Maryland Department of Health
Maryland Comprehensive Cancer Control Plan
2026 - 2030

It is our privilege to introduce the 2026–2030 Maryland Comprehensive Cancer Control Plan. Cancer continues to impact the lives of countless Marylanders and remains the second leading cause of death both in our state and nation. This updated plan represents our continued commitment to working together to improve outcomes throughout the cancer continuum.

This plan is a strategic framework for action and collaboration. It serves as a guide for individuals directly involved in planning, directing, implementing, and evaluating cancer programs and initiatives in the state. It is also a valuable resource for all Marylanders—including individuals, caregivers, health care providers, researchers, policy makers, communities, and organizations—who play a role in cancer control efforts. This edition of the plan introduces updated goals, objectives, and strategies presented across cross-cutting sections and topics that reflect current priorities and emerging challenges in cancer control. It emphasizes the importance of coordination, innovation, and equity in our collective response to cancer.

The development of this plan was a collaborative effort involving the Maryland Department of Health, the Maryland Cancer Collaborative, the Maryland State Council on Cancer Control, cancer survivors, and numerous experts from across the state. Their insights and experiences were essential to shaping a plan that is both comprehensive and actionable.

We recognize that no single person or organization can accomplish all of the goals outlined in this plan. Instead, this is a call to action for everyone to engage in the strategies listed in the plan and to contribute to progress wherever and whenever possible. Together, through coordinated and sustained efforts, we can further reduce the burden of cancer in Maryland.

Sincerely,

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DEDICATION

This Cancer Plan is dedicated to all the courageous Marylanders and their loved ones who have been affected by cancer.

MARYLAND COMPREHENSIVE CANCER CONTROL PLAN

2026-2030

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ACKNOWLEDGMENTS

The updated 2026-2030 Maryland Comprehensive Cancer Control Plan represents a collaborative effort involving individuals and organizations from across the state of Maryland, including many members of the Maryland Cancer Collaborative. The contributors donated their time, expertise, and experience, and sincere thanks must go to those individuals who helped to draft sections of the plan, as well as to those who reviewed drafts and provided feedback to the Maryland Department of Health (MDH). A list of individuals who contributed to the development of this updated plan can be found on the following pages.

In addition, various offices within MDH contributed staff expertise and resources during the updating process, including:

- Center for Cancer Prevention and Control in the Cancer and Chronic Disease Bureau
- Center for Tobacco Prevention and Control in the Cancer and Chronic Disease Bureau
- Center for Chronic Disease Prevention and Control in the Cancer and Chronic Disease Bureau
- Office of Oral Health in the Cancer and Chronic Disease Bureau
- Environmental Health Bureau
- Infectious Disease Prevention and Health Services Bureau
- Infectious Disease Epidemiology and Outbreak Response Bureau

This publication was supported by Cooperative Agreement NU58DP007114 funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the U.S. Department of Health and Human Services.

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INTRODUCTION

Since the inception of the Maryland Cancer Control Plan in 1991, the state of Maryland has observed significant improvement in reducing its cancer morbidity and mortality burden.[1] This may be attributed to initiatives and advancements across the spectrum of cancer control, including the prevention of cancer, such as the introduction of the human papillomavirus (HPV) vaccination and reductions in tobacco use and exposure; the widespread adoption of screening for early detection of certain cancers; the expanded access to health care, notably through increased health insurance coverage; and the use of novel and personalized treatment options.

Measures to broaden the reach of prevention, education, screening, treatment, and research programs to reduce the burden of cancer in Maryland have benefitted from the now 25-year investment by the Maryland Cigarette Restitution Fund (CRF).[2] With the CRF's continued focus on seven intervenable cancers, Maryland has seen an improvement in the mortality rates for these cancers in the past two and a half decades.[3] However, the improvements are not equally distributed and disparities persist, likely due to an interplay among many factors, including social determinants of health, behavior, biology, genetics, and the availability of and access to high-quality early detection and treatment options.[4,5]

Primary prevention of cancer through lifestyle modification remains an important tool to reduce the overall incidence of cancer. With increased avoidance of tobacco and alcohol usage, obesity, and sedentariness, the incidence and mortality from multiple cancer sites could be reduced.[6,7,8]

More can be done to increase early detection of cancer. The utilization of optimal and highly acceptable early detection methods is imperative. For example, the adoption of low-dose computed tomography (CT) scan for lung cancer screening among former smokers can convey lifesaving benefits.[9] With increased awareness of its effectiveness and a reduction in social stigma, participation rates among at-

[1] J Southard, N Kanarek; G Matanoski. Maryland Cancer Plan. Maryland Department of Health and Mental Hygiene, Baltimore, MD: 1991.
[2] State of Maryland. Cigarette Restitution Fund. Health -- General Article, Title 13, Subtitles 10 and 11 Annotated Code of Maryland, 2000.
[3] Centers for Disease Control and Prevention. Wonder. https://wonder.cdc.gov/. Accessed December 12, 2024.
[4] HS Iyer, N Zeinomar, AR Omilian, M Perlstein, MB Davis, CO Omene, K Pawlish, K Demissie, C-C Hong, S Yao, CB Ambrosone, EV Bandera, B Qin. Neighborhood Disadvantage, African Genetic Ancestry, Cancer Subtype, and Mortality Among Breast Cancer Survivors. JAMA Netw Open. 2023 Aug 1;6(8).
[5] Burnett AL, Nyame YA, Mitchell E. Disparities in prostate cancer. J Natl Med Assoc. 2023 May;115(2S): S38-S45.
[6] National Cancer Institute. "Tobacco" https://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco. Accessed December 2024.
[7] National Cancer Institute. "Cancers Associated with Drinking Alcohol" https://www.cancer.gov/about-cancer/causes-prevention/risk/alcohol/alcohol-fact-sheet.
[8] National Cancer Institute. "Cancers Associated with Overweight and Obesity" https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/obesity-fact-sheet; Accessed December 2024.
[9] Jonas D, Reuland DS, Reddy SM, et al. Screening for Lung Cancer with Low-Dose Computed Tomography: An Evidence Review for the U.S. Preventive Services Task Force. Evidence Synthesis No. 198. Agency for Healthcare Research and Quality; 2021. AHRQ publication 20-05266-EF-1.

risk populations may improve.[10] Awareness and use of increasingly sensitive stool-based testing and innovative tests (e.g. liquid biopsy) to detect early-stage cancers may help improve outcomes.[11,12]

Also, as our understanding of cancer epidemiology expands, additional population subgroups at elevated risk will be discovered and will require attention during the implementation of current and subsequent cancer control efforts. For instance, there is growing concern regarding an increased risk of colorectal cancer among individuals younger than 50 years, which necessitated an update to screening guidelines.[13]

This plan acknowledges the progress achieved and anticipates further innovation in public health, academic research, and clinical care that can be utilized to achieve further reductions in Maryland's cancer burden.

[10] N Nourmohammadi, THP Liang, G Sadigh. Patient-Provider Lung Cancer Screening Discussions: An Analysis of a National Survey. Clin Lung Cancer. 2024 Jun;25(4):e189-e195.
[11] H Almeida-Lousada, A. Mestre, S Ramalhete, AJ Price, RA de Mello, AD Marreiros , RP das Neves, P Castelo-Branco. Screening for Colorectal Cancer Leading into a New Decade: The "Roaring '20s" for Epigenetic Biomarkers. Curr Oncol. 2021 Nov 20;28(6):4874-4893.
[12] M Malla, JM Loree, PM Kasi, AR Parikh. Using Circulating Tumor DNA in Colorectal Cancer: Current and Evolving Practices. J Clin Oncol 2022 Aug 20;40(24):2846-2857.
[13] US Preventive Services Task Force (USPSTF). Screening for colorectal cancer: USPSTF Recommendation Statement. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening. Accessed December 12, 2024.

WHAT IS THE MARYLAND CANCER COLLABORATIVE?

The Maryland Cancer Collaborative (MCC) is a statewide coalition of volunteers who implement the Maryland Comprehensive Cancer Control Plan. The goals of the MCC are:

- To work with individuals and organizations to implement the Maryland Comprehensive Cancer Control Plan, and
- To bring together existing groups and new partners to collaborate on a common goal: reduce the burden of cancer in Maryland.

MCC STRUCTURE

Members of the MCC choose priority objectives and strategies from the Maryland Comprehensive Cancer Control Plan and form workgroups that meet regularly to implement projects in support of those priorities. Examples of current and past MCC workgroups include a Survivorship Workgroup, a Palliative Care Workgroup, a Tobacco Control Workgroup, and a Worksite Wellness Workgroup. The MCC is led by a Steering Committee that is comprised of workgroup chairs.

ANYONE WHO IS INTERESTED CAN JOIN THE MCC!

Membership is open to individuals and organizations who are interested in taking action to reduce the burden of cancer in Maryland. Benefits of membership include:

- Collaboration to increase impact and maximize resources;
- Regular updates on cancer control activities;
- Access to educational resources, training opportunities, job openings, and grant opportunities; and
- Opportunities to shape MCC activities.

Members agree to:

- Take specific action to implement the Maryland Comprehensive Cancer Control Plan;
- Participate in meetings regularly;
- Contribute to MCC activities, including donating time, funding, expertise, meeting space, educational materials, mailing support; and
- Abide by MCC policies and procedures.

To learn more about the MCC or to access the membership agreement form to join, visit the MCC website at https://health.maryland.gov/phpa/cancer/cancerplan/pages/collaborative.aspx. You may also visit the MCC on Facebook at https://www.facebook.com/MarylandCancerCollaborative/

WHAT IS THE MARYLAND COMPREHENSIVE CANCER CONTROL PLAN (CANCER PLAN)?

Each year, thousands of Marylanders are diagnosed with invasive cancer, and countless family members, friends, and co-workers support these patients through their journeys. While the death rate from cancer in the United States has steadily declined since its peak in 1991, cancer continues to be the second leading cause of death in the United States and in Maryland, behind heart disease.[14] For both males and females aged 45 to 64 years, cancer is the leading cause of death.[15]

Comprehensive cancer control is a strategic approach that involves communities and partners working together, combining resources, and coordinating efforts to maximize impact in controlling cancer. This includes:

- Reducing risk;
- Detecting cancers early;
- Improving treatment; and
- Enhancing survivorship.

The U.S. Centers for Disease Control and Prevention (CDC) provides funding, guidance, and technical assistance to 50 states, the District of Columbia, seven tribes and tribal organizations, and eight U.S. territories and freely associated states through the National Comprehensive Cancer Control Program (NCCCP). The NCCCP helps local cancer control coalitions implement effective and sustainable plans to prevent and control cancer, which includes the creation and implementation of a Comprehensive Cancer Control Plan.

WHAT IS THE PURPOSE OF THE CANCER PLAN?

The Cancer Plan serves as a guide for professionals who are involved in planning, directing, implementing, evaluating, or performing research on cancer control in Maryland. It is also a resource for all Marylanders (e.g., individuals and families, health care providers, communities, and organizations) on cancer control topics.

HOW WAS THE CANCER PLAN DEVELOPED?

The Cancer Plan represents the coordinated efforts of the MDH as well as 36 public and private stakeholders from across the state. MDH used the 2021-2025 Cancer Plan as a starting point for revisions, and development of the 2026-2030 Cancer Plan occurred in phases:

1. MDH engaged subject matter experts to review and update the 2021-2025 Cancer Plan.
2. The updated Cancer Plan was presented to partner stakeholders who reviewed and provided feedback.
3. MDH incorporated partner feedback.
4. The revised Cancer Plan was presented to partner stakeholders and the general public for additional comments.
5. MDH finalized the Cancer Plan in the fall of 2025.

[14] American Cancer Society. Cancer Facts & Figures 2024. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2024/2024-cancer-facts-and-figures-acs.pdf. Accessed June 15, 2025.
[15] Ahmad FB, Cisewski JA, Anderson RN. Mortality in the United States — Provisional Data, 2023. MMWR Morb Mortal Wkly Rep 2024;73:677–681. DOI: http://dx.doi.org/10.15585/mmwr.mm7331a1. Accessed June 15, 2025.

The 2026-2030 Cancer Plan continues to focus on goals, objectives, and strategies to promote implementation and provides consolidated, cross-cutting content and topic areas.

Objectives in the Cancer Plan are specific, measurable, attainable, relevant, time-bound (SMART), and based on available data sources. Most objectives are relevant to multiple cancer sites. Strategies in the Cancer Plan are updated from the 2021-2025 Cancer Plan or based on recent evidence, and when possible, are focused on policy, systems, and environmental changes to impact populations versus individuals.

WHO SHOULD USE THE CANCER PLAN?

The Cancer Plan is intended for use by all cancer control professionals throughout the state, including health care providers, public health professionals, academic researchers; representatives of community, nonprofit, advocacy, and business organizations; and members of the public. The goals, objectives, and strategies listed in the Cancer Plan can be tailored to many settings to help guide cancer control activities.

Additionally, the MCC, a statewide coalition of volunteers and organizations that work to implement the Cancer Plan, will review the objectives and strategies and select priority projects to work on in the coming years.

WHAT CAN YOU DO?

Implement, implement, implement! The Cancer Plan aims to foster collaboration and cohesiveness among stakeholders in their shared pursuit of reducing the cancer burden in the state. The plan's goals, objectives, and strategies are ambitious and multifaceted, requiring a collective effort. No single entity can undertake all the necessary actions. Instead, the Cancer Plan serves as a rallying point, encouraging individuals and organizations involved in any area of cancer control to contribute by:

- Selecting and focusing on one or more of the plan's objectives.
- Applying appropriate strategies and resources to address these chosen objectives.
- Actively seeking and capitalizing on opportunities for meaningful engagement.

By working together, we can leverage our collective strengths and resources to make a significant impact on the cancer landscape in Maryland. Examples of what stakeholders can do to reduce the burden of cancer in Maryland include:

Individuals and Families

- Familiarize yourself with the Cancer Plan!
- Take action to reduce your risk of getting cancer (see Section 1).
- Talk to your health care provider about cancer screenings that are right for you.
- Support cancer-related organizations and efforts in the community.
- Advocate for policies that support cancer control.
- Share and take advantage of resources that are available to support cancer survivors.

Local Health Departments and Community Organizations

- Use the Cancer Plan as a guide when selecting and planning cancer control initiatives.
- Promote wellness initiatives and events that promote preventive behaviors and offer early detection opportunities.
- Advocate for policies, programs, and funding that support cancer control.
- Share resources that are available to support cancer survivors.

Health Care Providers

- Be aware of the comprehensive cancer control planning efforts in Maryland.
- Educate patients about preventive behaviors, early detection, clinical trials, and survivorship resources.
- Participate in community cancer control efforts and work toward the elimination of disparities in underserved populations.
- Report cancer cases, as directed by Maryland law, to the Maryland Cancer Registry.
- Advocate for policies that support cancer control.
- Share resources that are available to support cancer survivors.

Academic and Other Cancer Researchers

- Use the Cancer Plan as a guide when selecting and planning cancer control research efforts.
- Distribute research findings, for which evidence is sufficient, widely to other cancer control stakeholders in Maryland.

The Cancer Plan's goal is to encourage collaboration and cohesiveness among stakeholders as they work toward reducing the burden of cancer in Maryland.

KEY TERMS AND ACRONYMS USED IN THE CANCER PLAN

Several cancer and surveillance terms are used throughout the Cancer Plan. Acronyms are also used to refer to various organizations, departments, offices, programs, and data collection and surveillance systems. A list of the most commonly used terms is provided below; please refer to the chart on page 20 for acronym references.

Age-Adjustment

Age is the most important risk factor for the incidence of most cancers. Cancer rates derived from populations that differ in underlying age structure are not comparable. Age-adjustment is a statistical technique that allows for the comparison of rates among populations having different age distributions by weighting the age-specific rates in each population to one standard population.

Age-Specific Rate

The total number of events occurring in a specified age or age group in a definitive geographic region (state, county, etc.) divided by the total population of the same age or age group in the same geographic region during a specified time period, usually one year.

Cancer

A collection of diseases in which abnormal cells divide without control and can spread to nearby tissues and other parts of the body through the blood and lymph systems.

Carcinogen

Any substance that causes cancer.

Health Care Provider

A health professional who delivers health care services. Providers may include doctors (e.g., internists, family physicians, pediatricians, oncologists, and surgeons), nurse practitioners, physician assistants, and dentists.

Incidence

The number of newly diagnosed cases during a specific time period. Cancer incidence rates in the Cancer Plan are the number of cases diagnosed per 100,000 population and reported for one year (e.g., 2021) or as the average annual incidence rate for several aggregated years (usually five years, e.g., 2017 through 2021).

In situ

In its original place. When cancer is “in situ,” abnormal cells are found only in the place where they first formed. At some point, these cells may become cancerous and spread into nearby normal tissue.

Malignant

A term used to describe cancer. A malignant tumor is a tumor that has the ability to invade nearby tissue and spread to other parts of the body.

Morbidity

A disease or the incidence of disease within a population. Morbidity also refers to adverse effects caused by a disease or treatment of disease.

Mortality

The number of deaths during a specific time period. Cancer mortality rates in the Cancer Plan are the number of deaths per 100,000 population and are reported for one year (e.g., 2021) or as the average annual rate for several aggregated years (usually five years e.g., 2017 through 2021).

Primary Prevention

Action taken to decrease the chance of getting a disease or condition. Primary prevention of cancer includes avoiding risk factors (such as smoking, obesity, lack of exercise, radiation exposure, sun and ultraviolet radiation exposure), increasing protective factors (such as getting regular physical activity, staying at a healthy weight, having a healthy diet, getting vaccinated against cancer-causing viruses), and having early pre-cancers removed before they become invasive.

Rate

An estimate of the burden of a given disease on a defined population in a specified period of time. A crude rate is calculated by dividing the number of cases or deaths by the population at risk during a given time period. Cancer incidence and mortality rates are usually presented per 100,000 population during a defined time period. All rates in the Cancer Plan are either age-specific or age-adjusted using the method described above.

Risk Factor

A characteristic, condition, or behavior that may increase the chance of developing disease. Examples of risk factors for cancer include age, a family history of certain cancers, use of tobacco products, certain eating habits, obesity, lack of exercise, exposure to the sun or other radiation, exposure to other cancer-causing agents at work or at home, and certain genetic changes.

Screening

A test to look for cancer before symptoms are present. Screening involves the use of a variety of tests and medical equipment to look for cancer or pre-cancer, such as mammograms to screen for breast cancer and colonoscopies to screen for colorectal cancer.

Stage

The extent of a cancer in the body. 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 such as the lungs, liver, bones, or brain. The stage at diagnosis information used in the Cancer Plan is based on the Surveillance, Epidemiology, and End Results (SEER) Summary Stage Guidelines:

- **In situ**: The cancerous cells have not invaded the tissue basement membranes. In situ cancers are not considered malignant (with the exception of bladder cancers) and are not included in incidence rate calculations.
- **Localized**: The tumor is confined to the organ of origin.
- **Regional**: The tumor has spread to adjacent organs or tissue. Regional lymph nodes may also be involved.
- **Distant**: The tumor has spread beyond the adjacent organs or tissues. Distant lymph nodes, organs, and/or tissues may also be involved.
- **Unstaged**: Refers to a cancer case where there is insufficient information available to determine the stage of the disease. Also, a tumor can be precancerous.

Survivor

An individual living with, through, or beyond cancer from the moment of diagnosis through the rest of life.

Survival Rate

The percentage of people in a study or treatment group who are alive for a given period of time after diagnosis. The Cancer Plan generally presents five-year survival rates.

Tumor

An abnormal mass of tissue that develops when cells grow and divide more than they should or do not die when they should. Tumors may be benign (not cancer) or malignant (cancer).

Cancer Plan Acronyms

ACA	Patient Protection and Affordable Care Act, or Affordable Care Act for short
ACIP	Advisory Committee on Immunization Practices
ACS	American Cancer Society
ASCO	American Society of Clinical Oncology
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CDC WONDER	CDC Wide-Ranging Online Data for Epidemiologic Research
CoC	American College of Surgeons Commission on Cancer
CRF	Maryland Cigarette Restitution Fund
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
HP 2030	Healthy People 2030
MCR	Maryland Cancer Registry
MDE	Maryland Department of the Environment

MDH	Maryland Department of Health
NCCN	National Comprehensive Cancer Network
NCHS	CDC's National Center for Health Statistics
NCI	National Cancer Institute
NIS	National Immunization Survey
SNAP & SNAP-Ed	Supplemental Nutrition Assistance Program & SNAP Education
USDA	United States Department of Agriculture
USPSTF	United States Preventive Services Task Force
US SEER & SEER*Stat	NCI's Surveillance, Epidemiology, and End Results Program & SEER Statistical Software
YRBS/YTS	Youth Risk Behavior Survey/Youth Tobacco Survey

SURVEILLANCE AND CANCER DATA USED IN THE CANCER PLAN

Public health surveillance is the ongoing, systematic collection, analysis, and interpretation of health data, essential to the planning, implementation, and evaluation of public health practice, and closely integrated with the dissemination of these data to those who need to know. Cancer surveillance includes the collection of data on the occurrence of cancer (incidence), cancer deaths (mortality), risk factors for the development of cancer (e.g. smoking, overweight, ultraviolet radiation exposure), cancer screening behaviors (e.g. the use of mammography, colonoscopy, and Pap and/or HPV tests), and diagnostic and treatment services. A well-functioning cancer surveillance system transforms complete, timely, and high-quality data into information that is easily accessible to those who use it to prevent and control the disease.

In Maryland, there are several programs and surveys that collect, store, and disseminate data related to cancer, and these sources are referenced throughout the Cancer Plan. The main sources of state-level cancer data are summarized below, with additional data sources available online at phpa.health.maryland.gov/cancer/Pages/surv_data-reports.aspx.

MARYLAND CANCER REGISTRY (MCR)

MDH manages the MCR, which collects and maintains confidential data on all reportable cancers diagnosed or treated in Maryland residents. Within six months after a diagnosis of invasive and in situ cancer (excluding basal and squamous skin cancer of non-genital sites), information about the individual and the cancer must be reported to the MCR by hospitals, radiation therapy centers, ambulatory care centers, laboratories, and/or physicians. Cases among Maryland residents diagnosed or treated outside of Maryland are reported through interstate data exchange agreements with other registries.

CDC WONDER

CDC WONDER is an online, menu-driven system that makes CDC information resources available to public health professionals and the public at large. It permits access to statistical research data published by CDC, as well as reference materials, reports, and guidelines on health-related topics. For this Cancer Plan, data on both national and Maryland-specific mortality rates across all types of cancers were obtained through this system.

BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

MDH conducts a statewide BRFSS survey each year, which collects data from adults ages 18 and older on many health-related risk factors, the use of preventive services, and prevalence of chronic diseases, including cancer. BRFSS collects data on tobacco use, nutritional habits, cancer screening behaviors, cancer survivorship, and many other topics related to cancer.

YOUTH RISK BEHAVIOR SURVEY/YOUTH TOBACCO SURVEY (YRBS/YTS)

MDH conducts the YRBS/YTS, which is a combination of the YRBS and the previous YTS. The YRBS/YTS collects data on a broad range of youth tobacco and other risk behaviors among both middle and high school youth from randomly selected schools and classrooms across the state.

Cancer data can be used to support population-based research, which can identify trends and drive progress in cancer prevention, detection, diagnosis, treatment, and quality of life. Enhanced research into cancer risk factors, etiology, outcomes, and knowledge, attitudes, and behaviors of the public and of providers is needed. Section 2 further discusses the importance of cancer research.

SPECIAL TOPICS IN CANCER CONTROL

ACCESS TO HEALTH CARE

Health insurance coverage helps patients access affordable, quality health care. Lack of adequate coverage makes it difficult for people to get the health care they need, and when they do get care, they can be faced with large medical bills. Uninsured people are:[16]

- More likely to have a poor health status
- Less likely to receive medical care
- More likely to be diagnosed later
- More likely to die prematurely

Access to health care is vitally important for optimal cancer prevention, early detection, and treatment. A major study of health insurance and cancer outcomes, led by the American Cancer Society, shows an association between health insurance status and screening, stage at diagnosis, and survival.[17] The study finds substantial evidence that uninsured Americans are less likely to get screened for cancer, more likely to be diagnosed with an advanced stage of the disease, and less likely to survive that diagnosis than people with private insurance. Recent research from the American Cancer Society indicates that advancements in cancer treatment, such as the introduction of immunotherapy drugs, have unfortunately widened the survival gap between privately insured and uninsured patients with certain advanced cancers, underscoring the critical link between insurance status and access to life-saving care.[18] Uninsured cancer patients are at greater risk of being diagnosed with a relatively more advanced, late-stage cancer due to delays in cancer diagnosis. The uninsured are also at increased risk of financial hardship from cancer treatment.[19]

In 2010, the Patient Protection and Affordable Care Act (ACA) put into place comprehensive health insurance reforms, including several notable provisions that make cancer prevention, screening, diagnosis, and treatment more accessible. These include:

- Expanding Medicaid eligibility for adults.
- Establishing health insurance marketplaces for individuals and small businesses to purchase health insurance plans.
- Requiring health insurance plans in marketplaces to cover essential benefits, including cancer screening, treatment, and follow-up care.
- Prohibiting insurers from refusing to provide health insurance coverage based on a pre-existing condition.
- Offering tax credits to low- and moderate-income families and small businesses to make health insurance more affordable.
- Making many recommended preventive services available at no cost through most plans.

Maryland's health insurance marketplace, Maryland Health Connection, became operational in 2013. Open enrollment is available each fall, with enrollment also available at other times of the year under certain circumstances. A total of 249,603 people enrolled in private plans through Maryland Health

[16] U.S. Department of Health and Human Services. Healthy People 2030. https://odphp.health.gov/healthypeople. Accessed December 12, 2024

[17] Zhao, J., Han, X., Nogueira, L., Fedewa, S.A., Jemal, A., Halpern, M.T. and Yabroff, K.R. (2022), Health insurance status and cancer stage at diagnosis and survival in the United States. CA A Cancer J Clin. https://doi.org/10.3322/caac.21732. Accessed June 15, 2025.

[18] Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2024. CA Cancer J Clin. 2024;74(1):12-49. doi:10.3322/caac.21820.

[19] National Cancer Institute (NCI). The Costs of Cancer Among Uninsured People. Fight Cancer. https://www.fightcancer.org/costs-cancer. Accessed June 15, 2025.

Connection during the 2024 open enrollment period for coverage.[20] In addition, 1,161,480 Marylanders were enrolled in Medicaid in 2024, the government insurance program for low-income individuals, which helped reduce the number of uninsured people in the state to approximately 6%.[21] See the Maryland Health Connection website for details: www.marylandhealthconnection.gov.

Many newly insured Marylanders may not be aware of the cancer prevention and screening services that are available through their health insurance plan, or of the importance of these services. Health care systems and medical providers are in a strong position to ensure that patients are informed about and take advantage of health insurance benefits by discussing United States Preventive Services Task Force (USPSTF) guidelines with patients and recommending appropriate services.

Preventive services, including cancer preventive services and screenings with a USPSTF A or B recommendation, are now available at no cost through most health insurance plans. These recommendations are included throughout the Cancer Plan, both in the narrative content of each section and in the strategies. The complete list of USPSTF A and B recommendations is available online: https://www.uspreventiveservicestaskforce.org/uspstf/recommendation-topics/uspstf-a-and-b-recommendations. All health insurance plans differ, and patients should contact their insurer for details about coverage and out-of-pocket costs, including co-payments, deductibles, and coinsurance.

CANCER DISPARITIES AND CANCER EQUITY

Healthy People 2030 (HP 2030) defines health disparities as differences in health closely linked to social, economic, and environmental disadvantages[22]. These disparities adversely affect groups who have systematically encountered greater obstacles to health due to factors such as race or ethnicity, religion, socioeconomic status, gender, age, mental health, disabilities, sexual orientation, gender identity, geographic location, and other characteristics historically associated with discrimination or exclusion.[23] Such differences may manifest as higher disease incidence, earlier disease onset, increased mortality rates, decreased life expectancy, and a heavier overall disease burden. While not all variations in cancer rates constitute disparities as defined by HP 2030, data indicates that many Marylanders from these vulnerable populations, defined by socioeconomic status, race or ethnicity, geographic location, or sexual orientation, lack the same opportunities to make choices that promote long, healthy lives.

Disparities in cancer risk (incidence) are commonly due to differences in the prevalence of the causes of cancer.[24] The leading cause of cancer is tobacco use.[25] Energy imbalance (consumption of too many calories, not burning calories off through exercise, and storage of the excess caloric energy through obesity) is the second leading cause of cancer in the U.S. Energy imbalance is an increasing influence on cancer incidence.[26] Other causes of cancer include alcohol abuse, infectious diseases such as

[20] Maryland Health Connection. Data Report January 31, 2025. https://www.marylandhbe.com/wp-content/uploads/2025/02/Executive-Report-as-of-01.31.25.pdf. Accessed May 19, 2025.
[21] America's Health Rankings. United Health Foundation. Uninsured in Maryland. https://www.americashealthrankings.org/explore/measures/HealthInsurance/MD. Accessed June 15, 2025.
[22] Office of Disease Prevention and Health Promotion. Healthy People 2030. U.S. Department of Health and Human Services. https://odphp.health.gov/healthypeople/priority-areas/social-determinants-health. Accessed June 13, 2025.
[23] U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Disparities. Healthy People 2030. https://odphp.health.gov/healthypeople/objectives-and-data/about-disparities-data. Accessed October 28, 2024.
[24] National Cancer Institute. Cancer Disparities. https://www.cancer.gov/about-cancer/understanding/disparities. Accessed March 6, 2025.
[25] National Cancer Institute. Tobacco. https://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco. Accessed March 6, 2025.
[26] World Cancer Research Fund/American Institute for Cancer Research. (2020). Continuous Update Project Expert Report 2020. https://doi.org/10.1093/jn/nxz268. Accessed June 15, 2025.

hepatitis B, hepatitis C, HPV, and the human immunodeficiency virus. Certain environmental and occupational exposures also cause cancer.[27]

Disparities in cancer death rates (mortality) are also due to barriers in accessing effective health services, early detection, and high-quality medical treatment, as well as challenges in adhering to care.[28]

Social Determinants of Health

HP 2030 defines social determinants of health (SDOH) as the conditions in the environments where people are born, live, learn, work, play, worship, and age, which significantly impact health, functioning, and quality-of-life outcomes and risks. In essence, variations in SDOH influence individuals' exposure to unhealthy environments and behaviors, potentially leading to disproportionate cancer rates within populations. SDOH can be categorized into five key domains: education access and quality, health care access and quality, economic stability, neighborhood and built environment, and social and community context. (Figure 1) Resources associated with these domains include safe and affordable housing, high-quality education, nutritious food options, accessible health care and emergency services, and environments free from harmful toxins, with opportunities for safe physical activity.[29] Evidence suggests that social determinants of health have a far greater impact on health disparities than biological factors alone.[30]

Figure 1. 5 Domains of Social Determinants of Health

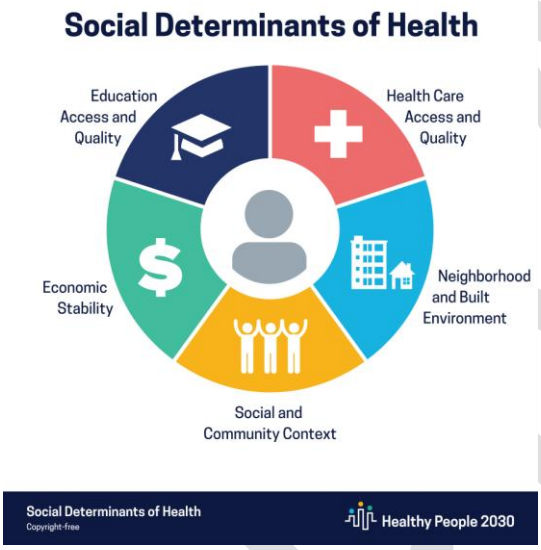


Table 1 provides specific examples of each social determinant of health with precipitating unhealthy exposures and behaviors.

[27] World Health Organization. Fact sheet: Cancer. https://www.who.int/news-room/fact-sheets/detail/cancer. Accessed March 6, 2025.
[28] American Cancer Society. The State of Cancer Disparities in the United States. https://www.cancer.org/research/acs-research-highlights/cancer-health-disparities-research/state-of-cancer-disparities-in-the-united-states.html. Accessed March 6, 2025.
[29] Healthy People 2030, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. shttps://odphp.health.gov/healthypeople/objectives-and-data/social-determinants-health. Accessed March 6, 2025.
[30] World Health Organization. A Conceptual Framework for Action on the Social Determinants of Health. https://www.who.int/publications/i/item/9789241500852. Accessed October 28, 2024.

Table 1. Example of social determinants of health and precipitating unhealthy exposure and behaviors

SOCIAL DETERMINANTS OF HEALTH	
Type	**Examples**
Neighborhood and Built Environment	Limited access to and cost of healthy fruits and vegetables
	Unhealthy air and water pollution Exposure to radon
Social and Community Context	Social and community norms Cigarette smoking Unhealthy eating habits and obesity
Health Care Access and Quality	Lack of health insurance; limited access to care, challenges with adherence to care
	Medical providers with poor skills in cultural competency*
Economic Stability	Availability of opportunity and resources Racial injustice Unemployment
Education Access and Quality	Access to high-quality educational opportunities

*Unconscious, unintentional, or implicit biases among health care providers and public health professionals can significantly affect patient communication, the quality of care, and ultimately, health outcomes. These biases may lead providers to hold differing expectations for patients from disadvantaged backgrounds, defined by factors such as race, ethnicity, income, and education, which can, in turn, shape patient expectations and behaviors, contributing to health disparities.[31] In an effort to combat these issues, the Association of Cancer Care Centers and the American Society of Clinical Oncology developed the "Just Ask™" program, which aims to train health care providers on the

[31] Dimarco R, Guinigundo AS, Valdueza C: Uncovering and addressing Implicit Bias in Oncology. J Adv Pract Oncol 2023 Apr 1;14(3):195–199. doi: 10.6004/jadpro.2023.14.3.3.

influence of implicit bias in clinical trial discussions.[32] This program comprises interactive modules that cover essential concepts, such as diversity, equity, and health disparities, utilizing clinical vignettes that illustrate real-world examples of implicit bias. It also provides strategies for mitigating disparities within cancer research settings.

Another web-based training series developed by the Prevention Institute's Health Equity and Prevention Primer (HEPP) and designed for public health practitioners and advocates focuses on advancing health safety and equity through policy advocacy, community transformation, and multi-sector collaboration. The series consists of seven interactive modules, each offering presentations developed by state and local health departments and recognized nationally by health equity experts.[33]

Cancer Disparities in Maryland

Disparities in cancer incidence, mortality, and screening rates are experienced across many population groups in Maryland, including racial and ethnic minorities; individuals living in Baltimore City, rural, and other geographic areas of the state; and the uninsured.[34] See Section 2 of the Cancer Plan for data on differences and/or disparities in cancer rates. While the availability of data for cancer disparities by language, disabilities, and sexual orientation is not consistently available in Maryland, studies done nationally and in other states have shown that they exist.[35,36,37]

Race and ethnicity

Racial and ethnic minorities are more likely to be socioeconomically disadvantaged, suffer from racial injustice, live in substandard housing, and have less access to high-quality health care. In Maryland, as of 2020, racial and ethnic minorities represented 51.3% of the population. It is estimated that the Black or African American population made up 29.4% of the total population; the Asian population made up 6.8%; the American Indian and Alaska Native population made up 0.5%; the Native Hawaiian and Other Pacific Islander population made up <0.1%; and the Hispanic population made up 11.8%.[38]

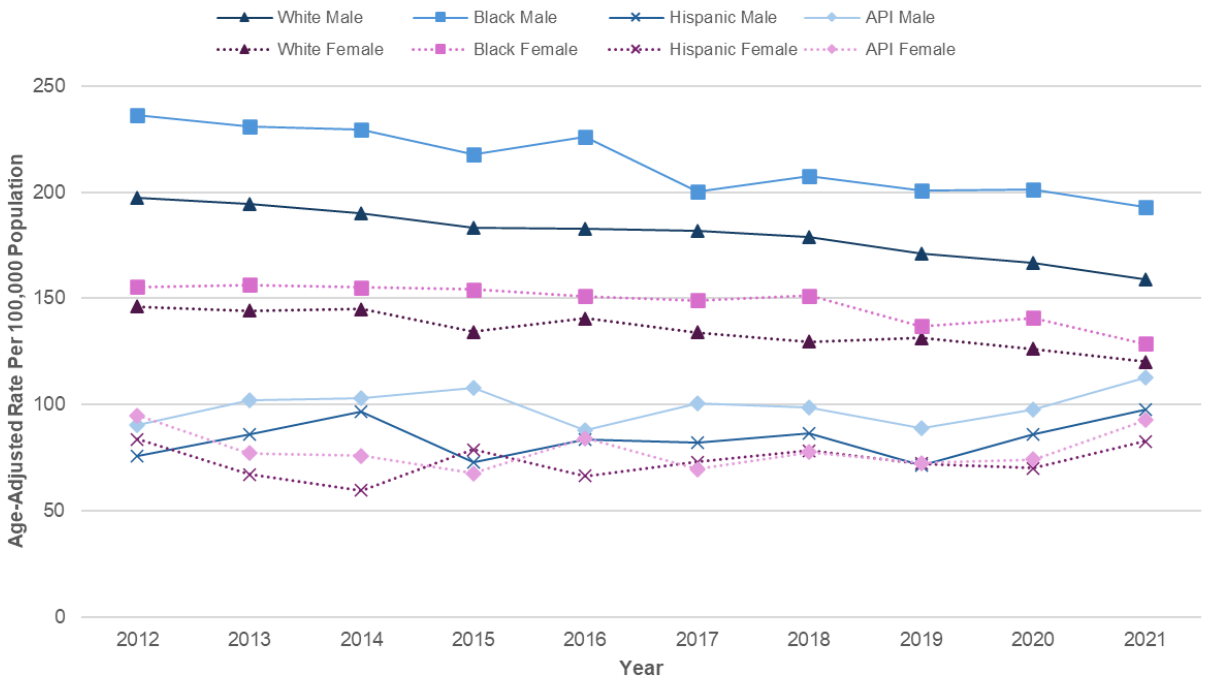
Black men and women have higher cancer mortality rates than their White counterparts. Black men continued to have the highest overall cancer mortality rate among both sexes and racial groups over the last ten years in Maryland (Figure 2). Over the past 20 years, the mortality rate has been declining in all races, and the Black – White mortality disparity has been getting smaller. Figure 2 also demonstrates a difference in mortality rates between men and women, with men having higher cancer incidence and mortality rates, although this may not represent a disparity as defined by HP 2030.

Black or African American individuals in Maryland had the highest overall cancer incidence and

[32] Association of Cancer Care Centers. Just Ask™: Increasing Diversity in Cancer Clinical Research. https://www.accc-cancer.org/home/attend/event-template/2022/07/25/on-demand/just-ask-increasing-diversity-in-cancer-clinical-research. Accessed October 31, 2024.
[33] Prevention Institute. Health Equity and Prevention Primer. https://www.preventioninstitute.org/tools/tools-general/health-equity-toolkit. Accessed October 29, 2024.
[34] Maryland Department of Health, 2022 Cancer Report: Cigarette Restitution Fund Program, Prevention and Health Promotion Administration, Cancer and Chronic Disease Bureau, Center for Cancer Prevention and Control, Dec 2024.
[35] Clarke TC, Endeshaw M, Duran D, Saraiya M. Breast Cancer Screening Among Women by Nativity, Birthplace, and Length of Time in the United States. National Center for Health Statistics October 9, 2019. https://pubmed.ncbi.nlm.nih.gov/31751203/. Accessed November 1, 2024.
[36] Khan M, Patel G, Srivastava S, Carter J, et al. (2019). Looking at Cancer Health Disparities Without the Colored Lenses. Cancer Health Disparities. 3. e1-e9. 10.9777/chd.2019.1004.
[37] Steele CB, Townsend JS, Courtney-Long EA, Young, M. Cancer Screening Prevalence Among Adults with Disabilities, United States, 2013. Preventing Chronic Disease 2017;14:160312
[38] U.S. Census Bureau. American Community Survey, 5-Year Population Estimates, 2009-2022. https://www.census.gov/data/developers/data-sets/acs-5year.html. Accessed November 1, 2024.

mortality rate of any racial or ethnic group, including White individuals in Maryland, during the period 2012 to 2021 (Table 2).*

Figure 2. All Sites Cancer Mortality Rates by Race/Ethnicity and Sex in Maryland, 2012-2021



API: Asian/Pacific Islander
Sources: CDC Wonder data 1999-2020 with Underlying Cause of Death
Maryland Vital Statistics 2021

Table 2. Maryland Cancer Incidence and Mortality by Race and Ethnicity, 2017-2021

2017-2021	Incidence	Mortality
Total Population	**441.6**	**144.8**
White	479.4	146
Black	435.2	162
Hispanic/Latino	269.8	79.9
Asian	273.4	90.4
AI/AN	236.1	66.2

Rates are per 100,000 population per year and age-adjusted to the year 2000 standard.
Sources: Maryland Cancer Registry, SEER*Stat Static data as of January 29, 2024
Maryland Department of Health Vital Statistics Administration

Geographic location

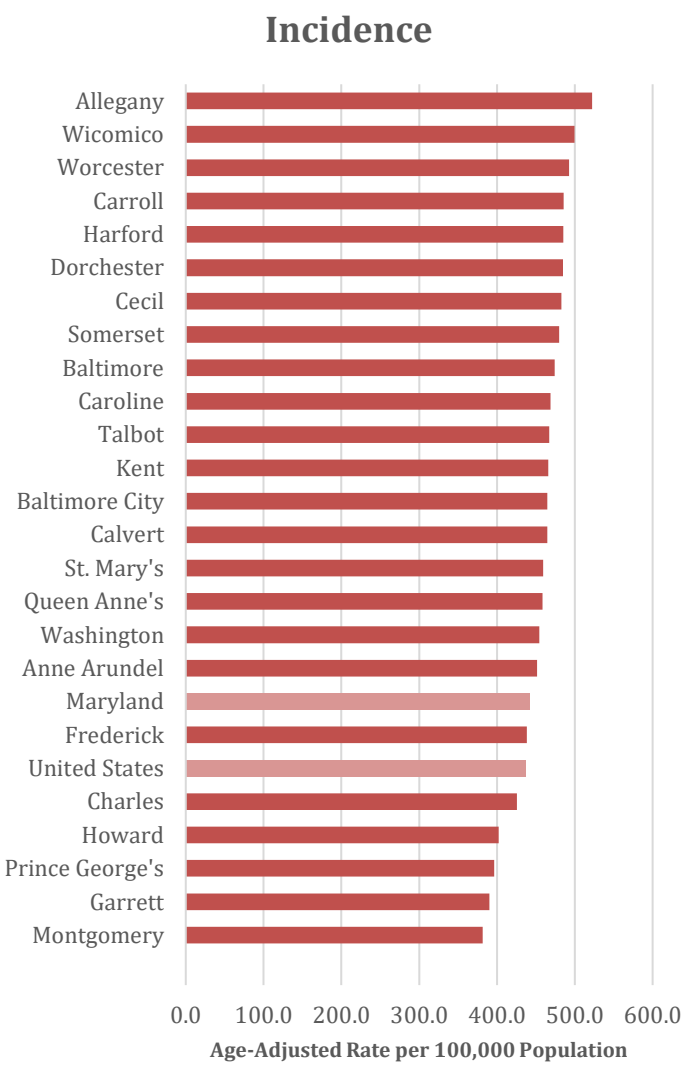
As shown in Figure 3, the cancer mortality rate varies significantly when assessed by region and jurisdiction, varying by almost 2-fold. While cancer control efforts should be spread throughout Maryland, specific cancer control efforts should be intensified in areas of high need. Factors such as distance to travel to get a diagnosis and care can significantly contribute to these disparities.

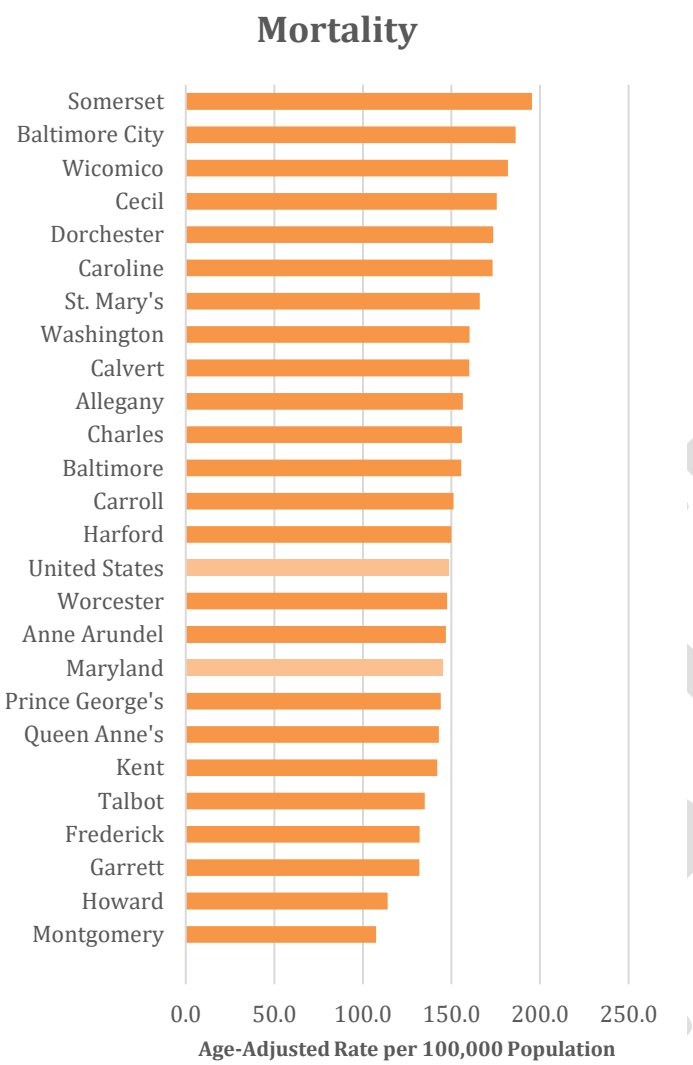
- **Limited access to transportation:** In rural areas or underserved communities, limited access to reliable transportation can pose a significant barrier to timely cancer diagnosis and treatment.
- **Long travel distances:** Individuals residing in remote areas may have to travel long distances to reach cancer centers or specialized health care providers, increasing the burden of travel time and associated costs. Long travel times can also make it challenging to schedule and attend appointments consistently, potentially leading to delays in diagnosis and treatment.

Addressing these transportation-related challenges is crucial for improving cancer outcomes in underserved areas of Maryland.

Figure 3: Maryland's Age-Adjusted All Sites Cancer Incidence and Mortality Rates by Jurisdiction, 2017-2021[39,40]

[39] Maryland Cancer Registry, SEER*Stat Static data as of January 29, 2024.
[40] Maryland Department of Health Vital Statistics Administration.


Incidence
Allegany
Wicomico
Worcester
Carroll
Harford
Dorchester
Cecil
Somerset
Baltimore
Caroline
Talbot
Kent
Baltimore City
Calvert
St. Mary's
Queen Anne's
Washington
Anne Arundel
Maryland
Frederick
United States
Charles
Howard
Prince George's
Garrett
Montgomery
0.0
100.0
200.0
300.0
400.0
500.0
600.0
Age-Adjusted Rate per 100,000 Population



Rates are per 100,000 population per year and age-adjusted to the year 2000 standard.
Sources: Maryland Cancer Registry, SEER*Stat Static data as of January 29, 2024.
Maryland Department of Health Vital Statistics Administration

Health insurance coverage

A higher proportion of Marylanders with health insurance report being up to date with recommended screenings for colorectal, breast, and cervical cancer compared to those without health insurance.[41]

Populations of Concern for Cancer Disparities

In the past, much interest in disparities focused on racial/ethnic differences in outcome—especially Black-White disparities. There is clear differential access to health promotion, disease prevention, early detection, and high-quality medical treatment by race, resulting in poorer outcomes.

[41] Maryland Department of Health. Maryland Behavioral Risk Factor Surveillance System (BRFSS) 2022.

There is a significant correlation between socioeconomic status and cancer. Those with lower income or lower education have higher cancer mortality rates.[42] Approximately two-thirds of Marylanders living below the poverty line are minorities, and a higher proportion of Marylanders living in rural counties live below the poverty line.[43]

There is growing recognition that other groups are also medically underserved and experience poorer health outcomes. Unfortunately, existing databases do not demonstrate these disparities as clearly. Rural Marylanders have greater difficulty accessing health care, both preventive and therapeutic, most often due to distances that must be traveled to see a health care provider. Some of this disparity is also driven by socioeconomic deprivation and issues with cost and affordability of health care.[44]

The lesbian, gay, bisexual, transsexual, queer and questioning (LGBTQ) community, also referred to as sexual minorities, is another group that suffers disparities in health outcomes.[45] Sexual minorities represent 7.1% of the adult U.S. population.[46] They span all races, ethnicities, ages, socioeconomic statuses, and regions of the United States. Sexual minorities are also medically underserved.[47] HP 2030 has several objectives to improve the health and well-being of the LGBTQ community and the objectives focused on cancer include increasing data collection through national surveys and states, increasing the proportion of females who get screened for cervical cancer, reducing current tobacco and alcohol use, and reducing the number of new HIV infections.[48] Sexual minorities appear to have a higher prevalence of smoking, alcohol use, and overweight/obesity, which are factors that increase the risk of cancer and are areas in which public health and health care providers might focus on.[49,50] Surveys show that many sexual minorities underutilize and delay seeking health care. This is often related to

[42] Singh, Gopal K., Jemal, Ahmedin, Socioeconomic and Racial/Ethnic Disparities in Cancer Mortality, Incidence, and Survival in the United States, 1950–2014: Over Six Decades of Changing Patterns and Widening Inequalities, *Journal of Environmental and Public Health*, 2017, 2819372, 19 pages, 2017. https://doi.org/10.1155/2017/2819372

[43] U.S. Census Bureau. American Community Survey, 5-Year Population Estimates, 2009-2022. https://www.census.gov/data/developers/data-sets/acs-5year.html. Accessed October 31, 2024.

[44] Durham, Kristopher S. and Gietzen, Lindsay (2024) "Social Determinants of Health and How They Affect a Small Rural Community (Case Study) Eastern Shore of Maryland," *Pacific Journal of Health*: Vol. 7: Iss. 1, Article 22. DOI: https://doi.org/10.56031/2576-215X.1080

[45] Lampe NM, Barbee H, Tran NM, Bastow S, McKay T: Health Disparities Among Lesbian, Gay, Bisexual, Transgender, and Queer Older Adults: A Structural Competency Approach. Int J Aging Hum Dev. 2023 25: 98(1): 39-55.

[46] LGBT Identification in U.S. Ticks up to 7.1%. https://news.gallup.com/poll/389792/lgbt-identification-ticks-up.aspx. Accessed October 31, 2024.

[47] Baptiste-Roberts K, Oranuba E, Werts N, Edwards LV. Addressing Health Care Disparities Among Sexual Minorities. Obstet Gynecol Clin North Am. 2017 Mar;44(1):71-80. doi: 10.1016/j.ogc.2016.11.003. PMID: 28160894; PMCID: PMC5444328.

[48] U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2030: Lesbian, Gay, Bisexual, and Transgender Health (LGBT): https://odphp.health.gov/healthypeople/objectives-and-data/browse-objectives/lgbt. Accessed November 1, 2024.

[49] Quinn GP, Sanchez JA, Sutton SK, et al. Cancer and Lesbian, Gay, Bisexual, Transgender/Transsexual, and Queer/Questioning (LGBTQ) Populations. CA Cancer J Clin. 2015;65(5):384–400. doi:10.3322/caac.21288.

[50] American Cancer Society: Lesbian, Gay, Bisexual, Transgender*, Queer (LGBTQ) People with Cancer Fact Sheet. https://moqc.org/wp-content/uploads/ACS-LGBTQ-Fact-sheet.pdf. Accessed November 1, 2024.

concerns about discrimination and stigma.[51,52,53] The common perception of a barrier to health care access demonstrates the need for culturally competent health care providers and welcoming health care systems. Indeed, health care providers need to focus on providing a safe environment for LGBTQ-friendly services.

By some estimates, as many as one in five U.S. adults has a physical disability.[54] Disabilities in mobility and cognition are the most common. People with disabilities also experience significant disparities in cancer outcomes. Disparities in the receipt of care, both preventive and therapeutic, have been noted.[55,56] The causes include access barriers such as transportation, as well as the perception of prejudice on the part of the health care provider. Again, the health care provider having cultural competence and providing a safe, welcoming environment are important.

Immigrants are also at an increased risk of some cancers because of the risk factors they are exposed to in their countries of origin. Some are less likely to access needed care due to language and cultural barriers to cancer screening and cancer care.[57] Additionally, health issues and potentially carcinogenic exposures (including sun and pesticide exposure) in the migrant worker population in Maryland are an emerging public health concern.

Interventions and Promising Practices to Eliminate Cancer Disparities

Literature suggests that any efforts to reduce or eliminate cancer disparities without addressing social issues such as poverty, culture, and social injustice are unlikely to be successful.[58] Important factors for the success of interventions to eliminate cancer disparities include:

- Conducting a needs assessment to define specific areas of concentration prior to implementing an intervention.
- Improving data collection, analysis, and reporting that focuses on and tracks results for disadvantaged subpopulations.
- Using intensive recruitment and follow-up methods, specifically targeting disadvantaged populations.

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[51] Baptiste-Roberts, Kesha & Oranuba, Ebele & Werts, Niya & Edwards, Lorece. (2017). Addressing Health Care Disparities Among Sexual Minorities. Obstetrics and Gynecology Clinics of North America. 44. 71-80. 10.1016/j.ogc.2016.11.003.

[52] Seelman KL, Colón-Diaz MJP, LeCroix RH, Xavier-Brier M, Kattari L. Transgender Noninclusive Healthcare and Delaying Care Because of Fear: Connections to General Health and Mental Health Among Transgender Adults. Transgend Health. 2017;2(1):17–28. Published 2017 Feb 1. doi:10.1089/trgh.2016.0024.

[53] LaVeist TA, Isaac LA, Williams KP. Mistrust of Health Care Organizations is Associated with Underutilization of Health Services. Health Serv Res. 2009;44(6):2093–2105. doi:10.1111/j.1475-6773.2009.01017.x.

[54] Courtney-Long EA, Carroll DD, Zhang QC, Stevens AC, Griffin-Blake S, Armour BS, et al. Prevalence of Disability and Disability Type Among Adults — United States, 2013. MMWR Morb Mortal Wkly Rep 2015;64(29):777–83.

[55] Steele CB, Townsend JS, Courtney-Long EA, Young M. Prevalence of Cancer Screening Among Adults with Disabilities, United States, 2013. Preventing Chronic Disease. 2017 Jan 26;14.

[56] Horner-Johnson W, Dobbertin K, Lee JC, Andresen EM; Expert Panel on Disability and Health Disparities. Disparities in Health Care Access and Receipt of Preventive Services by Disability Type: Analysis of the Medical Expenditure Panel Survey. Health Serv Res 2014;49(6):1980–99.

[57] Alcaraz K, Wiedt T, Daniels E, Yabroff R, Guerra C, Wender R. (2019). Understanding and Addressing Social Determinants to Advance Cancer Health Equity in the United States: A Blueprint for Practice, Research, and Policy. CA: A Cancer Journal for Clinicians. 70. 10.3322/caac.21586.

[58] American Association for Cancer Research. AACR Cancer Disparities Progress Report (2024). Understanding and Addressing Drivers of Cancer Disparities. https://cancerprogressreport.aacr.org/disparities/cdpr24-contents/cdpr24-understanding-and-addressing-drivers-of-cancer-disparities/. Accessed March 31, 2025.

- Ensuring community commitment and input, and full involvement in planning from community members, leaders, and stakeholders.
- Educating community members, leaders, and stakeholders on how to advocate for interventions, programs, and policies.
- Ensuring that the intervention is culturally competent by assuring the use of culturally competent intervention staff and educational materials.
- Ensuring adequate diversity of the intervention staff and workforce.
- Employing the use of multidisciplinary teams and multiple strategies.
- Deploying intervention elements that seek to mitigate the harmful effects of adverse social determinants of health. Community Health Worker (CHW) interventions are particularly promising for this purpose.
- Providing resources that allow the intervention to be sustainable.

The opportunities presented by health care access and the challenges around cancer disparities are addressed throughout the Cancer Plan. Section 2 takes a closer look at disparities in cancer incidence, mortality, and screening rates in Maryland.

Literature suggests that any efforts to reduce or eliminate cancer disparities without addressing social issues such as poverty, culture, and social injustice are unlikely to be successful.

CANCER AND MENTAL HEALTH

Understanding the Emotional Impact of Cancer
Cancer diagnosis and treatment profoundly affect patients, often triggering a range of psychological responses. Addressing these emotional impacts is essential for comprehensive care. While the physical toll of cancer is well recognized, the emotional burden can be equally significant, affecting a patient's quality of life and overall well-being.

The Psychological Toll: Emotional Responses to Cancer
Patients with cancer can face a variety of emotions throughout their cancer journey. Each individual experiences their diagnosis and treatment in unique ways, and it is normal to experience changes in emotional health. Emotional responses may fluctuate based on the stage of illness, treatment outcomes, and personal factors, and often include both negative and positive emotions. Negative emotions may include distress, fear, anxiety, depression, and grief, while positive emotions may include greater life appreciation and meaning, enhanced self-esteem, heightened spirituality, benefit-finding, or greater feelings of peacefulness and purposefulness. Evidence suggests that distress and growth are not mutually exclusive but rather can be experienced concurrently throughout the cancer experience.[59]

Coping Mechanisms
Effective coping strategies are essential for managing the emotional and psychological toll of cancer. Dealing with and coping with cancer looks different for everyone, but for many, it becomes a way of life. Several approaches can be beneficial in helping patients process their emotions and maintain mental health during the cancer experience. See "Tips for Managing Mental Health" after a cancer diagnosis from Georgetown University's School of Nursing for examples of coping strategies, available at https://online.nursing.georgetown.edu/blog/cancer-mental-health/.

Barriers to Mental Health Care in Patients with Cancer
While mental health care is a critical component of cancer care, there are several barriers that prevent patients from accessing necessary psychological support. Cancer, anxiety, and depression share common symptoms, including fatigue, sleep difficulties, and changes in appetite. This overlap can make it challenging to recognize mental health concerns in patients with cancer. In addition, because individuals with cancer are a group that regularly face threats to their physical well-being, differentiating between a "normal" reaction to cancer diagnosis and treatment versus signs of a

[59] Andrykowski MA, Lykins E, Floyd A. Psychological health in cancer survivors. Semin Oncol Nurs. 2008 Aug;24(3):193-201. doi: 10.1016/j.soncn.2008.05.007. PMID: 18687265; PMCID: PMC3321244.

possible mental health condition can be challenging.[60] Stigma around mental health, limited access to mental health care, and financial constraints are additional barriers to mental health care in people with cancer. Only a relatively small percentage of people with cancer actively seek mental health care, with estimates ranging from 25%-35%.[61]

Supporting a Loved One with Cancer
Supporting a loved one through a cancer diagnosis can be both challenging and rewarding. Whether offering emotional or practical support, caregivers play a crucial role in the well-being of cancer patients. It is essential to strike a balance between supporting loved ones and taking care of oneself as a caregiver to ensure sustainable, compassionate care throughout the cancer journey.

Offering Emotional and Practical Support
When a family member or friend is diagnosed with cancer, offering emotional and practical support can make a significant difference in their experience. The emotional impact of cancer can be overwhelming, but there are meaningful ways to provide comfort and assistance during such a critical time. Simply being present for a loved one, listening without judgment, and offering empathy are powerful ways to provide emotional support. It's important to acknowledge the person's feelings of fear, anger, or grief without trying to "fix" the situation or deny or discount any negative feelings they share.

Offering help with practical needs, such as cooking, household chores, transportation to and from treatment appointments, or childcare, can also significantly ease a patient's burden. Coordinating care calendars or organizing a support network with friends and family members ensures that no one person is overburdened, and the patient feels supported in multiple ways.

Emotional Toll of Caring for a Patient with Cancer
Caring for a loved one with cancer can have a profound emotional impact on caregivers. Common reactions include anger, grief, guilt, anxiety, depression, and loneliness.[62] The emotional and practical toll of caring for a patient with cancer may make caregivers more likely to experience burnout.
It is important to be aware of possible signs of caregiver burnout when caring for a patient with cancer. Changes in mood, increased anger or frustration toward the patient, exhaustion that makes completing daily tasks challenging, health problems, concentration difficulties, sleep concerns, and social withdrawal may be signs of burnout and may signify a need to get additional support.

Self-Care for Caregivers
The role of a caregiver is demanding, making self-care an essential component to sustaining long-term caregiving. Without proper self-care, caregivers risk burnout, which can ultimately affect their ability to provide support.

- **Prioritize Mental Health**: Caregivers may seek emotional support through therapy, support groups, or counseling services specifically designed for caregivers of cancer patients. Regular check-ins with a mental health professional can provide a safe space to process emotions and manage stress.
- **Set Boundaries**: While caregiving is an act of love, it's essential to set boundaries to avoid exhaustion. Caregivers can aim to communicate their limits and delegate tasks when possible, ensuring they have time for rest and personal care.
- **Express feelings**: It is important to take time and space to cope with the various challenges that caregivers face. Caregivers are not required to be happy and cheerful all the time. Give permission to notice sadness or feel upset.

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[60] Mental Health Alliance. Cancer and Mental Health. https://www.mhanational.org/cancer-and-mental-health. Accesses November 1, 2024.
[61] Fernando A, Tokell M, Ishak Y, Love J, Klammer M, Koh M. Mental health needs in cancer - a call for change. Future Healthc J. 2023 Jul;10(2):112-116. doi: 10.7861/fhj.2023-0059. PMID: 37786642; PMCID: PMC10540791.
[62] Gérain, P., & Zech, E. (2022). A harmful care: The association of informal caregiver burnout with depression, subjective health, and violence. Journal of interpersonal violence, 37(11-12), NP9738-NP9762.

- **Engage in Self-Care Practices**: Engaging in regular physical activity, maintaining a healthy diet, practicing mindfulness or meditation, and ensuring adequate sleep are all vital aspects of self-care. Taking time to recharge allows caregivers to remain resilient and more present for their loved ones. Practicing letting go of mistakes, focusing on what matters most, and giving oneself grace are other self-care strategies.

Caregivers are essential to the cancer journey, providing critical emotional and practical support. However, without proper care for themselves, they risk physical and emotional exhaustion. It is crucial to recognize the needs of caregivers and to ensure that support systems are in place for them as well.

Resources for Caregivers

1. National Cancer Institute. **Emotional support for cancer patients**. https://www.cancer.gov/about-cancer/coping
2. Cancer Care. **Resources for patients and caregivers.** https://www.cancercare.org/
3. American Cancer Society. **Resources for patients and caregivers**. https://www.cancer.org/support-programs-and-services.html
4. American Psychological Association. **Stress and Anxiety in Caregivers.** https://www.apa.org/pi/about/publications/caregivers/resources
5. National Cancer Institute. **Support for Caregivers**. https://www.cancer.gov/publications/patient-education/when-someone-you-love-is-treated.pdf

Cancer and Body Image

Cancer treatment may involve chemotherapy, radiation therapy, or surgery. Each of these treatments can impact a patient's physical abilities and appearance, leading to functional limitations and decreased self-confidence related to body image. Reconstructive surgery seeks to improve patients' quality of life by restoring the structures and functions that have been affected by cancer.

The Physical Impact of Cancer

Chemotherapy, radiation therapy, and surgery can all alter a patient's physical function and appearance. Hair loss is one of the most common and noticeable effects of chemotherapy, but these medications may also cause skin and nail changes, weight fluctuations, and numbness and pain in the hands and feet.[63] Radiation therapy may cause skin dryness, itching, or darkening and may impact deeper structures like blood vessels and fat.[64] Physical changes caused by surgery may or may not be obvious, depending on the type and location of cancer; however, all surgeries can cause scars or damage to nearby structures.[65] Tumors that are large, affect bones, or are closer to the skin may result in more obvious physical changes. Surgeons may need to remove an entire body part (e.g., breast, leg, jaw) to remove all the cancer. These physical changes often have a profound psychological impact, leading to emotional distress, anxiety, depression, and a loss of self-esteem as patients struggle with an altered body image.[66] Despite these risks, improvements in chemotherapy, radiation therapy, and surgery have improved outcomes for patients with many types of cancer.[67]

Reconstruction

The goal of reconstructive surgery is to restore the structures and functions that have been affected by cancer, thereby improving patients' quality of life. Reconstruction is performed after the cancer has

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[63] American Cancer Society. Chemotherapy Side Effects. May 1, 2020. https://www.cancer.org/cancer/managing-cancer/treatment-types/chemotherapy/chemotherapy-side-effects.html. Accessed November 13, 2024.

[64] American Cancer Society. Side Effects of Radiation Therapy. December 10, 2020. https://www.cancer.org/cancer/managing-cancer/treatment-types/radiation/effects-on-different-parts-of-body.html. Accessed November 13, 2024.

[65] American Cancer Society. How Surgery Is Used for Cancer | Curative Surgery. September 10, 2024.. https://www.cancer.org/cancer/managing-cancer/treatment-types/surgery/how-surgery-is-used-for-cancer.html. Accessed November 13, 2024

[66] National Cancer Institute. Emotions and Cancer. https://www.cancer.gov/about-cancer/coping/feelings. Accessed August 7, 2025.

[67] Tonorezos E, Devasia T, Mariotto AB, et al. Prevalence of cancer survivors in the United States. JNCI J Natl Cancer Inst. 2024;116(11):1784-1790. doi:10.1093/jnci/djae135.

been removed, and it can be achieved in many ways. Small tumors with minor surgical changes may be reconstructed by moving nearby skin over the wound. Larger tumors and surgical changes, however, may require plastic and reconstructive surgeons to perform more advanced techniques. Surgeons may move skin, fat, muscle, or bone from one part of the body to another to replace the structure that was affected by cancer. Surgeons may also use implants to improve the strength or shape of the reconstructed body part. The techniques used depend on the size, type, and location of the cancer, but the goal is to create a structure that appears and functions like the body part that was removed.

Evidence suggests that reconstruction improves patients' physical function, satisfaction with body image, and overall quality of life, and reconstructive surgery is an important component of treatment for cancer patients.[68,69] Nevertheless, access to board-certified plastic and reconstructive surgeons is limited, and there are disparities in the types of reconstruction available to patients belonging to marginalized communities.[70,71]

Role of Reconstruction Post-Cancer: An Example
The female breast plays a central role in body image and is often linked to societal and personal notions of femininity. Given the significant psychological impact of breast cancer, reconstruction is an important avenue to restore the sense of self-image and confidence. It offers patients a sense of "normality," and allows them to view their bodies without being constantly reminded of their disease.[72] Studies have shown that undergoing reconstruction after mastectomy can improve mental health, with patients experiencing reduced anxiety and depression, as well as improved self-esteem, body image, and feelings of attractiveness.[73] While breast reconstruction is not a guaranteed solution to address the psychological and emotional consequences of cancer for every patient, offering the option is essential to ensure comprehensive post-oncologic care.[74]

ADVANCE CARE PLANNING

Advance care planning (ACP) is a process of communication that allows a person to make decisions about what health care they would want if they could not communicate. At its best, this process should allow individuals to share their goals, values, and wishes, and receive information from health care providers about the health and treatment decisions they can make. Often, these conversations lead to the creation of documents to capture the individual's wishes, such as an advance directive, health-care agent, or Medical Order for Life Sustaining Treatment (MOLST).

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[68] Zehra S, Doyle F, Barry M, Walsh S, Kell MR. Health-related quality of life following breast reconstruction compared to total mastectomy and breast-conserving surgery among breast cancer survivors: a systematic review and meta-analysis. Breast Cancer. 2020;27(4):534-566. doi:10.1007/s12282-020-01076-1.
[69] Davudov MM, Harirchi I, Arabkheradmand A, et al. Evaluation of quality of life in patients with oral cancer after mandibular resection: Comparing no reconstruction, reconstruction with plate, and reconstruction with flap. Medicine (Baltimore). 2019;98(41):e17431. doi:10.1097/MD.0000000000017431.
[70] Moore T, Nees D, Jacobsen S, et al. Health Inequities in the Epidemiology, Diagnosis, Treatment, and Outcomes of Plastic Surgery: A Scoping Review. Plast Surg. Published online November 3, 2023:22925503231210878. doi:10.1177/22925503231210878.
[71] Bauder AR, Sarik JR, Butler PD, et al. Geographic Variation in Access to Plastic Surgeons. Ann Plast Surg. 2016;76(2):238. doi:10.1097/SAP.0000000000000651
[72] Pittermann A, Radtke C. Psychological Aspects of Breast Reconstruction after Breast Cancer. Breast Care (Basel). 2019 Oct;14(5):298-301. doi: 10.1159/000503024. Epub 2019 Sep 24. PMID: 31798389; PMCID: PMC6883458.
[73] Roy N, Downes MH, Ibelli T, Amakiri UO, Li T, Tebha SS, Balija TM, Schnur JB, Montgomery GH, Henderson PW. The psychological impacts of post-mastectomy breast reconstruction: a systematic review. Ann Breast Surg. 2024 Jun 30;8:19. doi: 10.21037/abs-23-33. Epub 2023 Nov 10. PMID: 39100730; PMCID: PMC11296521.
[74] Harcourt DM, Rumsey NJ, Ambler NR, et al. The psychological effect of mastectomy with or without breast reconstruction: a prospective, multicenter study. Plast Reconstr Surg. 2003;111(3):1060-1068. doi:10.1097/01.PRS.0000046249.33122.76.

ACP aims to increase the self-determination an individual has over their health care experiences. By documenting acceptable care, it also reduces the burden on caregivers to make decisions for their loved one without a roadmap. Documented ACP increases the likelihood that an individual will die in the place they choose, and decreases the likelihood that they will receive unwanted care. ACP benefits adults at any age or stage of wellness or illness. However, in the United States, many adults arrive at a serious diagnosis without an advance care plan in place.

ACP Documents

Marylanders can use any advance directive form, including those created by faith-based groups, estate planners and lawyers, and forms created and stored online (electronic advance directives) – all of which can be personalized, as needed. Maryland has prioritized expanding access to electronic advance directives, which can be retrieved by health care providers at the point of care, increasing opportunities for a variety of providers to share understanding of an individual's wishes, and the likelihood that those wishes will be followed. The most common ACP documents are:

Advance Directive: a legal document that directs preferences for life-sustaining treatments in a future time when an individual can no longer communicate *and* they are in an irreversible (incurable) condition.

Health Care Agent: sometimes called a surrogate decision-maker, or health care power of attorney, this individual is designated to make health care decisions when an individual is unable to do so.

MOLST: medical orders that are effective as soon as a provider signs them. While an advance directive outlines choices about potential future care, MOLST creates orders to direct acceptable care in the present, particularly for emergencies.

Making the Most of ACP

Ideally, ACP occurs even before a serious diagnosis, in a supportive ecosystem that includes individuals, health care systems, and policy makers. What follows are actions that leverage the benefits of advance care planning conversations and documents.

Individuals and Families

Sometimes, the individual may be the person to start advance care planning conversations with their health care providers.

- Have conversations about health, illness, health care, and values with family members
- Access resources to learn about and create advance directives. More information can be found at https://health.maryland.gov/phpa/ccdb/ADP/Pages/Home.aspx
- Ask health care providers about advance care planning
- After designating a health care agent and making documents, let loved ones know about the decisions

Community-Based Organizations

Increasingly, ACP is viewed as a public health issue, given its potential to prevent unnecessary suffering and to support an individual's health care decisions and preferences.[75] Studies are showing the benefits

[75] Prince-Paul, M., DiFranco, E. (2017) Upstreaming and normalizing advance care planning conversations – a public health approach. Behav Sci. 2017 Apr 12;7(2):18

of engaging Community Health Workers (CHWs) in decreasing longstanding gaps, delays, and hurdles in advance care planning completion.[76,77]

- Promote advance care planning education and efforts
- Train CHWs to facilitate ACP conversations and help individuals complete documents

Health Care Providers

Professional oncology organizations have long emphasized early advance care planning as a critical component of optimal palliative care, as reflected in the National Comprehensive Cancer Network (NCCN) guidelines as early as 2001.[78] Research from ASCO reveals that while advance care planning billing codes are used more broadly by cancer-related specialists than in 2016, overall rates remain low.[79] These lagging rates may be explained by a reluctance to have conversations perceived to diminish hope. However, research shows ACP can increase the feeling of hope in cancer patients, possibly tied to an increased sense of self-determination.[80]

- Implement standard workflows to facilitate ACP as a routine element of care provision, before diagnosis, early in diagnosis, and throughout the progression of care
- Normalize ACP as a health care conversation
- Engage support roles like social workers and navigators in ACP efforts[81]
- Utilize technology to ensure ACP documents are available to health information exchanges

Policy Makers

ACP thrives in the relationships between patients and providers, providers and systems, and systems and power structures.[82] A robust ACP ecosystem requires policies that support individuals' rights to communicate and advance the expectation that a person's documented ACP must be prioritized in care, both as an intervention of care and in leading decisions when that person cannot communicate.

- Ensure that ACP legislation removes burdens and hurdles to individuals expressing and recording their directives
- Support legislation that holds health care systems accountable for activating and following advance care plans
- Design legislation to promote technology standards for ACP accessibility at local, state, and national levels

ACP functions best as a collaboration between individuals, loved ones, and the health care system, and represents a powerful mechanism for centering the voice and wishes of an individual in their health care.

[76] Tan, M. M. et al (2023) Advance care planning with Black women with breast cancer: A community health worker model. Cancer Control. 2023 Jan-Dec:30:10732748231162479

[77] Patel, M. (2022). Effect of a community health worker intervention on acute care use, advance care planning, and patient-reported outcomes among adults with advanced stages of cancer. JAMA Oncol. 2022 Jun 30;8(8):1139-1148

[78] Walling, AM et al. (2024) NCCN Guidelines ®: Palliative Care, Version 1.2024. 2024:43-46

[79] Wang, N. (2024) Trends in the providers' uptake of advance care planning from 2016 to 2021. J Clin Oncol 42, 2024 (16;1538)

[80] Cohen, M. et al (2022) Hope and advance care planning in advanced cancer: Is there a relationship? Cancer. 2022 Mar 15;128(6):1339-1345.

[81] Marcouiller, N. et al. (2024) Improving advance care planning outcomes through social work and provider collaboration. JCO Oncol Pract 20, 2024 (10,55).

[82] Johnson, S. et al. (2016) Advance Care Planning for Cancer Patients: A Systematic Review of Perceptions and Experiences of Patients, Families, and Healthcare Providers. Psycho-Oncology, 25: 362–386.

SECTION 1

PRIMARY PREVENTION OF CANCER

PRIMARY PREVENTION OF CANCER

Primary prevention is action taken to decrease the chance of getting a disease or condition. Cancer prevention continues to be a priority for public health practitioners and health care providers in Maryland. This section focuses on risk factors where healthy behaviors may prevent or lower the risk of cancer.

One's risk for developing and dying from cancer may be reduced by maintaining a healthy weight (eating a healthy diet and being physically active), preventing or stopping tobacco use, getting vaccinated to prevent certain types of cancer, limiting alcohol use, and avoiding excessive exposure to ultraviolet rays from the sun and tanning beds.[83] Table 3 summarizes estimates of the proportion of cancer deaths attributable to various risk factors, many of which are modifiable.

Table 3. Proportion of Cancer Cases Attributable to Potentially Modifiable Risk Factors in the U.S.

RISK FACTOR	ESTIMATE
Cigarette Smoking	19.0%
Excess Body Weight	7.8%
Alcohol	5.6%
UV Radiation	4.7%
Physical Inactivity	2.9%
Low Fruit/Vegetable Intake	1.9%
HPV Infection	1.8%

Source: Islami F, Goding Sauer A, Miller KD, Siegel RL, Fedewa SA, et. al. Proportion and Number of Cancer Cases and Deaths Attributable to Potentially Modifiable Risk Factors in the United States. CA Cancer J Clin 2018 Jan;68(1):31-54.

TOBACCO USE

THIS SECTION REFERS TO COMMERCIAL TOBACCO USE (CIGARETTES, CIGARS, SMOKELESS TOBACCO, AND ELECTRONIC SMOKING DEVICES), NOT THE SACRED AND TRADITIONAL USE OF TOBACCO BY SOME AMERICAN INDIAN CULTURES

Tobacco use remains the number one cause of preventable death and disease in the U.S. Nearly 36 million U.S. adults still smoke combustible tobacco products, and about 2.8 million middle and high

[83] American Cancer Society. Cancer Facts & Figures 2024. Atlanta: American Cancer Society; 2024. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2024/2024-cancer-facts-and-figures-acs.pdf. Accessed May 24, 2025.

school students use at least one tobacco product, including e-cigarettes, placing their health at risk.[84,85] Each year, nearly half a million Americans die prematurely of smoking or exposure to secondhand smoke.[86] Another 16 million live with a serious illness caused by smoking.[87] The U.S. Surgeon General's 2014 Report on the Health Consequences of Smoking links tobacco use to Type 2 diabetes, rheumatoid arthritis, respiratory and cardiovascular diseases, stroke, and more than 15 different types of cancers, including cancer of the oral cavity and pharynx, larynx, liver, lung, bronchus, trachea, stomach, colon, rectum, cervix, esophagus, bladder, kidney, pancreas, and blood.[88,89]

Approximately 80% to 90% of all lung cancer deaths in the U.S. are linked to smoking.[90] Lung and bronchus cancers are the leading causes of cancer deaths in both men and women in Maryland, responsible for 2,246 deaths in 2023.[91] Furthermore, there are disparities in tobacco-related cancers, including diagnosis and treatment. In Maryland, 24.6% of lung cancer cases are diagnosed at an early stage among Black Marylanders, which is significantly lower than the rate of 27.9% among White Marylanders; however, 19.3% of Black Marylanders with lung cancer did not receive any treatment, which is significantly higher than the rate of 17.4% among White Marylanders.[92]

The U.S. Surgeon General's 2020 Report on Smoking Cessation demonstrates that quitting tobacco use can dramatically decrease the risk of 12 tobacco-related cancers.[93] Increasing both the number of Marylanders who have never smoked a cigarette (or used other tobacco products, such as cigars, chew, snuff, snus, pipe) and the number of tobacco users who quit and remain tobacco-free reduces avoidable death and suffering due to tobacco-related diseases. Lung cancer screening is recommended for adults who are at high risk for developing the disease because of their smoking history (20 packs per year or more) and age (50 to 80 years old). For those diagnosed with cancer, treating tobacco use leads to improvement in cancer treatment outcomes, as well as decreased

[84] Centers for Disease Control and Prevention. Tobacco Product Use Among Adults—United States, 2021. *MMWR Morb Mortal Wkly Rep*. 2024;72(18). https://www.cdc.gov/mmwr/volumes/72/wr/mm7218a1.htm. Accessed May 24, 2025.
[85] Centers for Disease Control and Prevention. Tobacco Product Use Among U.S. Middle and High School Students—National Youth Tobacco Survey, 2023. *MMWR Morb Mortal Wkly Rep*. 2024;72(44). https://www.cdc.gov/mmwr/volumes/72/wr/mm7244a1.htm. Accessed May 24, 2025.
[86] Centers for Disease Control and Prevention. Chronic Disease Indicators - Tobacco. https://www.cdc.gov/cdi/indicator-definitions/tobacco.html. Accessed May 24, 2025.
[87] Centers for Disease Control and Prevention. About Health Effects of Cigarette Smoking. https://www.cdc.gov/tobacco/about/index.html. Accessed May 24, 2025.
[88] U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014. https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf. Accessed May 24, 2025.
[89] U.S. Department of Health and Human Services. Smoking Cessation. A Report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2020.https://www.hhs.gov/sites/default/files/2020-cessation-sgr-full-report.pdf. Accessed May 24, 2025.
[90] Centers for Disease Control and Prevention, Lung Cancer Risk Factors. https://www.cdc.gov/lung-cancer/risk-factors/index.html. Accessed May 24, 2025.
[91] Centers for Disease Control and Prevention. United States Cancer Statistics: Data Visualizations. CDC. https://gis.cdc.gov/Cancer/USCS/#/. Accessed July 15, 2025.
[92] American Lung Association, State of Lung Cancer, Maryland 2023. https://www.lung.org/research/state-of-lung-cancer/states/maryland. Accessed May 24, 2025.
[93] U.S. Department of Health and Human Services. *Smoking Cessation: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General; 2020. https://www.hhs.gov/sites/default/files/2020-cessation-sgr-full-report.pdf. Accessed June 14, 2025.

recurrence. [94] The NCCN recommends rigorous tobacco treatment plans, including counseling, pharmacotherapy, and retreatment as needed, for all tobacco users diagnosed with cancer, as smoking relapse is common.[95]

Implementation of evidence-based tobacco prevention and control strategies, along with enhanced strategies to support tobacco treatment, will help achieve a major reduction in tobacco-related death and disease in Maryland.[96,97]

YOUTH TOBACCO USE

In the 2022-2023 school year (referred to as 2022 data), 15.9% (about 41,000) of Maryland youth reported current tobacco product use, including e-cigarette, or electronic smoking device (ESD) use.* ESDs were by far the most popular tobacco product, followed by little cigars, cigarettes, and smokeless tobacco.[98]

In 2018, the U.S. Surgeon General called the surge in ESD use among youth an epidemic, with national data showing a 78% increase in current youth use between 2017 and 2018.[99] Maryland saw youth ESD use increase at a similar rate — 72.9% between 2016 and 2018.[100] From 2018 to 2022, ESD use among Maryland youth has decreased by 37.8%.[101] Despite this recent decrease, ESD use among youth remains alarmingly high and is still a public health concern. The high level of nicotine, coupled with known and unknown effects of chemicals and other ingredients inhaled, makes ESD use a public health concern. The human brain is not fully developed until 25 to 26 years of age. Introducing nicotine, which is highly addictive, can negatively impact development, including areas of the brain that control learning, mood, attention, and impulse control.[102] The American Lung Association states that inhaling the aerosols from ESDs can cause lung disease and irreversible lung damage due to lung exposure to inhaled toxins.[103] Furthermore, youth who use ESD products are more likely to smoke cigarettes or become addicted to other drugs, as nicotine primes the young brain for addiction.[104]

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[94] U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014. https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf. Accessed May 24, 2025.

[95] National Comprehensive Cancer Network. 2023. Clinical Practice Guidelines in Oncology for Smoking Cessation. https://jnccn.org/view/journals/jnccn/21/3/article-p297.xml?content=pdf-7340. Accessed May 24, 2025.

[96] National Comprehensive Cancer Network. Clinical Practice Guidelines in Oncology for Smoking Cessation. 2023. https://jnccn.org/view/journals/jnccn/21/3/article-p297.xml?content=pdf-7340. Accessed May 24, 2025.

[97] U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014. https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf. Accessed May 24, 2025.

[98] Maryland Department of Health. Youth Risk Behavior Survey/Youth Tobacco Survey, 2022-2023.

[99] Office of the Surgeon General. *Surgeon General's Advisory on E-Cigarette Use Among Youth*. US Dept of Health and Human Services; 2018. https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf. Accessed July 3, 2025.

[100] Maryland Department of Health. Youth Risk Behavior Survey/Youth Tobacco Survey, 2018.

[101] Maryland Department of Health. Youth Risk Behavior Survey/Youth Tobacco Survey, 2021-2022.

[102] Centers for Disease Control and Prevention, Smoking and Tobacco Use, Health Effects of Vaping. https://www.cdc.gov/tobacco/e-cigarettes/health-effects.html. Accessed May 24, 2025.

[103] American Lung Association: The Impact of E-Cigarettes on the Lung. https://www.lung.org/quit-smoking/e-cigarettes-vaping/impact-of-e-cigarettes-on-lung. Accessed May 24, 2025.

[104] U.S. Department of Health and Human Services. *E-Cigarette Use Among Youth and Young Adults: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease

E-cigarettes often come in bright colors and are available in flavors that appeal to youth, like fruit, candy, mint, or menthol. In 2024, 87.6% of youth who used an ESD used a flavoring other than tobacco flavor.[105] Cigars and little cigarillos are also available in a variety of attractive flavors, and these products are sold in single or small packs that are accessible to price-sensitive youth. A common misperception is that ESDs, as well as cigars and smokeless tobacco products, are less harmful than cigarettes; however, they are just as addictive. ESDs release a chemical aerosol (not water vapor), which can include nicotine, acetone, carcinogens, and ultrafine particles that should not be inhaled into the lungs.

**** ESDs, also known as electronic nicotine delivery systems (ENDS), refer to electronic products, such as vapes, vaporizers, vape pens, cartridge and tank systems, and other pod-based, disposable, and refillable devices.***

YOUTH PERCEPTIONS OF TOBACCO USE

MDH measures youth attitudes toward tobacco use in the YRBS/YTS through two questions: "Do you think young people who smoke have more friends?" and "Do you think smoking makes young people 'look cool' or 'fit in'?" Both indicators have been tracked since 2000 for Maryland high school youth reporting "yes" to both questions. Among youth who smoke, the belief that smoking helps youth "fit in" or "look cool" decreased from 37.5% in 2013 to 36.9% in 2022, and the belief that smokers have more friends than nonsmokers increased from 50.7% in 2013 to 56.9% in 2022. Among youth who do not smoke, the belief that smoking helps youth "fit in" or "look cool" decreased from 19.8% in 2013 to 17.4% in 2022 and the belief that smokers have more friends than nonsmokers increased from 36.1% in 2013 to 42.6% in 2022.[106]The abundance of flavors, "techy" and "stealthy" designs, and youthful targeted marketing practices of the industry, coupled with a lack of awareness regarding the nicotine content of these products, likely aided in contributing to the popularity of ESDs as well as some of the false positive perceptions of tobacco use.

YOUTH ACCESS TO TOBACCO PRODUCTS

Federal law requires Maryland retailers to ask for photo identification and verify customer age for everyone who appears to be under 30 years of age.[107] In 2022, 75.9% of high school students reported that they were not asked for photo identification when attempting to purchase tobacco products from a retailer during the past 30 days. Tobacco retailers that did not ask for photo identification were two times more likely to illegally sell cigarettes to youth.[108,109] On October 1, 2019, a new Maryland law raising the minimum legal sales age for tobacco products from 18 to 21 years of age, "Tobacco 21," took effect with the aim to reduce youth access to tobacco and ESD products by delaying the age of experimentation – few smokers start after age 21 – as well as reducing the likelihood of sharing tobacco products through peer networks and keeping tobacco products out of schools. During the 2024 legislative session, the military exemption from Maryland's Tobacco 21 law was removed, thus aligning it

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Control and Prevention; 2016. https://e-cigarettes.surgeongeneral.gov/documents/2016_SGR_ECig_FullReport_Non-508.pdf. Accessed July 3, 2025.

[105] Truth Initiative. *E-cigarettes: facts, stats and regulations*. https://truthinitiative.org/research-resources/emerging-tobacco-products/e-cigarettes-facts-stats-and-regulations. Accessed June 18, 2025.

[106] Maryland Department of Health, Center for Tobacco Prevention and Control, Prevention and Health Promotion Administration. (2022-2023). Maryland Youth Risk Behavior Survey/Youth Tobacco Survey (YRBS/YTS).

[107]Family Smoking Prevention and Tobacco Control Act, Public Law 111-31 (2009); 21 C.F.R. §1140.14

[108] Maryland Department of Health. Youth Risk Behavior Survey/Youth Tobacco Survey, 2021-2022.

[109] Levinson AH, Ma M, Jason LA, et al. Assessment of the US Federal Retailer Violation Rate as an Estimate of the Proportion of Retailers That Illegally Sell Tobacco to Adolescents. JAMA Pediatr. 2018;172(10):966–972. doi:10.1001/jamapediatrics.2018.2038

with the Federal Tobacco 21 law, which has no exemptions for tobacco sales to persons under 21 years old.

OVERALL ADULT TOBACCO USE

More than 776,000 Maryland adults currently use tobacco and ESD products, with cigarettes more popular than any other tobacco product type, followed by ESDs, cigars, smokeless tobacco, and other tobacco products, such as pipes, bidis, kreteks, and hookahs.[110] However, there has been a substantial decrease in current cigarette smoking by Maryland adults since 2011 and more adults are reporting never being a smoker; between 2011 and 2023, there was a 21.1% increase in Maryland adults who reported never being a cigarette smoker (58.3% to 70.6%, respectively).[111] On July 1, 2024, a new Maryland tax increase went into effect, bringing Maryland to the second-highest tax in the nation after New York.[112] Tax rates are $5.00 per pack of cigarettes, 20% sales and use tax for ESDs, and other tobacco products, not including cigars, are 60% of the wholesale price tax.

In 2022, the majority of current smokers in Maryland wanted to quit, with 61.7% having stopped smoking for one day or longer because they were trying to quit.[113] An average of 8 to 11 quit attempts are needed to permanently quit smoking.[114] Clinical Practice Guidelines published in Treating Tobacco Use and Dependence: 2008 Update identifies a list of ten recommendations for providers, insurers, and health systems to aid their clients in ending tobacco dependence; these include access to a Quitline, medications, counseling, and tobacco treatment programs.[115]

Maryland tobacco users who want to quit have several resources to assist them, including the Maryland Tobacco Quitline (1-800-QUIT-NOW), cessation efforts through local health departments, counseling from a health professional or health insurance program, and/or Food and Drug Administration (FDA)-approved smoking tobacco treatment aids (non-nicotine prescription medication, such as bupropion, and/or nicotine replacement therapy (NRT)). In 2022, 38.9% of Maryland adults reported getting help to quit smoking via the Quitline, a tobacco cessation/treatment program, counseling, or medications during their most recent quit attempt.[116]

In Maryland adults, there is a vast disparity in menthol tobacco users among Black, non-Hispanic Marylanders and White Marylanders.[117] In 2023, Black Maryland adults usually used menthol cigarettes significantly more than White Maryland adults (84.4 percent and 34.5 percent, respectively).[118] The addition of menthol makes cigarettes easier to smoke and harder to quit because it creates a cooling effect, which reduces the harshness of cigarette smoke and suppresses coughing. The tobacco industry aggressively markets menthol cigarettes to select populations (e.g., LGTBQ, Black Americans, youth, and women). The menthol taste and odor can also mask the early warning signs of smoking-induced respiratory problems. This leads to menthol tobacco use disparities in the targeted groups.[119]

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[110] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2023.
[111] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2023.
[112] Campaign for Tobacco Free Kids, State Cigarette Excise Tax.
https://assets.tobaccofreekids.org/factsheets/0097.pdf. Accessed May 24, 2025.
[113] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2022
[114] US Department of Health and Human Services. (2001). "Women and Smoking: A Report of the Surgeon General." US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. https://www.ncbi.nlm.nih.gov/books/NBK44303. Accessed May 24, 2025.
[115] Fiore, M. C., Jaen, C. R., Baker, T., et al. (2008). "Treating Tobacco Use and Dependence: 2008 Update." US Department of Health and Human Services. https://www.ncbi.nlm.nih.gov/books/NBK63952. Accessed May 24, 2025.
[116] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2022.
[117] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2023.
[118] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2023.
[119] Centers for Disease Control and Prevention, Menthol Smoking and Related Health Disparities. https://www.cdc.gov/tobacco/menthol-tobacco/health-

EXPOSURE TO SECONDHAND ENVIRONMENTAL SMOKE

Exposure to secondhand environmental smoke and/or thirdhand smoke (residual nicotine and other chemicals left on indoor surfaces by tobacco smoke or aerosols) can occur at home, in the car, or in other indoor locations. There is no risk-free exposure to secondhand smoke; secondhand smoke contains over 50 carcinogens and 7,000 chemicals and causes premature death and disease in youth and adults who do not smoke.[120] Several initiatives, including Maryland's Clean Indoor Air Act (CIAA) and efforts to promote voluntary smoke-free homes, have significantly reduced involuntary indoor exposure to secondhand smoke among nonsmokers. In 2024, revisions to the CIAA prohibited the use of ESDs in the same indoor public areas and workplaces where smoking tobacco products and cannabis are already prohibited, including public transportation; it applies to tobacco, cannabis, and hemp-derived products as well. In addition, it requires businesses and workplaces to post signs indicating where smoking and vaping are prohibited. Currently, 75.5% of youth and 90.3% of adults report not being exposed to secondhand smoke indoors.[121,122] Exposure to secondhand environmental smoke affects individuals across the life span, from fetal development through adulthood. Smoking during pregnancy is harmful to both women and babies because nicotine can travel across the placenta of a pregnant woman and cause spontaneous abortion, pregnancy complications, premature birth, low birth weight, sudden infant death syndrome (SIDS), as well as delayed behavioral, physical, and cognitive development.[123]

Secondhand environmental smoke refers to the complex mixture of emissions released from burning or exhaled tobacco, cannabis, or hemp products, as well as aerosol produced or exhaled by electronic smoking devices (ESDs). This includes sidestream smoke from combustible products and aerosolized chemicals from vapes, e-cigarettes, and other ENDS.

YOUTH AND ADULT TOBACCO-RELATED HEALTH DISPARITIES AND INEQUITIES

Tobacco-related disparities and inequities exist in Maryland youth and adults. The health disparities that result in increased tobacco use rates in some populations compared to others lead to tobacco-related inequities such as higher rates of cancer in certain populations. Identifying the tobacco-related disparities and inequities in Maryland allows for tailored programming and focused outreach to decrease the disparities.

There are many tobacco-related disparities in Maryland when looking at historic tobacco-related disparity demographics and social determinants of health. For example, the number of tobacco retailers per person in Maryland varies by geographic location and are more dense in low income and racial minority neighborhoods. Frederick County, the largest county in Maryland with an area of 660 square miles, has roughly 250 tobacco retailers. In contrast, Baltimore City, covering 92 square miles, is home to approximately 1,200 tobacco retailers. In Maryland, tobacco use disparities are most severe when looking at education, employment, income, and health insurance type in adults.[124] Among Maryland youth, tobacco use disparities are notably higher among those who use alcohol, drugs, or

disparities.html?CDC_AAref_Val=https://www.cdc.gov/tobacco/basic_information/menthol/related-health-disparities.html. Accessed May 24, 2025.

[120] Centers for Disease Control and Prevention. Health problems caused by secondhand smoke. Centers for Disease Control and Prevention. https://www.cdc.gov/tobacco/secondhand-smoke/health.html. Accessed June 14, 2025.

[121] Maryland Department of Health. Youth Risk Behavior Survey/Youth Tobacco Survey, 2022-2023.

[122] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2022.

[123] Centers for Disease Control and Prevention: Substance Use During Pregnancy. https://www.cdc.gov/maternal-infant-health/pregnancy-substance-abuse/index.html#cdc_generic_section_6-tobacco. Accessed May 24, 2025.

[124] Maryland Department of Health. Behavioral Risk Factor Surveillance System, 2023.

cannabis; have experienced adverse childhood experiences (ACEs); face housing instability; or identify with diverse gender identities.[125]

Identified priority populations for tobacco prevention and cessation support in Maryland based on tobacco use disparity data and inequities due to targeted marketing by the tobacco industry include:

1. Youth, with a focus on prevention and education around healthy coping techniques.
    a. Youth who experienced childhood trauma (high ACE score) and are at risk for tobacco initiation.
    b. Youth who are placed at a higher risk (behavioral health factors).
2. Populations with a lack of access to positive social determinants of health, with a focus on upstream approaches through collaboration and partnerships.
    a. Persons who did not pursue higher education and use tobacco.
    b. Persons who are unemployed and use tobacco.
    c. Medicaid and state insurance recipients who use tobacco.
    d. Persons who have low socioeconomic status and use tobacco.
3. Populations disproportionately targeted by the tobacco industry, with a focus on community mobilization and capacity building.
    a. Persons who are: African Americans/Black, Hispanic/Latinx, and American Indians/Alaskan Natives.
    b. Persons who are part of the LGBTQ+ community.
    c. Persons with mental or behavioral health conditions.
        i. Persons who experience substance misuse.
4. Frequent, current or former tobacco users, with a focus on screening for cancer and chronic obstructive pulmonary disorder.
    a. Persons living with disabilities who are/were chronic tobacco users.
    b. Persons living below the poverty line who are/were chronic tobacco users.
    c. Persons who are unemployed and are/were chronic tobacco users.
    d. Persons who served as active military and are/were chronic tobacco users.
    e. Persons living with coronary heart disease, strokes, COPD, and diabetes, who are/were chronic tobacco users.

FUTURE TOPICS IN TOBACCO CONTROL

Levels of ESD use by youth continue to alarm public health officials; continued attention must be focused on the availability of flavored products, disclosure of ingredients and nicotine content, marketing and promotion, cost, and indoor and outdoor locations that permit use of ESDs. Moreover, there is a gap in research regarding methods to assist youth in quitting ESD use. Counseling and behavioral interventions are recommended for youth addicted to nicotine because NRT is not approved for individuals under age 18 without a doctor's approval. Surveillance and research into the short- and long-term health effects of vaping products is ongoing and may inform future policy and programmatic initiatives.

Also important to the future tobacco control landscape is the emergence of new products, including heated tobacco products, sometimes marketed as “heat-not-burn”, and oral nicotine pouches. Heated tobacco products produce an aerosol that contains nicotine, chemicals, additives, and flavorings; however, this is generated by heating tobacco, not liquid nicotine. Public health officials are still learning about the short- and long-term health effects of heated tobacco products; however, the use of any tobacco product, including heated tobacco products, is harmful. Although the FDA granted marketing authority for the IQOS and Eclipse brands of heated tobacco products, the agency emphasized that this does not equate with FDA approval, and there is no safe tobacco product. Oral nicotine pouches, gaining in popularity with brands such as Zyn, On!, and Velo, are placed between the lip and gum, similar to Snus. Unlike Snus’ tobacco leaf, these products contain powders with high concentrations of nicotine. Due to the lack of tobacco leaf, the FDA does not classify them as smokeless

[125] Maryland Department of Health. Youth Risk Behavior Survey/Youth Tobacco Survey, 2022-2023.

tobacco, resulting in weaker regulations and marketing restrictions compared to combustible and smokeless tobacco products.

On July 1, 2023, Maryland legalized recreational marijuana for adults 21 years or older, bringing potential implications on tobacco use rates, successful tobacco cessation, and health effects of dual use of marijuana and tobacco products. The harmful effects of cannabis vary greatly depending on how it is used. Smoking cannabis is the most common consumption method and poses the greatest health risks to users. Cannabis smoke contains many of the same toxic and carcinogenic chemicals found in tobacco smoke, which can damage lung tissue and small blood vessels.[126] Regularly (i.e., weekly or more) smoking cannabis is associated with a greater risk for developing chronic bronchitis and other respiratory problems.[127] Cannabis smokers tend to inhale deeper and hold their breath longer than cigarette smokers, which may exacerbate these pulmonary health risks.[128] While research is still emerging on the long-term health effects, secondhand cannabis smoke exposure is also a concern, given the aforementioned similarities between cannabis and tobacco smoke. In addition, non-cannabis users exposed to secondhand cannabis smoke have tested positive for tetrahydrocannabinol (THC), the psychoactive compound in cannabis that makes users feel "high", in their blood and urine.[129]

Recent cannabis research has yielded some potential health benefits. A comprehensive 2017 report from the National Academies of Science, Engineering, and Medicine found that cannabis is effective for treating some chronic pain, nausea, and vomiting from chemotherapy, and certain multiple sclerosis symptoms.[130] The FDA has approved several cannabis-derived or cannabis-related drug products to manage certain disease symptoms.[131] However, concerns remain over youth access to cannabis products and the negative health impacts of cannabis use. The federal government, including the FDA, has not approved recreational cannabis use.

HEALTHY WEIGHT, NUTRITION, AND PHYSICAL ACTIVITY

[126] Wang X, et al., "One Minute of Marijuana Secondhand Smoke Exposure Substantially Impairs Vascular Endothelial Function," Journal of the American Heart Association, 27 Jul 2016, 5: e003858. https://www.ahajournals.org/doi/10.1161/jaha.116.003858. Accessed May 24, 2025.
[127] Gabrys R and Porath A, "Clearing the Smoke on Cannabis Regular Use and Cognitive Functioning," 2019, Canadian Centre on Substance Use and Addiction. https://www.ccsa.ca/sites/default/files/2019-09/CCSA-Cannabis-Use-Cognitive-Effects-Report-2019-en.pdf. Accessed May 24, 2025.
[128] Murtha L, et al., "Chest CT Findings in Marijuana Smokers," Radiology. 15 Nov 2022, doi:10.1148/radiol.212611. https://pubs.rsna.org/doi/epdf/10.1148/radiol.212611. Accessed May 24, 2025.
[129] Cone EJ, et al., "Non-Smoker Exposure to Secondhand Cannabis Smoke. I. Urine Screening and Confirmation Results," Journal of Analytical Toxicology, Jan 2015, 39(1): 1-12. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4342697/. Accessed May 24, 2025.
[130] Solmi, M., De Toffol, M., Kim, J. Y., Choi, M. J., Stubbs, B., Thompson, T., Firth, J., Miola, A., Croatto, G., Baggio, F., Michelon, S., Ballan, L., Gerdle, B., Monaco, F., Simonato, P., Scocco, P., Ricca, V., Castellini, G., Fornaro, M., Murru, A., ... Dragioti, E. (2023). Balancing risks and benefits of cannabis use: umbrella review of meta-analyses of randomized controlled trials and observational studies. BMJ (Clinical research ed.), 382, e072348. https://doi.org/10.1136/bmj-2022-072348
[131] Food and Drug Administration. FDA Regulation of Cannabis and Cannabis-Derived Products, Including Cannabidiol (CBD). https://www.fda.gov/news-events/public-health-focus/fda-regulation-cannabis-and-cannabis-derived-products-including-cannabidiol-cbd. Accessed May 24, 2025.

An estimated 18% of cancer cases are attributable to the combined effects of excess body weight, alcohol consumption, physical inactivity, and an unhealthy diet.[132] Cancer risk may be reduced through adherence to nutrition and physical activity behavior guidelines.[133]

OVERWEIGHT AND OBESITY

Excess body fat and obesity can increase the risk of certain cancers and are a major health concern in the U.S. Scientific evidence has established clear associations between being overweight or obese and the leading causes of morbidity and mortality in the U.S., including cardiovascular disease, cancer, and diabetes.[134] Obesity results from an energy imbalance, meaning too many calories taken in or too few calories expended in physical activity.

The most common tool to measure overweight and obesity is the Body Mass Index (BMI), which is calculated using height and weight. The CDC adult and youth BMI calculators can be found at the following website: https://www.cdc.gov/bmi/?CDC_AAref_Val=

Adults with a BMI between 25 and 29.9 kg/m^2 are considered overweight, and adults with a BMI of 30 kg/m^2 or higher are considered obese. BMI scores are measured in percentiles by age and sex in children aged two through adolescence.[135] A child with a BMI above the 95th percentile for age and sex is considered obese. A child with a BMI between the 85th and 95th percentile is considered overweight.[136]

Being overweight or obese is associated with increased risk of developing and dying from cancers of the breast (in postmenopausal women), colon, endometrium, esophagus, and kidney. Evidence also indicates that obesity increases the risk for cancers of the gallbladder, prostate, ovary, pancreas, thyroid, and cervix, and for multiple myeloma and Hodgkin lymphoma.[137]

Children and young adults are especially vulnerable to the effects of obesity and being overweight, as being obese or overweight during the period of childhood and growth into adolescence and early adulthood may present a cumulative risk for later adult-onset cancers.[138] Interventions to promote healthy weight and healthy behaviors during these ages are critical.

An estimated 18% of cancer cases are attributable to the combined effects of excess body weight, alcohol consumption, physical inactivity, and an unhealthy diet.

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[132] Islami F, Goding Sauer A, Miller KD, Siegel RL, Fedewa SA, et al. Proportion and Number of Cancer Cases and Deaths Attributable to Potentially Modifiable Risk Factors in the United States. CA Cancer J Clin 2018 Jan; 68(1):31-54.

[133] American Cancer Society. Diet and Physical Activity: What's the Cancer Connection? https://www.cancer.org/cancer/risk-prevention/diet-physical-activity/diet-and-physical-activity.html. Accessed March 31, 2025.

[134] Pati S, Irfan W, Jameel A, Ahmed S, Shahid RK. Obesity and Cancer: A Current Overview of Epidemiology, Pathogenesis, Outcomes, and Management. Cancers (Basel). 2023 Jan 12;15(2): 485. doi: 10.3390/cancers15020485. PMID: 36672434; PMCID: PMC9857053.

[135] Centers for Disease Control and Prevention (US). Child and Teen BMI Categories https://www.cdc.gov/bmi/child-teen-calculator/bmi-categories.html. Accessed May 24, 2025.

[136] Centers for Disease Control and Prevention (US). Child and Teen BMI Categories. https://www.cdc.gov/bmi/child-teen-calculator/bmi-categories.html. Accessed May 24, 2025.

[137] Pati S, Irfan W, Jameel A, Ahmed S, Shahid RK. Obesity and Cancer: A Current Overview of Epidemiology, Pathogenesis, Outcomes and Management. Cancers (Basel). 2023. Jan 12; 15(2): 485. doi: 10.3390/cancers15020485. PMID: 36672434; PMCID: PMC9857053.

[138] Mohammadian Khonsari N, Shahrestanaki E, Ehsani A, Asadi S, Sokoty L, Mohammadpoor Nami S, Hakak-Zargar B, Qorbani M. Association of childhood and adolescence obesity with incidence and mortality of adulthood cancers. A systematic review and meta-analysis. Front Endocrinol (Lausanne). 2023 Jan 19; 14:1069164. doi: 10.3389/fendo.2023.1069164. PMID: 36742402; PMCID: PMC9892178.

NUTRITION

Healthy nutrition habits are important for obesity prevention. Obesity is associated with an increased risk of certain cancers. Consumption of fruits and non-starchy vegetables is often promoted for general health and well-being, as well as prevention of obesity, diabetes, and cardiovascular disease. People whose diets are rich in plant-based foods have a lower risk of getting certain cancers, including mouth, pharynx, larynx, esophagus, stomach, and lung cancer.[139] Foods high in dietary fiber are recommended for obesity prevention and may play a role in cancer risk reduction. Some studies have found that consumption of red meat, processed meat, and salt is associated with a higher risk of certain cancers, including colorectal and stomach.[140]

The U.S. Department of Agriculture (USDA) 2020-2025 Dietary Guidelines recommend dietary patterns that are rich in vegetables, fruit, whole grains, seafood, legumes, and nuts; moderate in low- and non-fat dairy products and alcohol (among adults); lower in red and processed meat; and low in sugar-sweetened foods and beverages and refined grains.[141] Additionally, these dietary recommendations align with recommendations from other groups, including the American Institute for Cancer Research and the American Heart Association.[142,143]

According to the 2021 Maryland BRFSS, 37.1% of Maryland adults reported consuming fruits less than one time daily, and 19.2% of Maryland adults reported consuming vegetables less than one time daily.[144] About 70.7% of Maryland adolescents reported consuming fruits less than one time daily, and 43.2% of Maryland adolescents reported consuming vegetables less than one time daily.[145]

Breastfeeding can also result in cancer prevention. Breastfeeding for a minimum of six months is recommended to reduce the risk of future obesity for the infant, and obesity prevention is important as obesity later in life is associated with an increased risk of certain cancers.[146] An additional benefit of breastfeeding is that it reduces the risk of developing breast cancer in the mother and may provide greater protection against aggressive types of breast tumors.[147]

[139] Cancer Prevention & Early Detection Facts & Figures. 2023 - 2024. https://www.cancer.org/research/cancer-facts-statistics/cancer-prevention-early-detection.html. Accessed May 24, 2025.

[140] Sivasubramanian BP, Dave M, Panchal V, Saifa-Bonsu J, Konka S, Noei F, Nagaraj S, Terpari U, Savani P, Vekaria PH, Samala Venkata V, Manjani L. Comprehensive Review of Red Meat Consumption and the Risk of Cancer. Cureus. 2023 Sep 15;15(9):e45324. doi: 10.7759/cureus.45324. PMID: 37849565; PMCID: PMC10577092.

[141] U.S. Department of Health and Human Services and U.S. Department of Agriculture. Current Dietary Guidelines. Dietary Guidelines for Americans, 2020-2025 and Online Materials. https://www.dietaryguidelines.gov/resources/2020-2025-dietary-guidelines-online-materials. Accessed May 24, 2025.

[142]American Institute for Cancer Research. Healthy Eating: Serving Up Better Health. https://www.aicr.org/cancer-prevention/healthy-eating/. Accessed May 24, 2025.

[143] American Heart Association. The American Heart Association Diet and Lifestyle Recommendations. https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/nutrition-basics/aha-diet-and-lifestyle-recommendations. Accessed May 24, 2025.

[144] Maryland Behavioral Risk Factor Surveillance System, 2023.

[145] Maryland Behavioral Risk Factor Surveillance System, 2023.

[146] Islami F, Liu Y, Jernal A Zhou J, Weiderpass E, et al. Breastfeeding and Breast Cancer Risk by Receptor Status – A Systematic Review and Meta-Analysis. Annals of Oncology, December 2015; 26:2398-2407.

[147] Obeagu EI, Obeagu GU. Exploring the profound link: Breastfeeding's impact on alleviating the burden of breast cancer - A review. Medicine (Baltimore). 2024 Apr 12;103(15):e37695. doi: 10.1097/MD.0000000000037695. PMID: 38608095; PMCID: PMC11018178.

PHYSICAL ACTIVITY

Physical activity is an important determinant of overall health and specifically of cancer risk since physical activity can help maintain a healthy weight and reduce obesity. Evidence supports the role of physical activity in the prevention and reduced risk of many types of cancer including colon, breast, lung, pancreatic, renal, gastric, and endometrial cancers.[148,149,150,151,152] Additionally, sedentary time, or time spent not engaged in physical movement, is linked with an increased risk of cancer incidence and mortality.[153]

Physical activity includes any bodily movement that is done as a part of daily life, including working, playing, exercising, running errands, and recreational activities. Physical activity can be aerobic (e.g. walking, swimming, and biking), muscle-strengthening (e.g. gardening and carrying heavy loads like groceries), and bone-strengthening (e.g. jumping rope and running), and physical activity can also involve balance and flexibility activities or exercises.[154]

Individual recommendations for physical activity are important in cancer prevention and can easily be implemented through lifestyle changes. Physical activity is safe for most people and essential for healthy aging.[155] Preexisting medical conditions, disability, or limitations related to aging should be considered when recommending a physical activity program, but almost everyone can be active in some way.[156]

According to data from 2023, almost one quarter (22.7%) of Marylanders aged 18 years and older reported engaging in no physical activity other than their regular job in the past 30 days. That same

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[148] Patel AV, Freidenreich CM, Moore SC, Hayes SC, Silver JK et al. American College of Sports Medicine Roundtable Report on Physical Activity, Sedentary Behavior, and Cancer Prevention and Control. Medicine & Science in Sports & Exercise. November 2019; 51:2391-2402.

[149] Campbell KL, Winters-Stone KM, Wiskemann J, May AM, Schwartz AL, et al. Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable. Medicine & Science in Sports & Exercise. November 2019; 51:2375-2390.

[150] Schmitz KH, Campbell AM, Stuvier MM, Pinto BM, Schwartz AL., et al. Exercise is Medicine in Oncology: Engaging Clinicians to Help Patients Move Through Cancer. Medicine & Science in Sports & Exercise. November 2019: 51:468-484.

[151] 2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services, 2018. https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf. Accessed April 19, 2020.

[152] Biswas A, Oh PI, Faulkner GE, Bajaj RR, Silver MA, Mitchell MS. Sedentary Time and Its Association with Risk for Disease Incidence, Mortality, and Hospitalization in Adults: A Systematic Review and Meta-Analysis. Ann Intern Med. 2015;162(2):123-132. doi:10.7326/M14-1651.

[153] Islami F, Goding Sauer A, Miller KD, Siegel RL, Fedewa SA, et. Al. Proportion and Number of Cancer Cases and Deaths Attributable to Potentially Modifiable Risk Factors in the United States. CA Cancer J Clin 2018 Jan; 68(1):31-54.

[154] 2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services, 2018. https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf. Accessed November 15, 2019.

[155] Cartee GD, Hepple RT, Bamman MM and Zierath JR. Exercise Promotes Healthy Aging of Skeletal Muscle. Cell Metabolism. June 2016; 23:1034-1047.

[156] 2018 Physical Activity Guidelines Advisory Committee. 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Washington, DC: U.S. Department of Health and Human Services, 2018. https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf. Accessed April 19, 2020.

data showed that men had slightly lower physical inactivity (19.3%) compared to women (25.8%), and people ages 18 to 44 years had lower physical inactivity (19.4%) compared to adults 45 to 64 (21.3%) and those older than 65 (31.5%). Also notable was that those with a college education or more were the least sedentary (13.2%).[157]

According to 2023 Maryland BRFSS data, 59.8% of Maryland adults engage in regular (150+ minutes a week or vigorous equivalent) physical activity each week. A higher proportion of men achieved moderate or vigorous activity levels at 62.9% compared to women at 56.9%.[158]

ALCOHOL CONSUMPTION

Alcohol intake is associated with an increased risk of developing oral cancer (cancer of the lip, oral cavity, and oropharynx), as well as cancer of the pharynx, larynx, breast, esophagus, liver, colon, and rectum.[159] General guidelines advise no more than one drink per day for women and two drinks for men; however, women who drink even a glass or two of alcohol daily have a higher risk of breast cancer.[160,161]

Youth who engage in heavy, episodic drinking are more likely to experience alcohol dependence and multiple dependence episodes in life.[162] The more an individual drinks over their lifetime, the higher the risk of cancer.[163] Tobacco use in combination with excessive drinking appears to promote higher rates of oral and head and neck cancers.[164] Researchers are investigating the exact mechanism connecting alcohol consumption and cancer/tumor growth, as well as potential methods of risk reduction, including the relationship of the B-vitamin folate to alcohol and colon and breast cancer associations.[165] Health care providers should discuss the risks of alcohol consumption with patients and the importance of limiting intake.

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[157] United Health Foundation. Physical Inactivity in Maryland. America's Health Rankings analysis of CDC, Behavioral Risk Factor Surveillance System; 2023. https://www.americashealthrankings.org/explore/measures/Sedentary/MD. Accessed June 14, 2025.
[158] Maryland Department of Health. Physical Activity Among Adults in Maryland, 2023. Maryland Behavioral Risk Factor Surveillance System. https://ibis.health.maryland.gov/ibisph-view/query/builder/brfss23/PAStAe1/Crude.html. Accessed June 14, 2025.
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[162] Maimaris W., McCambridge J. Age of First Drinking and Adult Alcohol Problems: Systematic Review of Prospective Cohort Studies. J Epidemiol Community Health 2014:68:268-74
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[165]American Cancer Society. Alcohol and Cancer. https://www.cancer.org/cancer/risk-prevention/diet-physical-activity/alcohol-use-and-cancer.html. Accessed June 15, 2025.

INFECTIONS AND CANCER PREVENTION VACCINES

Infectious agents have been estimated to cause 15% of all cancer cases globally.[166] Infectious agents that have been linked to various types of cancer include HPV, hepatitis B and C, Epstein-Barr virus, and *Helicobacter pylori*.[167]

Cancer vaccines can be preventive (prophylactic) vaccines, which prevent the development of cancer in healthy people, or treatment vaccines, which treat cancer that has already developed by boosting the body's immune system against that cancer. Preventive vaccines are currently used to prevent the development of certain cervical, genital, and anal, head and necks cancers (caused by the HPV) and hepatocellular carcinoma (caused by the hepatitis B virus).[168]

VACCINES TO PREVENT HUMAN PAPILLOMAVIRUS INFECTION

Over 100 HPV types have been identified, with infection from at least 14 types linked to cancer.[169,170] HPV types 16 and 18 are responsible for approximately 66% of all cervical cancer cases, and HPV infection (mainly with HPV type 16 and 18) is thought to cause 90% of anal cancers; 71% of oropharyngeal cancers; and 71% of vulvar, vaginal, or penile cancers.[171,172,173,174]

Vaccination is an important public health measure to lower the risk of most cervical, genital, and anal cancers that are caused by HPV. Three HPV vaccines are licensed for use in the US by the FDA: Gardasil® (Merck, 4vHPV), Cervarix® (GlaxoSmithKline, 2vHPV), and Gardasil 9® (Merck, 9vHPV). All three vaccines protect against HPV types 16 and 18, and it is recommended that HPV vaccines are given

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[166] Brown HE, Dennis LK, Lauro P, Jain P, Pelley E, et al. Emerging Evidence for Infectious Causes of Cancer in the United States. Epidemiologic Reviews. https://doi.org/10.1093/epirev/mxz003. Accessed June 15, 2025.
[167] National Cancer Institute. Cancer Prevention Overview (PDQ). http://www.cancer.gov/about-cancer/causes-prevention/hp-prevention-overview-pdq#section/_1. Accessed May 24, 2025.
[168] Centers for Disease Control and Prevention. Cancer Prevention and Control: Vaccines (Shots). https://www.cdc.gov/cancer/prevention/vaccination.html. Accessed November 17, 2019.
[169] World Health Organization. Human Papillomavirus (HPV) and Cervical Ca. 24 January 2019. https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer. Accessed May 24, 2025.
[170] National Cancer Institute. HPV and Cancer. http://www.cancer.gov/cancertopics/causes-prevention/risk-factors/infectious-agents/hpv-fact-sheet. Accessed May 24, 2025.
[171] World Health Organization. Human Papillomavirus (HPV) and Cervical Ca. 24 January 2019. https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer. Accessed May 24, 2025.
[172] K.P. Maniar, R. Nayar. HPV-Related Squamous Neoplasia of the Lower Anogenital Tract: An Update and Review of Recent Guidelines Adv Anat Pathol, 21 (2014), pp. 341-348, 10.1097/PAP.0000000000000035.
[173] Kreimer AR, Bhatia RK, Messeguer AL, et al. Oral Human Papillomavirus in Healthy Individuals: A Systematic Review of the Literature. Sex Transm Dis. 2010; 37:386-391.
[174] Zhang J, Zhang Y, Zhang Z. Prevalence of Human Papillomavirus and its Prognostic Value in Vulvar Cancer. A Systematic Review and Meta-Analysis. PLoS One. 2018; 13(9): e0204162.

as a series of two or three shots.[175] As of late 2016, only Gardasil 9® is currently distributed in the United States.

The HPV vaccine is recommended for routine vaccination at age 11 or 12 years although vaccination can be started at age 9. ACIP also recommends vaccination for everyone through age 26 years if not adequately vaccinated when younger. HPV vaccination is given as a series of either two or three doses, depending on age at initial vaccination.

Vaccination is not recommended for everyone older than age 26 years. Some adults ages 27 through 45 years might decide to get the HPV vaccine based on discussion with their clinician, if they did not get adequately vaccinated when they were younger. HPV vaccination of people in this age range provides less benefit, for several reasons, including that more people in this age range have already been exposed to HPV.

The Advisory Committee on Immunization Practices (ACIP) recommendations for HPV vaccination are:

- Routine vaccination: Age 11-12 years, can be started at age 9 years
- Catch up vaccination: Age 13-26 years, if not adequately vaccinated
- Shared clinical decision-making: Some adults ages 27-45 years, if not adequately vaccinated

Table 4. Maryland and National HPV Vaccination Coverage, Teens Aged 13-17 Years, 2023[176,177]

MARYLAND AND NATIONAL HPV VACCINATION COVERAGE, TEENS AGED 13-17 YEARS, 2023				
		Maryland	**US National**	**HP 2030 Target**
Girls	≥1 dose	83.7%	78.5%	80.0%
	Up to date	70.2%	64.0%	80.0%
Boys	≥1 dose	78.8%	75.1%	80.0%
	Up to date	64.3%	59.0%	80.0%

Gender disparities in HPV vaccination coverage persist in Maryland, as evidenced by 2023 data.[178,179] As shown in the table above, vaccination completion rates for boys are lower than for girls.

[175] Centers for Disease Control. HPV Vaccine Schedule and Dosing. Human Papillomavirus. https://www.cdc.gov/vaccines/vpd/hpv/hcp/recommendations.html. Accessed November 18, 2019.
[176] Pingali, Cassandra, Yankey D, Elann-Evans, Laurie, et al. Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, National Immunization Survey – Teen, 2022. MMWR Morb Mortal Wkly Rep 2023;72 (34):912-919.
[177] Centers for Disease Control and Prevention (CDC). 2023. Adolescent Human Papillomavirus (HPV) Vaccination Coverage Report. https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm. Accessed: August 22, 2024.
[178] Pingali, Cassandra, Yankey D, Elann-Evans, Laurie, et al. Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, National Immunization Survey – Teen, 2022. MMWR Morb Mortal Wkly Rep 2023;72 (34):912-919.
[179] Centers for Disease Control and Prevention. Adolescent Human Papillomavirus (HPV) Vaccination Coverage Report. https://www.cdc.gov/mmwr/volumes/73/wr/mm7333a1.htm. Accessed: August 22, 2024.

Some of the key barriers to HPV vaccination among U.S. adolescents include:[180]

- Knowledge gap and lack of information among parents and health care professionals,
- Financial concerns on the part of parents and health care professionals,
- Parents' attitudes and concerns regarding the vaccine,
- Distrust of the health care system,
- Lack of awareness and lack of perceived benefit or need to vaccinate males,
- Not receiving a health care professional's recommendation for the vaccine,
- Little contact with the medical system, and
- Being unaware of or forgetting about the need for additional doses.

Health care providers play an important role in increasing the HPV vaccination rates, as physician recommendation is often the strongest predictor of HPV vaccination among teenagers.[181,182,183]

VACCINE TO PREVENT HEPATITIS B INFECTION

Hepatocellular carcinoma is the most common form of liver cancer in adults.[184] Chronic infection with the hepatitis B virus (HBV) or hepatitis C virus (HCV) is a major risk factor for hepatocellular carcinoma.[185] Although there are currently no vaccines available against HCV, a vaccine against HBV has been available since 1982. The most important strategy to prevent HBV-related hepatocellular carcinoma is HBV vaccination, and immunizing individuals against HBV has been linked to a decrease in the incidence of hepatocellular carcinoma.[186,187,188]

The HBV vaccine is typically given to infants as three or four shots over a six-month period. In Maryland, HBV vaccination is included in the state's list of school immunization requirements.[189] Unvaccinated adults who are at risk for HBV infection should also be vaccinated, including those who are at risk by sexual exposure, injection drug users, developmentally disabled persons in long-term care facilities, and those at risk by occupational exposure.[190]

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[180] Centers for Disease Control and Prevention (CDC). Human Papillomavirus (HPV) Vaccination Report: Maryland. Centers for Disease Control and Prevention; 2014.

[181] Holman DM, Benard V, Roland KB, Watson M, Liddon N, Stokley S. Barriers to Human Papillomavirus Vaccination Among US Adolescents: A Systematic Review of the Literature. JAMA Pediatr. 2014 Jan;168(1):76-82.

[182] Rahman M, Laz TH, McGrath CJ, Berenson AB. Provider Recommendation Mediates the Relationship Between Parental Human Papillomavirus (HPV) Vaccine Awareness and HPV Vaccine Initiation and Completion Among 13-to 17-year-old U.S. Adolescent Children. Clin Pediatr. 2015; 54(4): 371-375. Doi: 10.1177/0009922814551135.

[183] Gilkey, M.B., & McRee, A.L. (2016). Provider Communication about HPV Vaccination: A Systematic Review. Human Vaccines & Immunotherapeutics, 12(6), 1454-1468. Doi:10.1080/21645515.2015.1129090.

[184] American Cancer Society. What is Liver Cancer? https://www.cancer.org/cancer/liver-cancer/about/what-is-liver-cancer.html. Accessed November 18, 2024.

[185] Centers for Disease Control and Prevention (CDC). Liver Cancer. https://www.cdc.gov/cancer/liver/index.htm. Accessed November 18, 2024.

[186] Lim SG, Mohammed R, Yuen MF, Kao JH. Prevention of Hepatocellular Carcinoma in Hepatitis B Virus Infection. J Gastroenterol Hepatol. 2009 Aug; 24(8):1352-7.

[187] National Cancer Institute. Liver (Hepatocellular) Cancer Prevention (PDQ). http://www.cancer.gov/cancertopics/pdq/prevention/hepatocellular/HealthProfessional. Accessed May 24, 2025.

[188] Chang MH, You S., et al. Long-Term Effects of Hepatitis B Immunization of Infants in Preventing Liver Cancer. Gastroenterology. 2016 Sep;151(3):472-480.e1. doi: 10.1053/j.gastro.2016.05.048. Epub 2016 Jun 4. PMID: 27269245.

[189] Maryland Department of Health. Vaccine Requirements for Children Enrolled in Preschool Programs and in Schools – Per COMAR 10.06.04.03: Maryland School Year 2019-2020. Accessed November 18, 2019.

[190] Centers for Disease Prevention and Control (CDC). Vaccine information: Hepatitis B VIS. https://www.cdc.gov/vaccines/hcp/current-vis/hepatitis-b.html. Accessed May 24, 2025.

Vaccine recommendations and immunization schedules are available online from the CDC: www.cdc.gov/vaccines/index.html.

SCREENING FOR HEPATITIS C INFECTION

Hepatitis C is a liver disease that results from infection with HCV.[191] HCV can cause liver damage, cirrhosis, and liver cancer in some people. Adults born during 1945 through 1965 are more likely to be infected; 75% of adults with HCV were born during this timeframe.[192] However, early diagnosis and treatment can help prevent liver damage, cirrhosis, and liver cancer. The USPSTF recommends a one-time screening for HCV for adults born between 1945 through 1965.[193]

FAMILY HISTORY OF CANCER

Individuals with a family history of certain types of cancer may have an increased risk of cancer.[194] For individuals at a higher risk for cancer due to family history, certain interventions or recommendations, such as cancer chemoprevention to reduce risk (see below for information about chemoprevention) or screening test intervals, may be different than those for the general population. For those at high risk because of family history, identifying pre-cancerous changes to diagnose cancer at the earliest stage is an important action to reducing risk and illness from cancer (see Section 2 of the Cancer Plan for cancer screening recommendations). The CDC recommends that individuals talk with their family members about family health history, write the information down, and update it from time to time so that it can be shared with health care providers.[195]

CANCER CHEMOPREVENTION FOR HIGH-RISK POPULATIONS

Cancer chemoprevention is the use of various compounds, such as drugs or dietary derivatives, to inhibit, delay, or reverse cancer progression.[196] Chemoprevention is usually recommended in people who have a higher risk of developing cancer.[197]

[191] Centers for Disease Control. Hepatitis C Information. https://www.cdc.gov/hepatitis/hcv/index.htm. Accessed November 18, 2024.
[192] Hofmeister MG, Rosenthal EM, Barker LK, et al. Estimating Prevalence of Hepatitis C Virus Infection in the United States, 2013-2016. Hepatology. 2019; 69(3): 1020-31. Doi: 10.1002/hep. 30297. PMID: 30398671.
[193] U.S. Preventive Services Task Force. Draft Recommendation Statement: Hepatitis C Virus Infection in Adolescents and Adults: Screening. https://www.uspreventiveservicestaskforce.org. Accessed November 18, 2024.
[194] Centers for Disease Control and Prevention. https://www.cdc.gov/cancer/risk-factors/family-health-history.html. Accessed September 4, 2024.
[195] Centers for Disease Control and Prevention. About Family Health History. https://www.cdc.gov/family-health-history/about/index.html. Accessed September 4, 2024.
[196] National Cancer Institute. NCI dictionary of cancer terms. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/chemoprevention. Accessed September 16, 2024.
[197]National Cancer Institute. Cancer Prevention Overview (PDQ®) – Patient Version. https://www.cancer.gov/about-cancer/causes-prevention/patient-prevention-overview-pdq. Accessed June 15, 2025.

Many agents have been tested for their cancer prevention potential; several have demonstrated efficacy and received regulatory approval.[198,199] Among women at increased risk of developing breast cancer (determined as a five-year predicted risk for breast cancer of 1.7% or more calculated by the modified Gail model), taking the drug tamoxifen or raloxifene has been proven to reduce the risk of invasive breast cancer.[200] In 2019, the USPSTF recommended that clinicians offer to prescribe risk-reducing medications, such as tamoxifen, raloxifene, or aromatase inhibitors, to women who are at increased risk for breast cancer and at low risk for adverse medication effects.[201]

The use of chemoprevention agents as a tool in cancer prevention holds promise and is an area of continued research and expanding evidence. Future Cancer Plan updates may address chemoprevention recommendations more in-depth as the discovery and approval of more agents increases its important role in cancer prevention. Patients who are interested in learning more about chemoprevention should speak with their health care provider.

ULTRAVIOLET RADIATION EXPOSURE

Skin cancer is the most commonly diagnosed cancer in the United States. There are three major types of skin cancer: basal cell carcinoma, squamous cell carcinoma, and malignant melanoma. The majority of skin cancers are basal or squamous cell carcinomas. Basal and squamous cell carcinomas are not reportable to the MCR.

Melanoma is the third most common skin cancer type but is the deadliest form of skin cancer and is reportable to the MCR.[202] Between 1999 and 2020, the age-adjusted national mortality rate declined from 2.7 to 2.0 per 100,000 people at a rate of -1.3% annually.[203] Melanoma mortality rates in Maryland are also significantly lower than in most states, with Maryland ranking 42nd in the country for melanoma mortality at a rate of 1.8 deaths per 100,000 persons in 2022.[204]

Ultraviolet radiation exposure has been identified as a risk factor for skin cancer. Ultraviolet radiation is commonly divided into three bands: UVA, UVB, and UVC. UVC is completely absorbed in the atmosphere before reaching the Earth's surface. The rays of UVB are shorter and are the primary cause of tanning and sunburn. The longer rays of UVA penetrate the skin more deeply and contribute to wrinkling of the skin as well as tanning. Besides sunburn, skin cancer, and wrinkling, other negative

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[198] Maresso KC, Tsai KY, Brown PH, Szabo E, Lippman S, et al. Molecular cancer prevention: Current status and future directions. CA Cancer J Clin. 2015 Sep-Oct;65(5):345-83.

[199] Perloff M, Steele VE. Early-phase development of cancer prevention agents: challenges and opportunities. Cancer Prev Res (Phila). 2013 May;6(5):379-83. doi: 10.1158/1940-6207.CAPR-12-0463. Epub 2013 Mar 6. PMID: 23466485; PMCID: PMC3657502.

[200] Nelson HD, Fu R, Zakher B, Pappas M, McDonagh M. Medication Use for the Risk Reduction of Primary Breast Cancer in Women: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. 2019; 322(9): 868-886

[201] U.S. Preventive Services Task Force. Breast Cancer: Medication Use to Reduce Risk. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/breast-cancer-medications-for-risk-reduction#:~:text=Recommendation%20Summary&text=The%20USPSTF%20recommends%20that%20clinicians,risk%20for%20adverse%20medication%20effects. Accessed September 16, 2024.

[202] Centers for Disease Control and Prevention. Melanoma Incidence and Mortality, United States-2012-2016. US Cancer Statistics Data Brief. https://stacks.cdc.gov/view/cdc/81890. Accessed November 20, 2024.

[203] Didier AJ, Nandwani SV, Watkins D, Fahoury AM, Campbell A, Craig DJ, Vijendra D, Parquet N. Patterns and trends in melanoma mortality in the United States, 1999-2020. BMC Cancer. 2024 Jul 2;24(1):790. doi: 10.1186/s12885-024-12426-z. PMID: 38956559; PMCID: PMC11221171.

[204] National Cancer Institute and Centers for Disease Control and Prevention. *State Cancer Profiles: Maryland – Melanoma of the Skin, Mortality*. https://statecancerprofiles.cancer.gov. Accessed June 15, 2025.

effects of ultraviolet radiation include cataracts, macular degeneration, and immune system suppression.[205]

There is solid evidence that exposure to sun and other forms of ultraviolet radiation, including artificial sources such as tanning beds, is associated with increased risk of basal and squamous cell carcinomas.[206] There is also solid evidence that exposure to ultraviolet radiation increases the risk of melanoma, especially if the exposures occur before age 24. The USPSTF recommends that fair-skinned youth ages 6 months to 24 years minimize their exposure to ultraviolet radiation to reduce their risk of melanoma.[207,208]

Artificial tanning has also been shown to increase the incidence of skin cancers, including melanoma. Some research has also shown that tanning bed use is associated with an increased risk of early-onset melanoma.[209] The International Agency for Research on Cancer has listed tanning beds as known carcinogens.[210] Due to the increased risk for minors, as of October 1, 2019, it is unlawful for any Maryland tanning facility operator to allow anyone under the age of 18 to use their artificial sunlight or tanning devices.[211]

To reduce the risk of skin cancer, it is generally recommended that individuals reduce their exposure to ultraviolet radiation by practicing the following sun-safe behaviors: avoid direct sunlight between the hours of 10 a.m. and 4 p.m., wear sun-protective clothing including a wide-brimmed hat and sunglasses when exposed to sunlight, and apply a broad-spectrum sunscreen with a sun-protection factor (SPF) of 15 or higher 30 minutes before going outside and reapply sunscreen every two hours while outdoors.[212]Individuals are also advised to avoid exposure to artificial sources of ultraviolet light (e.g. indoor tanning), and newborns should always be protected from direct sunlight.[213]

Education efforts are important to promote sun-safe behaviors. Special populations to target include those in occupations requiring outdoor exposure, children and adolescents, school educators, and

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[205] Environmental Protection Agency. Health effects of UV radiation. https://www.epa.gov/sunsafety/health-effects-uv-radiation. Accessed July 17, 2025.
[206] American Cancer Society: UV (Ultraviolet) Radiation and Cancer Risk. https://www.cancer.org/cancer/risk-prevention/sun-and-uv/uv-radiation.html. Accessed November 1, 2024.
[207] US Preventive Services Task Force; Grossman DC, Curry SJ, Owens DK, Barry MJ, Caughey AB, Davidson KW, Doubeni CA, Epling JW Jr, Kemper AR, Krist AH, Kubik M, Landefeld S, Mangione CM, Silverstein M, Simon MA, Tseng CW. Behavioral Counseling to Prevent Skin Cancer: US Preventive Services Task Force Recommendation Statement. JAMA. 2018 Mar 20;319(11):1134-1142. doi: 10.1001/jama.2018.1623. PMID: 29558558.
[208] U.S. Preventive Services Task Force. Skin Cancer Prevention: Behavioral Counseling. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/skin-cancer-counseling. Accessed June 15, 2025.
[209] Cust AE, Armstrong BK, Goumas C, et al. Sunbed Use During Adolescence and Early Adulthood is Associated with Increased Risk of Early-Onset Melanoma. Int J Cancer J Int Cancer. 2011;128(10):2425-2435. doi:10.1002/ijc.25576
[210]World Health Organization. International Agency for Research on Cancer. *Exposure to artificial UV radiation and skin cancer* (IARC Working Group Report Vol. 1). https://publications.iarc.fr/Book-And-Report-Series/Iarc-Working-Group-Reports/Exposure-To-Artificial-UV-Radiation-And-Skin-Cancer-2006. Accessed June 18, 2025.
[211] Maryland Department of Health. Notice: Tanning and Minors. 2019. https://phpa.health.maryland.gov/OEHFP/EH/Shared%20Documents/Tanning/TanningMinorsNotice_2019.pdf. Accessed December 10, 2024.
[212] Skin Cancer Foundation. Prevention Guidelines. Skin Cancer Foundation. http://www.skincancer.org/prevention/sun-protection/prevention-guidelines. Accessed December 10, 2024.
[213]Skin Cancer Foundation. Prevention Guidelines. Skin Cancer Foundation. http://www.skincancer.org/prevention/sun-protection/prevention-guidelines. Accessed December 10, 2024.

health care providers. Public policy efforts to support sun-safe behavior are also valuable, including regulation enforcement of youth access to indoor tanning facilities.

ENVIRONMENTAL/OCCUPATIONAL ISSUES AND CANCER

The relationship between cancer and environmental and occupational factors is complex; some factors are well-known causes of cancer, while others are more speculative. Exposure to potential cancer-causing agents can occur through multiple pathways, each with different effects. Cancer-causing agents can enter the body through inhalation, absorption through direct contact with the body or skin, or ingestion (taken in by mouth). In addition, our understanding of cancer causation is generally based on models or observations of only one chemical or physical hazard at a time, and we have much less understanding of the complex interactions and risks that arise from exposure to multiple hazards over a person's lifetime.

Two important principles underlie much of the current discussion of occupational and environmental cancer. First, the precautionary principle* is often promoted to minimize exposures, meaning that if there is a reasonable concern that a threat exists, precautionary measures to reduce the risk should be taken, even if there is uncertainty about the exact nature or magnitude of the risk. Second, the concept of environmental justice focuses on the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal is achieved when everyone enjoys the same degree of protection from environmental hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.[214]

This section outlines the links that are known between environmental and occupational exposures and cancer. Additionally, this chapter highlights the roles of cancer surveillance and research for improved understanding, prevention, and management of occupational and environmentally related cancers.

MDH is working with the Maryland Department of the Environment (MDE) to make more information about potential environmental carcinogens accessible to the public. An example is the group of chemicals collectively known as "PFAS", or Per- and polyfluoroalkyl substances. These compounds, also known as "forever chemicals" due to their persistence in the environment, are suspected carcinogens and have other health effects as well. MDH and MDE are working together as part of the State PFAS Action Plan to characterize where the PFAS chemicals are in the environment and how the State can reduce exposure, especially in populations that may be more susceptible to the effects of PFAS.[215]

***Precautionary Principle:** When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically. (1998 Wingspread Consensus Statement on the Precautionary Principle)*

OCCUPATIONAL HAZARDS

Occupational hazards, as defined for the purposes of this Cancer Plan, are exposures received at the workplace that increase an individual's risk of developing cancer. Workers are often exposed to

[214] Morello-Frosch, R., Pastor, M., & Sadd, J. (2002). Integrating Environmental Justice and the Precautionary Principle in Research and Policy Making: The Case of Ambient Air Toxics Exposures and Health Risks among Schoolchildren in Los Angeles. *The ANNALS of the American Academy of Political and Social Science, 584*(1), 47–68. https://doi.org/10.1177/0002716202584400104SAGE Journals+2. Accessed May 24, 2025.

[215] Maryland and PFAS. Maryland Department of the Environment. https://mde.maryland.gov/PublicHealth/Pages/PFAS-Landing-Page.aspx. Accessed May 24, 2025.

chemicals in higher concentrations than are typically found in other environments. Various state and federal regulations and agencies exist to control and/or limit those exposures. Examples of occupational exposures include:

- Silica (associated with lung cancer),
- Asbestos (associated with lung cancer and mesothelioma), and
- Ultraviolet radiation from the sun (outdoor work associated with skin cancer).

There have been considerable improvements in the control of many occupational hazards, but exposures to carcinogens still occur in many industries. According to the CDC, fewer than 2% of chemicals manufactured or processed in the U.S. have been tested for carcinogenicity (ability to cause cancer), and it is estimated that 2% to 8% of worldwide cancers (and 45,000-91,000 new cases in the U.S. annually) are caused by occupational exposures.[216] However, some studies suggest that significant racial disparities exist, with higher rates of cancer in non-Whites than in Whites. Though the reasons for these disparities are not completely clear, differences in exposures are thought to account for at least some of the observed differences.[217]

Patterns of employment have changed, but there is still a need for surveillance for occupational cancer, as well as collection and analysis of information about both current and former employment as potential risk factors. More information regarding occupational cancers is available online from the CDC: https://www.cdc.gov/niosh/cancer/about/index.html.

OUTDOOR AIR POLLUTION

Air pollution is a complex mixture of chemicals, many of which are known or suspected carcinogens, from a variety of sources. The cancer risk from airborne chemicals in the environment is low compared to other types of exposures. Even so, public health practitioners remain concerned about air quality due to the number of people exposed to air pollutants and because individuals may be exposed to poor air quality for their entire lifespan.

Most hazardous air pollutants (HAPs) are produced by mobile sources (e.g. vehicles) and stationary sources (e.g. factories). It is difficult to calculate the risks associated with individual chemical hazards in the air, so risks are estimated using models such as the EPA National-Scale Air Toxics Assessment. However, these are only estimates, and there is a need for more detailed monitoring in certain areas of Maryland (including the Eastern and Western regions). The MDE released the "2025 Clean Air Progress Report," which outlines Maryland's continuing focus on improving air quality as well as major accomplishments in air quality improvement. The report is published annually and available online at: https://mde.maryland.gov/programs/Air/Pages/AirQualityReports.aspx.

Additionally, the American Lung Association grades Maryland counties on air quality, including disparities in air quality across Maryland counties, at: https://www.lung.org/research/sota/city-rankings/states/maryland.

WATERBORNE EXPOSURES

Water sources can contain contaminants that occur naturally, are man-made, or are formed when water is disinfected to make it suitable for drinking. Water quality standards are in place to protect Maryland surface waters (lakes and streams), and public drinking water systems are regulated under the Safe Drinking Water Act. While public drinking water systems are monitored by utilities for a range of contaminants, each private well owner is responsible for the safety of his or her own well water, once

[216] Center for Disease Prevention and Control. National Institute for Occupational Safety and Health (NIOSH). https://www.cdc.gov/niosh/cancer/about/index.html. Accessed May 24, 2025.
[217] Islami, F., et al. (2023). "Cancer Disparities by Race and Ethnicity in the United States." CA: A Cancer Journal for Clinicians, 73(2), 137–153.

the well is approved. For more information on keeping private well water safe, see the MDE's "Well Wise" page at: https://mde.maryland.gov/programs/Water/Water_Supply/Pages/Be_Well_Wise.aspx.

FOODBORNE HAZARDS

The sources of carcinogens in food may be naturally occurring (such as toxins from fungi, called mycotoxins) or related to human activity (such as those produced by industry, agricultural practices, food cooking methods, food additives, and food preservation). Only a limited number of chemicals in food can be assessed for their cancer-causing potential because the biological activity of extremely low concentrations of these chemicals in food is not calculable with our current level of knowledge. However, technology continues to improve, allowing the detection of ever smaller concentrations of chemicals in food. The FDA is responsible for the protection of processed foods, produce, imported foods, and milk and dairy products. The Food Quality Protection Act of 1996 enacted a strict standard regarding pesticide chemical residues in foods and requires that the administrator must determine "that there is a reasonable certainty that no harm will result from aggregate exposure to pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information" (Title 4, Section 408, 21 U.S.C. 346a).

Some contaminants found in water can accumulate in fish and may pose risks to people who eat fish on a regular basis. Fish consumption advisories recommend how often certain fish can be eaten so that health risks are minimized. The MDE issues fish and shellfish consumption advisories for people who eat Maryland fish on a regular basis. Advisories, an interactive map, and current recommendations for women, children, and the general population regarding Maryland seafood consumption can be found at: https://mde.maryland.gov/programs/marylander/fishandshellfish/pages/fishconsumptionadvisory.aspx. Information on store-bought fish is available from the EPA at: https://www.epa.gov/choose-fish-and-shellfish-wisely, and the FDA at: https://www.fda.gov/food/consumers/advice-about-eating-fish.

PHYSICAL AGENTS

Physical agents that are carcinogens include radiation (such as radon, ultraviolet radiation from sun exposure and tanning beds, and personal radiation from medical imaging technologies) and particles such as asbestos.

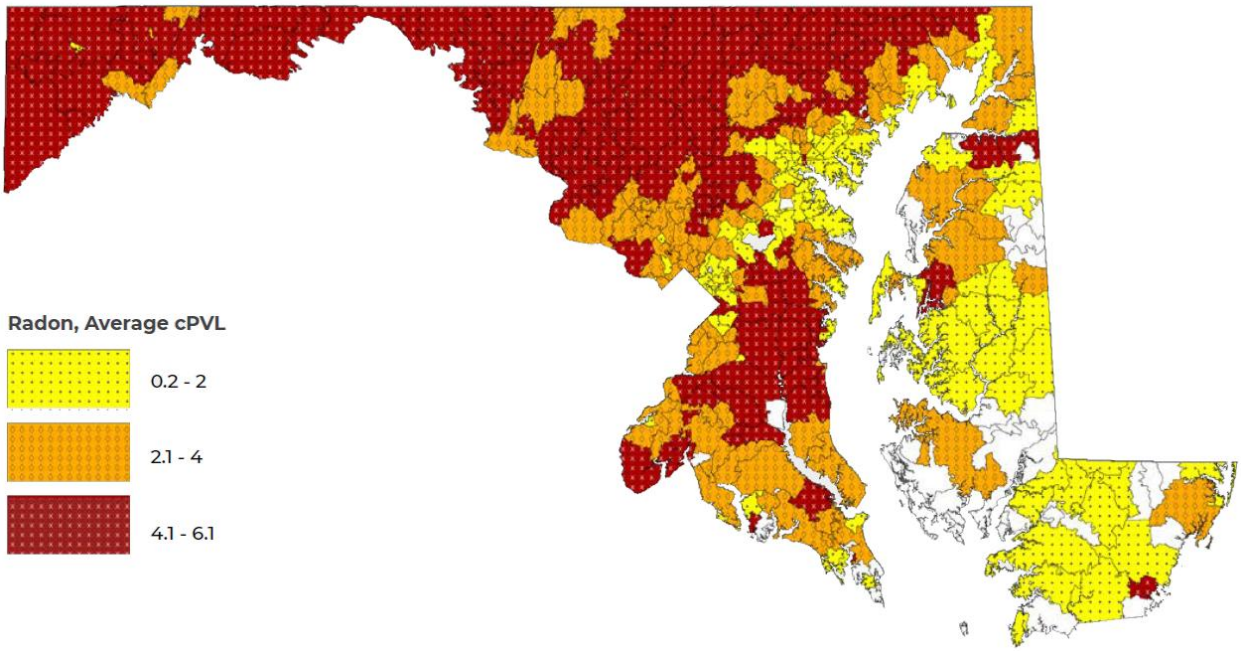
Radon

Radon is a naturally occurring, invisible, odorless gas that forms from the radioactive decay of uranium and radium. These radioactive elements are found throughout the Earth's crust in rock formations. In Maryland, radon concentrations are generally higher in the middle and western parts of the State, compared with the Eastern Shore, due to differences in geology. However, radon can be found in all parts of the State.

Radon concentrations cannot be predicted by where an individual lives or when a home was built. Radon can come through cracks and gaps in buildings and homes, particularly in the foundations. This means that two homes side by side may have different levels of radon due to different openings in their foundations. To see an interactive map of radon concentrations in Maryland, go to: https://health.maryland.gov/phpa/OEHFP/EH/pages/radon.aspx.

The map in Figure 4 does not predict radon levels in individual homes. The only way to determine radon levels in the home is to purchase a radon testing kit. Place the testing kit on the lowest level of the home (basement or crawl space) near any breaks in the foundation. If increased radon is found, a simple ventilation system can be placed in the basement to remove the radon from the home.

Figure 4. Maryland: 2005-2016 Average Radon Measurements by ZIP Code



Because radon comes naturally from the earth, people are always exposed to it. However, being exposed to higher levels over a long period can increase a person's risk of lung cancer. Radon is the second leading preventable cause of lung cancer after smoking and is the biggest preventable risk factor for lung cancer in non-smokers. Since radon exposure is preventable, it is recommended that everyone test their homes for radon every few years. For more information on how to protect a home from radon, go to: https://www.cdc.gov/radon/prevention/index.html#:~:text=If%20your%20home%20radon%20level,sealing%20cracks%20in%20your%20home.

Ultraviolet Radiation

See the Ultraviolet Radiation Exposure section on earlier pages for more information on ultraviolet radiation and prevention methods.

Indoor Air Quality

Indoor air quality is influenced by sources both in and around the home. Potential indoor sources of carcinogens include building materials, furniture, household cleaning products, and sources of combustion gases such as wood stoves and fireplaces. In addition, environmental smoke and naturally occurring radon are two important carcinogens that can be present in the indoor environment.

Data Sources, Analytical Methods, and Research

Research and data collection are essential for understanding and reducing cancer from exposure to carcinogens in the environment and workplace. Use of cancer surveillance data for evaluating environmental causation or association is challenging for a number of reasons:

- Cancer is usually caused by more than one factor, including a combination of genetics, environment, and personal lifestyle factors
- Cancer often has a long latency period
- In the MCR database, people with a diagnosis of cancer are identified by their address at diagnosis, which may be different than where they lived when they were exposed to a chemical or physical agent that contributed to their risk of cancer

- The MCR does not often have information on where people have worked
- Chemical exposures have often occurred at work, but occupational information is often missing
- Personal risk factors such as tobacco use and body mass are often missing
- Some cancers are often diagnosed in an outpatient setting, particularly skin cancer and urologic cancers, which limits reporting of these cancers to state registries

Investigating Unusual Patterns of Cancer

In 2022, the CDC/Agency for Toxic Substances and Disease Registry (ATSDR) released an updated guidance document for the investigation of unusual patterns of cancer (previously described in Maryland as Cancer Cluster Investigation Guidelines). Maryland is now in the process of revising and updating its own guidelines for the investigation of unusual patterns of cancer, based on the updated CDC/ATSDR guidance. The new guidance makes some significant revisions to the previous CDC/ATSDR guidance, particularly the following:

- Introduces the concept of "unusual patterns of cancer" to describe situations that may warrant further assessment
- Revises the definition of a cancer cluster to include cancers that may be etiologically similar (have similar causes)
- Includes specific and standardized approaches to better engage community advocates
- Provides a standardized template to better document the nature and extent of cancer and environmental concerns
- Updates approach to identify and investigate unusual patterns of cancer, including the suggestion for proactive evaluation and routine monitoring
- Provides criteria to help guide community cancer investigations
- Enhances appendices describing statistical and geospatial methods supporting the evaluation of unusual patterns of cancer

Maryland is currently adapting these recommendations for use in current and future investigations.

GOAL 1: PRIMARY PREVENTION

INCREASING CANCER PREVENTION BEHAVIORS IN MARYLAND: TOBACCO USE AND EXPOSURE OBJECTIVES

OBJECTIVE 1: By 2030, reduce the prevalence of current cigarette smoking* among adults to 8.6%. (2023 Baseline: 9.1%)

Target Setting Method: 5% reduction
Source: BRFSS
*Targets for other tobacco products are not included because prevalence of use among adults is very low.

Strategies

1. Support and implement CDC-recommended evidence-based interventions that reduce tobacco use and increase the demand for cessation, including:[218]
    a. Explore an increase in the price of tobacco products, including menthol cigarettes, ESDs, and nicotine pouches,
    b. Enact comprehensive tobacco-free policies, including ESDs,
    c. Fund mass reach health communications campaigns,
    d. Make tobacco cessation and treatment services fully accessible to tobacco users, and
    e. Promote lung cancer screening for adults who are at high risk due to smoking history and age.
2. Increase tobacco use prevention education and the provision and expansion of tobacco cessation and treatment resources in institutions of education (middle and high schools, colleges and universities), with a focus on reducing e-cigarette use.
3. Educate vulnerable populations, such as the LGBTQ communities and those with mental health and substance use disorders, through health communications efforts (including mass-reach health communications) to change social norms about tobacco use (including ESDs) and to promote evidence-based tobacco cessation and treatment services including the Maryland Tobacco Quitline, local health department-funded resources, and available Medicaid benefits.
4. Cultivate and maintain new and existing partnerships to enhance tobacco cessation and treatment outreach among vulnerable populations.
5. Maintain capacity for the Maryland Tobacco Quitline, including access to phone, web, and text-based counseling and the provision of nicotine replacement therapy.
6. Educate and increase engagement of health care providers to promote cessation and provide tobacco treatment following the CDC Tobacco Cessation Change Package
    a. Conduct targeted outreach to specialists with high-risk populations, including behavioral health providers, pediatricians, pulmonologists, radiologists, oncologists, primary care providers and dentists.
    b. Work with health systems to expand utilization of evidence-based tobacco cessation and treatment methods, including inpatient tobacco treatment counseling, referrals to the Maryland Tobacco Quitline, and nicotine replacement therapy.
    c. Educate health care providers about the dangers of menthol found in tobacco products, particularly the detrimental impact to Black and African American communities. Promote HIPAA-compliant telehealth options for tobacco cessation.
7. Partner with health insurance and human resource organizations to communicate and promote cessation information and resources among adults.
8. Increase referrals for tobacco cessation support to Maryland adults, young adults, and priority populations such as individuals with low socioeconomic status, individuals with behavioral health conditions, and LGBTQ communities.
9. Reduce menthol use, particularly among Black and African American populations.

[218] Center for Disease Prevention and Control. REACH. Public Health Strategies for Tobacco Prevention and Control. https://www.cdc.gov/reach/php/strategies/tobacco-prevention-control.html. Accessed June 18, 2025.

10. Encourage counties/state to restrict/license smoke shops, including nontransferable licenses to reduce access.

OBJECTIVE 2: By 2030, reduce the prevalence of tobacco use+ among high school and middle school youth as measured by YRBS/YTS* to reach the following targets:

High School Youth:

- **Cigarette use: 3.0% (2022 Baseline: 3.2%)**
- **Cigar use: 3.9% (2022 Baseline: 4.1%)**
- **Smokeless tobacco use (chewing tobacco or snuff): 2.5% (2022 Baseline: 2.6%)**
- **Electronic Smoking Devices (ESDs): 13.6% (2022 Baseline: 14.3%)**
- **Any type of tobacco (cigarettes, cigars, smokeless tobacco, nicotine pouches, or ESDs): 15.1% (2022 Baseline: 15.9%)**

Target Setting Method: 5% reduction
Source: YRBS/YTS

**YRBS/YTS collects data on tobacco use in the past month.*
+The term tobacco product is now inclusive of electronic smoking devices, such as e-cigarettes, vapes, pod-based devices like Juul, Elf Bar, Puff Bar, and Smoke.

Middle School Youth:

- **Cigarettes: 1.1% (2022 Baseline: 1.2%)**
- **Smokeless Tobacco (chewing tobacco or snuff): 1.3% (2022 Baseline: 1.4%)**
- **Cigars: 1.6% (2022 Baseline: 1.7%)**
- **ESDs: 5.6% (2022 Baseline: 5.9%)**
- **Any type of tobacco (cigarettes, cigars, smokeless tobacco, or ESDs): 6.6% (2022 Baseline: 6.9%)**

Target Setting Method: 5% reduction
Source: YRBS/YTS

Strategies

1. Support and implement CDC-recommended evidence-based interventions that reduce tobacco use and increase the demand for cessation, including:[1219]
    a. Explore and increase in the price of tobacco products, including ESDs,
    b. Enact comprehensive tobacco-free policies, including ESDs, in public meeting spaces, public vehicles and indoor places of employment,
    c. Fund mass media campaigns, and
    d. Make tobacco cessation and treatment services fully accessible to tobacco users.
2. Maintain capacity for the Maryland Tobacco Quitline for Marylanders age 13 and older; increase youth engagement with evidence-based tobacco treatment programs (i.e., Live Vape Free) including in school settings.
3. Support reduction in youth access to tobacco products.
    a. Increase tobacco retailer education and compliance checks to enhance statewide and local enforcement of Maryland's restrictions on the sale of tobacco products to youth under 21 years of age.
    b. Build community capacity to adopt state and local policies that restrict the sale, advertising, and promotion of tobacco products, including reducing overall prevalence of tobacco retail licenses, eliminating flavored tobacco products, reducing availability of retail tobacco sales near schools, and maintaining retailer accountability through license suspension and revocation for repeat violators.
    c. Educate providers and health care professionals about the effectiveness of evidence-based policy and environmental change strategies to shift the social norm to tobacco-free, including age restrictions, flavor bans, and tobacco-free multi-unit home policies.

[219] Center for Disease Prevention and Control. REACH. Public Health Strategies for Tobacco Prevention and Control. https://www.cdc.gov/reach/php/strategies/tobacco-prevention-control.html. Accessed June 18, 2025.

4. Partner with priority youth/young adult groups, community-based organizations, and colleges/universities to identify innovative strategies to reduce youth initiation among target populations.
5. Implement evidence-based, mass-reach health communications interventions to prevent initiation and encourage tobacco-free norms among vulnerable youth populations.
6. Partner with schools to determine alternatives to suspension and provide effective tobacco cessation treatment and referral to tobacco cessation services options for students addicted to nicotine.
7. Educate and increase the engagement of health care providers to promote cessation and provide tobacco treatment resources.

OBJECTIVE 3: By 2030, reduce the prevalence of tobacco use among Maryland adults who have a depressive disorder as measured by BRFSS to 25.3%. (2023 Baseline: 26.6%)

Target Setting Method: 5% reduction
Source: BRFSS

Strategies

1. Build upon existing resources for Behavioral Health providers.
2. Encourage providers to screen for tobacco use in all adults with depressive disorders and refer for appropriate treatment.
3. Partner with Behavioral Health facilities to incrementally implement tobacco-free campus policies.

OBJECTIVE 4: By 2030, reduce exposure of high school youth to secondhand smoke as measured by YRBS/YTS* to 23.3%. (2022 Baseline: 24.5%)

Target Setting Method: 5% reduction
Source: YRBS/YTS
**YRBS/YTS collects data on students who were in the same room with someone who was smoking cigarettes on one or more of the past seven days.*

Strategies

1. Promote tobacco-free policies that protect against involuntary smoke and aerosol exposure without exemptions, including in multi-unit housing, parks, beaches, college campuses, recreational venues, and others.
2. Implement mass-reach health communications to increase awareness about the health hazards of second and thirdhand smoke and aerosol exposure, as well as tobacco litter; and encourage voluntary adoption of smoke-free households.
3. Promote health equity and healthy childhood experiences by educating families with infants and young children about the dangers of secondhand smoke and the importance of smoke-free households, as well as increasing availability of tobacco cessation and treatment resources and supporting tobacco-free norms.

Note that the above strategies are intended to reduce youth exposure to secondhand smoke but will ultimately benefit adults as well.

OBJECTIVE 5: By 2030, reduce tobacco use rates in the LGBTQ community to 23.2%. (2023 Baseline: 24.4%)

Target Setting Method: 5% reduction
Source: BRFSS

Strategies

1. Decrease smoking rates among LGBTQ communities by referring current smokers to LGBTQ-affirming smoking cessation services.
2. Partner with LGBTQ serving organizations, local health departments, other community partners to provide tobacco use prevention and cessation resources.
3. Create culturally-tailored prevention and cessation messaging resources for organizations serving the LGBTQ communities of Maryland.

HEALTHY WEIGHT, NUTRITION, AND PHYSICAL ACTIVITY OBJECTIVES

OBJECTIVE 6: By 2030, reduce the proportion of Marylanders who are overweight/obese to meet the following targets:

a. Adults age 18 years and older: 65.4% (2023 Baseline: 68.8%)
b. High school youth: 29.5% (2022 Baseline: 31.1%)

Target Setting Method: 5% reduction
Source: BRFSS; YRBS/YTS

Strategies

1. Strengthen healthier food access and sales in retail venues and community venues through increased availability, improving pricing, placement, and promotion.
2. Implement food and beverage guidelines including sodium standards (i.e. food service guidelines for cafeterias and vending) in public institutions, worksites, child care settings, schools, community venues, and other key locations such as hospitals.
3. Ensure that patients aged six years and older are screened for obesity and offered or referred to behavioral interventions.
4. Implement evidence-based youth and family-based community programs that promote healthy weight, encourage healthy eating, and increase opportunities for safe, physical activity.
5. Increase opportunities for school-based, community-based gardens and educational opportunities associated with incorporating vegetables and fruits into healthy meals.
6. Ensure the Accessibility and Accommodations toolkit on Disability and Health is inclusive in state and community-based health promotion programs for people living with a disability.
7. Increase health care providers' awareness to screen for obesity in children and adolescents and offer or refer them to comprehensive intensive behavioral interventions to promote improvements in weight status.
8. Increase health care providers' awareness to offer or refer adults with a BMI of 30 or higher to intensive, multicomponent behavioral interventions.
9. Implement food and beverage guidelines including sodium and sugar standards.
10. Implement strategies for increasing physical activity for all ages.
11. Promote obesity screening in the dental setting to include BMI screenings and referrals to primary care providers as needed.
12. Increase awareness of walking as the state designated physical activity and benefits of walking.

OBJECTIVE 7A: By 2030, increase the proportion of Marylanders who consume fruits daily to reach the following targets:

a. Adults age 18 years and older: 66.1% (2021 Baseline: 62.9%)
b. High school youth: 30.8% (2022 Baseline: 29.3%)

Target Setting Method: 5% increase
Source: BRFSS; YRBS/YTS

OBJECTIVE 7B: By 2030, increase the proportion of Marylanders who consume vegetables daily to reach the following targets:

a. Adults ages 18 years and older: 84.8% (2021 Baseline: 80.8%)
b. High school youth: 59.6% (2022 Baseline: 56.8%)

Target Setting Method: 5% increase
Source: BRFSS; YRBS/YTS

Strategies

1. Support policies and implement programs that provide access to fruits and vegetables, including providing financing initiatives, bulk pricing discounts, and other cost saving approaches for grocery stores in food deserts (through the Maryland Department of Housing and Community Development), increasing access to farmers' markets, and farmers accepting federal benefit payments supporting farm-to-school initiatives.
2. Implement nutrition education programming (such as Market to Mealtime or SNAP-ED) in the community setting to provide education about general nutrition as well as the purchasing, preparation, and service of fruits and vegetables.
3. Create partnerships with the food and/or restaurant industry to support healthy eating initiatives in restaurants (including fast food restaurants) that focus on offering affordable fruit and vegetable menu options.
4. Implement school policies and practices that create a supportive nutrition environment, including establishing standards for all competitive foods; prohibit advertising of unhealthy foods; promote healthy foods in schools, including those sold and served within school meal programs and other venues.
5. Promote maximum implementation and utilization of subsidized food programs for students.
6. Offer more farmers' markets and education about eating fruits and new fruits.
7. Establish partnerships with the Department of Agriculture to implement community gardens in schools and farm to school programs.
8. Implement community gardens in schools and make it sustainable.
9. Create partnerships with community grocers to offer incentives for providing fresh vegetables in the community.
10. Implement a social media marketing campaign to increase interest in fruit and vegetable consumption.

OBJECTIVE 8: By 2030, promote physical activity among Maryland adults age 18 years and older:

a. Reduce the proportion of adults who engage in no leisure-time physical activity to 21.6%. (2023 Baseline: 22.7%)
b. Increase the proportion of adults who engage in moderate physical activity for at least 150 minutes or vigorous physical activity for at least 75 minutes per week or an equivalent combination to 62.8%. (2019 Baseline: 59.8%)

Target Setting Method: 5% change
Source: BRFSS

Strategies

1. Strengthen community promotion of physical activity through signage, worksite policies, social support, infrastructure improvements, state agency partnerships, and joint-use agreements to allow for use of safe facilities.
2. Develop and/or implement transportation and community plans that promote walking and other methods of active transport.
3. Increase access to physical activity programs for all ages (e.g., access to gyms, education classes).
4. Promote access to physical activity programs for older adults.
5. Increase awareness of inclusive physical activity and self-management education programs.
6. Promote personal objectives for exercise (e.g., 60 minutes a day).
7. Incorporate strategies to reduce sedentary time across various settings (e.g., workplaces, schools, homes) by promoting movement breaks, standing desks, active meeting options, and encouraging limiting prolonged screen time. This acknowledges that reducing sedentary behavior is important for health, even among individuals who meet physical activity guidelines.

OBJECTIVE 9: By 2030, increase the proportion of Maryland youth who meet the federal physical activity guidelines (60 minutes daily) for aerobic physical activity to reach the following targets:

a. High school youth: 40.4% (2021-2022 Baseline: 38.5%)
b. Middle school youth: 47.5% (2021-2022 Baseline: 45.2%)

Target Setting Method: 5% increase
Source: YRBS/YTS

Strategies

1. Implement and evaluate quality, comprehensive physical education and physical activity programs in kindergarten through grade 12 schools.
2. Promote the adoption of physical activity in early child care and education.

3. Implement and evaluate comprehensive physical activity programs in the community.
4. Decrease the proportion of Maryland youth who play video or computer games or use a computer three or more hours per day.
5. Implement diverse group and individual physical activities for youth outside of competitive sports.
6. Develop a physical activity social media campaign for youth to incorporate in schools through partnership with the Maryland State Department of Education.

ALCOHOL CONSUMPTION OBJECTIVE

OBJECTIVE 10: By 2030, reduce drinking among Maryland adults to reach the following targets:

a. Chronic drinking (up to 2 drinks per day for men, up to one drink per day for women per National Institute on Alcohol Abuse and Alcoholism guidelines): 3.8% (2023 Baseline: 4.0%)
b. Binge drinking (5 or more drinks for men and 4 or more drinks for women on a single occasion on at least one day in the past month): 12.3% (2023 Baseline: 12.9%)

Target Setting Method: 5% reduction
Source: BRFSS

Strategies

1. Increase awareness of alcohol use as a cancer risk factor among Marylanders by pooling resources from public health agencies, the health care system, non-traditional partners such as local substance abuse prevention programs, organizations working on alcohol issues (e.g. Mothers Against Drunk Driving), faith-based and community organizations, schools, law enforcement agencies, workplaces, and businesses.
2. Work with health care providers to promote awareness of alcohol as a cancer risk factor and to promote alcohol misuse screening and brief behavioral counseling interventions via traditional (face-to-face) or electronic means.
3. Promote awareness of existing resource lists for individuals and families seeking help with alcohol consumption, such as Alcoholics Anonymous and other evidence-based treatment and support services.
4. Promote resources and coverage through employers and universities to promote changes in problem behavior.
5. Provide education in schools and through community-based programs.
6. Promote more strategies for schools and provide school health messaging to youth, as well as screening.
7. Provide specific, evidence-based strategies in schools, such as:
    a. Delivering comprehensive alcohol education curricula that include the link between alcohol and cancer.
    b. Providing school health messaging through various channels (e.g., posters, announcements, digital platforms) to raise awareness about the risks of alcohol use.
    c. Implementing age-appropriate screening and brief intervention programs for students at risk of alcohol misuse, coupled with referral pathways for support.
8. Develop strategies to reduce alcohol use as incentives for fundraising efforts.

CANCER VACCINES OBJECTIVE

OBJECTIVE 11: By 2030, increase youth HPV vaccine coverage rates to reach the following targets:

a. Girls age 13-17 that are up to date on HPV vaccination to 73.1% (2023 Baseline: 70.2%)
b. Boys age 13-17 that are up to date on HPV vaccination to 67.5% (2023 Baseline: 64.3%)

Target Setting Method: 5% increase
Source: National Immunization Survey-Teen, ACIP

Strategies

1. Increase awareness of HPV infection as a cancer risk factor among Marylanders.
2. Educate health care providers, particularly pediatricians, on the importance of making a strong and timely HPV vaccination recommendation, with a focus on cancer prevention.

3. Encourage cancer experts and leaders to provide peer education to immunization providers about cancer prevention and the role of the HPV vaccine.
4. Educate parents and/or guardians about the availability and importance of HPV vaccination for adolescent girls and boys, with a focus on cancer prevention.
5. Implement systems changes within health care practices to:
    a. Check teenage patients' vaccination status and offer all indicated vaccines at each visit,
    b. Schedule the next HPV vaccination dose before the end of the current appointment, and
    c. Utilize reminder and recall strategies.
6. Increase HPV awareness and access to vaccination in school settings, including offering adult catch-up HPV vaccination clinics or information sessions in Maryland colleges and universities settings.
7. Develop and implement targeted interventions to increase HPV vaccination rates among populations with lower uptake compared to jurisdictions with the highest coverage, utilizing culturally tailored messaging, addressing specific barriers to access, and partnering with trusted community leaders within these populations.
8. Implement specific strategies to reduce the disparity between boys and girls being up to date on HPV vaccination. This could include:
    a. Targeted educational campaigns aimed at parents and guardians to emphasize the importance of HPV vaccination for boys' cancer prevention.
    b. Provider education to ensure equitable recommendations for both male and female adolescents.
    c. Utilizing gender-neutral messaging in public health campaigns.

ULTRAVIOLET RADIATION EXPOSURE OBJECTIVE

OBJECTIVE 12: By 2030, increase the proportion of Maryland adults age 18 years and older who always or most of the time protect themselves from the sun as measured by BRFSS to 54.39%. (2021 Baseline: 51.8%)

Target Setting Method: 5% increase
Source: BRFSS

Strategies

1. Encourage the development of sun-safe environments including building-covered, shaded structures, and implementing signage at public beaches and parks reminding people to wear sunscreen.
2. Educate the public about sun-safe behaviors, the dangers of ultraviolet radiation, and skin cancer early detection. Use media outlets such as websites, print, radio, television public service announcements, billboards, and press releases, and social media platforms.
3. Develop programs encouraging sun-safe behaviors for outdoor workers.
4. Promote/integrate the use of sun safety educational curricula in elementary and middle schools.
5. Support school policies that permit students to bring and apply sunscreen.
6. Ensure that children, adolescents, and young adults who have fair skin types are counseled by health care providers about minimizing their exposure to ultraviolet radiation.
7. Promote awareness on the harms of tanning booths and emphasize the Maryland law prohibiting individuals under 18 years of age from using tanning devices in tanning facilities.

RADON OBJECTIVE

OBJECTIVE 13: By 2030, improve availability of and access to information and resources to reduce radon exposure in Maryland.

Strategies

1. Reduce radon exposure in Maryland through outreach, education about testing and remediation, and other strategies.
2. Increase public awareness about the relationship between indoor radon exposure and lung cancer.

3. Reduce radon exposure in new and existing construction by requiring radon risk reduction in building codes.
4. Increase capacity of health care providers and staff to ask about radon testing in the home and provide educational and testing resources.
5. Develop a partnership with targeted counties that are at high risk for radon exposure.

ENVIRONMENTAL AND OCCUPATIONAL EXPOSURES OBJECTIVE

OBJECTIVE 14: By 2030, improve availability of and public access to information about environmental and occupational exposures.

Strategies

1. Utilizing the Environmental Public Health Tracking platform or other tools, improve access to locally relevant data on exposures, public health impacts, vulnerabilities, and cumulative exposure/environmental justice considerations.
2. Establish a partnership between state agencies and academia to develop a state strategy for routine collaboration to translate current and/or new understanding about environmental carcinogens into education and outreach aimed at improving the public understanding of relationship between exposures and associated health outcomes.
3. Increase public awareness about exposure to environmental and occupational carcinogens.

SECTION 2

HIGH BURDEN CANCERS IN MARYLAND

HIGH-BURDEN CANCERS IN MARYLAND

Improvement in the prevention, early detection, and treatment of many types of cancer has led to a decline in cancer incidence and mortality rates in Maryland and the nation.[220] Despite these declines, the cancer burden remains large when measured by human suffering, loss of life, loss of quality of life, and expenditures for medical care. Section 2 examines the current cancer burden in Maryland to identify priority cancers and effective interventions to reduce cancer incidence, mortality, and disparities.

PRIORITY CANCERS IN MARYLAND

INCIDENCE

In 2021, almost 34,000 Marylanders were diagnosed with invasive cancer (excluding basal and squamous cell skin cancer). The 2021 age-adjusted cancer incidence rate for Maryland is 440.4 cancer cases per 100,000, which is statistically similar to the 2021 U.S. cancer incidence rate of 439.7 per 100,000 (Table 5). The age-adjusted incidence rate for all cancer sites among non-Hispanic Black individuals in Maryland remained below the incidence rate for non-Hispanic White individuals in Maryland, continuing the trend since 2011.

Table 5. Overall Cancer Incidence and Mortality by Sex and Race in Maryland and the United States, 2021

INCIDENCE								
	Total	**Male**	**Female**	**White**	**Black**	**Hispanic**	**API**	**AIAN**
Maryland New Cases (count)	33,945	16,950	16,990	21,210	9,637	1,261	1,384	69
Maryland Incidence Rate	440.4	476.3	418.2	467	439.8	278.9	279.8	286.1
U.S. SEER Rate	439.7	472.8	420.2	471.4	459.4	341.4	312.9	387.7

MORTALITY								
	Total	**Male**	**Female**	**White**	**Black**	**Hispanic**	**API**	**AIAN**
Maryland Deaths (count)	10,540	5,356	5,184	6,544	3,152	333	483	18
Maryland Mortality Rate	136.4	161.6	119.9	135.9	152.2	87.8	101.3	**
U.S. Mortality Rate	144.2	170.8	125	149.8	164.3	105.5	93.2	129.2

Rates are per 100,000 population and are age-adjusted to 2000 U.S. standard population

All race rates and counts, except Hispanic, are non-Hispanic/Latino

** Maryland mortality rates based on death counts of 0-19 are suppressed per MDH/Center for Cancer Prevention and Control Mortality Data Suppression Policy

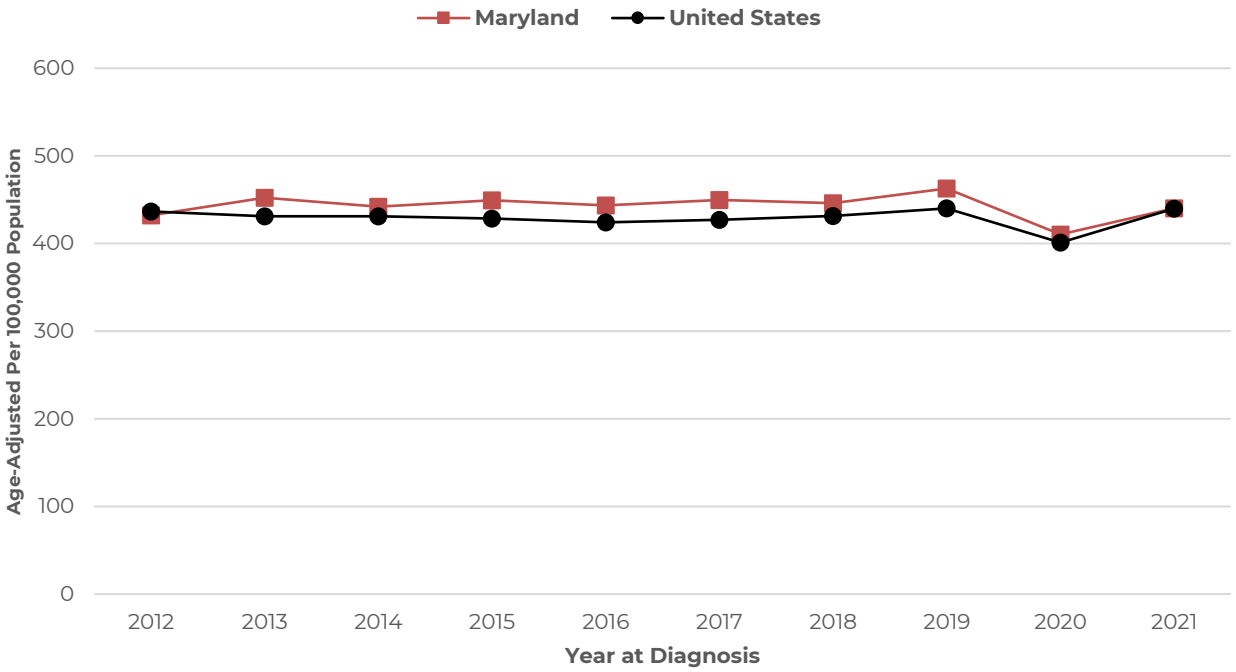
Source: Maryland Cancer Registry, U.S. SEER, SEER*Stat, Maryland Department of Health Vital Statistics Administration, SEER Mortality All Cause of Death Data

[220] Maryland Department of Health, 2022 Cancer Report: Cigarette Restitution Fund Program, Prevention and Health Promotion Administration, Cancer and Chronic Disease Bureau, Center for Cancer Prevention and Control, Dec 2024.

API: Asian/Pacific-Islander; AIAN: American Indian/ Alaska Native

The overall cancer incidence rate in Maryland has increased overall since 2012, up from 432.1 cases per 100,000 to 440.4 per 100,000 in 2021 (Figure 5). Changes in cancer incidence can be the result of many factors, such as prevention and screening efforts, changes in screening recommendations (e.g., changes in screening recommendations for breast and prostate cancer), advances in diagnostic technologies, and changes in public health funding. Overall, cancer incidence increases with age, with a significant proportion of cancers diagnosed in people 55 years of age and older. While the exact percentage may fluctuate slightly year to year, this general trend remains consistent.[221]

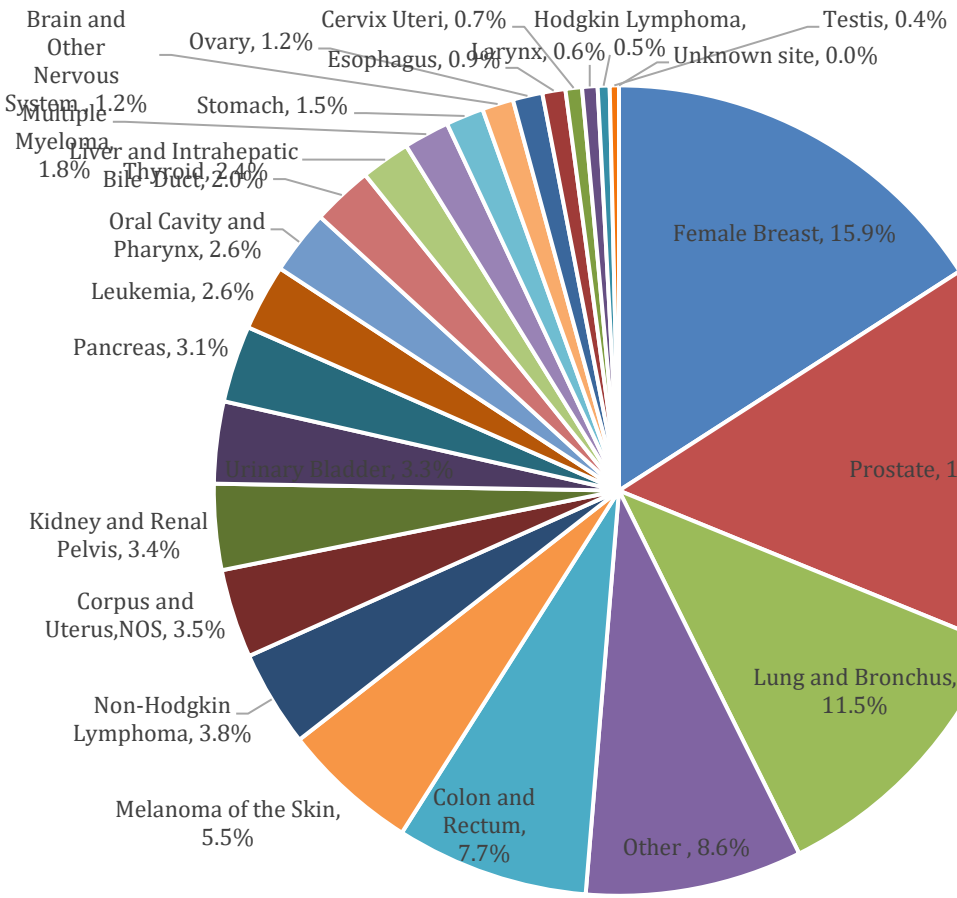
Figure 5. All Sites Cancer Incidence Rates Maryland and United States, 2012-2021



Source:
Maryland Cancer Registry, 2012-2021

Figure 6. Percent of All Incident Cancer Cases by Type of Cancer in Maryland, 2017-2021

[221] American Cancer Society. Cancer Facts & Figures 2024. Atlanta: American Cancer Society; 2024. https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/2024-cancer-facts-figures.html. Accessed May 24, 2025.



*NOS is defined as Not Otherwise Specified;
Source: Maryland Cancer Registry, 2017-2021

Cancer is classified according to the organ or tissue that is the site of the tumor and the type of cells that have become cancerous. The most commonly diagnosed cancers among Marylanders are female breast (15.9%), prostate (15.3%), lung and bronchus (11.5%), and colon and rectum (7.7%) cancers.[222] Combined, these four cancers comprise over half of all cancers diagnosed in the state (Figure 6). Among Maryland men, cancers of the prostate, lung and bronchus, and colon and rectum comprise 47.6% of all newly diagnosed cancers. Among Maryland women, cancers of the breast, lung and bronchus, and colon and rectum comprise 51.3% of all newly diagnosed cancer cases (Table 6).

Table 6. Ten Leading Cancer Incident Sites by Sex in Maryland, 2017-2021

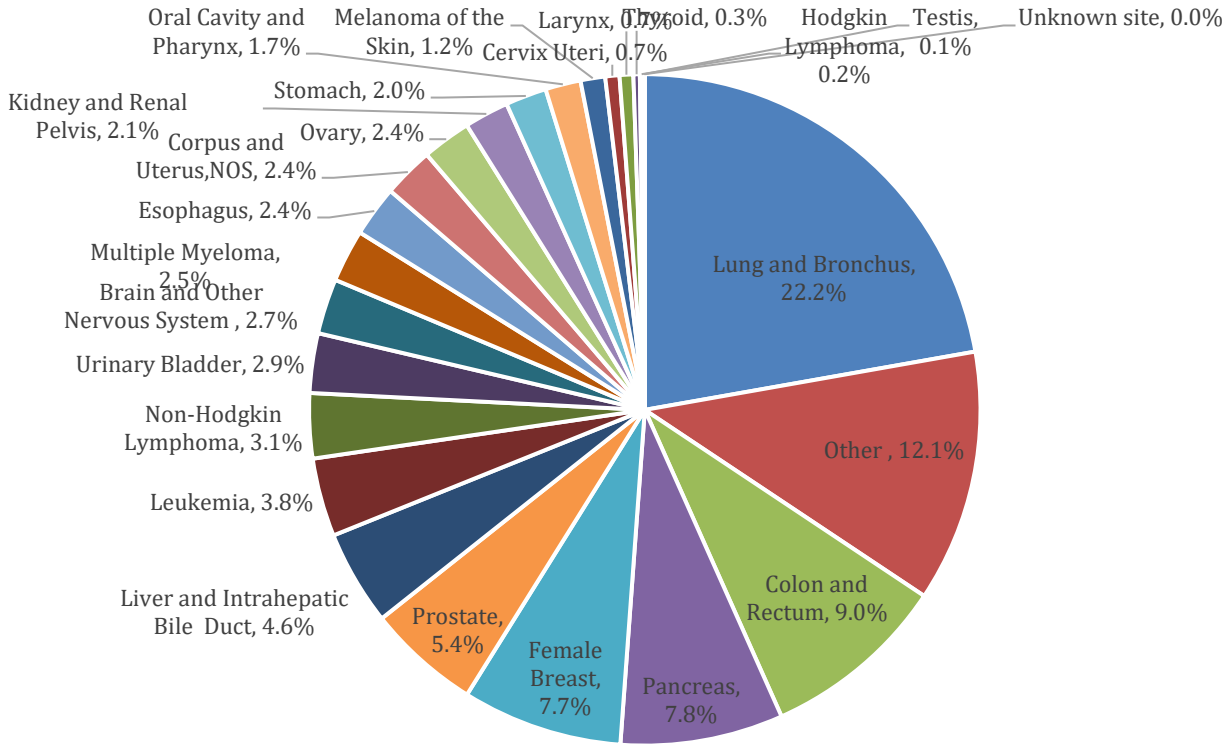
MEN	81,620	WOMEN	82,319
Prostate	30.7%	Female Breast	31.7%
Lung and Bronchus	11.0%	Lung and Bronchus	12.0%
Colon and Rectum	7.8%	Colon and Rectum	7.6%

[222] Maryland Department of Health. Maryland Cancer Registry (2017-2021)

Melanoma of the Skin	6.5%	Corpus and Uterus, NOS*	7.1%
Urinary Bladder	4.8%	Melanoma of the Skin	4.5%
Non-Hodgkin Lymphoma	4.2%	Thyroid	3.6%
Kidney and Renal Pelvis	4.2%	Non-Hodgkin Lymphoma	3.5%
Oral Cavity and Pharynx	3.7%	Pancreas	3.0%
Pancreas	3.1%	Kidney and Renal Pelvis	2.7%
Leukemia	3.0%	Ovary	2.4%

*NOS defined as Not Otherwise Specified;
Source: Maryland Cancer Registry, 2017-2021

Figure 7. Percent of All Cancer Deaths by Type of Cancer in Maryland, 2017-2021



*NOS is defined as Not Otherwise Specified
Source: Maryland Vital Statistics Administration

MORTALITY

More than 10,000 Marylanders die from cancer each year. Maryland's age-adjusted overall cancer mortality rate of 136.4 deaths per 100,000 in 2021 was statistically significantly lower than the 2021 U.S.

cancer mortality rate of 144.2 per 100,000. Maryland's rank in overall cancer mortality has been steadily improving compared to other states and the District of Columbia. For the period 1989-1993, Maryland had the third-highest cancer mortality rate in the nation.[223] This rate decreased over the following years and for the period 2017-2020, Maryland improved to having the 35th highest cancer mortality rate in the nation.[224]

For the five-year period from 2017 to 2021, lung cancer was the leading cause of cancer deaths, accounting for more than one quarter (22.2%) of all cancer deaths in Maryland (Figure 7). Colorectal cancer followed, accounting for 9.0% of all cancer deaths in the state. Pancreatic cancer accounted for 7.8%, female breast cancer accounted for 7.7%, and prostate cancer accounted for 5.4% of all cancer deaths in the state. Collectively, these five cancers accounted for 52.1% of all deaths due to cancer in Maryland.

Table 7 shows the ten leading causes of cancer death among men and women in Maryland. Cancer mortality in both men and women is similar, with the distinction of prostate cancer causing the second largest proportion of cancer deaths in men, while female breast cancer causes the second largest proportion of cancer deaths in women.

Table 7. Ten Leading Cancer Mortality Sites by Sex in Maryland 2017-2021

MEN	27,351	WOMEN	26,474
Lung and Bronchus	22.2%	Lung and Bronchus	22.2%
Prostate	10.7%	Female Breast	15.7%
Colon and Rectum	9.2%	Colon and Rectum	8.8%
Pancreas	7.9%	Pancreas	7.8%
Liver and Intrahepatic Bile Duct	6.1%	Corpus and Uterus, NOS*	5.0%
Leukemia	4.3%	Ovary	4.8%
Urinary Bladder	3.9%	Leukemia	3.2%
Esophagus	3.7%	Liver and Intrahepatic Bile Duct	3.0%
Non-Hodgkin Lymphoma	3.5%	Non-Hodgkin Lymphoma	2.7%

[223] Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA. SEER Cancer Statistics Review, 1975-2011, 1975-2000, 1975-1993. Bethesda, MD: National Cancer Institute; 2015

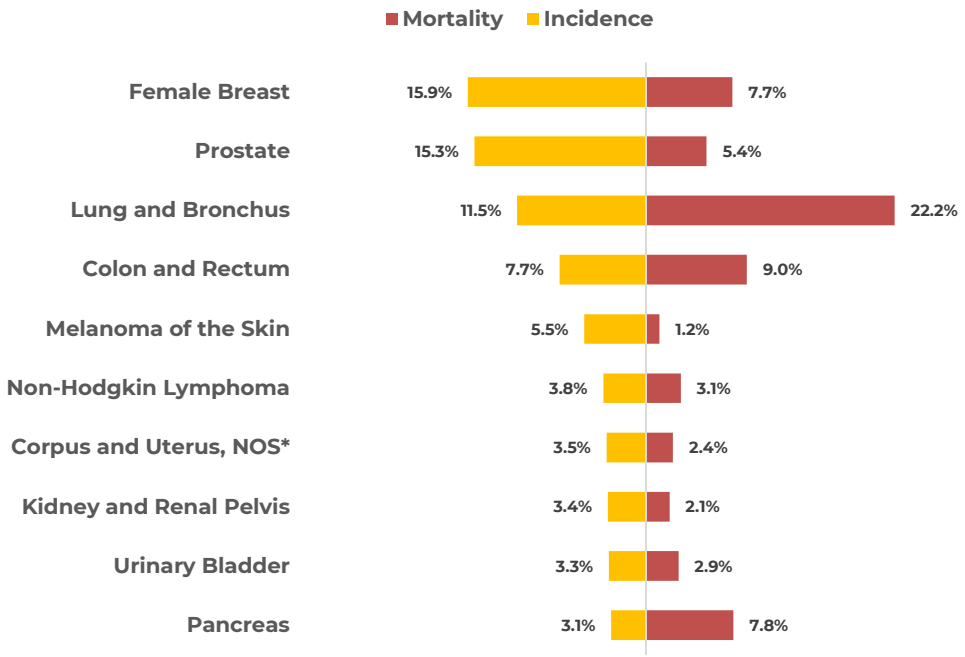
[224] National Cancer Institute; Centers for Disease Control and Prevention. State Cancer Profiles. https://statecancerprofiles.cancer.gov/. Accessed June 24, 2025.

Brain and Other Nervous System	2.9%	Multiple Myeloma	2.4%

*NOS defined as Not Otherwise Specified
Source: Maryland Vital Statistics Administration

The cancer types that contribute to the highest number of new cases (incidence) do not necessarily contribute to the same proportion of cancer deaths (mortality). Figure 8 represents the ten cancer types with the highest incidence in Maryland and their corresponding mortality proportions from 2017 to 2021. Although lung and bronchus cancer only make up 11.5% of the cancers diagnosed in Maryland, it causes more than 22.2% of cancer deaths. Prostate cancer, the second leading type of cancer diagnosed in Maryland, only caused 5.4% of cancer deaths from 2017 to 2021.

Figure 8. Percentage of Incidence Cancer Cases and Cancer Deaths by Type in Maryland, 2017-2021

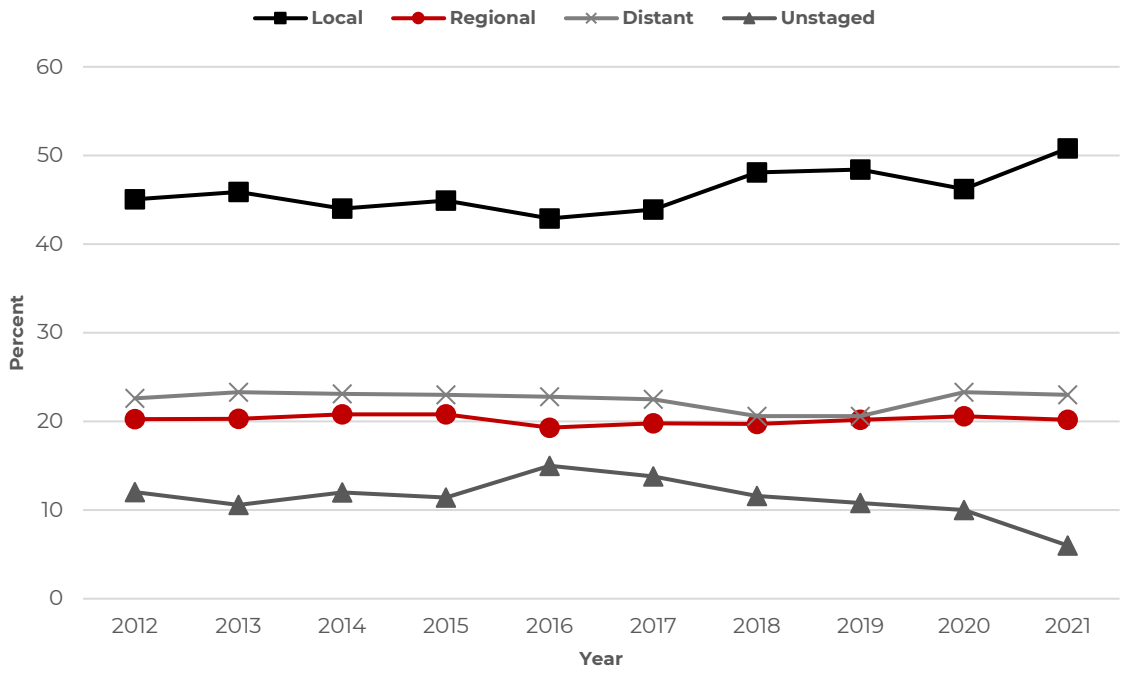


*NOS is defined as Not Otherwise Specified
Sources:
Maryland Cancer Registry;
Maryland Vital Statistics Administration

Cancer mortality is often linked with cancer stage, which refers to the extent of the cancer, including tumor size and whether the cancer has spread to surrounding tissues or other areas of the body. Cancer stage ranges from local (cancer cells are confined to the original organ site) to distant (advanced cancer that has spread to other areas of the body). In general, for most cancer types, patients who are diagnosed with local stage disease have a higher five-year survival rate (likelihood of living for at least five years after a diagnosis) than patients who are diagnosed with advanced disease.[225] Cancer staging data in Maryland from 2012 through 2021 are presented below in Figure 9.

Figure 9. All Cancer Sites by Stage at Diagnosis in Maryland, 2012-2021

[225] Kratzer, T., Jemal, A., Siegel, R., Sung, H., & Giaquinto, A. (2025). Cancer statistics, 2025. *CA: A Cancer Journal for Clinicians*, *75*(1), 10–45. https://doi.org/10.3322/caac.21871



Source: Maryland Cancer Registry, 2012-2021

TARGETED CANCERS

The Maryland Cigarette Restitution Fund (CRF) Cancer Prevention, Education, Screening, and Treatment Program has targeted seven cancers for public health intervention in Maryland. These cancers are categorized as all having a high burden in Maryland, modifiable risk factors, and/or effective screening tests for early detection. The seven targeted cancers are breast, cervical, colorectal, lung, oral, prostate, and skin cancer (melanoma). Local health departments and health systems in all 24 Maryland jurisdictions are funded by CRF to address one or more of the targeted cancers, and since funding became available in 2001, most have chosen to use funding to screen for colorectal cancer. Current incidence and mortality data on the seven targeted cancers are presented below.

Table 8. Incidence and Mortality Rates for Maryland and U.S., 2017-2021

	Maryland Incidence Rates	U.S. Incidence Rates	Maryland Mortality Rates	U.S. Mortality Rates
Cervical	6.4	7.4	2.0	2.2
Colorectal	34.8	36.4	13.1	13.1
Female Breast	134.7	129.6	20.5	19.6

Lung	49.2	46.8	31.7	33.8
Oral	11.1	11.4	2.4	2.6
Prostate	136.7	115.4	19.7	19.2
Skin (Melanoma)	24.7	23.8	1.8	2.1

Rates are per 100,000 population and are age-adjusted to the 2000 US standard population
Sources: Maryland Cancer Registry, Maryland Vital Statistics Administration, SEER Cancer Query System: US Mortality Statistics

Although the Cancer Plan focuses on the seven CRF-targeted cancers described on the previous page, efforts can be undertaken to raise awareness of other cancers. More information about the seven targeted cancers, as well as many other types of cancer, is available from the National Cancer Institute (NCI) and the American Cancer Society (ACS):

NCI: www.cancer.gov/cancertopics/types/alphalist
ACS: www.cancer.org/cancer/index

SCREENING

Cancer screening uses various tests and procedures to detect cancer in people who aren't experiencing symptoms. These methods can include physical exams, imaging (like CT scans or MRIs), lab tests (such as blood tests for tumor markers), and procedures (like colonoscopy). For some cancers, screening can find changes that are precancerous or cancerous at an early stage, when treatment is more likely to be successful. Early detection through screening remains a crucial strategy for improving cancer survival rates and, in some cases, preventing cancer altogether.

Cancer screening guidelines vary depending on the cancer type and the recommending organization. Several organizations publish these guidelines, including the ACS, the USPSTF, and the NCCN. The USPSTF is an independent panel of national experts in prevention and evidence-based medicine. They develop evidence-based recommendations for clinical preventive services, including screenings, counseling, and preventive medications. The USPSTF's recommendations are based on rigorous reviews of existing peer-reviewed evidence. Under the Affordable Care Act (ACA), health insurance plans are generally required to cover preventive services, including cancer screenings, that receive an "A" or "B" recommendation from the USPSTF. It is important to note that other organizations, like the ACS and NCCN, may have their own guidelines, which can sometimes differ from the USPSTF recommendations. USPSTF-recommended screening tests and other preventive health services can be viewed online at: www.uspreventiveservicestaskforce.org/uspstf/recommendation-topics/uspstf-a-and-b-recommendations.

Table 9 includes the current USPSTF screening recommendations for the general population for the seven targeted cancers, with additional recommendations from other organizations included as noted. Screening guidelines, however, may vary for special populations, depending on the assessed risk of an individual. This risk is based on many factors including an individual's health and family history, individual health behaviors, age, and current medical condition.

Table 9. Targeted Cancers - Screening Recommendations Based on USPSTF Guidance (As of December 2024)

CANCER TYPE	GENERAL SCREENING POPULATION	SCREENING TEST AND FREQUENCY OF SCREENING	ADDITIONAL RECOMMENDATIONS OR NOTES
Female Breast	Women age 40 to 74 years	Mammogram, every 2 years	Recommendations published in April 2024.
Cervical	Women age 21 to 65 years	Women ages 21 to 29: Pap test alone, every 3 years Women ages 30 to 65: Pap test alone, every 3 years; or hrHPV test alone, every 5 years; or cotesting (Pap and hrHPV), every 5 years	Recommendations were published in August 2018 and are in the process of being updated.
Colorectal	Adults age 45 to 75 years	The frequency and risks and benefits of different screening methods vary.	Recommendations were published in May 2021.
Lung	Adults age 50 to 80 years with a 20 pack-year smoking history and currently smoke or have quit within the past 15 years	Low-dose CT scan, annually	Recommendations were published in March 2021.
Oral	Insufficient Evidence to Recommend	N/A	Recommendations published in November 2013. The USPSTF states that its recommendation is intended for primary care providers and does not pertain to dental providers or otolaryngologists. Dental providers or otolaryngologists may conduct a comprehensive examination of the oral cavity and pharynx during the clinical encounter. The American Dental Association recommends that dentists look for signs of cancer while performing routine exams in all patients.*
Prostate	For men age 55 to 69 years, the decision to be screened for prostate cancer should be an individual one	N/A	Recommendations published in May 2018 and are in the process of being updated. The American Urological Association** recommends shared decision-making for men age 55 to 69 years, and individualized decisions regarding screening for men younger than age 55 at higher risk.

Skin	Insufficient Evidence to Recommend	N/A	Recommendations were published in March 2018. The USPSTF recommends counseling young adults, adolescents, children, and parents of young children about minimizing exposure to ultraviolet radiation for persons aged 6 months to 24 years with fair skin types.

*American Dental Association recommendations can be found at www.ada.org/resources/ada-library/oral-health-topics/cancer-head-and-neck
**The American Urological Association recommendations can be found at www.auanet.org/guidelines-and-quality/guidelines/prostate-cancer-early-detection-guideline

The Maryland BRFSS is an annual, statewide health survey administered to adults ages 18 and older that focuses on behavioral risk factors, preventive health measures, and health care access. The BRFSS includes questions that measure the proportion of Marylanders who are up to date with recommended cancer screening exams. Table 10 shows the most recent Maryland BRFSS data for each of the recommended screening exams. Skin cancer screening is not currently recommended by the USPSTF, and there are no questions included in the BRFSS that measure the proportion of Marylanders who have received that screening.

Table 10. Percentage of Maryland Adults Screened for Cancer by Type, Maryland BRFSS, 2022

CANCER	MEASURE	PERCENTAGE OF MARYLAND ADULTS
Female Breast	Women age 40 to 74 years who have had a mammogram within the past 2 years	78.3%
Cervical	Women age 21 to 65 years, with an intact cervix, who have had a cervical cancer screening within the past 3 years	51.4%
Colorectal	Adults age 45 to 75 years who have had a colonoscopy in the past 10 years, sigmoidoscopy in the past 5 years and blood stool test in the past 3 years, or blood stool test within the past year	71.8%
Lung	Adults age 50 to 80 years with a 20 pack-year smoking history who currently smoke or have quit within the last 15 years	16.8%
Oral*	Adults age 18 years and older who had an oral cancer screening exam in the past year	24.1%

Prostate+	Men ages 55 to 69 who have discussed the advantages and disadvantages of the prostate-specific antigen (PSA) test with their health care provider	18.3%

*Maryland BRFSS, 2018
+Maryland BRFSS, 2020

DISPARITIES IN CANCER INCIDENCE, MORTALITY, AND SCREENING RATES

In Maryland, data indicate that the burden of cancer is not distributed equally across different races and ethnicities, sexes and genders, and geographic locations. Differences are seen in incidence and mortality rates, screening rates, and stage at diagnosis, and many of these differences can likely be classified as health disparities that are linked with social, economic, and/or environmental disadvantage. Discussion of cancer disparities, including factors that are thought to play a role in disparities and social determinants of health, can be found in the initial sections of the Cancer Plan.

The charts and maps on the following pages display statistically significant differences in cancer incidence and mortality (2017-2021) and screening rates (2022) for the seven targeted cancers. Among the targeted cancers, significant racial, ethnic, and/or sex differences are seen in the incidence and mortality rates for cervical, colorectal, female breast, lung, oral, and prostate cancers, and in screening rates for female breast, colorectal, and cervical cancers. Although the Cancer Plan focuses on differences between racial and ethnic groups and between males and females, differences and cancer disparities may also occur due to other factors such as age, disability, and educational status.

Table 11a. Significant Disparities in Cancer Incidence and Mortality by Race/Ethnicity and Sex, Maryland, 2021

CANCER TYPE	INCIDENCE RATES	MORTALITY RATES
Cervix	Hispanic/Latino: 8.2 Black: 6.6 White: 4.8*	Black: 2.4 White: 1.4*
Colon and Rectum	**Black: 35.5** **White: 35.4** Asian/Pacific Islander: 29.7 Hispanic/Latino: 24.7* **Male: 38.8** Female: 31.6*	**Black: 14.9** White: 12.5 Asian/Pacific Islander: 11.9 Hispanic/Latino: 9.9* **Male: 15.6** Female: 11.2*
Female Breast	**White: 148.9** **Black: 143.7** American Indian/Alaska Native: 130.9 Asian/Pacific Islander: 100.2 Hispanic/Latino: 94.6*	**Black: 23.0** White: 17.7 Asian/Pacific Islander: 14.2 Hispanic/Latino: 13.1*
Lung	**White: 51.0** **Black: 43.1**	**White: 31.1** **Black: 29.2**

	Asian/Pacific Islander: 21.8 Hispanic/Latino: 19.0* **Male: 53.3** Female: 46.4*	**Asian/Pacific Islander: 18.2** Hispanic/Latino: 11.1* **Male: 37.3** Female: 27.7*
Oral	**White: 14.1** Asian/Pacific Islander: 8.6 Black: 7.3 Hispanic/Latino: 5.7* **Male: 18.0** Female: 5.7*	White: 2.7 Black: 2.0* **Male: 4.0** Female: 1.2*
Prostate	**Black: 201.9** **White: 120.7** Hispanic/Latino: 78.7 Asian/Pacific Islander: 70.6*	**Black: 36.3** White: 14.0*

Bolded values were statistically significant in comparison to the reference group (p<0.05)
For each cancer, statistical significance was tested off the group with the lowest rate (i.e., the reference group), excluding zero and/or suppressed values
*Reference group
Rates are per 100,000 and are age-adjusted to 2000 US Standard Population
All race rates, except Hispanic, are non-Hispanic/Latino
Sources: Maryland Cancer Registry; Maryland Vital Statistics Administration

Table 11b. Significant Disparities in Late Stage at Diagnosis by Race/Ethnicity, Maryland, 2017-2021

CANCER	White	Black	Hispanic/ Latino	Asian/Pacific Islander	American Indian/Alaska Native
Cervix	52.3%	52.5%	45.3%*	46.3%	66.6%
Colon and Rectum	60.6%	58.2%*	57.5%	59.7%	58.3%
Female Breast	28.1%*	**36.9%**	**37.5%**	30.6%	28.6%
Lung	63.5%*	**65.0%**	67.6%	**67.2%**	85.2%
Oral	63.0%	**68.3%**	65.3%	57.8%*	66.7%
Prostate	16.8%	16.3%*	**21.0%**	18.2%	24.0%

Bolded values were statistically significant in comparison to the reference group (p<0.05)
For each cancer, statistical significance was tested off the group with the lowest rate (i.e., the reference group)
*Reference group
All groups, except Hispanic, are non-Hispanic/Latino
Source: Maryland Cancer Registry

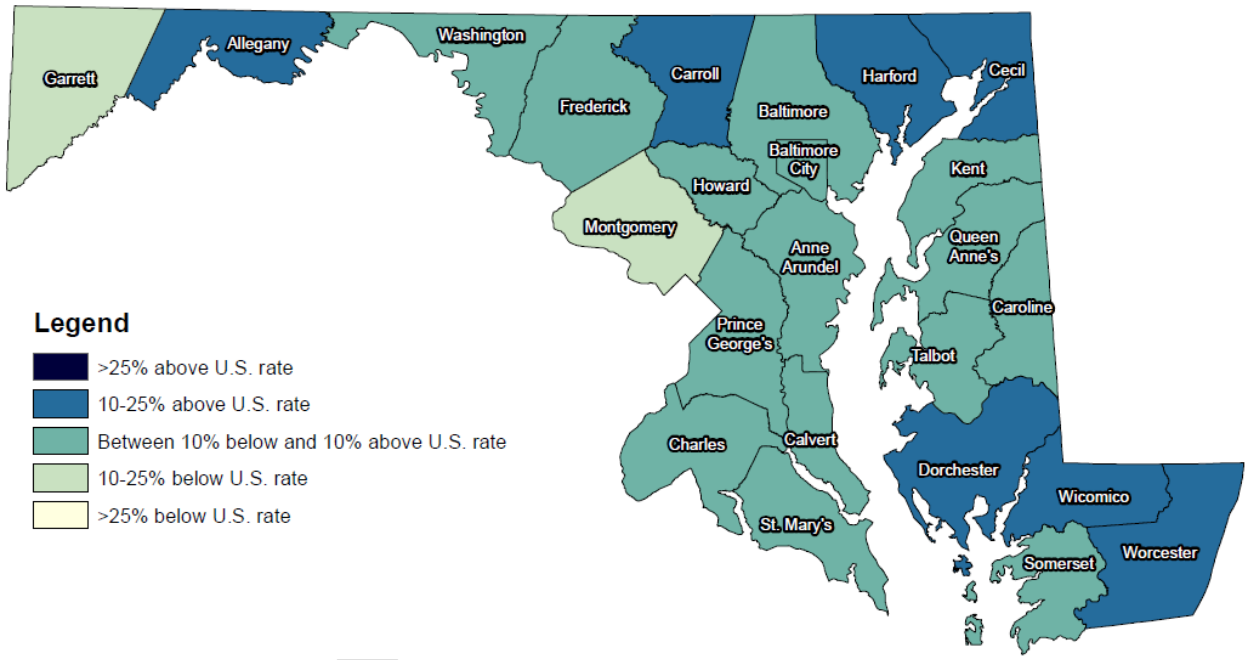
Table 12. Significant Disparities in Cancer Screening

SCREENING TYPE	BRFSS QUESTION	PERCENT RESPONDENTS
Female Breast	Percentage of women in Maryland ages 40 to 74 years of age who have received a mammogram in the past two years.	Asian/Pacific Islander: 85.4%* Black: 82.5% White: 77.3%

		Hispanic/Latino: 67.6%
Colon and Rectum	Percentage of adults aged 45 to 75 years who have had a blood stool test in the past year, sigmoidoscopy in the past 5 years and blood stool test in the past 3 years, or a colonoscopy in the past 10 years.	White: 73.2%* Black: 73.2% Hispanic/Latino: 64.5% **Asian/Pacific Islander: 61.9%**
Cervical	Percentage of women aged 21 to 65 years who have not had a hysterectomy and have had a cervical cancer screening test in the past 3 years.	White: 59.0%* Black: 51.4% Hispanic/Latino: 37.0% **Asian/Pacific Islander: 32.6%**

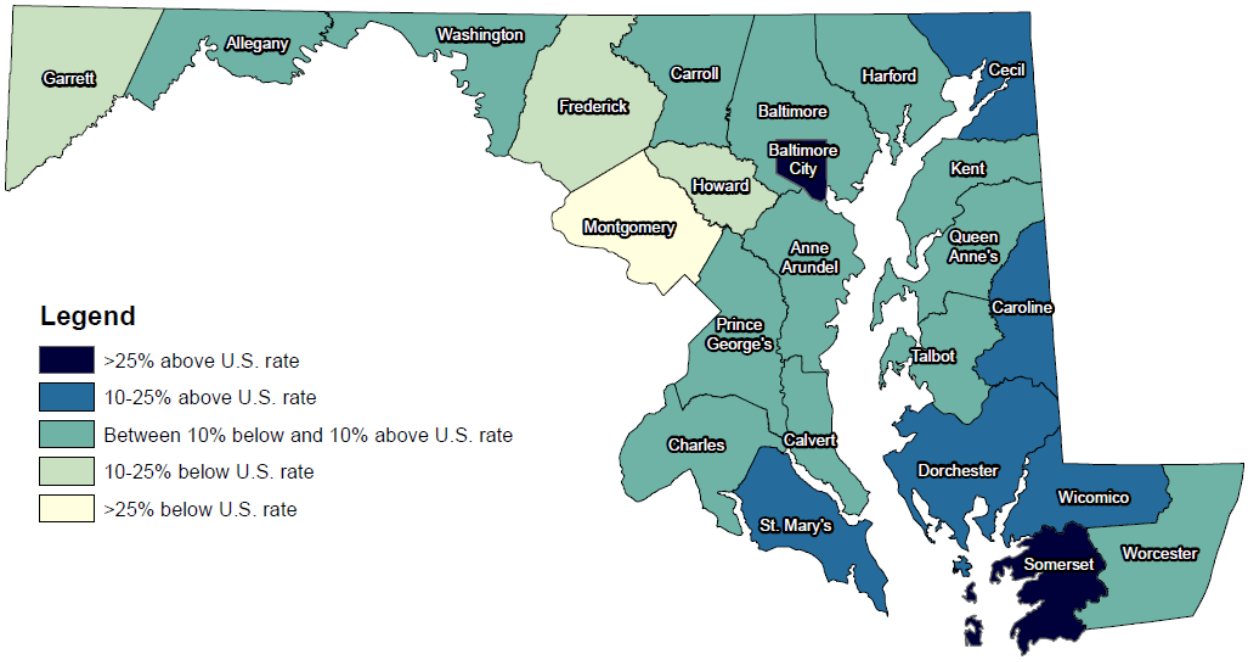
Bolded values were statistically significant in comparison to the reference group (p<0.05)
For each cancer, statistical significance was tested off the group with the highest rate (i.e., the reference group)
*Reference group
Source: Maryland BRFSS 2022

Figure 10. Maryland All Sites Cancer Incidence Rates by Geographical Area: Comparison to US Rate, 2017-2021



Rates are age-adjusted to the 2000 U.S. standard population and per 100,000 population.
U.S. all sites cancer incidence rate, 2017-2021: 436.6 / 100,000
Maryland all sites cancer incidence rate, 2017-2021: 441.6 / 100,000
Sources: Maryland Cancer Registry; U.S. SEER, SEER*Stat Database

Figure 11. Maryland All Sites Cancer Mortality Rates by Geographical Area: Comparison to US Rate, 2017-2021



Rates are age-adjusted to the 2000 U.S. standard population and per 100,000 population.
U.S. all sites cancer mortality rate, 2017-2021: 148.4 / 100,000
Maryland all sites cancer mortality rate, 2017-2021: 144.8 / 100,000
Sources: Maryland Vital Statistics Administration; U.S. SEER, Cancer Statistics Review

Although disparities in the incidence and mortality of certain cancers have declined, some disparities continue to persist over time. Additional data on cancer disparities for the seven CRF-targeted cancers are available in the annual MDH CRF Cancer Report, which include incidence and mortality disparities by race over time, as well as additional maps displaying county-level disparities. The reports are published online at: phpa.health.maryland.gov/cancer/Pages/surv_data-reports.aspx.

CHILDHOOD CANCER

Despite notable advances, childhood cancer remains a pressing challenge in both Maryland and across the United States. Early diagnosis is particularly difficult, as symptoms often resemble those of more common childhood illnesses. While survival rates have improved dramatically since 1970—evidenced by a 70% decline in cancer mortality among children and a 63% decline among adolescents, primarily due to improved treatments and high participation in clinical trials—cancer remains the leading cause of disease-related death in U.S. children beyond infancy.[226]

The scope of childhood cancer is substantial both nationally and globally. In 2024, an estimated 14,910 children and adolescents (ages 0–19) in the United States are expected to be diagnosed with cancer, and approximately 1,590 are expected to die from the disease.[227] Globally, more than 400,000 new

[226] National Cancer Institute. (n.d.). Childhood cancer statistics. https://www.cancer.gov/types/childhood-cancers/child-adolescent-cancers-fact-sheet. Accessed May 24, 2025.
[227] American Cancer Society. (2024). Cancer facts & figures 2024. https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2024.html. Accessed May 24, 2025.

childhood cancer cases are estimated annually, though this figure is likely a significant underestimate due to underdiagnosis and underreporting in many regions with limited health care infrastructure.[228]

From 2017 to 2021, there were 1,246 cases of cancer diagnosed among Maryland children under age 20 (Table 13). In 2024, approximately 9,620 children ages 0–14 are projected to be diagnosed with cancer nationwide, with an estimated 1,040 cancer-related deaths in this age group. The most commonly diagnosed cancers in children include leukemias, brain and other central nervous system tumors, and lymphomas.[229]

Table 13. Number of Cancer Cases in Children by Site and by Age in Maryland 2017-2021

	< 1 Year	1-4 Years	5-9 Years	10-14 Years	15-19 Years
All Sites	93	290	251	237	375
Oral Cavity and Pharynx	<6	0	<6	<6	9
Digestive System	16	14	<6	15	26
Bones and Joints	0	<6	13	30	31
Soft Tissue including Heart	16	26	15	7	23
Melanoma of the Skin	<6	0	<6	<6	13
Ovary	<6	<6	<6	<6	8
Testis	0	<6	<6	<6	20
Kidney and Renal Pelvis	6	29	13	<6	<6
Eye and Orbit	<6	10	<6	<6	0
Brain and Other Nervous System	12	60	69	40	29
Thyroid	<6	0	0	14	54
Other Endocrine including Thymus	7	16	8	<6	6
Hodgkin Lymphoma	0	<6	<6	26	48
Non-Hodgkin Lymphoma	<6	8	11	19	38
Acute Lymphocytic Leukemia	7	84	85	36	22
Chronic Lymphocytic Leukemia	0	0	0	0	0
Acute Myeloid Leukemia	<6	11	7	11	14
Chronic Myeloid Leukemia	<6	0	0	<6	<6

<6=Case count of 1-5 are suppressed per MDH/MCR Data Use Policy.
Source: Maryland Cancer Registry, 2017-2021

Effective treatment of childhood cancer requires specialized, multidisciplinary care. Experts strongly recommend that children be treated at pediatric cancer centers that offer individualized protocols and access to clinical trials. However, a major challenge is the toxicity of many life-saving treatments, which can result in a wide range of serious, long-term—often lifelong—health complications. These "late effects" may impact nearly every bodily system, including cardiovascular, neurological, respiratory,

[228] World Health Organization. (2023). Childhood cancer: Key facts. https://www.who.int/news-room/fact-sheets/detail/cancer-in-children. Accessed May 24, 2025.
[229] American Cancer Society. (2024). Cancer facts & figures 2024. https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2024.html. Accessed May 24, 2025.

endocrine, skeletal, urinary, and reproductive systems, and may lead to increased risks of obesity, sensory impairments, and psychosocial difficulties.[230]

Studies indicate that approximately 95% of childhood cancer survivors will experience at least one chronic health condition by age 45, many of which may be severe or life-threatening. These conditions can include secondary cancers, cardiac and pulmonary complications, and cognitive impairments. This underscores the urgent need for individualized, long-term follow-up care tailored to survivors' treatment histories and associated risks.[231]

Continued progress against childhood cancer depends on sustained investment in research and survivor support. In Maryland, the Pediatric Cancer Fund was created to help drive cancer treatment innovation by supporting the development of more effective and less toxic treatments for young patients.

The Children's Oncology Group has created comprehensive long-term follow-up guidelines for survivors of childhood cancers, available at www.survivorshipguidelines.org. It also offers the "Passport for Care", a web-based clinical tool that enables providers to input treatment details and receive personalized screening recommendations and late-effect risk profiles. This resource is available at www.passportforcare.org.

CANCER BURDEN IN YOUNG ADULTS

About 220,740 newly diagnosed cancer cases and 28,060 cancer deaths occurred among young adults (aged 20-49 years) in the United States in 2025, representing 11% of overall cases and 4.5% of overall deaths.[232] The burden of cancer among young adults has been rising for the past few decades. According to a recent comprehensive study, cancer incidence in the United States increased in successive younger men and women born after the 1950s for 17 of the 34 cancer types studied, including colon and rectum, pancreas, kidney, endometrium, and hormone-positive female breast cancers.[233] Reasons for this increased risk are unknown, but suspected risk factors include obesity, consumption of unhealthy diet, and physical inactivity, which have been increasing in young men and women during the past few decades. It's important to note that while these are suspected risk factors at a population level, individual cancer development is complex and often involves a combination of genetic and environmental influences. Nevertheless, the elevated cancer risk in successive younger generations born since the 1960s has significant public health, societal, and economic implications. First, the pattern may halt or reverse the progress in reducing the cancer burden attained over the past decades as young adults with elevated risk age and enter older age, where cancer most frequently occurs. Also, the morbidity and premature mortality associated with the rising burden incur huge economic losses to families and to the nation.[234] Beyond the economic impact, the emotional and psychological toll on young adults, their families, and their support networks is substantial.

[230] American Cancer Society. Late Effects of Childhood Cancer Treatment. https://www.cancer.org/cancer/survivorship/children-with-cancer/late-effects-of-cancer-treatment.html. Accessed May 24, 2025.
[231] Bhatia S, Tonorezos ES, Landier W. Clinical Care for People Who Survive Childhood Cancer: A Review. JAMA. 2023 Sep 26;330(12):1175-1186. doi: 10.1001/jama.2023.16875. PMID: 37750876.
[232] American Cancer Society. Cancer Facts and Figures 2025. https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/2025-cancer-facts-figures.html. Accessed June 15, 2025.
[233] Sung, Hyuna et al. Differences in cancer rates among adults born between 1920 and 1990 in the USA: an analysis of population-based cancer registry data. Sung, Hyuna et al. The Lancet Public Health, Volume 9, Issue 8, e583 - e593.
[234] Sung, Hyuna et al. Differences in cancer rates among adults born between 1920 and 1990 in the USA: an analysis of population-based cancer registry data. Lancet Public Health, Volume 9, Issue 8, e583 - e593.

Mitigating the rising burden of cancer in young adults requires concerted and coordinated efforts by the public, legislators, and public health experts. First, there is a need to increase awareness about the rising burden of cancer in young adults among the general public and health care providers to promote prevention and early detection as cancers occurring in young adults are more likely to have a family history or genetic predisposition and to be aggressive. Therefore, increased access to genetic counseling and testing for high-risk individuals could be beneficial. Optimal adoption of healthy lifestyle and behaviors, however, requires new or strengthening existing public policies at local, state, and federal levels. Furthermore, addressing health disparities that may contribute to these rising rates in certain populations is crucial. More funding is needed for large-scale, life-course epidemiologic studies to identify the underlying risk factors for planning preventive measures. Research should also focus on understanding the unique biological characteristics of cancers that develop in young adults to improve treatment strategies and outcomes.

CROSS-CUTTING TOPICS

Prevention and early detection are not the only components of a comprehensive effort to reduce cancer incidence, mortality, and its associated disparities. This section discusses several cross-cutting topics in cancer control, including patient navigation, patient education, provider education, quality monitoring and improvement, cancer genetics, immunotherapy, personalized medicine, and research and clinical trials. These topics present various opportunities for health care providers, health systems, public health entities, community organizations, insurers, and the public to reduce the burden of cancer in Maryland.

PATIENT NAVIGATION

The complexity of the health care system often presents cancer patients with many challenges and barriers in obtaining appropriate and timely care. Since the concept of patient navigation was first introduced by Harold P. Freeman in 1990, patient navigation has emerged as an effective, evidence-based strategy that addresses health disparities. Patient navigation improves outcomes in underserved populations through timely cancer prevention, early detection, diagnosis, treatment, and survivorship in a competent and culturally appropriate manner.[235]

Patient navigators assess and eliminate barriers while helping patients understand and utilize the health care system more effectively and efficiently. They provide services that assist individuals in overcoming obstacles from screening to treatment, as well as coping with challenges during survivorship. Patient navigation shares many characteristics with other models of patient assistance, such as case management. Both case management and patient navigation include case identification, identifying barriers to care, developing individual plans to overcome barriers, and tracking care over time.[236] Those who work in cancer patient navigation are trained, culturally competent health care professionals who work with patients, families, health care providers, and the health care system to ensure cancer patients' needs are appropriately and effectively addressed.[237]

[235] Wells KJ, Battaglia TA, Dudley DJ, Garcia R, Greene A, Calhoun E, Mandelblatt JS, Paskett ED, Raich PC; Patient Navigation Research Program. Patient navigation: state of the art or is it science? Cancer. 2008 Oct 15;113(8):1999-2010. doi: 10.1002/cncr.23815. PMID: 18780320; PMCID: PMC2679696.
[236] Chan RJ, Milch VE, Crawford-Williams F, Agbejule OA, Joseph R, Johal J, Dick N, Wallen MP, Ratcliffe J, Agarwal A, Nekhlyudov L, Tieu M, Al-Momani M, Turnbull S, Sathiaraj R, Keefe D, Hart NH. Patient navigation across the cancer care continuum: An overview of systematic reviews and emerging literature. CA Cancer J Clin. 2023 Nov-Dec;73(6):565-589. doi: 10.3322/caac.21788. Epub 2023 Jun 26. PMID: 37358040.
[237] Phillips S, Villalobos AVK, Crawbuck GSN, Pratt-Chapman ML. In their own words: patient navigator roles in culturally sensitive cancer care. Support Care Cancer. 2019 May;27(5):1655-1662. doi: 10.1007/s00520-018-4407-7. Epub 2018 Aug 14. PMID: 30109486; PMCID: PMC6449285.

The role of patient navigators includes helping patients to overcome health system barriers, providing health education across the cancer continuum from prevention to survivorship, addressing patient barriers to cancer care, and providing psychosocial support. Patient navigators help facilitate patient-provider communication, provide psychosocial support, manage logistical obstacles, increase adherence to care recommendations, and improve quality of life and survival. To these ends, those who work in patient navigation may coordinate medical appointments, maintain telephone contact between patients and health care providers, arrange transportation to and from medical services, assist with completing forms and obtaining documentation, and much more.[238]

Patient navigation has proven to be an effective intervention in promoting screening and achieving timely diagnosis and treatment of cancer, and numerous studies have demonstrated its benefits.[239] A study in 2014 examining the Cancer Prevention Treatment Demonstration (CPTD) Screening Trial revealed that patient navigation was effective in increasing colorectal cancer screening among older African American adults in Baltimore City.[240] Another study that also looked at the CPTD showed that patient navigation was effective for participants' breast cancer screening adherence among African American Medicare beneficiaries in Baltimore City, particularly for women who were not up to date on their screening at the time of enrollment.[241] Patient navigation also reduces health disparities, increases patients' satisfaction with medical treatment and care, increases patients' access to care, and improves timely cancer care.[242] Patients who receive navigation support are more likely than non-navigated patients to receive timely cancer screening, treatment initiation, and follow-up with diagnostic tests.[243]

In 2022, the Professional Oncology Navigation Task Force updated and obtained consensus for consistent phrasing for different types of patient navigators. Positions that fall under the professional navigator category include oncology patient navigators and clinical navigators, defined as oncology nurse navigators and oncology social work navigators. The Task Force also created the Oncology Navigation Standards of Professional Practice to provide professional oncology clinical navigators and patient navigators with clear information regarding the standards of professional practice. This includes the knowledge and skills all professional navigators should possess to deliver high-quality, competent, and ethical services to people impacted by cancer.

To support patient navigation in Maryland, MDH facilitates a statewide Maryland Patient Navigation Network (PNN). The PNN brings together individuals from public and private organizations who navigate patients through cancer care or who are interested in patient navigation, and provides opportunities for networking, sharing resources, and training. More information about the PNN can be found here: https://health.maryland.gov/phpa/cancer/cancerplan/pages/pnn.aspx

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[238] Natale-Pereira A, Enard KR, Nevarez L, Jones LA. The role of patient navigators in eliminating health disparities. Cancer. 2011 Aug;117(15 Suppl):3543-52. doi: 10.1002/cncr.26264. PMID: 21780089; PMCID: PMC4121958.

[239] Chen M, Wu VS, Falk D, Cheatham C, Cullen J, Hoehn R. Patient Navigation in Cancer Treatment: A Systematic Review. Curr Oncol Rep. 2024 May;26(5):504-537. doi: 10.1007/s11912-024-01514-9. Epub 2024 Apr 6. PMID: 38581470; PMCID: PMC11063100.

[240] Horne HN, Phelan-Emrick DF, Pollack CE, Markakis D, Wenzel J, Ahmed S, Garza MA, Shapiro GR, Bone LR, Johnson LB, Ford JG. Effect of patient navigation on colorectal cancer screening in a community-based randomized controlled trial of urban African American adults. Cancer Causes Control. 2015 Feb;26(2):239-246. doi: 10.1007/s10552-014-0505-0. Epub 2014 Dec 17. PMID: 25516073; PMCID: PMC4370183.

[241] Marshall, J.K., Mbah, O.M., Ford, J.G. et al (2016) Effect of Patient Navigation on Breast Cancer Screening Among African American Medicare Beneficiaries: A Randomized Controlled Trial. J Gen Intern Med 31: 68.

[242] Natale-Pereira A, Enard KR, Nevarez L, Jones LA. The role of patient navigators in eliminating health disparities. Cancer. 2011 Aug;117(15 Suppl):3543-52. doi: 10.1002/cncr.26264. PMID: 21780089; PMCID: PMC4121958.

[243] Niharika Dixit et al., Navigating a Path to Equity in Cancer Care: The Role of Patient Navigation. Am Soc Clin Oncol Educ Book 41, 3-10(2021). DOI:10.1200/EDBK_100026

PATIENT-LEVEL EDUCATION

Patient education is crucial throughout the cancer continuum, from prevention to treatment and survivorship. Educating individuals about cancer prevention through healthy behaviors, the importance of early detection through screening, and adherence to treatment plans is essential for improving patient outcomes, increasing survival rates, and reducing disparities. This education is vital for both those who regularly use the health care system and those who do not.

Education can address fears and misconceptions about cancer, empowering individuals to make informed decisions about their health. Many people may underestimate their cancer risk or not fully appreciate the benefits of early screening and treatment, which can delay or prevent them from seeking timely care when cancer is most treatable. For those less familiar with the health care system, providing accessible resources and clear information can help them navigate the process of getting screened, following up on recommendations, and completing treatment.

Research indicates that a lack of a provider recommendation is a main reason why eligible adults do not get screened for colorectal cancer.[244] Educating patients about and recommending appropriate cancer screenings is an example of how providers can increase screening rates and improve outcomes. The Community Guide recommends one-on-one education about cancer screening and the use of small media (e.g. videos, brochures, and newsletters) to increase screening rates of breast, cervical, and colorectal cancer.

Increasing public awareness of cancer risk factors, screening, and survivorship is also important. Studies have shown that the stigma associated with lung cancer influences medical help-seeking behavior for lung cancer symptoms.[245,246] The American Lung Association recommends increased public education efforts to raise awareness about the factors beyond smoking that can lead to lung cancer and that lung cancer can strike non-smokers as well as former smokers who quit many years ago.[247]

HEALTH CARE PROVIDER EDUCATION

Health care providers are trusted sources of information and play a vital role in improving patient knowledge and health outcomes. However, several factors can hinder optimal cancer care. These include inconsistent messaging among providers, gaps in provider knowledge regarding best practices, and communication barriers related to language and cultural differences.

Primary care providers are a critical audience for educational efforts aimed at improving cancer care. The growing demand for oncology services presents a significant challenge. While precise projections can vary, it's widely recognized that the need for oncology care is increasing and the number of oncologists may not keep pace. This anticipated gap underscores the importance of primary care

[244] Zhu X, Weiser E, Jacobson DJ, Griffin JM, Limburg PJ, Finney Rutten LJ. Provider-perceived barriers to patient adherence to colorectal cancer screening. Prev Med Rep. 2021 Dec 27;25:101681. doi: 10.1016/j.pmedr.2021.101681. PMID: 35127359; PMCID: PMC8800035

[245] Jamie L Studts, Catherine M Deffendall, Shelby L McCubbin, Heidi A Hamann, Kaitlyn Hoover, Whitney M Brymwitt, Timothy J Williamson, Examining evidence of lung cancer stigma among health-care trainees, JNCI Monographs, Volume 2024, Issue 63, June 2024, Pages 20–29, https://doi.org/10.1093/jncimonographs/lgae010. Accessed May 24, 2025.

[246] Carter-Harris L. Lung cancer stigma as a barrier to medical help-seeking behavior: Practice implications. J Am Assoc Nurse Pract. 2015 May;27(5):240-5. doi: 10.1002/2327-6924.12227. Epub 2015 Mar 3. PMID: 25736473; PMCID: PMC4414901.

[247] American Lung Association. State of Lung Cancer. Lung Cancer Key Findings. https://www.lung.org/research/state-of-lung-cancer/key-findings. Accessed January 10, 2025.

providers in cancer care.[248] While some cancer survivors express a preference for ongoing care from oncologists due to perceived knowledge gaps among primary care providers, effective collaboration and care transitions between oncologists and primary care providers are essential. Facilitating smooth transitions of post-treatment care to primary care providers allows oncologists to focus on patients requiring active treatment, ensuring efficient and accessible care for all. This collaborative approach becomes increasingly vital as the demand for oncology services grows. Furthermore, equipping primary care providers with the necessary knowledge and resources to manage post-treatment care can improve patient outcomes and satisfaction.[249]

Strengthened educational initiatives for health care providers in cancer prevention, risk assessment, screening, and post-treatment survivorship can significantly improve patient outcomes. These educational opportunities can be delivered through various channels, including live and web-based continuing medical education activities, as well as dissemination through newsletters and publications from medical professional associations and organizations. Target audiences for these programs should encompass a range of health care professionals, such as primary care physicians, advanced practice providers (nurse practitioners, physician assistants), nurses, social workers, and specialty physicians.

A lack of cultural competence can contribute to health care disparities, leading to misunderstandings and poorer patient outcomes. Evaluations of a web-based breast cancer cultural competency course for primary care providers in Montgomery County, Maryland, demonstrated increased awareness of breast cancer knowledge, disparities, and the importance of cultural competence.[250] Web-based education and video teleconferencing offer promising avenues for expanding access to provider education, particularly for those in rural or underserved areas.

QUALITY MONITORING AND IMPROVEMENT

Quality is defined as the extent to which health services increase the likelihood of desired health outcomes for individuals and populations and are consistent with current professional knowledge.[251] Quality monitoring and improvement are designed to standardize processes and structure (e.g., technology) to reduce variation, achieve predictable results, and improve outcomes for people and organizations.[252] Quality improvement focuses on improving the safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity of care.[253]

In comprehensive cancer control, quality monitoring and improvement include efforts such as quality-focused planning, data collection, and evaluation; development and implementation of evidence-based clinical practice guidelines; evaluation of clinical performance measures; inclusion of health equity quality metrics; and attention to patient-reported outcomes.

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[248] Institute of Medicine (US) National Cancer Policy Forum. Ensuring Quality Cancer Care through the Oncology Workforce: Sustaining Care in the 21st Century: Workshop Summary. National Academies Press (US); 2009. https://www.ncbi.nlm.nih.gov/books/NBK215252/ Accessed June 15, 2025.
[249] Smith TG, Strollo S, Hu X, Earle CC, Leach CR, Nekhlyudov L. Understanding Long-Term Cancer Survivors' Preferences for Ongoing Medical Care. J Gen Intern Med. 2019 Oct;34(10):2091-2097. doi: 10.1007/s11606-019-05189-y. Epub 2019 Jul 31. PMID: 31367870; PMCID: PMC6816669.
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[251] Institute of Medicine Committee on Quality of Health Care in A. In: Crossing the Quality Chasm: A New Health System for the 21st Century. Washington (DC): National Academies Press (US). Copyright 2001 by the National Academy of Sciences. All rights reserved.; 2001.
[252] Centers for Medicare & Medicaid Services. Quality Measurement and Quality Improvement. https://www.cms.gov/medicare/quality-initiatives-patient-assessment-instruments/mms/quality-measure-and-quality-improvement-. Accessed November 15, 2024.
[253] Davidoff F, Batalden P, Stevens D, Ogrinc G, Mooney S. Publication guidelines for quality improvement in health care: evolution of the SQUIRE project. Qual Saf Health Care. 2008;17 Suppl 1(Suppl_1):i3-9.

Public health entities and/or cancer researchers

Data collection using quantitative and qualitative methods, data analysis, and dissemination of results to stakeholders are critical for quality monitoring and improvement in cancer control. Data for quality monitoring and improvement may include existing surveillance data on cancer incidence, mortality, risk factors for the development of cancer, screening behaviors, and diagnostic and treatment services to identify potential areas for intervention. Quality monitoring and improvement data may also include data from the evaluation of quality improvement strategies or interventions, particularly evaluation of implementation processes and outcomes.[254]

Health care systems

The use of quality performance measures by health care entities such as hospitals, provider groups, and managed care systems is effective for monitoring and improving the quality of cancer care. Clinical performance measures include both processes of care and outcomes of care. Absence or poor quality of cancer screening programs, structural or other barriers that limit access to health care services, lack of attention to health equity and patient-reported outcomes, and lack of effective referral systems adversely impact outcomes in cancer screening, diagnosis, treatment, and survivorship.

Medical professional associations/organizations

The development, implementation, and evaluation of evidence-based clinical practice guideline recommendations by local and national professional organizations helps to ensure a high quality of cancer care. Educating members on practice guidelines and encouraging members to adhere to these guidelines can improve the quality of cancer screening, diagnosis, patient-centered care, and health equity efforts.

Health care providers

Practice-level efforts to monitor and improve quality are critical. For example, assessing cancer screening rates among the patient population or assessing provider adherence to advising patients on age- and sex-appropriate cancer screening can identify missed opportunities and areas for improvement. Electronic health records can be a useful tool in the evaluation of practice-level data.[255] By continuously utilizing process and quality improvement methods such as the Plan Do Study Act model, health care providers (including private providers, community health clinics, and hospitals) can objectively review current processes for potential areas of improvement. Once an improvement is put into place, the provider can use data to monitor the extent to which the change was successful and inform how to further alter practice.[256]

Guidance is available for quality monitoring and improvement. The Agency for Healthcare Research and Quality provides recommendations for planning, implementing, and evaluating quality improvement processes, including those addressing health disparities. The Commission on Cancer convenes clinical experts to develop and maintain quality measures as part of the CoC's Quality Assurance and Data Committee. The Quality Improvement Organization Program, led by the Centers

[254] Tyler A, Glasgow RE. Implementing Improvements: Opportunities to Integrate Quality Improvement and Implementation Science. Hosp Pediatr. 2021;11(5):536-545.
[255] Institute of Medicine Committee on Quality of Health Care in A. In: Crossing the Quality Chasm: A New Health System for the 21st Century. Washington (DC): National Academies Press (US) Copyright 2001 by the National Academy of Sciences. All rights reserved.; 2001.
[256] Centers for Medicare & Medicaid Services. Quality Measurement and Quality Improvement. https://www.cms.gov/medicare/quality-initiatives-patient-assessment-instruments/mms/quality-measure-and-quality-improvement-. Accessed November 15, 2024.

for Medicare & Medicaid Services, is a federal program designed to improve health quality for people with Medicare. Other entities with guidance for quality monitoring and improvement include the American Society of Clinical Oncology through its Quality Oncology Practice Initiative; the American College of Surgeons through its Cancer Quality Improvement Programs; the National Cancer Institute's Surveillance, Epidemiology, and End Results Program through its cancer registry quality improvement methods and measures, and the Quality and Patient Safety organization of the U.S. Department of Veterans Affairs.[257]

Quality monitoring and improvement are a vital component of comprehensive cancer control. Proactive and focused efforts to monitor and improve the quality of cancer care can lead to improvements in health care quality (e.g., guideline-concordant advice or treatment across the cancer patient population), patient health outcomes (e.g., improvements in the early detection of cancer), and population health (e.g., reduced cancer mortality and advancement toward health equity).[258]

CANCER GENETICS

The expanding knowledge base in the field of cancer genetics has improved our understanding of genetic variants and their role in the development of cancer.[259] Gene variants are alterations in the DNA sequence of genes. These changes can occur in two main ways: germline variants, which arise in egg or sperm cells and are inherited by offspring, affecting every cell in the body; and somatic variants, which occur after conception in any cell except egg and sperm, and are not passed on to future generations. Variants are classified based on their potential impact, ranging from benign (harmless) and likely benign, to variants of uncertain significance, likely pathogenic, and finally, pathogenic (disease-causing). Pathogenic variants can increase the risk of diseases like cancer.[260]

Advances in genomic sequencing have significantly expanded our understanding of the microbiome - the diverse community of commensal, symbiotic, and pathogenic microorganisms that inhabit our bodies.[261] Recognized as a component of human biological inheritance, the microbiome's role in various bodily systems is being increasingly explored, including its influence on cancer development, treatment response, and patient outcomes.[262]

Hereditary Cancers

[257] Davidoff F, Batalden P, Stevens D, Ogrinc G, Mooney S. Publication guidelines for quality improvement in health care: evolution of the SQUIRE project. *Qual Saf Health Care.* 2008;17 Suppl 1(Suppl_1):i3-9.
[258] Tyler A, Glasgow RE. Implementing Improvements: Opportunities to Integrate Quality Improvement and Implementation Science. *Hosp Pediatr.* 2021;11(5):536-545.
[259] National Cancer Institute (US). Cancer Genetics Overview (PDQ). https://www.cancer.gov/publications/pdq/information-summaries/genetics/overview-hp-pdq. Accessed February 3, 2025.
[260] National Cancer Institute (US). Genetic Testing for Inherited Cancer Risk. https://www.cancer.gov/about-cancer/causes-prevention/genetics/genetic-testing-fact-sheet. Accessed February 2. 2025.
[261] Gilbert JA, Blaser MJ, Caporaso JG, Jansson JK, Lynch SV, Knight R. Current understanding of the human microbiome. Nat Med. 2018 Apr 10;24(4):392-400. doi: 10.1038/nm.4517. PMID: 29634682; PMCID: PMC7043356.
[262] Bhatt AP, Redinbo MR, Bultman SJ. The role of the microbiome in cancer development and therapy. CA Cancer J Clin. 2017 Jul 8;67(4):326-344. doi: 10.3322/caac.21398. Epub 2017 May 8. PMID: 28481406; PMCID: PMC5530583.

Inherited genetic variants can increase a person's risk of developing certain types of cancers, and they account for up to 10% of all cancers.[263] Cancers that occur because of inherited variants are called hereditary or inherited cancers. Several features can suggest an inherited cancer predisposition:[264]

- **Multiple primary cancers:** The same individual may develop multiple distinct cancers within the same organ or in different organs.
- **Bilateral or multifocal cancers:** Cancer may develop in both organs of a paired set (e.g., both breasts, both kidneys) or appear in multiple locations within a single organ.
- **Early-onset cancer:** Cancer diagnosis occurs at a younger age than typically expected for that specific cancer type.
- **Family history:** Multiple first-degree relatives (parents, siblings, children) are diagnosed with the same type of cancer.
- **Unusual cancer presentations:** This includes rare cancer types (e.g., duodenal cancer, medullary thyroid cancer, epithelial ovarian, fallopian tube, or primary peritoneal cancer) or uncommon histological features, such as male breast cancer.
- **Cancer across generations:** Cancer affects multiple family members across multiple generations.
- **Birth defects:** The presence of specific birth defects known to be associated with inherited cancer syndromes.
- **Racial or ethnic background:** Membership in a racial or ethnic group with a known increased risk of certain cancer susceptibility syndromes.

Genetic variants have been linked to more than 50 hereditary cancer syndromes, including the syndromes listed in the table below.[265]

Table 14. Examples of Hereditary Cancer Syndromes

HEREDITARY CANCER SYNDROME	ASSOCIATED CANCERS	GENE VARIANT(S)
Hereditary breast cancer and ovarian cancer syndrome	Breast (male and female), ovarian, pancreatic, prostate	BRCA1, BRCA2
Li-Fraumeni syndrome	Breast, brain, adrenocortical, osteosarcoma, chondrosarcoma, rhabdomyosarcoma, leukemia, lymphoma	TP53
Hereditary nonpolyposis colorectal cancer (Lynch syndrome)	Colorectal, endometrial, ovarian, stomach, hepatobiliary, urinary tract, small intestine, brain/central nervous system	MLH1, MSH2, MSH6, PMS2, EPCAM

[263] National Cancer Institute (US). The Genetics of Cancer. https://www.cancer.gov/about-cancer/causes-prevention/genetics . Accessed February 3, 2025.
[264] PDQ Cancer Genetics Editorial Board. Cancer Genetics Risk Assessment and Counseling (PDQ®): Health Professional Version. 2025 Jan 3. In: PDQ Cancer Information Summaries [Internet]. Bethesda (MD): National Cancer Institute (US); 2002-. https://www.ncbi.nlm.nih.gov/books/NBK65817/. Accessed February 3, 2025.
[265] Imyanitov EN, Kuligina ES, Sokolenko AP, Suspitsin EN, Yanus GA, Iyevleva AG, Ivantsov AO, Aleksakhina SN. Hereditary cancer syndromes. World J Clin Oncol. 2023 Feb 24;14(2):40-68. doi: 10.5306/wjco.v14.i2.40. PMID: 36908677; PMCID: PMC9993141.

Familial Adenomatous Polyposis	Colorectal, hepatoblastoma, small intestine, brain, thyroid	APC
Von-Hippel Lindau syndrome	Kidney	VHL

Risk Assessment and Genetic Testing

Identifying individuals and families at increased risk for hereditary cancers enables health care professionals to refer them for comprehensive genetic services, including counseling, risk assessment, and consideration of genetic testing. Cancer risk assessment involves a consultative process that typically includes a clinical evaluation, genetic testing (when appropriate), and personalized risk management recommendations, often delivered over one or more genetic counseling sessions.[266] Genetic testing itself analyzes an individual's chromosomes, genes, or proteins to identify specific inherited variants, helping to confirm or rule out a hereditary cancer syndrome.

The American College of Medical Genetics and Genomics (ACMG) and the National Society of Genetic Counselors (NSGC) have published and regularly update a comprehensive set of indications for cancer predisposition assessment.[267] Individuals positive for any of the ACMG/NSGC criteria should be referred for genetic counseling, and if indicated, genetic testing. Polygenic risk scores (PRS) that are calculated from a weighted sum of trait-associated genetic variants, usually from genome-wide association studies (GWAS), and summarize the effect of these genes are emerging tools for the prediction of cancer risk, screening, and risk stratification.[268] They also play roles in cancer management and prognostication. Expanded PRS (EPRS) approach that combines common and rare genetic variants to generate scores has been introduced for more effective risk stratification.[269]

If an individual is determined to be at increased risk of developing cancer, specific interventions may be recommended to reduce the individual's risk. For example, bilateral prophylactic (preventive) mastectomy can be performed in women with a BRCA1 or BRCA2 gene variant.[270] For individuals carrying the hereditary nonpolyposis colorectal cancer gene variant, surveillance for colorectal cancer may be initiated earlier or performed more frequently.[271] Knowledge about a cancer-predisposing variant may also benefit the family members of the individual who was tested. One study performed on parents who received BRCA1/2 testing found that a significant proportion of parents shared their test

[266] National Cancer Institute (US). Cancer Genetics Risk Assessment and Counseling (PDQ). https://www.cancer.gov/publications/pdq/information-summaries/genetics/risk-assessment-hp-pdq. Accessed February 3, 2025.
[267] Miller DT, Lee K, Abul-Husn NS, Amendola LM, Brothers K, Chung WK, Gollob MH, Gordon AS, Harrison SM, Hershberger RE, Klein TE, Richards CS, Stewart DR, Martin CL; ACMG Secondary Findings Working Group. Electronic address: documents@acmg.net. ACMG SF v3.2 list for reporting of secondary findings in clinical exome and genome sequencing: A policy statement of the American College of Medical Genetics and Genomics (ACMG). Genet Med. 2023 Aug;25(8):100866. doi: 10.1016/j.gim.2023.100866. Epub 2023 Jun 22. PMID: 37347242; PMCID: PMC10524344.
[268] Wang Y, Zhu M, Ma H, Shen H. Polygenic risk scores: the future of cancer risk prediction, screening, and precision prevention. Med Rev (2021). 2022 Feb 14;1(2):129-149. doi: 10.1515/mr-2021-0025. PMID: 37724297; PMCID: PMC10471106.
[269] Kang, J.H., Lee, Y., Kim, D.J. *et al.* Polygenic risk and rare variant gene clustering enhance cancer risk stratification for breast and prostate cancers. *Commun Biol* **7**, 1289 (2024). https://doi.org/10.1038/s42003-024-06995-9.
[270] National Cancer Institute (US). Surgery to Reduce the Risk of Breast Cancer. https://www.cancer.gov/types/breast/risk-reducing-surgery-fact-sheet. Accessed February 3, 2025.
[271] Bhattacharya P, Leslie SW, McHugh TW. Lynch Syndrome (Hereditary Nonpolyposis Colorectal Cancer) [Updated 2024 Jun 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK431096/. Accessed February 3, 2025.

results with their children.[272] Maintenance of family health was cited as a key reason why tested parents chose to disclose their genetic information to their children.[273]

For individuals who are found to have a genetic variant that increases their cancer risk, the Genetic Information Nondiscrimination Act (GINA) is a federal law that protects them from genetic discrimination in health insurance and employment. For more information about GINA, visit www.ginahelp.org.

Under Maryland law, a covered entity or business associate of a covered entity under HIPAA can advertise CLIA-certified laboratory genetic testing, such as diagnostic laboratory tests performed for the purpose of screening, diagnosing, managing, or treating a condition or disease, and ancestry testing related to parental lineage and ethnicity.[274] Significant concerns remain about the specificity, sensitivity, predictive values, ethical, and legal issues raised by "Direct to Consumer" genetic tests.[275] Requiring individuals to go through a health care provider enables patients to have the opportunity to discuss the benefits and limitations of genetic testing with a qualified professional.[276]

To optimize the benefits of genetic testing, ASCO recommends that genetic testing for cancer susceptibility be offered only when the following three criteria are met:[277]

- The individual tested has a personal or family history suggestive of genetic cancer susceptibility,
- The genetic test can be adequately interpreted, and
- The test results have accepted clinical utility.

It is also recommended that genetic testing be conducted in the setting of pre- and post-test counseling, and that these services be provided by experienced health care professionals.[278]

Sporadic Cancers

Sporadic cancers contain many acquired genetic variants, some of which reveal basic biological processes gone awry that are required for cancer initiation and progression.[279] An acquired genetic variant, also known as sporadic or spontaneous variant, is a mutation that occurs due to changes to an

[272] Bradbury AR, Patrick-Miller L, Egleston B, et al. When Parents Disclose BRCA1/2 Test Results: Their Communication and Perceptions of Offspring Response. Cancer. 2012 Jul 1;118(13):3417-25.
[273] Sharff ME, DeMarco TA, Mays D, et al. Parenting Through Genetic Uncertainty: Themes in the Disclosure of Breast Cancer Risk Information to Children. Genet Test Mol Biomarkers. 2012 May; 16(5):376-82
[274] Maryland Division of State Documents. Regulations. 10.25.18.2. https://dsd.maryland.gov/regulations/Pages/10.25.18.02.aspx. Accessed February 2025.
[275] Genetic Alliance; The New York-Mid-Atlantic Consortium for Genetic and Newborn Screening Services. Understanding Genetics: A New York, Mid-Atlantic Guide for Patients and Health Professionals. Washington (DC): Genetic Alliance; 2009 Jul 8. CHAPTER 8:, ETHICAL, LEGAL, AND SOCIAL ISSUES. Available from: https://www.ncbi.nlm.nih.gov/books/NBK115574/
[276] American College of Obstetricians and Gynecologists. Counseling About Genetic Testing and Communication of Genetic Test Results. https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2017/04/counseling-about-genetic-testing-and-communication-of-genetic-test-results. Accesses February 3, 2025.
[277] Nadine Tung et al., Selection of Germline Genetic Testing Panels in Patients With Cancer: ASCO Guideline. JCO 42, 2599-2615(2024).
[278] Faucett WA, Peay H, Coughlin CR 2nd. Genetic Testing: Consent and Result Disclosure for Primary Care Providers. Med Clin North Am. 2019 Nov;103(6):967-976. doi: 10.1016/j.mcna.2019.07.001. Epub 2019 Aug 20. PMID: 31582007; PMCID: PMC6779337.
[279] Lu Y, Ek WE, Whiteman D, Vaughan TL, Spurdle AB, Easton DF, Pharoah PD, Thompson DJ, Dunning AM, Hayward NK, Chenevix-Trench G; Q-MEGA and AMFS Investigators; ANECS-SEARCH; UKOPS-SEARCH; BEACON Consortium; Macgregor S. Most common 'sporadic' cancers have a significant germline genetic component. Hum Mol Genet. 2014 Nov 15;23(22):6112-8. doi: 10.1093/hmg/ddu312. Epub 2014 Jun 18. PMID: 24943595; PMCID: PMC4271103.

individual's genes, usually in a specific tissue or organ, over the course of his or her lifetime. Unlike inherited mutations, they are not passed on from one generation to another. These mutations can be due to errors during the cell division process, or by environmental elements that can damage a cell's DNA, such as radiation or tobacco exposure.[280]

Testing cancers for somatic variation is increasingly done to inform prognosis, detect actionable variants for targeted therapeutics, and identify germline variants. These tests can be done by sequencing the entire genome of the tumor (Whole Genome Sequencing – WGS), sequencing only the protein-coding region of the cancer genome (Whole Exome Sequencing – WES), or sequencing only specific regions of interest (Targeted Sequencing).[281]

Epigenetics, Liquid Biopsy, and Precision Oncology

Epigenetic modifications, including DNA methylation, histone modifications, and non-coding RNA alterations, represent a key layer of gene regulation beyond the DNA sequence itself. These changes influence gene expression and cellular function and are increasingly recognized as critical drivers and indicators of cancer. Distinct epigenetic profiles can be leveraged for cancer detection, offering a promising avenue for non-invasive diagnostics. Specifically, the analysis of circulating tumor DNA (ctDNA) for epigenetic markers holds significant potential in precision oncology. This approach allows for patient stratification, real-time monitoring of treatment response, and the possibility of earlier intervention, even before symptoms manifest or imaging detects a tumor. Such liquid biopsy-based epigenetic diagnostics, alongside other genomic data, are integral to the advancement of precision oncology, enabling more tailored and effective cancer care and prevention strategies.[282]

Microbiomes and Cancer

Next-generation sequencing (NGS) has revolutionized our understanding of the complex microbial communities inhabiting various human body sites. These technologies provide comprehensive characterization of the microbiome, revealing the trillions of microorganisms (bacteria, fungi, viruses, etc.) that coexist with us. While often symbiotic, disruptions in the delicate balance of these microbial ecosystems (dysbiosis) can contribute to a range of inflammatory conditions and even influence cancer development.[283] Cancers of the stomach, esophagus, and colon, among others, have been linked to distinct microbiome signatures and the presence or absence of specific bacterial taxonomy. Furthermore, the microbiome is increasingly recognized to play a role in modulating the efficacy and response to various cancer therapies, including chemotherapy, immunotherapy, and radiation. It can also influence the incidence and severity of treatment-related side effects.[284]

Familial Cancers

[280] Miles B, Tadi P. Genetics, Somatic Mutation. In: StatPearls. StatPearls Publishing; 2025 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK557896/. Accessed February 3, 2025.
[281] Liu YL, Stadler ZK. The Future of Parallel Tumor and Germline Genetic Testing: Is There a Role for All Patients With Cancer? J Natl Compr Canc Netw. 2021 Jul 28;19(7):871-878. doi: 10.6004/jnccn.2021.7044. PMID: 34340209; PMCID: PMC11123333.
[282] Kamińska K, Nalejska E, Kubiak M, Wojtysiak J, Żołna Ł, Kowalewski J, Lewandowska MA. Prognostic and Predictive Epigenetic Biomarkers in Oncology. Mol Diagn Ther. 2019 Feb;23(1):83-95. doi: 10.1007/s40291-0180371-7. Review. PubMed PMID: 30523565; PubMed Central PMCID: PMC6394434.
[283] Wensel CR, Pluznick JL, Salzberg SL, Sears CL. Next-generation sequencing: insights to advance clinical investigations of the microbiome. J Clin Invest. 2022 Apr 1;132(7):e154944. doi: 10.1172/JCI154944. PMID: 35362479; PMCID: PMC8970668.
[284] LaCourse KD, Johnston CD, Bullman S. The relationship between gastrointestinal cancers and the microbiota. Lancet Gastroenterol Hepatol. 2021 Jun;6(6):498-509. doi: 10.1016/S2468-1253(20)30362-9. Epub 2021 Mar 18. PMID: 33743198; PMCID: PMC10773981.

Familial cancers describe instances where cancer appears to cluster within a family, but without the clear-cut patterns of inheritance characteristic of hereditary cancer syndromes. While multiple family members may be affected, these cancers don't typically exhibit the specific features associated with hereditary cancers (e.g., earlier age of onset, multiple primary cancers in the same individual, or specific tumor types clustering together). The observed cancer clustering in familial cancers often arises from a complex interplay of shared genetic susceptibility (though not necessarily a single, highly penetrant gene mutation), common environmental exposures, lifestyle factors, or chance. While the risk for close relatives is modestly elevated compared to the general population, genetic testing is generally not informative in these cases. However, personalized cancer screening strategies, including earlier or more frequent screenings, may be recommended for family members based on their individual and family history. It's important to distinguish familial cancer from hereditary cancer syndromes, as the management and risk assessment strategies differ significantly.[285] Identification of individuals and family members with cancer-predisposing genetic variants is important because these individuals may benefit from potentially life-saving clinical interventions.[286] It is key that Marylanders are aware of their family history of cancer and share that information with their health care providers.

IMMUNOTHERAPY

Ongoing research and clinical trials continue to revolutionize cancer treatment and care, leading to significant improvements in patient outcomes. Immunotherapy has become a cornerstone of modern oncology, demonstrating remarkable efficacy across a broad spectrum of malignancies. By harnessing the body's own immune system to target and destroy cancer cells, immunotherapy has transformed the treatment landscape for various cancer types, including melanoma, lung cancer, and certain hematologic malignancies. Current research focuses on refining immunotherapy strategies, such as identifying predictive biomarkers to personalize treatment, developing novel immunotherapeutic agents, and exploring synergistic combinations with other treatment modalities like chemotherapy, targeted therapy, and radiation. These efforts aim to further enhance the effectiveness of immunotherapy, overcome resistance mechanisms, and ultimately improve long-term survival for cancer patients.[287]

Immunotherapy works by stimulating and strengthening the patient's own immune system to recognize and attack cancer cells. Unlike traditional chemotherapy, which directly targets cancer cells but can also damage healthy tissues, immunotherapy aims to empower the immune system to selectively eliminate malignant cells. This approach can lead to more durable responses and fewer long-term side effects for some patients. However, immunotherapy is not without its challenges. Not all patients respond to immunotherapy, and some may experience immune-related side effects. Researchers are actively working to address these challenges and expand the benefits of immunotherapy to a wider range of cancer patients.[288]

Several types of immunotherapies are currently used in cancer treatment:[289]

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[285] Hemminki K, Sundquist K, Sundquist J, Försti A, Hemminki A, Li X. Familial Risks and Proportions Describing Population Landscape of Familial Cancer. Cancers (Basel). 2021 Aug 30;13(17):4385. doi: 10.3390/cancers13174385. PMID: 34503195; PMCID: PMC8430802.
[286] Hemminki K, Sundquist K, Sundquist J, Försti A, Hemminki A, Li X. Familial Risks and Proportions Describing Population Landscape of Familial Cancer. Cancers (Basel). 2021 Aug 30;13(17):4385. doi: 10.3390/cancers13174385. PMID: 34503195; PMCID: PMC8430802.
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[288] National Cancer Institute (US). Immunotherapy to Treat Cancer. https://www.cancer.gov/about-cancer/treatment/types/immunotherapy. Accessed February 21, 2025.
[289] Shiravand Y, Khodadadi F, Kashani SMA, Hosseini-Fard SR, Hosseini S, Sadeghirad H, Ladwa R, O'Byrne K, Kulasinghe A. Immune Checkpoint Inhibitors in Cancer Therapy. Curr Oncol. 2022 Apr 24;29(5):3044-3060. doi: 10.3390/curroncol29050247. PMID: 35621637; PMCID: PMC9139602.

- **Immune checkpoint inhibitors:** These drugs block "checkpoint" proteins on immune cells that normally prevent them from attacking healthy tissues. By blocking these checkpoints, the brakes are taken off the immune system, allowing it to recognize and attack cancer cells more effectively.
- **Adoptive cell therapy:** This approach involves collecting a patient's own immune cells (often T cells), modifying them in the lab to recognize cancer cells, and then infusing them back into the patient.
- **Monoclonal antibodies:** These are lab-created antibodies designed to bind to specific targets on cancer cells, marking them for destruction by the immune system or directly interfering with cancer cell growth.
- **Cancer vaccines:** These vaccines stimulate the immune system to recognize and attack cancer cells. They may contain cancer-specific antigens or other substances that trigger an immune response.
- **Cytokines:** These are signaling proteins that help regulate the immune system. Some cytokines can be used as cancer treatments to boost immune responses.

PERSONALIZED MEDICINE

Precision medicine, a more encompassing term than personalized medicine, represents a shift away from a "one-size-fits-all" approach to tailoring medical decisions to individual patients. While genetic information plays a crucial role, precision medicine also integrates other data, including lifestyle, environment, and clinical factors, to provide the most effective prevention, diagnosis, and treatment strategies. Genetics remains a cornerstone, informing our understanding of how cancer develops and progresses. By analyzing the genetic makeup of both the patient and their tumor, researchers can identify specific vulnerabilities that can be targeted with tailored therapies. This has led to the development of more effective treatments and diagnostic tools.[290]

Historically, cancer treatment was often standardized based on the cancer's location. However, it became evident that even within the same cancer type, patients responded differently to the same treatment. This variability prompted research into the underlying causes, revealing that genetic differences between individuals and their tumors were key factors influencing treatment response. Precision medicine addresses this heterogeneity, aiming to match the right treatment to the right patient at the right time.

Several approaches contribute to precision medicine in oncology:[291,292]

- **Targeted therapy:** This approach utilizes drugs or other substances that specifically interfere with molecules involved in cancer growth, progression, and spread. These targets are often identified through genetic analysis of the tumor, allowing for a more precise attack on cancer cells while minimizing damage to healthy tissues.
- **Pharmacogenomics:** This field studies how an individual's genetic makeup affects their response to drugs. By understanding these genetic variations, clinicians can personalize drug selection and dosage to maximize efficacy and minimize adverse reactions.
- **Immunotherapy:** While not solely based on genetics, immunotherapy's effectiveness can be influenced by certain genetic factors. Precision medicine approaches are being used to identify patients most likely to benefit from immunotherapy and to develop strategies to overcome resistance.

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[290] Wang RC, Wang Z. Precision Medicine: Disease Subtyping and Tailored Treatment. Cancers (Basel). 2023 Jul 28;15(15):3837. doi: 10.3390/cancers15153837. PMID: 37568653; PMCID: PMC10417651.
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[292] Saeed RF, Awan UA, Saeed S, Mumtaz S, Akhtar N, Aslam S. Targeted Therapy and Personalized Medicine. Cancer Treat Res. 2023;185:177-205. doi: 10.1007/978-3-031-27156-4_10. PMID: 37306910.

- **Liquid biopsies:** These non-invasive blood tests can detect circulating tumor DNA (ctDNA) and other biomarkers, providing real-time insights into tumor evolution, treatment response, and minimal residual disease. This information can guide treatment decisions and monitor for recurrence.
- **Data analytics and artificial intelligence (AI):** The vast amounts of data generated in precision medicine, including genomic, clinical, and lifestyle data, require sophisticated analytical tools. AI and machine learning are being used to integrate this data, identify patterns, and develop predictive models to guide personalized cancer care.

RESEARCH AND CLINICAL TRIALS

Cancer research continues to fuel advancements across the entire cancer continuum, from prevention and early detection to diagnosis, treatment, survivorship, and quality of life. This multifaceted research effort encompasses laboratory studies, population-based (epidemiological) research, clinical trials, and real-world clinical practice. A growing emphasis on translational research bridges the gap between scientific discoveries and practical applications, accelerating the transformation of laboratory, clinical, and population study findings into tangible improvements in cancer care. This translational approach aims to reduce cancer incidence, morbidity, and mortality by translating research into effective prevention strategies, innovative diagnostic tools, and more targeted therapies.[293]

The field of cancer control is dynamic and constantly evolving, driven by ongoing research and the results of clinical trials. As new technologies and knowledge emerge in areas like early detection (e.g., liquid biopsies, advanced imaging), personalized medicine, and treatment (e.g., immunotherapy, targeted therapies), cancer control strategies and guidelines are regularly reviewed and updated to reflect the latest evidence. This iterative process ensures that cancer care remains at the forefront of medical innovation, incorporating the most effective approaches to prevention, diagnosis, treatment, and survivorship care.

Research Facilities in Maryland

Across the state of Maryland, cancer research is conducted at various universities, research institutions, and medical facilities, with the support of federal, state, and private funding. Maryland is also home to two nationally recognized cancer research institutions. The NCI has awarded the NCI-Designated Comprehensive Cancer Center honor to the Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins University, Baltimore, and to the University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center in Baltimore. This designation is reserved for institutions that are recognized by the NCI for the depth and breadth of their research in each of the three major areas (i.e., laboratory, clinical, and population-based research), as well as substantial transdisciplinary research that bridges these scientific areas.[294] The NCI's Center for Cancer Research offices and research programs are located on several campuses in Maryland.

Clinical Trials

Clinical trials are research studies involving human volunteers that evaluate the safety and efficacy of new medical interventions. In cancer, clinical trials investigate innovative approaches to prevention, screening, diagnosis, treatment, and symptom management. Participants in these trials may gain access to cutting-edge therapies not yet widely available, receive expert medical care from leading researchers, and play a vital role in advancing cancer research, ultimately contributing to improved outcomes for future patients.

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[293] Elmore LW, Greer SF, Daniels EC, Saxe CC, Melner MH, Krawiec GM, Cance WG, Phelps WC. Blueprint for cancer research: Critical gaps and opportunities. CA Cancer J Clin. 2021. https://doi.org/10.3322/caac.21652. Accessed February 3, 2025.
[294] National Cancer Institute (US). Find a Cancer Center. https://www.cancer.gov/research/infrastructure/cancer-centers/find. Accessed May 24, 2025.

Types of Clinical Trials

There are several types of cancer clinical trials:[295]

- **Treatment trials** are used to test the effectiveness of new treatments or new ways of using current treatments.
- **Prevention trials** are used to test new interventions that may lower the risk of developing certain types of cancer.
- **Screening trials** are used to test new ways of finding cancer in its early stages.
- **Quality of life/supportive care/palliative care trials** are used to study new ways of improving the comfort and quality of life of cancer patients and cancer survivors, especially those who have side effects from cancer or its treatment.

Clinical Trial Participation Rates and Disparities

Clinical trials offer numerous potential benefits for individuals with cancer, yet adult participation rates remain disappointingly low. Studies have highlighted this issue, demonstrating that a small fraction of adult cancer patients enroll in clinical trials. In contrast, participation rates among children with cancer are notably higher, underscoring a significant disparity in research engagement between these two groups. It's important to acknowledge that comparing adult and pediatric participation rates directly is challenging due to variations in data collection and research methodologies. Additionally, clinical trial participation can vary considerably based on geographic location and other factors.[296]

Underrepresentation in clinical trials persists for several groups, including racial and ethnic minorities, older adults, individuals living in rural areas, and other underserved populations.[297] While data on specific racial and ethnic group participation in all cancer trials is challenging to aggregate, it's widely acknowledged that disparities exist. For example, despite higher incidence and mortality rates for certain cancers, African Americans and other minority groups are often underrepresented in trials that lead to drug approvals.[298] This disparity limits the generalizability of research findings and can perpetuate health inequities.[299] In Maryland, studies have shown higher accrual rates for pediatric and adolescent age groups, White patients, females (for sex-specific tumors), and those with private insurance.[300]

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[295] National Cancer Institute (US). Clinical Trials Information for Patients and Caregivers. https://www.cancer.gov/research/participate/clinical-trials. Accessed February 24, 2025.
[296] Joseph M. Unger et al., National Estimates of the Participation of Patients With Cancer in Clinical Research Studies Based on Commission on Cancer Accreditation Data. JCO 42, 2139-2148(2024). DOI:10.1200/JCO.23.01030
[297] Javier-DesLoges J, Ithaar B, Goff SL, et al. Disparities and trends in the participation of minorities, women, and the elderly in National Cancer Institute–sponsored clinical trials. Cancer. 2021;127(11):1859-1870. doi:10.1002/cncr.33991
[298] Ajewole VB, Akindele O, Abajue U, Ndulue O, Marshall JJ, Mossi YT. Cancer Disparities and Black American Representation in Clinical Trials Leading to the Approval of Oral Chemotherapy Drugs in the United States Between 2009 and 2019. JCO Oncol Pract. 2021 May;17(5):e623-e628. doi: 10.1200/OP.20.01108. Erratum in: JCO Oncol Pract. 2021 Jul;17(7):459. doi: 10.1200/OP.21.00391. PMID: 33974825; PMCID: PMC8120664.
[299] National Academies of Sciences, Engineering, and Medicine; Policy and Global Affairs; Committee on Women in Science, Engineering, and Medicine; Committee on Improving the Representation of Women and Underrepresented Minorities in Clinical Trials and Research; Bibbins-Domingo K, Helman A, editors. Improving Representation in Clinical Trials and Research: Building Research Equity for Women and Underrepresented Groups. Washington (DC): National Academies Press (US); 2022 May 17. 2, Why Diverse Representation in Clinical Research Matters and the Current State of Representation within the Clinical Research Ecosystem. https://www.ncbi.nlm.nih.gov/books/NBK584396/. Accessed June 15, 2025.
[300] Baquet CR, Ellison GL, Mishra SI. Analysis of Maryland cancer patient participation in national cancer institute-supported cancer treatment clinical trials. J Clin Oncol. 2008 Jul 10;26(20):3380-6. doi:

Several factors contribute to these low participation rates. Health care provider awareness, referral practices, and encouragement play a crucial role. Patient awareness and understanding of clinical trial opportunities are also significant barriers. Surveys have indicated that many patients are unsure of their eligibility or would be interested if they knew they qualified.[301] Other challenges include patient concerns about costs, logistical barriers (transportation, time off work), fear or mistrust of the research process, cultural differences, and language or literacy barriers.[302] Maryland law mandates that health insurers cover specific patient costs associated with cancer prevention, early detection, and treatment trials, which can help mitigate some of the financial barriers.[303] Resources like the NCI Clinical Trials website (www.cancer.gov/clinicaltrials/search) provide information on available trials.

10.1200/JCO.2007.14.6027. Erratum in: J Clin Oncol. 2008 Nov 1;26(31):5142. PMID: 18612153; PMCID: PMC3602973.

[301] Institute of Medicine (US) Committee on Cancer Clinical Trials and the NCI Cooperative Group Program; Nass SJ, Moses HL, Mendelsohn J, editors. A National Cancer Clinical Trials System for the 21st Century: Reinvigorating the NCI Cooperative Group Program. Washington (DC): National Academies Press (US); 2010. 4, Physician and Patient Participation in Cancer Clinical Trials. Available from: https://www.ncbi.nlm.nih.gov/books/NBK220370/

[302] Durden K, Hurley P, Butler DL, Farner A, Shriver SP, Fleury ME. Provider motivations and barriers to cancer clinical trial screening, referral, and operations: Findings from a survey. Cancer. 2024 Jan 1;130(1):68-76. doi: 10.1002/cncr.35044. Epub 2023 Oct 18. PMID: 37851511.

[303] Insurance Article, §15-827, Annotated Code of Maryland.

HIGH-BURDEN CANCER GOALS, OBJECTIVES, AND STRATEGIES

GOAL: REDUCE THE BURDEN OF CANCER IN MARYLAND.

OBJECTIVE 1: By 2030, reduce age-adjusted cancer incidence rates* to reach the following targets:

Maryland

- All Cancer Sites: 433.6 per 100,000 (2021 Baseline: 440.4 per 100,000)
- Cervical: 5.6 per 100,000 (2021 Baseline: 5.7 per 100,000)
- Colorectal: 32.0 per 100,000 (2021 Baseline: 34.5 per 100,000)
- Female Breast: Not greater than 141.3 per 100,000 (2021 Baseline: 141.3 per 100,000)
- Lung: 36.2 per 100,000 (2021 Baseline: 45.8 per 100,000)
- Melanoma (Skin): Not greater than 25.5 per 100,000 (2021 Baseline: 25.5 per 100,000)
- Oral: Not greater than 11.3 per 100,000 (2021 Baseline: 11.3 per 100,000)
- Prostate: Not greater than 139.9 per 100,000 (2021 Baseline: 139.9 per 100,000)

Target Setting Method: Trend Analysis^
Source: Maryland Cancer Registry

*The Cancer Plan focuses on reducing the incidence of cancers that have a high burden in Maryland, and/or modifiable risk factors, and/or effective screening tests for early detection; however, efforts can be undertaken to raise awareness of other cancers.
^Targets are set using trend analysis that does not take into account external factors such as changes in screening recommendations, and changes in public health cancer program funding. These external factors may shift trends and result in targets not being met.

OBJECTIVE 2: By 2030, reduce age-adjusted cancer mortality* rates to reach the following targets:

Maryland

- All Cancer Sites: 113.3 per 100,000 (2021 Baseline: 136.4 per 100,000)
- Cervical: Not greater than 1.9 per 100,000 (2021 Baseline: 1.9 per 100,000)
- Colorectal: 11.2 per 100,000 (2021 Baseline: 12.9 per 100,000)
- Female Breast: 16.1 per 100,000 (2021 Baseline: 18.9 per 100,000)
- Lung: 18.9 per 100,000 (2021 Baseline: 29.0 per 100,000)
- Melanoma: 1.1 per 100,000 (2021 Baseline: 1.7 per 100,000)
- Oral: Not greater than 2.4 per 100,000 (2021 Baseline: 2.4 per 100,000)
- Prostate: 17.9 per 100,000 (2021 Baseline: 18.5 per 100,000)

Target Setting Method: Trend Analysis^
Source: Maryland Vital Statistics Administration

*The Cancer Plan focuses on reducing the mortality of cancers that have a high burden in Maryland, and/or modifiable risk factors, and/or effective screening tests for early detection; however, efforts can be undertaken to raise awareness of other cancers.
^Targets are set using trend analysis that does not take into account external factors such as changes in screening recommendations, and changes in public health cancer program funding. These external factors may shift trends and result in targets not being met.

OBJECTIVE 3:* By 2030, increase cancer screening rates to reach the following targets:
Cervical: Increase the proportion of women ages 21 to 65 who have had a cervical cancer screening test in the past three years.

- 79.2% of Maryland women ages 21 to 65
  (2022 Baseline: 51.4%)

Target Setting Method: HP 2030 Target
Source: Maryland BRFSS

Colorectal: Increase the proportion of adults ages 45 to 75 who have had a blood stool test in the past year, sigmoidoscopy in the past 5 years and blood stool test in the past 3 years, or a colonoscopy in the past 10 years.

- 72.8% of Maryland adults ages 45 to 75
  (2022 Baseline: 71.8%)

Target Setting Method: HP2030
Source: Maryland BRFSS

Female Breast: Increase the percentage of women ages 40 to 74 who have had a mammogram in the past 2 years per USPSTF recommendations.

- 79.4% of Maryland women ages 40 to 74
  (2022 Baseline: 75.6%)

Target Setting Method: 5% increase
Source: Maryland BRFSS

Oral^: Increase the proportion of adults age 18 and older who have had an oral cancer exam in the past year.

- 25.3% of Maryland adults age 18 and above
  (2018 Baseline: 24.1%)

Target Setting Method: 5% increase
Source: Maryland BRFSS

Prostate^: Increase the proportion of men ages 55 to 69 who have discussed the advantages and disadvantages of the prostate-specific antigen (PSA) test to screen for prostate cancer with their health care provider.

- 19.2% of Maryland men ages 55 to 69
  (2020 Baseline: 18.3%)

Target Setting Method: 5% increase
Source: Maryland BRFSS

Lung: Increase the proportion of high-risk adults (ages 50 to 80 years of age who have had a 20-pack-year history of smoking and are a current smoker, or have quit within the last 15 years) screened for lung cancer.

- 17.6% of Maryland adults at high-risk for lung cancer
  (2022 Baseline: 16.8%)

Target Setting Method: 5% increase
Source: BRFSS 2022

*Screening targets are set only for priority cancers for which there are screening recommendations and available BRFSS baseline data. As of publication, there were no recommendations or available data for skin cancer screening.
^Objectives are based on recommendations from the American Dental Association for oral cancer, and the American Urological Association for prostate cancer.

OBJECTIVE 4. By 2030, reduce disparities* in cancer incidence and mortality to reach the following targets:

Incidence (age-adjusted):

All Cancers
Ensure that each jurisdiction-level 5-year cancer incidence rate is no more than 10% above the U.S. 5-year cancer incidence rate. (Refer to the map on page 86 for baseline jurisdiction-level cancer incidence rates.)

Breast
Ensure that the difference in the female breast cancer incidence rates between racial and ethnic groups is 47.3 or lower. (2021 Baseline: 52.5 difference between rates [White: 148.9 per 100,000; Hispanic/Latino: 96.4 per 100,000])

Lung
Ensure that the difference in the lung cancer incidence rates between racial and ethnic groups is 28.8 or lower. (2021 Baseline: 32.0 difference between rates [White: 51.0 per 100,000; Hispanic/Latino: 19.0 per 100,000])

Colon and Rectum
Ensure that the difference in the colorectal cancer incidence rates between racial and ethnic groups is 9.7 or lower. (2021 Baseline: 10.8 difference between rates [Black: 35.5 per 100,000; Hispanic/Latino: 24.7 per 100,000])

Prostate
Ensure that the difference in the prostate cancer incidence rates between racial and ethnic groups is 118.2 or lower. (2021 Baseline: 131.3 difference between rates [Black: 201.9 per 100,000; Asian/Pacific Islander: 70.6 per 100,000])

Oral
Ensure that the difference in the oral cancer incidence rates between racial and ethnic groups is 6.6 or lower. (2021 Baseline: 7.3 difference between rates [White: 13.0 per 100,000; Hispanic/Latino: 5.7 per 100,000])

Target Setting Method: Reduce disparities by 10%
Source: Maryland Cancer Registry

Mortality (age-adjusted):

All Cancers
Ensure that each jurisdiction-level 5-year cancer mortality rate is no more than 10% above the U.S. 5-year cancer mortality rate. (Refer to the map on page 87 for baseline jurisdiction-level cancer mortality rates.)

Breast
Ensure that the difference in the female breast cancer mortality rates between racial and ethnic groups is 8.9 or lower. (2021 Baseline: 9.9 difference between rates [Black: 23.0 per 100,000; Hispanic/Latino: 13.1 per 100,000])

Lung
Ensure that the difference in the lung cancer mortality rates between racial and ethnic groups is 18.0 or lower. (2021 Baseline: 20.0 difference between rates [White: 31.1 per 100,000; Hispanic/Latino: 11.1 per 100,000])

Colon and Rectum

Ensure that the difference in the colorectal cancer mortality rates between racial and ethnic groups is 4.5 or lower. (2021 Baseline: 5.0 difference between rates [Black: 14.9 per 100,000; Hispanic/Latino: 9.9 per 100,000])

Prostate
Ensure that the difference in the prostate cancer mortality rates between racial and ethnic groups is 20.1 or lower. (2021 Baseline: 22.3 difference between rates [Black: 36.3 per 100,000; White: 14.0 per 100,000])

Target Setting Method: Reduce disparities by 10%
Source: Maryland Vital Statistics Administration

*Targets based on disparities that were statistically significant in Maryland using 2021 data; however, it is important to reduce rates of all cancers in all racial and ethnic groups.

Strategies

General

- Maintain or increase public health funding for cancer screening, diagnosis, and treatment for low-income and uninsured Marylanders.
- Plan and develop standard operating procedures to maintain cancer prevention and control activities during a state of emergency to ensure timely cancer screening, diagnosis, and treatment.

Barriers to Care and Patient Navigation

- Reduce structural barriers to cancer screening and diagnostic work-up, such as modifying hours of service and offering services in alternative settings.
- Encourage employers to provide employees with paid time off at work for cancer screening appointments, or to provide free or subsidized cancer screenings onsite.
- Utilize targeted client reminders to encourage screening.
- Adopt culturally sensitive patient navigation in health care provider settings and/or CHW programs in neighborhoods to increase access to screening and diagnostic services and to improve treatment adherence.
- Encourage payers to reimburse for patient navigation, including navigation conducted by CHWs.
- Encourage patient navigation professionals to join and support the Maryland Patient Navigation Network.
- Support hospitals and cancer centers in conducting community health needs assessments and encourage sharing of results.
- Leverage technology and innovative practice models, such as telemedicine and visiting consultants, to improve patient access and better connect primary care and other health care providers to cancer specialists.

Cancer Disparities

- Implement innovative methods to identify hard-to-reach, underserved populations.
- Increase community engagement in targeted outreach and education about cancer to minority and other underserved populations by utilizing faith-based, community, and civic/social/service organizations.
- Ensure cultural, financial, and geographic access and provide information to underserved populations on how to access health care and supportive services.

- Ensure that information provided is age-, literacy-, and culturally appropriate; collaborate with those who represent minority and other underserved populations to help design, implement, and evaluate culturally appropriate and effective education and outreach strategies and messages.
- Increase diversity in the health care, research, and community health worker workforce to represent populations being served; use innovative means to recruit students from underserved populations, such as developing internships and/or shadow programs for high school students and educating high school and college students on available incentives such as student loan forgiveness programs.
- Work through professional medical associations/organizations and schools of medicine, nursing, and dentistry to build health care provider cultural and linguistic competency and understanding of health disparities and unintentional bias.
- Encourage medical specialists and oncologists to practice (permanently or traveling) in rural and underserved areas in Maryland by offering incentives such as student loan repayment and tax incentives.
- Continue to enhance surveillance of cancer disparities among vulnerable populations, including disparities by race, ethnicity, geography, income, education level, and disability status.

Education

- Provide targeted, culturally, and linguistically sensitive educational information to the public about cancer and about health insurance options available through the Maryland Health Connection, and prevention services covered by insurance options.
- Utilize evidence-based education methods, such as one-on-one education and small media to provide culturally sensitive information to patients about cancer prevention and early detection.
- Use media outlets such as websites and social media outlets; print, radio, and television public service announcements; billboards; and press releases to provide public health messages related to cancer.
- Provide continuing education opportunities for primary care providers, dentists, and other health care providers in cancer prevention and early detection, diagnosis and treatment guidelines, and post-treatment patient management. Utilize web-based methods, health care provider meetings and conferences, seminars, grand rounds, and/or other opportunities.
- Educate family members around the importance of sharing personal and family health history with relatives.
- Educate people on cancer risk factors, including lifestyle factors such as tobacco use, physical inactivity, and obesity.
- Educate health care providers on the rising incidence of cancers in adults under 50 years old.

Quality Monitoring and Improvement

- Develop methods to measure health care provider adherence and non-adherence to screening, diagnosis, and treatment standards and national guidelines.
- Develop and utilize tools that allow for aggregate-level data monitoring in health care provider offices (e.g. electronic health record systems). Encourage health care providers and systems to use tools to monitor the amount of time to diagnosis and/or treatment, and adherence to treatment plans.
- Promote the use of systems-level processes and quality improvement activities among health care providers to optimize adherence to national guidelines for screening, and times to diagnosis and treatment.
- Encourage complete reporting to the MCR from hospitals, freestanding facilities, and other health care providers.

Cancer Genetics

- Work through professional medical associations/organizations to distribute cancer risk assessment tools and USPSTF recommendations regarding risk assessment, genetic counseling, and genetic testing.
- Educate the public on the relationship between family history, inherited genetic variants, cancer risk, and the importance of genetic counseling prior to genetic testing.
- Utilize telemedicine to increase access to genetic counselors and programs.

Research and Clinical Trials

- Maintain or increase funding for basic, clinical, population, and translational research.
- Provide culturally sensitive education to patients, health care providers, and members of the public about clinical trials and research to increase awareness, engagement, and participation.
- Encourage collaboration among hospitals and cancer centers to increase patient access to and participation in clinical trials.
- Implement system-level changes to reduce barriers to clinical trials and ensure equitable access for low-income or uninsured patients to increase diversity in patient participation.

SECTION 3

CANCER SURVIVORSHIP, PALLIATIVE CARE, AND HOSPICE CARE

CANCER SURVIVORSHIP, PALLIATIVE CARE, AND HOSPICE CARE

The term “cancer survivor” refers to someone living with, through, or beyond cancer from the moment of diagnosis through the rest of life. This includes patients who are being treated for cancer, who are free of cancer, and who live with cancer as a chronic disease, undergoing continued treatment and surveillance. The term “co-survivor” refers to friends, family members, and caregivers who share in the experience of caring for a person with cancer.

The effects that a cancer diagnosis has on a person do not end with the completion of cancer treatment. Individuals who are cancer-free once treatment ends face a variety of challenges as they transition back into their pre-cancer diagnosis routines. Increasingly, individuals are living many years, even decades, with metastatic and advanced disease, which presents its own unique set of physical, emotional, psychosocial, and financial challenges. It's crucial to distinguish between advanced disease and end-of-life care, as these are distinct phases with different needs. While individuals whose treatment is not ultimately successful may encounter significant end-of-life challenges and decisions, many individuals with advanced cancer live active, though often altered, lives for extended periods. These individuals with advanced, but not terminal, disease often require specialized support and care that focuses on managing symptoms and maintaining quality of life, a need that is often distinct from end-of-life care.

SURVIVORSHIP

The ACS estimates that in 2022, there were more than 18 million cancer survivors in the United States.[304] In 2021, approximately 34,000 Marylanders were diagnosed with cancer, and approximately 6.3% of Marylanders were cancer survivors.[305] People are living longer after a cancer diagnosis than in the past, thanks to improvements in health care providers' ability to find cancer earlier, diagnose cancer more accurately, and treat cancer more effectively. 70% of people diagnosed with cancer are expected to live at least five years after diagnosis.[306]

Cancer survivors and their co-survivors face an array of difficulties and needs related to their diagnosis and treatment. These challenges and needs extend beyond immediate treatment side effects and can persist long after treatment ends. They may include:[307]

- **Access to comprehensive care, information, and resources:** This encompasses access to health care providers and specialists, clear explanations of diagnosis and treatment options, effective management of both short-term and long-term side effects, information and support for fertility preservation, and readily available resources for both the patient and their co-survivors. Navigating the health care system and finding reliable information can be a significant burden for survivors.

[304] American Cancer Society. Cancer Treatment and Survivorship Facts & Figures 2022-2024. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-treatment-and-survivorship-facts-and-figures/2022-cancer-treatment-and-survivorship-fandf-acs.pdf. Accessed January 8, 2025.
[305] Maryland Department of Health, Maryland Cancer Registry, 2021.
[306] National Institute of Health. Division of Cancer Control and Population Science. Statistics and Graphs. https://cancercontrol.cancer.gov/ocs/statistics. Accessed January 8, 2025.
[307] National Cancer Institute. Life After Cancer Treatment. https://www.cancer.gov/about-cancer/coping/survivorship/new-normal. Accessed January 9, 2025.

- **Psychosocial and emotional well-being:** Cancer can significantly impact mental and emotional health. Survivors and their loved ones may experience a range of emotions, including fear, anger, depression, anxiety, uncertainty about the future, and even post-traumatic stress. Changes in sexuality and intimate relationships are common, as are spiritual struggles and questions of meaning. Addressing these psychosocial needs is crucial for overall well-being.

- **Financial burdens:** The costs associated with cancer care can be substantial, even with health insurance coverage. Survivors may face challenges with insurance coverage, high deductibles and co-pays, and the cost of medications and ongoing care. Work-related issues, such as taking time off for treatment and managing childcare or elder care responsibilities, can further strain finances. These financial stressors can significantly impact quality of life.

- **Long-term survivorship challenges:** The long-term effects of cancer and its treatment can be significant. These may include cognitive deficiencies ("chemobrain"), the need to adopt and maintain healthy lifestyle choices, the risk of developing secondary cancers, and the ongoing management of chronic treatment side effects such as pain, fatigue, and neuropathy. For younger survivors, fertility preservation and family planning can be a major concern. Long-term follow-up care and support are essential to address these ongoing needs.

ACCESS TO CARE, INFORMATION, AND RESOURCES

Accessing lifesaving and evidence-based cancer care is a major concern for newly diagnosed cancer survivors and their co-survivors. This includes access to state-of-the-art treatment and specialists. Crucially, this also includes comprehensive symptom management, which should be a core competency and expectation of all oncology providers and their teams. Additional resources and specialists, such as palliative care teams, can be consulted for complex or refractory symptom management. Other essential aspects of access include fertility preservation options, information about and access to clinical trials and immunotherapies, and connection to resources and services that support both the patient and their co-survivors. Approximately 70% of all newly diagnosed cancer patients in the United States are treated at a facility accredited by the American College of Surgeons' Commission on Cancer (CoC), which accredits programs that meet comprehensive standards of care intended to improve survival and quality of life for cancer patients.[308] Patients can access CoC-accredited centers throughout Maryland, with accredited centers located in about two-thirds of the counties in the state; a list of CoC-accredited centers is available online at: https://www.facs.org/quality-programs/cancer-programs/commission-on-cancer/coc-accreditation/.

Patient navigation can play an important role in helping cancer patients and their co-survivors access care and resources, coordinate appointments, and understand information related to their diagnosis so the patient can make informed decisions. Refer to Section 2 of the Cancer Plan for more information about the benefits of patient navigation.

In 2022, 98.3% of cancer survivors in Maryland had some form of health care coverage, and among survivors, health insurance status did not differ significantly by any demographic characteristic.[309] Cancer survivors in Maryland were significantly more likely than persons without a cancer history to have at least one health care provider (97.7% compared to 86.4%, respectively) and to have had a routine physical checkup in the past year (87.9% compared to 77.7%, respectively).[310] The ACA and the Maryland Health Benefit Exchange (MHBE) have expanded access to health insurance for individuals with and without cancer, and have allowed cancer patients to gain health insurance coverage without being denied due to their diagnosis. Continued education and outreach to uninsured and

[308] Schroeder MC, Gao X, Lizarraga I, Kahl AR, Charlton ME. The Impact of Commission on Cancer Accreditation Status, Hospital Rurality and Hospital Size on Quality Measure Performance Rates. Ann Surg Oncol. 2022 Apr;29(4):2527-2536. doi: 10.1245/s10434-021-11304-3. Epub 2022 Jan 23. PMID: 35067792; PMCID: PMC11559211.
[309] Maryland Department of Health. Behavioral Risk Factor Surveillance System.
[310] Maryland Department of Health. Behavioral Risk Factor Surveillance System.

underinsured cancer survivors about insurance options that are available through the MHBE will ensure that even more survivors have access to high-quality care.

PSYCHOSOCIAL ISSUES

Cancer survivors and their loved ones often experience significant emotional and psychological distress, which can be eased through psychosocial support services like counseling, support groups, and educational events. Unfortunately, stigma and reluctance to discuss these concerns often prevent people from seeking help. Health care providers should proactively address this by normalizing psychological distress and offering information and referrals to available resources. While guidelines and requirements for distress screening exist, implementation and utilization remain suboptimal. Refer to the Special Topics section of the Cancer Plan for more information about cancer and mental health.

FINANCIAL ISSUES

The ACS estimates that the number of new cases of cancer will increase to 26 million worldwide in 2030.[311] The cancer-related health care costs in the United States are projected to exceed $245 billion by 2030.[312] This is a more than 30% increase from 2015, when the cost was estimated at $183 billion.[313]

The high costs associated with cancer treatment create significant financial burdens not only for the uninsured but also for insured survivors and their co-survivors. Even with quality health insurance, individuals can face substantial out-of-pocket expenses, including co-payments, deductibles, coinsurance; costs for transportation, childcare, or eldercare during appointments; homecare; specialized food or equipment; and lost wages due to time off for treatment. These treatment-related costs compound existing basic living expenses like rent or mortgage payments, utilities, and food, potentially leading to significant financial strain. Furthermore, insurance coverage may not always align with a health care provider's recommended treatment plan, leaving survivors to shoulder additional costs. Many survivors also require services often not covered by insurance, such as mental health care, fertility preservation or treatment, physical or occupational therapy, and integrative medicine.

The financial impact of a cancer diagnosis can be profound, and research indicates that roughly half of adult survivors experience debt as a result.[314] Health care providers and patient navigators should proactively assess and discuss the financial needs of all patients and co-survivors, connecting them with relevant financial resources and counseling when necessary.

Cancer survivors and their co-survivors may also encounter numerous employment-related challenges. Disability, managing time off from work, and negotiating accommodations upon returning to work can present significant hurdles. Some survivors may experience discrimination from employers or colleagues due to misconceptions about their cancer prognosis or perceived productivity. It is crucial for cancer survivors and their co-survivors to be well-informed about their employment rights and available resources.

[311] American Cancer Society. Global Cancer Facts and Figures. https://www.cancer.org/research/cancer-facts-statistics/global-cancer-facts-and-figures.html. Accessed January 8, 2025.
[312] American Association of Cancer Research. Cancer Care Costs in the United States Are Projected to Exceed $245 Billion by 2030. https://www.aacr.org/about-the-aacr/newsroom/news-releases/cancer-care-costs-in-the-united-states-are-projected-to-exceed-245-billion-by-2030/. Accessed January 8, 2025.
[313] American Association of Cancer Research. Cancer Care Costs in the United States Are Projected to Exceed $245 Billion by 2030. https://www.aacr.org/about-the-aacr/newsroom/news-releases/cancer-care-costs-in-the-united-states-are-projected-to-exceed-245-billion-by-2030/. Accessed January 8, 2025.
[314] American Cancer Society Cancer Action Network. Press Room. Survey: Half of Cancer Patients and Survivors Report Incurring Cancer-Related Medical Debt; Over 70% Are Worried About Affording Care. https://www.fightcancer.org/releases/survey-half-cancer-patients-and-survivors-report-incurring-cancer-related-medical-debt-over. Accessed January 8, 2025.

LONG-TERM SURVIVORSHIP

Long-term cancer survivorship marks a significant transition for patients, moving from active treatment to a new phase of life. While this milestone is often celebrated, it can also bring unique challenges. Survivors may grapple with lingering physical and emotional effects of their cancer journey, sometimes for years or even decades after treatment concludes. Health care providers play a vital role in recognizing these potential long-term issues and connecting survivors with appropriate resources and support.

These long-term effects can be varied and complex. Some survivors experience cognitive difficulties, often referred to as "chemobrain," which can impact memory, concentration, and other cognitive functions. Chronic pain, a persistent reminder of the cancer experience, can significantly affect quality of life. The fear of cancer recurrence or the development of secondary cancers can create ongoing anxiety. Furthermore, the treatments themselves can have lasting impacts on other aspects of health, potentially leading to heart or liver problems, osteoporosis, or fertility issues. Addressing these diverse challenges requires a comprehensive and personalized approach to survivorship care.

Supporting long-term survivors involves more than just monitoring for recurrence. It requires proactive assessment and management of physical and psychological late effects, as well as promoting overall well-being. This includes encouraging healthy lifestyle choices, providing access to mental health support, and connecting survivors with resources that address their specific needs, such as support groups, rehabilitation services, and fertility specialists. By acknowledging and addressing the long-term impact of cancer, health care providers can empower survivors to live full and meaningful lives beyond their diagnosis.

The CoC recognizes the importance of comprehensive survivorship care and recommends that all cancer patients receive a survivorship care plan.[315] These plans serve as a roadmap for the patient's post-treatment journey, outlining their individual needs and providing guidance for long-term follow-up. A survivorship care plan typically includes a summary of the cancer treatment received, potential long-term or late effects of that treatment, recommendations for follow-up care and screening, strategies for managing any ongoing symptoms, and resources for physical and psychosocial support.[316] The CoC emphasizes that these plans should be personalized to address the unique circumstances of each survivor. They are intended to improve communication between the patient and their health care providers, empower survivors to actively participate in their own care, and promote overall health and well-being after cancer treatment. While the specific format and content of survivorship care plans may vary, the core goal is to provide a comprehensive and coordinated approach to long-term cancer care.

Long-term monitoring and support are critical for childhood cancer survivors, as late effects from treatment are frequently experienced in adulthood. These survivors face an increased risk of various long-term health issues, the specific risks depending on factors such as the type of cancer, the treatments used (including dosages), and the child's age at the time of treatment. Potential late effects can include:[317]

- **Cardiopulmonary issues:** Heart or lung problems may arise due to certain chemotherapy drugs or radiation therapy to the chest area.

[315] Stal J, Miller KA, Mullett TW, Boughey JC, Francescatti AB, Funk E, Nelson H, Freyer DR. Cancer Survivorship Care in the United States at Facilities Accredited by the Commission on Cancer. JAMA Netw Open. 2024 Jul 1;7(7):e2418736. doi: 10.1001/jamanetworkopen.2024.18736. PMID: 38958979; PMCID: PMC11222991.
[316] Center for Disease Prevention and Control. Cancer Survivors. Cancer Survivorship Care Plans. https://www.cdc.gov/cancer-survivors/life-after-cancer/survivorship-care-plans.html.
[317] National Cancer Institute. Late Effects of Treatment for Childhood Cancer (PDQ®)–Patient Version. https://www.cancer.gov/types/childhood-cancers/late-effects-pdq. Accessed January 8, 2025.

- **Growth and development**: Slowed or delayed growth and development, affecting bones or overall stature, can occur.
- **Reproductive health:** Changes in sexual development and potential impacts on fertility are possible.
- **Cognitive function:** Learning problems or other cognitive difficulties may emerge.
- **Secondary cancers:** Childhood cancer survivors have an increased risk of developing other cancers later in life.

The Children's Oncology Group has developed long-term follow-up guidelines for childhood cancer survivors, providing valuable resources for both families and health care providers. These guidelines are available online at www.survivorshipguidelines.org.

**For more information about healthy behaviors, see Section 1 of the Cancer Plan. Smoking cessation is especially important for cancer survivors, as smoking may reduce the effectiveness of treatment and increase the likelihood of a second cancer.*[318]

CANCER SELF-MANAGEMENT EDUCATION

Cancer self-management education (SME) programs offer individuals affected by cancer the tools to proactively manage their health. Participants learn strategies to alleviate symptoms like fatigue and pain, address emotional challenges such as anxiety and depression, and implement healthy lifestyle changes. SME also emphasizes effective communication with health care providers and informed decision-making, empowering patients to navigate the complexities of cancer with greater confidence and resilience. More information about self-management for cancer patients is available online at: https://selfmanagementresource.com/programs/small-group/cancer-thriving-and-surviving-small-group/

ADVANCED CARE PLANNING

ACP is a process that benefits not only the individual but also their loved ones and health care providers. For patients, it provides a sense of control over their future medical care, ensuring their wishes are respected even if they become unable to communicate them. This can alleviate anxiety and promote peace of mind. By clearly outlining preferences, ACP helps loved ones navigate difficult decisions during emotionally challenging times, reducing potential conflict and guilt. For clinicians, having access to a patient's advance directive facilitates ethical and patient-centered care, aligning medical decisions with individual values and goals. This fosters stronger patient-provider relationships and promotes trust. In essence, ACP fosters open communication and shared decision-making, benefiting everyone involved. Refer to the Special Topics section of the Cancer Plan for more information about advanced care planning.

PALLIATIVE CARE

Palliative care is specialized medical care for people with serious illnesses such as cancer. It promotes quality of life by preventing, treating, and relieving pain and other negative effects of illness. Palliative care offers comprehensive care and support (physical, emotional, social, and spiritual) including treatment of pain and other symptoms; relief from worry, anxiety, and depression; close

[318] Chellappan S. Smoking Cessation after Cancer Diagnosis and Enhanced Therapy Response: Mechanisms and Significance. Curr Oncol. 2022 Dec 17;29(12):9956-9969. doi: 10.3390/curroncol29120782. PMID: 36547196; PMCID: PMC9776692.

communication about care; well-coordinated care during illness transitions; support for co-survivors; and a sense of safety in the health care system. It can be offered to patients of all ages as well as co-survivors, at all stages of a serious illness. **It is not limited to the end of life** – this is the primary distinction between palliative care and hospice care, which will be discussed later in Section 3.

Palliative care is delivered by a multidisciplinary team, typically including nurses, social workers, chaplains, physicians, mid-level providers, pharmacists, and other specialists like child life therapists. This care can be provided alongside curative treatments and is available in various settings. These include hospital consultations, outpatient clinics, nursing homes, assisted living facilities, private homes, and hospice facilities.

The benefits of palliative care for patients are well-documented:[319]

- **Improved Quality of Life:** Specialized palliative care improves patient well-being by reducing pain and other symptoms and relieving anxiety.
- **Enhanced Treatment:** Studies show that integrating palliative care, even during active treatment, can lead to better quality of life and may even extend survival for some patients.
- **Focus on What Matters:** Palliative care helps patients and families clarify their goals and values, ensuring that medical decisions align with what's most important to them.
- **Support for the Whole Person:** Palliative care addresses the physical, emotional, and spiritual needs of patients and their families, providing comprehensive support throughout the illness experience.
- **Reduced Hospitalizations:** Randomized trials have found that palliative care is associated with a decrease in the number of hospitalizations and intensive care unit days. This can help patients remain comfortable at home.
- **Improved Communication and Decision-Making:** Palliative care specialists help patients and families understand their illness and treatment options, enabling them to make informed decisions that align with their values and goals.

As the U.S. population ages and the number of cancer survivors continues to rise, the demand for palliative care has also increased. Palliative care is appropriate for many disease diagnoses, but it is especially important for cancer patients and co-survivors given the physical and emotional impacts of treatment. The ASCO recommends that combined standard oncology care and palliative care should be considered early in the course of illness for any patient with metastatic cancer and/or high symptom burden. CoC-accredited cancer centers are required to either have onsite palliative care services or have them available to patients by referral.[320]

The Center to Advance Palliative Care (CAPC) and the National Palliative Care Research Center (NPCRC) assign grades to states based on access to hospital-based palliative care, using a 5-point scale. A score of 4.0 out of 5.0 reflects a high level of access to palliative care services and indicates that most hospitals in the state provide such care. In the most recent Report Card (2024), Maryland received a score of 4.0 and was recognized as one of the top-scoring states.[321] Research indicates that common barriers to palliative care provision in hospital settings include limited patient and family awareness of palliative care services, insufficient physician support, and budgetary constraints. Furthermore, the growth of community-based palliative care programs reflects an increasing demand for at-home support. To enhance palliative care access, there's a recognized need for increased public awareness and improved communication and networking between hospitals and palliative care providers.[322]

[319] Laura A. Petrillo et al., Why and How to Integrate Early Palliative Care Into Cutting-Edge Personalized Cancer Care. Am Soc Clin Oncol Educ Book 44, e100038(2024). DOI:10.1200/EDBK_100038
[320] American College of Surgeons. Cancer Program. Commission on Cancer. https://www.facs.org/quality-programs/cancer-programs/commission-on-cancer/. Accessed. January 10, 2025.
[321] Center for Advance Palliative Care. America's Readiness to Meet the Needs of People with Serious Illness. 2024 Serious Illness Scorecard. https://scorecard.capc.org/. Accessed January 10, 2025.
[322] National Cancer Institute. Palliative Care in Cancer. https://www.cancer.gov/about-cancer/advanced-cancer/care-choices/palliative-care-fact-sheet. Accessed January 10, 2025.

PAIN MANAGEMENT

Pain management is a fundamental component of palliative care, addressing a significant burden for cancer patients. Studies indicate that a substantial portion of cancer patients experience chronic pain, both during and after treatment. During active cancer treatment and in advanced stages, pain often stems directly from the tumor itself. However, cancer survivors frequently contend with pain resulting from treatment modalities such as surgery, chemotherapy, and radiation therapy. This can manifest as conditions like post-surgical pain, chemotherapy-induced peripheral neuropathy, or radiation-induced tissue damage.[323]

While cancer pain can be effectively managed for many patients, persistent challenges exist for both patients and health care providers. These challenges include:

Patient-Related Issues

Education and Advocacy:

- Patients and their caregivers require comprehensive education on pain management strategies, empowering them to actively participate in their care and advocate for effective pain relief.
- This includes understanding different pain medications, non-pharmacological approaches, and how to communicate their pain effectively.

Access to Pain Medications:

- Access to opioid pain medications remains a significant barrier for some patients. This can be due to factors such as pharmacy shortages, restrictive prescribing practices, and geographical disparities.
- Concerns about opioid misuse have led to increased scrutiny, which can unintentionally limit access for patients with legitimate pain needs.

The CDC has released information regarding the issue of access to pain medication, which can be found at https://www.cdc.gov/mmwr/volumes/71/rr/rr7103a1.htm

Health Care Provider-Related Issues

Pain Assessment and Management Expertise:

- Clinicians need a thorough understanding of pain as a symptom and disease process, along with proficiency in comprehensive pain assessment.
- This includes the ability to differentiate between various types of cancer pain and to develop individualized treatment plans.

Substance Use Disorder and Controlled Substance Management:

- Clinicians need specialized training in managing patients with cancer pain who also have a history of or active substance use disorder.
- This includes understanding the complexities of addiction, managing opioid therapy in this population, and adhering to state and federal regulations regarding controlled substances.

[323] Deng G. Integrative Medicine Therapies for Pain Management in Cancer Patients. Cancer J. 2019 Sep/Oct;25(5):343-348. doi: 10.1097/PPO.0000000000000399. PMID: 31567462; PMCID: PMC6777858.

The NCI also provides information regarding the use of opioids in cancer patients at https://www.cancer.gov/about-cancer/treatment/side-effects/pain/pain-pdq. The American Society of Clinical Oncology also has information regarding pain management at https://asco.org/guidelines.

HOSPICE CARE

Hospice care offers comprehensive medical, psychological, and spiritual support to patients and their families facing a terminal illness. To qualify for hospice under Medicare and many private insurance plans, a physician must certify that the patient's life expectancy is approximately six months or less, assuming the illness runs its normal course. Hospice care prioritizes enhancing quality of life by focusing on symptom management, including pain control, and providing emotional and spiritual support during the end-of-life period. More information can be found on the National Alliance for Care at Home (NAHC) website at https://allianceforcareathome.org/.

Hospice care is provided by a multidisciplinary team of health care professionals, including physicians, nurses, hospice aides, social workers, therapists, clergy or bereavement counselors, and trained volunteers. While most often delivered in the patient's home, hospice services are also available in various settings, such as hospital hospice units, freestanding hospice centers, nursing homes, long-term care facilities, and residential hospices. These services are accessible to patients of all ages, races, and with any terminal illness, and are typically covered by Medicare, Medicaid, most private insurance plans, Tricare, the US Department of Veterans Affairs, and other managed care organizations.[324]

Hospice care shares a core focus with palliative care, namely enhancing quality of life and managing symptoms; however, their timing differs significantly: palliative care can be integrated at any stage of cancer treatment, alongside curative efforts, while hospice care, governed by regulatory guidelines, is specifically reserved for the end of life, typically within the last six months.[325]

Despite the significant advantages of hospice care, including reduced end-of-life hospitalizations, ICU admissions, and invasive procedures, it remains underutilized. Patient-level barriers include misconceptions that hospice means "giving up hope," overestimating survival, preferring life-sustaining treatments, and a general lack of hospice knowledge.[326] Health care provider-level barriers consist of difficulties in accurately predicting life expectancy and concerns that hospice referral may be viewed as professional failure.[327] Notably, disparities exist in hospice utilization, with minority patients, particularly Black and Hispanic individuals, using hospice at disproportionately lower rates than White patients. Addressing these barriers through targeted education for communities, cancer survivors, and caregivers, with a focus on dispelling misconceptions and providing clear information about hospice

[324] National Hospice and Palliative Care Organization. Hospice Care Overview for Professionals. Hospice FAQs. https://www.nhpco.org/hospice-care-overview/hospice-faqs/. Accessed January 11, 2025.
[325] National Institute on Aging. What are Palliative Care and Hospice Care? https://www.nia.nih.gov/health/hospice-and-palliative-care/what-are-palliative-care-and-hospice-care. Accessed January 11, 2025.
[326] Cicolello K, Anandarajah G. Multiple Stakeholders' Perspectives Regarding Barriers to Hospice Enrollment in Diverse Patient Populations: A Qualitative Study. J Pain Symptom Manage. 2019 May;57(5):869-879. doi: 10.1016/j.jpainsymman.2019.02.012. Epub 2019 Feb 18. PMID: 30790720.
[327] McGorty EK, Bornstein BH. Barriers to physicians' decisions to discuss hospice: insights gained from the United States hospice model. J Eval Clin Pract. 2003 Aug;9(3):363-72. doi: 10.1046/j.1365-2753.2003.00406.x. PMID: 12895158.

services and insurance coverage, is essential.[328] Additionally, enhanced training for health care providers is needed to improve prognostication and address concerns about referrals.[329]

CANCER SURVIVORSHIP GOALS, OBJECTIVES, AND STRATEGIES

GOAL: INCREASE THE QUALITY OF LIFE OF CANCER SURVIVORS IN MARYLAND.

OBJECTIVE 1. By 2030, increase the proportion of cancer survivors who report that during the past 30 days, poor physical or mental health did not keep them from doing usual activities on any days to 75.7%. (2023 Baseline: 68.8%)

Target Setting Method: 10% increase
Source: BRFSS 2023

Strategies

- Educate patients upon diagnosis about the availability of support and survivorship groups.
- Utilize patient navigators to link cancer survivors with available resources, including financial resources and insurance options available through the MHBE.
- Implement a multidisciplinary team introductory meeting for newly diagnosed patients and facilitate immediate referrals for services, such as fertility preservation, physical therapy, and mental health support.
- Develop a system for staged resource delivery and proactive follow-up, such as introductions to key support staff (navigator, social worker) during initial appointments and followed by a check-in by the navigator or social worker midway through active treatment to assess resource utilization and address emerging needs.
- Develop and promote the routine integration of mental health screening tools (e.g., PHQ-9, GAD-7) at key points along the cancer care continuum, from diagnosis through survivorship and during mid-treatment check-ins.
- Ensure all messaging and activities related to cancer survivorship are inclusive and respectful of diverse experiences, particularly for individuals with stage 4 or metastatic disease, by exploring alternative phrasing like "living with cancer" and actively seeking input from relevant advocacy groups.
- Advocate for policies and funding mechanisms that improve access to affordable mental health services for cancer patients and their caregivers.
- Develop and disseminate public health campaigns that normalize the emotional impact of cancer and promote the acceptance of seeking mental health support.
- Integrate discussions about body image concerns and the availability of reconstructive options into standard cancer care, particularly for cancers with visible physical impacts (e.g., breast, head and neck).
- Offer self-management workshops to cancer survivors.

[328] National Hospice and Palliative Care Organization. Hospice Care Overview for Professionals. Hospice Facts and Figures. https://www.nhpco.org/hospice-care-overview/hospice-facts-figures/. Accessed January 11, 2025
[329] National Hospice and Palliative Care Organization. Hospice Care Overview for Professionals. Hospice Facts and Figures. https://www.nhpco.org/hospice-care-overview/hospice-facts-figures/. Accessed January 11, 2025.

- Educate cancer survivors about the importance of healthy behaviors to reduce cancer recurrence risk (see section 1).
- Promote an annual awareness campaign around National Cancer Survivors Day to educate cancer survivors, the general public, policymakers, media, and health care providers about the needs of cancer survivors (including access to care, psychosocial needs, long-term survivorship, financial issues, and palliative care/pain management).
- Leverage telehealth platforms to deliver educational programs and support services to cancer survivors, particularly those in rural communities or urban areas with transportation limitations.

OBJECTIVE 2. By 2030, of those cancer survivors who report physical pain caused by their cancer or cancer treatment, increase the proportion that report that their pain is currently under control to 70.0%. (2023 Baseline: 63.6%)

Target Setting Method**: 10% increase**
Source**: BRFSS 2023**

Strategies

- Improve the assessment and treatment of pain and other symptom management by including pain assessments at each follow-up visit.
- Increase clinician education and awareness of pain management and assessment by providing seminars, grand rounds, and other opportunities for education at cancer centers.
- Collaborate with pharmacies and policymakers to ensure that pain medicine is adequately stocked in all communities, and policies around prior authorization are as least stringent and restrictive as possible.
- Ensure that pain medicine coverage policies are easily accessible to patients considering health plans available through the MHBE.
- Increase educational opportunities for physicians to increase understanding and knowledge of palliative care and how and when to refer patients to a palliative care team.
- Provide targeted, culturally, and linguistically sensitive palliative care educational information to patients and caregivers.
- Utilize telehealth for pain management consultations and follow-up care, improving access for patients in underserved areas.

OBJECTIVE 3. By 2030, increase the proportion of cancer survivors who report receiving a written summary of all cancer treatments received and written instructions about where to return or who to see for routine cancer check-ups after completing treatment to 45.4%. (2023 Baseline: 41.3%)

Target Setting Method: 10% increase
Source: BRFSS 2023

Strategies

- Promote the use of survivorship care plans in standard practice by health care providers.
- Provide professional education to primary care providers regarding use of Survivorship Care Plans.
- Increase awareness about care plans, including the Institute of Medicine recommended elements, among health care providers and cancer survivors.
- Promote systems changes to integrate survivor care plans into systems of care (e.g. using electronic medical records to populate care plans).
- Explore the use of telehealth platforms for delivering and explaining survivorship care plans to patients.

OBJECTIVE 4: By 2030, obtain data on the number of Marylanders with cancer who have completed an advanced directive that is accessible by health care providers.

Strategies

- Establish a plan to collect Maryland-level data on the number of Marylanders with cancer who have completed an advanced directive that is accessible by health care providers.
- Implement a standardized process to collect ongoing data on the number of Marylanders with cancer who have completed an advanced directive that is accessible by health care providers.
- Convene a workgroup to develop a systematic approach to assess data trends on advance directive usage among Marylanders with cancer. Data sources may include Maryland BRFSS, electronic health records, Chesapeake Regional Information System for our Patients (CRISP), Maryland Health Care Commission's State Recognition Program for electronic advance directive services, and utilization of these directives at the point of care.

OBJECTIVE 5: Through 2030, support ACP for cancer survivors and their families.

Strategies

- Partner with Maryland cancer support networks and coalitions to determine effective strategies to support ACP among cancer survivors.
- Educate health care providers on having culturally sensitive ACP discussions, including the sharing and accurate completion of key documents, with all Marylanders newly diagnosed with cancer, and provide resources on how to address cancer-specific end-of-life considerations within these discussions.
- Support dissemination of the Maryland Advance Directive Information Sheet to cancer centers, providers, support groups, and other partners.
- Implement systems changes to support the use of electronic advance directives.
- Offer advance care planning workshops to Marylanders with cancer in diverse settings.
- Provide targeted, culturally, and linguistically sensitive advance care planning educational information to patients and caregivers.
- Partner with community organizations, faith-based groups, and social service agencies to offer ACP education and support.
- Develop a tracking system to determine ACP rates among different demographic groups to identify disparities and inform targeted interventions.
- Partner with health systems to move Advance Directives from electronic health records to CRISP and ensure seamless integration and accessibility for all relevant health care providers across different settings.
- Evaluate the effectiveness of ACP interventions in increasing ACP rates and improving the quality of ACP conversations.
- Implement a standardized process within all Maryland cancer centers to proactively offer ACP information, resources (including the Maryland Advance Directive Information Sheet and electronic directive options), and access to trained facilitators (e.g., social workers, navigators) to all newly diagnosed patients and their families.
- Educate health care providers and patients on the distinct but complementary roles of advance directives and MOLST, particularly in the context of cancer care progression.

OBJECTIVE 6. Through 2030, ensure continued access to palliative care services for cancer patients.

Strategies

- Develop an awareness campaign to educate Marylanders about palliative care.
- Educate primary care providers and health care providers in hospital-based settings about the availability and application/referral process for palliative care services, and benefits of palliative care services for cancer patients in active treatment.
- Support mechanisms that bring together palliative care professionals to share best practices, such as professional networks and conferences.
- Support the development of minimum standards for palliative care programs in Maryland hospitals with greater than 50 beds.

- Support the development of palliative care services in the home and community settings at scale to support those with cancer throughout the state.

OBJECTIVE 7. By 2030, develop and implement a process to expand the collection of Maryland-level data on palliative care and hospice utilization by cancer patients to include average length of stay, location of death, and demographic information such as race, sex, and age.

- Create partnerships to develop and implement a plan to collect cancer patient palliative care and hospice utilization data. Partners may include the Maryland Health Care Commission, Maryland BRFSS, the Hospice and Palliative Care Network of Maryland, and the National Hospice and Palliative Care Organization, among others.

OBJECTIVE 8: By 2030, improve statewide surveillance of sexual and gender minority (SGM) population, including health risks.

- Include the CDC Optional Module on Sexual Orientation and Gender Identity in the Maryland BRFSS to collect data that identify health risk behaviors of SGM individuals, including cancer survivors.
- Improve cancer surveillance by collecting and analyzing data as appropriate to establish cancer risks, monitor cancer survivorship, and promote health equity among Maryland's SGM populations.

OBJECTIVE 9. By 2030, increase timely access to hospice care and improve hospice length of stay in Maryland.

- Develop statewide education initiatives for oncology teams, hospitalists, and discharge planners on the importance of early hospice conversations and referrals. Consider utilizing telehealth platforms for these educational initiatives to reach a wider audience.
- Partner with provider organizations to offer communication training for health care providers on discussing prognosis and care options with patients and families. Explore the use of virtual training modules and role-playing scenarios via telehealth.
- Raise community awareness around hospice eligibility and the benefits of early referral. Utilize various communication channels, including online platforms.

OBJECTIVE 10: By 2030, provide education and resources for families of children diagnosed with cancer, including palliative care and hospice support.

- Promote early integration of pediatric palliative care alongside curative treatments.
- Increase community outreach to raise awareness of available support services for families with a child facing serious illness. Utilize online resources and virtual support groups to enhance accessibility.
- Train health care providers in age-appropriate, compassionate communication with pediatric patients and their families. Incorporate telehealth-based training modules that include simulated patient-family interactions.

APPENDIX: DATA SOURCES AND CONSIDERATIONS

SOURCES OF MARYLAND DATA

The Maryland-specific data used in the Cancer Plan were supplied by MDH, including MCR and BRFSS, and the National Center for Health Statistics (data in CDC WONDER).

MARYLAND CANCER REGISTRY

Cancer incidence and stage data were provided by the MCR in the MDH Center for Cancer Prevention and Control, https://health.maryland.gov/phpa/cancer/pages/mcr_home.aspx.

The MCR is a computerized data system that registers all new cases of reportable cancers (excluding non-genital squamous cell or basal cell carcinoma) diagnosed or treated in Maryland. The Maryland cancer reporting law and regulations mandate the collection of cancer information from facilities that are licensed in Maryland, including hospitals, radiation therapy centers, diagnostic laboratories, freestanding ambulatory care facilities, surgical centers, and physicians whose non-hospitalized cancer patients are not otherwise reported. The MCR also participates in data exchange agreements with many states including the neighboring states of Delaware, Pennsylvania, Virginia, West Virginia, and the District of Columbia. Information on Marylanders diagnosed or treated for cancer in these states is included in this plan.

MARYLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

The Maryland BRFSS is an annual telephone survey conducted on a random sample of Maryland adult residents and is part of CDC's national BRFSS. This survey, managed by the MDH Center for Chronic Disease Prevention and Control, provided cancer risk behavior (e.g., adult tobacco use, sun exposure, diet, physical activity) and cancer screening information used in the Cancer Plan. Maryland data can be accessed online at: https://ibis.health.maryland.gov/. Both Maryland and state-aggregated national data on health risk behavior can also be obtained from the CDC BRFSS website at: www.cdc.gov/brfss.

As measures for cancer-related behaviors (e.g. screening tests) and the recommendations for their use change, questions in the BRFSS that measure screening and other health behaviors are updated to reflect these modifications. Data are weighted to the age of the Maryland population in that year but are not age-adjusted to the year 2000 U.S. standard population.

MARYLAND YOUTH RISK BEHAVIOR SURVEY/YOUTH TOBACCO SURVEY

The Maryland YRBS/YTS collects data from middle and high school youth on several priority health risk behaviors as well as behaviors that support health. In 2013, the Maryland YRBS was combined with the former Maryland YTS, resulting in a combined survey. Published reports are available on the MDH website at: https://health.maryland.gov/phpa/ccdpc/reports/pages/yrbs-main.aspx.

SOURCES OF NATIONAL DATA

National statistics cited in this plan were obtained from the CDC, the ACS, National Center for Health Statistics (NCHS), and the NCI.

SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM

The SEER Program, managed by the NCI, is an authoritative source of information on cancer incidence, stage, and survival in the U.S. The SEER Program, which began in 1973, collects, analyzes, and publishes cancer incidence and survival data from population-based cancer registries participating in the program. Since 2000, SEER incidence data have been collected from 22 SEER registries throughout the U.S. (SEER 22 registry database) and are estimated to represent approximately 47.9% of the U.S. population. The SEER database represents cancer incidence in the U.S. population with regard to race, ethnicity, age, sex, poverty, and education, and by collecting data on epidemiologically significant population subgroups.

SEER 22 incidence data are used in the Cancer Plan for comparisons with the most recent Maryland data (2017-2021) because they provide the broadest population coverage that is currently available. All SEER 22 rates were obtained from SEER*Stat (version 8.4.3), a statistical software tool for the analysis of SEER and other cancer-related databases. Further information about SEER can also be found on the website at https://seer.cancer.gov/.

NATIONAL CENTER FOR HEALTH STATISTICS

The U.S. mortality rates for single year 2012 to 2021 and 5-year aggregate data (2017 to 2021) were obtained from SEER Cancer Query System: US Mortality Statistics, which are provided by NCHS.

HEALTHY PEOPLE 2030 (HP 2030)

HP 2030 is a collaboration of local and national governmental agencies and private organizations that have developed prevention-oriented national objectives to improve the health of Americans. The HP initiative is under the Office of Disease Prevention and Health Promotion at the U.S. Department of Health and Human Services. There are 62 focus areas and 357 core or measurable objectives, as well as developmental and research objectives, in HP 2030. For cancer prevention, the overarching HP 2030 goal is to “reduce new cases of cancer and cancer-related illness, disability, and death.” To achieve this goal, measurable objectives related to cancer screening and cancer risk behaviors were established, each with a specific quantitative target. Further information about HP 2030 can be found at https://odphp.health.gov/healthypeople.

In the Cancer Plan, quantitative HP 2030 targets, where available, are compared to Maryland data related to cancer risk behaviors (e.g., smoking, sun exposure) and adherence to cancer screening recommendations. Specifically, HP 2030 targets are compared to data from the Maryland BRFSS.

CDC BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

The national counterpart to Maryland's BRFSS system is operated by the CDC's National Center for Chronic Disease Prevention and Health Promotion. National statistics on behavioral health risks, as well as select individual state data may be accessed at https://www.cdc.gov/brfss/.

NATIONAL CANCER INSTITUTE PHYSICIAN DATA QUERY (PDQ)

This source provides information for health professionals and the public on various aspects of cancer control such as prevention, screening, treatment, genetics, and clinical trials. The information is reviewed by a scientific editorial board and is updated as new research becomes available. Each statement listed in the PDQ is based on current knowledge as defined by the most recent literature using established levels of evidence. More information about NCI's PDQ can be accessed at https://www.cancer.gov/publications/pdq.

DATA CONSIDERATIONS

DATA CONFIDENTIALITY

MDH regards all data received, processed, and reported to and by the MCR as confidential. Data are secured from unauthorized access and disclosure. The MCR manages and releases cancer information in accordance with the laws and regulations established by the state of Maryland as set forth in the Code of Maryland Regulations, COMAR 10.14.01 (Cancer Registry) and Health-General Article, § 18-203 and § 18-204, Annotated Code of Maryland. To ensure patient confidentiality and to comply with the MCR Data Use Manual and Procedures, cells with counts of 1-5 cases are suppressed and presented as "<6."

Mortality data in the Cancer Plan obtained from Maryland Department of Vital Statistics comply with data use restrictions stipulated by the NCHS.

SEX

Sex was reported to the MCR as of 2012 as (a) male, (b) female, (c) other (hermaphrodite), (d) transsexual, and (e) not stated/unknown. The totals shown in the count for the number of cancer cases may not equal the sum of males and females because of cases in these other gender categories.

RATE ANALYSIS AND THE YEAR 2000 U.S. POPULATION STANDARD

Age-adjustment, also called age-standardization, is one of the tools used as a control for the different and changing age distributions of the population in states, counties, etc., and to enable meaningful comparisons of vital rates over time. Federal agencies have adopted the year 2000 U.S. standard population as the new standard for age-adjusting incidence and mortality rates, beginning in data year 1999. Incidence and mortality rates in the Cancer Plan were calculated and age-adjusted using the 2000 U.S. population as the standard population. Additional information on age-adjustment can be found at: https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

STATISTICAL SIGNIFICANCE

Statistical significance, as cited in the Cancer Plan, was determined by performing Z-test calculations using p-value < 0.05 to determine significance unless otherwise noted.

RACIAL AND ETHNIC MINORITY POPULATIONS

The 2024 update of Directive 15 of the Federal Office of Management and Budget defined a minimum list of categories for racial and ethnic data collection. The revisions to SPD 15 require the use of one combined question for race and ethnicity, and encourage respondents to select as many options as apply to how they identify. These options now include Middle Eastern or North African as a required minimum category. The revised SPD 15 also requires the collection of additional detail beyond the minimum required race and ethnicity categories for most situations.

In the Cancer Plan, as data collected precedes this update, the race/ethnicity categories reported are non-Hispanic White (White), non-Hispanic Black (Black), Hispanic/Latino, non-Hispanic Asian or Pacific Islander (Asian/Pacific Islander or API), and non-Hispanic American Indian or Alaska Native (American Indian/Alaska Native or AIAN).

HEALTHY PEOPLE 2030 OBJECTIVES

HP 2030 objectives are generally age-adjusted to the year 2000 U.S. standard population.

DATA YEARS

Significant efforts were made toward consistency of data years reported throughout the Cancer Plan. Age-adjusted incidence and mortality statistics are reported through 2021, which is the most recent data year available at the time of writing.

Behavioral risk factor data from the BRFSS are reported for the most recent year available at the time of writing, or for several different years in order to establish a trend over time. The most recent data year available for behavioral risk factor data varies from topic to topic, based on which survey questions were asked in various years.

AGE-ADJUSTED INCIDENCE AND MORTALITY RATES

To ensure that race-specific rates align with all race rates, a population weighted average was used to estimate all race rates. A best fit (least squares) linear regression forecast function (Microsoft Excel) was used to estimate the 2020 population using U.S. Census Bureau yearly population estimates for Maryland, and a proportion of the total was determined for each race- and sex-specific category. This 2020 population proportion was then applied to each race-specific rate and these values were added to obtain the all-race age-adjusted rate.

TARGET SETTING FOR SMART OBJECTIVES

The majority of objectives in the Cancer Plan include specific data targets to be met by year 2030. The methods below were used to develop the targets, with a few exceptions noted.

1. Targets under objectives to decrease incidence or mortality: 2030 rates were projected using Microsoft Excel. Known Maryland data values were used to predict a future value for the year 2030 using linear regression. The projected value was graphed by adding a linear trendline (in Microsoft

Excel) to the known data points, then extending the line forward to the year 2030. Incidence and mortality projections are based on Maryland age-adjusted rates for the 10-year period from 2012 to 2021.

Notes:

a. This APC of projecting based on actual data does not consider demographic, screening, or funding factors that may influence the trend through 2030.
b. Some of the 2030 incidence and mortality projections using this method were higher than the baseline incidence rate; because these projections were not in the direction desired to control cancer, the targets are described as "not greater than" the 2021 baseline.

2. Targets under the objective to decrease disparities in cancer incidence and mortality: For each (CRF-target) cancer with statistically significant disparities between race/ethnicity rates at baseline (2021), the target was set to reduce this maximal rate difference by 10% by 2030.

3. Targets under objectives with behavioral and risk factor projections: Target-setting methods are noted under individual objectives and are based on HP 2030 objectives, goals/targets of MDH, and CDC-funded programs. For behavior and risk factor projections where: 1) the Maryland baseline already exceeded the HP 2030 objective, 2) HP 2030 objectives do not exist, or 3) the HP 2030 data source is not available at the state-level, the Cancer Plan target was determined using the HP 2030 target-setting method of increasing or decreasing the baseline by 5-10% of the baseline percentage.

CITATIONS