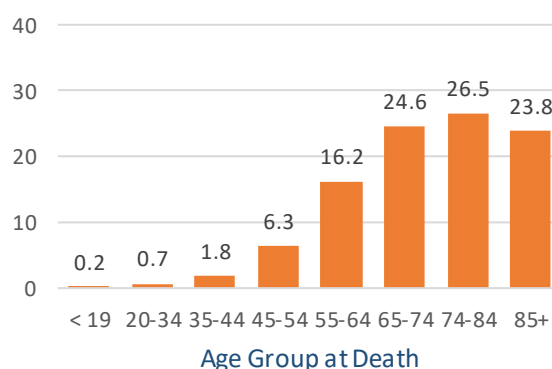


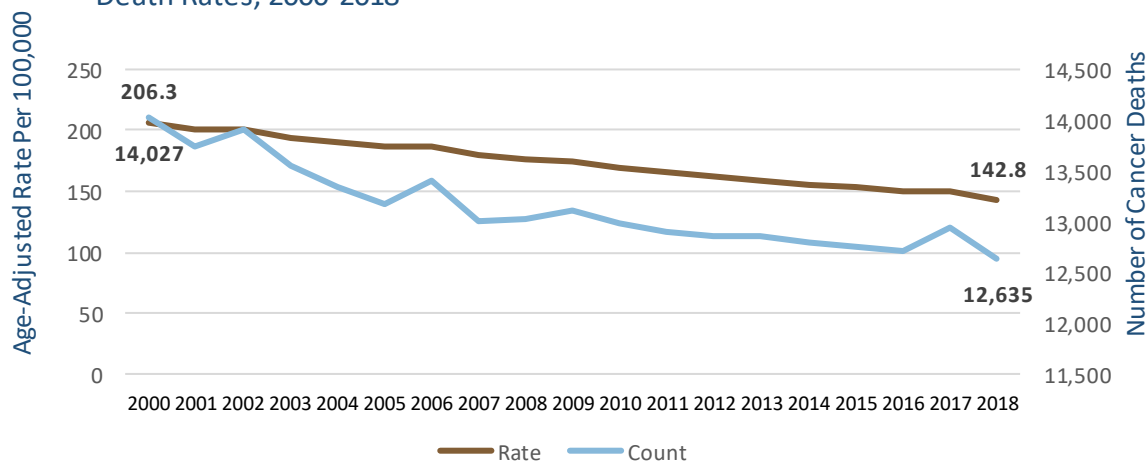
Figure 12. Percent of all Cancer Deaths by Age Group in Massachusetts Females, 2014-2018



Source: Massachusetts Registry of Vital Records and Statistics

- Mortality rates were highest in the 65-74 and 75 to 84 age groups in both males and females between 2014 and 2018.
- Females had a greater proportion of deaths in the 85 and above age group compared to males (23.8% vs. 19.1%), respectively.
- Less than three percent of all deaths in both males and females occurred in those aged less than 44 years of age.

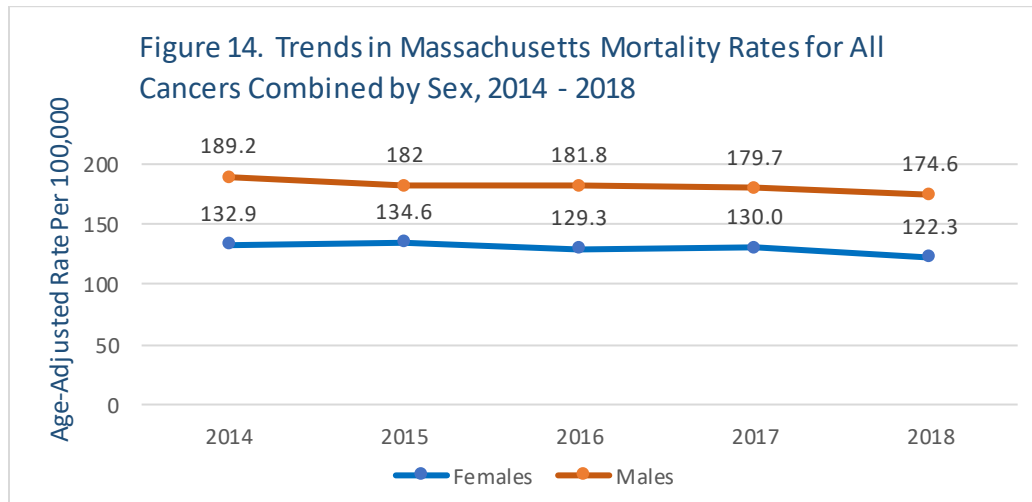
Figure 13. Trends in Total Number of Massachusetts Cancer Deaths and Death Rates, 2000-2018



Source: Massachusetts Registry of Vital Records and Statistics, SEER\*Stat

- The mortality rate and the number of deaths for all cancers combined significantly decreased between 2000 and 2018 in Massachusetts.
- Mortality decreased from 206.3 per 100,000 in 2000 to 142.8 per 100,000 in 2018, and the number of cancer deaths per year decreased from 14,027 in 2000 to 12,635 in 2018.

- The decline in mortality rates and number of deaths is attributed to the decrease in smoking and advances in cancer screening and treatment<sup>26</sup>.

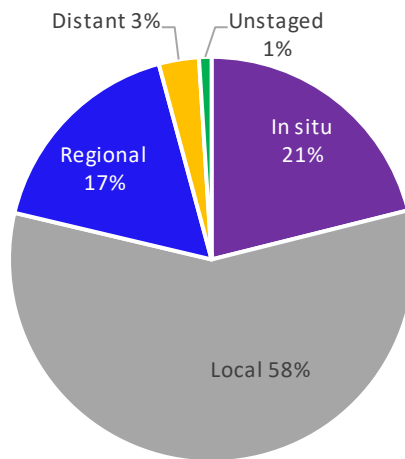


Source: Massachusetts Registry of Vital Records and Statistics

- Between 2014 and 2018 the mortality rate for all cancers combined in Massachusetts significantly decreased by 1.7% annually from 189.2 per 100,000 to 174.6 per 100,000 in males.
- The mortality rate also decreased annually from 132.9 to 122.3 per 100,000 in females, but the decrease was not statistically significant.

## Stage at Diagnosis for Selected Cancers<sup>27</sup>

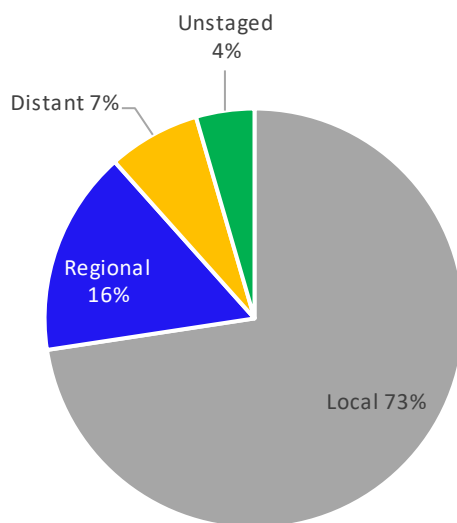
Figure 15. Breast Cancer Stage at Diagnosis in Massachusetts, 2014-2018



Source: Massachusetts Cancer Registry

- Nearly four in five (79%) of breast cancers among Massachusetts females between 2014 and 2018 were diagnosed early (in situ or at a local stage).
- Seventeen percent of breast cancers among Massachusetts females were diagnosed at a regional stage and 3% at a distant stage.
- The relative survival for breast cancer when it is diagnosed early is 99 percent compared to 29 percent when diagnosed at a distant stage.

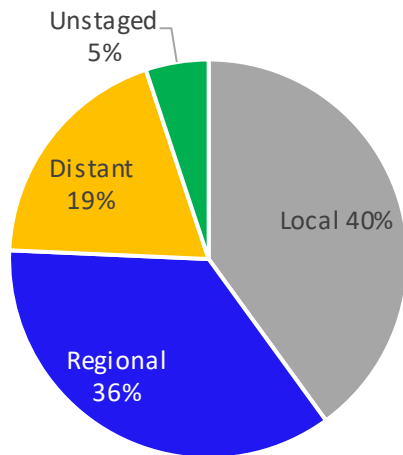
Figure 16. Prostate Cancer Stage at Diagnosis in Massachusetts, 2014-2018



Source: Massachusetts Cancer Registry

- Almost three in four (73%) of prostate cancers among Massachusetts males between 2014 and 2018 were diagnosed at a local stage and 16 percent at a regional stage.
- Seven percent of prostate cancers among Massachusetts males were diagnosed at a distant stage.
- The relative survival for prostate cancer when it is diagnosed early is 100 percent compared to 30.6 percent when diagnosed at a distant stage.

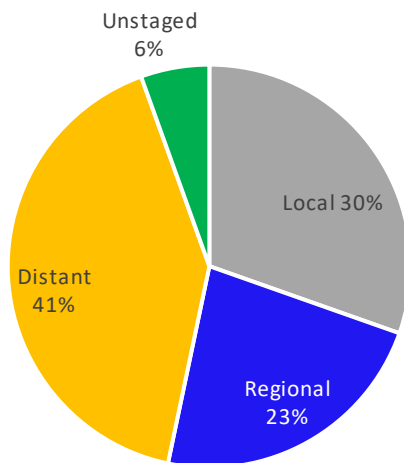
Figure 17. Colon and Rectum Cancer Stage at Diagnosis in Massachusetts, 2014-2018



Source: Massachusetts Cancer Registry

- Four in ten (40%) of colon and rectum cancers in Massachusetts between 2014 and 2018 were diagnosed at a local stage and 36% were diagnosed at a regional stage.
- One in five (19%) of colon and rectum cancers in Massachusetts were diagnosed at a distant stage.
- The relative survival for colon and rectum cancers when it is diagnosed early is 91 percent compared to 14.7 percent when it is diagnosed late.

Figure 18. Lung and Bronchus Cancer Stage at Diagnosis in Massachusetts, 2014-2018

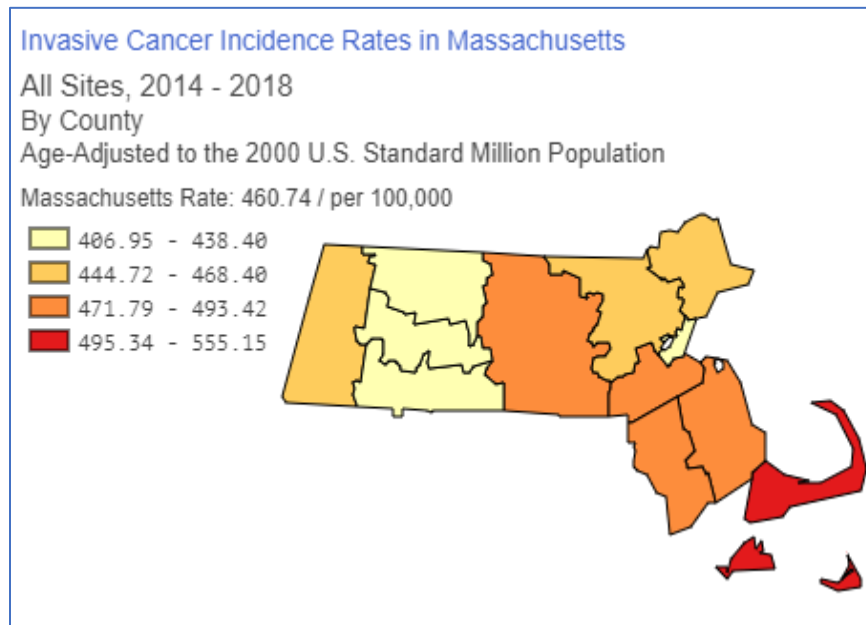


Source: Massachusetts Cancer Registry

- Almost one third (30%) of lung and bronchus cancers in Massachusetts between 2014 and 2018 were diagnosed at a local stage.
- Nearly one in four (23%) of lung and bronchus cancers in Massachusetts were diagnosed at a regional stage and 41 percent at a distant stage.
- The relative survival for lung and bronchus cancers when it is diagnosed early is 59.8% compared to 6.3% when it is diagnosed late (at a distant stage).

## Cancer Incidence and Mortality in Massachusetts by County

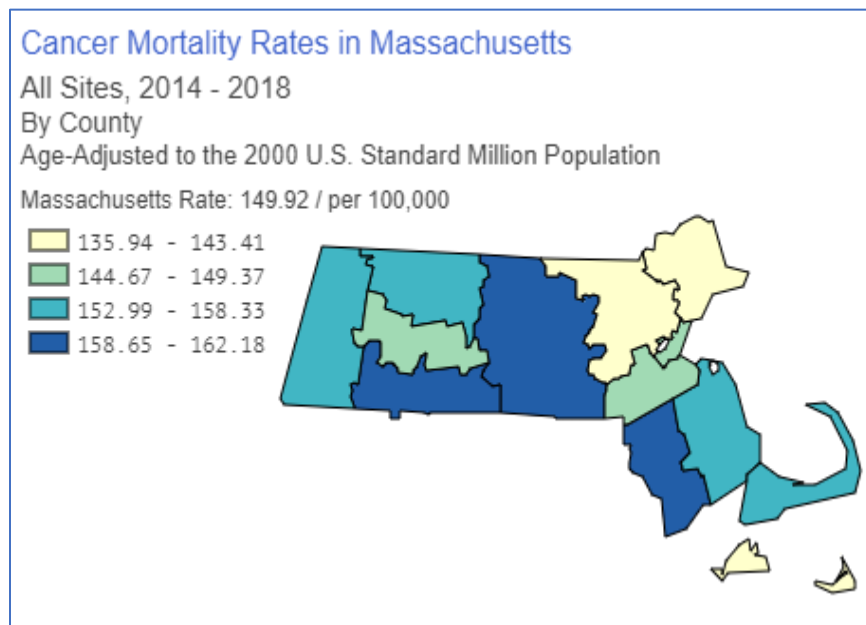
Figure 19. Incidence Rates for all Cancer Sites in Massachusetts by County, 2014-2018



Source: Massachusetts Cancer Registry  
MCR Web Query Tool: <https://www.cancer-rates.info/ma/>

- Cancer incidence rates in Massachusetts varied by county between 2014-2018.
- Counties with the highest incidence rates included:
  - Dukes
  - Nantucket
  - Barnstable
- Incidence rates in these three counties were greater than the state rate of 460.7 per 100,000.
- Counties with the lowest cancer incidence were:
  - Suffolk
  - Hampshire
  - Hampden
  - Franklin

Figure 20. Mortality Rates for all Cancer Sites in Massachusetts by County, 2014-2018



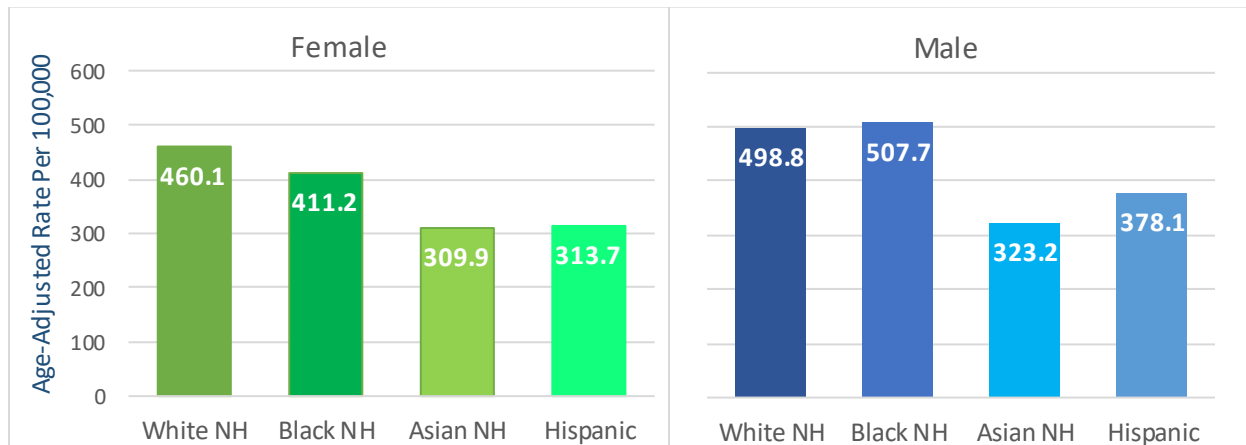
Source: Massachusetts Registry of Vital Records and Statistics  
MCR Web Query Tool: <https://www.cancer-rates.info/ma/>

- Cancer mortality rates in Massachusetts varied by county between 2014-2018.
- Counties with the highest mortality rates were:
  - Bristol
  - Worcester
  - Hampden
- Mortality rates in the three counties were greater than the state rate of 149.9 per 100,000.
- Counties with the lowest cancer mortality rates were:
  - Dukes
  - Nantucket
  - Essex
  - Middlesex



## Cancer Disparities and Health Equity

Figure 21. Age-Adjusted Cancer Incidence Rates in Massachusetts by Sex and Race/Ethnicity, 2014–2018



Source: Massachusetts Cancer Registry

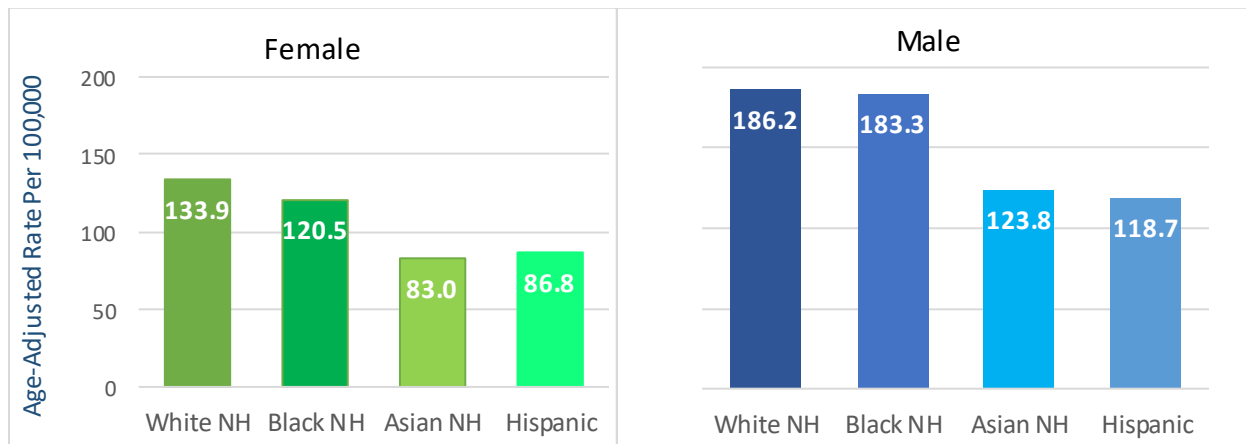
### Females Incidence

- White non-Hispanic (NH) females had significantly higher age-adjusted incidence rates of all cancers combined than Black NH, Asian NH, and Hispanic females.
- Asian NH females had the lowest age-adjusted incidence rate for all cancers combined than other racial/ethnic groups.

### Males Incidence

- Among males, Black NH and White NH had significantly higher age-adjusted incidence rates for all cancers combined than Asian NH and Hispanic males.
- There was no significant difference in the incidence rates for all cancers combined between White NH and Black NH males.
- Asian NH males had the lowest age-adjusted incidence rate for all cancers combined.

Figure 22. Age-Adjusted Cancer Mortality Rates in Massachusetts by Sex and Race/Ethnicity, 2014–2018



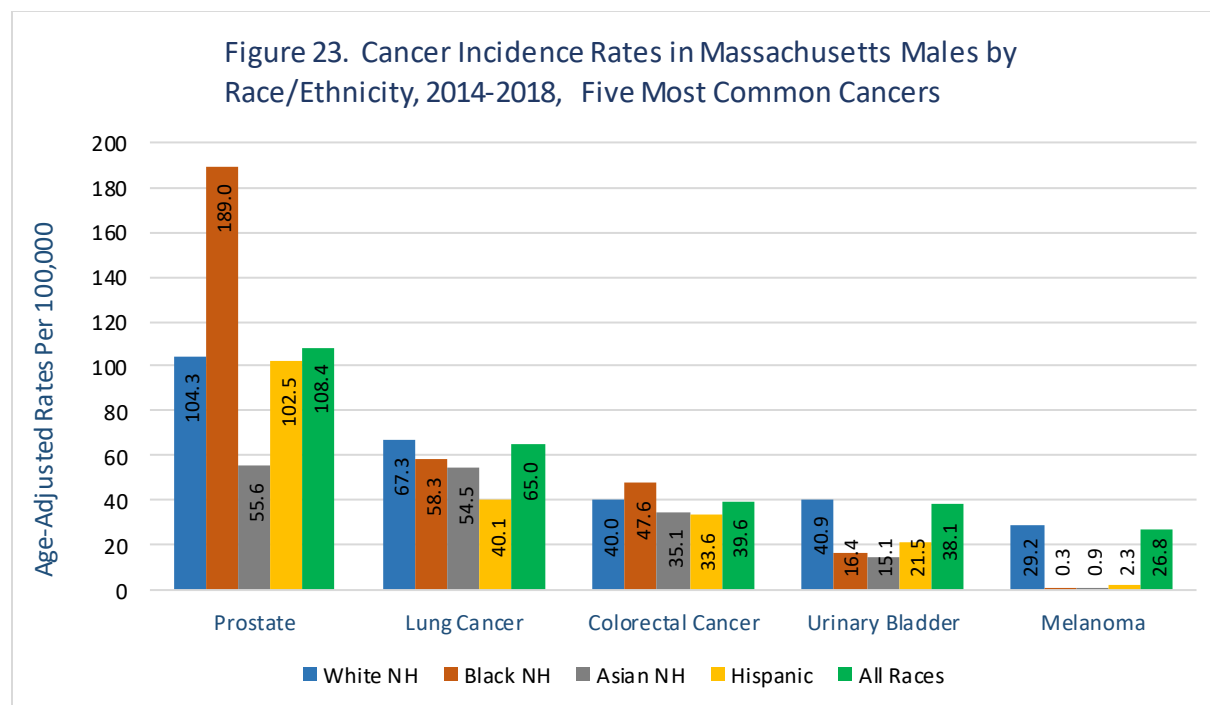
Source: Massachusetts Registry of Vital Records and Statistics

## Females Mortality

- White NH females had the highest mortality rate for all cancers combined, significantly higher than for Asian NH, Black NH, and Hispanic females.
- Asian NH females had the lowest mortality rate for all cancers combined compared to other racial/ethnic groups.

## Males Mortality

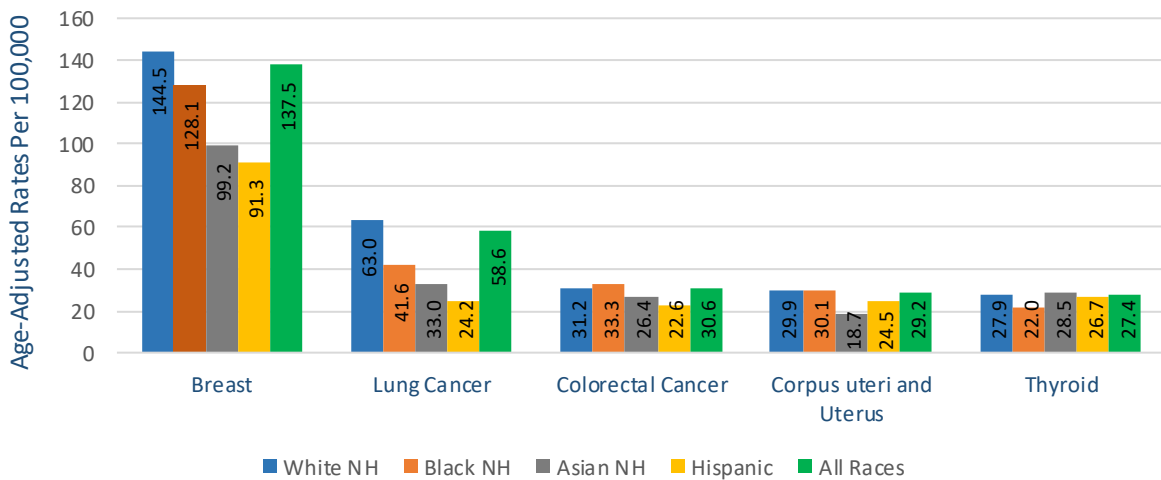
- White NH and Black NH males had significantly higher mortality rate for all cancers combined than Asian NH and Hispanic males.
- There was no significant difference in the mortality rates for all cancers combined between White NH and Black NH males.
- Asian NH males had the lowest age-adjusted mortality rate for all cancers combined compared with other racial/ethnic groups.



Source: Massachusetts Cancer Registry

- Black NH males had higher incidence rates of prostate cancer (189.0 per 100,000) and colon and rectum cancer (47.6 per 100,000) than other racial/ethnic groups.
- Prostate cancer incidence among Black NH males was more than one and half times higher than rates in White NH males (189.0 per 100,000 vs. 104.3 per 100,000).
- White NH males had higher incidence rates for lung and bronchus cancer (67.3 per 100,000), urinary bladder (40.9 per 100,000), and melanoma of the skin (29.2 per 100,000) compared to other racial/ethnic groups.

Figure 24. Cancer Incidence Rates in Massachusetts Females by Race/Ethnicity, 2014-2018, Five Most Common Cancers



Source: Massachusetts Cancer Registry

- White NH females had higher incidence rates of breast cancer (144.5 per 100,000), lung and bronchus cancer (63.0 per 100,000), corpus uteri and uterus (29.9 per 100,000), and thyroid cancer (27.9 per 100,000) than other racial/ethnic groups.
- Black NH females had higher incidence rates of colon and rectum cancer (33.3 per 100,000) than other racial/ethnic groups.
- White NH and Black NH females had higher incidence rates of corpus uteri and uterus cancer (30.0 per 100,000).

Figure 25. Cancer Incidence in Massachusetts Females by Year at Diagnosis and Race/Ethnicity, 2014-2018

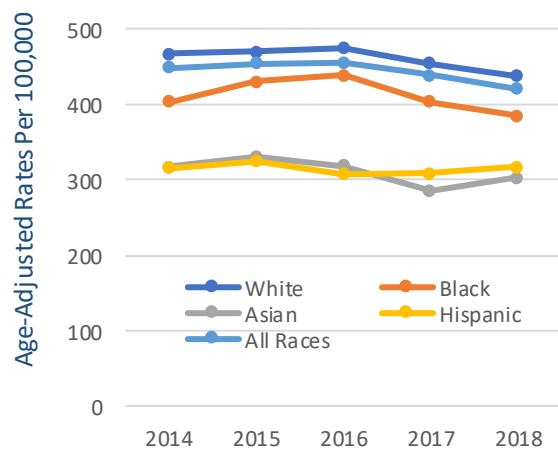
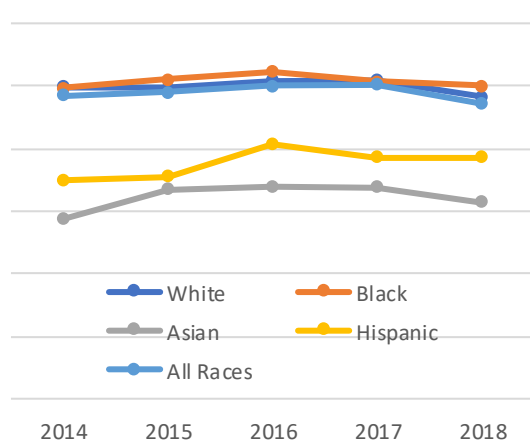
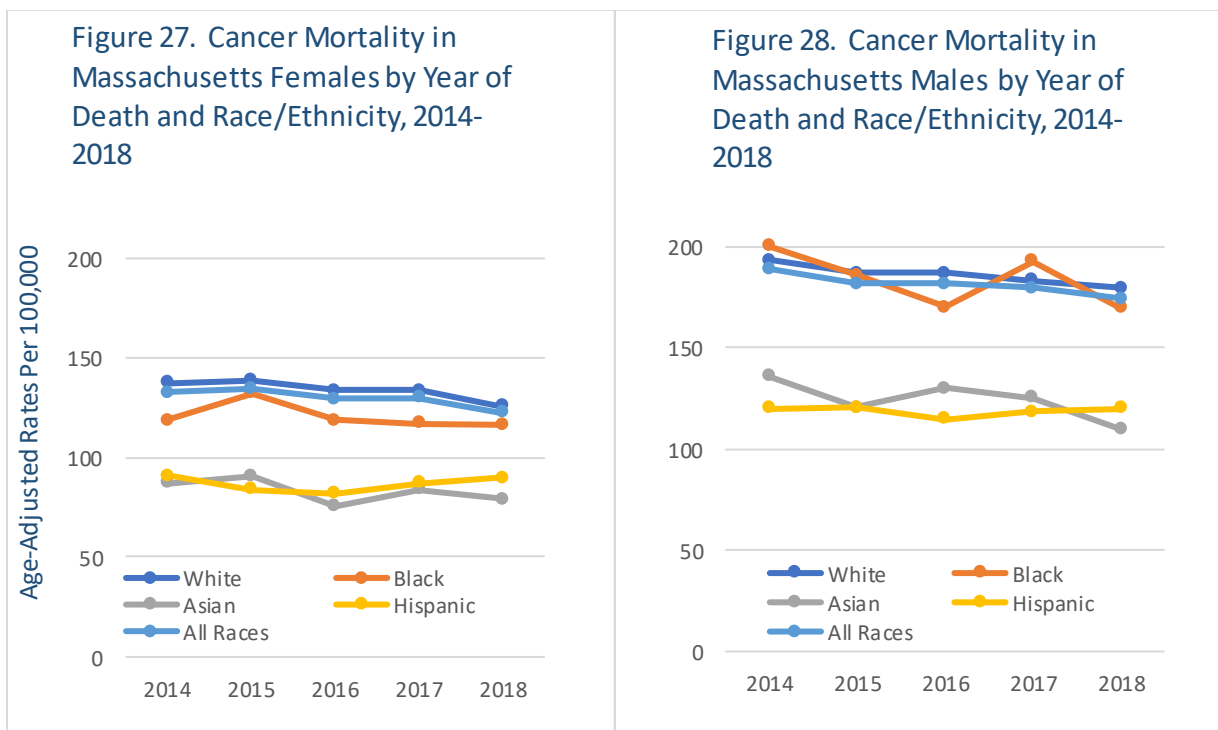


Figure 26. Cancer Incidence in Massachusetts Males by Year at Diagnosis and Race/Ethnicity, 2014-2018



Source: Massachusetts Cancer Registry

- Among females, incidence rates for all cancers combined in Massachusetts decreased by 1.6% annually between 2014-2018. However, this decrease was not statistically significant.
- Among males, incidence rates for all cancers combined in Massachusetts decreased non-significantly by 0.3% between 2014-2018.
- There were no significant decreases in cancer incidence rates by race/ethnicity in both Massachusetts males and females between 2014 and 2018.



Source: Massachusetts Registry of Vital Records and Statistics

- Among Massachusetts females, the mortality rate for all cancers combined decreased by 2.0% between 2014 and 2018, but this decrease was not statistically significant.
- There was a significant decrease of 2.2% in all cancers combined mortality rate among White NH females during this period.
- There were no significant decreases in cancer mortality rates among Black NH, Asian NH, and Hispanic females.
- The mortality rate for all cancers combined decreased by 1.7% among Massachusetts males between 2014 and 2018.
- White NH males saw a significant decrease of 1.6% in mortality rate during this period.
- There were no significant decreases in cancer mortality rates in Black NH, Asian NH, and Hispanic males.

Table 3: Ten Most Common Causes of Cancer Deaths Among Massachusetts Females by Race/Ethnicity, 2014-2018

Rank	White non-Hispanic	Rate*	Black non-Hispanic	Rate	Asian non-Hispanic	Rate	Hispanic	Rate
1	Lung and bronchus	35.7	Lung and bronchus	21.0	Lung and bronchus	20.0	Lung and bronchus	12.1
2	Breast	17.7	Breast	19.0	Breast	9.6	Breast	11.9
3	Colon and rectum	10.2	Pancreas	10.1	Pancreas	8.0	Colon and rectum	7.7
4	Pancreas	10.2	Colon and rectum	10.0	Colon and rectum	6.4	Pancreas	6.9
5	Ovary	7.2	Uterus	7.8	Liver	5.2	Liver	5.0
6	Uterus	4.6	Ovary	5.2	Stomach	4.2	Uterus	4.1
7	Leukemia	4.5	Myeloma	5.0	Ovary	3.8	NHL	4.1
8	NHL†	4.3	Liver	4.0	NHL	3.1	Stomach	4.1
9	Brain	4.1	Stomach	3.9	Leukemia	2.3	Leukemia	3.2
10	Liver	3.4	Leukemia	3.8	Brain	2.0	Ovary	3.1

Source: Massachusetts Registry of Vital Records and Statistics

\*Age adjusted mortality rate per 100,000

†NHL= Non-Hodgkin Lymphoma

Color-coded table by cancer type showing age-adjusted mortality rates for the top ten cancers for each race/ethnic group

- Among Massachusetts females, lung and bronchus cancer was the most common cause of cancer deaths in all racial/ethnic groups.
- Breast cancer was the second most common cause of all cancer deaths in all racial/ethnic groups.
- Colon and rectum cancer was the third most common cause of all cancer deaths in White NH and Hispanic females, and the fourth most common cause of cancer deaths in Black NH and Asian females.
- Pancreatic cancer was the fourth most common cause of cancer deaths in White NH and Hispanic females, and the third leading cause of cancer deaths in Black NH and Asian NH females.
- Ovarian cancer mortality varied greatly among the different racial/ethnic groups. It was the fifth leading cause of cancer deaths in White NH, the sixth in Black NH, the seventh in Asian NH, and tenth in Hispanic females.

Table 4: Ten Most Common Causes of Cancer Deaths Among Massachusetts Males by Race/Ethnicity, 2014-2018

Rank	White non-Hispanic	Rate*	Black non-Hispanic	Rate	Asian non-Hispanic	Rate	Hispanic	Rate
1	Lung and bronchus	44.8	Prostate	37.8	Lung and bronchus	34.8	Lung and bronchus	19.3
2	Prostate	18.1	Lung and bronchus	36.6	Liver	16.8	Prostate	19.0
3	Colon and rectum	14.2	Colon and rectum	16.4	Colon and rectum	9.5	Liver	12.8
4	Pancreas	13.5	Pancreas	15.0	Pancreas	7.3	Colon and rectum	8.2
5	Bladder	9.2	Liver	13.1	Stomach	6.9	Stomach	7.6
6	Liver	9.1	Stomach	7.9	Prostate	6.8	Pancreas	6.6
7	Esophagus	8.9	Myeloma	6.4	NHL	5.0	Leukemia	5.2
8	Leukemia	8.3	Esophagus	4.9	Oral	4.5	NHL	5.1
9	NHL†	7.1	Leukemia	4.4	Esophagus	4.3	Myeloma	3.4
10	Brain	6.1	Kidney	4.1	Leukemia	4.0	Bladder	2.8

Source: Massachusetts Registry of Vital Records and Statistics

\*Age adjusted mortality rate per 100,000

†NHL= Non-Hodgkin Lymphoma

Color-coded table by cancer type showing age-adjusted mortality rates for the top ten cancers for each race/ethnic group

- Among Massachusetts males, lung and bronchus cancer was the most common cause of cancer deaths in all racial/ethnic groups, except in Black non-Hispanics (NH) where prostate cancer was leading cause of cancer deaths.
- Prostate cancer was the second most common cause of cancer deaths in White NH and Hispanic males, and sixth among Asian NH males.
- Colon and rectum cancer was the third most common cause of cancer deaths in all racial/ethnic groups except, in Hispanic males, where it was the fourth most common cause of cancer deaths.
- Pancreatic cancer was the fourth most common cause of cancer deaths in all racial/ethnic groups, except in Hispanic males, where it was the sixth leading cause of cancer deaths.
- Bladder cancer was the fifth leading cause of cancer death in White NH, and the tenth in Hispanic males.

## Data Sources and Online Visualization Tools

- Massachusetts Cancer Registry (MCR) Website: <https://www.mass.gov/massachusetts-cancer-registry>  
The MCR website offers a wide variety of statistical products, including statewide reports, city and town series, and special reports. It also includes abstracting and coding manuals as well as Massachusetts Cancer Registry edits.
- MCR Web Query Tool: <https://www.cancer-rates.info/ma/>  
The MCR web query tool allows users to customize cancer incidence and mortality rate tables and maps by cancer site, sex, time frame and race/ethnicity.
- MA Population Health Information Tool (PHIT): <https://www.mass.gov/dph/phit>  
PHIT Tool is a web-based core data dissemination platform at the MDPH which shares reliable and relevant health and racial equity data to the public.
- MA EPHT: Environmental Public Health Tracking (EPHT): <https://matracking.ehs.state.ma.us/>  
The EPHT provides access to up-to-date health and environmental data and visualization tools for the communication and evaluation of environmental public health trends, and for the implementation of successful environmental public health actions.
- CDC/NCI State Cancer Profiles: <https://statecancerprofiles.cancer.gov/>  
State Cancer Profiles provides dynamic views demographic and cancer data including screening and risk factors, incidence, prevalence, and mortality for prioritizing cancer control efforts at the national, state, and local levels.
- Cancer Control P.L.A.N.E.T: <https://cancercontrolplanet.cancer.gov/planet/>  
Cancer Control P.L.A.N.E.T. portal provides access to data and resources that can help planners, program staff, and researchers design, implement and evaluate evidence-based cancer programs.
- U.S. Cancer Statistics Data Visualizations Tool: <https://www.cdc.gov/cancer/uscs/dataviz/index.htm>  
The Data Visualizations tool provides information on the numbers and rates of new cancer cases and deaths at the national, state, and county levels. The tool also provides cancer data by sex, age, race and ethnicity, trends over time, stage at diagnosis survival by stage, and prevalence. Screening data for breast, colon and rectum, and cervical cancer, and risk factors such as (obesity, nutrition, physical inactivity, tobacco use, and alcohol consumption) are estimated from BRFSS. In addition, Human papillomavirus (HPV) vaccination coverage estimates from the National Immunization Survey-Teen are provided.
- Cancer Statistics Website: <https://cancerstatisticscenter.cancer.org/#/>  
The Cancer Statistics Center website is primarily based on the data and analysis provided in the American Cancer Society's annual Cancer Statistics paper, published in CA: A Cancer Journal for Clinicians, and its consumer-friendly companion report, Cancer Facts & Figures.
- CiNA Explorer: <https://apps.naaccr.org/explorer/>  
CiNA Explorer is an interactive tool that provides easy access to a wide range of NAACCR cancer statistics by NAACCR region or registry, cancer site, gender, race, calendar year, age, and stage.

## Appendices

### Appendix I. New Cancer Cases and Incidence Rates by Cancer Site and Sex, Massachusetts, 2014 -2018

	Male		Female		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
<b>All Cancer Sites</b>	<b>93,246</b>	<b>489.3</b>	<b>98,704</b>	<b>442.7</b>	<b>191,977</b>	<b>459.4</b>
Brain & Other Nervous System	1,473	8.1	1,232	6.1	2,705	7.0
Breast	256	1.4	29,920	137.5	*	*
Breast In situ	37	0.2	7,999	38.2	*	*
Lung & Bronchus	12,198	65.0	13,890	58.6	26,091	61.0
Cervical Cancer	*	*	1,031	5.5	*	*
Colon and Rectum	7,311	39.6	7,002	30.6	14,314	34.6
Corpus Uterus	*	*	6,838	29.2	*	*
Esophagus	1,785	9.3	536	2.2	2,321	5.4
Hodgkin Lymphoma	547	3.1	487	2.7	1,035	2.9
Kidney & Renal Pelvis	4,298	22.5	2,384	10.6	6,684	16.1
Larynx	1,000	5.0	277	1.2	1,277	2.9
Leukemia	2,971	16.4	2,168	9.8	5,141	12.7
Liver & Intrahepatic Bile Ducts	2,753	13.7	977	4.1	3,731	8.5
Melanoma of Skin	4,934	26.8	3,979	18.5	8,914	21.8
Multiple Myeloma	1,554	8.3	1,215	5.2	2,769	6.5
Non-Hodgkin Lymphoma	4,367	23.7	3,565	15.7	7,934	19.2
Oral Cavity & Pharynx	3,585	17.9	1,551	6.8	5,136	11.9
Ovary	*	*	2,339	10.4	*	*
Pancreas	2,909	15.4	2,865	12.1	5,775	13.5
Prostate	22,432	108.4	*	*	*	*
Stomach	1,700	9.1	1,024	4.5	2,725	6.6
Testis	976	5.9	*	*	*	*
Thyroid	1,887	10.4	5,169	27.4	7,056	19.1
Urinary Bladder	6,932	38.1	2,484	10.4	9,417	22.2
Other Sites	7,378	41.0	7,771	33.7	15,154	36.6

Rates are age-adjusted to the 2000 U.S. Standard Population, per 100,000 total population

Breast in situ is excluded from "All Cancer Sites"

\*Cancers found in only one sex or predominantly in one sex (breast cancer)

Total includes persons classified as a transgender and persons of unknown sex

Source: Massachusetts Cancer Registry



**Appendix II. Number of Cancer Deaths and Death Rates by Cancer Site and Sex, Massachusetts, 2014 - 2018**

	Male		Female		Total	
	Deaths	Rate	Deaths	Rate	Deaths	Rate
<b>All Cancer Sites</b>	<b>32,603</b>	<b>179.0</b>	<b>31,198</b>	<b>129.7</b>	<b>63,801</b>	<b>157.3</b>
Brain & Other Nervous System	1,047	5.6	849	4.0	1,896	4.7
Breast	48	0.3	4,077	19.0	*	*
Lung & Bronchus	7,809	41.7	7,961	35.2	15,770	38.0
Cervical Cancer	*	*	229	1.1	*	*
Colon and Rectum	2,480	14.0	2,460	11.3	4,940	12.6
Corpus Uterus	*	*	1,131	4.9	*	*
Esophagus	1,539	8.1	425	1.9	1,964	4.7
Hodgkin Lymphoma	50	0.3	39	0.2	89	0.2
Kidney & Renal Pelvis	850	4.5	472	2.1	1,322	3.2
Larynx	270	1.4	84	0.4	354	0.8
Leukemia	1,366	7.8	1,076	4.9	2,442	6.2
Liver & Intrahepatic Bile Ducts	1,924	9.9	861	3.8	2,785	6.6
Melanoma of Skin	608	3.4	374	1.7	982	2.4
Multiple Myeloma	704	2.2	592	1.9	1,296	3.2
Non-Hodgkin Lymphoma	1,181	6.8	1,032	4.7	2,213	5.6
Oral Cavity & Pharynx	659	3.4	331	1.5	990	2.4
Ovary	*	*	1,591	7.1	*	*
Pancreas	2,406	12.9	2,436	10.7	4,842	11.8
Prostate	3,135	18.5	*	*	*	*
Stomach	771	4.3	501	2.3	1,272	3.2
Testis	29	0.2	*	*	*	*
Thyroid	91	0.5	117	0.5	208	0.5
Urinary Bladder	1,460	8.5	580	2.6	2,040	5.1
Other Sites	4,176	23.1	3,980	18.0	8,156	20.3

Rates are age-adjusted to the 2000 U.S. Standard Population, per 100,000 total population

\*Cancers found in only one sex or predominantly in one sex (breast cancer)

Total includes persons classified as a transgender and persons of unknown sex

Source: Massachusetts Registry of Vital Records and Statistics

### Appendix III. Technical Notes and Definitions

**Population Estimates:** Population estimates used for this report were developed by the University of Massachusetts Donahue Institute (UMDI) in partnership with the Massachusetts Department of Public Health, Bureau of Environmental Health.

**Race/Ethnicity:** The MCR collects reports of newly diagnosed cases of cancer from Massachusetts health care facilities and providers who diagnose or treat patients. Race and ethnicity data are obtained from the medical record, which may be self-reported by a patient or noted by a patient's provider. The MCR uses an algorithm developed by NAACCR called the NAACCR Hispanic Identification Algorithm (NHIA) to help classify Hispanic ethnicity. The algorithm is only applied to cases with an unknown Spanish/Hispanic origin or cases that have been classified as Hispanic based on a Spanish surname only. The algorithm uses last name, maiden name, birthplace, race, and sex to determine the ethnicity of these cases.

The race/ethnicity categories presented in this report are mutually exclusive. Cases and deaths are only included in one race/ethnicity category. The race/ethnicity tables and figures include the categories White non-Hispanic, Black non-Hispanic, Asian non-Hispanic, and Hispanic. The total population in Massachusetts also includes unknown races/ethnicities and Native Americans. As a result, the number of cases for the total population is not the sum of cases by race/ethnicity presented in the tables and figures.

**Age-Adjusted Rates:** A weighted average of the age-specific rates, where the weights are the proportions of persons in the corresponding age groups of the standard population. The 2000 U.S. Census Bureau population distribution was used as the standard. Rates were age-adjusted using nineteen 5-year age groups (<1, 1-4, 5-9, 10-14, 15-19 ... 85+). Age-adjusted rates can only be compared if they are adjusted to the same population.

**Age-specific rate:** A rate among people of a particular age range in a given time period. In this report, age-specific rates were calculated by dividing the number of people in an age group who were newly diagnosed with cancer (incidence) or died of cancer (mortality) by the number of people in that same age group overall.

**Incidence:** The number of people who are newly diagnosed with a disease, condition, or illness during a particular time period. The incidence data presented in this report were coded using the International Classification of Disease for Oncology 3<sup>rd</sup> Edition (ICD-O-3) coding system.

**Mortality:** The number of people who died of a disease, condition, or illness during a particular time period. The mortality data presented in this report were coded using the International Classification of Diseases Tenth Revision (ICD-10).

**Annual Percent Change (APC):** A statistical method for trend analysis. It shows how much a cancer has increased or decreased over the observed period of time. This estimation assumes that the change in incidence and mortality is constant during the observed period. Trends in the age-standardized incidence and mortality rates in this report were analyzed using **Jointpoint regression**, a windows-based

statistical software provided by NCI/SEER that calculates the number and location of points where trends change directions (jointpoints).

**Statistically Significant:** Results were considered to be statistically significant when the p value was less than or equal to 0.05.

#### ICD codes used for this report

Cancer Site/Type	ICD-O-3 SEER Site Recode*	ICD-10**
Brain & Other Nervous System	31010, 31040	C70-C72
Breast (includes <i>in situ</i> )	26000	C50
Lung and Bronchus	22030	C34
Cervix Uteri	27010	C53
Colon/ Rectum	21041-21052	C18-C20, C26.0
Corpus Uteri & Uterus, NOS	27020, 27030	C54-C55
Esophagus	21010	C15
Hodgkin Lymphoma	33011, 33012	C81
Kidney & Renal Pelvis	29020	C64-C65
Larynx	22020	C32
Leukemia	35011-35013, 35021, 35031, 35022, 35023, 35041, 35043	C90.1, C91 – C95
Liver and Intrahepatic Bile Ducts	21071	C22
Melanoma of Skin	25010	C43
Multiple Myeloma	34000	C90.0, C90.2
Non – Hodgkin Lymphoma	33041, 33042	C82-C85, C96.3
Oral Cavity & Pharynx	20010-20100	C00-C14
Ovary	27040	C56
Pancreas	21100	C25
Prostate	28010	C61
Stomach	21020	C16
Testis	28020	C62
Thyroid	32010	C73
Urinary Bladder (includes <i>in situ</i> )	29010	C67

\*International Classification of Diseases for Oncology, 3<sup>rd</sup> Ed. Surveillance, Epidemiology, and End Results (SEER) Site Recode ICD-O-3/WHO 2008 Definition: [https://seer.cancer.gov/siterecode/icdo3\\_dwhohome/index.html](https://seer.cancer.gov/siterecode/icdo3_dwhohome/index.html)

\*\**International Classification of Diseases, Tenth Revision* (includes codes added since publication) for mortality data

#### Data Limitations

When interpreting the cancer data, it is important to consider certain limitations which include:

- Under-reporting in areas close to neighboring states: Although the MCR has reciprocal reporting agreements with 42 states, there may still be some Massachusetts residents who were diagnosed out of state and not reported to the MCR.

- Interpretation of trends: Apparent increases or decreases in cancer incidence over time may reflect changes in diagnostic methods or case reporting rather than true changes in cancer occurrence.
- Small number of cases: Some calculations in this report involved small numbers of cases. As a result, differences in rates may be due to chance, and the data should be interpreted with caution.

## Appendix IV. DPH Cancer Programs Health Equity Initiatives

### MA Statewide Cancer Plan

The [Massachusetts Statewide 2017-2021 Cancer Plan](#) sets forth a comprehensive cancer control blueprint for action to reduce the cancer burden in Massachusetts. It is designed as a guide for statewide, local, and community efforts in preventing and controlling cancer. The Plan addresses the social determinants and related risk factors that contribute to cancer in our communities by considering the policies, laws, and environments that impact our behavior and create social and physical environments that promote good health for all. The MA statewide cancer plan is intended for community health and faith-based coalitions, disease prevention and advocacy organizations, healthcare providers, researchers, policy makers, public health officials, cancer survivors, and individuals interested in cancer activities. The MA statewide cancer plan includes health equity and access as one of its cross-cutting themes to address root causes of cancer disparities and to achieve equity by increasing access to quality services, healthcare, and resources in a timely manner and creating environments for people to achieve their highest health potential.

### MA Colorectal Cancer Control Program's CRC Learning Collaborative

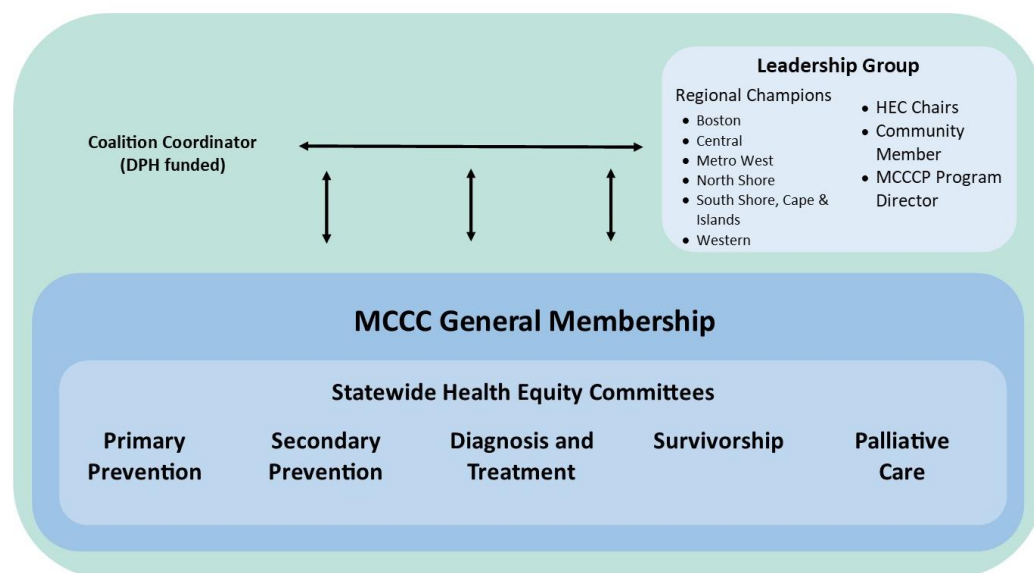
Although overall statewide colorectal cancer (CRC) screening rates are among the highest in the nation, disparities in CRC screening continue to persist among certain subpopulations in Massachusetts. According to the Massachusetts Behavioral Risk Factor Surveillance System (BRFSS), the overall CRC screening rate in Massachusetts in 2018 was 77.1%. At the state level there was no significant difference in colorectal cancer screening by race and ethnicity even though screening rates among Hispanics and Asian populations in Massachusetts were much lower at 68.3% among Hispanics and 70.0% in Asians, compared to 78.3% among Whites non-Hispanic and 79.9% among Black non-Hispanics adults. However, adults with less than high school education (66.5%) and those with less than \$25,000 household income (67.5%) were less likely to be screened compared to adults with college or more education and with household income greater than \$50,000. Similar disparities in CRC screening were observed among clients ages 51-75 receiving care in federally qualified health centers (FQHCs) where only 55.6% of patients were up to date with their CRC screening. These data also show that screening rates in FQHCs were over 20 percentage points lower than the state average. Within FQHCs, CRC screening rates ranged from 17.8%-80.5% in 2018. The MA Colorectal Cancer Control Program (CRCCP) works with the MA League of Community Health Centers (MLCHC) to help community health centers (CHCs) with low colorectal cancer screening rates to implement Community Guide recommended evidence-based interventions to increase CRC screening. Each participating CHC is coached through performing a disparities analysis on CRC screening rates by race/ethnicity/language to better understand gaps in care and then develop plans to decrease inequities that are identified.

### MA Comprehensive Cancer Control Program's (MCCCP)

Persistent inequities across the cancer care continuum from primary prevention to survivorship point to the need to 1) engage professionals from multiple sectors who work in different systems across the cancer continuum to align efforts and priorities, especially in focusing efforts on priority populations and 2) at each stage of the continuum, going beyond established "best practice" approaches to really understand the complex barriers and needs experienced by priority populations and working together with them to develop tailored solutions. Finally, geographic inequities underscore the need to have regional representation from across the state, especially areas with greater cancer burden, and developing regional solutions.

In 2021, after completing a qualitative assessment that indicated the MCCCCP's membership was largely Boston-based and hospital/clinical-focused, the MCCCCP began restructuring its Network into a broader, statewide [Comprehensive Cancer Coalition](#). This Coalition structure was designed with input from stakeholders in cancer care across the state.

The reorganized structure is as follows:



The Coalition's Leadership Group is comprised of Regional Champions from each region of MA and includes the Co-Chairs of the newly designed Health Equity Committees (HECs) organized across the cancer continuum (Primary Prevention, Secondary Prevention, Treatment and Diagnosis, Survivorship, and Palliative Care). Recruitment efforts are focused on increasing diverse membership within each HEC to include community-based and faith-based organizations, patients, caregivers, clinicians, academics, municipalities, and non-traditional partners to ensure diverse perspective as the Coalition develops the next 5-year State Cancer Plan. The Coalition's new vision and mission, developed by the Leadership Group, are as follows:

#### *Vision*

To significantly reduce the burden of cancer for all residents of Massachusetts.

#### *Mission*

To develop partnerships that address the disparities across the cancer continuum and improve the lives of cancer survivors and those living with cancer.

- Identify and eliminate barriers to health equity to close persistent gaps in cancer outcomes
- Prioritize the unmet needs of disproportionately affected communities through advocacy, multisectoral partnerships, and ensuring equitable access to quality resources
- Work collaboratively to implement and promote the Massachusetts State Cancer Plan

An example of the MCCCCP efforts to address the inequities in prostate cancer treatment outcomes in Black non-Hispanic men as specified in Massachusetts 2017-2021 State Cancer Plan is shown through its work with the Prostate Cancer Workgroup. One objective of the Massachusetts State Cancer plan was to conduct an in-depth analysis of the Massachusetts Cancer Registry (MCR) data to identify

racial/ethnic disparities in the treatment of prostate cancer and to guide development of interventions aimed at ensuring equitable treatment for prostate cancer. The MCCCCP worked with the MCR to conduct preliminary analysis of the MCR data and found that there were disparities in prostate cancer treatment between Black non-Hispanic and White non-Hispanic men in Massachusetts. Based on these findings, the MCR and MCCCCP collaborated with the Prostate Cancer Workgroup to conduct an in-depth analysis of the MCR data and prepared a manuscript on [racial differences in the treatment and outcomes for prostate cancer in Massachusetts](#) which was published in May 2021. The objective of the manuscript was to examine racial differences in the treatment and outcomes for prostate cancer in Massachusetts. The key finding of the study was that despite lower likelihood of definitive treatment, Black non-Hispanic men had better cancer specific survival than White non-Hispanic men both adjusted and unadjusted survival analyses. The workgroup also published a manuscript on [trends in mortality among Black and White men with prostate cancer in Massachusetts and Pennsylvania: Race and neighborhood socioeconomic position](#).

In addition, the Prostate Cancer Workgroup used MCCCCP funding to support qualitative evaluation of the issues and key factors that contribute to the disparities in prostate cancer treatment for Black men in Massachusetts. The main goal of this study was to understand the reasons for the identified disparities in use of definitive prostate cancer treatment identified using quantitative data indicating that Black non-Hispanic men were less likely to receive definitive treatment of prostate cancer compared to White non-Hispanic men. The MCCCCP and the Prostate Cancer Work Group hired JSI Research & Training Institute to conduct key informant interviews with Massachusetts prostate cancer providers and advocates regarding the perceived barriers to definitive prostate cancer treatment between Black non-Hispanic men and White non-Hispanic men. Key findings for the qualitative study included:

- There is a growing awareness that disparities in prostate cancer treatment may be more strongly associated with social determinants of health than biological factors.
- How care teams manage the “hand-off” of a patient from primary care to a specialist will have a significant effect on treatment decisions.
- Factors that affect prostate cancer treatment include access to care, health literacy, socio-economic status and financial concerns.
- Prostate cancer treatment decision-making is affected by factors such as medical and research mistrust, tolerance of side effects, shared decision-making, family support, and severity of disease.
- Disparities in prostate cancer treatment can be addressed through patient education, decision tools, improved communication, and the use of community health workers and patient navigators.

The prostate Cancer Workgroup is engaging with select Massachusetts hospitals to address inequities in prostate cancer treatment.

### **MA Breast and Cervical Cancer Program**

The Massachusetts Breast and Cervical Cancer Program (MBCCP) uses a multi-pronged systems approach aimed at effectively reaching, engaging, and addressing the barriers women of color face in accessing essential preventive, diagnostic and treatment services in Massachusetts. This is accomplished through two key strategies including providing patient navigation to reduce institutional, provider-level, and community barriers; and supporting the use of evidence-based interventions through client reminders, small media, one on one and group education through community-based organizations, and

provider reminders. The MBCCP works with CHCs that predominantly serve women residing in communities of color who face significant financial and structural barriers to accessing essential screening and diagnostic services. The MBCCP focuses on these centers because these are the safety net healthcare providers with the greatest ability to reach and provide culturally competent care to priority populations.

In the coming 5 years, the MBCCP will expand its equity-centered, best-practice approaches into more health systems by working collaboratively with the other DPH programs including the MCCCCP, MCR, other chronic disease prevention programs, and the MLCHC to reach, enroll, and serve more women in the state and over time, close the gap in breast and cervical cancer inequities in Massachusetts. This approach will also support state goals of reducing disparities in chronic disease and associated risk factors through promotion of healthy behaviors, engaging partners and enhancing linkages in communities, policy influence, system improvement, knowledge generation, dissemination of information, provision of resources, and conducting surveillance monitoring. It will also allow for the exploration of future expansion of services to meet the needs of those most vulnerable across the state.

#### **MA Bureau of Environmental Health: Environmental Justice**

- Environmental Justice is the principle that all people have the right to be protected from environmental pollution, and to live in and enjoy a clean, healthy environment.
- The [DPH Environmental Justice Tool](#) is an interactive online tool that facilitates use of the statewide [Environmental Justice Policy](#). This policy was established to help address the disproportionate environmental burdens experienced by individuals of color and lower-income people.
  - Environmental Justice (EJ) neighborhoods are defined as those that meet one or more criteria based on median household income, neighborhood race and ethnicity make-up, and English language isolation.
  - Vulnerable health EJ criteria further identify populations with evidence of higher-than-average rates of environmentally-related health outcomes. These include heart attack hospitalizations, childhood blood lead levels, low birth weight, and childhood asthma emergency department visits.
- The [MA Environmental Public Health Tracking \(EPHT\) website](#) hosts the DPH Environmental Justice Tool as well as many environmental and health datasets, including cancer incidence at the county, community, and census tract level.



## References

- 
- <sup>1</sup> Malignant disease and benign brain-related tumor registry; reports. Available at: <http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section111B>
- <sup>2</sup> American Cancer Society. Cancer Basics. What is Cancer? Available at: <https://www.cancer.org/cancer/cancer-basics/what-is-cancer.html>
- <sup>3</sup> National Cancer Institute. Available at: <https://www.cancer.gov/about-cancer/causes-prevention/patient-prevention-overview-pdq>
- <sup>4</sup> American Cancer Society. Cancer Facts and Figures 2022. Available at: <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2022/2022-cancer-facts-and-figures.pdf>
- <sup>5</sup> National Cancer Institute. Risk Factors for Cancer. Available at: <https://www.cancer.gov/about-cancer/causes-prevention/risk>
- <sup>6</sup> American Cancer Society. Cancer Facts and Figures 2022. Available at: <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2022/2022-cancer-facts-and-figures.pdf>
- <sup>7</sup> American Cancer Society. Cancer Facts and Figures 2022. Available at: <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2022/2022-cancer-facts-and-figures.pdf>
- <sup>8</sup> National Cancer Institute. Cancer Staging. Available at: <https://www.cancer.gov/about-cancer/diagnosis-staging/staging>
- <sup>9</sup> National Cancer Institute. Surveillance, Epidemiology, and End Results (SEER) Program. Cancer Stat Facts: Colon and rectum Cancer. Available at: <https://seer.cancer.gov/statfacts/html/colorect.html>
- <sup>10</sup> American Cancer Society. Cancer Facts and Figures 2022. Available at: <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2022/2022-cancer-facts-and-figures.pdf>
- <sup>11</sup> American Cancer Society. Diversity, Inclusion, and Equity in America. Available at: [http://pressroom.cancer.org/releases?item=908&\\_ga=2.125825354.1312072142.1633530743-909755451.1631827794](http://pressroom.cancer.org/releases?item=908&_ga=2.125825354.1312072142.1633530743-909755451.1631827794)
- <sup>12</sup> National Cancer Institute. Cancer Disparities. Available at: <https://www.cancer.gov/about-cancer/understanding/disparities>
- <sup>13</sup> Centers for Disease Control and Prevention. What is Health Equity? Available at: <https://www.cdc.gov/healthequity/index.html>
- <sup>14</sup> Centers for Disease Control and Prevention. What is Health Equity? Available at: <https://www.cdc.gov/healthequity/index.html>
- <sup>15</sup> American Cancer Society. Cancer Facts and Figures 2022. Cancer Facts and Figures. Available at: <https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2022.html>
- <sup>16</sup> US Census. American Community Survey. Percent of Poverty in Massachusetts. 2018. Available at: <https://data.census.gov/cedsci/table?q=poverty%20in%20Massachusetts%20in%202018&tid=ACSST1Y2018.S1703>
- <sup>17</sup> American Cancer Society. Cancer Facts and Figures 2022. Cancer Facts and Figures. Available at: <https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2022.html>
- <sup>18</sup> Behavioral Risk Factor Surveillance System (BRFSS). Available at: <https://www.cdc.gov/brfss>

- 
- <sup>19</sup> Massachusetts Department of Public Health. A Profile of Health Among Massachusetts Adults, 2018. Behavioral Risk Factor Surveillance System. December 2019. Available at: <https://www.mass.gov/doc/a-profile-of-health-among-massachusetts-adults-2018/download>
- <sup>20</sup> American Cancer Society. Cancer Facts and Figures 2022. Cancer Facts and Figures. Available at: <https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2022.html>
- <sup>21</sup> Zavala VA, Bracci PM, Carethers JM, et al. Cancer health disparities in racial/ethnic minorities in the United States. *Br J Cancer*. 2021;124: 315-332
- <sup>22</sup> Pampel FC, Krueger PM, Denney JT. Socioeconomic disparities in health behaviors. *Ann Rev Oncol*. 2010;36: 349-370.
- <sup>23</sup> Clegg LX, Reichman ME, Miller BA, et al. Impact of socioeconomic status on cancer incidence and stage at diagnosis: selected findings from the surveillance, epidemiology, and end results: National Longitudinal Mortality Study. *Cancer Causes Control*. 2009;20: 417-435.
- <sup>24</sup> Zavala VA, Bracci PM, Carethers JM, et al. Cancer health disparities in racial/ethnic minorities in the United States. *Br J Cancer*. 2021;124: 315-332
- <sup>25</sup> Weir HK, Thompson TD, Stewart SL, White MC. Cancer Incidence Projections in the United States Between 2015 and 2050. *Prev Chronic Dis* 2021;18:210006. DOI: <http://dx.doi.org/10.5888/pcd18.210006> external icon
- <sup>26</sup> Centers for Disease Control and Prevention. Cancer Research. An Update on Cancer Deaths in the United States. Available at: <https://www.cdc.gov/cancer/dcpc/research/update-on-cancer-deaths/index.htm>
- <sup>27</sup> National Cancer Institute. Cancer Stat Facts: Breast, Prostate, Colorectal, and Lung and Bronchus. Available at: <https://seer.cancer.gov/statfacts/html/breast.html>  
<https://seer.cancer.gov/statfacts/html/prost.html>  
<https://seer.cancer.gov/statfacts/html/colorect.html>  
<https://seer.cancer.gov/statfacts/html/lungb.html>