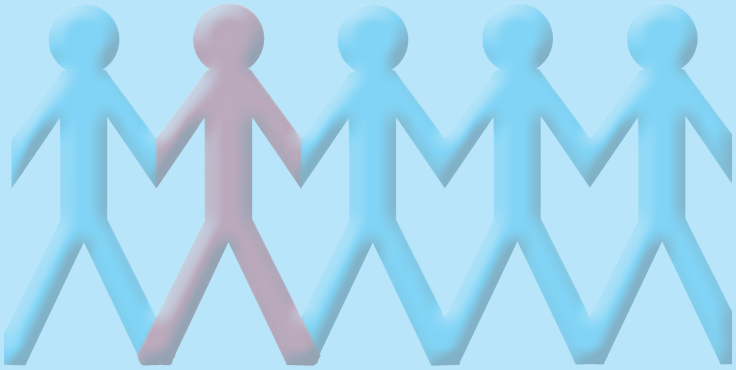
The Burden of Cancer in Missouri



A Comprehensive Analysis and Plan 2016-2020

Report Information

Title: *The Burden of Cancer in Missouri: A Comprehensive Analysis and Plan, 2016-2020*

Description: This report provides information about cancer incidence, prevalence, mortality (deaths) and existing disparities, as well as health care utilization by individuals with cancer in Missouri. The report also focuses on national recommendations and what is being done to address cancer in Missouri.

Audience: This report is intended for use by the general public as well as state and local policy makers, researchers, local public health agencies, health care personnel, voluntary organizations and others interested in the prevention and control of cancer in Missouri.

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About the Missouri Cancer Consortium

The Missouri Cancer Consortium (MCC) is a statewide coalition made up of individual health care professionals, health care organizations, academic and medical institutions, public health agencies and community-based groups concerned about cancer. Its mission is to reduce the human and economic burden of cancer on Missourians through the promotion of collaborative, innovative and effective programs and policies, and achieve the ultimate vision of a cancer-free Missouri.

MCC, in collaboration with the Missouri Department of Health and Senior Services' (DHSS) Comprehensive Cancer Control Program and other key partners, developed the Missouri Cancer Action Plan, which serves as a guide to addressing the cancer burden in the state. To accomplish its mission, MCC works with state and community leaders to implement the Missouri Cancer Action Plan. It combines efforts and pools resources to reduce cancer risks, find cancers earlier, improve treatments, increase the number of people who survive and improve the quality of life for cancer survivors.

Acknowledgements

This report is made possible through the partnership of DHSS and MCC. Special acknowledgement is given to the MCC action plan workgroups — DHSS Office of Epidemiology, Bureau of Health Care Analysis and Data Dissemination, Bureau of Vital Statistics, Bureau of Vital Records, the Missouri Cancer Registry, and DHSS Comprehensive Cancer Control Program manager. This booklet would not have been possible without the continued commitment and support of the Centers for Disease Control and Prevention.

This document represents a comprehensive analysis of cancer in Missouri, as well as a strategic plan to address the burden of cancer over the next five years. The strategies in the plan are designed to decrease the suffering, death and health care costs caused by cancer. These strategies include evidence-based prevention, early detection and treatment activities that will improve the quality of life of cancer survivors.

Sincerely,

Amanda Hamker

Amanda Hamker, MBA
Chair, Missouri Cancer Consortium

Dear Missourians,

Every day Missourians strive to improve the quality of their lives through healthy eating and other lifestyle changes. Even so, the burden of cancer is great. In 2012, more than 31,000 Missourians were diagnosed with invasive cancer. This was more than three new cases of cancer diagnosed every hour of every day in Missouri.

The Missouri Department of Health and Senior Services and the Missouri Cancer Consortium have partnered to address the burden of cancer in Missouri. The strategies outlined in this report are designed to decrease the suffering, death and health care costs caused by cancer.

The Burden of Cancer in Missouri: A Comprehensive Analysis and Plan, 2016-2020, incorporates comprehensive cancer control measures, focuses on national recommendations and provides a detailed plan to address cancer in Missouri. Furthermore, scientific data and research are being used to systematically identify priorities and inform decision making when it comes to cancer.

With your help, and the help of our partners, we accept the challenge of reducing the burden of cancer and individual risk factors, while reducing the disparities in cancer screening, incidence, treatment and survival.

Sincerely,

Randall W. Williams, MD, FACOG
Director
Missouri Department of Health and Senior Services

Executive Summary

The Burden of Cancer in Missouri: A Comprehensive Analysis and Plan, 2016-2020

This publication describes the cancer burden in Missouri with updated cancer data and analysis and identifies strategies for addressing the burden in a detailed Missouri Cancer Action Plan. The plan was developed by the Missouri Cancer Consortium (MCC) in collaboration with the Missouri Department of Health and Senior Services' Comprehensive Cancer Control Program. It focuses on four main goals in the cancer continuum - Prevention, Early Detection/ Screening, Diagnosis/Treatment, and Survivorship Through the End of Life. This framework helps identify gaps, where collaboration with others can have an impact, and where more resources are needed.

Prevention

The primary prevention of cancer involves individuals, communities, health care providers, and others practicing and encouraging healthy lifestyles and creating healthy environments. It is estimated that 50-75 percent of cancer deaths in the United States are caused by three preventable lifestyle factors: tobacco use, poor diet and lack of exercise. In Missouri, more than one in five adults smoke (22.3%), almost one-third of adults are obese (32.4%) and more than one-fourth (27.0%) are physically inactive during leisure time. An emerging issue is that one in five high school students (22.0%) and 7.2 percent of middle school students currently use some type of electronic nicotine delivery system, commonly known as e-cigarettes. In addition, more than one-half of adults consume fruit or vegetables less than one time per day. Healthy behaviors most effective in preventing cancer include avoiding tobacco products and exposure to secondhand smoke, minimizing alcohol intake, following a balanced diet, exercising regularly and taking precautions against ultraviolet exposure.

In 2012, 31,157 of Missouri's residents were diagnosed with invasive cancer. Lung and bronchus cancer continues to be the leading cause of cancer death in Missouri and cigarette smoking causes almost all cases. Compared to nonsmokers, men who smoke are about 23 times more likely to develop lung cancer and women who smoke are about 13 times more likely. Lung and bronchus cancer is the leading newly diagnosed invasive cancer in Missouri, followed by female breast; prostate; colon, rectum and rectosigmoid and urinary bladder cancers. Regarding trends, some significant changes in cancer incidents were observed during the ten-year period, 2003-2012. Overall, there has been a significant decline in lung cancer among men, and colorectal cancer has decreased among men and women. Most notable is the decrease in prostate cancer among men. However, there have been slight increases in corpus and uterine cancer among women and in melanoma skin cancer among men.

Although minorities only comprise 19.9 percent of Missouri's total population, many are disproportionately impacted by cancer. African Americans had significantly higher age-adjusted incidence rates of colorectal cancer, prostate cancer and all cancers combined compared to whites. In addition, African Americans had significantly higher age-adjusted cancer death rates from trachea/bronchus/ lung, prostate, female breast, colorectal, liver and pancreatic cancers.

Cancer incidence also varies geographically across the state. We looked at this variability for the leading invasive cancers (i.e., lung, colorectal, female breast and prostate) by gender for 2007-2012. Most notably,

"For the approximately 336,230 adult cancer survivors living in Missouri, access to resources and support that address physical, emotional, social, spiritual and financial challenges due to cancer diagnosis and treatment is critical to long-term recovery and quality of life."

the age-adjusted lung cancer incidence rate in 15 counties among females, and in 19 counties among males, was significantly higher than the state rate.

The plan focuses on promoting healthy lifestyles and reducing environmental hazards by working with partners to reduce smoking and exposure to secondhand smoke; encouraging physical activity and healthy eating; educating providers, parents and adolescents about the human papillomavirus (HPV) vaccination; and educating the public about the risks of sun exposure and indoor tanning.

Early Detection/Screening

Screening, available for some of the most common types of cancer, can prevent some cancers or detect the cancer early when treatment is likely to be more successful. Five-year relative survival rates for common cancers, such as breast, colorectal, cervical and melanoma of the skin, are 90 percent to 100 percent if they are discovered and treated before spreading beyond the organ or site where the cancer began. The prevalence of cancer screening for cervical, colorectal and breast cancers in Missouri is similar to the U.S., but still needs to be improved to reach the Healthy People 2020 objectives.

The plan strives to increase screening rates by promoting awareness among health care providers and the general public regarding the screening guidelines for breast, cervical, colorectal, prostate and lung cancers. It also addresses the need to connect people who have barriers to screening with community resources.

Diagnosis and Treatment

Cancer is the second leading cause of death in Missouri, following heart disease. On average, Missourians lose 13.6 years of potential life due to cancer. In 2014, 13,009 Missouri residents died from cancer, accounting for 22.4 percent of all deaths in Missouri. In 2014, the five leading causes of cancer deaths in Missouri were: lung/bronchus/trachea; colon, rectum and anus; breast; pancreas; and leukemia. While four of the five leading causes of cancer deaths have not changed since 2008, leukemia surpassed prostate cancer as the fifth leading cause of cancer death. The second leading new invasive cancer, colon/rectum/rectosigmoid, remained the second leading cause of cancer deaths for males, but is the third leading cause of cancer deaths for females. For the eleven year period, 2004-2014, there have been significant declines in deaths from prostate cancer in males; ovarian and breast cancer in women; lung/bronchus/trachea and colon, and rectum and anus cancers in both males and females.

"It is our hope that by working together, we are able to achieve the MCC vision to create a cancer-free Missouri."

The Burden of Cancer in Missouri: A Comprehensive Analysis and Plan, 2016-2020
Missouri Department of Health and Senior Services

With earlier diagnosis and advances in treatments, more people are surviving cancer. Access to quality cancer care and clinical trials is important to ensure that everyone is provided state-of-the-art treatment. Cancer is a complex chronic disease and treatment often requires coordinated care from multiple providers and health disciplines. Patients may need to make repeated visits for treatment. Significant disparities exist for those who are uninsured or underinsured, live in rural areas far from medical services and cancer treatment centers, or lack affordable transportation options. These and other factors and barriers can lead to delays in diagnosis that result in discovering cancers at more advanced stages, delays in treatment or no treatment, and ultimately, higher death rates in disparate populations.

The plan emphasizes timely access to evidence-based cancer diagnosis and treatment by expanding access to health insurance; increasing the awareness and participation in clinical trials; promoting evidence-based strategies to reach minority and medically underserved communities; and improving patient services and care coordination in line with the National Comprehensive Cancer Network guidelines.

Survivorship Through the End of Life

Due to advances in the early detection and treatment of cancer, people are living many years after a cancer diagnosis. Addressing matters such as coordination of care, patient-provider communication, palliative care, pain management and fertility preservation can improve patient health outcomes and quality of life. For the approximately 336,230 adult cancer survivors living in Missouri, access to resources and supports that address physical, emotional, social, spiritual and financial challenges due to a cancer diagnosis and treatment is critical to long-term recovery and quality of life.

The plan seeks to assure the highest quality of life for cancer survivors and their families by reducing barriers to quality care and services; supporting the use of survivorship care plans; and providing information to survivors, health care providers and policymakers about quality of life issues and service needs of people of various ages and ethnic, racial and economic backgrounds during each stage of survivorship.

The Missouri Cancer Consortium's main task is to implement the strategies set forth in the Missouri Cancer Action Plan. Implementation requires collaboration from all disciplines across the cancer continuum; including but not limited to, hospital systems, local public health departments, regional coalitions, community members, academic-institutions, physicians and nurses. It is our hope that by working together, we are able to achieve the MCC vision to create a cancer-free Missouri.

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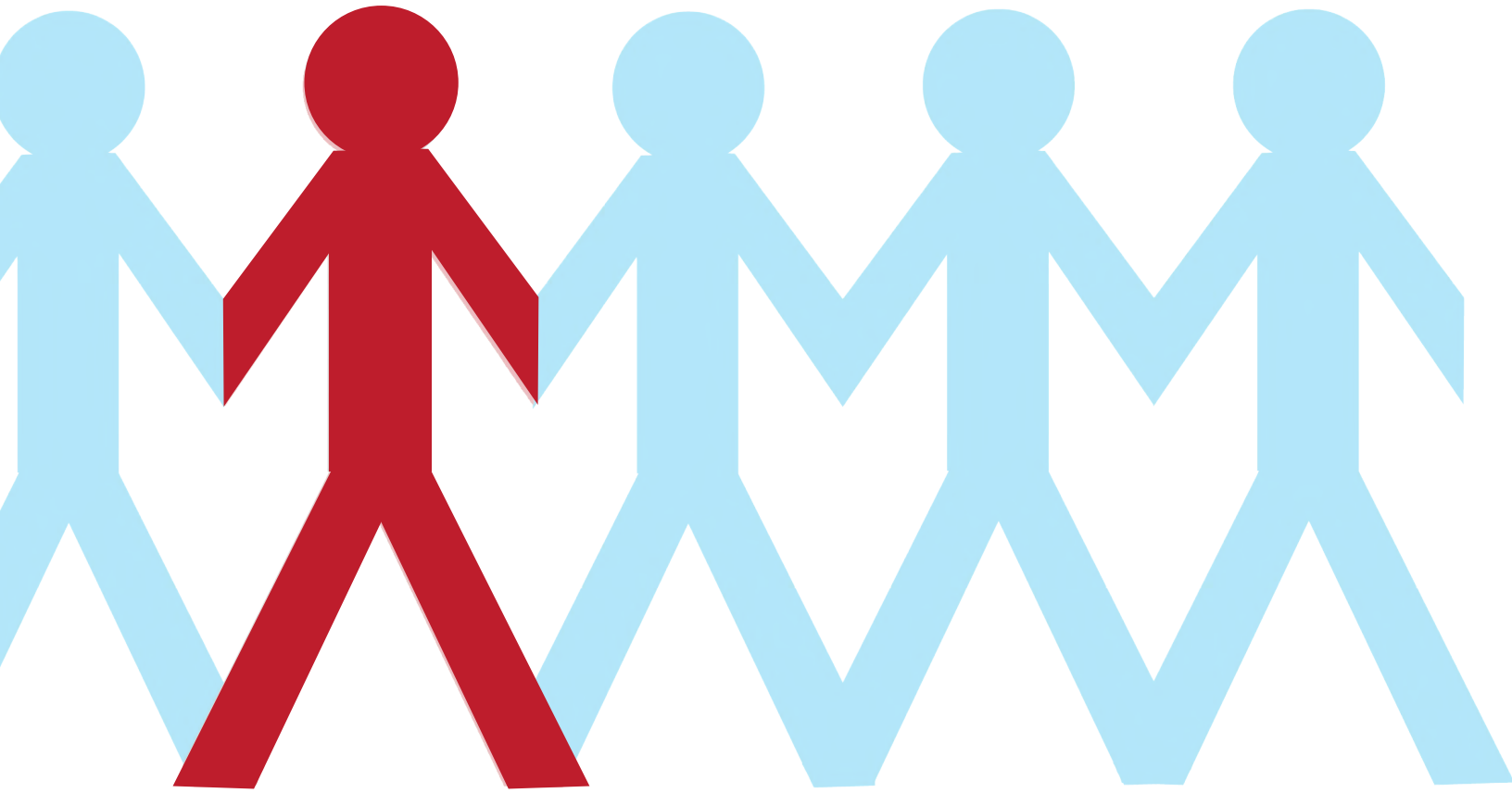


Introduction

The Challenge

Cancer is the second leading cause of death in Missouri, following heart disease.[1] Decreasing cancer-related morbidity and mortality requires continuous focus on the cancer continuum. Increased opportunities for education and awareness about high-risk behaviors and their impact on new cancer cases are needed to reach populations. The challenge is for everyone to be bold and daring by taking a proactive approach to assure the greatest number of Missourians will be offered appropriate, timely and much-needed information. Cancer is a condition that brings tremendous challenges, but with new technology and therapies, many cancers can be prevented, managed or even cured.

Cancer: Causes and Risk Factors

What is cancer?

For some, cancer statistics are just numbers. For others, the word "cancer" evokes fear and the inability to cope. Many people do not contemplate the impact of the disease until it confronts them or their family or friends. Maybe the disease is too frightening to think about, even though many people recover, survive and live long lives.

Cancer is not just one disease, but a group of diseases characterized by uncontrolled growth and spread of abnormal cells. All cancers cause cells in the body to change and grow out of control. Many types of cancer form a lump or mass called a tumor. The tumor can invade and destroy healthy tissues. Cells from the tumor can break off and go to other parts of the body, where they can continue to grow. This spreading process is called metastasis. If the spread is not controlled, it may result in death.[2, 3] When cancer spreads, it is still named after the part of the body where it started. If lung cancer spreads to the brain, it is still lung cancer, not brain cancer. Some cancers, such as leukemia and lymphoma, do not form a tumor.

What causes cancer?

Cancer may be caused by many different things. Some kinds of cancer are caused by behaviors – things people do. For example, smoking can cause cancer of the lungs, mouth, throat, bladder, kidneys and some other organs, as well as heart disease and stroke. While not everyone who smokes will get cancer, smoking increases a person's chance of getting the disease. Drinking large amounts of alcohol has also been shown to increase a person's chance of getting cancer of the mouth, throat and some other organs. This is especially true if the person drinks and smokes.[4]

Although sunlight is the main source of ultraviolet (UV) radiation, this radiation may also come from other sources, such as tanning booths. The best way to lower the risk of skin cancer is to practice sun safety when outdoors to limit exposure to UV light.[5] Individuals with lighter-toned skin are more susceptible to UV damage, although people of all races and ethnicities can be at risk for skin cancer. Those who have a family history of skin cancer, multiple moles or freckles, or a history of severe sunburns early in life, are at a higher risk of skin cancer. To minimize the harmful effects of excessive and unprotected sun exposure, protection from intense UV radiation should be a life-long practice for everyone.[5, 6]

Certain types of cancer are more common in some families. This can be caused by a number of factors. Often, family members have certain risk factors in common, such as smoking, which can cause many types of cancer. But in some cases, the cancer is caused by an abnormal gene that is passed from generation to generation. Although this is often referred to as inherited cancer, the abnormal gene that can lead to cancer is inherited, not the cancer itself. Only about 5 percent to 10 percent of all cancers are related to family genetics.[7]

In most cases, the exact cause of cancer remains a mystery. It is known that certain changes in our cells (mutations) during the course of our life can cause cancer to start, but it is not yet known exactly how this happens.

What are the risk factors?

Physicians and researchers often cannot explain why one person develops cancer and another does not. Some people will develop cancers that have no known risk factors. However, research shows that certain factors increase the chance that a person will develop cancer. The most common risk factors for cancer include:[4,7, 8, 9]

- Growing older
- Tobacco use
- Sunlight/UV exposure
- Ionizing radiation
- Certain chemicals and other substances
- Some viruses and bacteria
- Certain hormones
- Family history of cancer
- Alcohol use
- Poor diet, lack of physical activity, or being overweight

Although cancer may strike at any age, it is more commonly a disease of middle and older age. In 2012, about 79 percent of all cancers in Missouri were diagnosed at age 55 or older.[10] However, it is recognized that certain groups of people are at increased risk of dying from cancer, especially those with limited options for primary prevention (e.g., lack of healthy foods, particularly fresh fruits and vegetables, and lack of exercise) and secondary prevention services (e.g., screening), and those underserved by virtue of their income, race, ethnicity, disability, or sexual orientation.[8]

Many risk factors can be avoided. Others, such as age and family history, cannot be avoided or changed. According to the American Cancer Society (ACS), smoking and heavy alcohol consumption increase the risk for some people to get certain types of cancer.[11,12] Skin exposure to the sun's rays and indoor tanning are linked to more than one million skin cancers diagnosed every year. Although the exact links between what we eat (or don't eat) and some types of cancers are not yet clear, about one-third of the cancer cases every year are related to poor nutrition, being overweight or obese and physical inactivity, and could possibly be prevented.[13] Exercise has been shown to prevent several health problems, including cancer.[14] People can help protect themselves by staying away from known risk factors whenever possible. Those who think they may be at risk for cancer should discuss this concern with their doctor. They may want to ask about reducing their risk and about a schedule for routine checkups and screenings.

"It is estimated that 50-75 percent of cancer deaths in the U.S. are caused by three preventable lifestyle factors: tobacco use, poor diet and lack of exercise."

Over time, several factors may act together to cause normal cells to become cancerous. The following are things to keep in mind when considering a person's risk for cancer:

- Not everything causes cancer.
- Cancer is not caused by an injury, such as a bump or bruise.
- Cancer is not contagious. Although being infected with certain viruses or bacteria may increase the risk of some types of cancer, no one can "catch" cancer from another person.
- Having one or more risk factors does not mean that you will get cancer. Most people who have risk factors never develop cancer.
- Some people are more sensitive than others to known risk factors.

For more information on cancer causes and risk factors, see the National Cancer Institute booklet, "Cancer and the Environment."[9]

What You Can Do to Reduce Risk Factors!

Table 1 shows high proportions of adult Missourians who have modifiable risk factors, and the proportions have not changed significantly from 2011 to 2015.[15] The prevalence of these risk factors is consistently higher in Missouri than the U.S., with the exception of heavy alcohol use among women.

Table 1. Prevalence of risk factors among adults, Missouri and the United States

Risk factor	Missouri 2011 %	2012 %	2013 %	2014 %	2015 %	U.S. 2014 Median %
Current smoker	25.0	23.9	22.1	20.6	22.3	18.1
Currently using smokeless tobacco	5.3	5.1	5.2	4.8	5.5	4.2
Obesity	30.3	29.6	30.4	30.3	32.4	29.6
Physical inactivity	28.4	-	28.3	25.0	27.0	22.7
Consumed fruit less than one time per day	56.7	-	55.3	-	55.4	39.2^
Consumed vegetables less than one time per day	58.4	-	56.2	-	58.1	22.9^
Heavy alcohol use						
Men	9.6	8.2	7.6	6.8	8.0	6.8
Women	5.1	4.6	4.5	3.7	4.4	5.2

"^" 2013 U.S. data
Current smokers: individuals who have smoked at least 100 cigarettes in their lifetime and now smoke every day or some days
Currently using smokeless tobacco: chewing tobacco, snuff or snus (a smokeless tobacco product developed in Sweden)
Obesity: Body Mass Index (BMI) ≥30
Physical inactivity: No leisure time physical activity or exercise in past month
Heavy alcohol use: More than two drinks for men and more than one drink for women per day in past 30 days
"-" data not collected or not available for this year

Source: Missouri Department of Health and Senior Services and Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System.

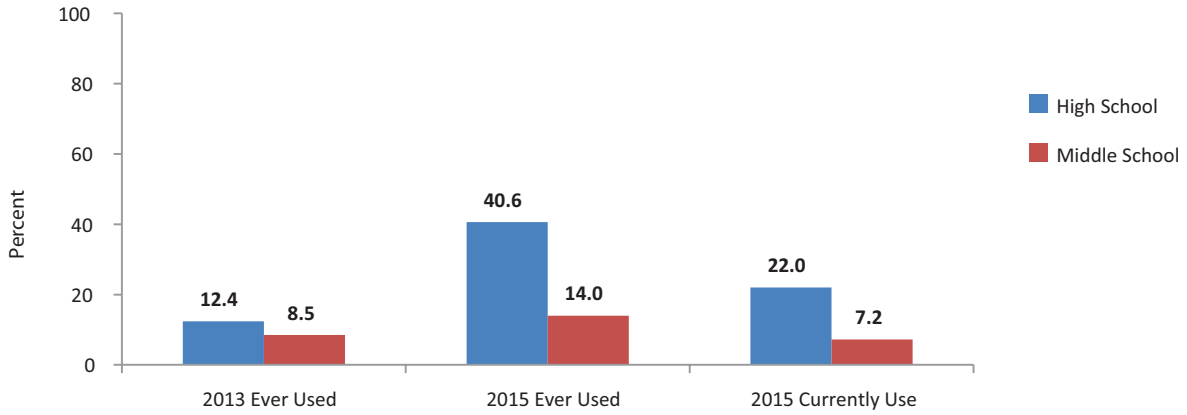
"Concentrations of many cancer-causing and toxic chemicals are greater in secondhand smoke than in the smoke inhaled by smokers."

Emerging issues in cancer risk

Electronic nicotine delivery systems (ENDS), commonly known as electronic cigarettes, e-cigarettes, vape pens or mods, are an emerging issue in cancer risk. While studies are being conducted and the science is not clear on how much of a cancer risk they pose, scientists are finding that they may not be risk-free.

- ENDS aerosol is not harmless water vapor. In addition to nicotine, some aerosol has been found to contain cancer causing agents like acrolein,[16] formaldehyde,[17] heavy metals[18] and volatile organic compounds.[19]
- ENDS aerosol damages DNA in ways that could lead to cancer or cell damage or death. It doesn't matter whether the ENDS liquid contains nicotine or not.[20]
- Nicotine is not only addictive, which continues to expose the user to other potentially harmful substances in the ENDS aerosol, it causes DNA mutation, which leads to cancer.[21]

Figure 1. Percentage of middle school and high school students by grade that ever used and currently use vapor products, Missouri, 2013-2015



Includes e-cigarettes, e-cigars, e-pipes vape pipes, vape pens, e-hookas, and hookah pens such as blue, NJOY or Starbuzz

Source: Missouri Department of Health and Senior Services. Youth Risk Behavior Survey for high school data and Youth Tobacco Survey for middle school students.

What is Comprehensive Cancer Control?

The cancer control continuum is used to describe cancer prevention, early detection, diagnosis, treatment, survivorship and end of life. The cancer control continuum is the framework on which this plan was developed. The framework helps identify gaps where collaboration with others can have an impact and where more resources may be needed.

The Centers for Disease Control and Prevention (CDC) helped to develop and clarify the concept of a comprehensive approach to cancer control. Through this process, Missouri joins 50 states, the District of Columbia, seven tribal groups and the U.S. Associated Pacific Islands/Territories in developing a plan to address the cancer continuum.

Comprehensive cancer control is based on the following principles:

- Scientific data and research are used systematically to identify priorities and inform decision making.
- The full scope of cancer care is addressed, ranging from primary prevention to early detection and treatment to survivorship and end of life issues.
- Many stakeholders are engaged in cancer control, including, but not limited to, the medical and public health communities, volunteer agencies, insurers, businesses, survivors, government, academia and advocates.
- All cancer programs and activities are coordinated, thereby creating integrated activities. The integrated activities encompass many disciplines, such as administration, basic and applied research, evaluation, health education, program development, public policy, surveillance, clinical services, and health communications.

"The cancer control continuum is the framework on which this plan was developed."

Evidence-based Interventions for Cancer Prevention and Control

According to the American Cancer Society, much of the suffering and death due to cancer can be prevented by the expanded use of established cancer screening tests, reducing tobacco use, reducing obesity, improving diets and increasing physical activity.[22]

The Community Preventive Services Task Force (CPSTF), a panel of public health and prevention experts, provides evidence-based findings and recommendations about community preventive services, programs and policies to improve health. The Guide to Community Preventive Services is a resource that documents program and policy interventions that have been proven effective and those that may be promising, but lack sufficient evidence of effectiveness. The recommendations include both client and provider oriented interventions.

Cancer Screening

To increase breast, cervical and colorectal cancer screening, recommended interventions include client reminders, small media and one-on-one education. Reminder letters, postcards or telephone calls can include facts about the screening and navigation assistance, such as offering to help set up an appointment. Small media, including videos and printed materials, can be targeted and/or tailored to individuals, subgroups or larger audiences.

Other effective interventions include reducing structural barriers for breast and colorectal cancer screenings, and reducing out-of-pocket costs and group education for breast cancer. Barriers, such as distance from screening location, limited hours of operation, lack of day care for children and language and cultural factors, can make it difficult for people to seek screening for cancer. Costs can be reduced by providing vouchers, reimbursing clients or clinics and increasing access to health insurance.

Tobacco Use

Tobacco use is responsible for more than 430,000 deaths each year in the United States.[23] Smoking causes many types of cancer, heart disease, stroke, lung diseases, diabetes and chronic obstructive pulmonary disease. Recommendations to reduce tobacco use include strategies to increase the price of tobacco products, health communications that target large audiences, mobile telephone-based cessation interventions, quitlines that provide behavioral counseling and telephonic support, reducing out-of-pocket costs to make medication and/or counseling more affordable, smokefree ordinances or policies, and efforts to restrict minors' access to tobacco products.

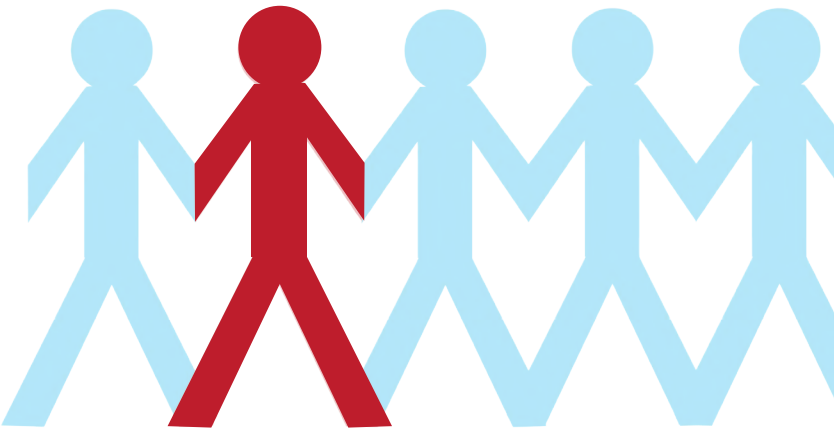
Obesity

More than one-third of U.S. adults (35.7%) and approximately 17 percent (or 12.5 million) of children and adolescents aged 2-19 years are obese.[24] Obesity is associated with increased risks of several types of cancer, including breast and colorectal. To reduce obesity, CPSTF recommends interventions that reduce recreational sedentary screen time among children, worksite physical and activity programs, and technology-supported coaching or counseling to reduce weight and maintain weight loss.

Physical Activity

Studies show that regular physical activity reduces the risk for depression, diabetes, heart disease, high blood pressure, obesity, stroke and certain kinds of cancer.[25, 26, 27] Recommendations include: individually adapted programs to increase physical activity and teach skills for incorporating physical activity into daily routines, social support for increasing physical activity, programs to increase the amount of time that students in grades K-12 engage in moderate or vigorous-intensity physical activity during physical education classes, community campaigns to increase physical activity, design and land use policies, and practices that support physical activity, and creation of or improving access to places for physical activity, such as walking trails.

Missouri Cancer Action Plan



Prevention

It is estimated that 50-75 percent of cancer deaths in the United States are caused by three preventable lifestyle factors: tobacco use, poor diet and lack of exercise.[15] Furthermore, the risk of getting cancer can be reduced in a variety of ways, including eating healthy and keeping a healthy weight, avoiding tobacco, limiting alcohol consumption, protecting your skin from the sun, and getting recommended screenings.

Lung cancer continues to be the leading cause of cancer death, and cigarette smoking causes most cases. Compared to nonsmokers, men who smoke are about 23 times more likely to develop lung cancer and women who smoke are about 13 times more likely.[28] Smoking causes about 90 percent of lung cancer deaths in men and almost 80 percent in women.[28] Smoking can also cause cancer of the voice box (larynx), mouth and throat, esophagus, kidney, pancreas, cervix, bladder, colon, rectum and stomach, and causes acute myeloid leukemia. Adults who are exposed to secondhand smoke at home or at work increase their risk of developing lung cancer. Concentrations of many cancer-causing and toxic chemicals are greater in secondhand smoke than in the smoke inhaled by smokers.

Although the exact links between what we eat (or don't eat) and some types of cancers are not yet clear, it has been estimated that one-third of all cancer cases in the U.S. are related to poor nutrition, being overweight or obese and physical inactivity, and could possibly be prevented.[13] In addition, research has shown that being overweight or obese substantially raises a person's risk of getting endometrial (uterine), breast, prostate and colorectal cancers.[26] Overweight is defined as a body mass index (BMI) of 25 to 29, and obesity is defined as a BMI of 30 or higher.

Certain infectious agents (i.e., viruses, bacteria and parasites) can also cause cancer in infected people or increase the risk of developing cancer. Types of human papillomavirus (HPV) cause many of the cervical and gynecological cancers in females and penile cancers in males. HPV also causes anal cancer and oral cancers. Experts recommend that children ages 11 and 12 receive the HPV vaccine that prevents the infection.[29] Hepatitis B and hepatitis C viruses can cause liver cancer.[30] Experts recommend that individuals get vaccinated against hepatitis B and seek treatment if either virus is detected. Additional cancers may be related to other infectious agents. The best ways to prevent these cancers are by getting vaccinated, not having unprotected sex, not sharing needles and being tested and treated.

Skin cancer is the most common form of cancer in the U.S. Exposure to the sun's ultraviolet (UV) rays appears to be the most important environmental factor involved with developing skin cancer. To help prevent skin cancer while still having fun outdoors, seek shade, apply sunscreen regularly, and wear sun-protective clothing, a hat and sunglasses.

Goal 1: Reduce incidence of cancer by promoting healthy lifestyles and reducing environmental hazards

Objective 1: By December 31, 2020, decrease the percentage of Missourians who smoke cigarettes

Measure: Adults – from 22.1% in 2013 to 19.7% (BRFSS)

Youth in grades 6-8 – from 4.0% in 2013 to 2.0% (YTS)

Youth in grades 9-12 – from 14.9% in 2013 to 10.0% (YRBS)

African-American Adults – from 22.6% in 2013 to 20% (BRFSS)

Annual household income less than $15,000 – from 38.9% in 2013 to 30% (BRFSS)

Target Audience: Youth, adult Missourians who smoke and policymakers

Strategies:

1. Collaborate with Tobacco Free Missouri and other partners to reduce smoking
2. Advocate for funding for the Missouri Tobacco Quitline and local cessation efforts, including nicotine replacement therapy
3. Encourage local coalitions to promote the Quitline and local cessation efforts
4. Support an increase in core state funding for the Comprehensive Tobacco Control Program from $0 ($1.2 million one-time funding in 2009-10) to $72.9 million (CDC's recommended level)
5. Disseminate the latest tobacco prevention, cessation and control research findings as available
6. Disseminate county level data to local coalitions and local public health departments

Objective 2: By December 31, 2020, increase the percentage of Missourians who are living in communities with a comprehensive smokefree policy

Measure: From 24% in 2014 to 30%

Target Audience: All Missourians and policymakers

Strategies:

1. Advocate with Tobacco Free Missouri and other partners for a smokefree Missouri
2. Increase the number of Missouri communities that implement comprehensive smokefree policies for all workplaces and public places
3. Increase awareness among education and community officials of the benefits of creating tobacco-free environments for youth
4. Advocate for tobacco-free mental health and substance abuse facilities
5. Advocate for expanded policies to prohibit smoking in childcare facilities, on the grounds and in vehicles at all times
6. Advocate for tobacco-free correctional facilities
7. Advocate for comprehensive tobacco-free higher education campuses and vehicles

8. Advocate for comprehensive tobacco-free school districts
9. Actively communicate evidence-based comprehensive cancer control activities, outcomes and successes to relevant constituencies (e.g., media, policymakers, health departments, the public)
10. Identify state and local leaders who can communicate the value of comprehensive cancer control to the public, the media and policymakers
11. Identify partnerships to implement the Missouri Comprehensive Tobacco Control state plan

Objective 3: By December 31, 2020, decrease the percentage of Missourians who are overweight and obese

Measure: Obesity: Adults – from 30.4% in 2013 to 27.2% (BRFSS); African-American adults – from 38.9% in 2013 to 35.6% (BRFSS); High school youth – from 14.9% in 2013 to 13.8% (YRBS)

Having no leisure time physical activity in the past month (BRFSS)
Adults – from 28.3% in 2013 to 25%
African-American women – from 26.8% in 2014 to 24.0%

High school youth who are physically active at least 60 minutes per day on 5 or more days – from 45.4% in 2013 to 50% (YRBS)

Consumed fruits less than one time per day (BRFSS)
Adults – from 55.4% in 2015 to 53.4%
African-American women – from 61.3% in 2015 to 60.0%
Adults with less than a high school education – from 64.5% in 2015 to 63.0%

Not eating fruit one or more times during the past 7 days
High school students – from 12.8% in 2015 to 11.0% (YRBS)
Middle school students – from 13.1% in 2015 to 12.0% (YTS)

Consumed vegetables less than one time per day (BRFSS)
Adults – from 58.1% in 2015 to 56.0%
African-American women – from 69.6% in 2015 to 67.6%
Adults with less than a high school education – from 62.0% in 2015 to 60.2%

Not eating vegetables one or more times during the past 7 days
High school students – from 6.1% in 2015 to 4.1% (YRBS)
Middle school students – from 21.5% in 2015 to 20.0% (YTS)

Target Audience: All Missourians

Strategies:

1. Collaborate with the Missouri Council for Activity and Nutrition and other partners to promote and support healthy eating and physical activity
2. Implement environmental change strategies to promote and support increased levels of physical activity and healthy eating
3. Engage community coalitions to increase opportunities and support for physical activity and healthy eating
4. Encourage policy development efforts to improve school lunch programs and physical activity levels
5. Advocate for physical education and adequate recess time during the school day

Objective 4: By December 31, 2020, increase the percentage of individuals ages 11 – 17 who receive the human papillomavirus (HPV) vaccine according to CDC guidelines

Measure: Females who received ≥ 1 HPV vaccine – from 47.5% in 2014 to 59.6% (NIS-Teen)

Females who received ≥ 2 HPV vaccine – from 36.3% in 2014 to 51.2% (NIS-Teen)

Females ages 15-17 who received ≥ 3 HPV vaccine – from 28.3% in 2014 to 43.3% (NIS-Teen)

Males who received ≥ 1 HPV vaccine – from 27.9% in 2014 to 39.5% (NIS-Teen)

Males who received ≥ 2 HPV vaccine – from 20.1% in 2014 to 31.0% (NIS-Teen)

Males ages 15-17 who received ≥ 3 HPV vaccine – from 11.3% in 2014 to 22.8% (NIS-Teen)

Target Audience: Health care providers, parents and adolescents

Strategies:

1. Educate providers on the latest HPV research and findings and encourage them to discuss with their patients
2. Promote HPV vaccination as cancer prevention among parents of adolescents, in collaboration with the Missouri Immunization Program and Adolescent Health Program
3. Promote HPV vaccination as cancer prevention among adolescents, in collaboration with the Missouri Immunization Program and Adolescent Health Program

Objective 5: By December 31, 2020, decrease the proportion of adolescents who report a sunburn or use of indoor tanning in the previous year

Measure: Proportion of Missouri adolescents who have had a sunburn in the past 12 months ____% in 2017 to ____% (YRBS) (baseline to be determined)

Proportion of adolescents reporting indoor tanning (sunlamp, sunbed or tanning booth, but not including a spray-on tan) in the past 12 months ____% in 2017 to ____% (YRBS) (baseline to be determined)

Target Audience: Policymakers, parents and adolescents

Strategies:

1. Support the implementation of evidence-based community level ultraviolet (UV) radiation protection programs, policies and messages through partnership with regional health coalitions, schools, local communities and health professionals
2. Address the risks of indoor tanning with improved warning labels and updated performance standards

Early Detection/Screening

Screening means checking your body for cancer before you have symptoms. Regular screening tests may find breast, cervical, colorectal (colon) and other cancers early, when treatment is likely to work best.

Lung Cancer

Lung cancer is the leading cause of cancer mortality in the U.S. with a relative five-year survival rate of just 17 percent.[31] Launched in 2002, the National Lung Screening Trial compared two methods of detecting lung cancer: low-dose helical (spiral) computed tomography (CT) and standard chest X-rays.[32] Both techniques have been used as a means to find lung cancer early, but the effects of these techniques on lung cancer mortality rates had not been determined definitively. This study found that the low-dose CT significantly reduced lung cancer mortality by 20 percent among high-risk individuals. The U.S Preventive Services Task Force now recommends annual screening for lung cancer with the low-dose CT for people 55 to 80 years of age who have a 30 or more pack-per-year history of smoking, are currently smoking, or have quit within the past 15 years.[33] For more information, visit https://www.uspreventiveservicestaskforce.org/BrowseRec/Search?s=lung+cancer.

Breast Cancer

Currently, the best way to find breast cancer is with mammography. Mammograms are the best method to detect breast cancer early when it is easier to treat. A new emerging technology, three-dimensional (3D) mammography, also known as digital breast tomosynthesis, is similar to conventional mammography, but many more pictures of the breast are taken at various angles to produce a 3D image during a regular mammogram. The 3D mammography has been found to detect more invasive cancers and reduce recall rates compared to regular 2D digital or film mammograms, but the full benefits and economical-personal costs remain largely unknown.[34] For more information, visit http://www.cdc.gov/cancer/breast/index.htm.

Cervical Cancer

The Pap test can find abnormal cells in the cervix which may turn into cancer. Pap tests can also find cervical cancer early, when the chance of being cured is very high. For more information, visit www.cdc.gov/cancer/cervical/basic_info/screening.htm.

Colorectal (Colon) Cancer

Colorectal cancer almost always develops from precancerous polyps (abnormal growths) in the colon or rectum. Screening tests can find precancerous polyps that can be removed before they turn into cancer. Screening tests can also find colorectal cancer early, when treatment works best. Colonoscopy is the gold standard screening for colon cancer; however, there are other effective tests that are less invasive and require less preparation than a colonoscopy.[35] Other options include the fecal immunochemical tests, or FIT, approved by the Food and Drug Administration; fecal occult blood tests (FOBT); flexible sigmoidoscopy (only examines the lower one-third of the colon); computed tomography (CT) colonography or virtual colonoscopy; double contrast barium enema; and the newest DNA stool test called Cologuard.[35] For more information, visit www.cdc.gov/cancer/colorectal/basic_info/screening/tests.htm.

Prostate Cancer

Men are at greater risk for developing prostate cancer if they are African-American, Caribbean, and/or have a father, brother or son who has had prostate cancer.[36] Age is also a risk factor, and increases at age 50. The CDC supports informed decision making regarding prostate cancer screening that occurs when a man understands the nature and risk of prostate cancer, understands the risks and benefits of screening and alternatives to screening, participates in the decision to be screened, or not, at a level he desires, and makes a decision consistent with his preferences and values.[37] For more information, see https://www.cdc.gov/cancer/prostate/index.htm.

Goal 2: Increase the early detection of cancer by promoting the use of evidence-based screening guidelines

Objective 1: By December 31, 2020, increase the percentage of women who receive regular breast cancer screening based on nationally recognized guidelines

Measure: The percentage of women 40 and older who had a mammogram within the past two years – from 72.9% in 2012 to 79.3% (BRFSS)

The percentage of women with a household income less than $15,000 who had a mammogram within the past two years – from 58% in 2012 to 70.0% (BRFSS)

The percentage of women with a household income between $15,000 – $24,999 who had a mammogram within the past two years – from 62.8% in 2012 to 75% (BRFSS)

Target Audience: Women ages 40 and over and populations at increased risk

Objective 2: By December 31, 2020, increase the percentage of women who receive cervical cancer screenings based on nationally recognized guidelines

Measure: Women 21 – 65 years who received a Pap test within the last three years – from 80.9% in 2014 to 93% (Healthy People 2020 and U.S. Preventive Services Task Force recommendation)

Target Audience: Women ages 21 and over

Strategies (Objective 1 and 2):

1. Promote evidence-based interventions and recommended screening/early detection exams, according to nationally recognized guidelines
2. Link community resources like Show Me Healthy Women or other breast and cervical screening services to the disparate population
3. Promote evidence-based small media campaigns about the need for breast and cervical cancer screening exams, according to nationally recognized guidelines
4. Provide health care providers with the information and tools to raise awareness of the current cancer screening guidelines
5. Identify unscreened, insured population segments and develop evidence-based targeted interventions to increase screening rates

Objective 3: By December 31, 2020, increase the percentage of colorectal cancer screenings for adults 50 and over

Measure: Missourians 50 and older who have had a colonoscopy in the last 10 years – from 60.5% in 2012 to 80% (BRFSS)

Missourians 50 and older who have had a home blood stool test within the past two years – from 12% in 2012 to 18% (BRFSS)

Target Audience: Missourians age 50 and older and populations at increased risk

Strategies:

1. Promote evidence-based interventions and recommended screening/early detection exams, according to nationally recognized guidelines
2. Promote evidence-based small media campaigns about colorectal cancer risk and the benefits of screening and early detection
3. Promote health care providers' awareness of current cancer screening guidelines and the variety of evidence-based screening options available
4. Link community resources to address barriers within the disparate population
5. Identify unscreened, insured population segments and develop evidence-based targeted interventions to increase screening rates

Objective 4: By December 31, 2020, increase the percent of men who have discussed with their health care provider the advantages and disadvantages of the Prostate-Specific Antigen (PSA) test to screen for prostate cancer (BRFSS)

Measure: Ever been told by a health care provider about the advantages of the PSA test – from 61.1% in 2012 to 70% (BRFSS)

Ever been told by a health care provider about the disadvantages of the PSA test – from 21.9% to 30% (BRFSS)

Target Audience: Men ages 40 and older and populations at increased risk

Strategies:

1. Promote patient informed decision-making regarding prostate cancer screening
2. Identify and provide education materials to encourage health care providers to recommend and deliver prostate cancer screenings based on the latest screening recommendations

Objective 5: By December 31, 2020, increase low-dose computed tomography (LDCT) lung cancer screenings in the targeted at risk population

Measure: Annual screening for lung cancer with LDCT in adults aged 55 to 80 years who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years – from ____% in 2017 to _____% (BRFSS) (baseline to be determined)

Target Audience: Health care providers, smokers and former smokers

Strategies:

1. Promote lung cancer screening awareness and guidelines to primary care practices and health systems, such as hospitals and community health centers
2. Implement a campaign to encourage smokers and former smokers to contact their health care provider about lung cancer screening

Diagnosis/Treatment

There are many types of treatment once cancer is diagnosed. The types of treatment that one receives depend on the type of cancer and how advanced it is when detected.[38] Some individuals with cancer will have only one treatment, but most people have a combination of treatments. The main types of cancer treatment include: surgery, radiation therapy, chemotherapy, immunotherapy, targeted therapy, hormone therapy, stem cell transplant, hyperthermia, photodynamic therapy, blood product donation, and transfusion and laser therapy.[38, 39] The National Cancer Institute provides evidence-based physician data query information for many complementary and alternative medicine therapies for patients and health professionals.[40]

Cancer treatment is improving – saving lives and extending survival for different types of cancer, including breast and colon, and for people with leukemias, lymphomas and pediatric cancers. The ultimate measure of success against cancer is quality of life years gained. Access to quality cancer care and clinical trials is important to ensure that everyone is provided with state-of-the-art treatment.

Clinical trials are the major avenue for discovering, developing and evaluating new therapies.[39, 41] However, only about 5.5 percent of all adult cancer patients in Missouri had participated in a clinical trial, according to the 2014 Behavioral Risk Factor Surveillance System data.[15] It is important to increase physician and patient awareness and participation in clinical trials to test new treatments more rapidly, find more effective treatments and broaden the options available to patients. Studies also show that older individuals and members of racial-ethnic minority groups are less likely to receive treatments or participate in clinical trials; thus, minority participation is crucial to address disparities in health outcomes.

Goal 3: Increase access to evidence-based treatment of cancer

Objective 1: By December 31, 2020, increase access to evidence-based treatment services by reducing the number of Missourians who are under/uninsured

Measure: Reduce the percentage of Missourians, age 18-64, who are uninsured – from 18.8% in 2013 to 10% (BRFSS)

Decrease the percentage of Missourians who needed to see a doctor in the past 12 months, but could not due to cost – from 16.1% in 2013 to 14.9% (BRFSS)

Decrease the percentage of survivors who report that they did not have health insurance that paid for all or part of their cancer treatment – from 9.0% in 2010 to 8% (BRFSS)

Target Audience: Uninsured, underinsured and policymakers

Strategies:

1. Support legislation to expand access to health insurance
2. Increase awareness of available health insurance plans

Objective 2: By December 31, 2020, increase the percentage of Missourians with a cancer diagnosis participating in clinical trials

Measure: From 5.5% in 2014 to 7% (BRFSS)

Establish a baseline number of cancer treatment centers that offer clinical trials in Missouri

Target Audience: General public, health care providers and policymakers

Strategies:

1. Develop a method to assess hospitals' patient participation in clinical trials
2. Support legislation that will improve cancer insurance coverage of routine care costs for patients who participate in cancer clinical trials
3. Ensure public awareness about purposes, benefits and enrollment to clinical trials, especially among minority and underserved populations
4. Encourage health care providers to suggest clinical trials as an option for treatment for patients newly diagnosed with cancer
5. Partner with cancer treatment centers to increase access to clinical trials

Objective 3: By December 31, 2020, increase the percent of cancer patients receiving evidence-based treatment according to National Comprehensive Cancer Network guidelines

Measure: Increase the percent of cancer patients receiving treatment within 30 days from the date of diagnosis:

Colon – from 84.9% in 2014 to 86.4%

Lung and bronchus – from 48.4% in 2014 to 49.4%

Melanoma of the skin (all races combined) – from 89.2% in 2014 to 91.3%

Female breast (in situ & invasive combined) – from 62.8% in 2014 to 65.3%

Cervix uteri – from 54.6% in 2014 to 58.7%

Target Audience: Health care providers

Strategies:

1. Increase the number of cancer treatment centers that utilize patient navigators
2. Increase the number of patient navigators who are certified in collaboration with the Academy of Oncology Nurse & Patient Navigators
3. Identify and promote the use of culturally and linguistically appropriate materials for cancer treatment and education
4. Promote evidence-based strategies to reach minority and medically underserved communities to achieve health equity
5. Promote timely utilization and access to evidence-based treatment options, as deemed by national standards, with a focus on health equity and literacy
6. Promote nationally recognized evidence-based treatment services among health care providers
7. Promote informed decision-making and utilization of appropriate cancer treatment
8. Support federal and state policies/legislation to enhance access to cancer treatment

Survivorship Through the End of Life

Due to advances in the early detection and treatment of cancer, people are living many years after a diagnosis. However, disparities in health care impact survival. Low-income men and women who have inadequate or no health insurance coverage are more likely to be diagnosed with cancer at a later stage, often reducing survival time.

For the approximately 336,230 adult cancer survivors living in Missouri,[15] access to resources and supports that address physical, emotional, social, spiritual and financial challenges due to a cancer diagnosis and treatment is critical to long-term recovery and quality of life.[15] Public health professionals strive to address survivorship and quality of life issues, such as the coordination of care, patient-provider communication, palliative care, pain management and fertility preservation. In light of these concerns, public health initiatives aimed at understanding and preventing secondary disease, recurrence and the long-term effects of treatment are essential.

Cancer changes a person's health care needs forever, and the National Coalition for Cancer Survivorship believes every person with cancer should receive written care plans and summaries that follow them from the time they are diagnosed through all the years of survivorship.[42] Although the Survivorship Care Plan (SCP) is a useful tool for patients and primary care physicians, more work is needed regarding care coordination and provider roles. In addition, future challenges involve the need for adequate reimbursement for creation and delivery of SCPs, as well as outcome studies to determine if SCPs improve patient outcomes.[43]

Goal 4: Assure the highest quality of life possible for cancer survivors and their families, including end-of-life transitions

Objective 1: By December 31, 2020, improve quality of life for cancer survivors, including physical and mental health, and end-of-life transitions

Measure: Decrease the number of cancer survivors who report having physical pain caused by cancer or cancer treatment – from 6.3% in 2014 to 4.5% (BRFSS)

Decrease the percentage of adults aged 18 years and older diagnosed with cancer who reported being kept from usual activities due to poor physical or mental health on 14 or more of the past 30 days – from 28.8% in 2014 to 23.5% (BRFSS)

Increase the average number of hospice days per cancer patient in Missouri during the last month of life – from 10 in 2012 to 14 (Dartmouth Atlas of Health Care)

Increase the percentage of survivors reporting receipt of a written treatment summary – from 35.0% in 2014 to 40.5% (BRFSS)

Target Audience: General public, cancer survivors, health care providers and policymakers

Strategies:

1. Identify educational resources about cancer survivorship for survivors, the general public, health care professionals and policymakers
2. Disseminate educational materials and programs on survivorship to promote knowledge and understanding of survivorship issues
3. Promote local and statewide survivorship events
4. Identify and evaluate gaps in existing survivorship programs and policies
5. Identify and promote comprehensive pain management programs for cancer survivors
6. Make available advance care planning and goals of care tools and resources for those with advanced illness, incorporating steps to target identified disparate populations (age, income, disability, rural-urban location, and race or ethnic status)
7. Support and promote policies and programs to reduce the financial burden on cancer survivors and their families

Objective 2: By December 31, 2020, increase health care providers' education regarding survivorship issues, including end of life, to improve comprehensive cancer care and management

Measure: Increase the percent of cancer survivors receiving information or a written SCP – from 69.1% in 2014 to 72.2% (BRFSS)

Provide one or more professional educational opportunities by 2020 to increase knowledge of comprehensive cancer care and management regarding survivorship issues

Target Audience: Health care providers and individuals with cancer

Strategies:

1. Support development and use of SCPs
2. Identify oncological champions to provide survivorship education and promote comprehensive cancer survivorship care and management including preventive and screening services
3. Identify and reduce barriers to ensure equal access to quality care and services
4. Increase information and awareness to survivors, health care providers and policymakers about quality-of-life issues and service needs of people of various ages and ethnic, racial and economic backgrounds during each stage of survivorship

Objective 3: By December 31, 2020, increase awareness regarding policies addressing cancer survivorship

Measure: State policies reviewed and gap analysis completed

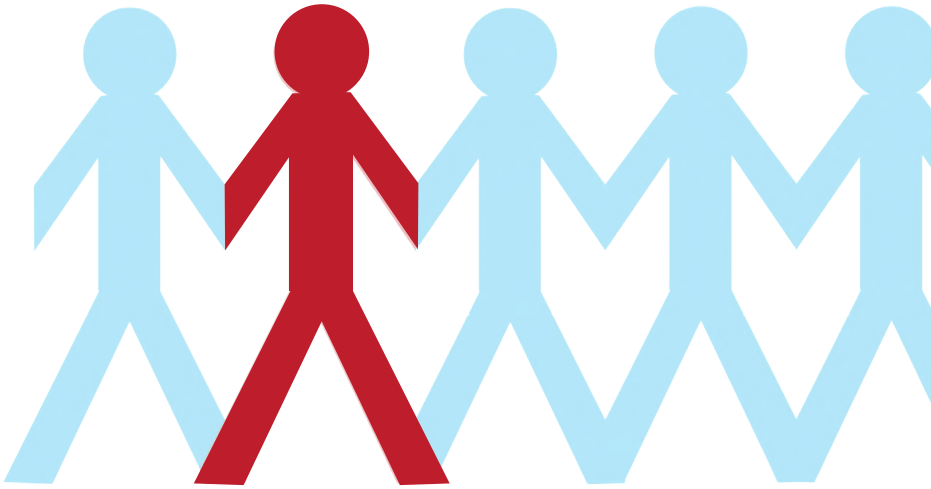
Creation of council on palliative care and quality of life

Target Audience: Policymakers

Strategies:

1. Identify policies addressing cancer survivorship issues
2. Promote policies that address the gaps and the barriers in areas of survivorship by creating a statewide survivorship advisory council on palliative care and quality of life
3. Disseminate information regarding gaps in cancer survivorship policies
4. Develop a plan to address gaps in cancer survivorship policies

Cancer Data and Analysis

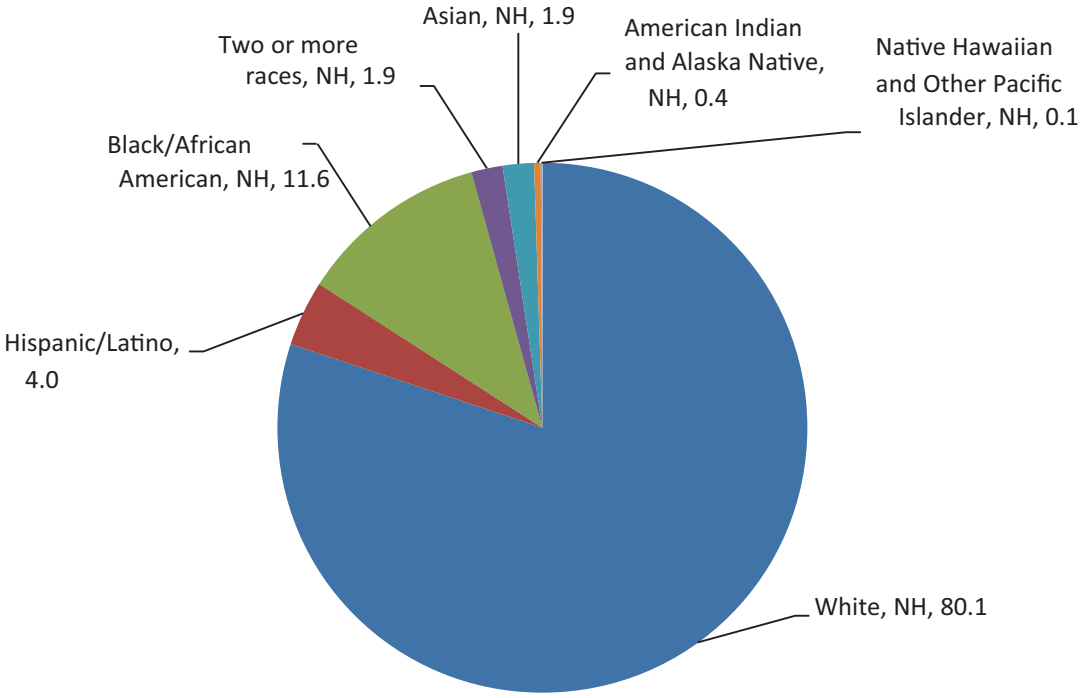


Cancer by the Numbers in Missouri

Missouri population by race and ethnicity, 2014

According to the 2014 estimates from the U.S. Census Bureau, there are approximately 6 million people in Missouri: 80.1 percent white, non-Hispanic (NH); 11.6 percent Black/African American, NH; 1.9 percent Asian, NH; 0.4 percent American Indian and Alaska Native, NH; 0.1 percent Native Hawaiian or Other Pacific Islander, NH; 4.0 percent Hispanic/Latino; and 1.9 percent of two or more races, NH (Figure 2). The Hispanic or Latino population in Missouri is 4.0 percent, up from 3.2 percent in 2008. Although minorities only comprise 19.9 percent of Missouri's total population, many are disproportionately impacted by cancer.

Figure 2. Population estimates, percentage by race in Missouri, 2014

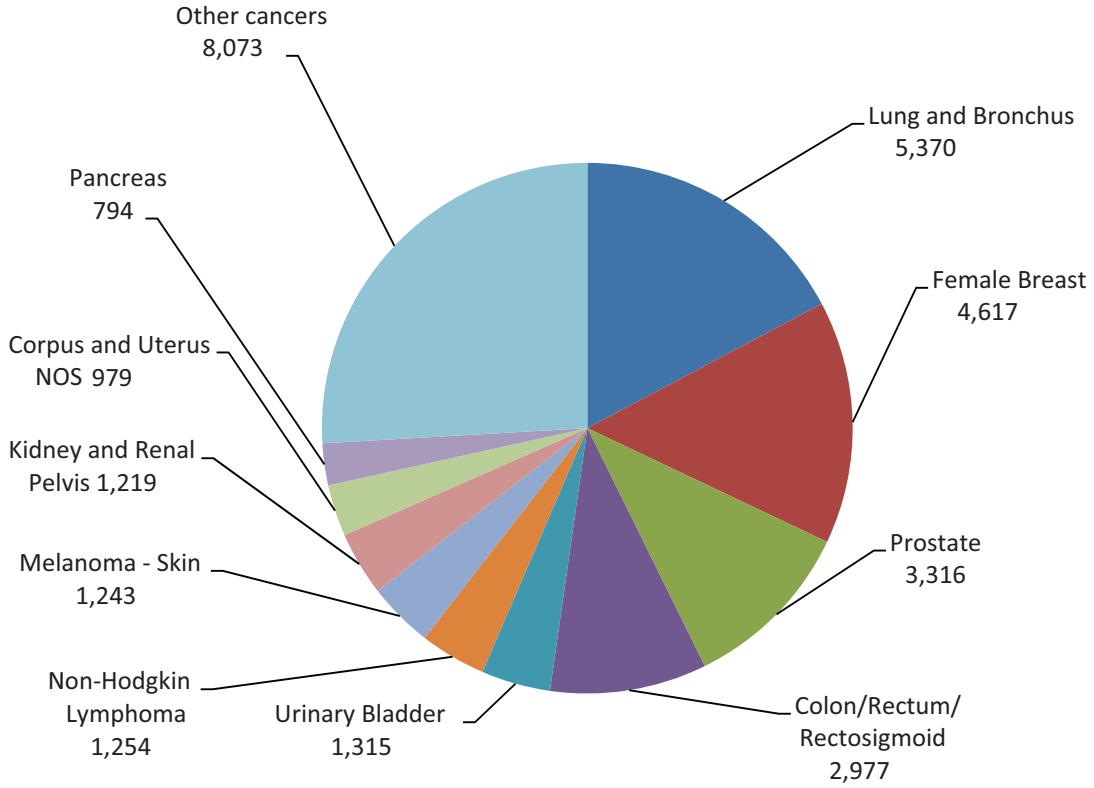


Source: U.S. Department of Commerce. United States Census Bureau. American Fact Finder. Annual Estimates of the Resident Population by Sex, Age, Race, and Hispanic Origin for the United States and States: April 1, 2010 to July 1, 2014 – 2014 Population Estimates. Retrieved June 8, 2016, from http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2013_PEPASR6H&prodType=table.

Leading types of new invasive cancers in Missouri

According to the Missouri Cancer Registry (MCR), 31,157 Missouri residents were diagnosed with invasive cancer in 2012.[10] This amounted to more than three new cases of cancer diagnosed every hour of every day in Missouri. The five leading invasive cancers in 2012 were lung and bronchus; female breast; prostate; colon, rectum and rectosigmoid; and urinary bladder (Figure 3). The five leading invasive cancers remained the same as in 2007 except that female breast and prostate cancers have switched positions.

Figure 3. Ten leading types of new invasive cancers, Missouri, 2012



Source: Missouri Department of Health and Senior Services, Cancer Registry MICA. Retrieved January 5, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php

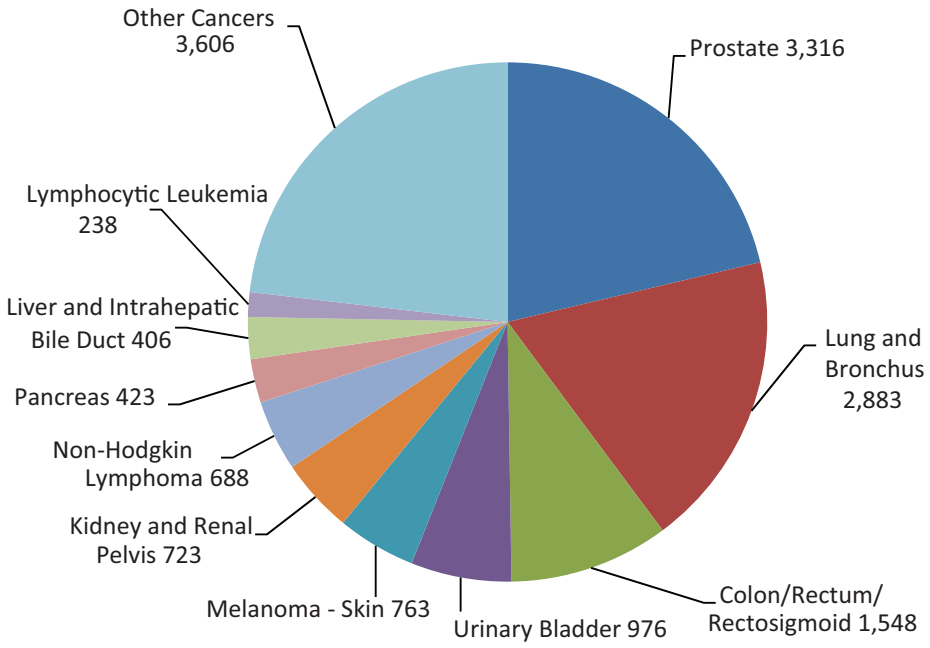
*Leading types of new invasive cancers in males**

Among males, the five leading cancers were prostate; lung and bronchus; colon, rectum and rectosigmoid; urinary bladder; and melanoma of the skin (Figure 4). These five sites accounted for 60.9 percent of all new cancer cases, down from 66.2 percent for the five leading cancers in 2007.

*Excludes basal and squamous cell skin cancers and in situ cancer except for urinary bladder.

Source: Missouri Department of Health and Senior Services. Cancer Registry MICA. Retrieved January 6, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php

Figure 4. Ten leading types of new invasive cancers in males, Missouri, 2012



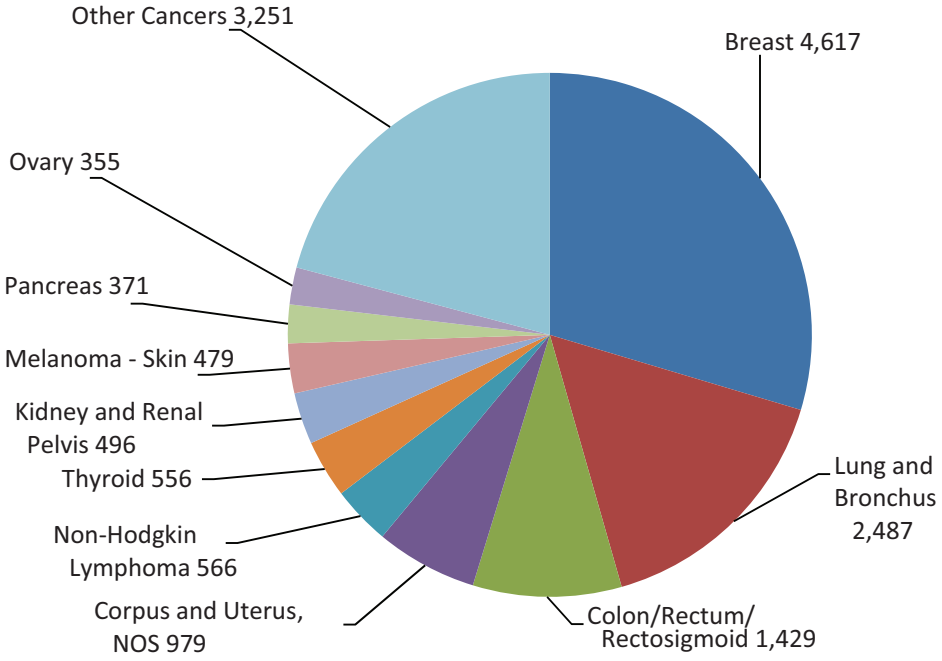
*Leading types of new invasive cancers in females**

Among females, the five leading cancers were breast; lung and bronchus; colon, rectum and rectosigmoid; corpus and uterus not otherwise specified (NOS); and non-Hodgkin lymphoma (Figure 5). These five sites accounted for 64.7 percent of all new cancer cases among women.

*Excludes basal and squamous cell skin cancers and in situ cancer except for urinary bladder.

Source: Missouri Department of Health and Senior Services. Cancer Registry MICA. Retrieved January 6, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php.

Figure 5. Ten leading types of new invasive cancers in females, Missouri, 2012



Ten-year trend in age-adjusted incidence rates of selected cancer sites

Figures 6 and 7 display the ten-year trends in incidence rates for the five leading cancer sites for men and women. Significant changes were observed during the ten-year period among men and women. Colorectal cancer has significantly decreased among men and women. Most notable is the significant decrease in prostate cancer among men since 2003, despite the slight increases during 2005 to 2007.

In addition, there have been significant declines in lung and bronchus and urinary bladder cancers among men since 2003. There was also a significant increase in corpus and uterus, NOS cancers among women (Figure 7).

Figure 6. Ten-year trend in age-adjusted incidence rates for the five leading invasive cancers in males, by cancer site, Missouri, 2003-2012*

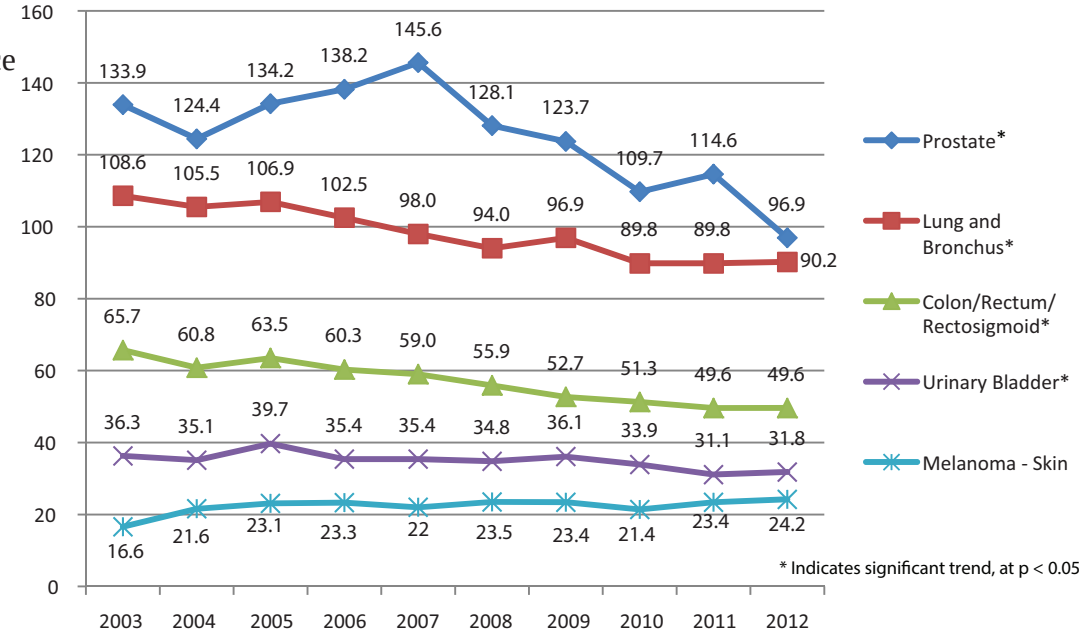
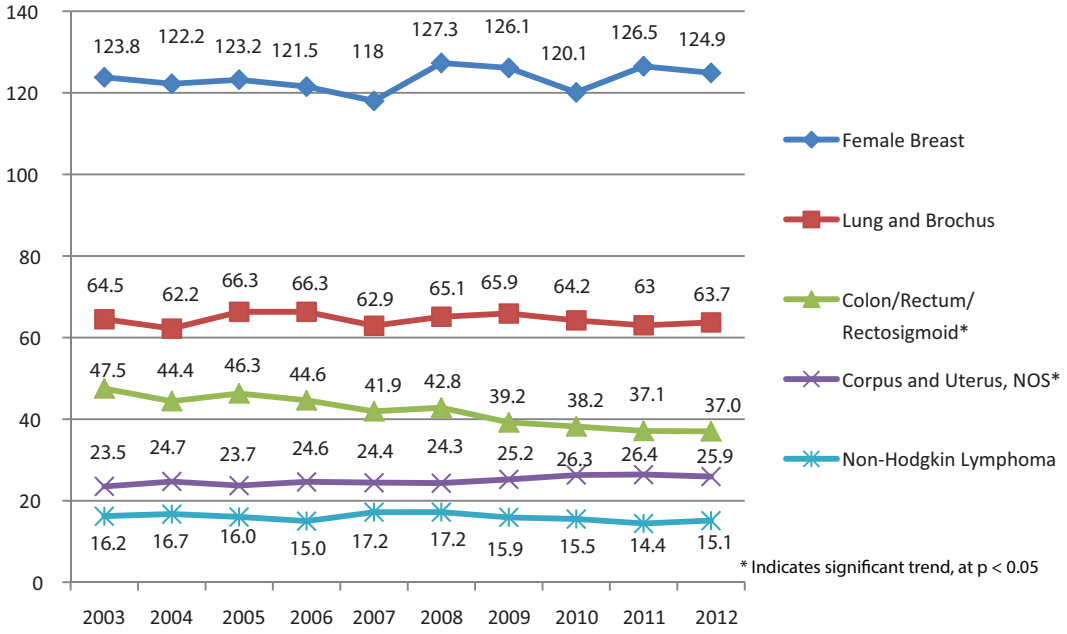


Figure 7. Ten-year trend in age-adjusted incidence rates for the five leading invasive cancers in females, by cancer site, Missouri, 2003-2012*

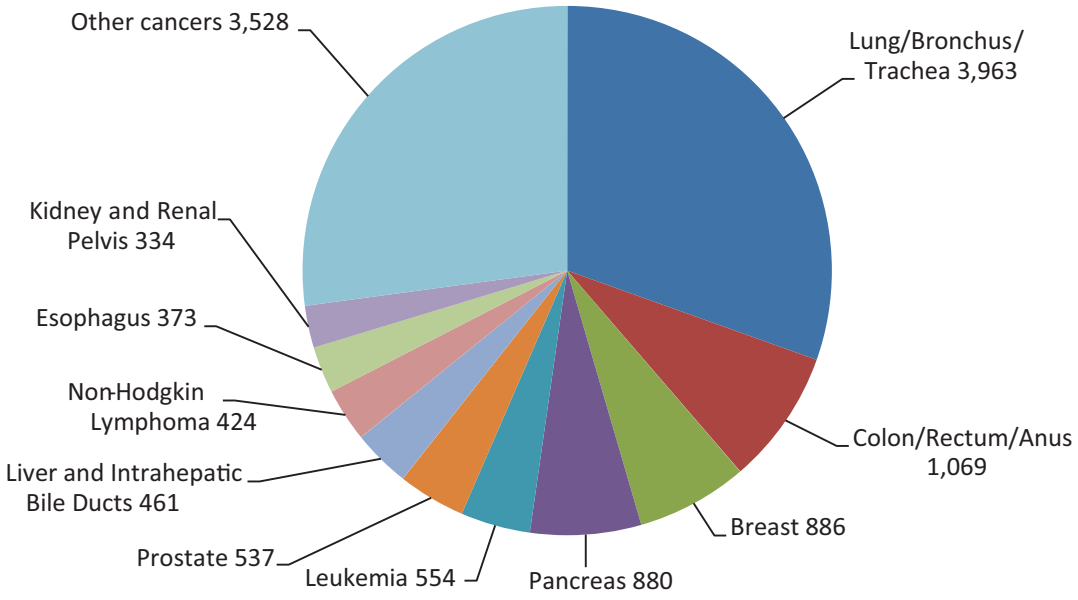


**Source: Missouri Department of Health and Senior Services, Cancer Registry MICA. Retrieved March 11, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php.*

Leading causes of cancer deaths in Missouri

In 2014, more Missouri residents died from cancer (13,009) than in 2008 (12,497), accounting for 22.4 percent of all deaths in Missouri.[1] Cancer is second only to heart disease, as a leading cause of death in Missouri.[1] In 2014, the five leading causes of cancer deaths in Missouri were: lung, bronchus, and trachea; colon, rectum, and anus; breast; pancreas; and leukemia (Figure 8). Four of the five leading causes of cancer deaths have not changed since 2008; however, leukemia surpassed prostate cancer as the fifth leading cause of cancer death in 2014. In Missouri, the second leading new invasive cancer for both females and males - lung and bronchus - (Figures 4 and 5) turned out to be the leading cause of cancer deaths for both (Figures 9 and 10). The third leading new invasive cancer for both males and females - colon, rectum and rectosigmoid - remained the second leading cause of cancer deaths for males (Figure 9), but is the third leading cause of cancer death among females (Figure 10).

Figure 8. Ten leading causes of cancer deaths, Missouri, 2014

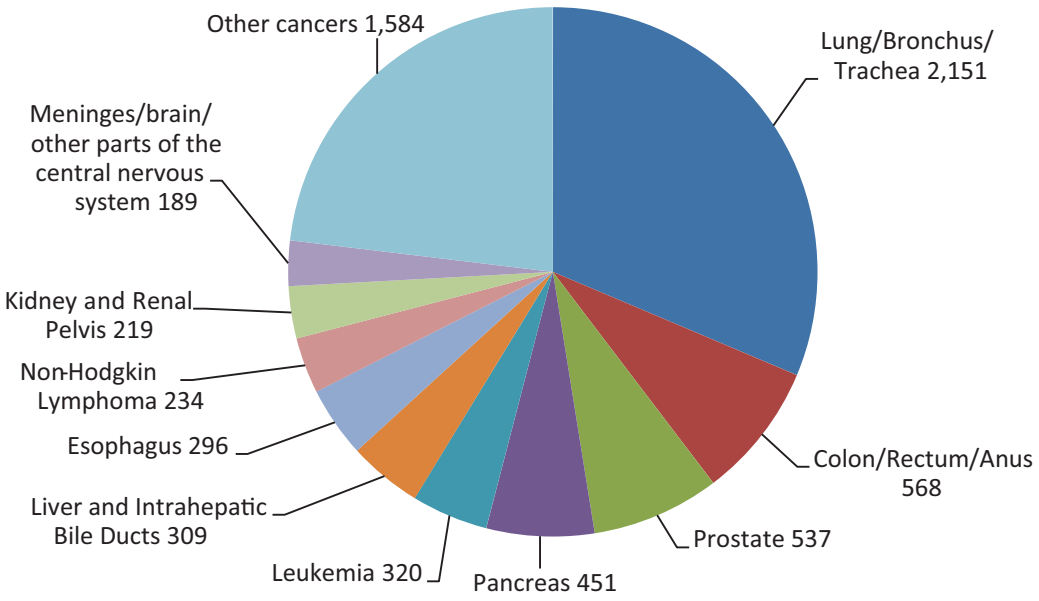


Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved June 9, 2016, from http://health.mo.gov/data/mica/DeathMICA/

Leading cause of cancer deaths in males

Among males, the five leading causes of cancer deaths were: lung, bronchus and trachea; colon, rectum and anus; prostate; pancreas; and leukemia (Figure 9). These were the same as in 2008. Liver and intrahepatic bile ducts cancer, which was the seventh leading cause of cancer death in 2008, surpassed non-Hodgkin lymphoma to become the sixth leading cause of cancer death among males in 2014. The five cancers represented 58.7 percent of the cancer deaths among men, which is 3.9 percentage points lower than the 62.6 percent in 2008.

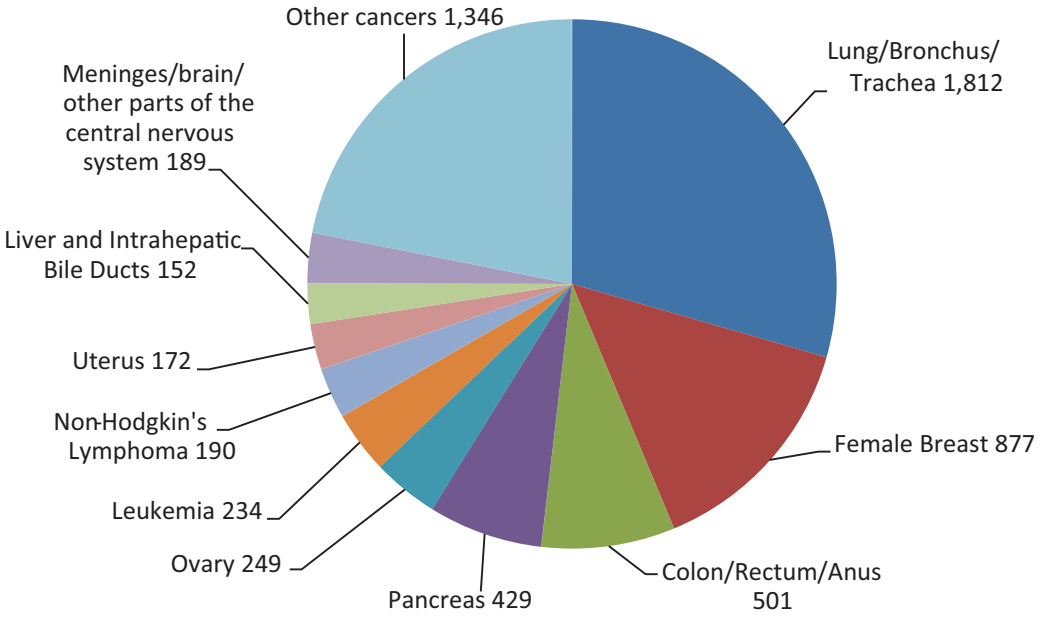
Figure 9. Ten leading types of cancer deaths in males, Missouri, 2014*



Leading cause of cancer deaths in females

Among females, the five leading causes of cancer deaths were: lung, bronchus and trachea; female breast; colon, rectum and anus; pancreas; and ovary (Figure 10). These were the same as in 2008 and these five leading cancers represented 62.9 percent of all cancer deaths among women in 2014, which was 0.3 percentage points lower than the 63.2 percent in 2008.

Figure 10. Ten leading types of cancer deaths in females, Missouri, 2014*



*Excludes basal and squamous cell skin cancer and in situ cancer except urinary bladder.
Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved June 6, 2016, from http://www.health.mo.gov/data/mica/DeathMICA

Eleven-year trend in age-adjusted death rates of selected cancer sites

Figures 11 and 12 display the 11-year trend in death rates for the five leading cancer sites for men and women. There have been significant declines in deaths from prostate cancer in males; ovarian cancer and breast cancer in women; and lung, bronchus, and trachea, and colon, rectum and anus cancers in both males and females. The age-adjusted mortality rate from colon, rectum and anus cancer among females in 2014 (12.4 per 100,000 population) was almost one-half of the 2008 rate (24.0 per 100,000 population). There has been a significant increase in liver and intrahepatic bile ducts cancer deaths in males and slight increases in pancreatic cancer deaths for both men and women, but these increases were not significant.

Figure 11. Eleven-year trend in age-adjusted death rates of five invasive cancers in males, by cancer site, 2004-2014*

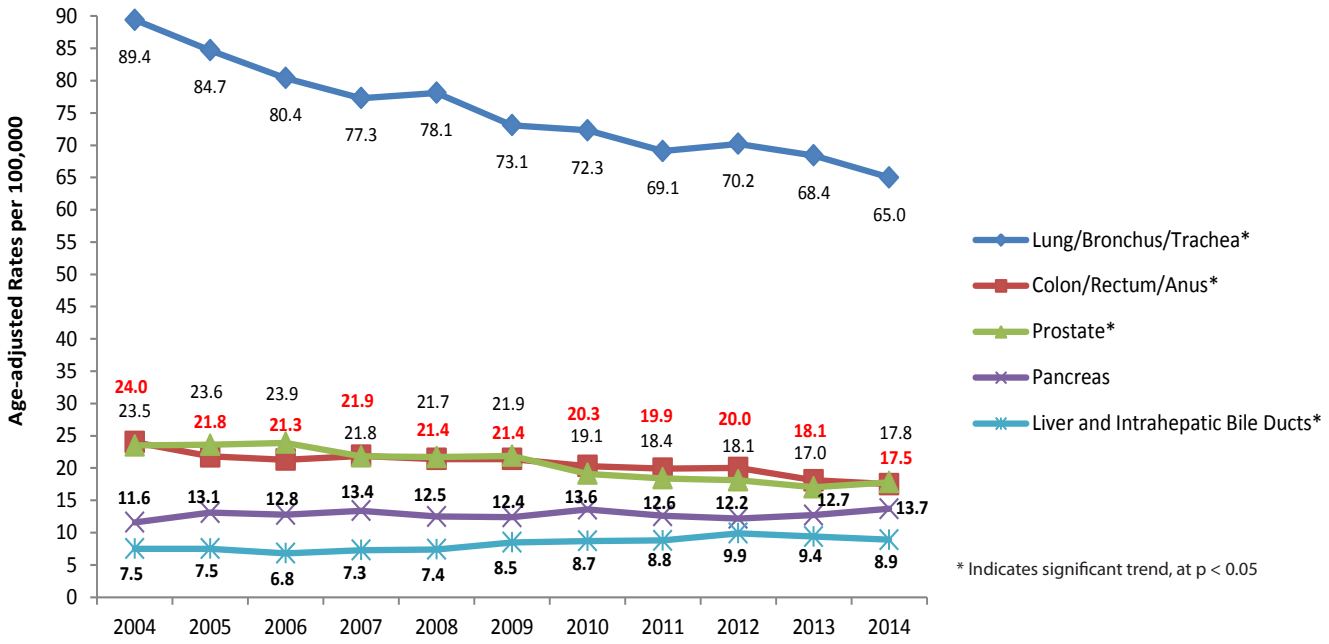
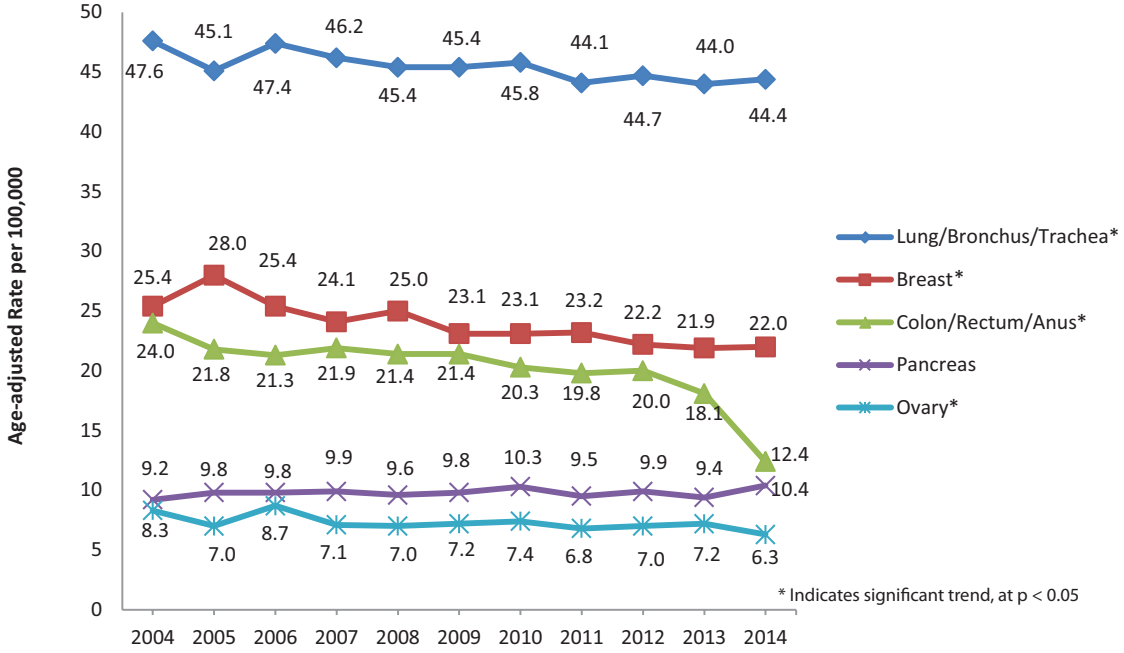


Figure 12. Eleven-year trend in age-adjusted death rates of five invasive cancers in females, by cancer site, 2004-2014*



**Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved June 9, 2016, from http://www.health.mo.gov/data/mica/DeathMICA*

Estimated number of new invasive cancer cases and mortality for 2015

The most current data on the number of new cancer cases and deaths in Missouri are from 2012 and 2014, respectively, from the Missouri Information for Community Assessment (MICA). In 2015, the American Cancer Society estimated approximately 34,680 Missourians would be diagnosed with cancer and about 12,830 would die of cancer (Table 2).

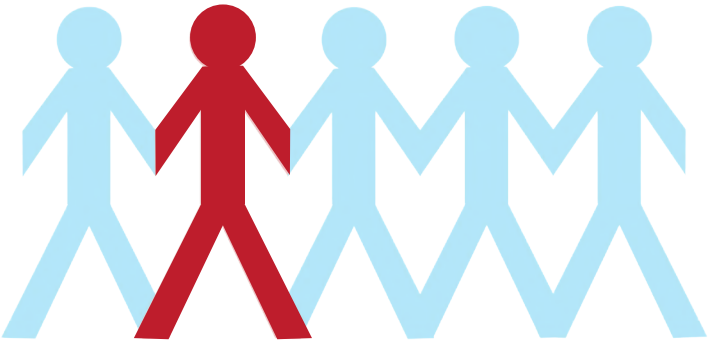
Table 2. Estimated number of new cancer cases and mortality for selected cancer sites, Missouri, 2015

Cancer Site	New Cases*	Percent	Mortality*	Percent
Lung and Bronchus	5,380	15.5	3,910	30.5
Breast (Female)	4,610	13.3	900	7.0
Prostate	3,900	11.2	500	3.9
Colon and Rectum	2,840	8.2	1,050	8.2
Urinary Bladder	1,500	4.3	†	NA
Melanoma of the skin	1,510	4.4	†	NA
Non-Hodgkin Lymphoma	1,450	4.2	400	3.1
Uterine Corpus	1,120	3.2	†	NA
Leukemia	1,100	3.2	530	4.1
Uterine Cervix	260	0.7	†	NA
All sites	34,680	100.0	12,830	100.0

*Rounded to the nearest 10 †Estimate not provided NA - Not applicable

Note: These estimates are offered as a rough guide and should be interpreted with caution. Percentages may not sum to 100 percent due to rounding.

Source: Cancer Facts and Figures. Retrieved January 21, 2016, from http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc-044552.pdf.



Cancer Disparities in Missouri

Research has shown that after adjusting for individual risk factors, there are neighborhood differences in cancer screening, incidence, treatment and survival.[44] It is the relationship between place, race and poverty that can lead to the greatest disparities. Significant disparities exist for those who are uninsured or underinsured, live in rural areas far from medical services and cancer treatment centers, or lack affordable transportation options. These and other disparities can lead to delays in diagnosis that result in discovering cancers at more advanced stages, delays in treatment or no treatment, and ultimately, higher death rates in disparate populations.

Reducing such disparities requires action at several levels to maximize impact. Individuals need to be equipped with the knowledge, skills and motivation to make changes. Community institutions such as health care facilities, work places, schools and faith-based organizations are ideal venues for reaching individuals. They also offer systems of social support that increase the likelihood of maintaining healthier behaviors.

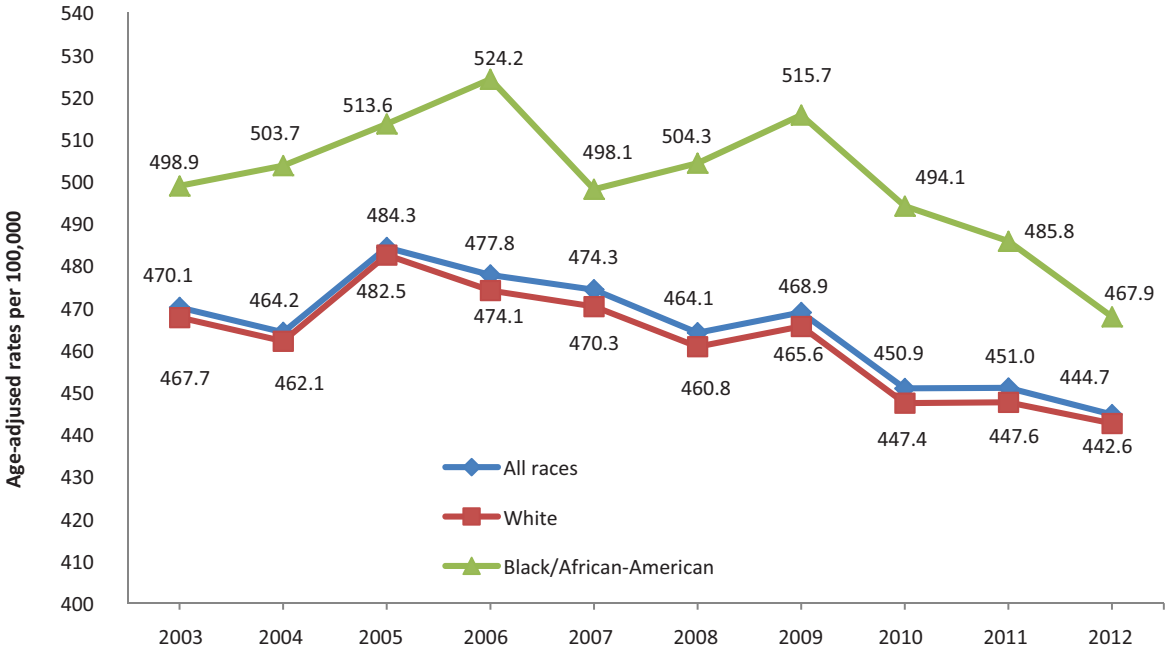
Focusing only on individual responsibility for lifestyle changes ignores larger environmental and policy factors that can work against the educational message.

In addition to shaping behavior, the environment also has a direct influence on cancer development. The physical environment tends to be worse in areas in which the population is low-income. There may be toxic sites and other hazards concentrated in areas where low-income and minority populations reside.

Elimination of financial and access barriers to screening improves screening rates. For example, through the use of health insurance coverage, reduced cost sharing and the availability of free screening at public clinics, screening rates increase.[45]

Consistent with the national pattern, African Americans in Missouri are more likely to develop cancer and more likely to die from cancer than whites. From 2003 to 2012, the age-adjusted invasive cancer incidence rate for all sites combined was significantly higher among African Americans than among whites (Figure 13), although the racial disparities have been decreasing over time.[12] Among seven selected cancer sites in 2012, African Americans have significantly higher incidence rates for prostate and colon, rectum and rectosigmoid cancers than whites; whereas whites have a significantly higher rate for urinary bladder cancer than African Americans (Table 3). The significant difference in rates of stated cancers between African Americans and whites is essentially unchanged since 2007.

Figure 13. Age-adjusted invasive cancer incidence rates* in Missouri, by race, 2003-2012



*Rates per 100,000 age-adjusted using 2000 U.S. standard population.

Source: Missouri Department of Health and Senior Services. Cancer Registry MICA. Retrieved January 21, 2016, from http://www.health.mo.gov/data/mica/mica/cancer_19sites2015.php

Table 3. Age-adjusted invasive cancer incidence rates* and confidence intervals for selected cancer sites by race, Missouri, 2012

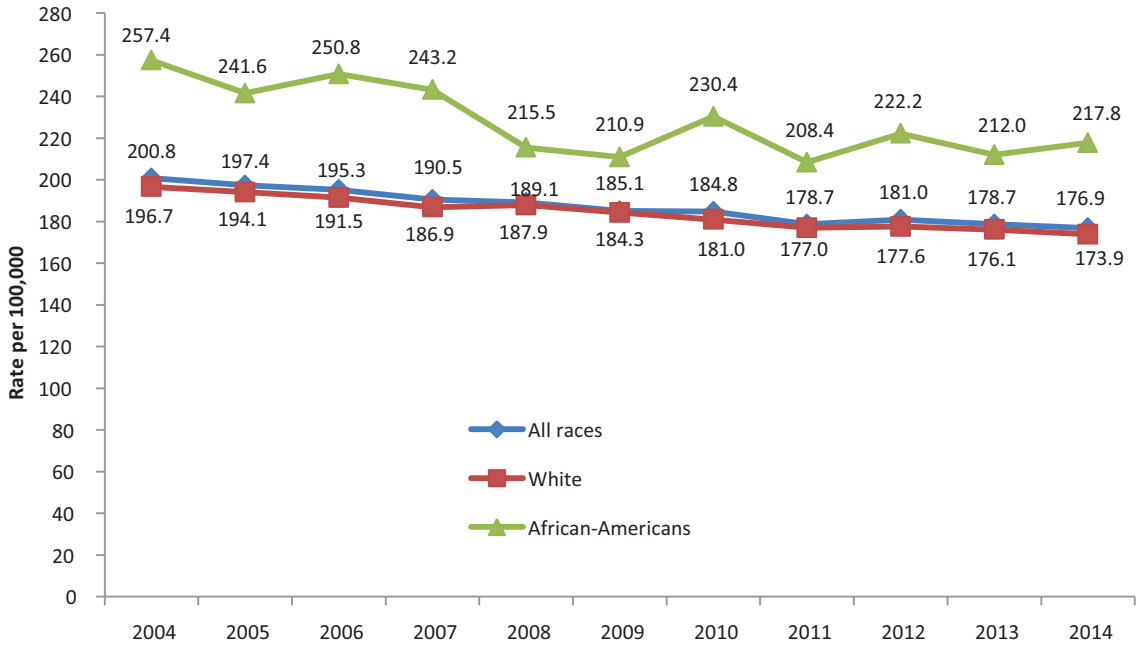
	African American		White	
Cancer site	**Rate***	**95% CI**	**Rate***	**95% CI**
Lung and Bronchus	83.5	76.2 - 91.3	74.4	72.3 - 76.6
Female Breast	124.7	113.4 - 136.8	124.9	121.0 - 128.9
Prostate**	57.7	52.0 - 63.9	42.9	41.3 - 44.5
Colon/Rectum/Rectosigmoid**	53.0	47.2 - 59.3	41.7	40.0 - 43.3
Urinary Bladder**	9.9	7.4 - 12.9	19.3	18.3 - 20.5
Corpus/Uterus/NOS	24.5	19.6 - 30.3	26.2	24.5 - 28.0
Cervix	13.5	9.9 - 18.1	8.9	7.8 - 10.2
All cancers**	467.6	450.5 - 485.3	442.7	437.4 - 448.1

*Rates are per 100,000 population. **Rates are statistically significantly different. Age-adjustment using the 2000 U.S. standard population. Confidence Interval (CI) for rates by the Inverse Gamma Method.

Source: Missouri Department of Health and Senior Services, Cancer Registry MICA. Retrieved February 5, 2016, from http://health.mo.gov/data/mica/mica/cancer_7sites2015.php

Figure 14 shows, from 2004 to 2014, the age-adjusted cancer death rates among African Americans remained significantly higher than among whites, although racial disparities declined during this time period.

Figure 14. Age-adjusted cancer death rates in Missouri, by race,* 2004-2014



*Rates per 100,000, age-adjusted using 2000 U.S. standard population.

Source: Missouri Department of Health and Senior Services. Death MICA. Retrieved August 5, 2016, from http://health.mo.gov/data/mica/DeathMICA/

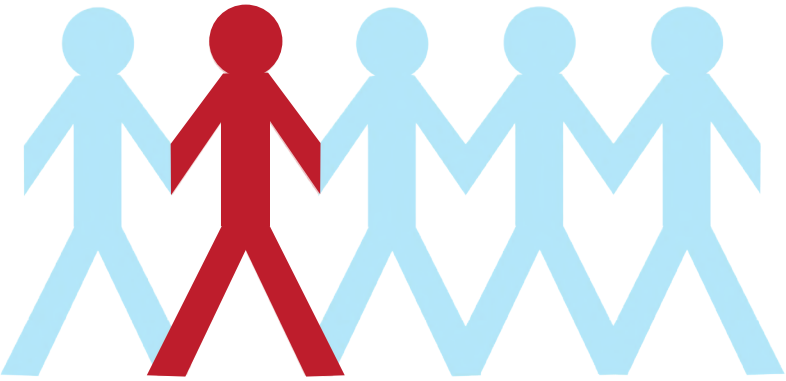
For individual cancers, the age-adjusted cancer death rates in 2014 were significantly higher among African Americans than among whites for female breast, pancreas, prostate, liver and intrahepatic bile ducts, trachea/bronchus/lung, and colon/rectum/anus (Table 4). There were no significant differences in cancer deaths between African Americans and whites for leukemia, non-Hodgkin lymphoma, kidney and renal pelvis, and esophageal cancers.

Table 4. Age-adjusted cancer death rates and confidence intervals for 10 leading causes of cancer deaths by race, Missouri, 2014

	African American		White	
Cancer site	**Rate***	**95% CI**	**Rate***	**95% CI**
Trachea/Bronchus/Lung**	62.2	56.0 - 68.8	53.0	51.3 - 54.8
Prostate**	33.3	25.6 - 42.7	16.8	15.2 - 18.4
Breast (female)**	32.5	26.9 - 38.9	20.9	19.4 - 22.5
Colon/Rectum/Anus**	21.0	17.5 - 25.1	14.0	13.1 - 15.0
Pancreas**	16.1	13.1 - 19.7	11.5	10.7 - 12.4
Liver and Intrahepatic Bile Ducts**	12.1	9.6 - 15.2	5.4	4.9 - 6.0
Leukemia	6.3	4.4 - 8.8	7.9	7.2 - 8.7
Non-Hodgkin Lymphoma	5.5	3.8 - 7.7	5.9	5.3 - 6.5
Kidney and Renal Pelvis	5.4	3.6 - 7.7	4.5	4.0 - 5.0
Esophagus	4.6	3.0 - 6.7	5.1	4.6 - 5.7

*Rates are per 100,000 population. Age-adjustment using the 2000 U.S. standard population. Confidence Interval (CI) for rates by the Inverse Gamma Method.
**Rates are statistically significantly higher in Black/African Americans than in whites.

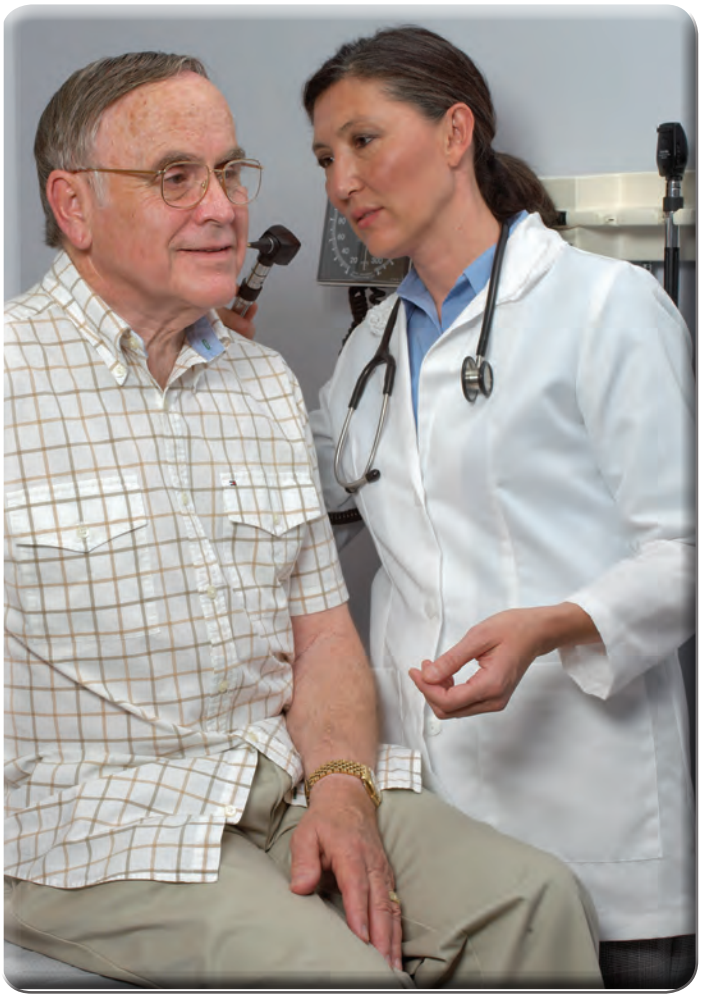
Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved June 22, 2016, from http://www.health.mo.gov/data/mica/DeathMICA/



Cancer in Missouri Counties

Figures 15-20 show age-adjusted incidence rates and mortality rates for the four leading types of cancer in Missouri from 2007 to 2012 by gender. Incidence or mortality rates in counties with fewer than 20 cases are not considered statistically reliable and are shown as having insufficient data for analysis.

Of particular interest are counties in which incidence rates are significantly lower than the state rate and mortality rates are significantly higher, suggesting that both detection and treatment may need to be improved. Conversely, some counties have incidence rates significantly higher than the state, but significantly lower mortality rates, which suggests that detection and treatment may be more effective than for the state in general. However, other explanations are also possible.

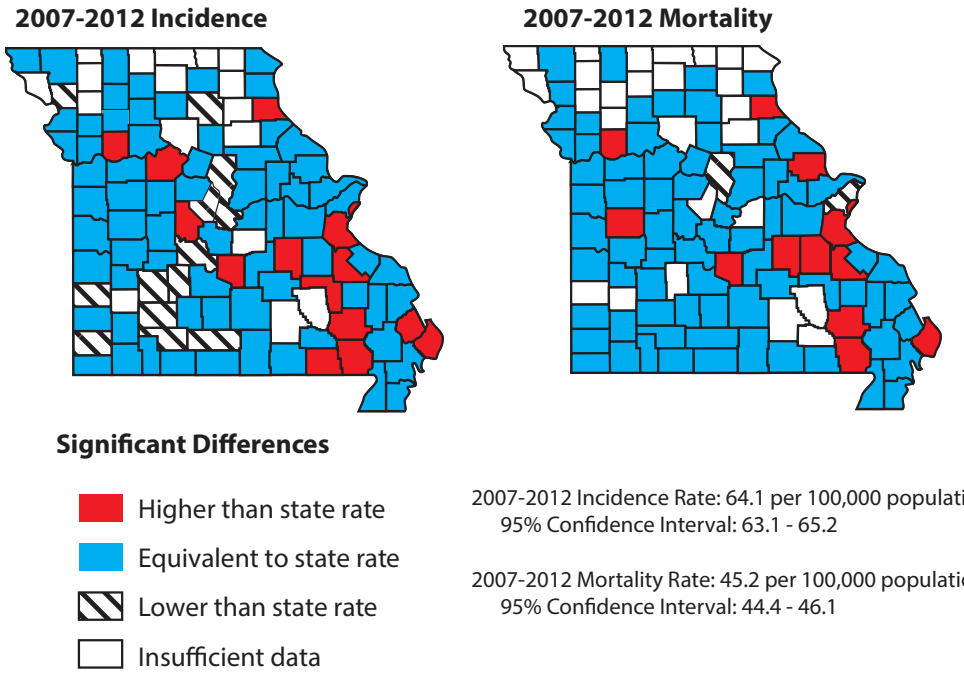


"Through the use of health insurance coverage, reduced cost sharing, and the availability of free screening at public clinics, screening rates increase."

Lung Cancer

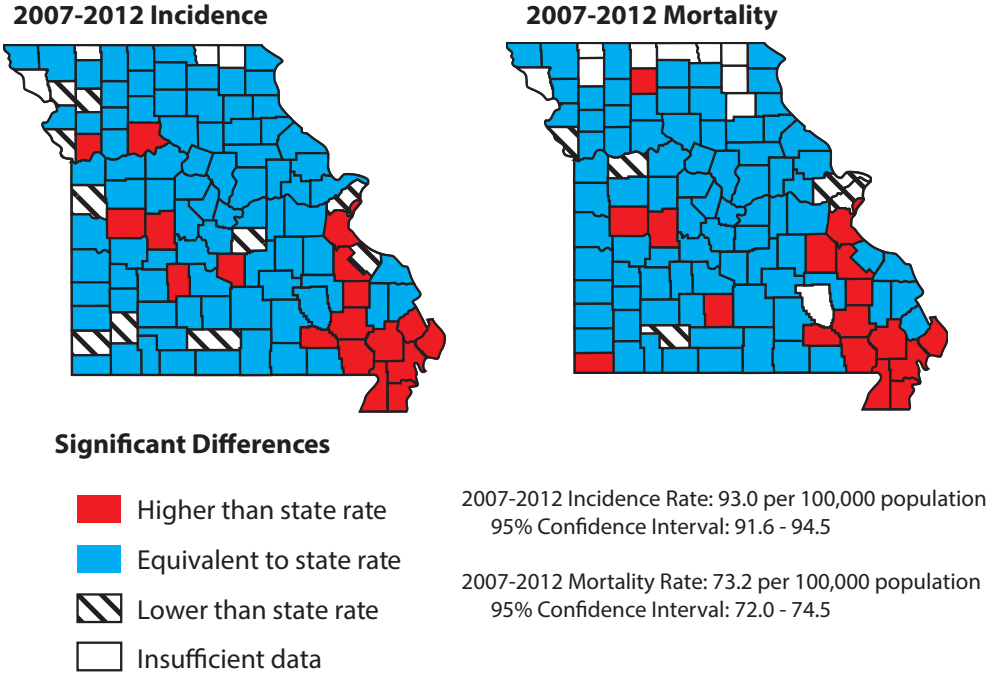
Among Missouri females, 15 counties had age-adjusted incidence rates significantly higher than the state. Thirteen counties had lower incidence rates than the state (Figure 15). Among females, 13 counties had a higher mortality rate than the state and two counties (Boone and St. Louis) had significantly lower mortality rates than the state.

Figure 15. Comparison of Missouri county age-adjusted incidence and mortality rates of female invasive lung cancer, 2007-2012*



Among Missouri males, 19 counties, mostly in southeastern Missouri, had age-adjusted incidence rates higher than the state and ten had lower rates (Figure 16). The patterns are similar for mortality among males. Eighteen counties, mostly in southeastern Missouri, have mortality rates higher than the state. In addition, among males, four counties (Grundy, McDonald, Washington and Wright) had incidence rates equivalent to the state, but significantly higher mortality rates.

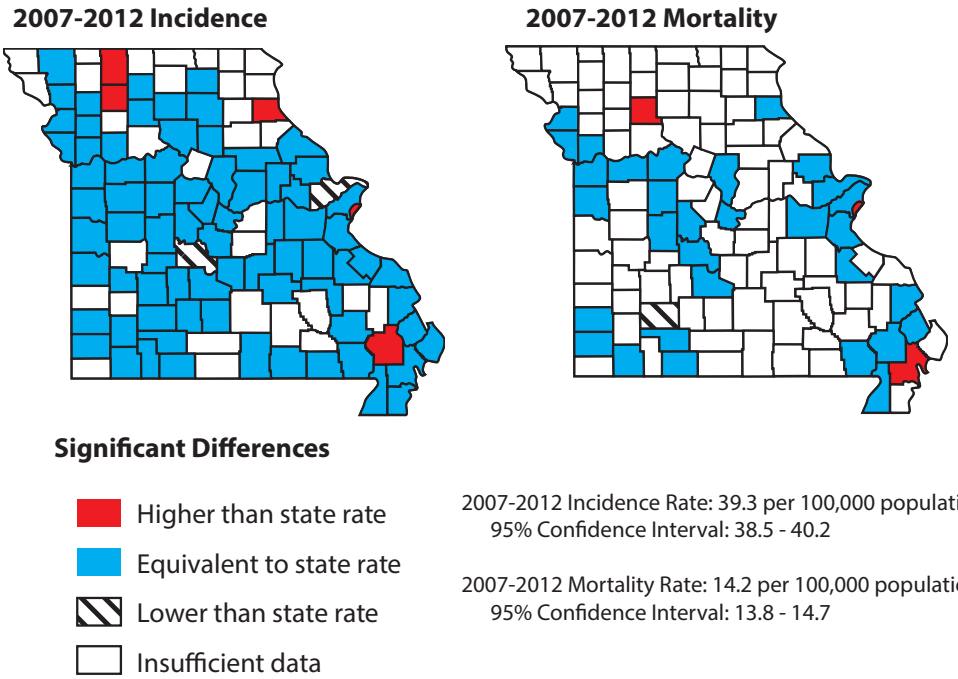
Figure 16. Comparison of Missouri county age-adjusted incidence and mortality rates of male invasive lung cancer, 2007-2012*



*Incidence includes cancer of the lung and bronchus. Mortality includes cancer of the lung, bronchus and trachea.
Source: Missouri Department of Health and Senior Services, Cancer Registry MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php
Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/DeathMICA/

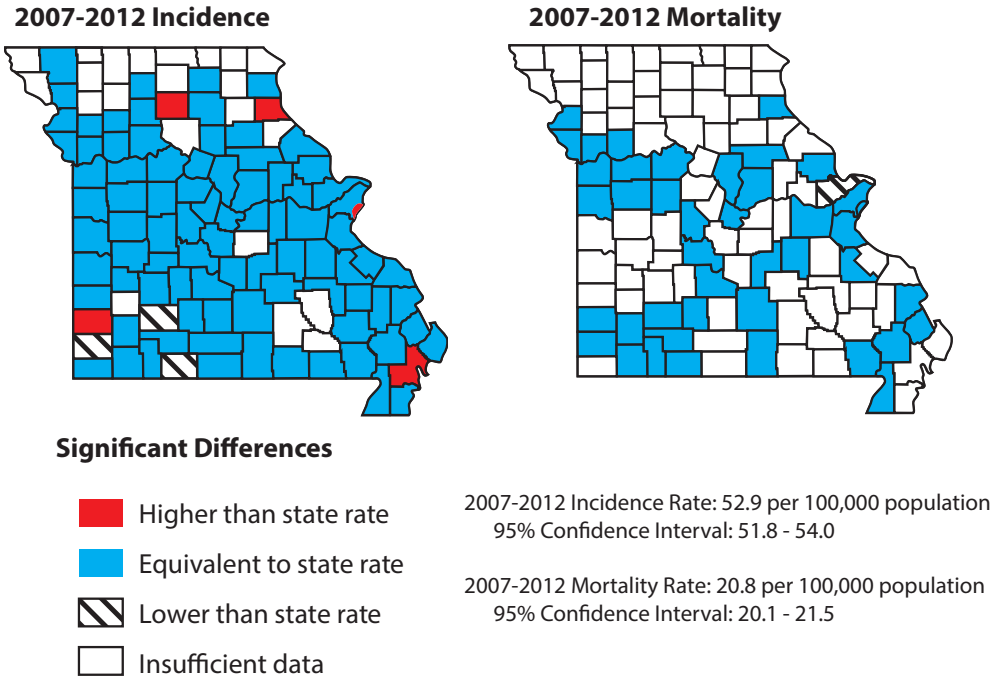
Colorectal Cancer

Figure 17. Comparison of Missouri county age-adjusted incidence and mortality rates of female invasive colorectal cancer, 2007-2012*



Among Missouri females, five counties had significantly higher age-adjusted incidence rates of colorectal cancer than the state during 2007-2012 (Figure 17). Only Camden and St. Charles counties had significantly lower incidence rates than the state. Livingston and New Madrid Counties and St. Louis City had mortality rates higher than the state. Only Greene County had a significantly lower mortality rate than the state.

Figure 18. Comparison of Missouri county age-adjusted incidence and mortality rates of male invasive colorectal cancer, 2007-2012*



Among Missouri males, during 2007-2012, five counties had significantly higher age-adjusted incidence rates of colorectal cancer than the state (Figure 18). St. Charles County was the only county to have a significantly lower mortality rate than the state rate of 20.8 per 100,000 population. None of the counties had mortality rates higher than the state. It should be noted that most counties had numbers too small to calculate stable rates.

*Incidence includes cancer of the colon, rectum and rectosigmoid. Mortality includes cancer of the colon, rectum and anus.

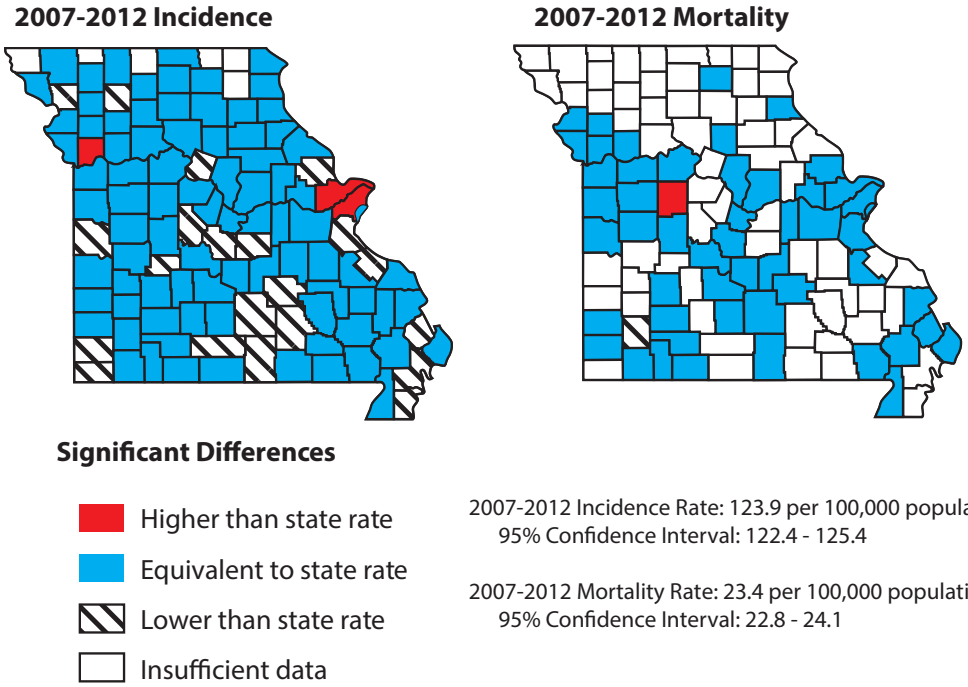
Source: Missouri Department of Health and Senior Services, Cancer Registry MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php

Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/DeathMICA/

Female Breast Cancer

Figure 19 shows age-adjusted incidence and mortality rates for female breast cancer during 2007-2012. Three counties (Clay, St. Charles and St. Louis) had significantly higher incidence rates than the state rate of 123.9 per 100,000 population. Twenty-one counties had incidence rates significantly lower than the state rate. Pettis County was the only county to have a mortality rate significantly higher than the state rate of 23.4 per 100,000 population, although its incidence rate was equivalent to the state.

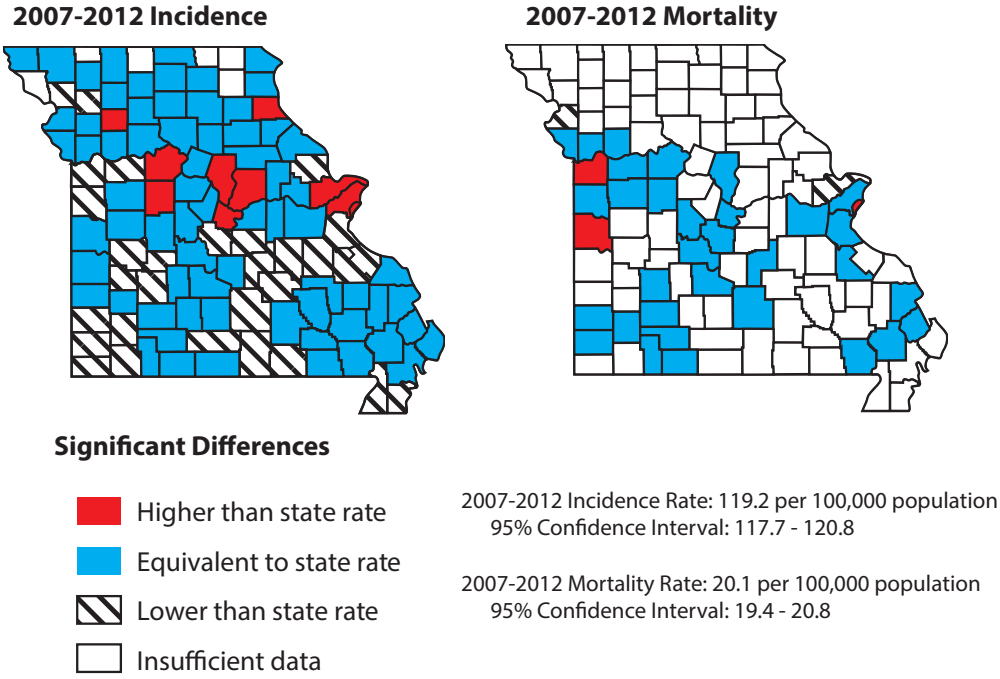
Figure 19. Comparison of Missouri county age-adjusted incidence and mortality rates of female invasive breast cancer, 2007-2012*



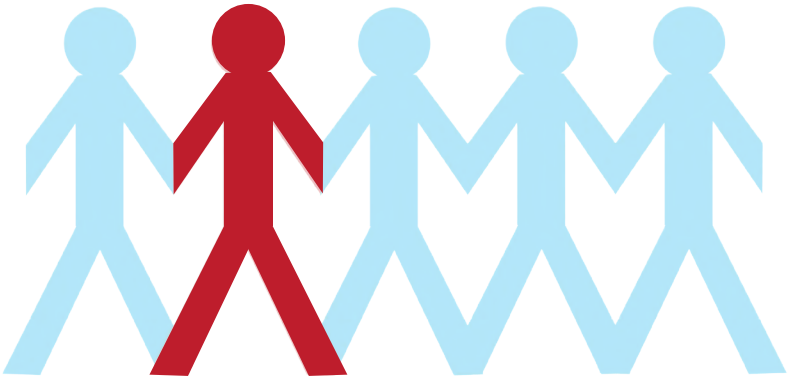
Prostate Cancer

Thirty counties (26.1%) had lower age-adjusted incidence rates of prostate cancer than the state for 2007-2012 (Figure 20). Ten counties had higher incidence rates than the state. St. Louis City, Bates and Jackson counties were significantly above the state rate for prostate cancer mortality. However, of the three, only St. Louis City had an incidence rate higher than the state rate, Jackson County was lower than the state rate and Bates County was equivalent to the state rate. It should be noted that most counties had numbers too small to calculate stable rates.

Figure 20. Comparison of Missouri county age-adjusted incidence and mortality rates of invasive prostate cancer, 2007-2012*



**Source: Missouri Department of Health and Senior Services, Cancer Registry MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/mica/cancer_19sites2015.php*
Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved May 11, 2016, from from http://health.mo.gov/data/mica/DeathMICA/



Social and Economic Burden of Cancer in Missouri

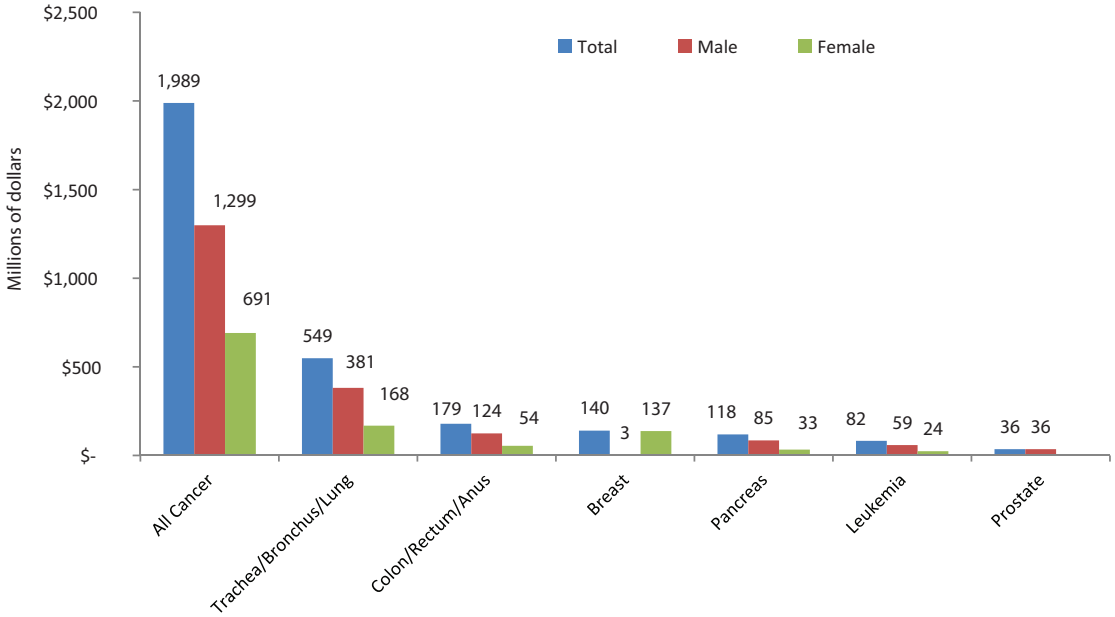
Although the most important cost of cancer is the loss of precious lives, there is a huge social and economic cost of cancer that cannot be ignored. This includes, but is not limited to, the financial cost of cancer treatment, years of potential life lost (YPLL) and productivity loss (PL) from cancer deaths.

The financial costs of cancer treatment are often a burden to people diagnosed with cancer, their families and society as a whole. The Agency for Health Care Research and Quality estimates that the direct medical costs (total of all health care costs) for cancer in the U.S. in 2011 were $88.7 billion.[46]

The concept of YPLL involves estimating the average years a person would have lived had he or she not died prematurely. It can, therefore, be considered a measure of premature death. Productivity loss is a cost borne by a society whose individuals are either prevented or deterred from producing goods and services in the marketplace, the public sector and/or household, due to premature death.

In Missouri, during 2010-2014, the annual average productivity loss due to cancer deaths was more than $2.0 billion, with 64.9 percent of the loss from males and 35.1 percent from females. In addition, the top five leading causes of cancer deaths contributed 51.6 percent of all productivity loss during the period (Figure 21).

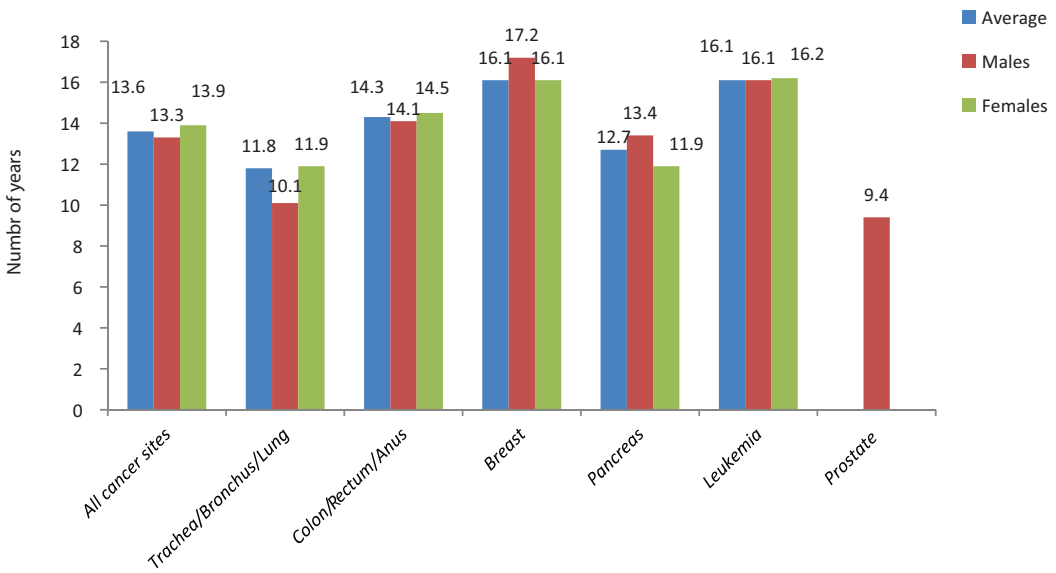
Figure 21. Annual productivity loss due to cancer deaths for all cancer sites and selected cancer sites, Missouri, 2010-2014



Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/DeathMICA/

In Missouri, during 2010-2014, the life span of a Missourian who died of cancer was shortened an average of 13.6 years. The highest annual average loss was from male breast cancer deaths (17.2 years), followed by female leukemia cancer deaths (16.2 years), female breast cancer deaths (16.1 years) and male leukemia cancer deaths (16.1 years) (Figure 22).

Figure 22. Annual average number of years of potential life lost per cancer death for all cancer sites and five selected cancer sites, Missouri, 2010-2014



Source: Missouri Department of Health and Senior Services, Death MICA. Retrieved May 11, 2016, from http://health.mo.gov/data/mica/DeathMICA/

Inpatient hospitalizations and hospital charges, 2013

In 2013, there were 21,264 hospitalizations with cancer as the principal diagnosis, down from 25,469 in 2008, resulting in more than $1.1 billion of hospital charges.[47] (Table 5)

- More than half ($574 million) was charged to Medicare.
- More than $126 million was charged to Medicaid.
- Lung and bronchus cancer has the highest number of hospitalizations at 2,924 (down from 3,457 in 2008), followed by colorectal cancer at 2,754 (down from 3,176 in 2008).

Table 5. Inpatient hospitalizations and hospital charges for the 10 leading new invasive cancers, Missouri, 2013

Principal Diagnosis	Number of Discharges	All Pay Sources*	Hospital Charges* Medicare	Medicaid Charges*
All cancer	21,264	$1,106.6	$574.5	$126.6
Lung and Bronchus	2,924	159.4	103.5	15.2
Colorectal	2,754	146.8	91.1	12.2
Prostate	1,343	42.5	19.2	0.9
Kidney and Renal Pelvis	983	41.1	22.3	2.7
Leukemia	794	96.8	33.1	15.1
Cancer of Head and Neck	754	44.7	20.2	10.5
Non-Hodgkin Lymphoma	737	56.3	29.1	6.8
Pancreas	667	32.1	18.9	1.9
Cancer of Brain and Nervous System	634	43.0	12.9	7.9
Uterus	578	23.9	13.4	1.7

*Figures are in millions of dollars

Source: Missouri Department of Health and Senior Services, Hospital Discharges, Charges & Days of Care MICA. Retrieved January 26, 2016, from http://health.mo.gov/data/mica/mica/hosp_new.php

Healthy People 2020: Are we meeting the objectives?

The Healthy People (HP) 2020 objectives provide a framework to address risk factors and health determinants.[48] HP 2020 contains 20 objectives related to cancer. The goal is to reduce the number of new cancer cases, as well as the illness, disability and death caused by cancer. Table 6 shows selected HP 2020 target objectives, 2012 Missouri incidence and 2013 Missouri death rates, and 2012 U.S. death and incidence rates. The late-stage female breast cancer cited is from 2011 data.

Table 6. Selected Healthy People 2020 objectives for cancer incidence and deaths

Healthy People 2020 Objective [a]	**2012 Missouri Incidence and 2013 Death rates** [b]	**2012 United States** [c]	**2020 Target**
Reduce the overall cancer death rate	178.7	166.4	161.4
Reduce the lung cancer death rate	54.6	45.0	45.5
Reduce the female breast cancer death rate	21.9	21.3	20.7
Reduce the death rate from cancer of the uterine and cervix	2.4	2.3	2.2
Reduce the colorectal cancer death rate	15.7	14.7	14.5
Reduce the oropharyngeal cancer death rate	2.3	2.5	2.3
Reduce the prostate cancer death rate	17.0	19.6	21.8
Reduce the melanoma cancer death rate	3.0	2.7	2.4
Reduce invasive colorectal cancer	42.7	38.9	39.9
Reduce invasive uterine cervical cancer	9.4	7.4	7.2
Reduce late-stage female breast cancer (2011)	54.0	41.9 [d]	42.1

[a] Healthy People 2020. Retrieved March 15, 2016, from https://www.healthypeople.gov/2020/topics-objectives/topic/cancer/objectives

[b] Missouri Department of Health and Senior Services. Cancer Registry MICA http://health.mo.gov/data/mica/CancerMICA/index2015.html and Death MICA http://health.mo.gov/data/mica/DeathMICA/

[c] United States Cancer Statistics: 1999 - 2012 Mortality, WONDER Online Database. United States Department of Health and Human Services, Centers for Disease Control and Prevention; 2015. Accessed at http://wonder.cdc.gov/CancerMort-v2012.html on Jan 25, 2016, and Healthy People Data 2020. Access at https://www.healthypeople.gov/2020/data-search/Search-the-Data. Accessed May 11, 2016.

[d] Late-stage female breast cancer data are 2011

Table 7 shows selected HP 2020 objectives related to cancer screening and the current prevalence of Missouri (2014) and U.S. (2013) data. Missouri is similar to the U.S. in the prevalence of cervical cancer screening, but is higher in colorectal and female breast cancer screenings.

Table 7. Comparison of selected Healthy People 2020 cancer screening objectives for Missouri and the United States, 2013-2014

Objective	Missouri BRFSS* Prevalence (%) 2014	United States NHIS** Prevalence (%) 2013
Increase the proportion of women who receive a **cervical cancer screening** based on the most recent guidelines [a]	80.9	80.7
Increase the proportion of adults who receive a **colorectal cancer screening** based on the most recent guidelines [b]	59.9	58.2
Increase the proportion of women who receive a **breast cancer screening** based on the most recent guidelines [c]	76.7	72.6

*Missouri Department of Health and Senior Services, Behavioral Risk Factor Surveillance System, 2014
**National Health Interview Survey (NHIS); Centers for Disease Control and Prevention, National Center for Health Statistics (CDC/NCHS). Retrieved March 16, 2016, from https://www.healthypeople.gov/node/4053/data_details

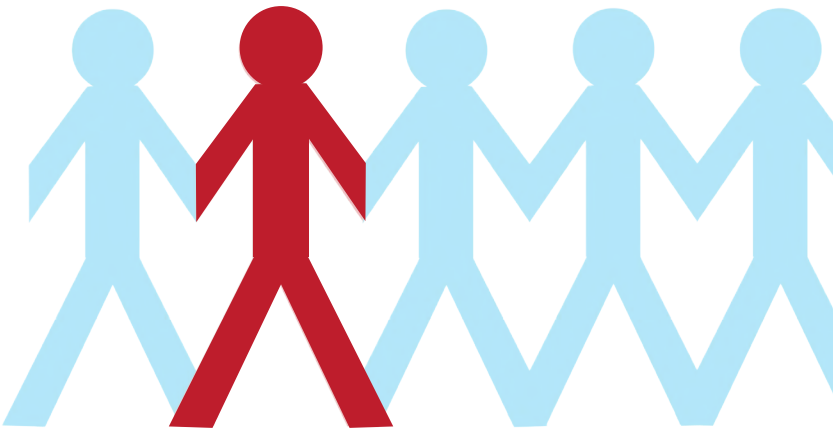
[a] Number of women aged 21 to 65 who have not had a hysterectomy and have had a Pap test in the past three years

[b] Number of persons aged 50 to 75 years who have had a blood stool test in the past year, a sigmoidoscopy in the past five years and a blood stool test in the past three years, or a colonoscopy in the past 10 years

[c] Number of women aged 50 to 70 years who have had a mammogram in the past two years

Cancer Survivors in Missouri

Five-year relative survival rates for common cancers such as breast, prostate, colorectal, cervical and melanoma of the skin are 90 percent to 100 percent, if discovered and treated before spreading beyond the site where the cancer began.[2]



In 2014, approximately 6.0 percent of Missouri adults had a skin cancer other than melanoma, and 7.2 percent had ever been told by a doctor that they had some type of cancer other than skin (Table 8). There are approximately 336,230 cancer survivors living in Missouri (excluding skin cancer). Female breast cancer (1.7%), and prostate cancer among men (0.9 percent), had the highest prevalence among all individual types of cancer.

Table 8. Percentage of Missouri adults with selected types of cancer,* Missouri, 2014

Cancer	Prevalence %	95% CI
Skin cancer	6.0	5.4 - 6.6
All other cancers**	7.2	6.4 - 7.9
Breast (female)	1.7	1.3 - 2.0
Prostate	0.9	0.7 - 1.2
Colorectal	0.5	0.3 - 0.7
Ovarian and Uterine	0.4	0.2 - 0.6
Lung	0.2	0.04 - 0.4
Bladder	0.1	0.08 - 0.3

Source: Missouri Department of Health and Senior Services, Behavorial Risk Factor Surveillance System 2014 Report. Retrieved March 16, 2016, from http://health.mo.gov/data/brfss/2014datareport.pdf
**Self-reported diagnosed most recent cancer*
***Excludes skin cancer*

Table 9 shows that a larger proportion of females than males (11.4% versus 7.2%) and those with less than a high school education, compared to those with education beyond high school (13.8% versus 9.7%), were currently receiving treatment for cancer. Individuals with household incomes below $15,000 (16.6%) were currently receiving treatment for cancer at a higher rate than all other household income levels shown.

Table 9. Estimated percentage of Missouri adults currently receiving treatment for cancer by gender, race, education and household income, Missouri, 2014

	Prevalence %	95% CI
Overall	9.5	7.2 - 11.8
Gender		
Female	11.4	8.1 - 14.7
Male	7.2	4.2 - 10.2
Race		
African American	20.5	3.5 - 37.6
White	9.1	6.8 - 11.4
Other	--	--
Education		
Less than High School	13.8	5.9 - 21.6
High School	7.5	4.2 - 10.7
Greater than High School	9.7	6.5 - 12.9
Household Income		
Less than $15,000	16.6	5.7 – 27.6
$15,000 - 24,999	6.6	2.9 – 10.2
$25,000 - 34,999	11.7	5.3 – 18.1
$35,000 - 49,999	8.0	2.3 – 13.8
$50,000 - 74,999	9.8	2.9 – 16.8
$75,000+	5.7	0.6 – 10.8

Source: Missouri Department of Health and Senior Services, Behavorial Risk Factor Surveillance System 2014 Report. Retrieved March 16, 2016, from http://health.mo.gov/data/brfss/2014datareport.pdf

Summary/Conclusion

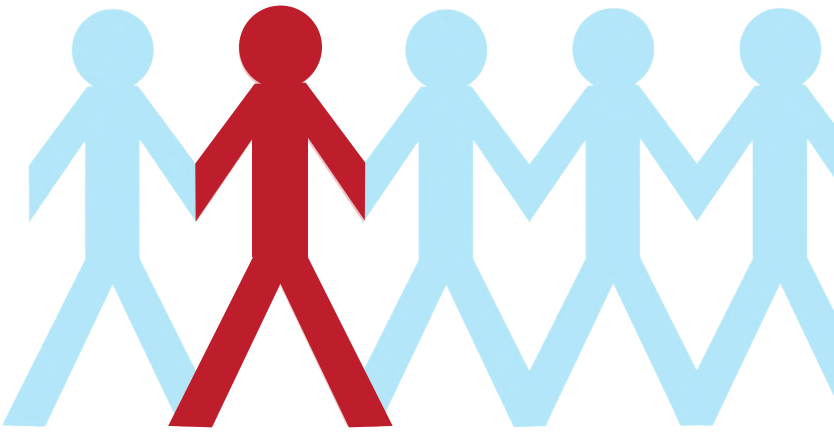
The Missouri Cancer Action Plan is the product of a statewide volunteer effort to identify cancer-related needs and priorities. It is organized based on the cancer control continuum, (i.e., Prevention, Early Detection, Treatment and Survivorship). The plan provides a framework for action to reduce the cancer burden for Missourians, and focuses on four overarching goals:

- Decrease cancer incidence
- Increase early detection of cancer
- Increase access to evidence-based treatment of cancer
- Improve quality of life of cancer survivors

Missouri's cancer death rate is the 10th highest in the U.S. The deadliest cancer is lung/bronchus followed by colorectal cancer and female breast cancer.[49] For the period of 2004 to 2014, the age-adjusted cancer death rates among African Americans remained significantly higher than among whites, although racial disparities have declined during this time. Of particular interest are counties in which cancer incidence rates are significantly lower and cancer mortality rates significantly higher than the state rate, suggesting that prevention, detection and treatment may need to be improved.

This plan strives to decrease cancer deaths and disparities among Missourians, in part, by increasing cancer screening rates by promoting awareness among healthcare providers and the general public regarding the screening guidelines for breast, cervical, colorectal, prostate and lung cancers. It also addresses the need to connect people who have barriers to healthcare access with community resources.

In order to achieve the goals and objectives outlined in the plan, the strategies will be implemented and monitored to assess progress and ensure outcomes. The plan will serve as a means to unite and mobilize individuals, organizations, institutions and communities throughout the state to embrace the plan and make a true impact on cancer prevention and control in Missouri.



Appendices

What Can You Do to Fight Cancer in Missouri?

The Missouri Cancer Action Plan identifies broad goals to reduce the burden of cancer. To accomplish these goals, everyone needs to be involved. What can you do? The following pages list examples of things that each of us can begin doing right now to work toward the mission of reducing the human and economic burden of cancer on Missourians.

What you can do if you are a:

Hospital

You can

- Assure that all cancer cases are reported in a timely manner
- Provide meeting space for cancer support groups
- Collaborate to sponsor community screening and education programs
- Maintain American College of Surgeons membership
- Assure patients have a written cancer treatment and survivorship care plan at discharge

Local Public Health Agency

You can

- Provide cancer awareness information and data to citizens and groups
- Collaborate in community-based coalitions
- Work with physicians to promote screening programs and case reporting
- Provide space for community survivor support groups
- Access community needs and implement policy and environmental changes to reduce cancer risks
- Assure access to care for the uninsured and underinsured
- Actively refer and link people with smoking cessation programs

Community-based Organization

You can

- Provide cancer awareness information to constituents
- Promote cancer screening among clients
- Encourage participation in clinical trials
- Collaborate to provide community prevention programs

Professional Organization

You can

- Provide continuing education credits on cancer topics
- Include clinical trials information in meeting agendas
- Form speakers' bureaus to provide cancer education
- Train facilitators for survivor support groups

Employer

You can

- Establish a smokefree workplace policy
- Provide healthy foods in vending machines and cafeterias
- Encourage employees to increase physical activity
- Collaborate with hospitals to host screening events
- Provide health insurance coverage

School or University

You can

- Include cancer prevention messages in health classes
- Provide healthy foods in vending machines and cafeterias
- Increase physical education requirements
- Make your entire campus a tobacco-free environment

Faith-based Organization

You can

- Provide cancer prevention information to members
- Collaborate with other community-based groups
- Provide healthy potlucks and meals at meetings
- Open your building for walking clubs in cold weather
- Encourage members to get cancer screening tests on time

Physician, Nurse or Health Care Professional

You can

- Make sure patients get appropriate cancer screening tests
- Refer patients to tobacco-cessation classes and nutrition programs
- Report cancer cases in a timely manner
- Find out how to enroll patients in clinical trials
- Make earlier referrals to hospice for end-of-life care
- Provide patients with a written cancer treatment and survivorship care plan

Health Insurer

You can

- Promote tobacco cessation benefits to subscribers
- Encourage cancer screening and preventative services

Missourian

You can

- Avoid all tobacco and secondhand smoke
- Eat a nutritious and balanced diet and maintain a healthy weight
- Increase your daily physical activity
- Know when to be screened and obtain screenings on schedule
- Support smokefree environments
- If diagnosed, consider enrolling in a clinical trial
- Volunteer with your hospital, health department, faith community or local groups who support cancer control efforts

Addressing Cancer in Missouri

The State of Missouri addresses the burden of cancer through the following programs/activites:

State and Regional Coalitions

Comprehensive cancer control in Missouri includes a regional approach from both state and local coalitions. Coalitions are defined as "a broad-based, multi-organizational, community partnership that may bring together the public, private and nonprofit sectors in an effort to reduce morbidity and mortality and improve quality of life." Coalitions work to develop goals and objectives that meet the needs of their own communities.

Local or regional coalitions that address cancer may be a cancer coalition, tobacco-free coalition or general community health coalition. The Missouri Cancer Consortium is the state coalition, supported by the Comprehensive Cancer Control Program (CCCP), that works together to implement the Missouri Cancer Action Plan.

Show Me Healthy Women

The Show Me Healthy Women (SMHW) program provides free breast and cervical cancer screenings to age- and income-eligible women.

Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) Lifestyle Interventions Program

WISEWOMAN, an expansion of the National Breast and Cervical Cancer Early Detection Program, known as SMHW in Missouri, helps underinsured, low-income women gain access to health screenings and lifestyle education that can reduce the risk of heart disease and stroke.

Data Collection and Analysis

Data used in cancer control and prevention is available from many sources. Missouri data, surveillance systems and statistical reports can be found on the Missouri Department of Health and Senior Services' (DHSS) website. Missouri's primary cancer data source is the Missouri Cancer Registry and Research Center (MCR-ARC). MCR-ARC, a collaborative partnership between DHSS and the University of Missouri, collects detailed information about Missouri cancer patients and the treatments they receive, provides annual reports on cancer incidence and mortality, monitors cancer incidence and mortality trends, and provides cancer data and analysis. Within DHSS, the Office of Epidemiology works with CCCP to provide data and analysis to identify priorities and inform decision-making.

Comprehensive Cancer Control Program

CCCP addresses the burden of cancer in Missouri by:

- Using scientific data and research to systematically identify priorities and inform decision-making.
- Addressing the full scope of cancer care, ranging from primary prevention to early detection and treatment to survivorship through end-of-life.
- Engaging many stakeholders in cancer prevention and control, including medical and public health communities, volunteer agencies, insurers, businesses, survivors, government, academia and advocates.
- Integrating activities of many disciplines, such as administration, basic and applied research, evaluation, health education, program development, public policy, surveillance, clinical services and health communications.

Missouri Cancer Action Plan

Missouri's Cancer Action Plan identifies strategies and interventions for addressing the burden of cancer in Missouri. The interventions include promoting healthy lifestyles and reducing environmental hazards that cause cancer, increasing early detection and appropriate screening for cancer using evidence-based guidelines, making evidenced-based treatment of cancer accessible to everyone, and improving the quality of life for cancer survivors and their families.

Comprehensive Tobacco Control Program

CTCP works to prevent youth initiation of tobacco use, promote quitting among youth and adults, eliminate exposure to secondhand smoke and reduce the impact on populations disproportionately affected by tobacco. Program staff works with youth advocacy groups, community-based coalitions, voluntary organizations and partners to educate the public about the health effects of tobacco use and exposure to secondhand smoke, and to advocate for policies to prohibit tobacco use on school property, in public places and workplaces. The Missouri Tobacco Quitline (800-QUIT-NOW) provides free help to Missourians who want to quit smoking.

Obesity Prevention/Physical Activity and Nutrition

The Obesity Prevention Program addresses access to healthy foods and safe places to be physically active. The program provides consultation, education, training, technical assistance and resources for health and public health professionals, school personnel, state agencies, community organizations and other stakeholders. The Missouri Council for Activity and Nutrition assists DHSS in identifying program priorities and promoting strategies to create environments that support a healthy weight and reduce chronic diseases.

Immunization/HPV

Missouri's Immunization Program works to stop the spread of vaccine-preventable diseases by providing vaccines to children and adolescents who cannot pay for them through the Vaccines for Children Program; educates health care professionals, medical providers and the public on the importance of vaccinations; and ensures that children who are in child care and school are adequately immunized against diseases that are harmful and sometimes deadly. The human papillomavirus (HPV) vaccine provides highly effective protection against specific types of HPV that have been shown to cause the development of cancer or genital warts that affect both females and males.

Environmental/Radon

Environmental public health officials work with individuals, communities, government agencies and industries throughout the state to reduce or eliminate exposure to substances that could be harmful to human health. One of those substances is radon, a naturally occurring gas that comes from rocks and dirt and can get trapped in houses and buildings. Radon is the second leading cause of lung cancer in the nation.

Cancer Action Plan Development Process

Planning Approach

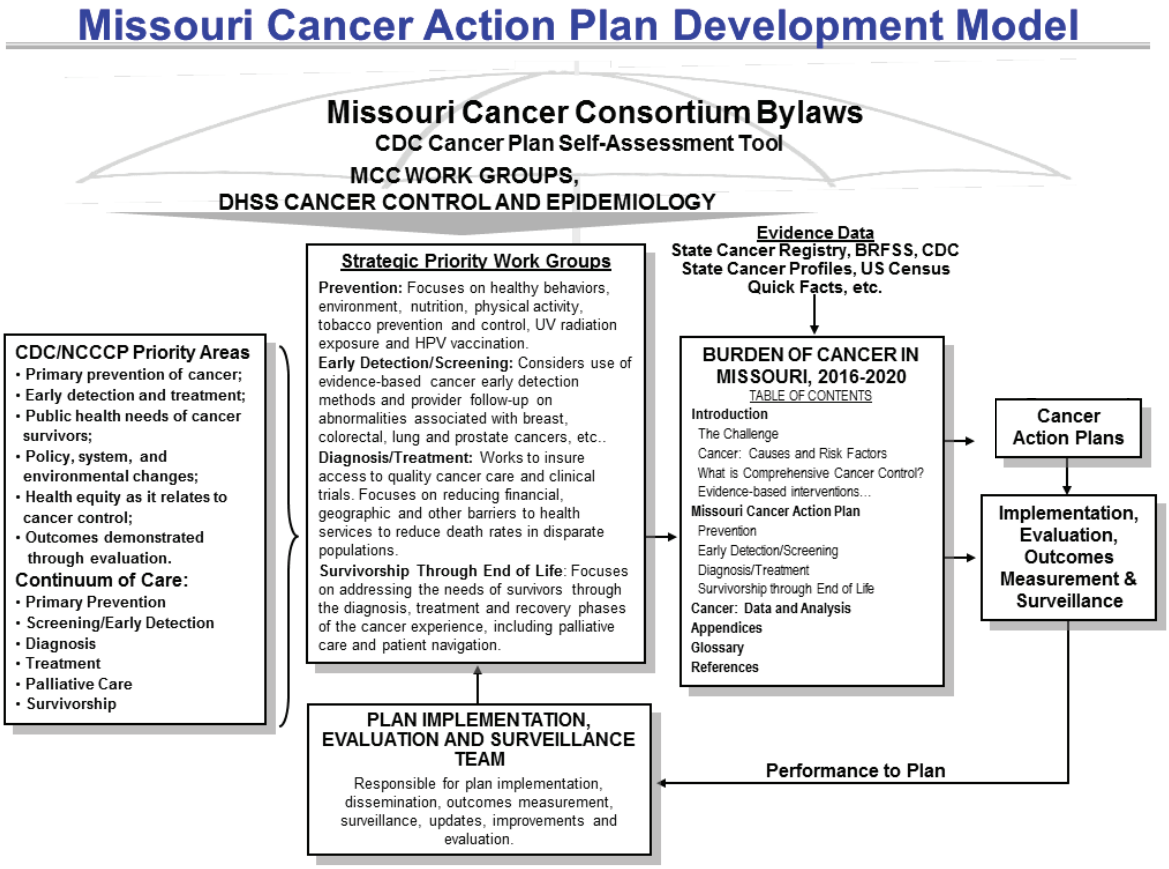
In early 2014 through June 2016, the Missouri Cancer Consortium (MCC) Executive Committee and members, assisted by the Missouri Department of Health and Senior Services' (DHSS) Comprehensive Cancer Control Program (CCCP), participated in the development of the Missouri Cancer Action Plan. Initially, the team reviewed the most current data and analysis to ascertain progress and continuing challenges for improving cancer outcomes in Missouri. A practical approach was taken, focusing on evidence-based interventions, with an emphasis on policy, systems or environmental changes that have the potential for a sustained impact. The 2016-2020 plan was based in part on prior versions of Missouri's Cancer Action Plan.

Input Gathering

A series of facilitated meetings and discussions began at an MCC meeting in Columbia, Missouri, on April 17, 2014. Four work groups were created to address the four goals of the action plan - Prevention, Early Detection and Screening, Diagnosis and Treatment, and Survivorship through the End of Life. The work groups, comprised of MCC members representing Missouri's cancer control experts and stakeholders from the public and private sectors, drafted recommendations to retain, modify and/or create goals, objectives and strategies for their respective domains across the cancer control continuum. The DHSS Office of Epidemiology was instrumental in providing guidance and recommendations for creating measures for evaluating progress toward the goals and objectives of the plan.

Final Plan Development

Once completed, the work groups submitted their respective plans to CCCP to facilitate editing and review and to add any measures that were needed. The final Missouri Cancer Action Plan was then submitted for publication in *The Burden of Cancer in Missouri: A Comprehensive Analysis and Plan, 2016-2020.*



Plan Implementation, Surveillance and Evaluation

Implementation

This Missouri Cancer Action Plan provides a framework for action and is the product of a statewide, volunteer effort to identify the cancer-related strengths, weaknesses and needs in Missouri.

In order to achieve the goals and objectives outlined in the plan, the strategies must be implemented. The plan will serve to unite and mobilize individuals, organizations, institutions and communities committed to fighting cancer. These groups can use this plan to select strategies for implementation consistent with their missions. Effective implementation of these diverse strategies will require an ongoing, coordinated and collaborative effort. All partners must embrace the plan to make a true impact on cancer prevention and control in Missouri.

Near the end of the plan development process, the MCC Executive Committee developed recommendations to enhance organizational structure and accountability in support of the plan. The MCC membership chose four priority objectives, one from each goal representing Prevention, Early Detection and Screening, Diagnosis and Treatment, and Survivorship through the End of Life to work on in 2016. Four implementation work groups were formed from the MCC membership and beyond to implement the 2016 priorities. It is anticipated that new priorities will emerge each year as MCC membership and capacity grow.

Implementation and Sustainment Plan:

- Begin implementation of selected strategies within three months of plan ratification
- Identify work groups to lead priority areas, goals, recommendations and strategies
- Identify strategies to be implemented first
- Develop written inter-organizational linkages
- Develop an evaluation mechanism
- Identify, coordinate and secure funding opportunities
- Expand partnerships and collaborations
- Continuously review progress by tracking activities and measuring results
- Develop and implement a resource plan

Surveillance

Reducing the cancer burden in Missouri depends on having timely, high quality and complete cancer surveillance data to determine priorities and inform the implementation and the continuing development of the Missouri Cancer Action Plan. Surveillance data can help determine where to target prevention efforts and identify which strategies are most effective in reducing cancer mortality.

The Missouri Cancer Registry manages the state's system for collection, storage, analysis and interpretation of data on cancer patients.[52] The information collected consists of demographics, site of cancer, type of cancer, type of treatments, stage of disease at diagnosis and vital status. Data are then analyzed so that crude, age-adjusted and age-specific annual cancer incidence rates can be produced, and trends in incidence for all cancers and for specific types/sites of cancer by age, sex and race can be assessed.

The availability of statewide cancer data enables health researchers and policymakers to analyze demographic and geographic factors that influence cancer risk, early detection and effective treatment of cancer patients.

Evaluation

Evaluation and surveillance guides the implementation and the continuing development of the Missouri Cancer Action Plan. The Missouri Cancer Consortium (MCC) will follow the CDC Framework for Program Evaluation in Public Health, including the six steps for evaluations and the associated standards illustrated below.[50, 51]

The plan strategies and interventions will be monitored and evaluated to determine their effectiveness in achieving the plan goals and objectives. The evaluation activities will include both implementation processes and outcomes. MCC and other stakeholders will be involved in the implementation process and will be responsible for collecting and reporting outcome measures to document the outcomes of the intervention strategies.

Steps in Evaluation Practice	Standards for Effective Evaluation
• **Engage stakeholders** Those involved, those affected, primary intended users • **Describe the program** Need, expected effects, activities, resources, stage, context, logic model • **Focus the evaluation design** Purpose, users, uses, questions, methods, agreements • **Gather credible evidence** Indicators, sources, quality, quantity, logistics • **Justify conclusions** Standards, analysis/synthesis, interpretation, judgement, recommendations • **Ensure use and share lessons learned** Design, preparation, feedback, follow-up, dissemination	• **Utility** Serve the information needs of intended users • **Feasibility** Be realistic, prudent, diplomatic, and frugal • **Propriety** Behave legally, ethically, and with due regard for the welfare of those involved and those affected • **Accuracy** Reveal and convey technically accurate information

Glossary

The glossary definitions combine resources from the Centers for Disease Control and Prevention online glossary,[53] Missouri Department of Health and Senior Services source documents, and staff descriptions.

Age Distribution: Numbers of people in specified age categories and the proportions of those categories in the population. Example: The 2000 U.S. Standard Population is based on the proportions of the U.S. population in specific age groups (< 1 year, 1–4 years, 5–9 years, 10–14 years, 15–19 years,…, ≥ 85 years), as measured in the 2000 U.S. Census.

Age-adjusted Rate: A rate, such as incidence or mortality, adjusted to the age distribution of a specified standard population, to permit comparison among populations having different age distributions. Rates are usually age-adjusted to the 2000 U.S. Standard Population.

BRFSS: The Behavioral Risk Factor Surveillance System is a state-based health survey that annually collects information on health conditions, behaviors, preventive practices and access to health care.

CDC: U.S. Centers for Disease Control and Prevention.

Confidence Interval (CI): A range of values, calculated from the sample observations that include the true value. For an incidence rate, the 95 percent CI will include the true rate 95 percent of the time, if the samples and calculations are repeated many times. The end points of the CI are called the Confidence Limits.

Disparity: Health disparities are preventable differences in the burden of disease, injury, violence or opportunities to achieve optimal health.

Ethnicity: A self-reported sociocultural classification indicating Spanish (Hispanic) cultural heritage or national origin. The U.S. Census defines Hispanics (or Latinos) as people of Mexican, Mexican-American, Chicano, Puerto Rican, Cuban or other South or Central American Spanish linguistic or cultural heritage, regardless of race. The Office of Management and Budget's Directive 15 states that the ethnicity category represents a social-political construct designed for collecting data on the race and ethnicity of broad population groups in this country and is not anthropologically or scientifically based.

In Situ Cancer: An early cancer that is present only in the layer of cells in which it began.

Incidence Rate: Number of new cases of a disease during a specified time period in a population at risk for developing the disease: (new cancer cases ÷ population at risk in one year) × 100,000

Invasive Cancer: Cancer that has spread beyond the layer of tissue in which it originated and is growing into surrounding healthy tissues.

MICA: Missouri Information for Community Assessment. A public, web-based, interactive data portal developed and maintained by the Missouri Department of Health and Senior Services, Bureau of Health Informatics.

Mortality Rate: Number of deaths in a specified population over a specified time period in a specified geographic area: (cancer deaths in 1 year ÷ population at midyear) × 100,000

NIS-Teen: The National Immunization Surveys are a group of telephone surveys used to monitor vaccination coverage among children 19-35 months, teens 13-17 years and flu vaccinations for children 6 months-17 years. The target population for the NIS-Teen is adolescents 13-17 years living in the United States at the time of the interview.

Population: The number of inhabitants (either total or grouped by age, race, sex, etc.) of a specified geographic area. In statistics, a population is the entire universe of items from which samples can be drawn, such as "all female citizens of Missouri." The true statistical population is rarely known and population figures are usually treated as estimates for analytical purposes.

Primary Site: The location or organ (site) in the body where the cancer first occurred.

Race: The classification of humans into groups based on physical traits, ancestry, genetics or social relations, or the relations between them. (OR) A social construct that groups people who have differences and similarities in biological traits.

Rate: A proportion over a specified time period, such as the number of new cancer cases in one year (see Incidence Rate and Mortality Rate).

Significant: A result is considered statistically significant if it is unlikely to have occurred by chance alone, at or above the probability level specified by the p-value or Confidence Interval (CI). The most commonly selected level is 95 percent (or $p = .05$), and is the level used throughout this report, unless otherwise stated. That is, where p-values are shown, significance was determined at $p \leq .05$, or for CIs, when the 95 percent confidence intervals for paired estimates did not overlap. (Note that CIs may overlap and still be significantly different. The standard used here is therefore a conservative determination.)

Stage (of cancer): A measure of disease progression, detailing the degree to which the cancer has advanced. Staging is usually based on the size of the tumor, whether lymph nodes contain cancer, and whether the cancer has spread from the original site to other parts of the body.

YRBS: The Youth Risk Behavior Surveillance System includes a school-based survey that monitors six types of health-risk behaviors that contribute to the leading causes of death and disability among youth and adults, and measures the prevalence of obesity and asthma among high school students.

YTS: The Youth Tobacco Survey is a surveillance system of self-reported tobacco-use knowledge, perceptions and behaviors among Missouri public middle and high school students. The Missouri DHSS conducts the YTS in coordination with the CDC Office on Smoking and Health.

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American College of Surgeons, Missouri Chapter
American Lung Association of the Central States
Butler County Health Department
Cancer Support Community of Greater St. Louis
Coalition of Hispanic Women Against Cancer
DHSS Comprehensive Cancer Control Program
DHSS Comprehensive Tobacco Control Program
DHSS Healthy Indoor Environments
DHSS Immunization Assessment and Assurance
DHSS Senior and Disability Services
Ellis Fischel Cancer Center
Gilda's Club Kansas City
Goldschmidt Cancer Center
Hannibal Clinic
Jefferson County Health Department
Lane Tabernacle CME
Marion County Health Department
Midwest Cancer Alliance
Missouri Association of Local Public Health Agencies
Missouri Cancer Registry
Missouri Council for Activity and Nutrition,
University of Missouri Extension
Missouri Hospice and Palliative Care Association
Missouri Nurses Association
Missouri Primary Care Association
Missouri State Medical Association
Nodaway County Crusade Against Cancer
Primaris
Prostate Network, Inc.
Pulaski County Health Department
RA Bloch Cancer Foundation
SAGE of PROMO Fund
Scott County Health Department
Southeast Cancer Control Coalition
SSM St. Mary's Hospital-Audrain
St. Charles Cancer Coalition
St. Louis Ovarian Cancer Awareness
St. Louis University Cancer Center
Susan G. Komen Missouri
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The Empowerment Network, Inc.
The Hope Light Foundation
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