Cancer Incidence and Mortality in Massachusetts 2016-2020

Statewide Report

Massachusetts Cancer Registry

Office of Population Health

Massachusetts Department of Public Health

June 2024

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Massachusetts Department of Public Health

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- Massachusetts Cancer Registry: mass.gov/massachusetts-cancer-registry
- Occupational Health Surveillance: mass.gov/orgs/occupational-health-surveillance-program
- Bureau of Climate and Environmental Health: mass.gov/bceh
- Comprehensive Cancer Control Program: mass.gov/comprehensive-cancer-control-program
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Preface

The Massachusetts Cancer Registry (MCR) Incidence and Mortality Statewide Report 2016-2020 presents a summary of cancer incidence (new cases) and mortality (deaths) for the Commonwealth of Massachusetts. The report's main objective is to provide cancer data by age, sex, race/ethnicity, stage at diagnosis, and county and to highlight trends in Massachusetts cancer rates for 2016-2020. The report also compares Massachusetts incidence and mortality rates 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, policymakers, researchers, and others to develop, implement, and evaluate cancer prevention and control activities, support cancer-related research, and 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 healthcare facilities and providers who diagnose or treat patients with cancer are required, by law,[1] to report each case of malignant disease and benign brain-related tumor disease to the MCR within six months of diagnosis or first contact. Basal and squamous cell skin cancer and *in situ* (non-invasive) cervical cancer are not reportable. Due to the complexity of the cancer data collection and quality control process, there is a delay between when a new cancer is diagnosed and when the data are ready for analysis. The typical delay is about 24 months after the end of the calendar year of diagnosis. *Cancer Incidence and Mortality in Massachusetts: Statewide Report,* is produced annually with the most recently available statewide data. This report focuses on the leading causes of new cancers and cancer deaths in men and women in Massachusetts.

The MCR also periodically produces another report, *Cancer Incidence in Massachusetts: City and Town Supplement*, which contains information for the state's 351 cities and towns. That report, covering 2016-2020, will be released separately in the Summer of 2024.

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). MCR data routinely meets 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 yearly, especially for smaller geographic areas and demographic subgroups.

The Registry of Vital Records and Statistics (RVRS) provides Massachusetts cancer death data. 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 mass.gov/dph/mcr.

Basic cancer facts

Cancer is the name given to a collection of related diseases, 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.[2] Cancer occurs when some of the body's cells begin to divide without stopping and spread into surrounding tissues. By detecting cancer earlier in the course of the disease, screening can help prevent more advanced disease and cancer deaths.[3]

Who is at risk of developing cancer?

One of the major risk factors of cancer is older age. Nine in ten cancers in the United States are diagnosed in people over 50 years of age, and 57% are 65 years or older. In addition to age, known cancer risks include cigarette smoking, certain infections, and radiation exposure, while factors that may increase the risk of cancer include excess body weight, drinking alcohol, and a poor or unhealthy diet. In the United States, the lifetime risk of developing cancer is 42 out of 100 in men and 40 out of 100 in women.[4] 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* increase 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. Usually, it results from a complex interaction of several factors, sometimes over long periods of time.[5]

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 840,000 cases in 2024 — 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 infection agents cause can be prevented through behavioral changes to avoid infection 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.[6]

How is cancer staged?

Staging describes the extent or spread of cancer at the time of diagnosis and guides treatment decisions. For most cancers, the 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.[7] Cancer staging is categorized into five main groups: In situ, local, regional, distant, and unknown.[8] 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 the chance of surviving. For example, between 2013 and 2019, the five-year survival for colon and rectum cancer diagnosed at the localized stage in the United States was 90.9%, whereas, when the cancer was diagnosed at the distant stage, the five-year relative survival was only 15.6%.[9]

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

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, worrying about, 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.[10] According to the National Cancer Institute, cancer-related direct medical costs in the US were estimated to be $183 billion in 2016 and are projected to increase to $246 billion by 2030, a 34% increase based only on population growth and aging.[10]

Executive summary

Cancer Incidence and Mortality in Massachusetts, 2016-2020: Statewide Report presents cancer incidence and mortality data for the Commonwealth from 2016 through 2020. 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, except urinary bladder (which includes in situ and invasive cancers combined) and in situ breast cancer.

All cancers combined incidence (new cases)

- Between 2016 and 2020, there were 196,399 new cancer cases in Massachusetts, an average of 39,280 cases yearly.
- During this period, there were:
    - 97,207 cancer cases among males
    - 99,152 cancer cases among females
- The age-adjusted incidence rate for all cancers combined was:
    - 491.3 per 100,000 in males
    - 433.9 per 100,000 in females

Note: There was an approximate 11% decrease in the number of cancer cases diagnosed in 2020 compared to 2019 in Massachusetts, in part due to the COVID-19 pandemic. When compared to the average incident cancer counts from 2016-2019, the incident count for 2020 was significantly lower than expected.

COVID and cancer:

- Massachusetts's overall cancer incidence rate decreased by 11% from 2019 to 2020, with similar declines observed among both males and females. The expected incident count for 2020, based on 2016-2019 counts, was significantly lowered for both males and females, with no significant difference.
- Decreases in incidence rates varied by cancer type from 2019-2020. Among males, cancers with the largest decreases included Hodgkin lymphoma, larynx, leukemia, prostate, and thyroid, while cervical, Hodgkin lymphoma, multiple myeloma, thyroid, urinary bladder, and stomach had the largest decreases among females. The expected incidence count for 2020 cases was significantly lower for the following cancers: breast, breast-in situ, cervical, colorectal, lung, prostate, stomach, thyroid, and uterine.
- When compared with cancer data as a combined time period from 2016-2019, there were significant decreases in 2020 cancers diagnosed in situ, at the local stage and the regional stage.

Overall, there was a decrease in cancer deaths in 2020, but when the observed number of deaths was compared to the expected number based on the combined 2016-2019 average, the difference in 2020 deaths was not significant.

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 2016 and 2020, there were 63,231 cancer deaths in Massachusetts, an average of 12,646 deaths per year.
- During this period, there were:
    - 32,504 cancer deaths among males
    - 30,727 cancer deaths among females
- The age-adjusted mortality rate for all cancer deaths combined was:
    - 174.0 per 100,000 in males
    - 124.0 per 100,000 in females

Cancer incidence

Breast cancer was the leading cancer among Massachusetts females between 2016 and 2020, followed by lung and bronchus, corpus uteri & uterus, colon and rectum, and thyroid cancers. Among males, prostate cancer was the leading cancer, followed by lung and bronchus, colon and rectum, urinary bladder, and melanoma of the skin 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 decreased in males and females between 2016 and 2020. However, this decrease was not statistically significant.

Cancer mortality

Lung and bronchus cancer was the leading cause of cancer deaths among Massachusetts females between 2016 and 2020, followed by breast, pancreas, and colon and rectum cancers. Among males, lung and bronchus cancer was also the leading cause of cancer deaths, followed by prostate, pancreas, and colon and rectum cancers. Nationally, lung and bronchus cancer were also the leading cause of cancer deaths in both males and females. In Massachusetts, the age-adjusted cancer mortality rate for all cancer sites combined significantly decreased annually by 2.7% in males and 2.8% in females between 2016 and 2020. The effects of COVID-19 on the incidence and mortality of specific cancers are described in the following section on cancer and COVID-19.

Cancer Trends 2016-2020

Statistically Significant Incidence Trends – Males

Cancer	Trend	% Decrease Per Year
Thyroid cancer	Falling ↓	6.8%
Stomach cancer	Falling ↓	4.3%
Colon and Rectum cancer	Falling ↓	4.1%
Brain & Other Nervous System	Falling ↓	2.0%
Oral Cavity & Pharynx	Falling ↓	1.5%

Statistically Significant Mortality Trends – Males

Cancer	Trend	% Decrease Per Year
Urinary Bladder	Falling ↓	6.6%
Lung and bronchus cancer	Falling ↓	5.9%
Liver & intrahepatic Bile Duct	Falling ↓	4.8%
All invasive cancers	Falling ↓	2.7%
Prostate	Falling ↓	0.8%

Statistically Significant Incidence Trends – Females

Cancer	Trend	% Decrease Per Year
Thyroid	Falling ↓	7.9%
Colon and Rectum cancer	Falling ↓	4.0%
Breast in Situ	Falling ↓	3.9%

Statistically Significant Mortality Trends – Females

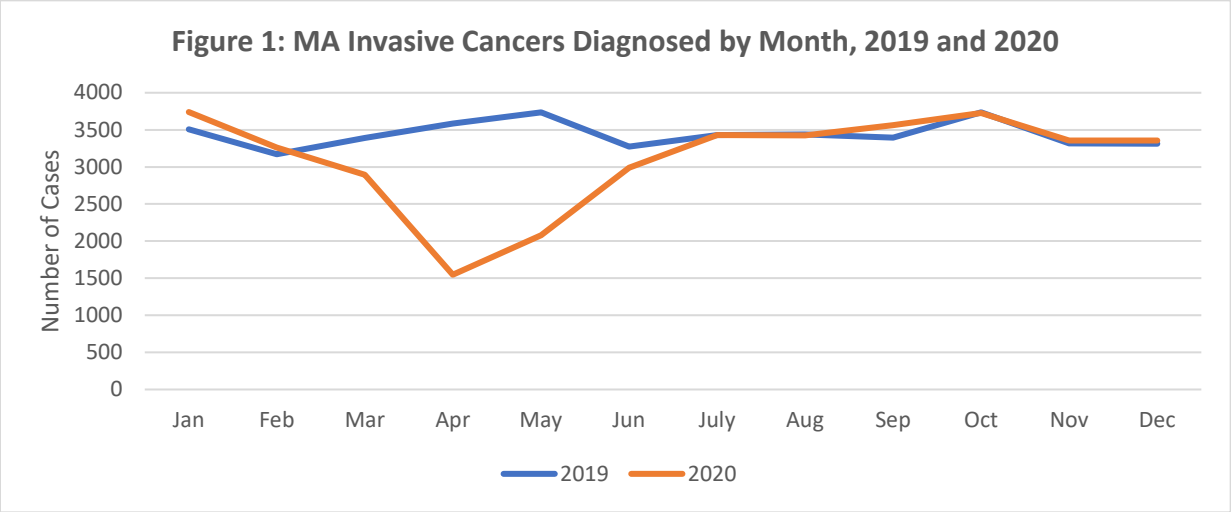
Cancer	Trend	% Decrease Per Year
Lung and bronchus cancer	Falling ↓	4.7%
All invasive cancers	Falling ↓	2.8%

Cancer	Trend	% Increase Per Year
Corpus Uteri &Uterus, NOS	Rising ↑	6.6%

Cancer and COVID

Incidence: The COVID-19 pandemic struck Massachusetts and the rest of the world in early 2020, resulting in a state of emergency declared by the governor on March 10, 2020, lifted over a year later on June 15, 2021. During the first 10 months of the pandemic (March-December 2020), there were significant reductions in cancer screenings nationwide, and a resultant decrease in cancer diagnoses.[11] Incidence rates (new diagnosed cases) from 2019 and 2020 were compared (Appendix III). Cancer incidence decreased by 11% from 2019 to 2020 in Massachusetts and was observed in both males and females. Decreases in incidence rates varied by cancer type. Among males, cancers with the largest decreases included Hodgkin lymphoma, larynx, leukemia, prostate, and thyroid, while cervical, Hodgkin lymphoma, multiple myeloma, thyroid, urinary bladder, and stomach had the largest decreases among females.

During the latter half of March 2020 and continuing through June 2020, the number of invasive cancer cases diagnosed each month was significantly lower (approximately 50%) than the number from that month in 2019. These differences between months of diagnosis over the two years were similar among different race/ethnic groups.



Based on national analyses, the observed numbers of 2020 invasive cancer diagnoses were compared with the expected numbers based on the average count from 2016-2019. Appendix IV shows the observed/ expected ratio and the 95% confidence intervals. Several cancers had significantly lower than expected diagnosis counts in 2020: all invasive, breast, cervical, colorectal, lung, prostate, stomach, thyroid, and uterine. Additionally, diagnoses of in situ breast cancer were significantly lower in 2020. These numbers were consistent with national data. [12]

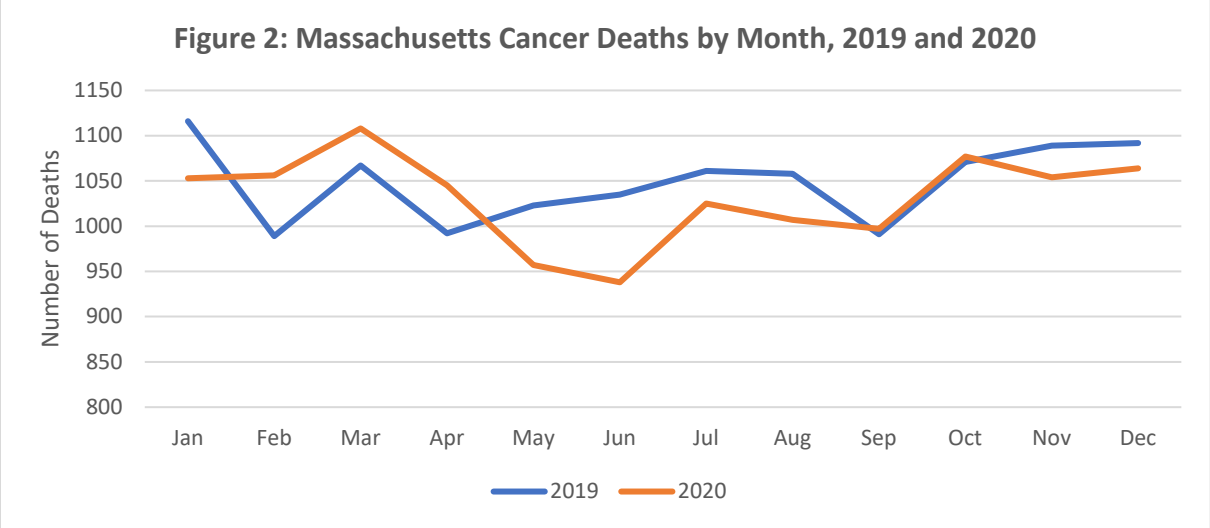
The observed and expected numbers were also calculated for the stage at diagnosis. There were significantly lower numbers of 2020 cases diagnosed in situ at the local and regional stages. There were no differences in the distant stage at diagnosis. There was also a

significantly smaller number of 2020 cases with an unknown stage of diagnosis. These results are also consistent with the national numbers.[12]

All the race/ethnic groups had significantly lower cancer incident counts in 2020 compared to 2016-2019, though the difference was only significant for White non-Hispanics.

Mortality:

Cancer deaths by month were comparable between 2019 and 2020. Overall, there was a decrease in cancer deaths in 2020, but when the observed number of deaths was compared to the expected number based on the 2016-2019 average, the difference in 2020 deaths was not significant. All the race/ethnic groups had significantly lower cancer mortality counts in 2020 compared to 2016-2019, though the difference, as with cancer incidence, was only significant for White non-Hispanics.



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.[13] 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, other factors characterize cancer disparities, including disability status, gender, income, education, sexual orientation, and other characteristics.[14] According to CDC, health equity is defined as the state in which everyone has a fair and just opportunity to attain their highest level of health.[15] 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.[16] Appendix V presents several programs at 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 socio-economic 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.[17] According to the US Census Bureau, 9.8% of the Massachusetts population lived below the federal poverty line in 2020. However, major differences emerged when poverty rates were stratified by race/ethnicity. Nearly one in five (17.6%) of Black non-Hispanic people and 23.0% of Hispanic people in Massachusetts lived below the poverty line in 2020, compared to 6.7% of White non-Hispanic people and 11.8% of Asian non-Hispanic people.[18] 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.[19] For example, in 2020, the tobacco smoking rate was 24.2% among US adults with less than a high school education compared to 5.6% among those who graduated from college or technical school.[20] Similarly, a greater proportion of Massachusetts adults with less than a high school education were cigarette smokers in 2020.[21] One possible explanation for the increased smoking among those from lower SES or low education status is the targeted marketing of tobacco products to people in low-income neighborhoods by tobacco companies.[22]

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.[23] 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 and have a higher risk of exposure to cancer-causing infections and harmful exposures.[24] As a result, people with lower SES have a higher likelihood of developing cancer, being diagnosed at a late stage, less likely to receive the standard of care, and more likely to have lower survival.[25]

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 people or Asian people than in other racial/ethnic groups because Hispanic people and Asian people, as a whole, are historically less

likely to smoke. On the other hand, because a relatively large proportion of Hispanic people or Asian people are recent immigrants to the 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.[26]

Although there are many contributing factors to racial/ethnic disparities in cancer burden, this report will focus on inequalities 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.
- Black non-Hispanic females had a significantly higher incidence rate for all cancers combined than 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-Hispanic males and White non-Hispanic males 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 rate, significantly higher than Asian non-Hispanic, Black non-Hispanic, and Hispanic females.
- Black non-Hispanic females had a significantly higher mortality rate for all cancers combined than Asian 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

- White non-Hispanic males had a significantly higher mortality rate for all cancers combined than other racial/ethnic groups.
- Black non-Hispanic males had a significantly higher mortality rate for all cancers combined than Asian non-Hispanic and Hispanic males.
- Asian non-Hispanic and 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 rates for all cancers combined in Massachusetts were slightly higher than the national rates among males. However, the difference was not statistically significant.
- Among females, the overall age-adjusted incidence rates for all cancers for all races combined were significantly higher in Massachusetts than the national rates.

Mortality

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

Cancer incidence (new cancer cases)

Table 1. New Cancer Cases by Sex for Leading Sites, Massachusetts, 2016-2020

FEMALES

CANCER SITE	NUMBER OF NEW CASES	% OF ALL CANCER CASES
Breast	30,214	30.5
Lung & Bronchus	14,344	14.5
Corpus Uteri &Uterus, NOS	6,936	7.0
Colon & Rectum	6,652	6.7
Thyroid	4,519	4.6
Melanoma of the Skin	3,724	3.8
Non-Hodgkin Lymphoma	3,681	3.7
Pancreas	2,999	3.0
Urinary Bladder	2,515	2.5
Kidney & Renal Pelvis	2,392	2.4
All others	21,176	21.4
TOTAL	**99,152**	**100.0**

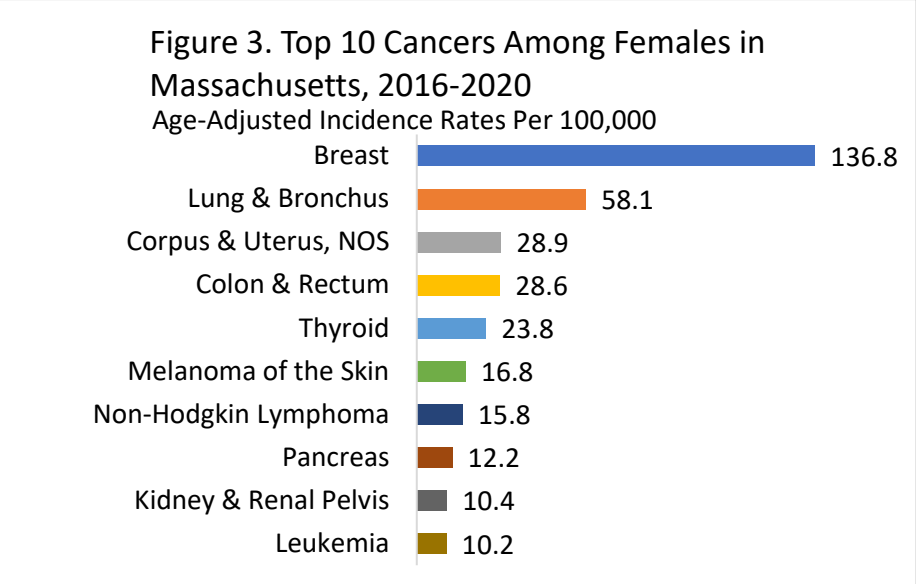
MALES

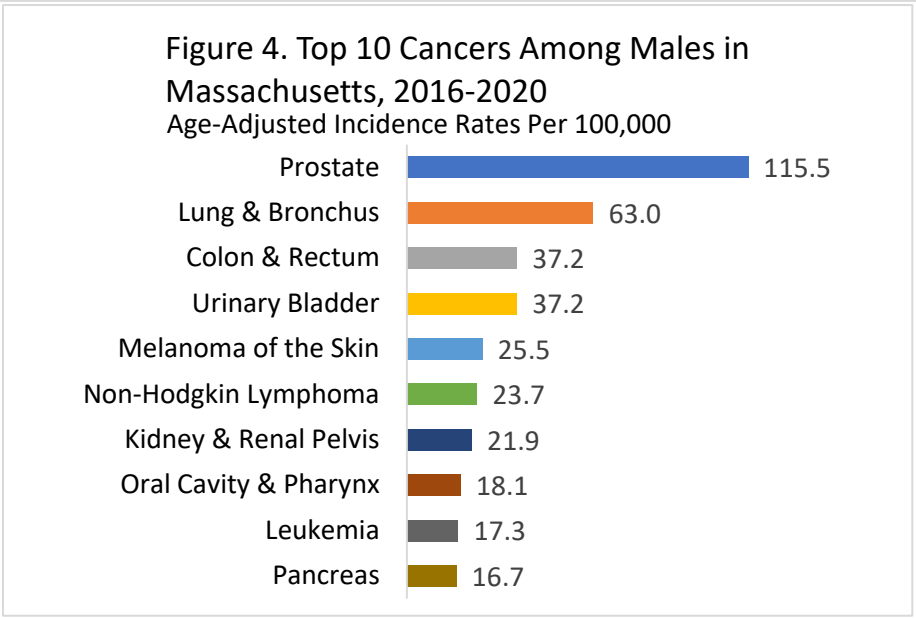
CANCER SITE	NUMBER OF NEW CASES	% OF ALL CANCER CASES
Prostate	24,805	25.5
Lung & Bronchus	12,429	12.8
Colon & Rectum	7,079	7.3
Urinary Bladder	7,052	7.3
Melanoma of the Skin	4,852	5.0
Non-Hodgkin Lymphoma	4,526	4.7
Kidney & Renal Pelvis	4,306	4.4
Oral Cavity & Pharynx	3,716	3.8
Pancreas	3,276	3.4
Leukemia	3,219	3.3
All others	21,947	22.6
TOTAL	**97,207**	**100.0**

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

- Almost one-third (30.5%) of all new cancers among females in Massachusetts between 2016 and 2020 were breast cancers, followed by lung and bronchus (14.5%), corpus uteri & uterus (7.0%), colon and rectum (6.7%), and thyroid cancers (4.6%).

- Nationally, breast cancer was also the leading cause of cancer among females.
- Among males, prostate cancer was the leading cause of cancer, with over a quarter (25.5%) of all new cancers in males, followed by lung and bronchus (12.8%), colon and rectum (7.3%), urinary bladder (7.3%), and melanoma of the skin (5.0%) cancers.
- Nationally, prostate cancer was also the leading cause of cancer among males.





Source: Massachusetts Cancer Registry

- Between 2016 and 2020, breast cancer was the leading cause of new cancers in Massachusetts females, with an age-adjusted incidence rate of 136.8 per 100,000.
- Among males, prostate cancer was the leading cause of new cancers, with an age-adjusted incidence rate of 115.5 per 100,000 during this period.

Figure 5. Percent of All Cancer Cases by Age Group in Massachusetts Males, 2016-2020

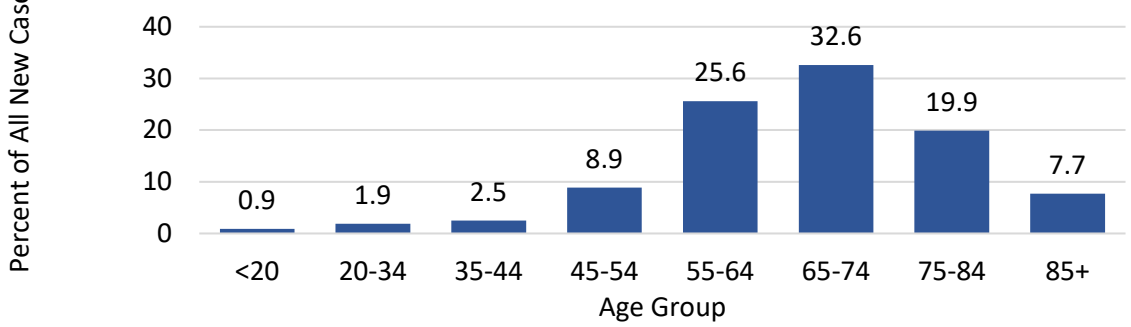
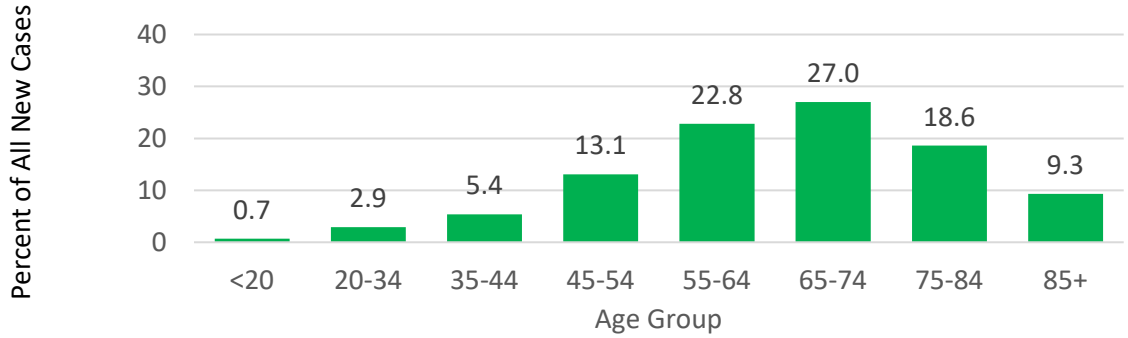


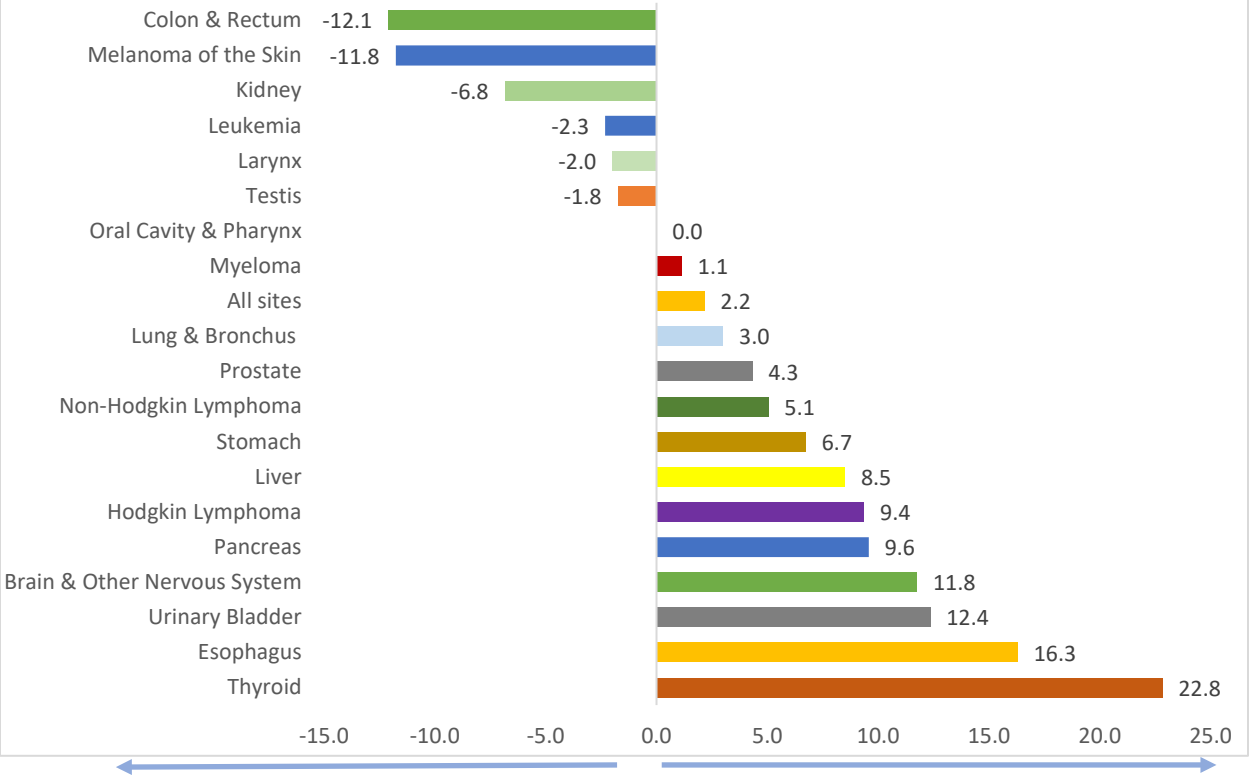
Figure 6. Percent of All Cancer Cases by Age Group in Massachusetts Females, 2016-2020



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 65-74 years.
- Less than one percent of all cancers were diagnosed among Massachusetts males and females younger than 20 years of age.

Figure 7. Comparison of Massachusetts and US Males Average Annual Age-adjusted Incidence by Cancer Site/Type, 2016-2020



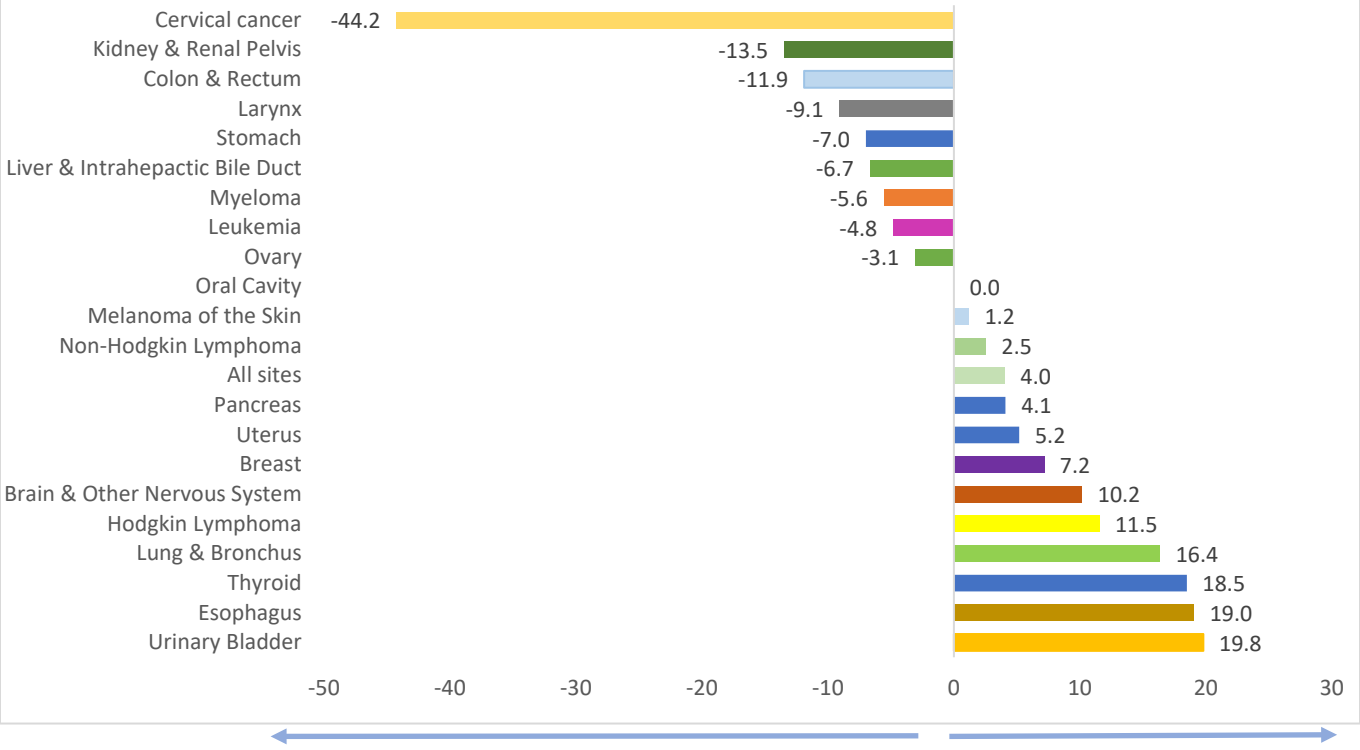
Source: Massachusetts Cancer Registry and CiNA Explorer: An interactive tool for quick access to key NAACCR cancer statistics based on the Cancer in North America (CiNA) dataset from the North American Association of Central Cancer Registries. Available from (apps.naaccr.org/explorer) and State Cancer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

When comparing Massachusetts cancer rates to US rates, it is important to note that differences can occur due to differences among racial and ethnic populations, variations in populations and health behaviors such as smoking prevalence, and variations in medical care. [27]

- Among males, there were several cancers with statistically significant lower or higher incidence rates in Massachusetts than in the US between 2016 and 2020. 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, kidney, melanoma of the skin, and colon and rectum.

- Cancers with significantly higher incidence rates in Massachusetts than national rates included thyroid, esophagus, urinary bladder, brain and other nervous system, pancreas, liver, and prostate.

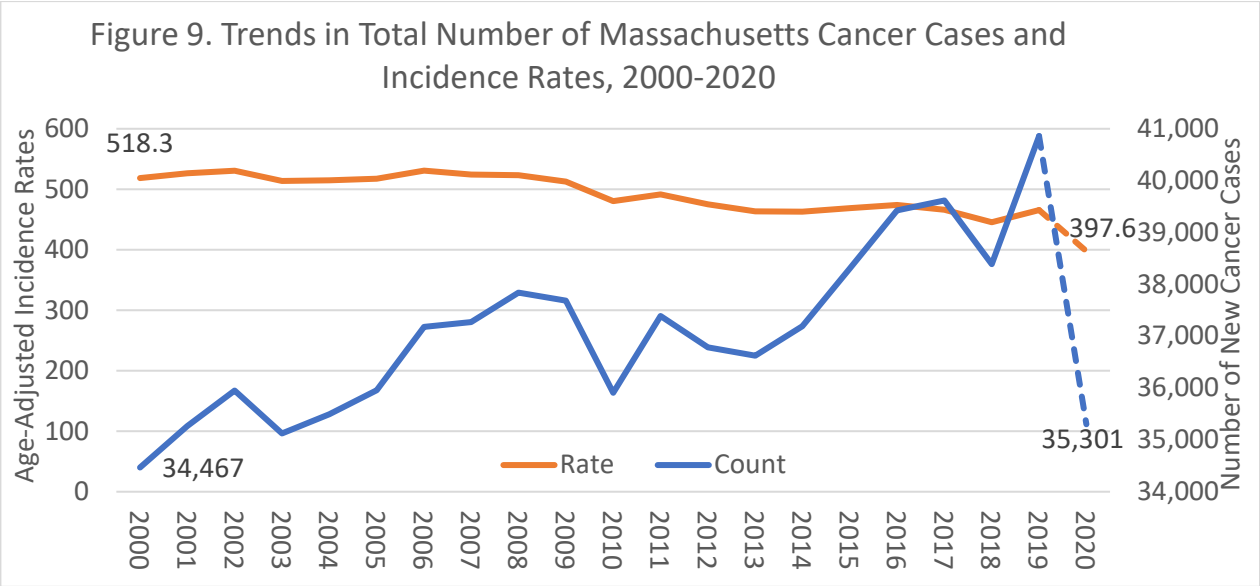
Figure 8. Comparison of Massachusetts and US Females Average Annual Age-adjusted Incidence by Cancer Site/Type, 2016-2020



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 (apps.naaccr.org/explorer) and State Cancer Profiles: statecancerprofiles.cancer.gov/incidencerates. 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 the US between 2016 and 2020. Only those with statistically significant differences are presented in the next two bullets:
  - Cancers with significantly lower incidence rates included cervical cancer, kidney, colon and rectum, myeloma, and leukemia.

- Cancers with significantly higher incidence rates included all cancers combined, urinary bladder, esophagus, thyroid, lung and bronchus, brain and other nervous system, breast, uterus, and melanoma of the skin.

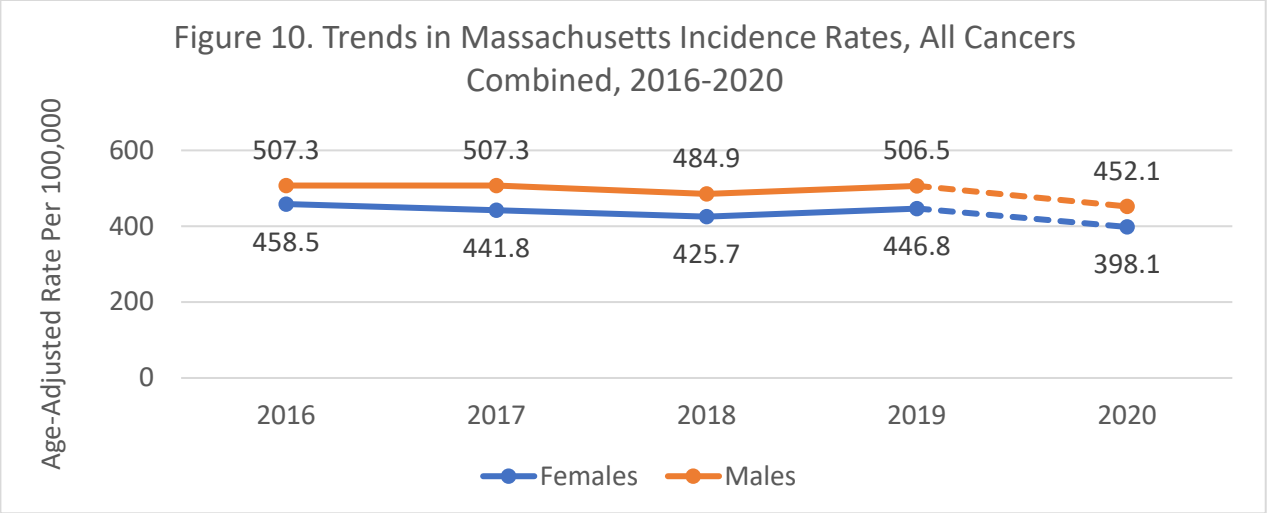


Source: Massachusetts Cancer Registry, SEER*Stat

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

As indicated by the dotted line, there was an approximate 11% decrease in the number of cancer cases diagnosed in 2020 compared to 2019 in Massachusetts, partly due to the COVID-19 pandemic.

- In general, cancer incidence rates have decreased in Massachusetts between 2000 and 2020, while the total number of cancers (cancer counts) have increased during this period.
- Incidence rates for all cancers combined decreased from 518.3 per 100,000 in 2000 to 397.6 per 100,000 in 2020, while cancer cases increased from 34,467 to 35,301.
- The rise in new cancer cases is mostly due to an aging and growing Massachusetts population.[28]



Source: Massachusetts Cancer Registry

As indicated by the dotted line, there was an approximate 11% decrease in the number of cancer cases diagnosed in 2020 compared to 2019 in Massachusetts, partly due to the COVID-19 pandemic.

- Between 2016 and 2020, the incidence rates for all cancers combined in Massachusetts remained unchanged for males and slightly decreased for females.
- Incidence rates for all cancers combined were significantly lower in females than males. For instance, in 2016, the cancer incidence rate was 458.5 per 100,000 among females and 507.3 per 100,000 among males.
- In 2020, the incidence rates had decreased to 398.1 per 100,000 for females and 452.1 per 100,000 for males, but the decreases were not statistically significant.

Note that the incidence counts for invasive melanoma of the skin for 2018-2020 are incomplete due to issues related to pathology laboratory data reporting. Consequently, there was a drop in invasive melanoma of the skin incidence counts and rates. MCR is working on pathology laboratory data for invasive melanoma of the skin, which is anticipated to improve the 2017-2021 cancer incidence data, adjusting the counts and incidence rates.

Cancer mortality

Table 2. Cancer Deaths by Sex for Leading Sites in Massachusetts, 2016-2020

FEMALES

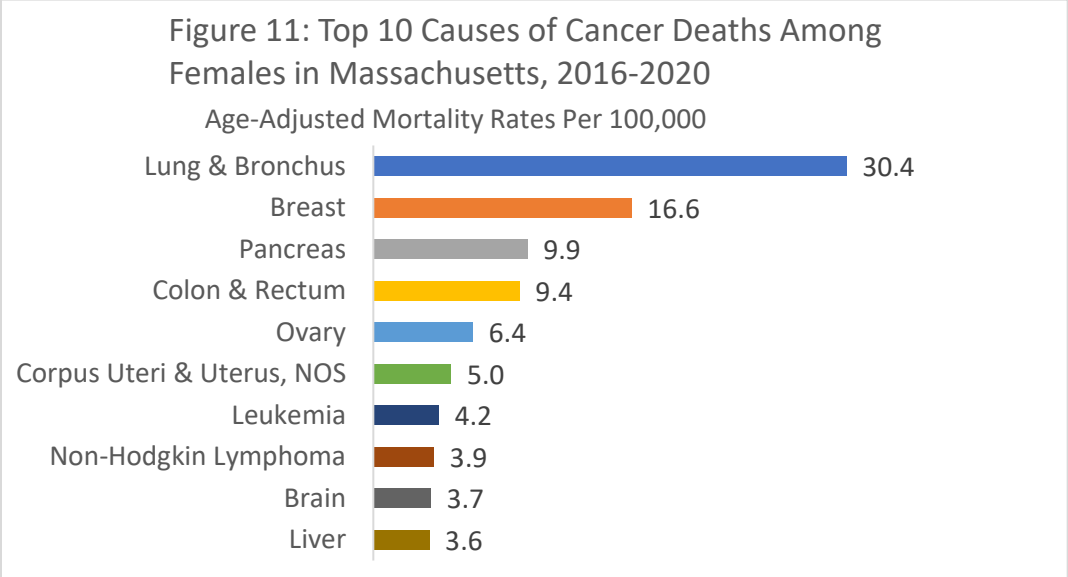
CANCER SITE	NUMBER OF DEATHS	% OF ALL CANCER DEATHS
Lung and Bronchus	7,574	24.7
Breast	4,010	13.1
Pancreas	2,480	8.1
Colon and Rectum	2,342	7.6
Ovary	1,549	5.0
Corpus Uteri & Uterus, NOS	1,240	4.0
Leukemia	1,068	3.5
Non-Hodgkin Lymphoma	970	3.2
Liver & intrahepatic Bile Duct	897	2.9
Brain & Other Nervous System	861	2.8
All others	7,736	25.2
TOTAL	**30,727**	**100.0**

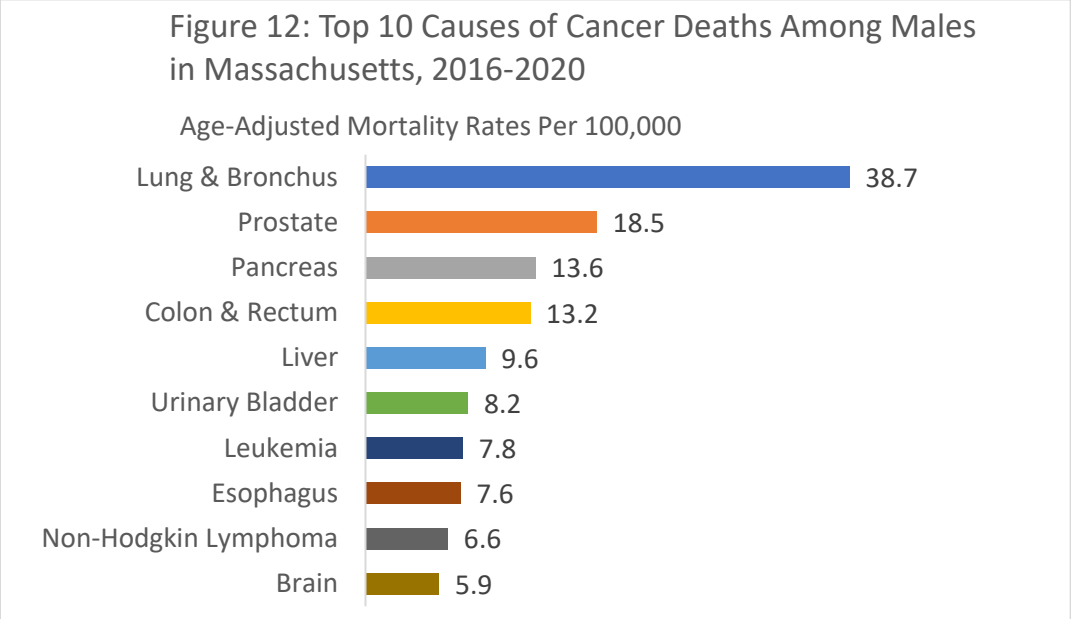
MALES

CANCER SITE	NUMBER OF DEATHS	% OF ALL CANCER DEATHS
Lung and Bronchus &Lung	7,357	22.6
Prostate	3,242	10.0
Pancreas	2,600	8.0
Colon and Rectum	2,457	7.6
Liver & intrahepatic Bile Ducts	1,941	6.0
Esophagus	1,484	4.6
Urinary Bladder	1,451	4.5
Leukemia	1,401	4.3
Non-Hodgkin Lymphoma	1,182	3.6
Brain & Other Nervous System	1,132	3.5
All others	8,256	25.4
TOTAL	**32,504**	100.0

- Lung and bronchus cancer was the leading cause of cancer deaths in Massachusetts females, accounting for nearly a quarter (24.7%) of all cancer deaths between 2016 and 2020.
- Other leading causes of cancer deaths in females included breast (13.1%), pancreas (8.1%), colon and rectum (7.6%), and ovarian (5.0%) cancers.

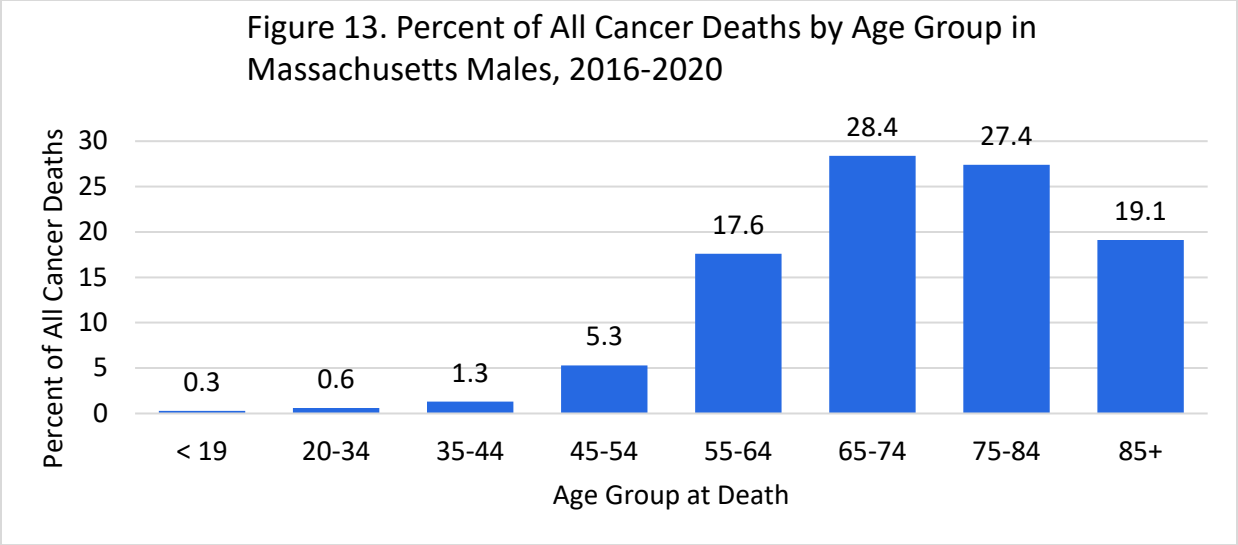
- Among males, lung and bronchus cancer was also the leading cause of cancer deaths, with over one in five (22.6%) of all cancer deaths, followed by prostate (10.0%), pancreas (8.0%), colon and rectum (7.6%), and liver and intrahepatic bile duct (6.0%) cancers.

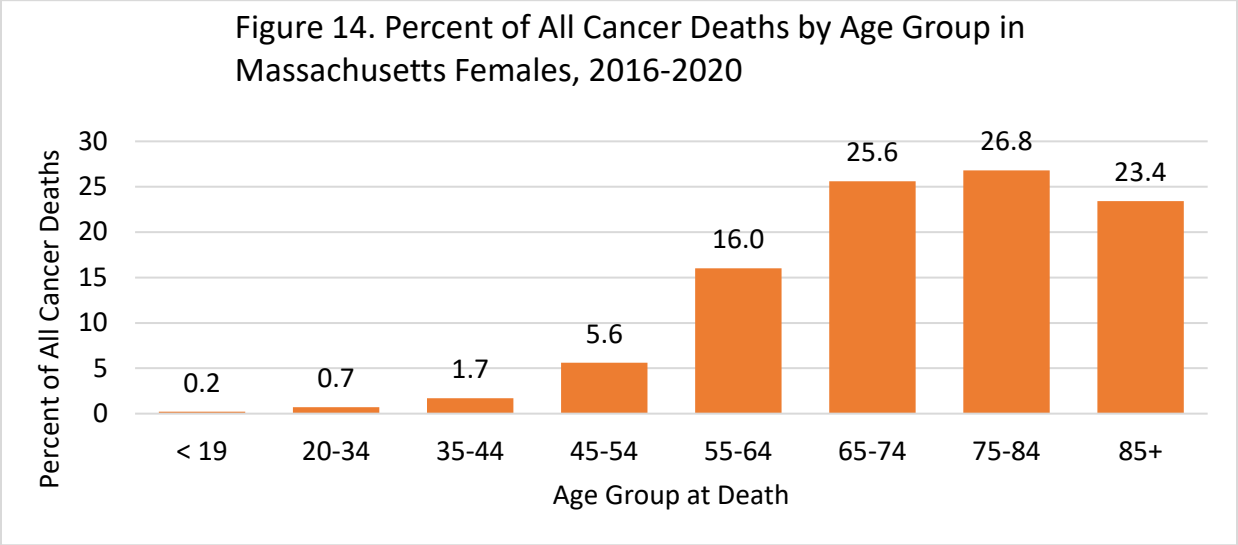




Source: Massachusetts Registry of Vital Records and Statistics

- Between 2016 and 2020, lung and bronchus cancer was the leading cause of cancer deaths in both Massachusetts females and males, with age-adjusted mortality rates of 30.4 per 100,000 and 38.7 per 100,000, respectively.
- In addition, breast, pancreatic, colon rectum, and ovarian cancers were among the top causes of cancer in females, while prostate, pancreas, colon and rectum, and liver cancers were among the leading causes of cancer deaths in males.

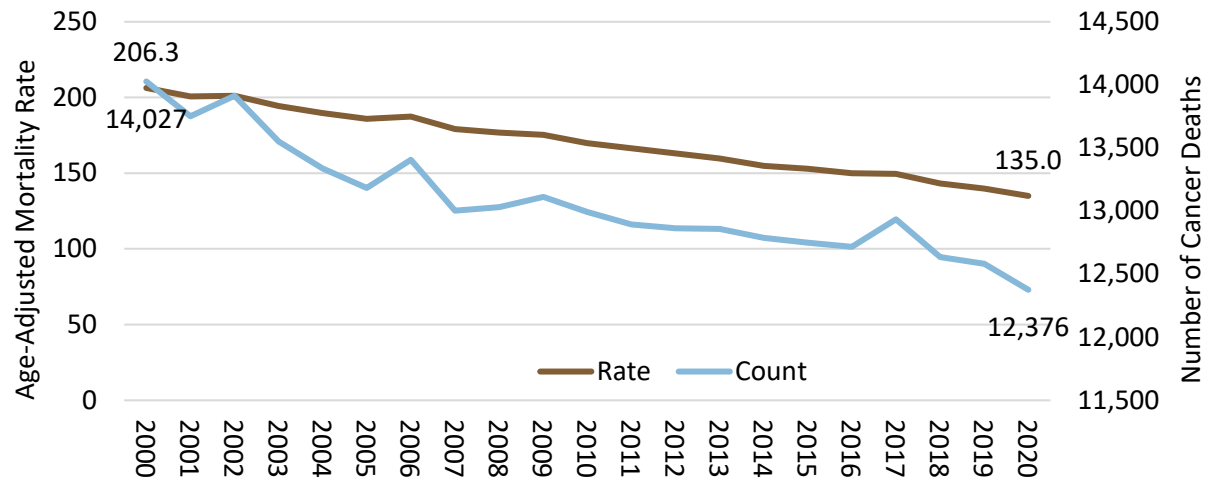




Source: Massachusetts Registry of Vital Records and Statistics

- Mortality rates were highest in the 65-74 and 75-84 age groups in both males and females between 2016 and 2020.
- Females had a greater proportion of deaths in the 85 and above age group compared to males (23.4% vs. 19.1%), respectively.
- Less than three percent of all deaths in both males and females occurred in those aged less than 45 years of age.

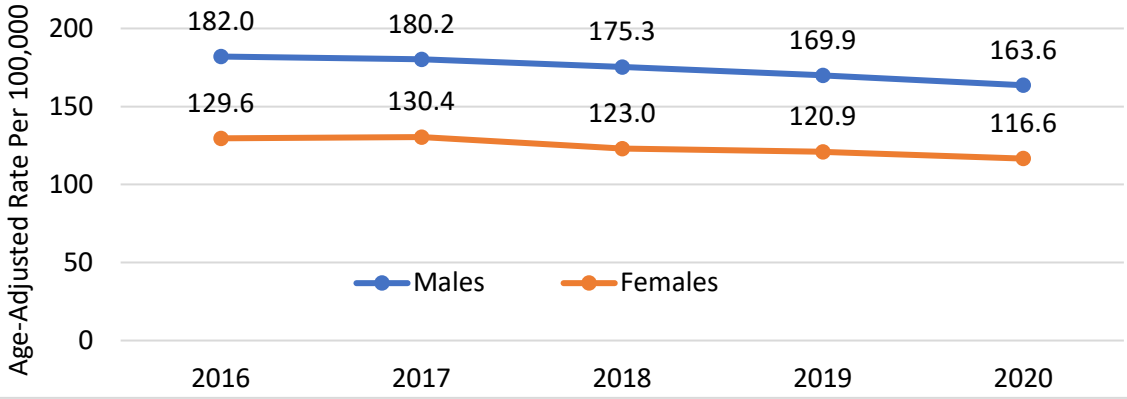
Figure 15. Trends in Total Number of Massachusetts Cancer Deaths and Death Rates, 2000-2020



Source: Massachusetts Registry of Vital Records and Statistics, SEER*Stat
Rates are per 100,000 age-adjusted to the 2000 U.S. Standard Population

- In Massachusetts, the mortality rate and the number of deaths from all cancers combined significantly decreased between 2000 and 2020.
- Mortality decreased from 206.3 per 100,000 in 2000 to 135.0 per 100,000 in 2020, and cancer deaths per year decreased from 14,027 in 2000 to 12,376 in 2020.
- The decline in mortality rates and number of deaths is attributed to the decrease in smoking and advances in cancer screening and treatment.[29]

Figure 16. Trends in Massachusetts Mortality Rates for All Cancers Combined by Sex, 2016-2020

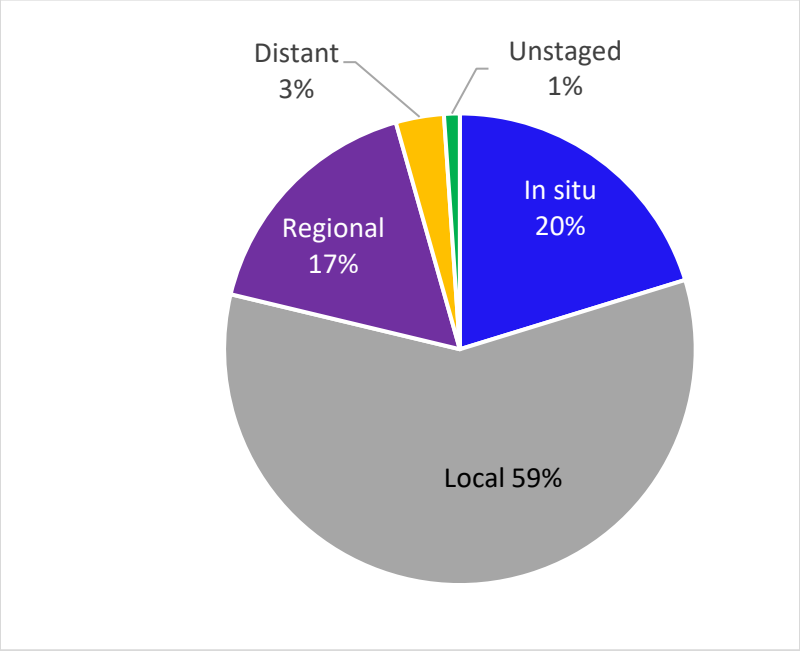


Source: Massachusetts Registry of Vital Records and Statistics

- Between 2016 and 2020, the mortality rate for all cancers combined in Massachusetts significantly decreased by 2.8% annually from 182.0 per 100,000 to 163.6 per 100,000 males.
- The mortality rate for all cancers combined in Massachusetts females also significantly decreased by 2.7% annually from 129.6 to 116.6 per 100,000.

Stage at diagnosis for selected cancers[30]

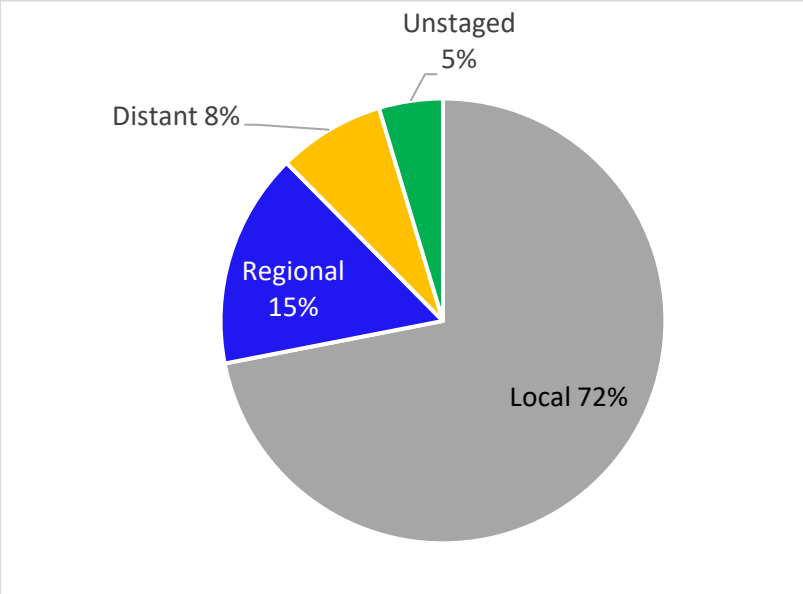
Figure 17. Breast Cancer Stage at Diagnosis in Massachusetts, 2016-2020



Source: Massachusetts Cancer Registry

- Nearly four in five (79%) of breast cancers among Massachusetts females between 2016 and 2020 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.
- Females under the age of 50 were significantly more likely to be diagnosed at the regional stage and less likely to be diagnosed at the local stage compared to older females.
- Nationally, the relative survival for breast cancer when it is diagnosed early is 99.3 percent compared to 31.0 percent when diagnosed at a distant stage.

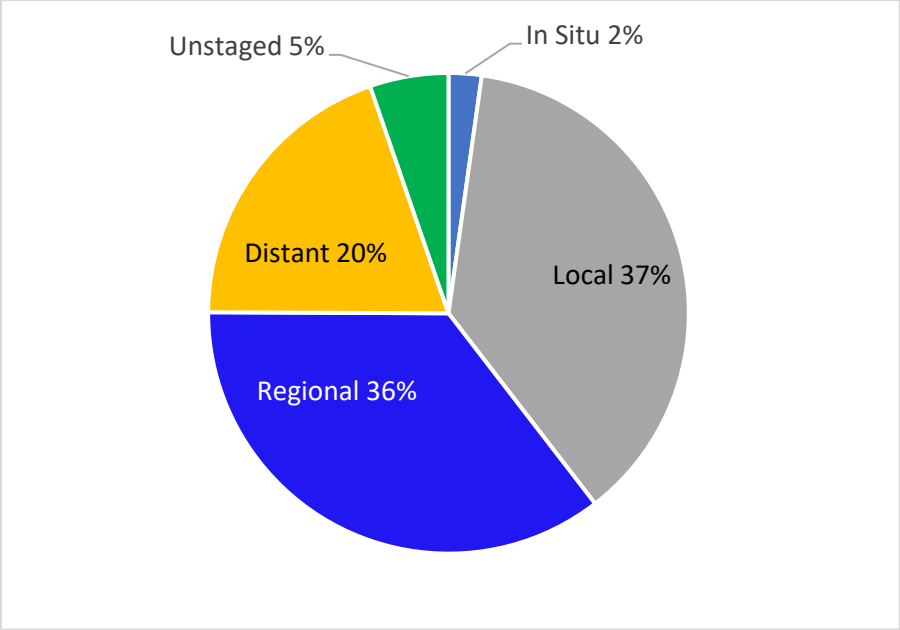
Figure 18. Prostate Cancer Stage at Diagnosis in Massachusetts, 2016-2020



Source: Massachusetts Cancer Registry

- Seven in ten (72%) of prostate cancers among Massachusetts males between 2016 and 2020 were diagnosed at a local stage and 15 percent at a regional stage.
- Eight percent of prostate cancers among Massachusetts males were diagnosed at a distant stage. There were no significant differences in stage at diagnosis between males under 50 and older males.
- Nationally, the relative survival for prostate cancer when it is diagnosed early is 100 percent compared to 34.1 percent when diagnosed at a distant stage.

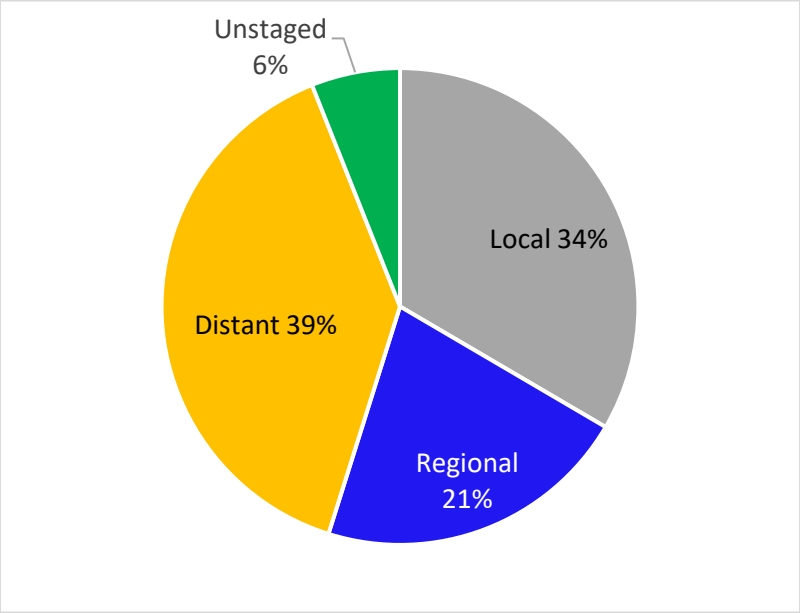
Figure 19. Colon and Rectum Cancer Stage at Diagnosis in Massachusetts, 2016-2020



Source: Massachusetts Cancer Registry

- Four in ten (39%) of colon and rectum cancers in Massachusetts between 2016 and 2020 were diagnosed early (in situ or at a local stage) and 36% were diagnosed at a regional stage.
- There were no significant differences in stage at diagnosis between males and females. Cases under 50 years of age were more likely to be diagnosed at a regional stage than compared to older age groups.
- One in five (20%) of colon and rectum cancers in Massachusetts were diagnosed at a distant stage.
- Nationally, the relative survival for colon and rectum cancers when it is diagnosed early is 90.9 percent compared to 15.6 percent when it is diagnosed late.

Figure 20. Lung and Bronchus Cancer Stage at Diagnosis in Massachusetts, 2016-2020

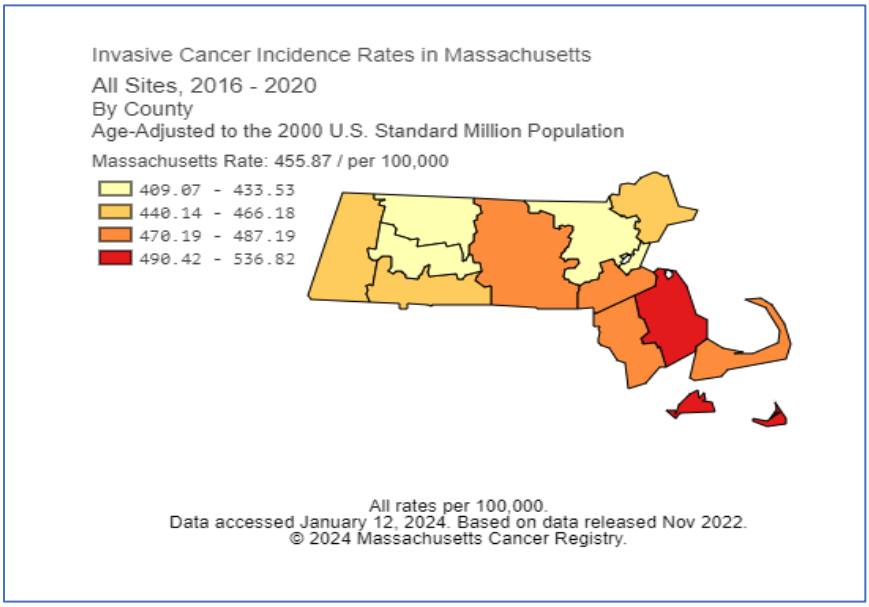


Source: Massachusetts Cancer Registry

- Over one third (34%) of lung and bronchus cancers in Massachusetts between 2016 and 2020 were diagnosed at a local stage.
- Over one in five (21%) of lung and bronchus cancers in Massachusetts were diagnosed at a regional stage and 39 percent at a distant stage. There were no significant differences in stage at diagnosis between males and females.
- Cases under 50 were significantly more likely to be diagnosed at a distant stage of lung cancer and less likely to be diagnosed at an early stage.
- Nationally, the relative survival for lung and bronchus cancers when it is diagnosed early is 62.8% compared to 8.2 percent when it is diagnosed late (at a distant stage).

Cancer incidence and mortality in Massachusetts by county

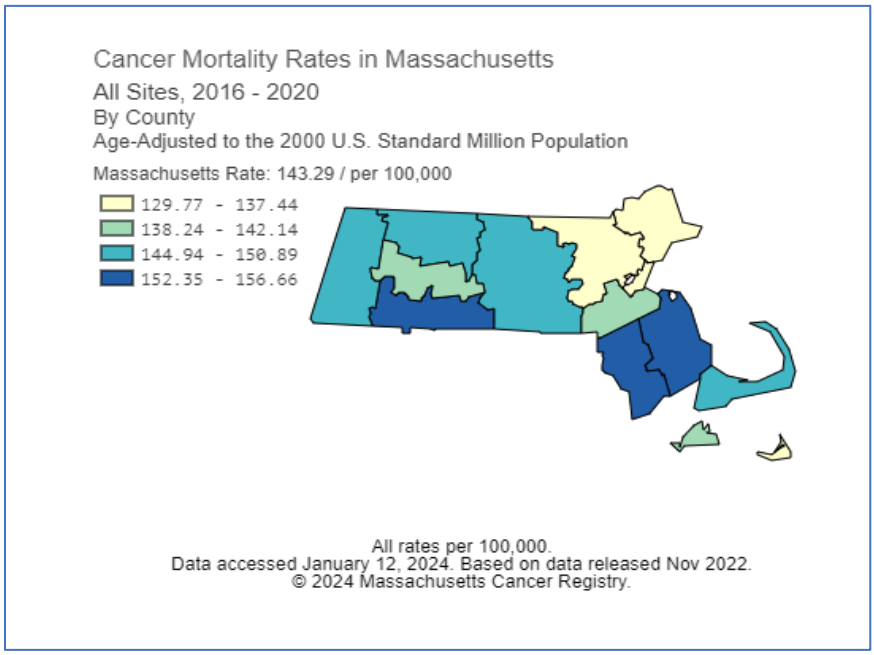
Figure 21. Incidence Rates for all Cancer Sites in Massachusetts by County, 2016-2020



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

- Cancer incidence rates in Massachusetts varied by county between 2016-2020.
- Counties with the highest incidence rates included:
    - Dukes
    - Nantucket
    - Plymouth
- Incidence rates in these three counties were greater than the state rate of 455.9 per 100,000.
- Counties with the lowest cancer incidence were:
    - Suffolk
    - Middlesex
    - Franklin
    - Hampshire

Figure 22. Mortality Rates for all Cancer Sites in Massachusetts by County, 2016-2020



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

- Cancer mortality rates in Massachusetts varied by county between 2016-2020.
- Counties with the highest mortality rates were:
    - Plymouth
    - Bristol
    - Hampden
- Mortality rates in the three counties were greater than the state rate of 143.3 per 100,000.
- Counties with the lowest cancer mortality rates were:
    - Suffolk
    - Nantucket
    - Essex
    - Middlesex

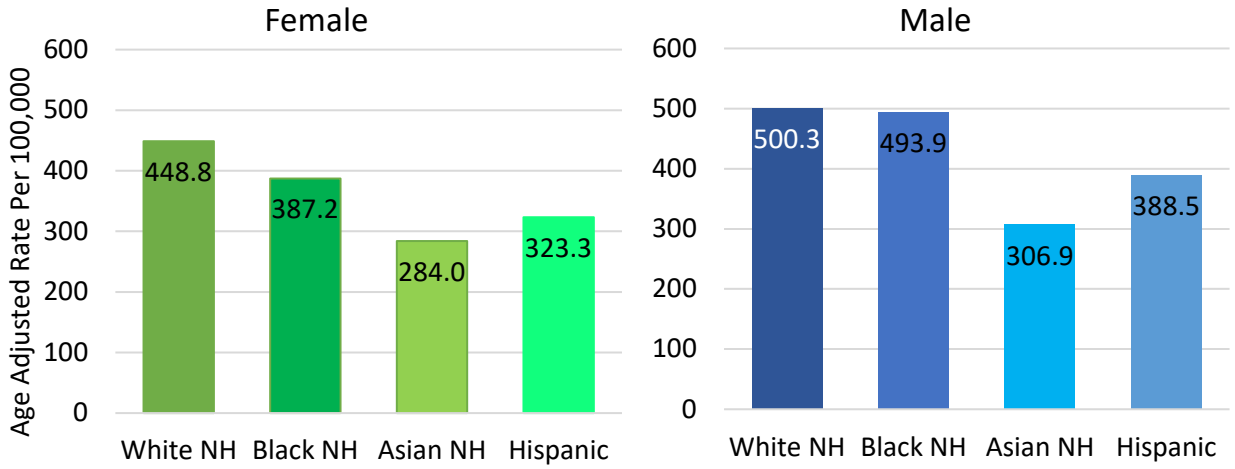
Compared with combined 2016-2019 incidence counts, the 2020 incidence counts for Essex, Middlesex, and Norfolk counties were significantly lower than expected.

Table 3: Observed Versus Expected Incidence Counts for 2020 by Massachusetts County					
County	2020 Expected Count*	2020 Counts	Observed/Expected	95% CI	
Barnstable	2034	1859	0.91	0.82	1.01
Berkshire	941	944	1.00	0.88	1.13
Bristol	3535	3279	0.93	0.86	1.00
Dukes	141	143	1.01	0.69	1.34
Essex	4731	4416	0.93	0.87	0.99
Franklin	463	423	0.91	0.72	1.11
Hampden	2635	2429	0.92	0.84	1.00
Hampshire	820	792	0.97	0.82	1.11
Middlesex	8380	7813	0.93	0.89	0.98
Nantucket	74	64	0.86	0.34	1.39
Norfolk	4304	4021	0.93	0.87	1.00
Plymouth	3495	3238	0.93	0.85	1.00
Suffolk	3324	3094	0.93	0.86	1.00
Worcester	4920	4696	0.95	0.90	1.01

*** - based on the average count for 2016-2019 cases.**

Cancer disparities and health equity

Figure 23. Age-Adjusted Cancer Incidence Rates in Massachusetts by Sex and Race/Ethnicity, 2016-2020



Source: Massachusetts Cancer Registry

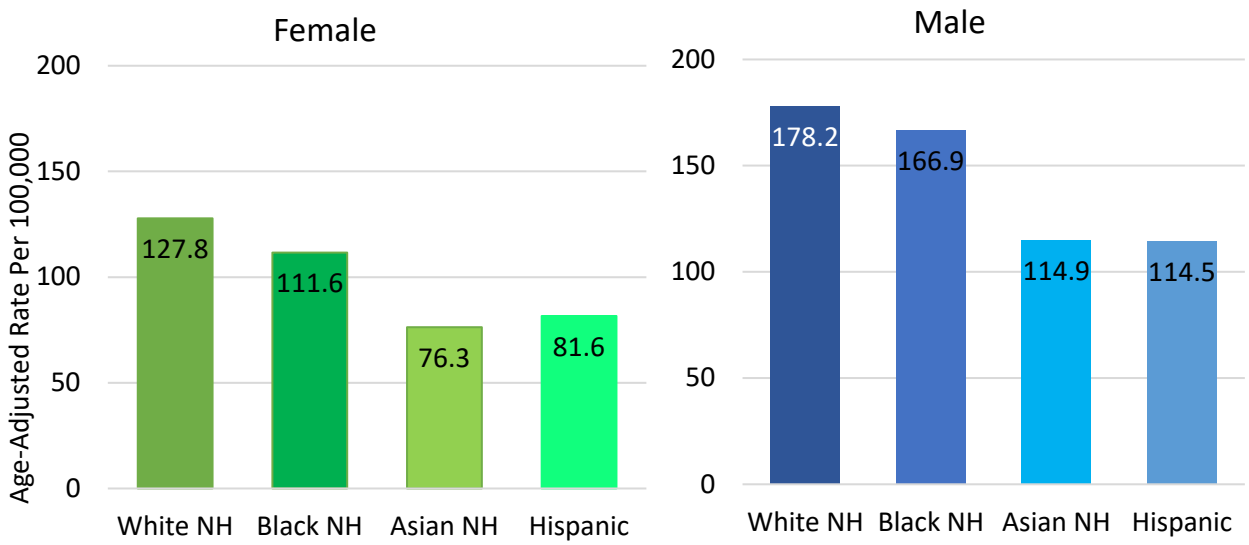
Females incidence

- White non-Hispanic (NH) females had significantly higher age-adjusted incidence rates of all cancers combined than Black NH, Asian NH, and Hispanic females.
- Black non-Hispanic (NH) females had significantly higher age-adjusted incidence rates of all cancers combined than 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 males 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 24. Age-Adjusted Cancer Mortality Rates in Massachusetts by Sex and Race/Ethnicity 2016-2020



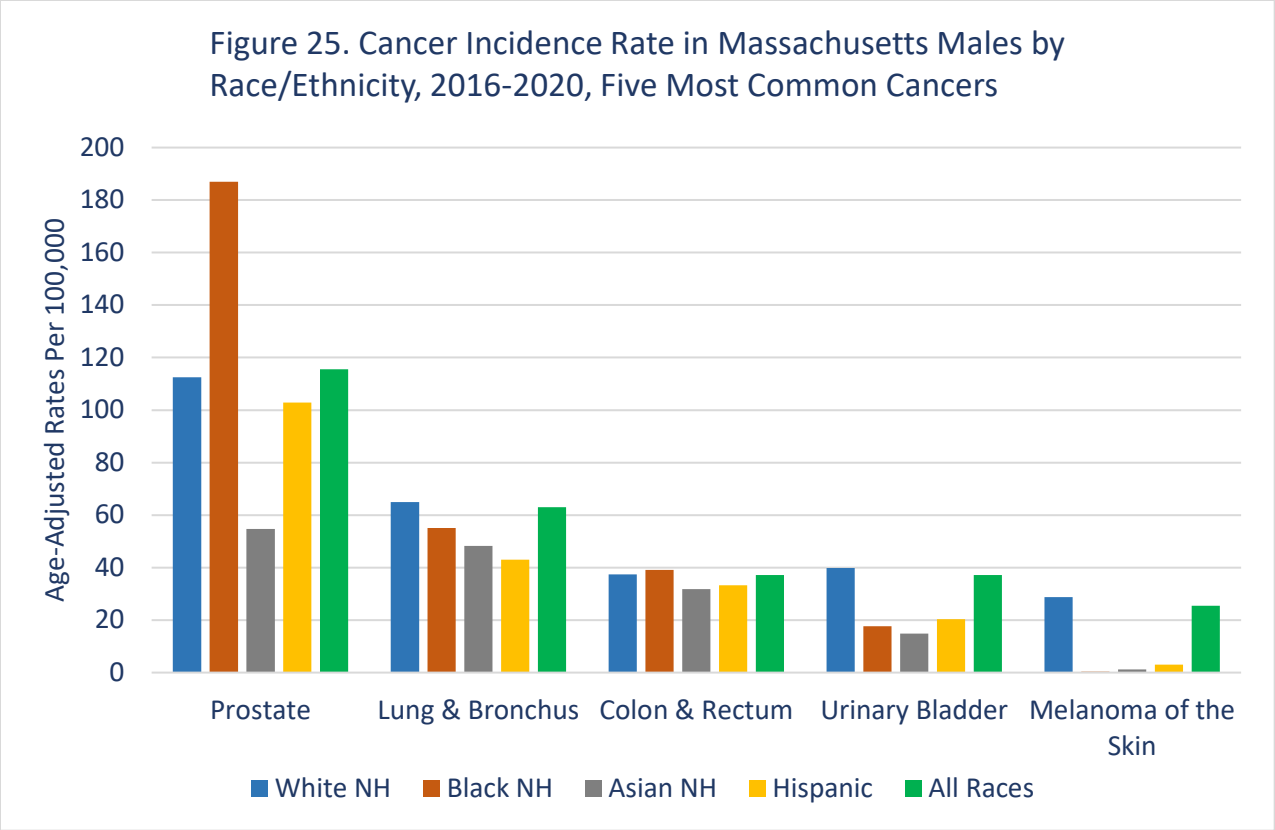
Source: Massachusetts Registry of Vital Records and Statistics

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

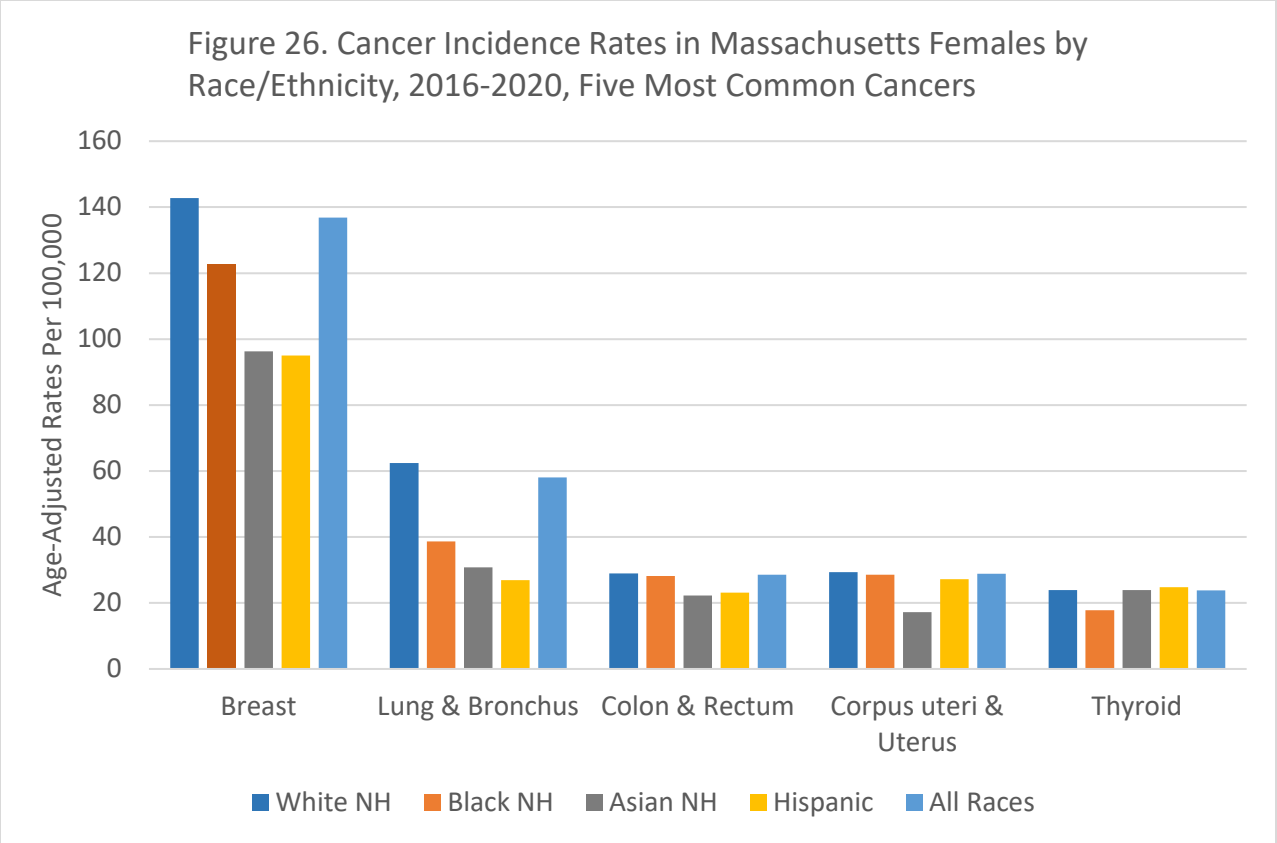
Males mortality

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



Source: Massachusetts Cancer Registry

- Black NH males had higher incidence rates of prostate cancer (187.0 per 100,000) and colon and rectum cancer (39.1 per 100,000) than other racial/ethnic groups.
- Prostate cancer incidence among Black NH males was more than one and a half times higher than rates in White NH males (187.0 per 100,000 vs. 112.5 per 100,000).
- White NH males had higher incidence rates of lung and bronchus cancer (64.9 per 100,000), urinary bladder (39.9 per 100,000), and melanoma of the skin (28.8 per 100,000) compared to other racial/ethnic groups.



Source: Massachusetts Cancer Registry

- White NH females had higher incidence rates of breast cancer (142.8 per 100,000) and lung and bronchus cancer (63.7 per 100,000) than other racial/ethnic groups.
- White NH (29.0 per 100,000) and Black NH (28.2 per 100,000) females had higher incidence rates of colon and rectum cancer than Asian NH and Hispanic females.
- White NH (29.3 per 100,000) and Black NH (28.6 per 100,000) females had higher incidence rates of corpus uteri and uterus cancer than Asian NH and Hispanic females.
- Black NH females had the lowest incidence rates of thyroid cancer (17.8 per 100,000) than other racial/ethnic groups.

Figure 27. Cancer Incidence in Massachusetts Females By Year at Diagnosis and Race/Ethnicity, 2016-2020

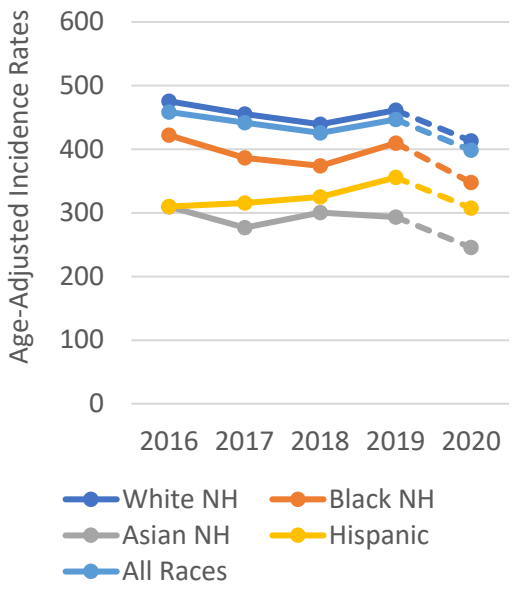
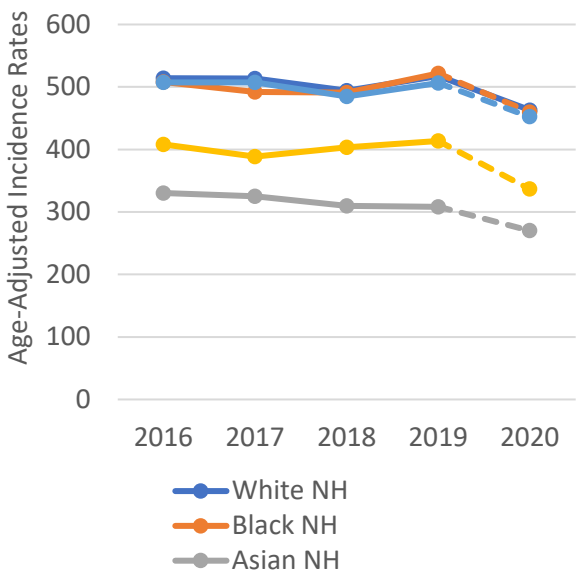


Figure 28. Cancer Incidence in Massachusetts Males By Year at Diagnosis and Race/Ethnicity, 2016-2020



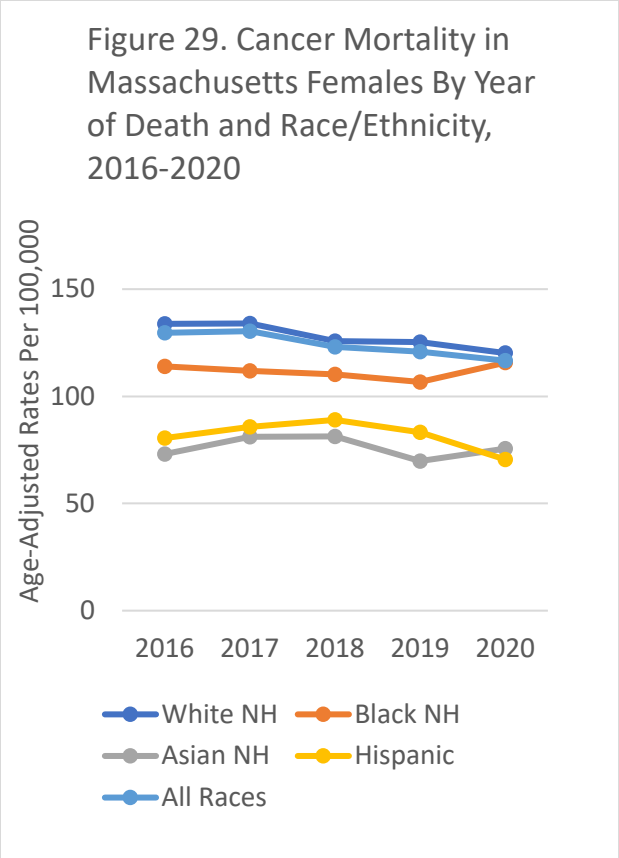
Source: Massachusetts Cancer Registry

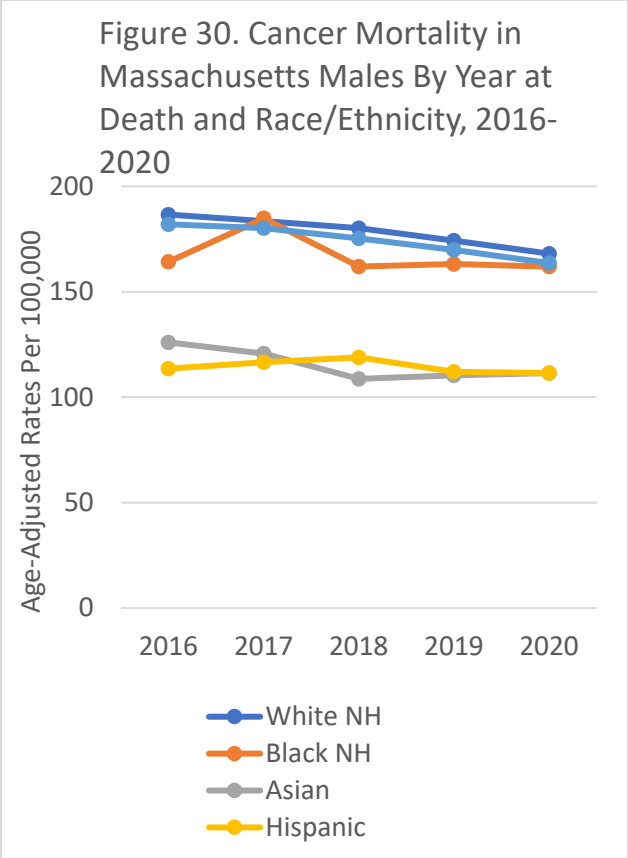
As indicated by the dotted line, there was an approximate 11% decrease in the number of cancer cases diagnosed in 2020 compared to 2019 in Massachusetts, in part due to the COVID-19 pandemic.

- Among females, the combined incidence rates for all cancers in Massachusetts decreased by 2.7% annually between 2016 and 2020. However, this decrease was not statistically significant.
- Among males, incidence rates for all cancers combined in Massachusetts increased non-significantly by 2.3% annually between 2016 and 2020.
- There were no significant decreases in cancer incidence rates by race/ethnicity in both Massachusetts males and females between 2016 and 2020 except for Asian NH males, whose incidence decreased by 4.5% per year.

Cancer among American Indians and Alaska Natives:

The MCR collects data on American Indians and Alaska Natives. The numbers, however, are too small for analysis. From 2016-2020, there were 123 invasive cancer cases among males and 119 among females. The most common cancers among males were prostate (29 cases), lung (23), and liver (10), while among females, the cancers were breast (23), colorectal (15), and uterine (14). National cancer data on American Indians/ Alaska Natives from 2012-2016 are available at cdc.gov/cancer/dcpc/research/articles/cancer-AIAN-US.htm.





Source: Massachusetts Registry of Vital Records and Statistics

- Among Massachusetts females, the mortality rate for all cancers combined significantly decreased by 2.8% per year between 2016 and 2020.
- There was a significant decrease of 2.8% annually in all cancers combined mortality rates among White NH females during this period.
- There were no significant decreases in cancer mortality rates among Asian NH, Hispanic, and Black NH females.
- The mortality rate for all cancers combined decreased by 2.7% annually among Massachusetts males between 2016 and 2020.
- There were significant decreases of 2.6% and 3.3% in cancer mortality rates among White NH and Asian NH males, respectively, between 2016 and 2020.

Table 4. Ten Most Common Causes of Cancer Deaths Among Massachusetts Females By Race/Ethnicity, 2016-2020

Rank	White non-Hispanic	Rate*	Black non-Hispanic	Rate	Asian non-Hispanic	Rate	Hispanic	Rate
1	Lung & bronchus	32.6	Breast	17.8	Lung & bronchus	17.3	Lung & bronchus	12.1
2	Breast	16.8	Lung & bronchus	17.7	Breast	8.9	Breast	11.7
3	Pancreas	10.0	Pancreas	11.0	Pancreas	6.5	Pancreas	7.7
4	Colon & rectum	9.6	Colon & rectum	8.7	Colon & rectum	5.8	Colon & rectum	6.0
5	Ovary	6.7	Uterus	7.8	Liver	5.0	Liver	5.3
6	Uterus	4.9	Ovary	4.7	Stomach	4.4	Uterus	4.6
7	Leukemia	4.4	Liver	4.6	Ovary	4.1	Stomach	3.7
8	Brain	4.1	Myeloma	4.4	Leukemia	2.5	Ovary	3.4
9	NHL	4.0	Stomach	3.1	Uterus	2.1	NHL	2.9
10	Liver	3.4	NHL	2.6	Cervix	1.9	Leukemia	2.8

Source: Massachusetts Registry of Vital Records and Statistics
NHL= Non-Hodgkin Lymphoma
*Age-adjusted mortality rate per 100,000
Color-coded table by cancer type showing the 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 except Black non-Hispanic (NH) females, where breast cancer was the leading cause of cancer deaths.
- Breast cancer was the second most common cause of cancer deaths in White NH, Asian NH, and Hispanic females.
- Pancreatic cancer was the third most common cause of cancer deaths in all racial/ethnic groups.
- Colon and rectum cancer was the fourth most common cause of cancer deaths in all racial/ethnic groups.
- 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 the eighth in Hispanic females.
- Uterus cancer was the fifth leading cause of cancer deaths in Black NH females and the sixth in White NH and Hispanic females.

Table 5. Ten Most Common Causes of Cancer Deaths Among Massachusetts Males By Race/Ethnicity, 2016-2020

Rank	White non-Hispanic	Rate*	Black non-Hispanic	Rate	Asian non-Hispanic	Rate	Hispanic	Rate
1	Lung & bronchus	40.2	Prostate	35.3	Lung & bronchus	31.7	Lung & bronchus	19.3
2	Prostate	18.0	Lung & bronchus	30.5	Liver	14.1	Prostate	17.5
3	Pancreas	14.0	Pancreas	15.9	Colorectal	8.1	Liver	13.0
4	Colorectal	13.4	Colorectal	15.6	Prostate	7.2	Colorectal	8.5
5	Liver	8.8	Liver	12.2	Stomach	7.0	Stomach	6.0
6	Bladder	8.7	Myeloma	6.7	Pancreas	7.0	Pancreas	5.9
7	Esophagus	8.3	Stomach	5.7	Leukemia	4.3	NHL	4.9
8	Leukemia	8.3	Bladder	4.9	NHL	4.0	Leukemia	4.5
9	NHL	6.9	Esophagus	4.5	Oral Cavity	3.7	Bladder	4.2
10	Brain	6.4	Leukemia	3.9	Esophagus	3.6	Esophagus	3.1

Source: Massachusetts Registry of Vital Records and Statistics
NHL= Non-Hodgkin Lymphoma
*Age-adjusted mortality rate per 100,000
Color-coded table by cancer type showing the 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 the leading cause of cancer deaths.
- Prostate cancer was the second most common cause of cancer deaths in White NH and Hispanic males and fourth 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.
- Liver cancer was the second leading cause of cancer deaths in Asian NH males. It was also the third most common cause of cancer deaths in Hispanics and the fifth in White NH and Black NH males.
- Pancreatic cancer was the third most common cause of cancer deaths in White NH and Black NH males and the sixth leading cause of cancer deaths in Asian NH and Hispanic males.
- Bladder cancer was the sixth leading cause of cancer deaths in White NH, the eighth in Black NH, and the ninth in Hispanic males.

Data sources and online visualization tools

- **Massachusetts Cancer Registry (MCR):** mass.gov/massachusetts-cancer-registry
  The MCR website offers statistical products, including statewide reports, city and town series, and special reports. It also includes abstracting and coding manuals and Massachusetts Cancer Registry edits.

- **MCR Web Query Tool:** 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.

- **CDC/NCI State Cancer Profiles:** statecancerprofiles.cancer.gov
  State Cancer Profiles provides dynamic views of 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:** 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 control programs.

- **U.S. Cancer Statistics Data Visualizations Tool:** 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, estimates of human papillomavirus (HPV) vaccination coverage from the National Immunization Survey-Teen are provided.

- **Cancer Statistics Website:** 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:** apps.naaccr.org/explorer
  CiNA Explorer is an interactive tool that provides easy access to a wide range of NAACCR cancer statistics. Detailed statistics are available for a NAACCR region or registry by cancer site, gender, race, calendar year, age, and stage.

- **SEER*Explorer:** seer.cancer.gov/statistics-network/explorer/overview.html
  SEER*Explorer is an interactive website that provides easy access to a wide range of SEER cancer statistics at the national level. Detailed statistics are available for a cancer site by sex, race, calendar year, and age, and a selected number of cancer sites by stage and histology.

Appendices

Appendix 1. New Cancer Cases and Incidence Rates by Cancer Site and Sex, Massachusetts, 2016-2020

	Male		Female		Total	
	Cases	**Rate**	**Cases**	**Rate**	**Cases**	**Rate**
All Cancer Sites	**97,207**	**491.3**	**99,152**	**433.9**	**196,399**	**455.9**
Brain & Other Nervous System	1,556	8.5	1,221	5.9	2,778	7.1
Breast	284	1.5	30,214	136.8	*	*
Breast In situ	38	0.2	7,672	36.2	*	*
Cervical Cancer	*	*	997	5.2	*	*
Colon & Rectum	7,079	37.2	6,652	28.6	13,733	32.5
Corpus Uterus	*	*	6,936	28.9	*	*
Esophagus	1,845	9.2	538	2.1	2,383	5.3
Hodgkin Lymphoma	565	3.2	471	2.6	1,039	2.9
Kidney & Renal Pelvis	4,306	21.9	2,392	10.4	6,700	15.7
Larynx	1,022	5.0	255	1.1	1,278	2.8
Leukemia	3,219	17.3	2,305	10.2	5,526	13.4
Liver & Intrahepatic Bile Duct	2,903	14.1	1,101	4.5	4,006	8.9
Lung & Bronchus	12,429	63.0	14,344	58.1	26,776	59.9
Melanoma of the Skin	4,852	25.5	3,724	16.8	8,577	20.4
Multiple Myeloma	1,684	8.7	1,307	5.4	2,991	6.8
Non-Hodgkin Lymphoma	4,526	23.7	3,681	15.8	8,210	19.3
Oral Cavity & Pharynx	3,716	18.1	1,536	6.5	5,253	11.9
Ovary	*	*	2,240	9.8	*	*
Pancreas	3,276	16.7	2,999	12.2	6,275	14.2
Prostate	24,805	115.5	*	*	*	*
Stomach	1,723	8.9	1,011	4.3	2,735	6.4
Testis	945	5.7	*	*	*	*
Thyroid	1,727	9.2	4,519	23.8	6,249	16.7
Urinary Bladder	7,052	37.2	2,515	10.1	9,568	21.7
Other Sites	7,693	41.2	8,194	34.6	15,891	37.3

Source: Massachusetts Cancer Registry
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).**
The total includes persons classified as transgender and persons of unknown sex.

Appendix II. Number of Cancer Deaths and Death Rates by Cancer Site and Sex, Massachusetts, 2016-2020

	Male		Female		Total	
	Deaths	**Rate**	**Deaths**	**Rate**	**Deaths**	**Rate**
All Cancer Sites	**32,504**	**174.0**	**30,727**	**124.0**	**63,231**	**144.4**
Brain & Other Nervous System	1,132	5.9	861	3.7	1,993	4.7
Breast	47	0.3	4,010	16.6	*	*
Lung & Bronchus	7,357	38.7	7,574	30.4	14,931	33.8
Cervical Cancer	*	*	239	1.1	*	*
Colon / Rectum	2,457	13.2	2,342	9.4	4,799	11.1
Corpus Uterus	*	*	1,240	5.0	*	*
Esophagus	1,484	7.6	426	1.7	1,910	4.3
Hodgkin Lymphoma	58	0.3	43	0.2	101	0.2
Kidney & Renal Pelvis	759	4.0	435	1.7	1,194	2.7
Larynx	276	1.4	77	0.3	353	0.8
Leukemia	1,401	7.8	1,068	4.2	2,469	5.8
Liver & Intrahepatic Bile Ducts	1,941	9.6	897	3.6	2,838	6.3
Melanoma of Skin	585	3.2	365	1.5	950	2.2
Multiple Myeloma	723	3.9	539	2.1	1,262	2.9
Non-Hodgkin Lymphoma	1,182	6.6	970	3.9	2,152	5.0
Oral Cavity & Pharynx	687	3.4	336	1.3	1,023	2.3
Ovary	*	*	1,549	6.4	*	*
Pancreas	2,600	13.6	2,480	9.9	5,080	11.5
Prostate	3,242	18.5	*	*	*	*
Stomach	738	4.0	494	2.0	1,232	2.9
Testis	37	0.2	*	*	*	*
Thyroid	99	0.5	134	0.5	233	0.5
Urinary Bladder	1,451	8.2	577	2.2	2,028	4.6
Other Sites	4,248	22.9	4071	16.3	8,319	19.1

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).**
The total includes persons classified as transgender and persons of unknown sex.
Source: Massachusetts Registry of Vital Records and Statistics

Appendix III. Annual cancer incidence age-adjusted rates and percentage change in rates by cancer type and sex in Massachusetts in 2019 and 2020

	Male			Female		
Cancer	**2019**	**2020**	**Percentage Change**	**2019**	**2020**	**Percentage Change**
All Cancer Sites	**506.5**	**452.1**	**-10.7**	**446.8**	**398.1**	**-10.9**
Brain & Other Nervous System	8.2	8.1	-1.2	5.6	5.5	-1.8
Breast	1.8	1.6	-11.1	142.8	127.4	-10.8
Breast In situ	0.2	0.2	0.0	36.5	32.6	-10.7
Cervical Cancer	*	*	*	5.1	4.4	-13.7
Colon & Rectum	37.3	32.7	-12.3	28.2	26.2	-7.1
Corpus Uteri	*	*	*	29.6	26.2	-11.5
Esophagus	9.2	8.2	-10.9	2.3	2.0	-13.0
Hodgkin Lymphoma	3.4	2.9	-14.7	2.9	2.3	-20.7
Kidney & Renal Pelvis	22.1	21.2	-4.1	10.0	10.2	2.0
Larynx	**5.6**	**4.5**	**-19.6**	1.1	1.0	-9.1
Leukemia	19.3	16.0	-17.1	10.4	9.9	-4.8
Liver & Intrahepatic Bile Duct	14.5	12.8	-11.7	5.1	4.5	-11.8
Lung & Bronchus	65.3	58.1	-11.0	61.0	53.9	-11.6
Melanoma of the Skin	**22.7**	**19.1**	**-15.9**	14.0	12.1	-13.6
Multiple Myeloma	8.5	8.3	-2.4	5.9	5.0	-15.3
Non-Hodgkin Lymphoma	24.9	22.3	-10.4	16.4	14.8	-9.8
Oral Cavity & Pharynx	17.9	17.4	-2.8	6.6	6.4	-3.0
Ovary	*	*	*	9.9	9.1	-8.1
Pancreas	18.0	17.7	-1.7	12.6	12.0	-4.8
Prostate	123.7	106.7	-13.7	*	*	*
Stomach	9.0	7.9	-12.2	5.3	3.8	-28.3
Testis	5.5	5.7	3.6	*	*	*
Thyroid	8.9	7.6	-14.6	22.9	18.9	-17.5
Urinary Bladder	37.5	35.3	-5.9	10.9	9.3	-14.7
Other Sites	43.4	37.8	-12.9	38.2	33.1	-13.4

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).**
Note: There was an approximate 11% decrease in the number of cancer cases diagnosed in 2020 compared to 2019 in Massachusetts, in part due to the COVID-19 pandemic
Source: Massachusetts Cancer Registry

Appendix IV. Observed vs. Expected 2020 Counts of Cancer in Massachusetts:

Cancer	2016	2017	2018	2019	2020	Expected	O/E Ratio	LCL	UCL
HL	201	192	231	227	188	213	0.88	0.76	1.01
NHL	1592	1614	1673	1748	1583	1657	0.96	0.91	1.00
Bladder	1932	1920	1829	2010	1877	1923	0.98	0.93	1.02
Brain/NS-invasive	575	546	574	536	547	558	0.98	0.90	1.06
Breast*	6242	6138	5939	6424	5757	6186	0.93	0.91	0.96
Breast-in situ*	1641	1589	1483	1578	1421	1573	0.90	0.85	0.95
Cervix*	232	194	205	200	166	208	0.80	0.67	0.93
Colorectal*	2963	2890	2822	2819	2551	2874	0.89	0.85	0.92
Esophageal	460	466	511	491	455	482	0.94	0.85	1.03
Kidney	1336	1327	1360	1351	1326	1344	0.99	0.93	1.04
Larynx	254	236	261	289	238	260	0.92	0.79	1.04
Leukemia	1028	1120	1096	1204	1078	1112	0.97	0.91	1.03
Liver	795	781	803	863	764	811	0.94	0.87	1.01
Lung*	5340	5389	5165	5713	5169	5402	0.96	0.93	0.98
Myeloma	612	585	575	636	583	602	0.97	0.89	1.05
Oral	1056	1054	1027	1063	1053	1050	1.00	0.94	1.06
Ovarian	453	442	454	457	434	452	0.96	0.87	1.05
Pancreas	1143	1223	1222	1356	1331	1236	1.08	1.02	1.14
Prostate*	4643	4968	5006	5440	4752	5014.25	0.95	0.92	0.98

Stomach*	553	536	537	612	497	559.5	0.89	0.80	0.97
Testes	185	180	209	183	190	189.25	1.00	0.86	1.14
Thyroid*	1406	1296	1317	1222	1008	1310.25	0.77	0.72	0.82
Uterine*	1407	1387	1409	1430	1305	1408.25	0.93	0.87	0.98
All invasive*	39597	39706	38663	41220	37212	39796.5	0.94	0.93	0.95

* - Observed cancer count in 2020 was significantly lower than expected.

Appendix V. 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 Climate and Environmental Health.

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 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 newly diagnosed with a disease, condition, or illness during a particular period. The incidence data presented in this report were coded using the International Classification of Disease for Oncology 3rd 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 **Joinpoint**

regression, a Windows-based statistical software provided by NCI/SEER that calculates the number and location of points where trends change directions (joinpoints).

Statistically Significant: Results were considered 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 *in situ*)	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 *in situ*)	29010	C67

*International Classification of Diseases for Oncology, 3rd Ed. Surveillance, Epidemiology, and End Results (SEER) Site Recode ICD-O-3/WHO 2008Definition:https://seer.cancer.gov/siterecode/icdo3_dwhoheme/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, some Massachusetts residents may still have been 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, rate differences may be due to chance, and the data should be interpreted cautiously.

Appendix VI. DPH Cancer Programs Health Equity Initiatives

MA Comprehensive Cancer Control Program (MCCCP)
Funded by the Centers for Disease Control and Prevention, the Massachusetts Comprehensive Cancer Control Program (MCCCP) is committed to an integrated, coordinated, and collaborative approach encompassing all points on the cancer continuum that will have the greatest impact on decreasing and eliminating cancer-related death and suffering. The continuum includes cancer prevention, early detection, treatment, survivorship, and end-of-life care. The MCCCP is committed to health equity across the continuum, and related initiatives are outlined below.

Link: Comprehensive Cancer Control Program

Preparing for the 2024-2029 Statewide Cancer Plan
In 2023, the MCCCP began the process of data gathering, updating, and drafting the MA Statewide 2024-2029 Cancer Plan (Cancer Plan). The Cancer Plan will set forth a comprehensive cancer control blueprint for action to reduce the cancer burden in Massachusetts. The 2024-2029 Cancer Plan will guide statewide, local, and community efforts in preventing and controlling cancer across the continuum from primary prevention (e.g., quitting tobacco, healthy eating, exercise) through survivorship and palliative care. The Cancer Plan will address the social determinants and related risk factors that contribute to cancer in our communities by moving upstream to consider the policies, laws, and environments that impact our behavior and create social and physical environments that promote good health for all. The Cancer Plan is intended for community health and faith-based coalitions, disease prevention and advocacy organizations, healthcare providers, researchers, policymakers, public health officials, cancer survivors, and individuals interested in cancer activities. The Cancer Plan will include health equity and access as one of its cross-cutting themes to address the 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.

To better understand regional and community-level perspectives on cancer-related issues, the MCCCP engaged in a qualitative data gathering process that included discussions with community-based organizations, community-level focus groups, and key informant interviews at regional cancer centers across Massachusetts. Through this process, key themes, strengths, challenges, and populations to engage were identified. The community-level information gathered during this qualitative data review was presented to the Coalition and incorporated into the Cancer Plan strategic planning process to ensure that chosen objectives and strategies considered the needs of all MA residents and focused on historically underserved populations.

Massachusetts Comprehensive Cancer Coalition (MCCCC)
The MCCCP's Massachusetts Comprehensive Cancer Coalition (MCCC) is a statewide coalition of individuals and organizations (e.g., patients/survivors/caregivers, clinical care providers, community organizations, cancer centers, community health centers, academic partners) working towards the following Vision and Mission:

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

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 priority populations to develop tailored solutions. Finally, geographic inequities underscore the need for regional representation across the state, especially in areas with greater cancer burdens, and for developing regional solutions.

With this in mind, the Coalition's Leadership Group comprises Regional Champions from each region of MA. It includes the Co-Chairs of the five Health Equity Committees (HECs) organized across the cancer continuum (Primary Prevention, Secondary Prevention, Treatment, 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 a diverse perspective as the Coalition develops the next 5-year State Cancer Plan.

Link: Massachusetts Comprehensive Cancer Coalition

Tufts Interdisciplinary Evaluation Research (TIER) Project on Survivorship in Rural MA
To understand how COVID-19 affects cancer survivors in rural Massachusetts, the MCCCP is partnering with Tufts University Interdisciplinary Evaluation Research (TIER) program. This ongoing project focuses on the unique needs of rural areas. It gathers data on the experiences and challenges faced by cancer survivors in this new normal of COVID-19 through a community-based participatory research framework. As the project unfolds, data and outcomes will be shared with the participating communities and made available Coalition-wide.

Annual Cancer Summit on Cancer-Related Disparities in the LGBTQ+ Population
The Cancer Summit is a Coalition-wide event held each year to raise pertinent cancer-related information across the continuum and highlight cancer-related disparities and potential solutions. The 2023 Cancer Summit focused on cancer care in the LGBTQIA+ population, including cancer-related disparities and risk factors, barriers to accessing care, and best practices for improving outcomes for the LGBTQIA+ population.

Partnership with the Office of Health Equity's Health and Disability Program
The MCCCP worked with the MDPH Office of Health Equity's (OHE) Disability Program on a joint project called the Office of Health Equity Mini-Grants to provide capacity-building funds to address primary prevention of cancer at the local level and elevate the needs of those communities that are most at-risk of cancer-related inequities by participating in the MA Comprehensive Cancer Coalition. The OHE Disability Program collaborated with Mass in Motion Municipal Wellness and Leadership Initiative, the Office of Local and Regional Health, the Root Cause Solutions Exchange, and the Massachusetts Health Officers Association (MHOA) to offer some mini-grants to perform community-level needs assessments on access to physical activity/recreation opportunities for persons with disabilities in various municipalities across MA. Grantees were charged with creating and reporting on a 6-month plan of action to implement healthy community design strategies aimed at creating conditions to support healthy behaviors for people with disabilities, including people with mobility limitations. The MCCCP augmented these mini-grants to increase the capacity for these municipalities to implement their plans for improving the built environment and reducing barriers to physical recreation for all.

MA Colorectal Cancer Control Program
The Massachusetts Colorectal Cancer Control Program (MCRCCP) aims to increase colorectal cancer screening rates across the Commonwealth and decrease inequities in colorectal cancer screening by supporting the implementation of evidence-based interventions and establishing a learning collaborative with health centers. Specifically, the MCRCCP 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 colorectal cancer screening, such as patient reminders, provider-reminders, provider assessment and feedback, and reducing structural barriers. This work is done through a Learning Collaborative & coaching model based on the Institute for Health Improvement's Model for Improvement. Each participating CHC is also coached through performing a disparities analysis on CRC screening rates by race/ethnicity to better understand gaps in screening and then develop plans to decrease inequities that are identified.

Link: MA Colorectal Cancer Control Program (MCRCCP)

MA Breast and Cervical Cancer Program

The Massachusetts Breast and Cervical Cancer Program (MBCCP) provides education and patient navigation services. It helps low-income, uninsured, and underinsured individuals in Massachusetts access free breast and cervical cancer screening and diagnostic services. The MBCCP uses a multi-pronged systems approach to effectively reach, engage, and address the barriers people of color face in accessing essential preventive, diagnostic, and treatment services in Massachusetts. This is accomplished through two key strategies: providing patient navigation to reduce institutional, provider-level, and community barriers and supporting 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 individuals 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 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 MCCCP, MCR, and other chronic disease prevention programs, to reach, enroll, and serve more people 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 promoting healthy behaviors, engaging partners, and enhancing linkages in communities, policy influence, system improvement, knowledge generation, dissemination of information, provision of resources, and surveillance monitoring. It will also allow for exploring future expansion of services to meet the needs of those most vulnerable across the state.

Link: Massachusetts Breast and Cervical Cancer Program (MBCCP)

MA Bureau of Climate and 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 using 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, 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 and many environmental and health datasets, including cancer incidence at the county, community, and census tract levels.

Link: Bureau of Climate and Environmental Health (BCEH)

References

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