Oregon Comprehensive Cancer Control Plan

A Cancer Burden Report to Guide Measurable Action

2025

Co-created by:

Knight Cancer Institute's Community Outreach and Engagement,
Oregon Health & Science University

Oregon Health Authority Public Health Division,
Health Promotion and Chronic Disease Prevention Section

Executive Summary

Since 2003, cancer has been the leading cause of death in Oregon. [1]

Approximately 22,000 Oregonians are diagnosed with cancer each year. [2] The burden of cancer not only impacts the cancer patient, but it also affects their family, friends, caregivers, and colleagues.

Oregon is not alone. Since cancer places a heavy burden almost everywhere, all 50 states, Tribes, and territories receive funding from the Centers for Disease Control and Prevention (CDC) to create Comprehensive Cancer Control Plans. These plans are developed for the express purpose of describing the ***cancer burden*** and offering objectives and strategies to reduce the number of people who are diagnosed with cancer (***incidence***) and the number of people who die from it (***mortality***).

This Plan presents data that describes current cancer and cancer-related ***disparities***. Data presented will inform the development of achievable, measurable action plans for reducing cancer burden and associated ***inequities*** in Oregon. In 2026, task forces will be created to address the Plan's four priority ***cancer sites*** (liver, colorectal, breast, and lung cancers), a special area of focus (HPV vaccinations), and to propose evidence-informed methods for reducing cancer-related disparities. Task forces will be encouraged to coalesce around other cancer sites or other important cancer-related issues (e.g., patient navigation, financial hardship or toxicity, data equity, clinical trials, etc.). The task forces will identify strategies and objectives and develop measurable action plans.

Oregon Health & Science University's Knight Cancer Institute and the Health Promotion and Chronic Disease Prevention Section of the Oregon Health Authority Public Health Division co-led the development of this document. Invaluable guidance and consultation were provided by a specialized data team, an equity consultant, an eleven-member steering committee from multiple sectors, and clinical and subject matter experts from both organizations. A detailed list of contributors is provided in Appendix D.

Please direct any questions about this Plan, how to participate in a task force, or about Oregon's cancer control work to **OregonCancerPlan@oha.oregon.gov**.

Funding Acknowledgment

Funding Acknowledgment

Knight Cancer Institute project staff were supported by the Knight Cancer Institute's National Cancer Institute cancer center support grant. Research reported in this cancer burden report was supported by the National Cancer Institute of the National Institutes of Health under award number P30CA069533. The content is solely the responsibility of the authors and does not represent the official views of the National Institutes of Health.

Oregon Health Authority staff were supported by the CDC's *Cancer Prevention and Control Programs for State, Territorial and Tribal Organizations* grant. We acknowledge the Centers for Disease Control and Prevention for its support of the Oregon Health Authority and the printing and distribution of the monograph under cooperative agreement NU58DP007105 awarded to Oregon Health Authority. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC.

Acknowledgment of and Collaboration with the Northwest Tribal Comprehensive Cancer Control Program

Funding for the Oregon Health Authority's (OHA) involvement in co-developing this document comes from the CDC, which also funds the Northwest Portland Area Indian Health Board (NPAIHB) to develop and implement the Northwest Tribal Comprehensive Cancer Program (NTCCP). The NTCCP's mission is "to envision and work toward cancer-free Tribal communities by taking an integrated and coordinated approach to cancer control."

The NTCCP supports the 43 Federally Recognized Tribes in Oregon, Washington, and Idaho served by NPAIHB, including the Nine Federally Recognized Tribes in Oregon. As part of the NTCCP, the NPAIHB and the Northwest Tribal Cancer Coalition facilitated the creation of a twenty-year Northwest **Tribal Comprehensive Cancer Control Plan**, which is in the process of being revised.

The Nine Federally Recognized Tribes in Oregon are each individual sovereign nations. OHA works with each Tribe through government-to-government relationships, and offers services to all people living in Oregon, including all American Indian/Alaska Natives (AI/AN).

It is important to acknowledge that this Oregon Comprehensive Cancer Control Plan and future statewide cancer control efforts will exist in parallel with the NTCCP. The Oregon Cancer Coalition will work alongside the NTCCP to decrease the burden of cancer for all people living in Oregon, including AI/AN.

The leadership team of this document sought to involve NPAIHB from the beginning of this document creation by asking NPAIHB if it would hold a seat on its steering committee; NPAIHB agreed to do so and has been present for the entire Plan creation process.

Involvement of the Nine Federally Recognized Tribes in Oregon

NPAIHB is a nonprofit organization that serves the Nine Federally Recognized Tribes in Oregon, along with Tribes in Washington and Idaho. The Tribes from all three states govern the operation of NPAIHB and the programming implemented.

At the beginning of the Plan development process, the leadership team worked with OHA Tribal Liaisons to invite Tribes to designate a representative to hold a seat on the steering committee. The Tribes chose to support the participation of NPAIHB's NTTCP Director on the steering committee; all steering committee members are listed in Appendix D. OHA will continue to work with each Tribe through government-to-government relationships on any future opportunities around Oregon's Cancer Plan or related work.

Table of Contents

SECTION 1

Introduction and Background

The Community Outreach and Engagement team at Oregon Health & Science University's Knight Cancer Institute, the Health Promotion and Chronic Disease Prevention Section of the Oregon Health Authority Public Health Division, Koffi Dessou Consulting, and an eleven-member steering committee collaborated to develop this equity-focused Comprehensive Cancer Control Plan (Plan). The Plan was also reviewed by clinical and subject matter experts. The Plan describes the most recently available data and will be used to guide measurable actions to decrease the cancer burden in Oregon. A detailed list of contributors is provided in Appendix D.

Comprehensive Cancer Control Plans are held by states, territories, and Tribes throughout the nation with funding support from the CDC. These entities create Comprehensive Cancer Control Plans for the express purpose of improving cancer outcomes.

Purpose of this Plan

- Describe Oregon's cancer burden
- Identify populations experiencing unequal effects of cancer incidence and mortality rates
- Identify geographical areas of the state where disparities exist
- Guide the development of priorities for cancer-focused organizations in the state
- Inform future task forces in the implementation of community-driven, equity-focused, and measurable actions for reducing the state's cancer burden

Principles Guiding This Plan's Development

1. Cancer is a multi-faceted and complicated disease that cannot be cured, prevented, or detected by using one approach with all patients and their families.
2. Complicated diseases require collective and collaborative approaches to achieve solutions.
3. Communities across Oregon are multi-faceted and diverse in thought, geography, and racial, ethnic, and cultural identities and traditions.
4. Publicly available data drives decisions presented in this Plan and not all communities or populations find their experiences represented accurately in the data. For instance, race categories are a social construct, not a true representation of people's identities.
5. Community members are experts about what strategies, initiatives, activities, and messaging work for and resonate with them.
6. Many factors impact inequities in cancer prevention, screening, early detection, and treatment, including systemic racism and geographic isolation.
7. Oregon's Comprehensive Cancer Control Plan is designed to ignite collective action around equitable cancer prevention, screening, early detection, treatment access, and survivorship care throughout the state.

Audience

The *Oregon Comprehensive Cancer Control Plan: A Cancer Burden Report to Guide Measurable Action* is written for those who are ready, willing, and able to take collective action to reduce Oregon's cancer burden.

The Plan highlights cancers that place the heaviest burden on Oregonians and the populations in which the biggest cancer inequities exist. Some examples of people for whom this document is written are:

- community advocates,
- individuals and organizations working to reduce the burden of cancer,
- policy makers at all levels who are responsible for strategic decision making and resource allocation,
- task forces that will develop measurable action plans responding to the burden of cancer, and
- individuals interested in joining a statewide Cancer Coalition.

Using This Cancer Plan for Collective Action

As Dr. Gilbert Friedell, the first director of Kentucky's Markey Cancer Center said, "If the problems are in the community, the solutions are in the community." To significantly affect change at the community level and reduce cancer incidence and mortality rates across the state, organizations, institutions, and community leaders need to work collectively.

This means combatting cancer by creating a common vision and agenda, building and/or leveraging the right partnerships, working alongside communities, thinking creatively to fill resource gaps, and committing in tangible, authentic ways to change cancer incidence and mortality rates to "move the needle" on the cancer burden in Oregon.

Focus on Equity

Different Oregon populations face unequal cancer burden impacts on their lives. It was imperative for the Plan's leadership team to focus on equity and identify opportunities to close cancer burden gaps across the state. A consultant was hired as part of the leadership team, ensuring an equity lens was applied at every step of the process.

This Plan categorizes rural and frontier counties as 'rural'.

Using data to drive decision-making, the Plan's leadership team focused primarily on ***disparities*** related to race, ethnicity, and those living in rural areas. Race and ethnicity are often a good starting framework for understanding inequities due to certain embedded societal systems that lead to disparate outcomes. [3] Oregon's geography is overwhelmingly ***rural*** and ***frontier***, which is one of many factors associated with inequities in cancer prevention, care, and outcomes. Rural residents face disproportionately high cancer incidence and mortality rates. The Plan's leadership team acknowledges that in Oregon, there are demographic groups other than those defined by race, ethnicity, and geography who consistently experience a higher burden of cancer and greater obstacles to health because of discrimination and exclusion. Further, the impact of ***social determinants of health*** (SDOH), or conditions in the environments where people are born, live, learn, work, play, worship, and age, affects a wide range of health, functioning, and quality-of-life outcomes and risks. [4] SDOH examples include, but are not limited to, economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context.

Data Driven Approach

The intention of this document is to provide an easy-to-reference document that can inform and drive real change. It was produced using a comprehensive analysis of publicly available data which helped identify populations experiencing the worst cancer outcomes in Oregon. Although the Plan contains the most recent cancer-related data available, it is acknowledged that there are gaps in the data. Data limitations are described in Appendix B.

Methodology

To inform the design of this Plan, leadership team members interviewed seven other CDC-funded state teams across the nation, documenting attributes, concepts, commonalities and best practices in the creation of cancer plans.

It is well documented that both rural and American Indian/Alaskan Native (AI/AN) populations face a disproportionate cancer burden compared to other groups. [5,6] To address this, another Plan leadership team member participated in national-level interviews and data collection focused on how state Plans respond to and should improve the incorporation of rural perspectives, resource levels, and cancer-related needs. This team member continued to work with a subset of the same national team to learn how state Plans incorporate Tribal needs, responsiveness, and sovereignty into statewide Plans.

Data were compiled by the Data Team, culminating in the selection of the five areas of focus highlighted in the Priority Cancers section. All data sources are publicly accessible. A steering committee was involved in the process of reviewing and approving the data and methodology used to choose the five areas of focus.

Orientation to the Plan

In the following sections, the Plan describes the types of cancers that represent the greatest cancer burden in Oregon and highlight populations and regions experiencing the greatest inequities. This document does not detail all types of cancer that impact the lives of Oregonians. It also does not convey all inequities experienced throughout Oregon.

Oregon Cancer Coalition's Goals for Cancer Control Efforts

This document is designed to guide actionable, achievable, and measurable cancer control outcomes. Oregon's Cancer Coalition will expand to meet the Plan's proposed outcomes. Goals for the Oregon Cancer Coalition include:

- Forming task forces to develop action plans,
- Ensuring geographic, racial, and ethnic diversity on the task forces,
- Supporting task forces to incorporate quantitative and qualitative data into measurable, actionable plans,
- Incorporating community perspectives into actions and strategies,
- Building upon the current collaboration, efforts, and statewide relationships,
- Inviting individuals, organizations, care teams, and institutions working along the cancer continuum to join the Coalition,
- Collecting and sharing qualitative data from Oregonians experiencing cancer care inequities,
- Planning a statewide Cancer Coalition conference.

Oregon can decrease both the burden of cancer in our state and the inequities that many populations face by working in a collaborative community-driven, innovative, inclusive, and equity-focused manner.

Priority Cancer Section

The Purpose of the Priority Cancer Section

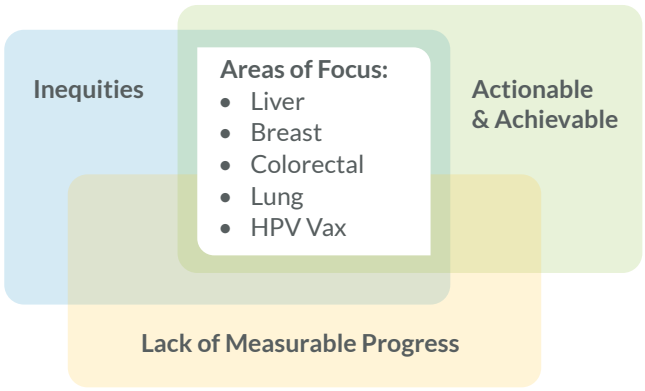
This 2025 Plan presents the most recent data available about four priority cancer types: liver, colorectal, breast, and lung cancers, and one special area of focus, HPV vaccination. Each of these focus areas merit measurable and collective action in Oregon and there is infrastructure in place to leverage this action. These priorities are based on expert data analysis, discussion, and agreement by individuals listed in Appendix D.

Each priority area is described in the following pages, including risk factors, cancer screening data, and concerning trends in incidence and mortality rates. Organizations, institutions, and workforces may be able to identify tangible opportunities to decrease cancer inequities and incidence and mortality rates by referencing data for each priority cancer. Key takeaways are noted at the end of each focus area that highlight opportunities for action.

How Were the Priorites Chosen?

To concentrate efforts to support the creation of change, the leadership team chose to limit its focus to four cancer types and one special area of focus. Three criteria were used to determine the four cancer sites:

Criteria for selecting the cancer disease sites: Areas of focus



1. cancer inequities, or excess cancer burden by group.
2. lack of measurable progress by cancer type, and
3. the extent to which actionable and achievable interventions or efforts already exist that could be harnessed to reduce the cancer burden.

Each criterion considered multiple data points. The data points led to a scoring system. Those scores were ***normalized*** across each criterion, combined to create a selection score for each area of focus, and the steering committee voted. Table 1 describes the criteria and examples of questions that were answered by analysis. Additional details about how these areas of focus were chosen are found in Appendix C.

Table 1. Priority Cancer Decision Making Matrix		
Criteria	**Guiding Questions**	**Examples of results or answers used to calculate the criteria score**
Cancer burden inequities	To what extent do demographic groups in Oregon experience disproportionate incidence and mortality rates compared to those same groups nationally? How do Oregon's different racial, ethnic, or geographic groups' cancer rates compare to Oregon's overall rates?	• The AI/AN population's liver cancer incidence rate in Oregon is 66% higher than the national AI/AN liver cancer incidence rate. • Oregon's Black or African Americans' liver cancer mortality rate is twice as high as Oregon's overall liver cancer mortality rate. • White, Black or African American, male, and rural Oregonians experience the highest lung cancer mortality rates.
Lack of measurable progress in incidence and/or mortality rates	Looking at trends over 25 years, which cancers are either increasing in incidence or mortality, or not decreasing as quickly as national rates? In Oregon, which cancers impact the most people? (overall incidence and mortality rates)	• Liver cancer has the highest increase in incidence and mortality rate in Oregon. • Among women, breast cancer has the highest incidence rate in Oregon. • Colorectal cancer incidence has decreased over time in Oregon, but not as fast as the national rate. • Lung cancer has the highest mortality rate in Oregon.
Actionable and achievable methods for prevention, screening, and/or early detection are available.	Are there known best practices or current opportunities that can be leveraged to improve prevention, screening, or early detection for a higher number of Oregonians? (yes or no)	• Standard clinical guideline for screening exists (i.e., the ***USPSTF*** recommends that women at average risk of breast cancer get a screening mammogram every other year starting at age 40). • Clinical treatment trials or early detection trials for this disease site are available for Oregon patients to enroll in. • Evidence-based early detection or prevention measures exist (e.g., mammograms, ***LDCT*** imaging, vaccines). • Some cancer risk factors are modifiable (i.e., when people stop smoking, it can reduce their risk of lung cancer).

How was Human Papillomavirus (HPV) Vaccination Chosen?

This Plan's additional special area of focus is HPV vaccination and the prioritization of increasing youth vaccination rates across the state. While HPV is not cancer, its family of 17 high risk HPV ***genotypes*** are associated with the highest proportion of HPV-related cancers. [7] HPV is associated with at least 91% of cervical cancers, 91% of anal cancer, 75% of vaginal cancer, 70% of oropharyngeal cancer, 69% of vulvar cancer, and 63% of penile cancer. [8] Improving and increasing HPV vaccination rates is a cancer prevention approach. By preventing cancer now, through vaccination, fewer Oregonians will develop HPV-related cancers in the future.

The Plan's leadership and steering committee did not use the same priority cancer scoring mechanism described above to decide on this special area of focus, though the criteria still apply. HPV vaccination rates are unequal across the state, showing the lowest rates in rural areas and among male youth. Measurable progress in meeting national goals has been hindered. Since 2019, the HPV ***initiation rate*** for Oregonians aged 13-17 has plateaued. [9]

Finally, evidence-based, actionable, and measurable initiatives are available, intact, and in motion. Preventing HPV infection with the HPV vaccine can prevent 90% of these cancers from developing. [10] Oregon institutions, tribal organizations, researchers, and community-based organizations are leading efforts across Oregon communities to improve and increase HPV vaccination rates. Additional collective action aimed at this complex priority is critical and welcomed. The priority to increase HPV vaccination rates is one that sits solidly within each principle guiding this Plan's development.

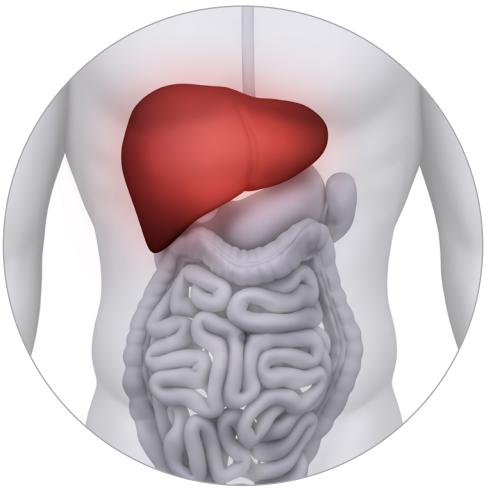
Table 2. Cancer Stage: Definitions

Cancer stage refers to the extent of a cancer, such as tumor size and how far it has spread. Knowing cancer stage is important because it helps people to understand how serious a cancer is, the chances of survival, and what the treatment should be. This Plan describes early and late-stage cancer disparities using the following definitions as provided by the National Cancer Institute. [11]

Localized (early stage)	Cancer is limited to the place where it started, with no sign that it has spread.
Regional (advanced stage)	Cancer has spread to nearby lymph nodes, tissues, or organs.
Distant (late stage)	Cancer has spread to distant parts of the body, such as other organs or bones.

PRIORITY #1

Liver and Intrahepatic Bile Duct Cancers



Description of Liver and Intrahepatic Bile Duct Cancers

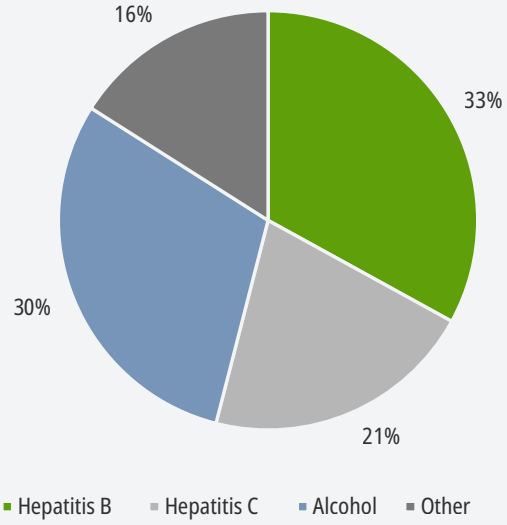
Liver and Intrahepatic Bile Duct Cancers originate in the liver or the network of bile ducts crisscrossing the liver. The liver is a vital part of the body. It is responsible for many functions including the support of metabolism, immunity, digestion, detoxification, and vitamin storage, among others. [12]

Intrahepatic bile ducts are a network of ducts that carry bile inside the liver. ***Bile***, released by the liver and stored in the gallbladder, helps our bodies digest fats and carry waste out of our bodies. In this report, we use the term "liver cancer" to describe all cancers originating in either the liver or intrahepatic bile ducts.

Risk Factors for Liver Cancer

The following are modifiable risk factors for liver cancer:

Image 1.1 Approximate percentage of liver cancer cases by risk factor



- **Having a long-term hepatitis B virus (*HBV*) or hepatitis C virus (*HCV*) infection.** [13] Approximately 54% of liver cancer cases are attributed to Hepatitis B and C worldwide (Image 1.1). [14] Although lower than the international average of 54%, Oregon data shows that 42% of liver cancer cases in the state were attributed to HBV and HCV from 1996-2021. [15]
- **Drinking alcohol.** [13] Approximately 30% of liver cancer cases are attributed to excessive alcohol consumption worldwide (Image 1.1). [16] From 2018-2022, 22% of liver cancer deaths in Oregon were alcohol-related. [195]
- **Having cirrhosis, or scarring of the liver.** Cirrhosis is most commonly associated with viral hepatitis, long term excessive alcohol use, and Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD). [18]

- **Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)**, previously called Nonalcoholic Fatty Liver Disease (NAFLD), is defined as extra fat in the liver that is not associated with alcohol. MASLD has a strong ***hereditary*** component (passed down from one generation to another) and can also have environmental factors contributing to the disease; neither of these factors are modifiable by an individual. [19,20] However, MASLD tends to develop in people who are overweight, have ***obesity*** or diabetes, and those with high cholesterol or high triglycerides; these are factors that can often be modified by individual efforts. [13,19]
- **Commercial tobacco use.** [13]
- **Being overweight or having obesity.** [13]
- **Having type 2 diabetes.** [13,21]
- **Eating foods that have aflatoxin, a fungus that can grow on foods, such as grains and nuts when they are not stored properly.** Aflatoxin is more common in warmer and tropical countries and developed countries (like the U.S.) are more likely to test foods for levels of aflatoxins. [13]

The following are non-modifiable risk factors for liver cancer:

- **Hemochromatosis**, a condition in which the body takes up and stores more iron than it needs. Hemochromatosis is most commonly associated with certain changes in a specific, inherited gene. [13]

Concerning Trends for Liver Cancer in Oregon

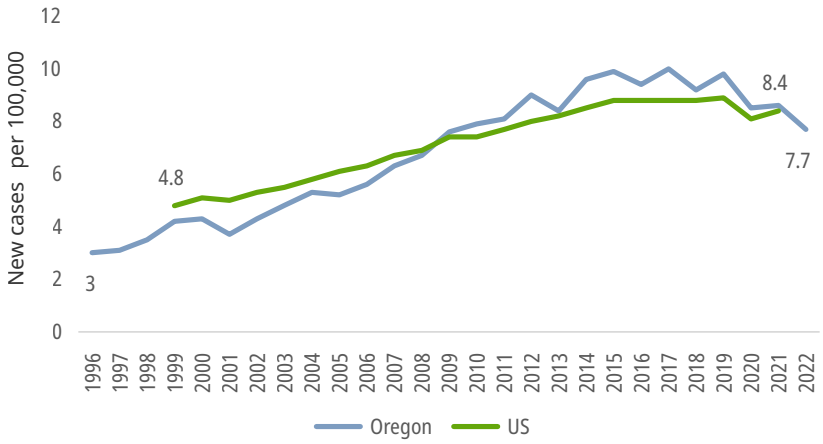
Oregon's Liver Cancer Incidence Rates Have Nearly Tripled in the Last 30 Years

Note: In data presented, all rates are age-adjusted, per 100,000 people, per year(s) specified.

Incidence rates of most cancers in Oregon are either decreasing or remaining flat. In contrast, Oregon's liver cancer incidence rates have increased dramatically since 1996. [2]

In 1996, Oregon had an overall incidence rate of 3 new cases per 100,000. In 2017, incidence peaked at 10 new cases per 100,000. As of 2022, Oregon's liver cancer incidence rate has nearly tripled to a rate of 7.7 new cases per 100,000 (Image 1.2). [2] These increases are not occurring uniformly across all demographic groups.

Image 1.2 U.S. and Oregon incidence rates for liver cancer, all years available



In addition, Oregon's liver cancer incidence rates are consistently higher than the U.S. national rate (Image 1.2). [2,22]

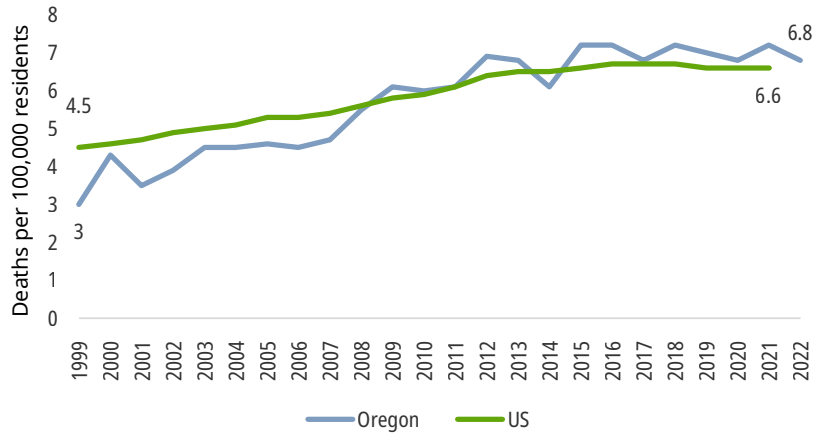
Oregon's Liver Cancer Mortality Rate is Increasing Compared to all Other Cancer Sites

In Oregon, liver cancer has the 7th highest mortality rate of all cancer sites. From 1999 to 2022, Oregon's liver cancer mortality rate increased the fastest compared to all other cancer sites. [23]

Nationally, liver cancer has one of the lowest ***relative survival rates*** of all cancers. [24] Relative survival rate is defined by the National Cancer Institute as "a way of comparing the survival of people who have a specific disease with those who don't." [25] This Plan is reporting relative survival rates over a 5-year period. Between 2014-2020, the relative survival rate of liver cancer was 21.7%, the third lowest survival rate behind pancreatic and esophageal cancers. [26] This means that compared to a cancer-free population, over 5 years, about 4 in 5 liver cancer patients died of their disease.

Liver cancer mortality rates have continued to rise nationally and in Oregon. In Oregon, deaths due to liver cancer increased from 3 per 100,000 in 1999 to 6.8 per 100,000 in 2022. The Oregon liver cancer mortality rate is also higher than the national average (Image 1.3). [23]

Image 1.3 U.S. and Oregon mortality rates for liver cancer, all years available.



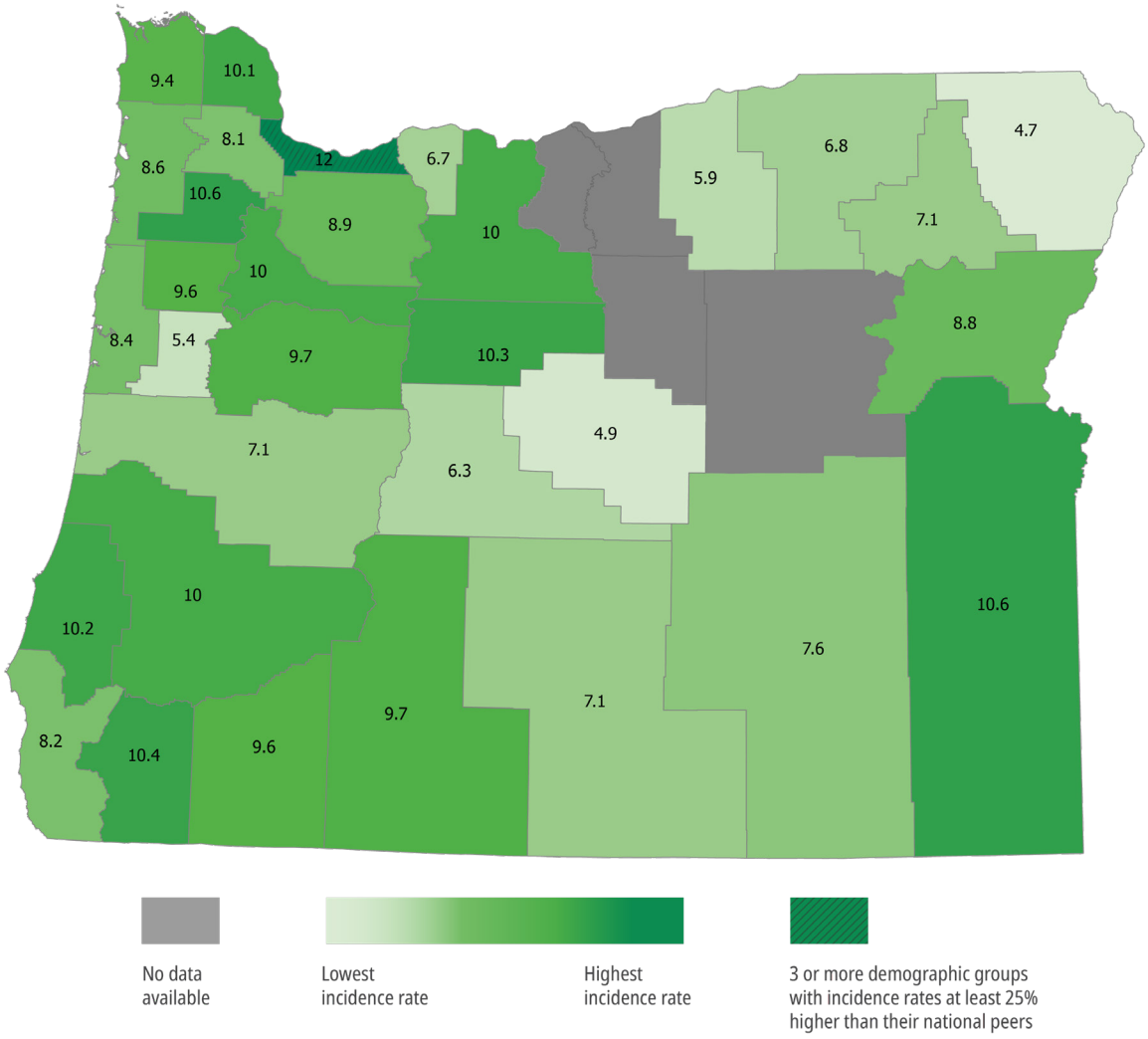
In 1999, Oregon was ranked 49th in the nation for liver cancer mortality, meaning that only one other state had a lower mortality rate. By 2021, Oregon's liver cancer mortality rate increased faster than the national rate and is now the 13th highest. [24,23]

Populations Experiencing Disproportionate Incidence Rates of Liver Cancer: Oregon Counties by Liver Cancer Incidence Rates and Cancer Disparities

Within Oregon, some demographic groups experience higher rates of liver cancer than expected, based on statewide and national data. Image 1.4 (the map) shows the overall incidence rate for Oregon counties. Additionally, incidence rates for each of the following demographic groups at the county level were compared to national and state incidence rates: White, Black or African American, American Indian/Alaska Native (AI/AN), Asian or Pacific Islander (API), Hispanic or Latino/a, Male, and Female.

Multnomah county reported 3 or more demographic groups with incidence rates at least 25% higher than their national peers. Residents living in 7 of Oregon's 36 counties are experiencing an incidence rate of liver cancer at least 10% higher than the state's overall incidence rate. These counties, in order of highest incidence rate to lowest, are Multnomah, Malheur, Yamhill, Josephine, Jefferson, Coos, and Columbia. [2]

Image 1.4 Liver cancer incidence rates by Oregon county per 100,000, 2013-2022



Males: Males in Oregon consistently have higher liver cancer incidence rates than females and experience about 70% of all new liver cancer diagnoses (Image 1.5 and 1.6).[2]

Image 1.5 Liver cancer incidence cases by gender, 2018-2022

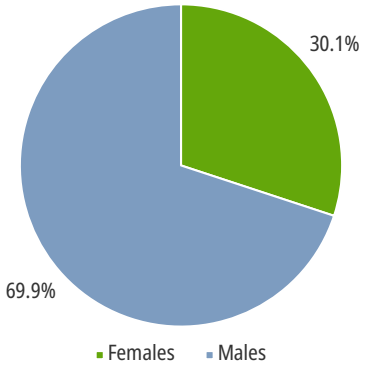
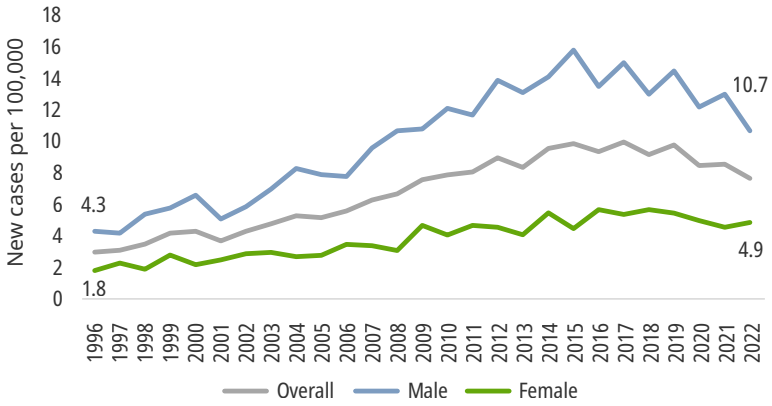
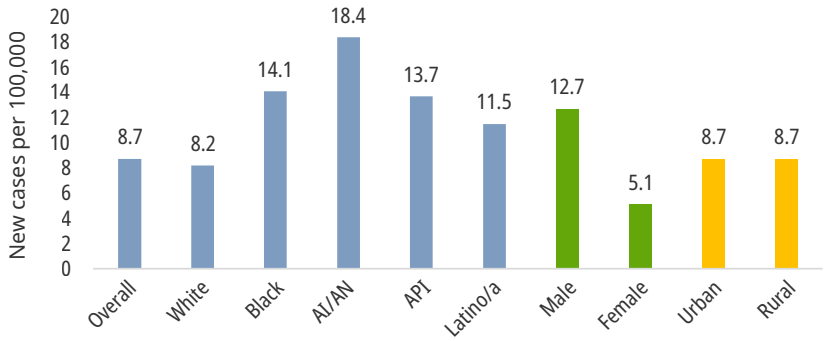


Image 1.6 Oregon liver cancer incidence rates, by gender and year.



People of color: All populations of color report higher incidence rates of liver cancer than Oregon's overall liver cancer incidence rate. Data from 2018-2022 demonstrates Oregon's overall incidence rate of 8.7 new cases per 100,000. In contrast, AI/AN populations experienced a rate of 18.4 cases, Black or African American counted 14.1 cases, API populations counted 13.7 cases, and Hispanic or Latino/a populations counted 11.5 cases per 100,000. New cases in White populations, at 8.2 cases per 100,000, were lower than Oregon's overall rate (Image 1.7).[2]

Image 1.7 Liver cancer incidence rates by race, ethnicity, gender, and geography, 2018-2022



Populations Experiencing Disproportionate Mortality Rates of Liver Cancer

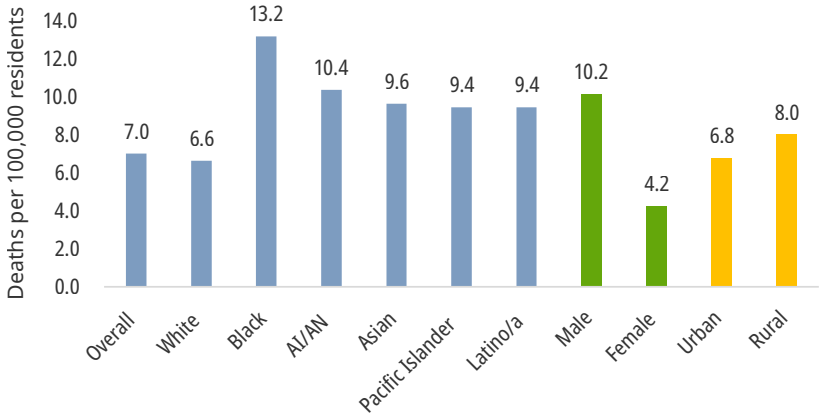
As with liver cancer incidence rates, liver cancer mortality rates are not equal across racial, ethnic, gender, or geographical groups (Image 1.8).

People of Color: All populations of color report higher mortality rates of liver cancer than Oregon's overall liver cancer mortality rate. Data from 2018-2022 demonstrates Oregon's overall mortality rate of 7 deaths per 100,000. In contrast, Black or African American populations have a mortality rate of 13.2 deaths per 100,000, followed by AI/AN (10.4), Asian (9.6), and Pacific Islander and Latino/a populations (both at 9.4). [23]

Males: Males in Oregon consistently have higher liver cancer mortality rates (10.2 deaths per 100,000) than females (4.2 deaths per 100,000). [23]

People living in rural areas: People living in rural areas have a higher liver cancer mortality rate (8.0 deaths per 100,000) compared to those living in ***urban*** areas (6.8 deaths per 100,000). [23]

Image 1.8 Liver cancer mortality rates by race, ethnicity, gender, and geography, 2018-2022



Hepatitis Screening and Treatment is Liver Cancer Prevention

Primary drivers of liver cancer incidence rates are having a chronic hepatitis B or chronic hepatitis C infection. [13] Vaccines can prevent hepatitis B transmission and medications can cure hepatitis C infection. [27,28]

Hepatitis B Virus (HBV)

HBV is a virus transmitted through infected blood, semen, and vaginal secretions entering the body of an uninfected person. The most common modes of transmission are by injection drug use (sharing needles and other drug equipment), having unprotected sex with a person who is infected with HBV, and during birth when a mother who has HBV passes the virus to her child. [15,29,30,31]

Most adults (95%) who are infected with this virus are able to clear it without intervention; for 5% it becomes a chronic condition. [32] In contrast, 90% of infants and 30% of children aged 1-5 do not clear the virus without intervention and develop a chronic HBV infection, thus increasing their risk of liver cancer. [33,34]

Often, HBV does not cause symptoms for 20 or 30 years after infection, so many people do not know they are infected with it until late-stage liver disease and related symptoms develop. [35] There is no cure for chronic HBV, but there are medications that can prevent it from spreading and creating further complications. [36]

Image 1.9 Case counts and rates of chronic hepatitis B in Oregon, 2003-2023

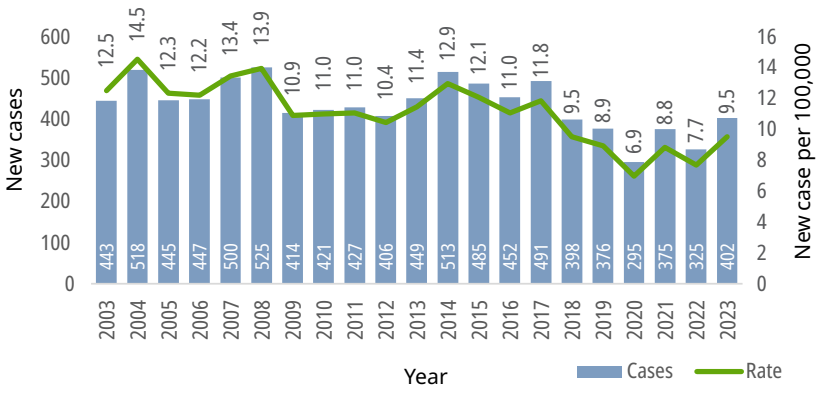
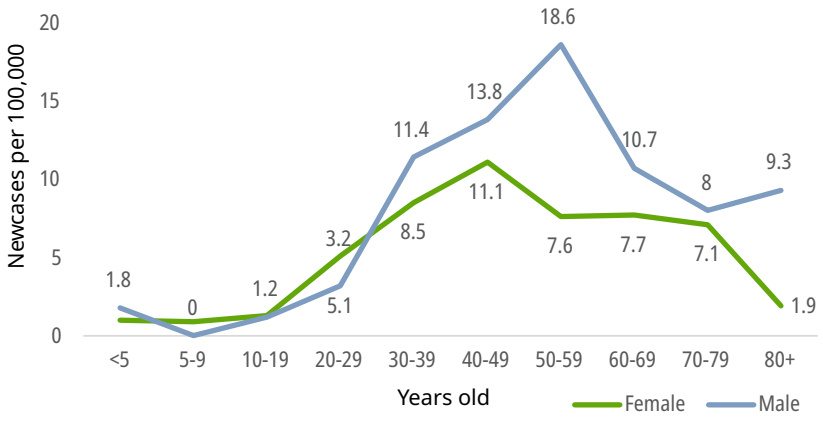


Image 1.10 Chronic hepatitis B rates in Oregon by age and sex, 2022



In 2023, 402 chronic HBV cases were recorded in Oregon for a rate of 9.5 per 100,000 - 1.5 times higher than the national rate of 6.1 per 100,000 (Image 1.9). Oregon also reported the fourth highest mortality rate for HBV nationally. In 2022, women age 40-49, and men age 50-59 had the highest rates of chronic HBV across age groups. (Image 1.10). All populations of color for whom data exist had higher rates of chronic HBV diagnosis than did White populations. Notably, people identified as Asian accounted for 45.5% of ALL newly reported cases between 2013 and 2022, despite being just 6.8% of the population. [31]

Screening and Treatment: Hepatitis B

Barriers to HBV screening and treatment include a lack of education about HBV and stigmatization in communities disproportionately affected by HBV. Lack of education about hepatitis, its transmission modalities, and stigmatization of people who are infected can perpetuate lower screening rates. [37,38]

The CDC recommends HBV screening for:

- all adults 18 and older at least once in their lifetime,
- all pregnant people during each pregnancy,
- infants born to a mother who has tested positive for hepatitis B, and
- anyone who may have been exposed to the virus. [39]

The CDC provides the following vaccination guidelines:

- all infants should be vaccinated for HBV,
- all children and adolescents younger than 19 who have not been vaccinated should be vaccinated for HBV,
- adults age 19-59, and
- adults 60 and older with risk factors for HBV should also be vaccinated. [27]

Hepatitis C Virus (HCV)

HCV is a virus transmitted through blood. HCV is most often transmitted by sharing needles, syringes, or other injection drug equipment. Other modes of transmission include intranasal drug use (inhaling powered drugs through the nose), receiving tattoos or body piercings in non-sterile environments, high-risk sexual activity, mother-to-infant transmission at birth, and having had a blood transfusion or organ transplant before 1992, the year that widespread screening of donated blood began. [15,31,40]

Most adults infected with HCV develop chronic hepatitis C. [15,41] Hepatitis C can be cured with medication. [28] Often, HCV will not cause symptoms until 20 or 30 years after infection, so many people do not know they have the virus until late-stage liver disease and related symptoms develop. [15,42]

Image 1.11 Case counts and rates of chronic hepatitis C in Oregon, 2005-2023

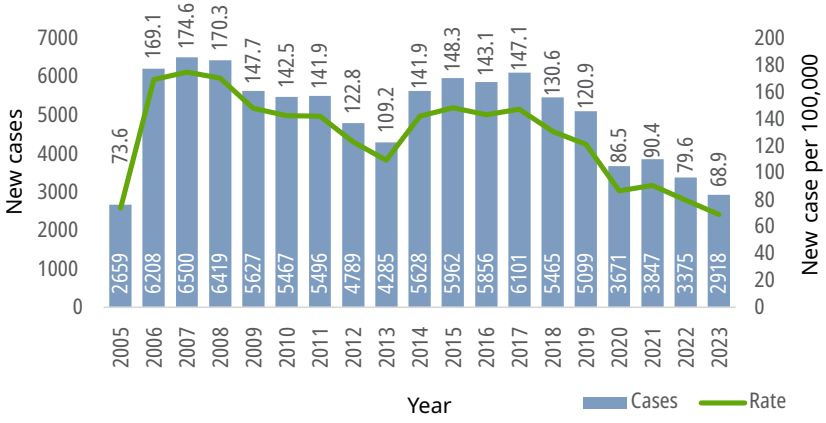
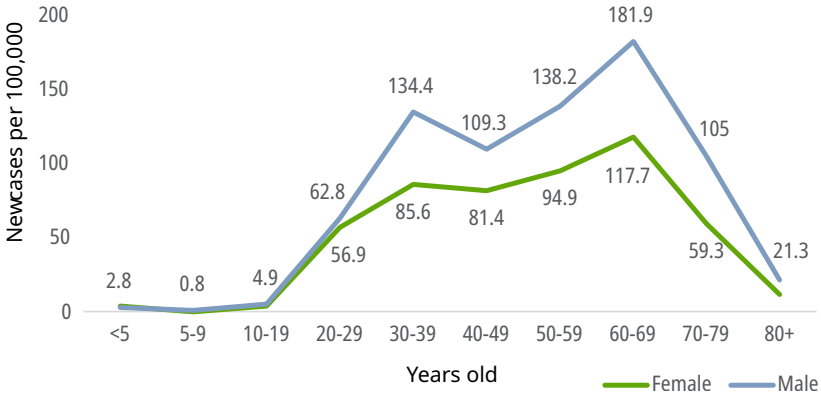


Image 1.12 Chronic hepatitis C rates in Oregon by age and sex, 2022

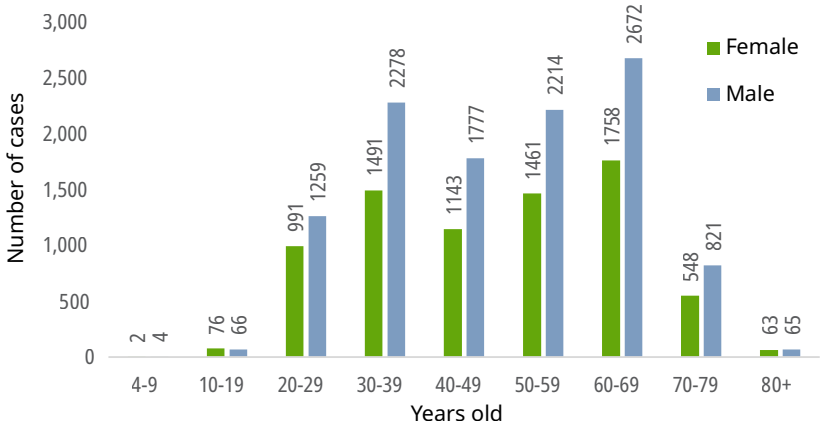


In 2023, 2918 chronic HCV cases were recorded in Oregon for a rate of 68.9 per 100,000, nearly double the national rate of 36.2 per 100,000 (Image 1.11). [31] Oregon ranks third highest in the nation for HCV mortality. [31]

For many years, HCV screening for ***baby boomers*** (people born between 1946 and 1964) was a priority. Baby boomers were in their 20s and 30s during the 1970s and 1980s when HCV infection rates were peaking in the U.S. [194] In 2022, almost 42% of Oregon's chronic HCV cases were reported among people aged 50-69 years old, with the highest rate among those aged 60-69 (Image 1.12). [31] Baby boomers can be at higher risk of liver cancer as they contracted the virus decades ago, experienced no signs or symptoms, were therefore not screened, and have only now begun to develop ***late-stage*** liver scarring, a precursor to liver cancer.

While it is true that baby boomers are a heavily impacted demographic group, there are other age groups that are equally impacted. From 2019-2023, HCV cases in Oregon were high for adults ages 20-39 (Image 1.13). [15] This suggests, without further intervention, younger people infected with HCV will become an older generation with advanced liver disease and cancer.

Image 1.13 Chronic hepatitis C cases in Oregon by sex and age, 2019-2023



Males also show a higher rate of chronic HCV compared to females across age groups (Image 1.13). Racial disparities in HCV infection identify Black or African American, and AI/AN as groups with highest infection rate. [15,31] Higher rates of HCV in these groups may contribute to their higher rates of liver cancer described in Image 1.7.

Screening and Treatment: Hepatitis C

Oregonians who currently inject drugs or ever injected drugs (even one time a long time ago) should be screened for HCV. Current injection drug users may require regular screening to ensure treatment can occur if needed. [44]

Many barriers exist for providers to implement the HCV ***test-to-treat*** model, including lack of provider knowledge of treatment options, lack of access in rural regions of the state, medication preauthorization, health insurance, understanding among the groups most heavily impacted by HCV, and rampant opioid and stimulant crises. [45]

The CDC recommends an HCV blood test screening for

- all adults 18 and older at least once in their lifetime,
- all pregnant people during each pregnancy,
- infants born to a mother who has tested positive for hepatitis C, and
- anyone who may have been exposed to HCV-infected blood for any reason, including people who currently inject drugs and share needles, syringes, or other drug preparation equipment. [44]

Decreasing Excessive Alcohol Use is Liver Cancer Prevention

Table 3. Excessive alcohol use, CDC definitions:	
Binge drinking	four or more drinks for women, or five or more drinks for men during an occasion
Heavy drinking	eight or more drinks for women, or 15 or more drinks for men, during a week
Underage drinking	Any alcohol use by people younger than 21
Drinking while pregnant	Any alcohol use during pregnancy [46]

Alcohol is a known carcinogen attributed to 30% of liver cancer cases and liver cancer deaths worldwide. [47] From 2020-2021 approximately 22% of all liver cancer deaths in Oregon were alcohol-related. [195]

Fewer than half of Americans understand the risk between alcohol use and cancer. [48] Decreasing rates of ***excessive alcohol use*** is an important component of cancer prevention, including liver cancer prevention. [196]

Image 1.14 Percent of Oregon adults who binge drink by income, 2023

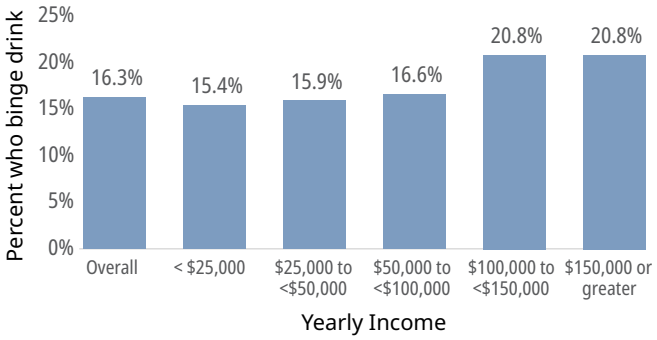
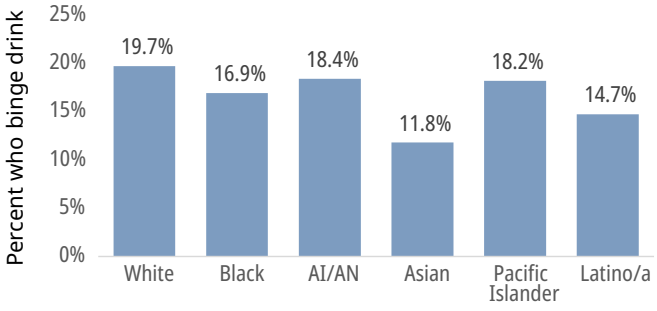


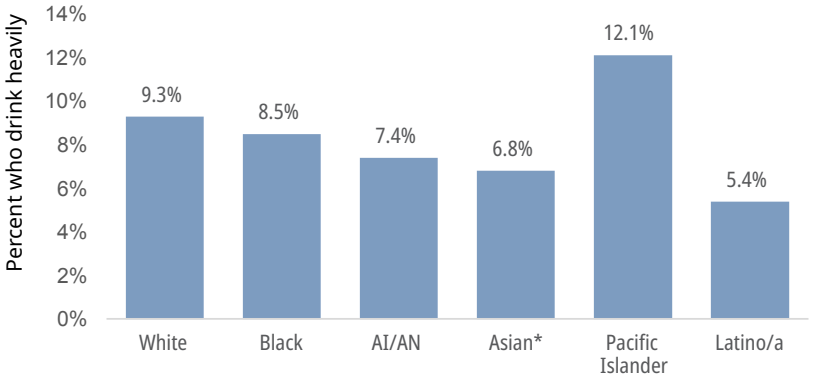
Image 1.15 Percent of Oregon adults who binge drink alcohol by race and ethnicity, 2018-2021



Binge drinking is a common and costly form of excessive alcohol use. [49] In 2023, about 1 in 6 (16.3%) Oregon adults reported binge drinking in the past 30 days. Adults with higher incomes ($100,000 per year or more) reported binge drinking at higher rates (20.8%) than those with lower incomes ($25,000 or less; 15.4%) (Image 1.14). From 2018-2021, binge drinking rates by race and ethnicity are reported as highest for those who are White (19.7%), followed by AI/AN (18.4%), Pacific Islander (18.2%), Black or African American (16.9%), Hispanic or Latino/a (14.7%), and Asian (11.8%) (Image 1.15). [50]

In 2023, 7.2% of Oregon adults reported heavy drinking in the past 30 days. From 2018-2021, heavy drinking rates by race and ethnicity are highest for those who are Pacific Islander (12.1%), White (9.3%), followed by Black or African American (8.5%), AI/AN (7.4%), Asian (6.8%), and Hispanic or Latino/a (5.4%) (Image 1.16). [50]

Image 1.16 Percent of Oregonians who drink alcohol heavily by race and ethnicity, 2018-2021



Note: Due to the small number of respondents, rate for Asian Oregonians may be unreliable

Evidence-based solutions that create healthier environments include targeting alcohol pricing, impacting access to alcohol (e.g., reducing density of alcohol retailers or hours of alcohol sales), and putting health warning labels on alcohol containers. [48,51,52] Health care providers can also screen their patients for excessive alcohol use and discuss options for reducing or stopping their alcohol intake. [53]

Key Takeaways for Liver Cancer

- Oregon's liver cancer incidence rates continue to grow faster than other cancer sites.
- Oregon's liver cancer mortality rates are higher than the nation's overall liver cancer mortality rates.
- Populations experiencing the largest disparities in liver cancer are those in rural areas, men, and communities of color.
- Approximately 54% of liver cancer cases are attributed to Hepatitis B and C.
- Approximately 30% of liver cancer cases are attributed to excessive alcohol consumption.

Comprehensive Cancer Control Plan Goals: Liver Cancer

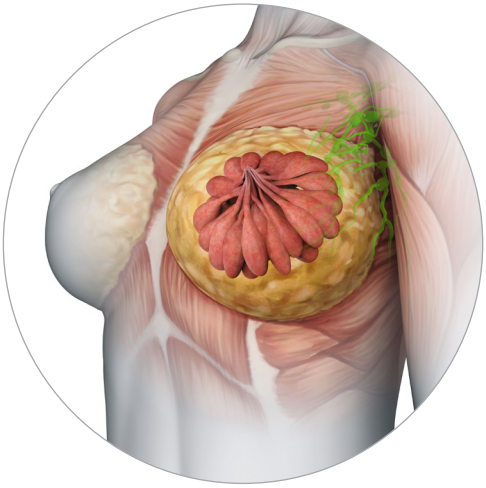
Taskforces will be formed starting in 2026 to develop more specific goals, objectives and strategies around decreasing liver cancer burden. This Plan recommends that taskforces to focus on the demographic groups facing the highest burden of liver cancer, starting with the following areas of action.

- Increase Hepatitis B vaccination rates.
- Increase Hepatitis B and C screening rates.
- Decrease rates of binge drinking and heavy drinking.

Note that the Oregon Health Authority's **Oregon Viral Hepatitis Elimination Plan 2024-2030** is available as a resource.

PRIORITY #2

Breast Cancer



Description of Breast Cancer

Breast cancer can occur in any part of the breast including but not limited to the ducts, areola, the nipple, lobules, stroma, and chest wall. [54] There are many different **types of breast cancers**, some are invasive, some are non-invasive. [55] This Plan focuses on invasive cancers.

Risk Factors for Breast Cancer

While male breast cancer diagnoses are possible, the Plan focuses exclusively on female breast cancer in Oregon. Annually, breast cancer is diagnosed in approximately 3,500 women. Male breast cancer affects fewer than 30 Oregonians annually. [2]

The following are non-modifiable risk factors for breast cancer:

- Breast cancer most commonly occurs as women get older, as most breast cancer cases occur in people who are 55 years of age or older. [56,57]
- 5-10% of breast cancer diagnoses occur due to **certain gene changes** (mutations) in genes such as BRCA 1 or BRCA 2 or CHEK2 that are associated with pre-disposition to this cancer. [57,58]
- Once a person has been diagnosed with breast cancer, they are more likely to develop another ***primary breast tumor***. [57]
- Having certain **benign (non-cancerous) breast conditions** may increase risk. [57,59]
- Beginning menstrual periods before age 12 and starting menopause after age 55. [57]
- Having **dense breast tissue**. [57,60]
- Having radiation to the chest or breasts before age 30. Young women who have chest radiation for another cancer such as Hodgkin or non-Hodgkin **lymphoma** have a higher risk of developing breast cancer as a secondary cancer. [57]
- Receipt of the drug **diethylstilbestrol (DES)**, which was a drug given to some pregnant people in America from the 1940s until the early 1970s. Women who received the drug or whose mother took the drug during pregnancy have a higher risk of breast cancer. [57,61]

The following are modifiable risk factors for breast cancer:

- Lack of **physical activity**. [57]
- Being overweight or having **obesity after menopause** .[57,62]
- Drinking **alcohol**. Alcohol is a known carcinogen linked to breast cancer in women. [57,63]
- Using some kinds of menopausal or post-menopausal **hormone replacement therapy** (HRT). The level of risk posed by HRT depends on many factors, such as personal history of breast cancer, the type of HRT, its dose, starting age, and length of use. [57,64]

Breast Cancer Incidence and Mortality Rates in Oregon

Note: In data presented, all rates are age-adjusted, per 100,000 people, per year(s) specified.

Image 2.1 U.S. and Oregon incidence rates for breast cancer, all years available`

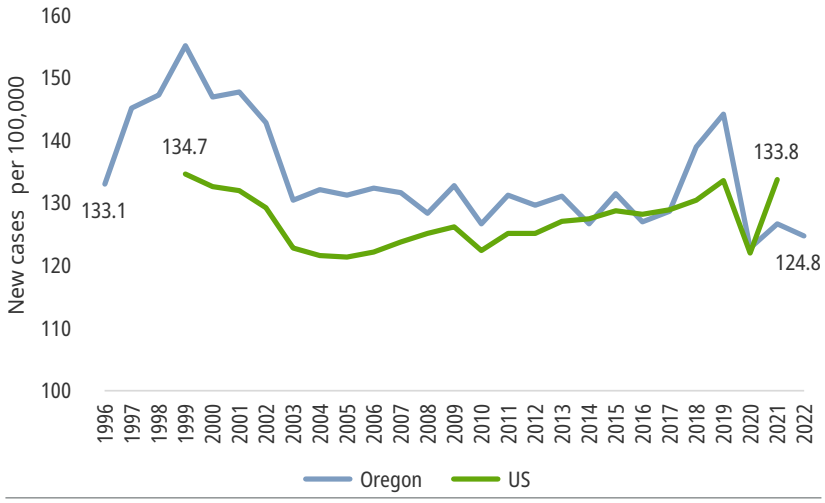
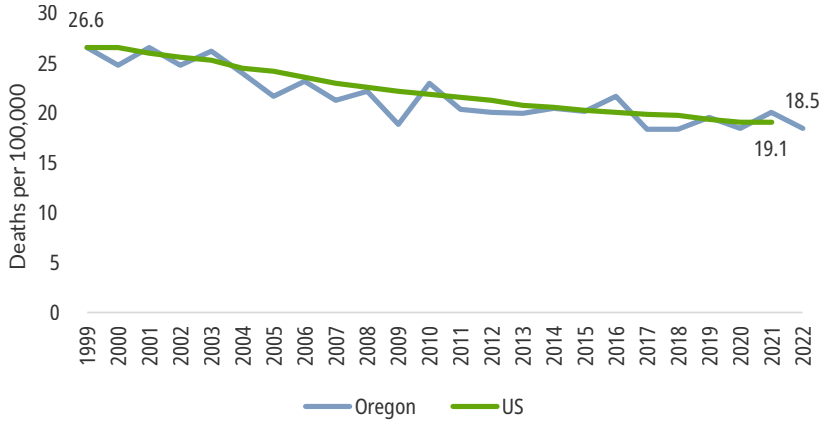


Image 2.2 U.S. and Oregon mortality rates for breast cancer, all years available



Breast cancer is the most commonly diagnosed cancer in the nation and in Oregon. Breast cancer diagnoses account for more than 15% of all new cancer diagnoses in Oregon. [2]

Approximately 5 out of 6 people with breast cancer will successfully complete treatment and become cancer-free. [2,22] Using data from 2019 through 2022, approximately 650 Oregonians die from breast cancer each year. [23]

Breast cancer incidence and mortality rates both in Oregon and nationally have decreased over the past 25 years due to increased screening and improved treatment options. [2,22,23,24]

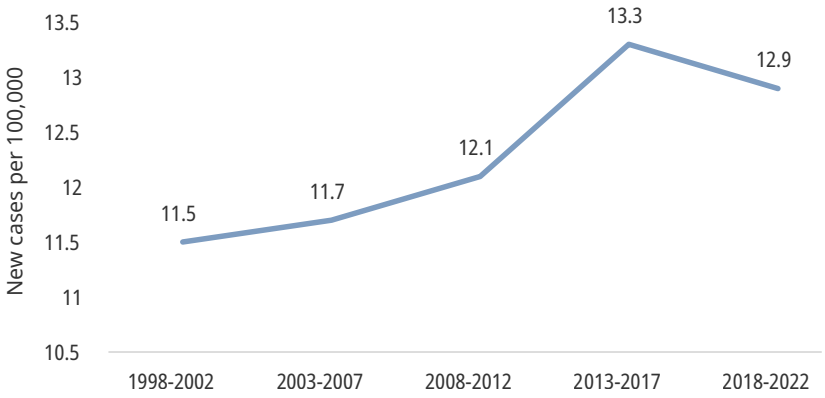
Oregon's breast cancer incidence rates dropped from 133.1 new cases per 100,000 in 1996 to 124.8 new cases per 100,000 in 2022 (Image 2.1). [2] Oregon's breast cancer mortality rates dropped from 26.6 deaths per 100,000 in 1999, to 18.5 deaths per 100,000 in 2022 (Image 2.2). [23] Oregon's drop in mortality rates mirrors the national trend (Image 2.1). [24]

Concerning Trends for Breast Cancer in Oregon

Breast Cancer Incidence in Women Under 40 is Rising

Despite an overall decrease in incidence rates over the past 20 years, breast cancer incidence rates for women under 40 have steadily increased from 11.5 new cases per 100,000, to 13 new cases per 100,000 in Oregon (Image 2.3). [2] At an individual level, this means roughly 40 additional women under 40 are diagnosed with breast cancer each year compared to 20 years ago.

Image 2.3: Breast cancer incidence rates over time for women under 40 years old in Oregon



Women Under 40 are More Likely to be Diagnosed with Metastatic Breast Cancer

Most cases of breast cancer in Oregon (95.1%) are diagnosed at ***local*** or ***regional*** stages versus ***distant stages***. It is more likely that if a woman is diagnosed with breast cancer at an age younger than 40, the cancer will be distant, or ***metastatic*** (Table 4). [2]

Table 4. Distribution of breast cancer diagnoses by stage and age groups (2018-2022, Oregon data).

	Women under age 40	Women age 40 and up
Localized (early-stage)	50.0%	71.6%
Regional	43.5%	23.5%
Distant or Metastatic (late-stage)	6.5%	4.8%

Women Under 40 are More Likely to be Diagnosed with Triple-Negative Breast Cancer Which is More Difficult to Treat

One-fourth (25.1%) of women diagnosed with breast cancer under age 40 in Oregon have a subtype of breast cancer known as ***triple-negative breast cancer***. [2] Nationally, Women who are younger than age 40, or are Black or African American, or have a BRCA 1 gene mutation are at the highest risk of developing triple negative breast cancer. [65]

Nationally, the overall 5-year survival rate for women under 40 with all subtypes of breast cancer is 91%. For women under 40 who have triple-negative breast cancer, their 5-year survival rate is 77%. [26] There are currently fewer treatment options available for triple-negative breast cancer than other types of breast cancer. Although new drugs, including immunotherapies, are being developed to treat triple-negative breast cancer, it remains the breast cancer subtype with lower response rates. [63]

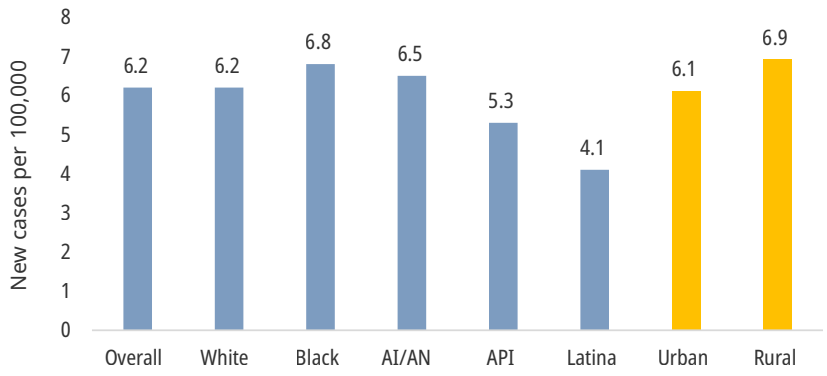
Additional Detail about Triple-Negative Breast Cancer

According to the American Cancer Society, triple-negative breast cancer cells are missing three factors that keep a usually successful therapy from working. Triple-negative breast cancer cells do not have **estrogen or progesterone hormone receptors** (ER or PR) and make too little of the **HER2** protein. Hormone (anti-estrogen) therapy is commonly used to treat other types of breast cancer. Hormone therapy works by blocking or reducing estrogen, but for cancer missing these receptors, hormone therapy does not work. The HER2 protein is the third missing factor that other cancer drugs target effectively. Since triple-negative breast cancer is missing these three factors, chemotherapy is used as the most common treatment. [63,66,67]

Women in Rural Communities are Being Diagnosed with Later Stage Breast Cancer at Higher Rates than in Urban Communities.

Most noticeably, rural-residing women are experiencing higher rates of late-stage diagnoses. Finding ***localized*** breast cancer leads to a 5-year relative survival rate of 99% after treatment. Finding breast cancer ***regionally*** has a moderately high survival rate of 86%. Distant or metastatic breast cancer has a 5-year relative survival rate of 31%. [26]

Image 2.4 Oregon incidence rate for late-stage breast cancer by race, ethnicity, and geography, 2018-2022



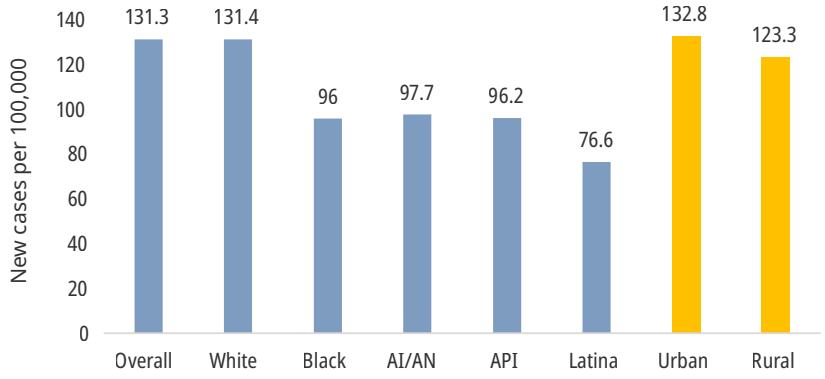
Late-stage breast cancer incidence rates measured by racial and ethnic categories and geography are not equal. From 2018 through 2022, Black or African American and American Indian/Alaska Native (AI/AN) women had the highest rates of 6.8 and 6.5 per 100,000, respectively. Women in rural areas had a rate of 6.9 per 100,000 compared to 6.1 per 100,000 for women living in urban areas (Image 2.4). [2]

Disproportionate Incidence Rates of Breast Cancer

Breast cancer incidence rates by racial and ethnic categories are also not equal. In 2021, Oregon's overall incidence rate of breast cancer was 131.3 per 100,000 (Image 2.5). [2]

People who are White had the highest incidence rate of breast cancer (131.4 new cases per 100,000). All other racial and ethnic groups had lower incidence rates than the statewide rate (Image 2.5). [2]

Image 2.5 Breast cancer incidence rates by race, ethnicity, and geography, 2018-2022



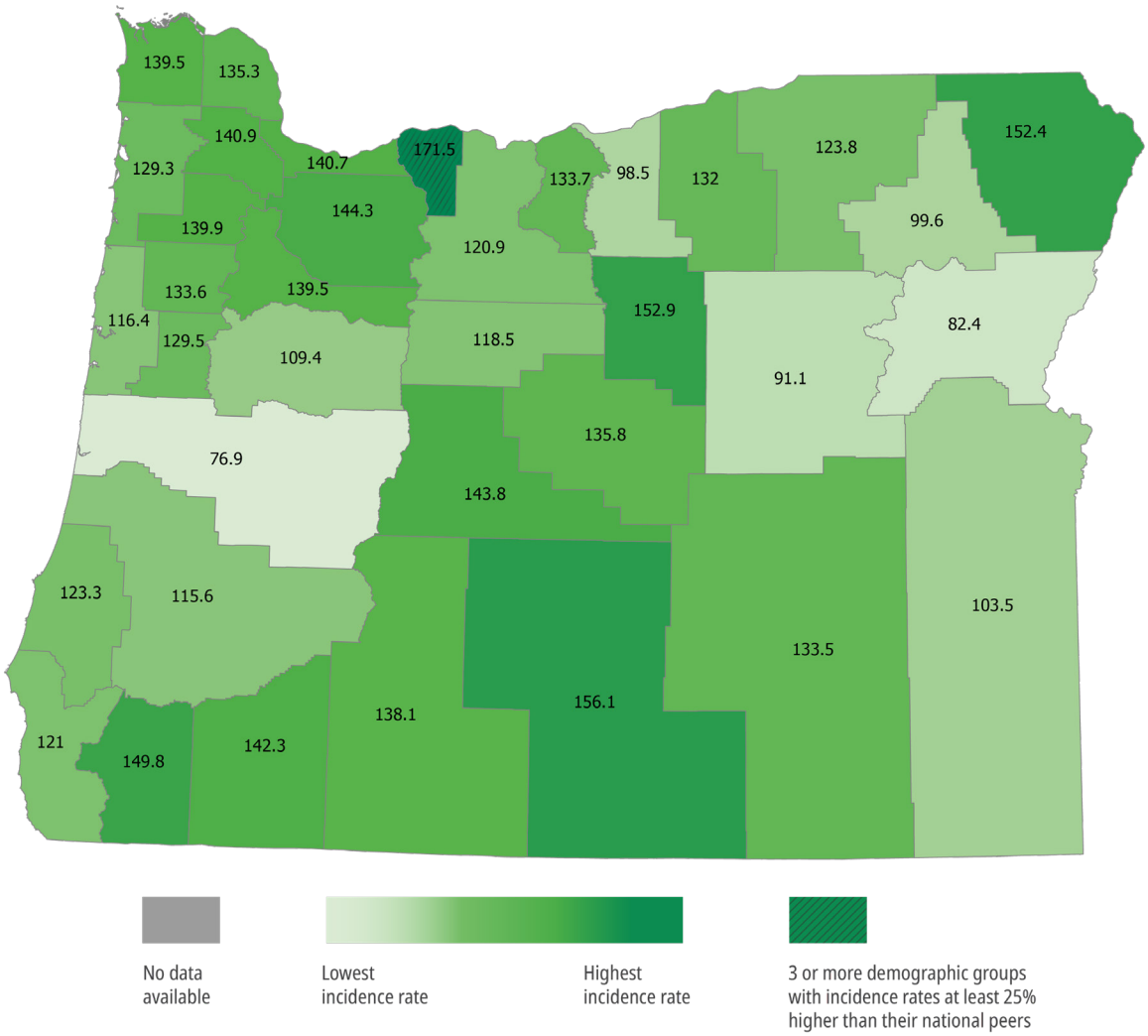
Geography also shows disparities in breast cancer incidence rates. Incidence rates in urban areas are highest at 132.8 per 100,000, followed by rural areas at 123.3 per 100,000 (Image 2.5). [2]

Oregon Counties by Breast Cancer Incidence Rates and Cancer Disparities

Within Oregon, some demographic groups experience higher rates of breast cancer than expected, based on statewide and national data. Image 2.6 (the map) shows the overall incidence rate for Oregon counties. Additionally, incidence rates for each of the following demographic groups at the county level were compared to national and state incidence rates: White, Black or African American, AI/AN, Asian or Pacific Islander, Hispanic or Latino/a, Male, and Female.

Hood River county reported 3 or more demographic groups with incidence rates at least 25% higher than their national peers. Although women living in urban areas have a higher incidence rate, four of the top five Oregon counties experiencing the highest incidence rates are rural or frontier (Hood River, Lake, Wheeler, and Wallowa). [2] Josephine is the only urban county in the top five.

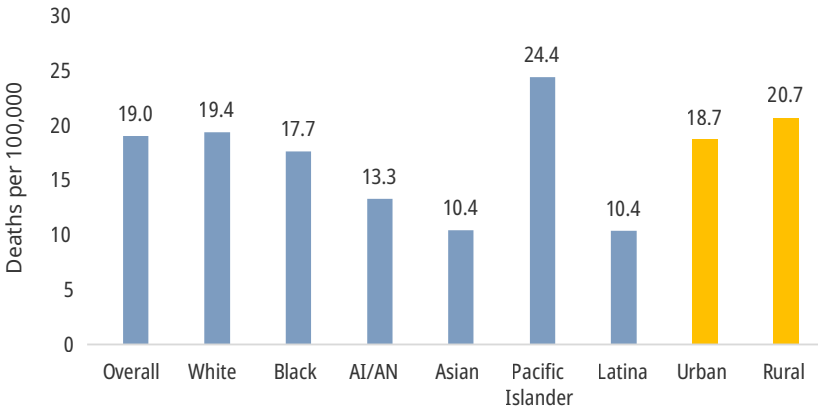
Image 2.6 Breast cancer incidence rates by Oregon county per 100,000, 2018-2022



Disproportionate Mortality Rates of Breast Cancer

To report mortality by group and geography, and to ensure all reported racial and ethnic groups are represented in the data, 5-year age-adjusted rates were used. If only one year of data was reported in this section, the low number of breast cancer deaths would be masked. Similar to Oregon's breast cancer incidence rates, mortality rates are not equal across racial, ethnic, or geographical groups.

Image 2.7 Breast cancer mortality rates by race, ethnicity, and geography, 2018-2022



From 2018-2022, Oregon's overall mortality rate for breast cancer in all races was 19 deaths per 100,000. Pacific Islander women's mortality rate was 24.4 deaths per 100,000, surpassing the state's overall rate. White women also experience a higher mortality rate (19.4 per 100,000) compared to the state's overall rate (19.0 per 100,000), followed by AI/AN women (13.3 deaths per 100,000) and Asian and Latina women (10.4 deaths per 100,000). By geography, women who live in rural parts of Oregon experience the highest breast cancer mortality rate (20.7 deaths per 100,000), followed by those in urban areas (18.7 deaths per 100,000) (Image 2.7). [23]

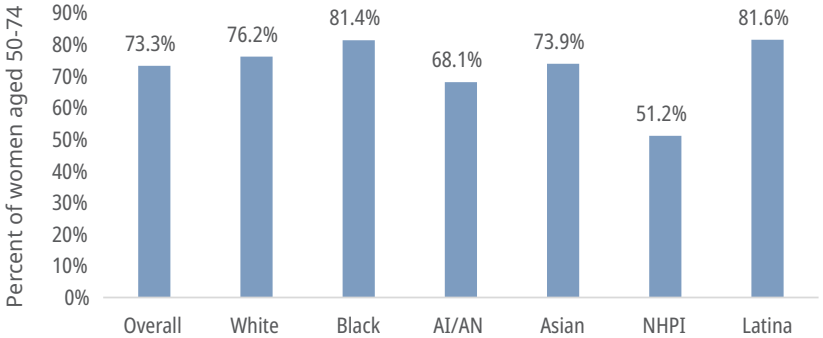
Black or African American women experience a mortality rate of 17.7 deaths per 100,000, despite having a relatively low incidence rate (Image 2.7). [23] Black or African American women experience the lowest 5-year relative survival rate compared to other groups (81% vs 92% for White women). [68]

As with the state's breast cancer incidence rates, all of the top five counties experiencing the highest mortality rates are rural or frontier counties (Crook, Morrow, Curry, Tillamook, and Klamath). [2]

Breast Cancer Screening Rates are Not Equal Across Demographic Groups

This Plan reports screening data for the 50-74 year-old population because previous screening guidelines (through 2023) targeted that age group. As of April 2024, the United States Preventative Services Task Force lowered its breast cancer screening recommendation from 50 to 40 every other year for women at average risk. [69,70]

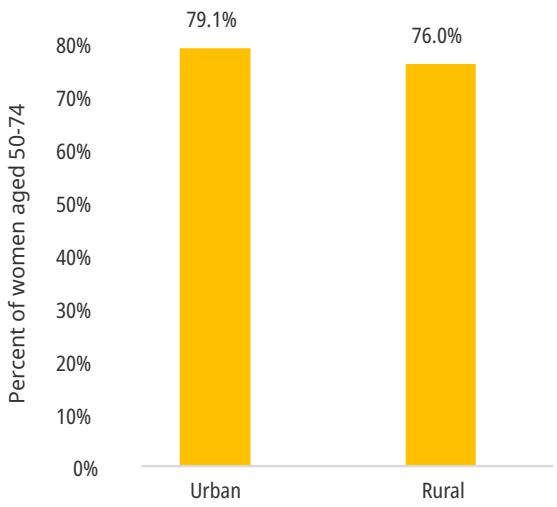
Image 2.8 Percentage of women aged 50-74 who have received a mammogram in the past 2 years by race and ethnicity, 2016-2021



From 2016-2021, Latinas, aged 50-74 reported the highest screening rate at 81.6%, followed by Black or African American (81.4%), White (76.2%), and Asian women (73.9%). The lowest screening rates were reported by AI/AN (68.1%) and Native Hawaiian and Pacific Islander (NHPI) women (51.2%)(Image 2.8). From 2018-2021, women living in rural areas reported a lower breast cancer screening rate than women in urban areas (76.0% and 79.1%, respectively) (Image 2.9). [71]

To assess risk, the American College of Radiology and the Society of Breast Imaging recommend that all women receive a formal breast cancer risk assessment at age 25. [72] The number of women who receive risk assessments are not being reported publicly. Women who learn they are at higher risk for developing breast cancer may need to initiate screening, genetic testing, or receive additional counseling at an earlier age than what is recommended for those at average risk. [73]

Image 2.9 Percentage of women aged 50-74 who have received a mammogram in the past 2 years by geography, 2016-2021



Key Takeaways for Breast Cancer

- Breast cancer is the most commonly diagnosed cancer in Oregon.
- Women in Oregon's rural areas and those under 40 are experiencing the highest rates of distant or metastatic stage cancer diagnosis.
- Women under 40 have the highest rates of triple-negative breast cancer diagnoses.
- Rural and White women are dying from breast cancer at higher rates than others.
- Breast cancer screening rates are lowest in NHPI, AI/AN, and rural populations.

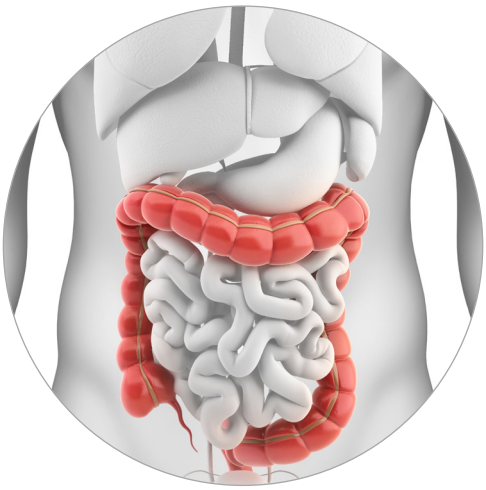
Comprehensive Cancer Control Plan Goals: Breast Cancer

Taskforces will be formed starting in 2026 to develop more specific goals, objectives and strategies around decreasing the state's breast cancer burden. This Plan recommends that taskforces focus on the demographic groups facing the highest burden of breast cancer, starting with the following areas of action.

- Achieve an annual state level breast cancer screening rate of at least 80.3% for women ages 40-74 at average risk for breast cancer to meet the Healthy People 2030 benchmark.

PRIORITY #3

Colon and Rectal Cancer



Description of Colorectal Cancer

Colon and rectal cancers are often grouped together as ***colorectal cancer*** because both are diseases that develop in the large intestine. The large intestine is part of the human digestive system which also includes the mouth, throat, esophagus, stomach, and small intestine. The large intestine is responsible for removing water from food and storing the eventual solid waste material (stool) until it passes through the anus. The colon is approximately five feet long and the rectum is approximately six inches long. [74]

Colorectal Cancer is one of the Most Preventable Types of Cancer

Colorectal cancer is considered one of the most preventable forms of cancer, as almost all cases start as precancerous growths or ***polyps*** in the colon or rectum. With appropriate colorectal cancer screening, polyps can usually be removed before they become cancerous. Screening for colorectal cancer includes using ***at-home stool test kits*** and ***colonoscopies***. Blood tests are an emerging option. [75,76]

Risk Factors for Colorectal Cancer

The following are non-modifiable risk factors for colorectal cancer:

- **Getting older.** The risk of developing colorectal cancer increases with age and most diagnoses occur after age 50. [74,77]
- **Inherited risk.** There are certain gene changes including **Lynch Syndrome (hereditary nonpolyposis colon cancer)** and **FAP (familial adenomatous polyposis)** that increases a person's risk of developing colorectal cancer. [74,77]
- Personal or **family history** of colon polyps or colorectal cancer. [78,77]
- **Inflammatory bowel disease** such as Crohn's disease or ulcerative colitis. [77,79]
- **Radiation therapy** to the abdomen or pelvis area. [77]

The following are modifiable risk factors for colorectal cancer:

- Having **type 2 diabetes.** [77,80]
- Being overweight or **having obesity**. [81,77]
- Lack of regular **physical activity**. [77,82,83]
- Commercial **tobacco use**. [77,85]
- **Diets** that are low in fiber, fruits, and vegetables and high in fat, or a diet high in red and processed meats. [77,84,83]
- **Alcohol use**. Alcohol is a known carcinogen linked to cancers of the colon and rectum for all people. [77,86]

Concerning Trends for Colorectal Cancer in Oregon

Colorectal Cancer has the Fourth Highest Incidence and Mortality Rates for All Cancers in Oregon

Note: In data presented, all rates are age-adjusted, per 100,000 people, per year(s) specified.

Like most other cancers in Oregon, colorectal cancer incidence and mortality rates have decreased over the past 25 years (Images 3.1 and 3.2). [2,23]

Image 3.1 U.S. and Oregon incidence rates for colorectal cancer, all years available

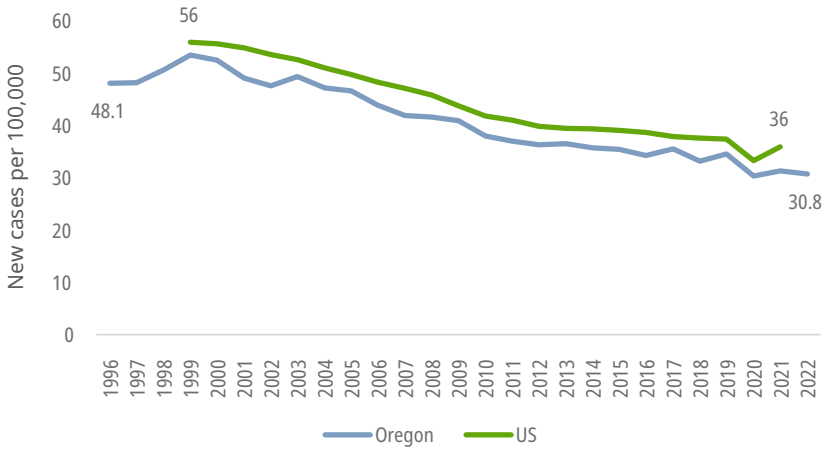
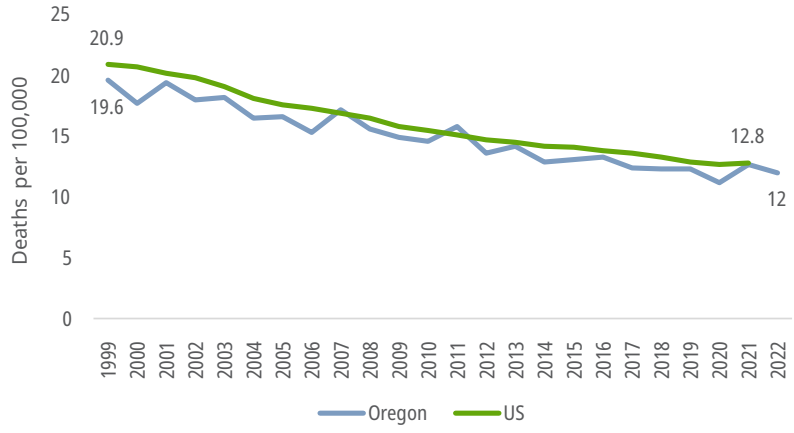


Image 3.2 U.S. and Oregon mortality rates for colorectal cancer, all years available



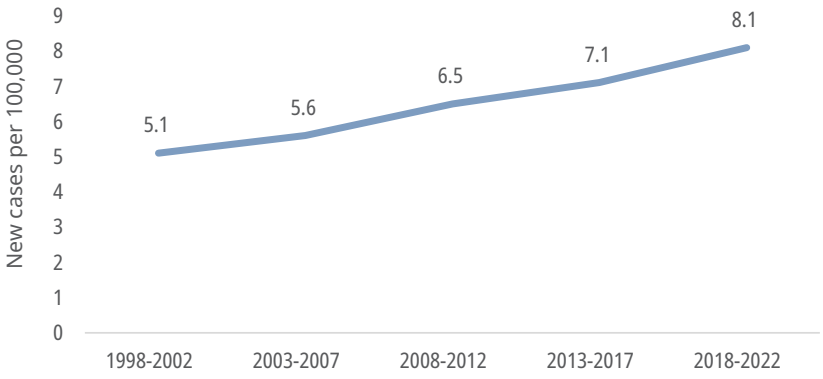
Despite this successful trend, colorectal cancer – one of the most preventable cancers – remains the fourth highest for both incidence and mortality rates compared to all other cancers. In 2021, 1,629 Oregonians were diagnosed with the disease and 681 people died from it. [2,23]

Since 1996, colorectal cancer incidence rates steadily dropped by approximately 36%, from a rate of 48.1 to 30.8 per 100,000. Oregon's incidence rate is slightly lower than the national incidence rate (Image 3.1). [2,22]

Over the same period, colorectal cancer mortality rates have decreased by approximately 39% from 19.6 to 12 per 100,000. Oregon's mortality rate is slightly lower than the national mortality rate (Image 3.2). [23,24]

Colorectal Cancer Incidence Rates are Increasing in People Under 50

Image 3.3 Colorectal cancer incidence rates for Oregon residents under the age of 50, 5-year rates, all years available

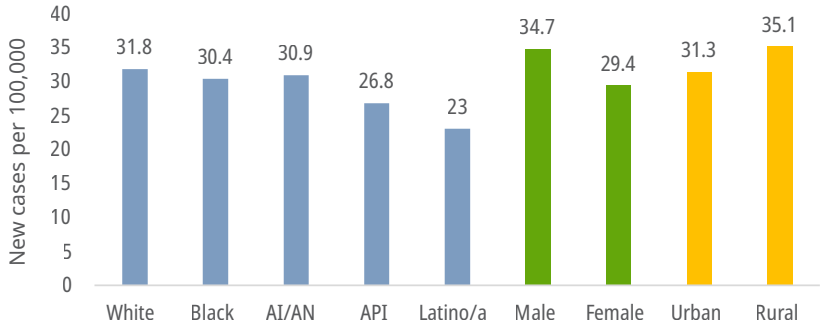


Although the risk of developing colorectal cancer increases with age, the rate of diagnoses in younger adults is steadily increasing in Oregon and nationally. [2,22,75] From 1998-2002, people under 50 were diagnosed with colorectal cancer at a rate of 5.1 new cases per 100,000. By 2018-2022, the incidence rate for people under 50 had nearly doubled to 8.1 new cases per 100,000 (Image 3.3). [2]

Populations Experiencing Disproportionate Rates of Colorectal Cancer

Incidence Rates

Image 3.4 Colorectal cancer incidence rates by race*, ethnicity, gender, and geography, 2018-2022



**124 colorectal cancer cases were reported by Oregonians with no known race. Individual racial group rates would increase if race was known for these cases.*

According to 2018-2022 data, Oregon's overall colorectal cancer incidence rate was 32 new cases per 100,000 people. People who live in rural areas of Oregon are diagnosed at a higher rate (35.1 per 100,000) compared to people living in urban areas (31.3 per 100,000). Males have a higher incidence rate than females (34.7 versus 29.4 per 100,000). People who are White have a higher incidence rate (31.8 per 100,000), compared to people who are Black or African American (30.4 per 100,000) or American Indian/Alaska Native (AI/AN) (30.9 per 100,000) (Image 3.4). [2]

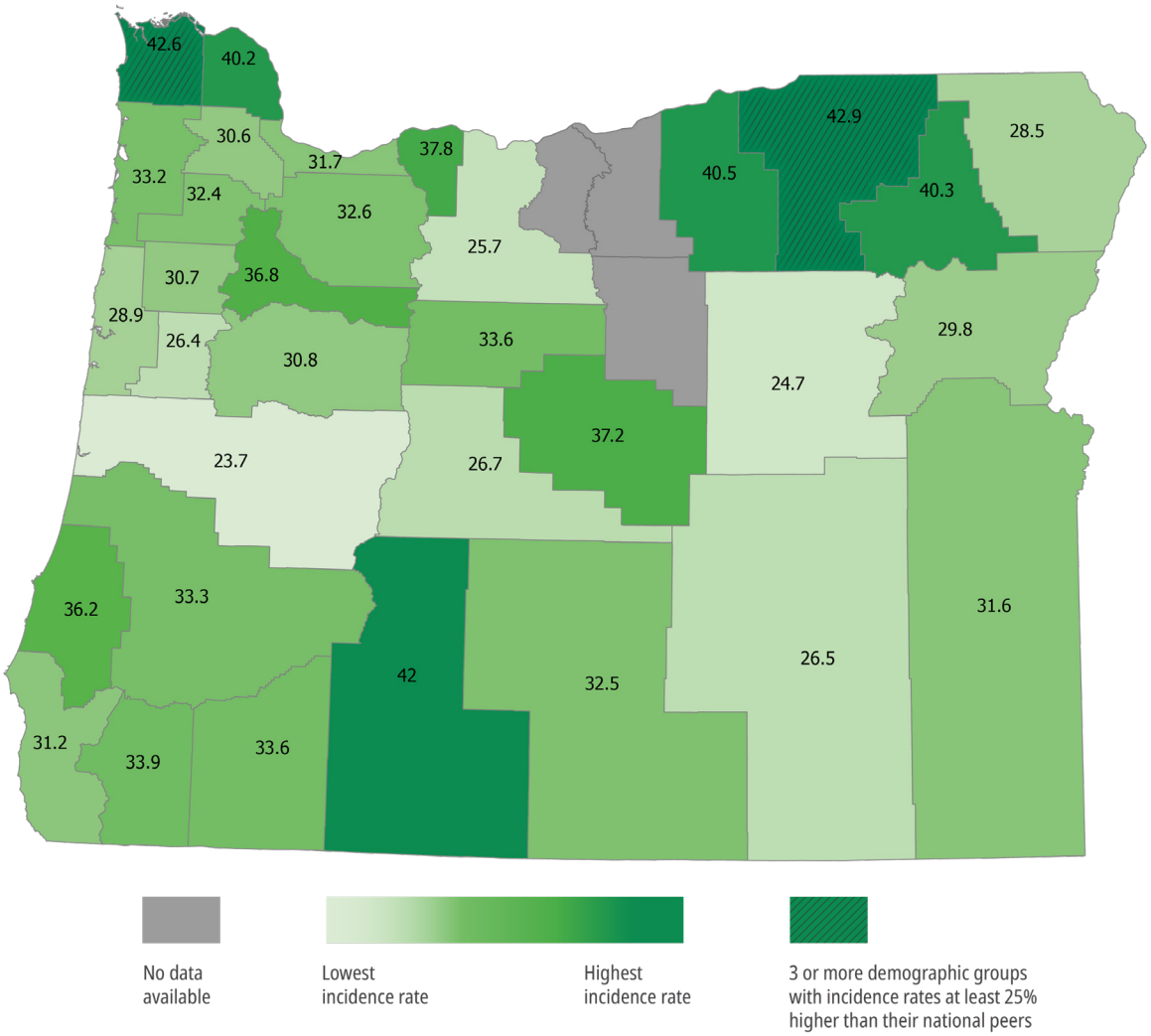
Oregon Counties by Colorectal Cancer Incidence Rates and Cancer Disparities

Within Oregon, some demographic groups experience higher rates of colorectal cancer than expected, based on statewide and national data. Image 3.5 (the map) shows the overall incidence rate for Oregon counties.

Additionally, incidence rates for each of the following demographic groups at the county level were compared to national and state incidence rates: White, Black or African American, AI/AN, Asian or Pacific Islander, Hispanic or Latino/a, Male, and Female.

Clatsop and Umatilla counties reported 3 or more demographic groups with incidence rates at least 25% higher than their national peers. The five counties with the highest incidence rates in Oregon for colorectal cancer are all rural or frontier (Umatilla, Clatsop, Klamath, Morrow, and Union).[2]

Image 3.5 Colorectal cancer incidence rates by Oregon county per 100,000, 2018-2022



Late-Stage Diagnoses for Colorectal Cancer are Occurring at Higher Rates for Some Groups

Although 33.4% of Oregon's colorectal cancer cases are diagnosed early, 350 Oregonians (or 22.7%) are diagnosed with late-stage colorectal cancer each year (Image 3.6). [2]

Relative Survival Rates for Colorectal Cancer

Nationally, the relative 5-year survival rate for people diagnosed with localized colorectal cancer is 88.5%, people diagnosed with regional cancer is 72.2%, and people diagnosed with distant cancer is 16.3%. [26] Relative 5-year survival rates demonstrate the importance of finding colorectal cancer early and following colorectal cancer screening recommendations (Image 3.7).

Image 3.6 Percent of Oregonians diagnosed with local, regional, and distant colorectal cancer, 2018-2022

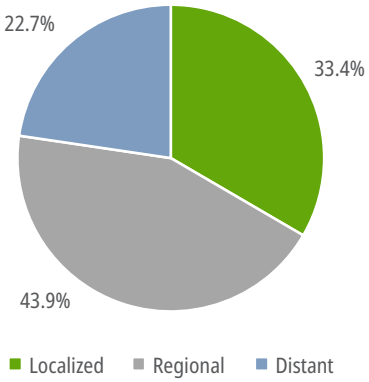
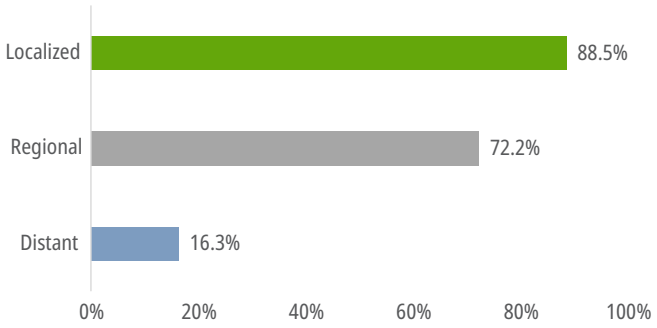


Image 3.7 National 5-year relative survival rate for colorectal cancer by stage



Oregon's male population has a higher rate of advanced stage and distant metastasis than females (7.5 per 100,000) (Image 3.8). [2]

Oregon's Rural residents are more likely than urban residents to have distant stage disease diagnoses at a rate of 7.4 new cases per 100,000 (Image 3.8). [2]

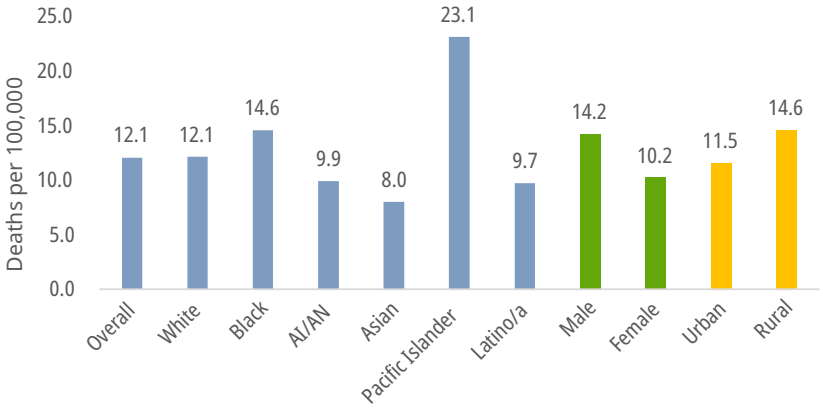
Oregon's Black or African American populations experience a higher rate of advanced stage diagnosis (7.3 new cases per 100,000) (Image 3.8). [2]

Image 3.8 Late-stage colorectal cancer incidence rates by race, ethnicity, gender, and geography, 2018-2022

Colorectal Cancer Mortality Rates are Substantially Higher for Some Populations than Others

According to 2018-2022 mortality data, **Pacific Islander** populations experience the highest rate of colorectal cancer mortality at 23.1 deaths per 100,000. Similar to incidence, **males** (14.2 per 100,000) have a higher mortality rate than females, as do individuals residing in **rural regions** (14.6 per 100,000) compared to their urban counterparts (Image 3.9). [23]

Image 3.9 Colorectal cancer mortality rates by race, ethnicity, gender, and geography, 2018-2022



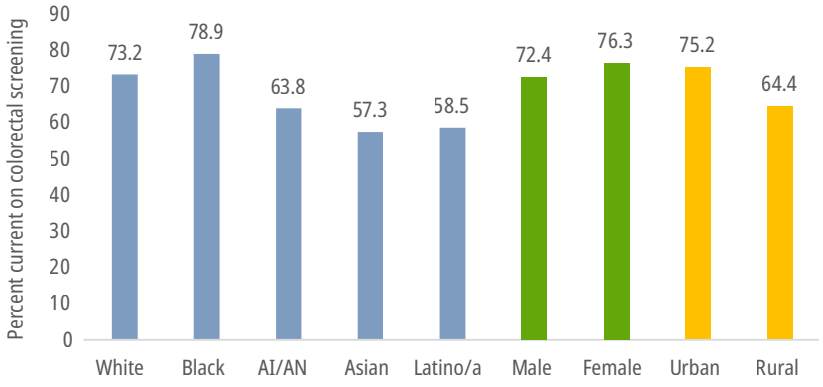
Screening (or Early Detection) Rates for Colorectal Cancer in Oregon are Lower for Some Demographic Groups

This Plan reports screening data for the 50-75 year-old population because previous screening guidelines included that age group. As of 2021, the United States Preventative Services Task Force lowered its colorectal cancer screening recommendation from 50 to 45 for people at average risk. [87] Multi-year screening data for those 45 and older are not yet available.

To prevent late-stage diagnoses and high mortality rates in Oregon, all people at average risk for colorectal cancer should begin colorectal cancer screening at age 45. [88]

The American Cancer Society's National Colorectal Cancer Roundtable has established a screening rate goal called *80% in Every Community.* [89] According to Oregon data from 2018-2022, no racial or ethnic group is meeting this screening rate goal, with Asian (57.3%), Latino/a (58.5%), AI/AN (63.8%), and rural residents (64.4%) furthest from the goal (Image 3.10). [71]

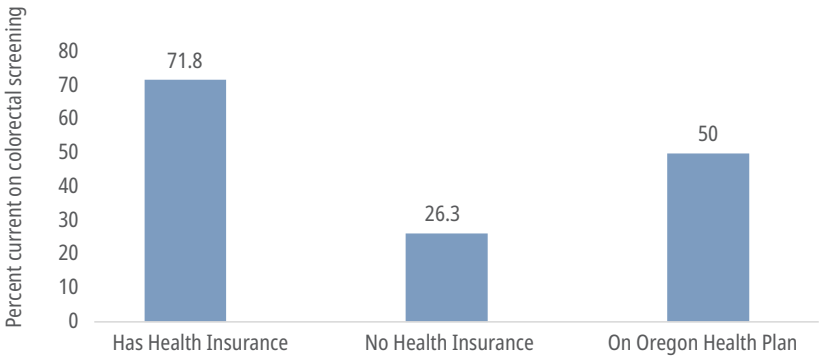
Image 3.10 Colorectal screening rates (50-75 year olds) by race, ethnicity, gender, and geography, 2018-2021



**Pacific Islander data is not shown due to a low number of respondents*

Closing colorectal cancer screening gaps between demographic groups will improve Oregon's incidence and mortality rates. Racial identity or rural-versus-urban-living are not the only factors associated with colorectal cancer screening rates. In Oregon's 2020 data, health insurance status demonstrates unequal screening rates.

Image 3.11 Colorectal cancer screening rates by health insurance status, 2020



People without health insurance have a screening rate of 26.3% and those who are insured by the Oregon Health Plan/Oregon Medicaid have a screening rate of 50%.[71] Both groups would benefit from increased colorectal cancer screening rates (Image 3.11).

Key Takeaways for Colorectal Cancer

- Colorectal cancer incidence is rising in those under 50 years of age.
- Colorectal cancer incidence rates are highest in rural regions vs. urban areas and in males vs. females.
- The highest rates of late-stage colorectal cancer diagnoses are occurring in men, those living in rural areas, and Black or African American populations.
- Mortality rates from colorectal cancer are highest in Pacific Islander and Black or African American populations, those living in rural areas, and men.
- Colorectal cancer screening rates are lowest in Asian, Latino/a, and AI/AN populations, those who live in rural areas, and males. Uninsured people and those who are insured by the Oregon Health Plan/Oregon Medicaid also face the lowest colorectal cancer screening rates.

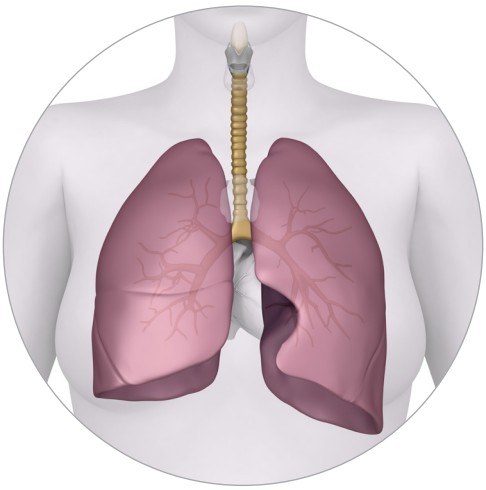
Comprehensive Cancer Control Plan Goals: Colorectal Cancer

Taskforces will be formed starting in 2026 to develop more specific goals, objectives and strategies around decreasing colorectal cancer burden. This Plan recommends that taskforces focus on the demographic groups facing the highest burden of colorectal cancer, starting with the following areas of action.

- Achieve an 80% colorectal cancer screening rate in all communities beginning at age 45 for those at average risk for colorectal cancer, as established by the American Cancer Society's National Colorectal Cancer Roundtable.[89]

PRIORITY #4

Lung and Bronchus Cancer



Description of Lung and Bronchus Cancers

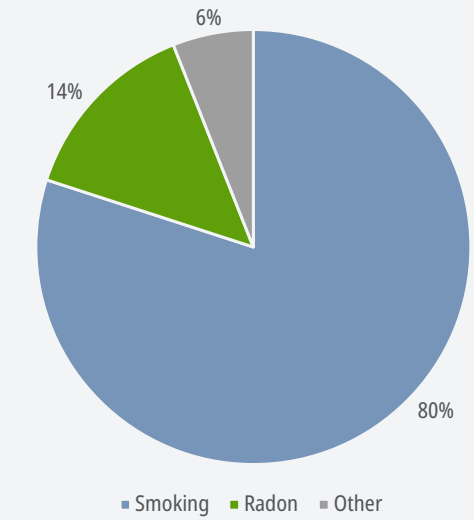
The lungs are separated into five lobes (two on the left side, three on the right). The primary function of the lungs is to take in air and oxygenate our blood. Lungs oxygenate blood when we inhale air through bronchus tubes, which branch into many smaller tubes called bronchioles, leading to the alveoli (tiny air-filled sacs). [90] Lung and Bronchus cancers originate in either the lung or bronchus tissue. In this report, we use the term "lung cancer" to describe all cancers originating in either lung or bronchus tissue. [91]

Risk Factors for Lung Cancers

The following are modifiable risk factors for lung cancer:

- Commerical tobacco usage, including exposure to secondhand smoke. Approximately 80-90% of lung cancer deaths are linked to commercial tobacco use (Image 4.1). [92] Also, if someone smokes and has any other risk factor for lung cancer, their risk for developing lung cancer is magnified and will be higher than in those who do not smoke. [93]
- The relationship between vaping and lung cancer is unclear and more research needs to be conducted to indicate vaping as another risk factor. [94]

Image 4.1 Approximate percentage of lung cancer cases by risk factor



- Radon is associated with approximately 14% of lung cancer. [95,96] Radon is a radioactive gas that forms naturally when uranium, thorium, or radium (radioactive metals) break down in rocks, soil, and groundwater. People can be exposed to radon from breathing the gas or drinking it in their water. [92,95,97,98] The Environmental Protection Agency recommends that all dwellings be tested for radon, which can be conducted using radon testing kits. [99] In Oregon, the lowest testing rates are reported in rural areas. [100]
- Exposure to toxins such as arsenic, some organic chemicals, asbestos, diesel exhaust, tar and soot. [101,92]

The following are non-modifiable risk factors for lung cancer:

- Air pollution [101]
- Personal or family history of lung cancer [101,92]
- People who received **radiation** treatment to the chest to treat other cancers. [101,92]

Concerning Trends for Lung Cancer in Oregon

In 1950, two American scientists published the first report indicating that 96.5% of lung cancer patients are moderate to heavy smokers. [102] Subsequent studies have validated that smoking is linked to lung cancer. [103] In 1998, 52 state and territory attorneys general signed the **Master Settlement Agreement** with the four largest commercial tobacco companies in the U.S. [104] The agreement's purpose is to reduce smoking in the U.S. and funds from the settlement support state level commercial tobacco prevention, education, and cessation efforts. Since 80-90% of all lung cancer deaths are associated with commercial tobacco use, it is critical to understand where and with which populations to implement and invest in evidence-based initiatives or programs to reduce the smoking burden. [92]

Image 4.2 Percent of Oregonians who are current smokers, by race, ethnicity, and gender, 2023

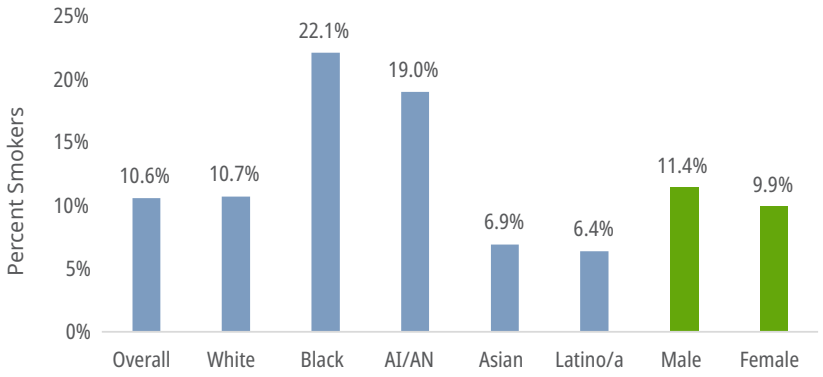
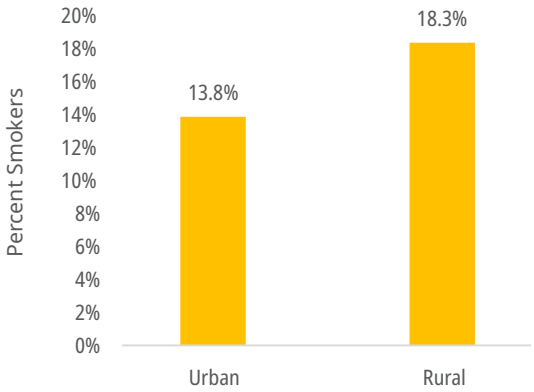


Image 4.3 Percent of Oregonians who are current smokers by geography, 2018-2021

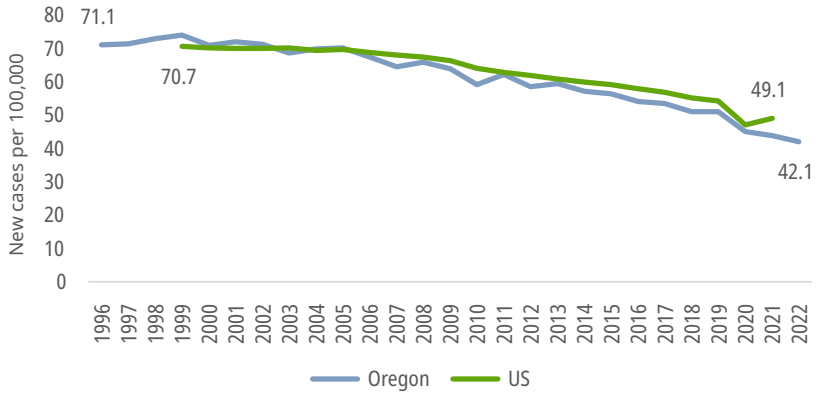


According to CDC's most recent Behavioral Risk Factor Surveillance System data (2023), 10.6% of all Oregonians report being current smokers (Image 4.2), although there is variability of smoking rates across different groups. Black or African American populations have the highest rate of smoking at 22.1%, followed by American Indian/Alaska Native (AI/AN) populations at 19%. Rural Oregonians smoke more than those who live in urban areas (18.3% vs. 13.8%) (Image 4.3). Further, males smoke at a higher rate than females (11.4% vs. 9.9%). (Image 4.2) [71]

Lung Cancer has the Third Highest Cancer Incidence Rate in Oregon

Note: In data presented, all rates are age-adjusted, per 100,000 people, per year(s) specified.

Image 4.4 Lung cancer incidence rates, Oregon and U.S., all years available

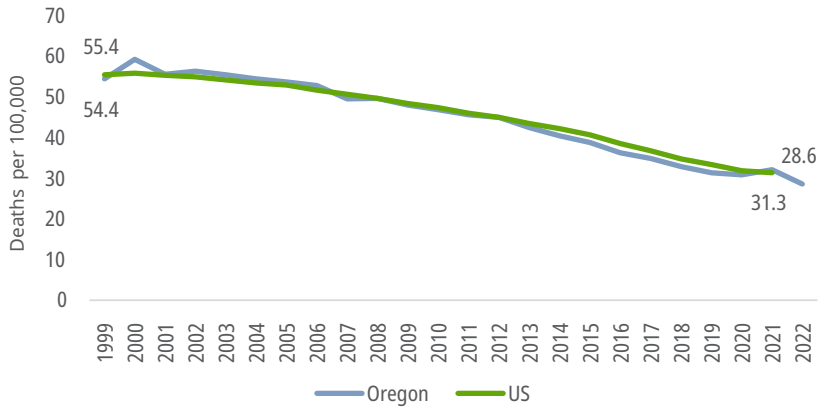


Oregon's lung cancer incidence rates have been declining steadily over the past 25 years, mirroring national trends. [2,22], Despite declining trends, lung cancer has the third highest diagnosis rate in Oregon. In 1996, there were roughly 71 new cases per 100,000. In 2020, there were roughly 41 new cases per 100,000 reported in Oregon (Image 4.4). [2]

Lung Cancer has the Highest Cancer Mortality Rate in Oregon

In 2022, 1,715 Oregon residents died from lung cancer. Notably, between 1999 and 2022, Oregon's lung cancer mortality rates dropped 47.4% (Image 4.5). However, lung cancer continues to have the highest mortality rates among all cancers in Oregon. [23]

Image 4.5 Lung cancer mortality rates, Oregon and U.S., all years available



To reduce lung cancer mortality, it is critical to identify lung cancer early. The evidence-based method for decreasing mortality rates is described below. It is important to increase cancer early detection for high-risk individuals by referring them to a comprehensive lung cancer screening program. (105,106)

Populations Experiencing Disproportionate Rates of Lung Cancer

Incidence and mortality rate decreases are not occurring uniformly across all demographic groups.

Within Oregon, some demographic groups experience higher rates of lung cancer than expected, based on statewide and national data. Image 4.6 (the map) shows the overall incidence rate for Oregon counties.

Additionally, incidence rates for each of the following demographic groups at the county level were compared to national and state incidence rates: White, Black, AI/AN, Asian or Pacific Islander, Hispanic or Latino/a, Male, and Female.

Crook, Josephine and Marion counties reported 3 or more demographic groups with incidence rates at least 25% higher than their national peers. Three of the five counties with the highest incidence rates in Oregon for lung cancer are urban (Columbia, Crook, and Josephine); Coos and Wasco counties are rural. [2]

Of note, members of AI/AN populations who reside in Coos, Marion, Multnomah, and Washington Counties and all demographic groups of women in Columbia and Harney Counties are experiencing lung cancer incidence rates that are double what we would expect based on statewide and national rates.

Image 4.6 Lung cancer incidence rates by Oregon county per 100,000, 2018-2022

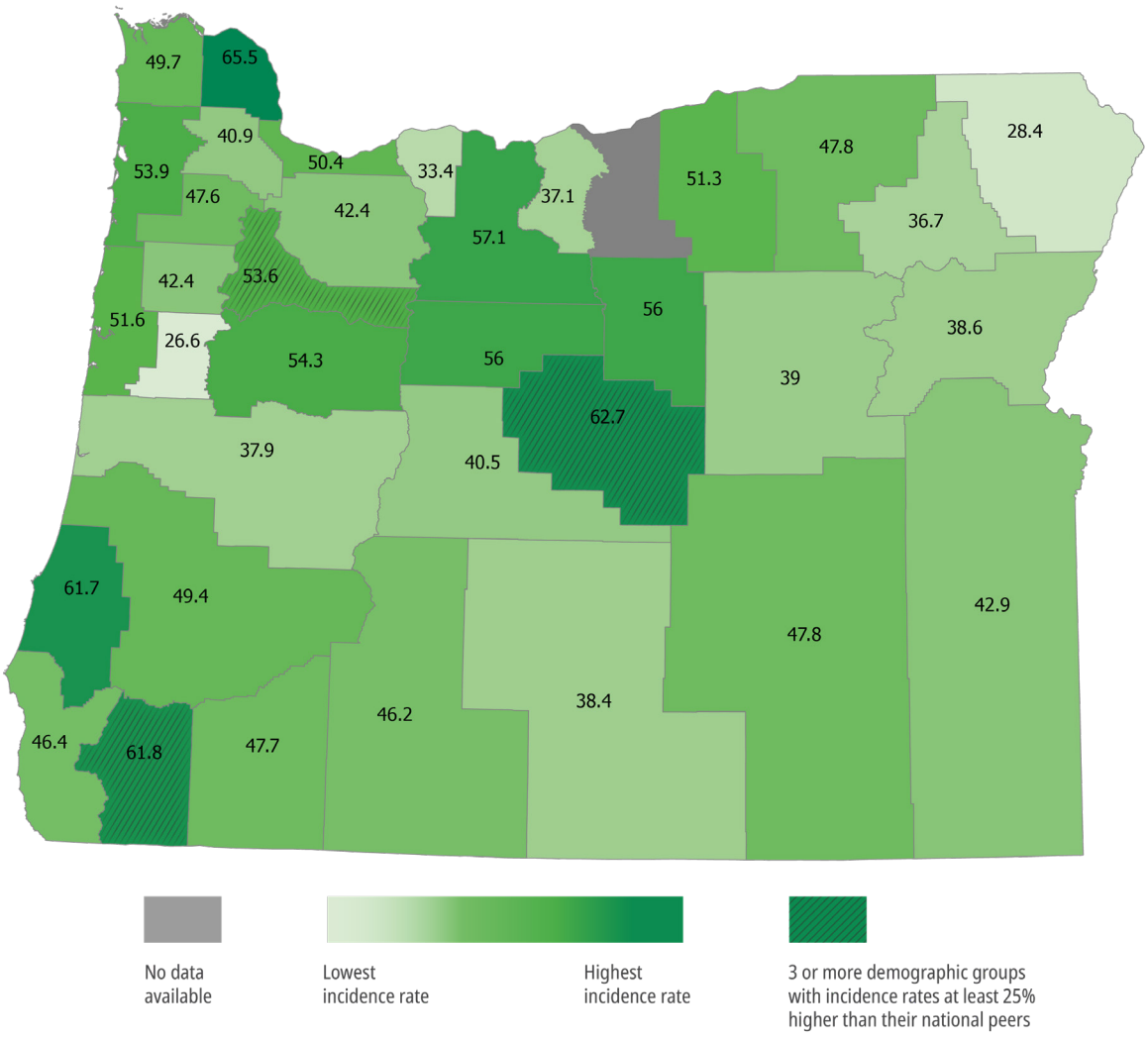


Image 4.7 Lung cancer incidence rates in Oregon by race, ethnicity, gender, and geography, 2018-2022

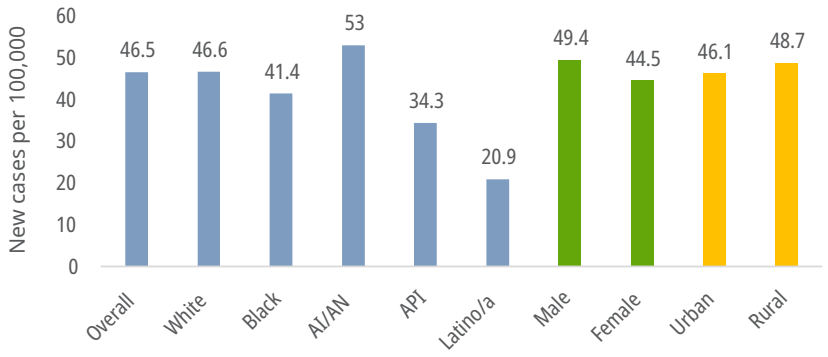


Image 4.8 National 5-year relative survival rate for lung and bronchus cancer by stage

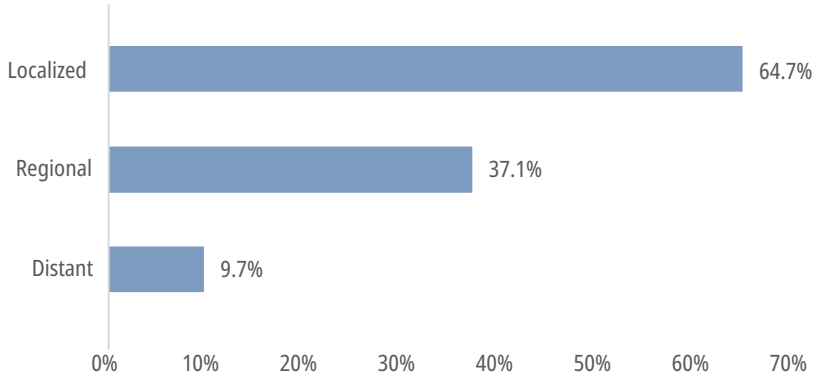
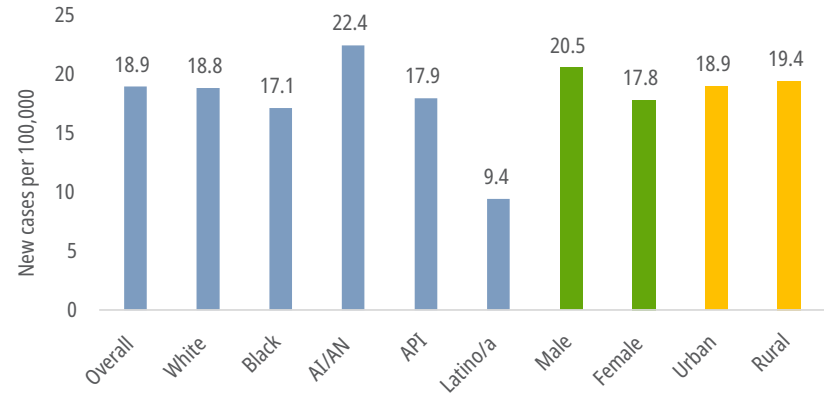


Image 4.9 Lung cancer incidence rates in Oregon for late stage (distant) disease by race, ethnicity, gender and geography, 2018-2022



Over the past 20 years the incidence rate for lung cancer in the AI/AN community has been reduced by half, starting at 105.3 new cases per 100,000 in 1998-2002 and dropping to 53 new cases per 100,000 in 2018-2022 (Image 4.7). Despite this large decrease, the AI/AN community's incidence rate remains 14% higher than Oregon's overall incidence rate for lung cancer and is the highest incidence rate compared to every other demographic group. [2]

Between 2018-2022, Oregonians experiencing the highest incidence rates of distant stage disease were AI/AN, males, and rural residents.

Nationally, localized lung cancer leads to a 5-year relative survival rate of 64.7%. Finding lung cancer regionally has a survival rate of 37.1% and lung cancer that is found in distant stages of disease has a 5-year relative survival rate of 9.7% (Image 4.8). [26]

In Oregon, late-stage lung cancer incidence rates measured by racial and ethnic categories, geography, and gender are not equal. From 2018 through 2022, those who are AI/AN had the highest late-stage lung cancer rates of 22.4 per 100,000, males had a rate of 20.5 per 100,000, and those living in rural areas had a rate of 19.4 per 100,000 (Image 4.9). [2]

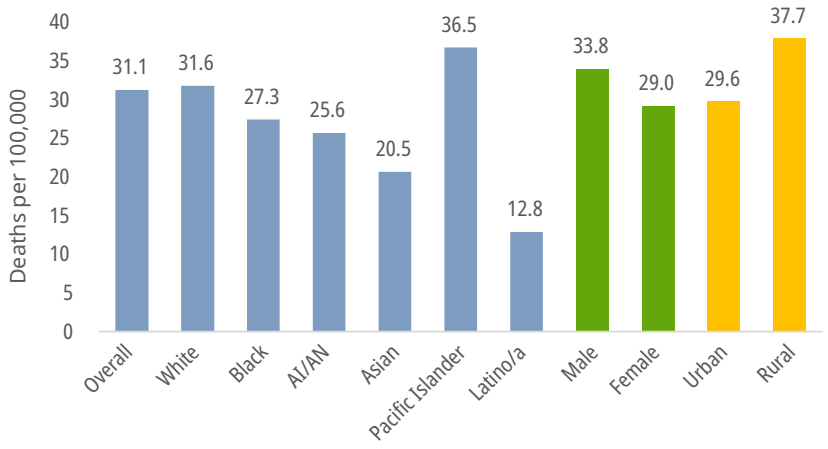
Lung cancer diagnosed as a metastatic nodule complicates treatment.

Metastatic disease presents as multiple tumor sites throughout the body. [107] Approximately 30% of lung cancers have been found to have metastatic nodules in other organs besides the lungs. [108] To identify the best treatment for each patient, providers need to know whether they are treating cancer that originated in the lung or in a different organ.

Molecular testing can determine a cancer's site of origin, offering providers and their patients personalized treatment guidance for the cancer. [109] The Veterans Administration and insurance companies in 20 states cover some level of molecular testing for patients. No Oregon based insurance provider covers the cost of molecular testing (Dr. P. Lee, email communication, February 18, 2025).

Pacific Islander, Males, and Rural Oregonians Experience the Highest Lung Cancer Mortality Rates

Image 4.10 Lung cancer mortality rates in Oregon by race, ethnicity, and gender, 2018-2022 *



According to 2018-2022 data, Pacific Islanders are dying from lung cancer at higher rates than other racial and ethnic groups (36.5 deaths per 100,000). Males have a higher rate of lung cancer mortality (33.8 deaths per 100,000) compared to females (29 deaths per 100,000). Oregonians living in rural areas have a higher rate of mortality (37.7 deaths per 100,000) than their urban counterparts (29.6 deaths per 100,000) (Image 4.10). [23] It is likely that the higher rate of late-stage diagnoses experienced by rural residents is related to their increased lung cancer mortality rate.

**Note: After careful analysis of available data, it is apparent that AI/AN populations are underrepresented in Oregon's mortality data. Given the number of new cancer cases found as metastasized lung cancer in those who are AI/AN, the Plan's data and leadership teams would expect a higher number of deaths in this population due to lung cancer. The Plan's data and leadership teams believe the contradiction between incidence and mortality rates in AI/AN populations is due to inaccurate race categorization.*

Evidence-based Lung Cancer Screening Programs Include Low-Dose Computed Tomography Scans

A low-dose computed tomography (LDCT) scan is an imaging test that takes multiple pictures as a person lies on a table that slides in and out of the CT machine. A computer then combines these images into a detailed picture of the patient's lungs. [110]

LDCT scans are the evidence-based approach to lung cancer screening, requiring regular screening for high-risk individuals. Additionally, LDCT scans can only identify suspicious masses, must be combined with other tests to determine if a person has cancer, and cannot be used as a stand-alone or one-time option. [111]

Image 4.11 Key components of a LDCT lung cancer screening program

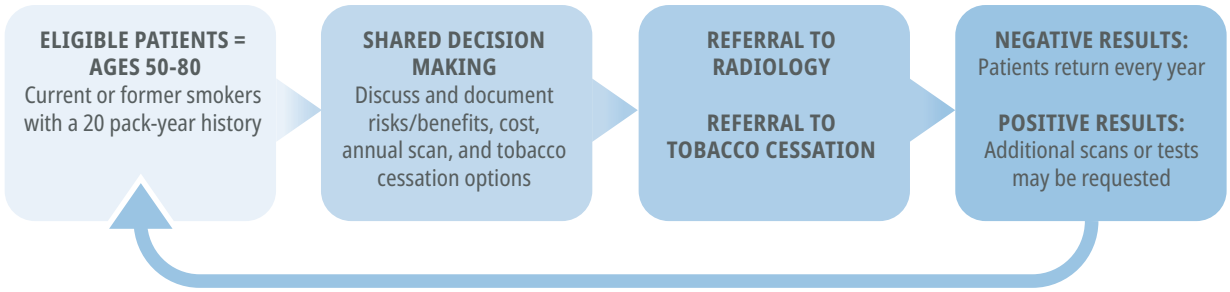
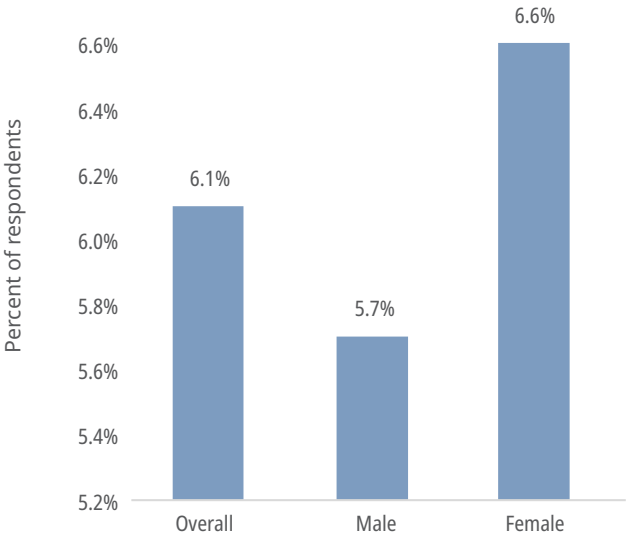


Image 4.12 Percent of Oregonians aged 50-80 who are current or former smokers who had an LDCT scan in the last year by gender, 2022



Evidence-based, comprehensive LDCT lung cancer screening programs include multiple components: identifying eligible patients, conducting a shared decision-making conversation between provider and patient (which must be documented for insurance to cover the cost), a referral to radiology to schedule the LDCT scan, a referral to individually tailored commercial tobacco cessation counseling, and expectations to schedule follow-up LDCT scans annually or bi-annually (Image 4.11). [112,113] Utilization of LDCT lung cancer screening programs help clinicians identify lung cancers in ***early stages***.

Often, high-risk or eligible patients are not accessing or do not have access to regular medical care so they can be referred to a lung cancer screening program. Incidental Lung Nodule "Safety Net" programs are critical for capturing eligible patients at any point of contact with the health care system when a chest scan is ordered (e.g., Emergency Department visits, inpatient admissions). [114,115] Incidental Lung Nodule programs refer patients to their primary care provider and/or a LDCT lung cancer screening program.

The American College of Radiology and the **U.S. Preventive Services Task Force** recommendation is to begin lung cancer screening at age 50 for current and former smokers with a 20 pack-year history (e.g., smoking one pack a day for 20 years or smoking 2 packs a day for 10 years). [111,116] Annual **lung cancer screening** with LDCT in high-risk patients significantly reduces lung cancer deaths. [117]

The Healthy People 2030 initiative sets a benchmark of 7.5% for the percent of eligible adults who should receive LDCT screening. [118] Females in Oregon have a 6.6% screening rate, while men have a 5.7% screening rate (Image 4.12). [71]

Key Takeaways for Lung and Bronchus Cancer

- Approximately 80% of lung cancer is associated with commercial tobacco and being exposed to secondhand tobacco smoke.
- Approximately 14% of lung cancer is associated with exposure to radon.
- Between 2018-2022, AI/AN populations were diagnosed with lung cancer at a rate 14% higher than the average for all races.
- Populations experiencing the greatest disparities in lung cancer mortality are rural Oregonians, and Pacific Islanders.

Comprehensive Cancer Control Plan Goals: Lung and Bronchus Cancer

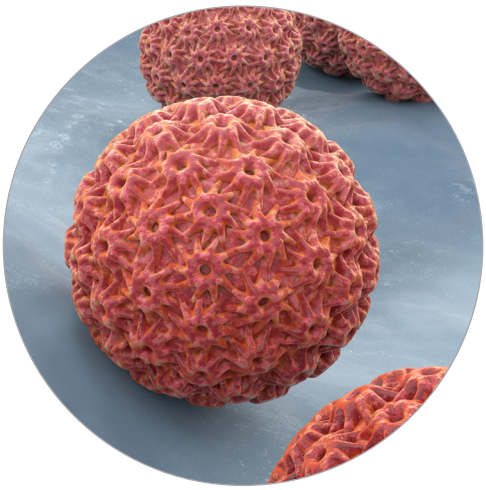
Taskforces will be formed starting in 2026 to develop more specific goals, objectives and strategies around decreasing lung cancer burden. Based on the data provided above, this Plan recommends that taskforces focus on the demographic groups facing the highest burden of lung cancer, potentially starting with the following areas of action.

According to the Healthy People 2030 initiative,

- Reduce commercial tobacco use in adults to 5% [193]
- Increase the number of eligible adults receiving lung cancer screening to at least 7.5% [118]
- Increase annual LDCT screening rates in rural regions of the state.
- Explore offering insurance coverage for molecular testing of metastatic lung cancer patients.
- Increase awareness of radon and radon testing; increase radon testing rates throughout the state with a focus on rural areas. [98]

PRIORITY #5

Human Papilloma Virus (HPV) Vaccination



Human Papilloma Virus (HPV) Vaccination is Cancer Prevention

This Plan's special area of focus is increasing HPV vaccination rates across the state. The HPV vaccine helps the body's immune system fight off infection when it is exposed to this virus. The vaccine builds a person's immunity against the most common, high-risk HPV virus genotypes. More than one injection is required to reach an immunity status that can prevent HPV infection and HPV-related cancers. [10] Therefore, the Plan will be referring to vaccine ***initiation rates*** and ***completion rates*** which differ across the state.

This special area of focus aligns with the scoring mechanism used to identify the Plan's priority cancers.

1. HPV vaccination rates are unequal across the state.
2. There is a lack of progress meeting statewide and national vaccination rate goals.
3. Evidence-based, measurable initiatives are available at a population level and in motion.

Description of Human Papilloma Virus (HPV):

Any Oregonian can contract this virus through intimate contact (e.g., oral and vaginal sex), as the Human Papilloma Virus (HPV) is the most common sexually transmitted infection in the world. [119] In the U.S., about 79 million people are currently infected with HPV, and about 14 million become newly infected with HPV each year. [120] Most people who have had a sexual experience will be exposed to and possibly infected with HPV at some point in their lives. [121]

HPV is Linked to Six Different Types of Cancer

HPV has been linked to six different cancer types, affecting both men and women (Image 5.1). While there are more than 200 strains of HPV, 17 high risk HPV types are associated with most HPV-related cancers. [7] Preventing HPV infection can keep these cancers from developing.

HPV is associated with at least 91% of cervical cancers, 91% of anal cancer, 75% of vaginal cancer, 70% of oropharyngeal cancer, 69% of vulvar cancer, and 63% of penile cancer. [122]

Image 5.1 Oregon's HPV-related cancer rates, 2021

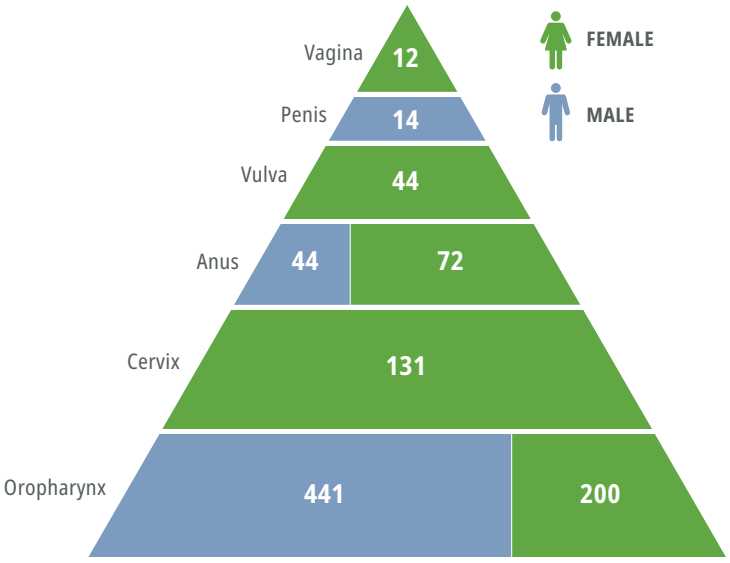
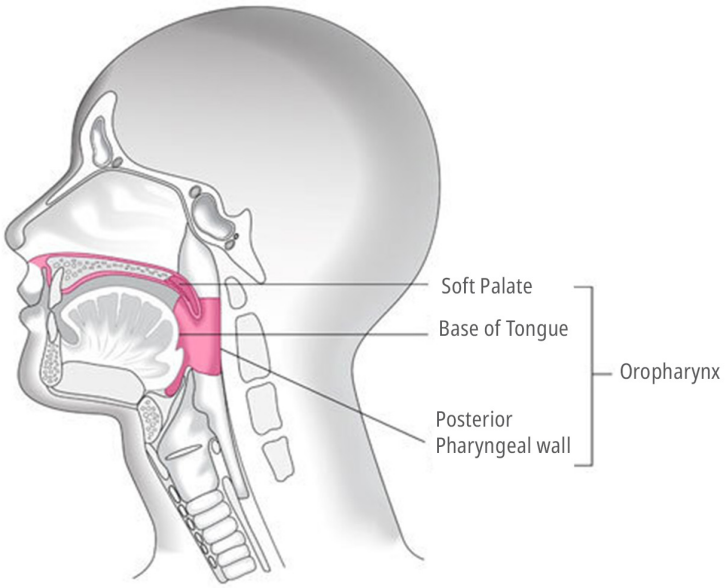


Image 5.1 demonstrates Oregon's 2021 HPV-related cancer diagnoses by cancer type and gender. These numbers total 958 people diagnosed with HPV-related cancer. In 2021, all HPV-related cancers accounted for 4.4% of all new cancer diagnoses in the state. [2]

Oregon HPV-related Oropharyngeal Cancer Incidence Rates Increasing in Men

Image 5.2 Location of the oropharynx, where oropharyngeal cancer is found/diagnosed



In the U.S., oropharyngeal cancer (Image 5.2) is on the rise. Between 2015–2019, oropharyngeal cancer rates increased in American men at three times the rate of American women. [123] Incidence rates of oropharyngeal cancer in Oregon are higher than the national rates. [124] Oregonian men accounted for more new diagnoses in 2021 (441 cases) than women (200 cases). [2]

While there is global motivation to eliminate cervical cancer incidence rates for young women, eliminating HPV-related cancers in young men is also critical.

HPV Vaccination is Cancer Prevention

The CDC and Federal Drug Administration (FDA) monitor vaccine safety, efficacy, and any vaccination related side effects beginning at time of manufacture. [125] A 2021 case-control study reported long-term HPV vaccine effectiveness against cervical cancer at the population level by assessing 867,689 Danish women. [126] A 2021 population-based cluster randomized study proved vaccination effectiveness against other "invasive HPV-positive cancers," inclusive of and in addition to cervical cancers, in 3,341 women. [127] These are not the only studies that have proven the efficacy of the HPV vaccine to prevent HPV-related cancers. [128,129,130]

Nearly all people are infected with HPV within months to a few years of an initiating sexual encounter. Approximately half of all initiating HPV infections are associated with a **high-risk HPV** genotype. [131,132] High-risk HPV genotypes are known to be associated with six cancers, described earlier.

CDC vaccination guidelines state that two to three injections are required to reach an HPV immunity status that can prevent infection and cancer. The number of injections needed depends on the age at which the first vaccination occurs (Image 5.3). [133]

About HPV Vaccination

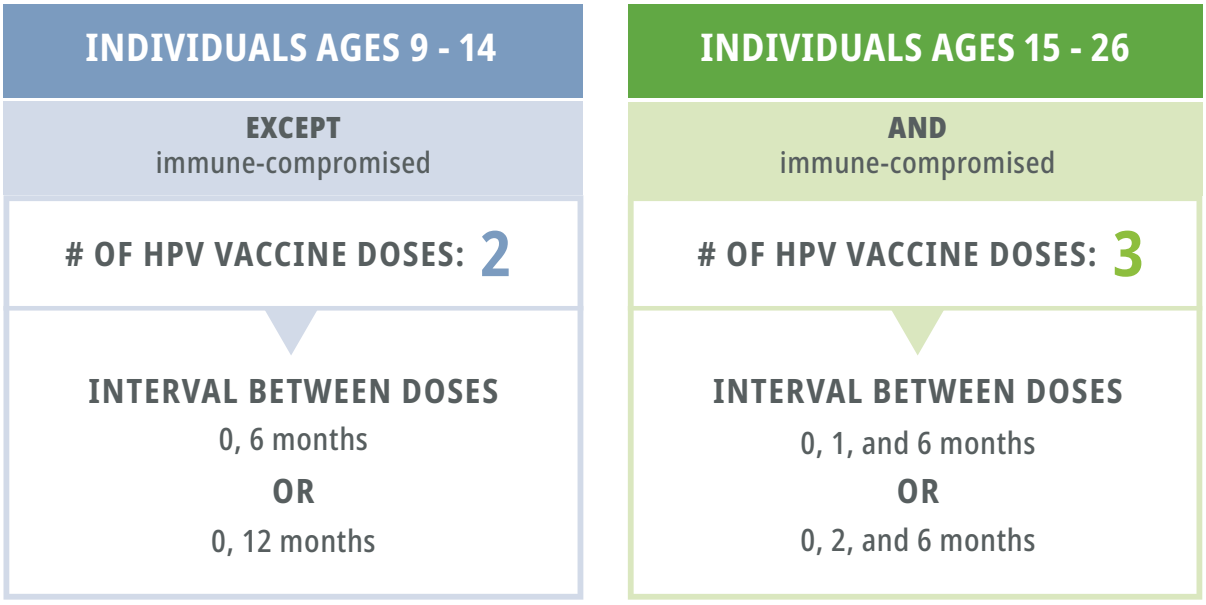
The HPV cancer prevention vaccine is safe, effective, and available to Oregonians, aged 9 to 45. [186]

The HPV vaccine is most effective when administered to youth ages 9-12, when their bodies have the best immune response to this cancer prevention vaccine. [185]

Youth and adults between the ages of 26 and 45 should talk to their healthcare providers about the value of HPV vaccination. [133]

In 2025, the CDC's Advisory Committee for Immunization Practices continues to recommend routine HPV vaccination from age 11 or 12 through 26, and the vaccine series can be started safely at age 9. [133]

Image 5.3 HPV Vaccination Guidelines



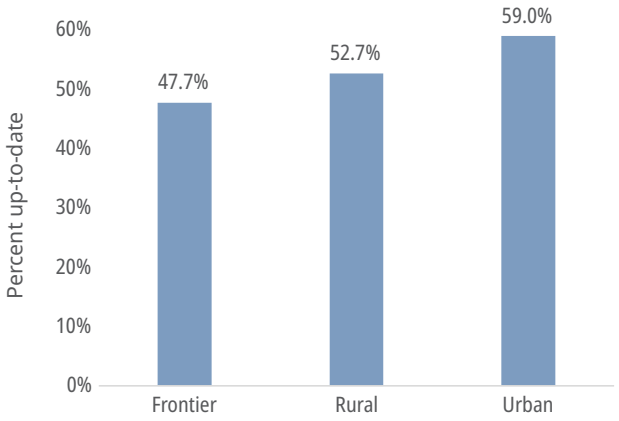
Populations Experiencing Disproportionate Rates of Vaccination Series Completion

Cancer Prevention Inequities

HPV vaccination completion rates are not occurring uniformly across all demographic groups.

- **Rural Youth:** In Oregon (and nationally), rural youth vaccination completion rates remain lower than for urban youth. In Oregon, 2023 HPV vaccination completion rates for youth ages 13-17 are at 47.7% and 52.7% in frontier and rural regions versus 59% in urban regions (Image 5.4) [9]
- **Boys:** In Oregon and per OHA, HPV vaccination rates comparing boys and girls is not publicly available (Email communication, Oregon Health Authority HPV Program, April 2025).

Image 5.4 Percent of Oregon's 13-17 year olds up-to-date (aka completion rates) with HPV vaccination by region, 2023

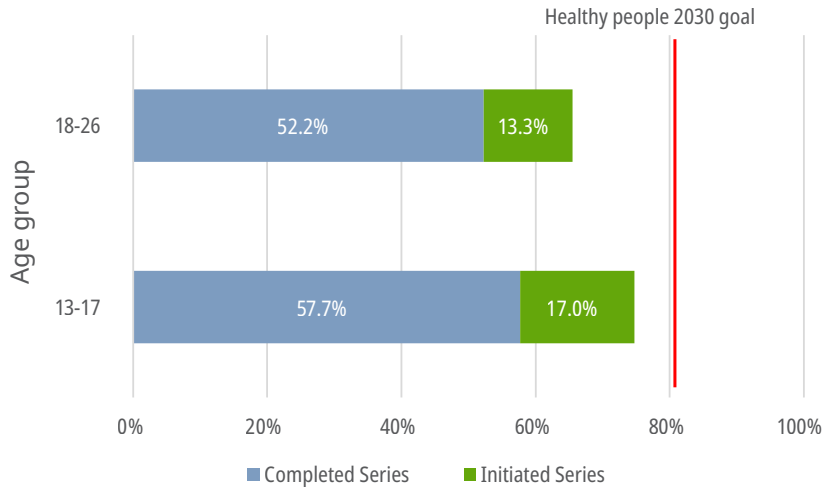


In 2022, the CDC produced a national data report that describes a lower HPV vaccination rate for boys compared to girls. The data described the HPV vaccine initiation rate (one dose) for males ages 13-17 as 74.4 %, compared to the vaccine initiation rate in same aged females as 77.8%. In the same year, 60.6% of 13–17-year-old males were up to date with the HPV vaccination series, whereas 64.6% of females were up to date. [134]

Girls' HPV vaccination completion rates are outpacing boys' vaccination completion rates. This disparity in modifiable cancer prevention care puts boys at higher risk for developing future HPV-related cancers, specifically cancers of the oropharynx (back of the throat and base of the tongue), anus, and penis.

- **Young adults:** Oregon's 2023 data shows that young adults ages 18-26 have a lower HPV vaccination rate compared to school aged youth ages 13-17. Only 52.2% of 18–26-year-olds have completed their HPV vaccination series and 13.3% have initiated the series. In contrast, 57.7% of 13–17-year-olds have completed their HPV vaccination series, and 17.0% have initiated it (Image 5.5). [9]

Image 5.5 Oregon HPV vaccination rates for school-age youth and young adults by completion status, 2023



While the gap between initiating HPV vaccine dosages, completing recommended HPV vaccine dosages, and meeting the 80% Healthy People 2030 HPV vaccination completion goal is narrowing for school-aged youth, young adults are experiencing a larger gap to close between initiation, completion, and meeting the national goal. [9,135]

One caveat: young adult HPV vaccination initiation and completion rates may be over or under-estimated due to the transient nature of people ages 18-26. [136]

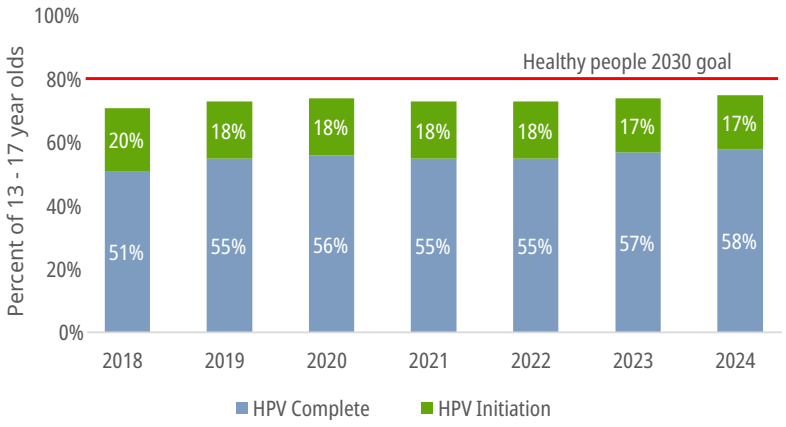
Vaccination Rates in Oregon Have Plateaued

Since 2019, the HPV initiation rate for Oregonians aged 13-17 has plateaued (Image 5.6). [9]

To meet the Healthy People 2030 goal of an 80% HPV vaccination completion rate, more Oregon youth and young adults will need to complete their HPV vaccination series. [135] Specifically, 22.3% of Oregon 13-17 year olds need to receive their remaining dose/s or initiate HPV vaccination (approximately 56,000 youth), while 27.8% of Oregon's 18-26 year olds need to do the same (approximately 125,000 young adults) (Image 5.5). [9]

Pediatrician and scientific communities noticed that when the HPV vaccine was offered to families starting at age 9, more youth were completing the vaccination series by the recommended age of 13. [137,138,139,140] The difference in vaccination completion between boys and girls nearly disappears when children begin the vaccination series at age 9. [136] This evidence supports a recommendation that the state's healthcare providers begin HPV vaccination starting at age 9.

Image 5.6 Oregon HPV immunization rates for 13-17 year olds, 2018-2023



HPV Vaccination-Related Cancer Prevention Disparities and Challenges: Why Have They Occurred?

Upon initial FDA approval in 2006, the vaccine was marketed solely to girls and young women. [144] As a result, local, national and international cervical cancer rates have been in decline. These successes in reducing HPV-related cancers affecting females have not been observed in male populations – likely due to the gap in vaccination rates between sexes. [189]

Original marketing did not sufficiently highlight the remarkable significance of developing a cancer prevention vaccine. Since this vaccine's original approval in 2006, clinicians and public health professionals across the nation have continually worked against insufficient cancer prevention messaging and increasing misinformation and disinformation about the value of the HPV vaccination as a safe cancer prevention tool. [190]

HPV Vaccination is Evidence-based, Actionable, and Achievable

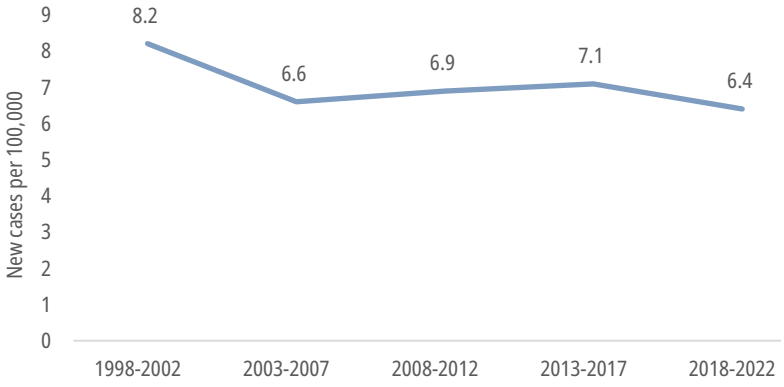
The HPV vaccine is an actionable, measurable cancer prevention tool. Vaccinating youth against HPV infection, starting at age 9, has been proven to be safe and effective.

Per Oregon law, clinical providers, pharmacists, and dentists can vaccinate against HPV. [141] Learning about this cancer prevention vaccine and having more than one type of vaccine administrating provider available to families may increase access to this prevention tool. [142] Oregonian youth ages 15 and older, who can by law make healthcare decisions for themselves, should be able to access and receive this vaccine. [143]

HPV-related Cervical Cancer Prevention Successes

Since the introduction of the HPV vaccine in 2006, cervical cancer incidence rates have been declining in the U.S. and in many regions around the world. [144,145,146] Nearly all cases of cervical cancer are associated with persistent HPV infection. [122]

Image 5.7 Oregon's cervical cancer incidence rates over time



In Oregon, the average cervical cancer incidence rate from 1998-2002 was 8.2 cases per 100,000, whereas from 2018-2022 it decreased to 6.4 per 100,000. [2]

HPV-related Cervical Cancer Prevention Highlights from Around the World

Australia's goal is to be the first country to eliminate cervical cancer by 2035. In 2007, they introduced a national HPV vaccination program, adding boys to the program in 2013. [191]

In February 2024, health authorities in **Kosovo rolled out a vaccination campaign** meant to reach 12,000 girls. This campaign offers HPV vaccine in schools and health workers will go door-to-door to offer the vaccine in minority communities. [192]

In 2022, **Uzbekistan vaccinated 94% of girls**, aged 12-14, against HPV. The two keys to this successful vaccination campaign were to develop a national communication plan and to actively monitor locally and regionally to respond swiftly and keep the initiative on track. [187]

In 2020, "Slovenia… [became] one of the most successful countries in the WHO European Region in the fight against cervical cancer. From having had one of the worst statistics in Europe on cervical cancer incidence, **Slovenia has managed to turn the tide thanks to political will, cooperation and a robust screening programme.**" [188]

Key Takeaways for HPV Vaccination

- Up to 90% of HPV-related cancers can be prevented by an HPV vaccine. We can reduce HPV-related cancers by increasing vaccination rates.
- Cervical cancer rates are declining in Oregon, likely due to HPV vaccination in girls and young women.
- Populations experiencing the largest disparities in receiving this cancer prevention tool are rural youth and boys.

Comprehensive Cancer Control Plan Goals: HPV Vaccination

Taskforces will be formed starting in 2026 to develop more specific goals, objectives and strategies around increasing HPV vaccination rates. Based on the data provided above, this Plan recommends that taskforces focus on the demographic groups facing the lowest rates of HPV vaccination, potentially starting with the following areas of action.

- Increase HPV vaccination completion rates to the to the Healthy People 2030 goal of 80%.
- Close the gap and increase HPV vaccination completion rates in college-aged youth (18-26).
- Increase HPV vaccination initiation and completion rates in Oregonian boys.

Appendix A: Oregon Overview

Cancer Burden by The Numbers

Data experts at the Oregon Health Authority and the Knight Cancer Institute used the best and most recently available data to create the document. The sources used are:

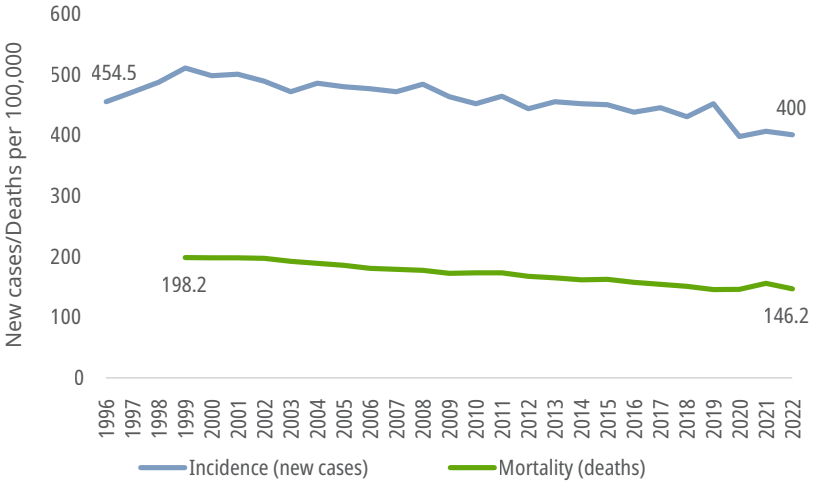
- Oregon State Cancer Registry (OSCaR)
- Behavioral Risk Factor Surveillance System (BRFSS)
- Oregon Health Authority (OHA) Health Promotion and Chronic Disease Prevention
- US Census
- OHSU's Office of Rural Health

There are known and perceived limitations to publicly available data. Data is inherently limited by the data collection methods used to compile datasets. There is no such thing as "bad data" or "perfect data," though the usefulness and the impact of a dataset is a product of the collection, interpretation, and the dissemination of that data. Additional information about data limitations and impacts on health equity are found in Appendix B.

Cancer in Oregon: Data Overview

Note: In data presented, all rates are age-adjusted, per 100,000 people, per year(s) specified.

Image 6.1 Oregon incidence and mortality ,1996-2022



Each year, more than 22,000 Oregonians are diagnosed with cancer. Of those diagnosed, more than 8,000 do not survive their disease. Based on 2022 data, the most recent data available at the time of publishing this document, roughly 250,000 cancer survivors who often have complicated or unique medical needs are living in Oregon. [2,23]

One Oregon success story is that both ***incidence*** rates (number of new cancer diagnoses per 100,000) and ***mortality*** rates (number of deaths per 100,000) continue to drop. [2,24]

In 1996, the rate of people diagnosed with cancer was 454.4 new cases per 100,000 in Oregon. By 2022, the number of cancer diagnoses dropped to 400 new cases per 100,000. [2]

A similar downward trend was demonstrated in relation to mortality. In 1999, the number of people who died from cancer was 198.2 deaths per 100,000. In 2022, this number decreased to a rate of 146.2 per 100,000 (Image 6.1). [23]

Oregon's incidence and mortality decreases mirror national data across the same timeframe. U.S. cancer incidence rates dropped from 480.9 to 439.1 new cases per 100,000 from 1999 to 2022 and cancer mortality dropped from 200.7 to 144.2 deaths per 100,000 in that same period (Images 6.2 and 6.3). [22,24]

Image 6.2 U.S. and Oregon age-adjusted cancer incidence rates for all sites combined, 1996-2022

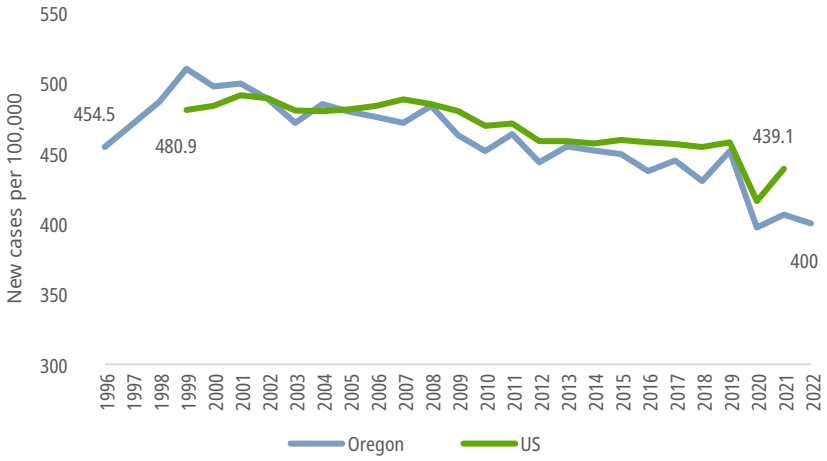
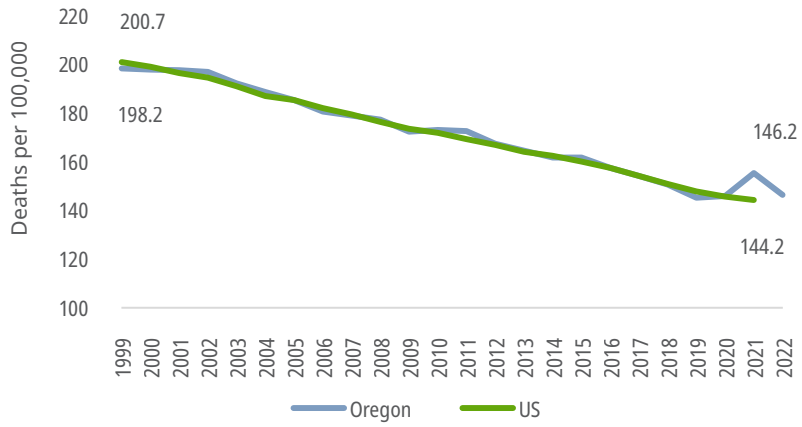


Image 6.3 U.S. and Oregon cancer mortality rates for all sites combined, 1996-2022



In 1999 and compared to other states in the U.S., Oregon had the 10th highest (worst) cancer incidence rates for all types of cancer combined. By 2021, Oregon had dropped to the 5th lowest (best) incidence rates in the country. [22]

Mortality has not decreased at the same rate as incidence. In 1999, Oregon had the 20th highest cancer mortality rate in the U.S., meaning 19 states had a higher overall cancer mortality rate compared to Oregon. By 2021, the state's mortality rate had dropped to the 29th highest, meaning 28 states had a higher overall cancer mortality rate compared to Oregon. [24]

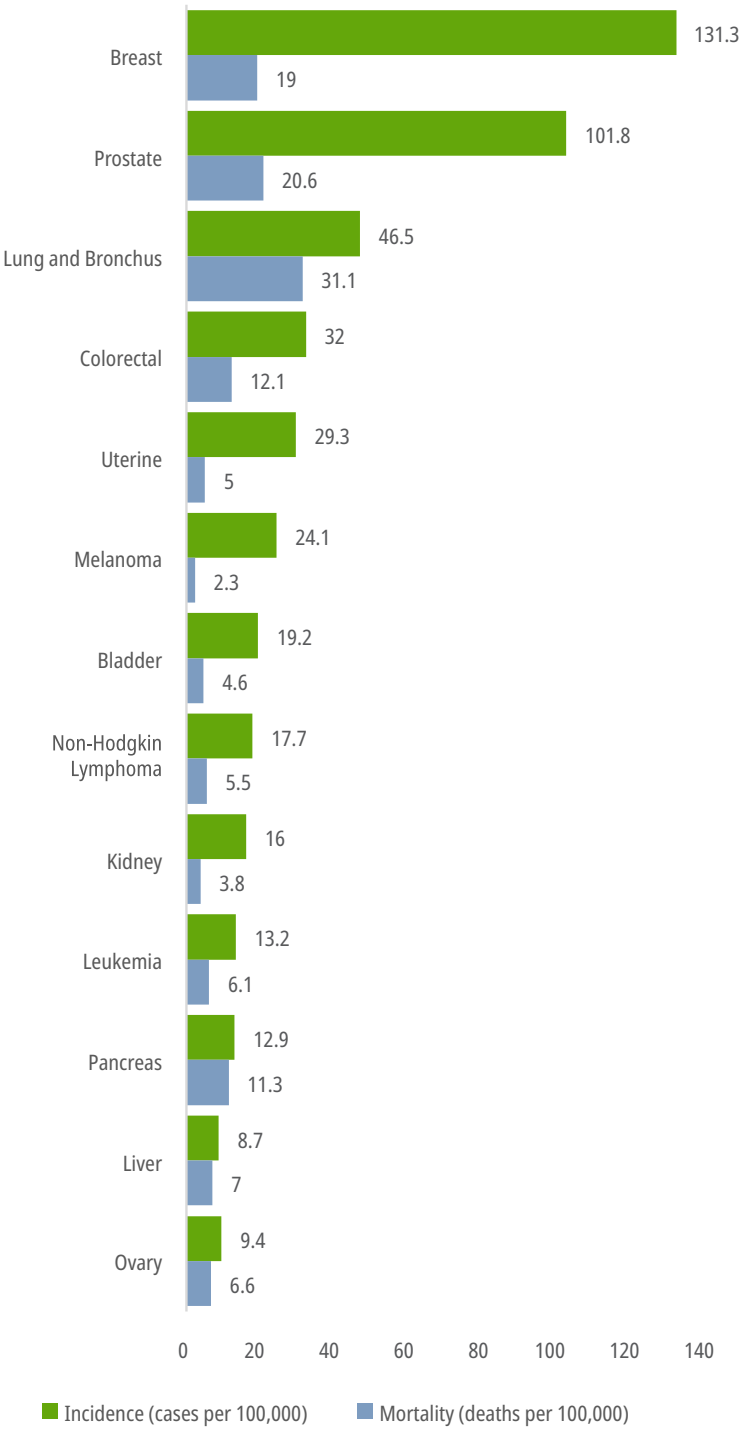
One factor in decreasing cancer mortality is detecting the disease in earlier stages. When cancer is detected earlier, it is often easier to treat. [147] It is important to note that incidence rates may rise initially as collective action improves cancer screening and early detection in our most underrepresented populations, but this increase is generally temporary and then will stabilize. [148]

Top 10 Cancers in Oregon

Over 100 different types of cancers affect Oregonians, most of which are described by the body part of origin or disease site. [2]

Image 6.4 shows incidence and mortality rates for the top ten types of cancers in Oregon. Breast and prostate cancers affect the most Oregonians and are diagnosed at the highest rates, but lung cancer patients experience the highest rate of mortality. [2,23]

Image 6.4 Top 10 disease sites in Oregon, 2018-2022



Cancer in Rural and Urban Areas

Cancer incidence is lower in rural Oregon but mortality is higher in these same regions compared to urban areas.

Overall cancer incidence rates in rural communities are consistently lower than incidence rates in urban areas over time (Image 6.5).[2] This difference in incidence rates is not necessarily because people develop cancer in rural areas at lower rates, but largely because rural communities lack access to primary care, cancer screenings, and medical specialists including those involved in cancer care.[149]

Image 6.5 Cancer incidence rates by rural and urban regions, 2018-2022

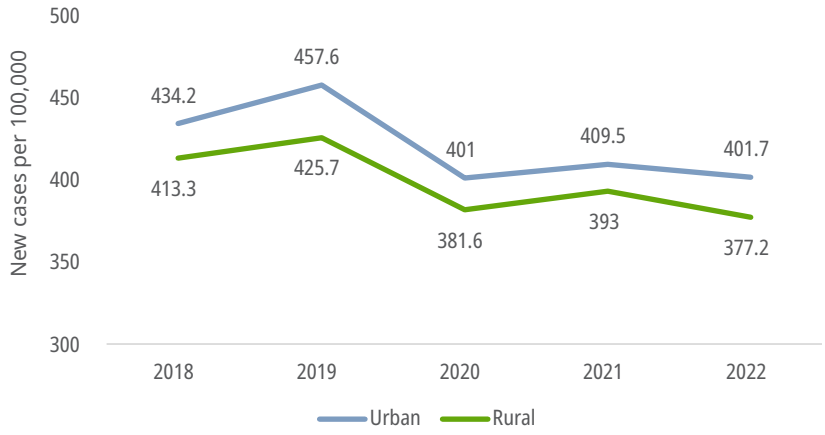
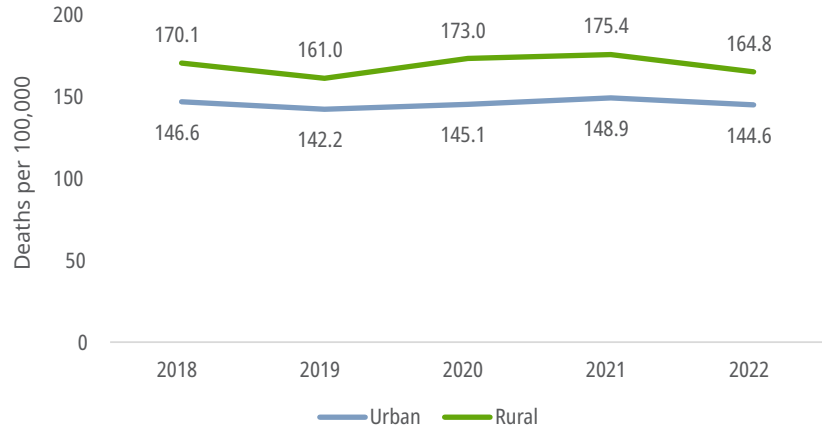


Image 6.6 Cancer mortality rates by rural and urban regions, 2018 -2022



These factors may result in cancers being diagnosed at a later stage and delayed treatment once the cancer is diagnosed. There are often longer wait times to see providers in rural areas, there may be no provider in a patient's county of residence, therefore, rural residents have no other option than to travel long distances to receive the medical care they need.[149] Barriers to health care lead to worse health outcomes and are a fundamental component of the Oregon Office of Rural Health's Areas of Unmet Health Care Need scores as described below.[150] Overall, the mortality rate in rural counties is higher than urban counties (Image 6.6), with eight of ten top counties in the state for overall cancer mortality being rural.[23]

This Plan categorizes rural and frontier counties as 'rural'.

Cancer by Race

The overall statewide decrease in cancer incidence has occurred in all racial groups (Image 6.7). [2]

Mortality has also decreased across all major racial groups, but the rate of decline in mortality is not uniform across racial groups (Image 6.8). The largest reduction in mortality across racial groups was seen in American Indian/Alaska Native (AI/AN) populations. In 2006 and when using 3-year mortality rates, 170.2 deaths per 100,000 in AI/AN populations were from cancer, and in 2022 mortality had decreased to 113.2 deaths per 100,000. [23]

Image 6.7 Cancer incidence rates by race and ethnicity, 1998-2022

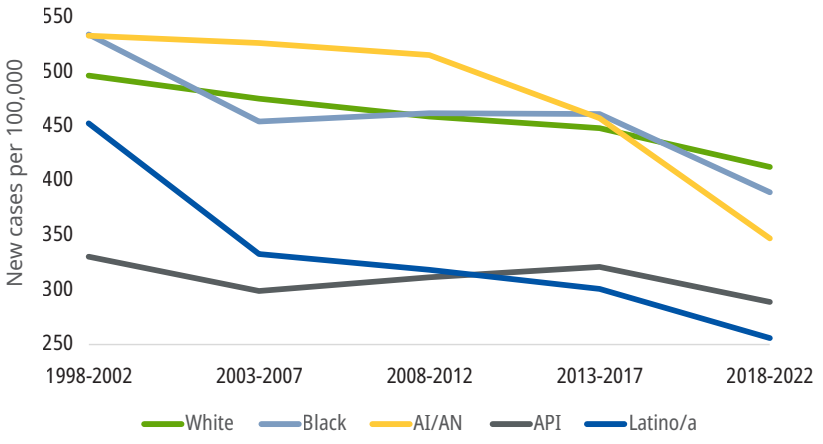
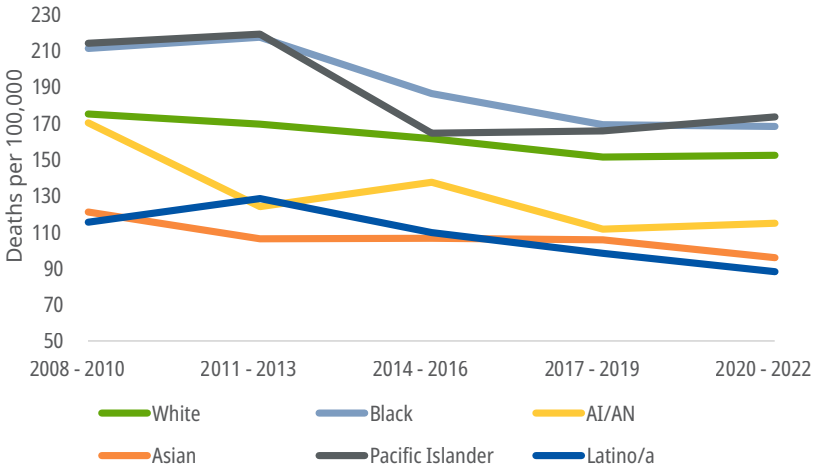


Image 6.8 Cancer mortality rates by race and ethnicity, 2008-2022



Despite a temporary short-term increase, Hispanic or Latino/a populations had substantially lower cancer incidence and mortality rates over the past three decades compared to non-Hispanic or Latino/a populations. In 2021-2022, cancer incidence rates for Hispanic or Latino/a or non-Hispanic or Latino/a were 230.2 and 382.4 per 100,000 respectively while mortality rates were 91.9 and 148.8 per 100,000 respectively. [2,23]

Cancer by Gender

Over the past 25 years, cancer incidence rates for both males and females have decreased. [2]

In 1996, the male incidence rate was 527.9 per 100,000 and the female incidence rate was 404.1 per 100,000. By 2021, the male cancer incidence rate had decreased to 400.8 per 100,000 and the female cancer incidence rate decreased to 380.6 per 100,000 (Image 6.9). This shows that the male incidence rate dropped much more than the female incidence rate. The difference in incidence rates has narrowed, but a rate difference of 20 per 100,000 remains. [2]

Image 6.9 Incidence rates for males and females in Oregon, 1996-2022

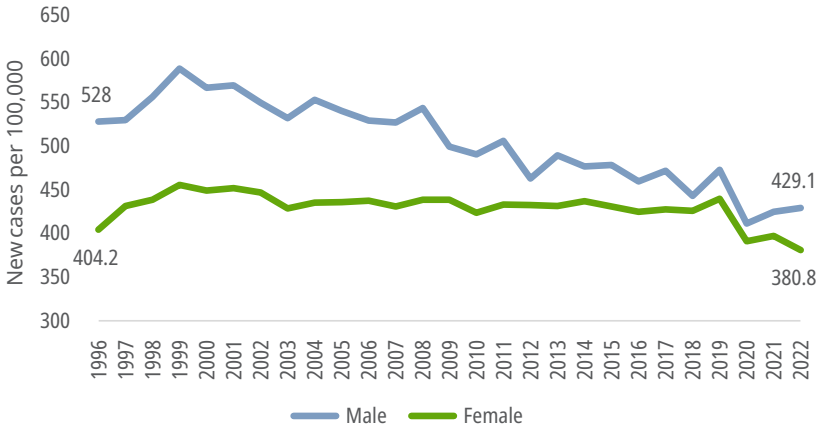
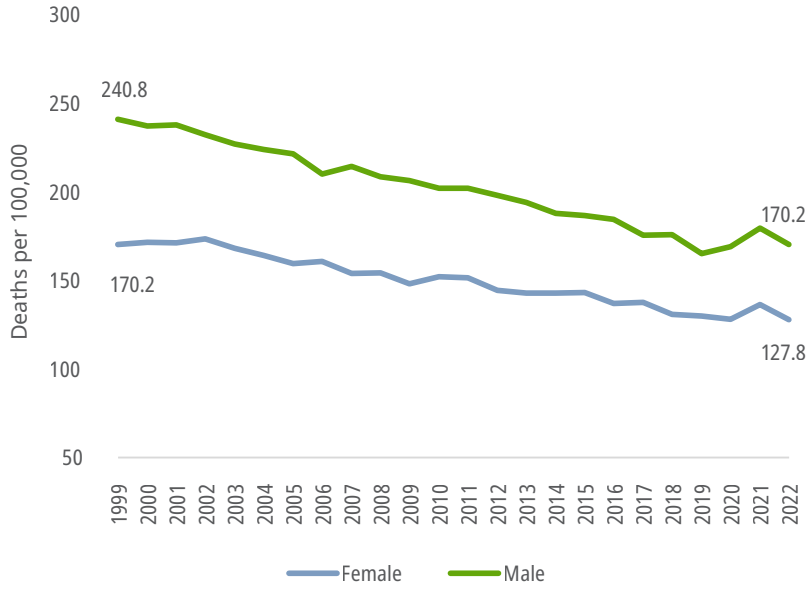


Image 6.10 Mortality rates for males and females in Oregon, 1999-2022



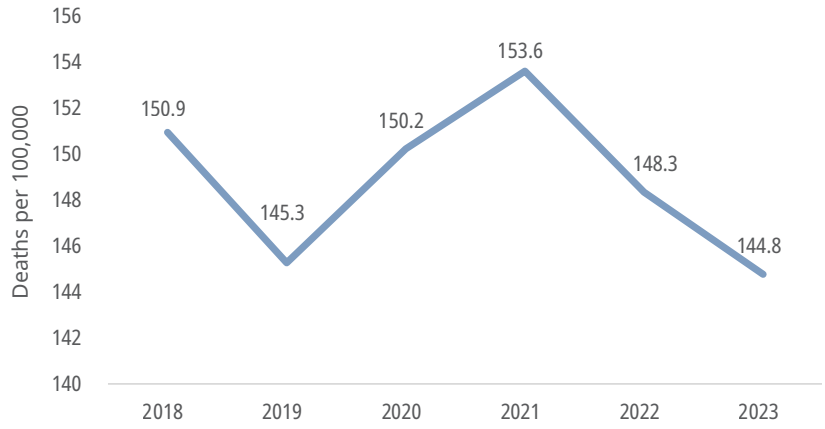
Mortality rates followed a similar trend, although male and female rates maintained a larger difference. In 1999, the cancer mortality rate for males was 240.8 per 100,000, whereas the female cancer mortality rate was 170.2 per 100,000, a difference of approximately 71 per 100,000. By 2022, the male and female mortality rates had decreased to 170.2 and 127.8 per 100,000 respectively, but with a rate difference of 42.8 deaths per 100,000 remaining (Image 6.10). [23]

Cancer Rates and the COVID-19 Pandemic

During the COVID-19 pandemic, due to healthcare resource rationing and social distancing protocols, many people were prevented from or chose not to receive routine medical care, including cancer screenings like mammograms and colonoscopies. [151] Cancer screening is often the way cancers are detected in early stages, when the cancer has not spread to other parts of the body and is often easier to treat. [147]

As described earlier, overall mortality rates from cancer (both nationally and in Oregon) decreased over the past decades partly because more people were getting screened for cancer. [152] The pandemic prevented or interrupted many routine cancer screening tests from happening, and there was great concern that this interruption would result in delayed diagnosis of cancers, meaning more cancer would be diagnosed at distant or late stages, when cancer has spread to other areas of the body. [153]

Image 6.11 Cancer mortality rate before and after the pandemic, 2018-2023



In 2020, the first year of the COVID-19 pandemic, there was a 12.1% decrease in new cancer diagnoses for all stages. [2] Unfortunately, this decrease in newly identified cancers was likely the result of fewer cases being identified through routine screening measures, not due to a reduction in the number of cancers affecting Oregonians. [153] In 2021, the mortality rate for all sites increased by 10 points from 145.9 to 155.2 per 100,000. This translates to 303 additional deaths compared to 2020. Mortality rates fell back to pre-pandemic levels in 2022 (146.2 deaths per 100,000) (Image 6.11). [23]

When cancer is found at later stages, it can be harder to treat. Treatment can be longer, can cost more, and often comes with a poorer prognosis. A systematic review of research conducted about missed cancer screening during the COVID-19 pandemic notes that the result will be a "large number of additional cancer deaths" that could have otherwise been avoided. [153]

This Plan is being written a few years post-inception of the COVID-19 pandemic and the health system at large is still adjusting to a post-pandemic normal while also reacting to new challenges arising in the state and national ever-changing health and policy systems.

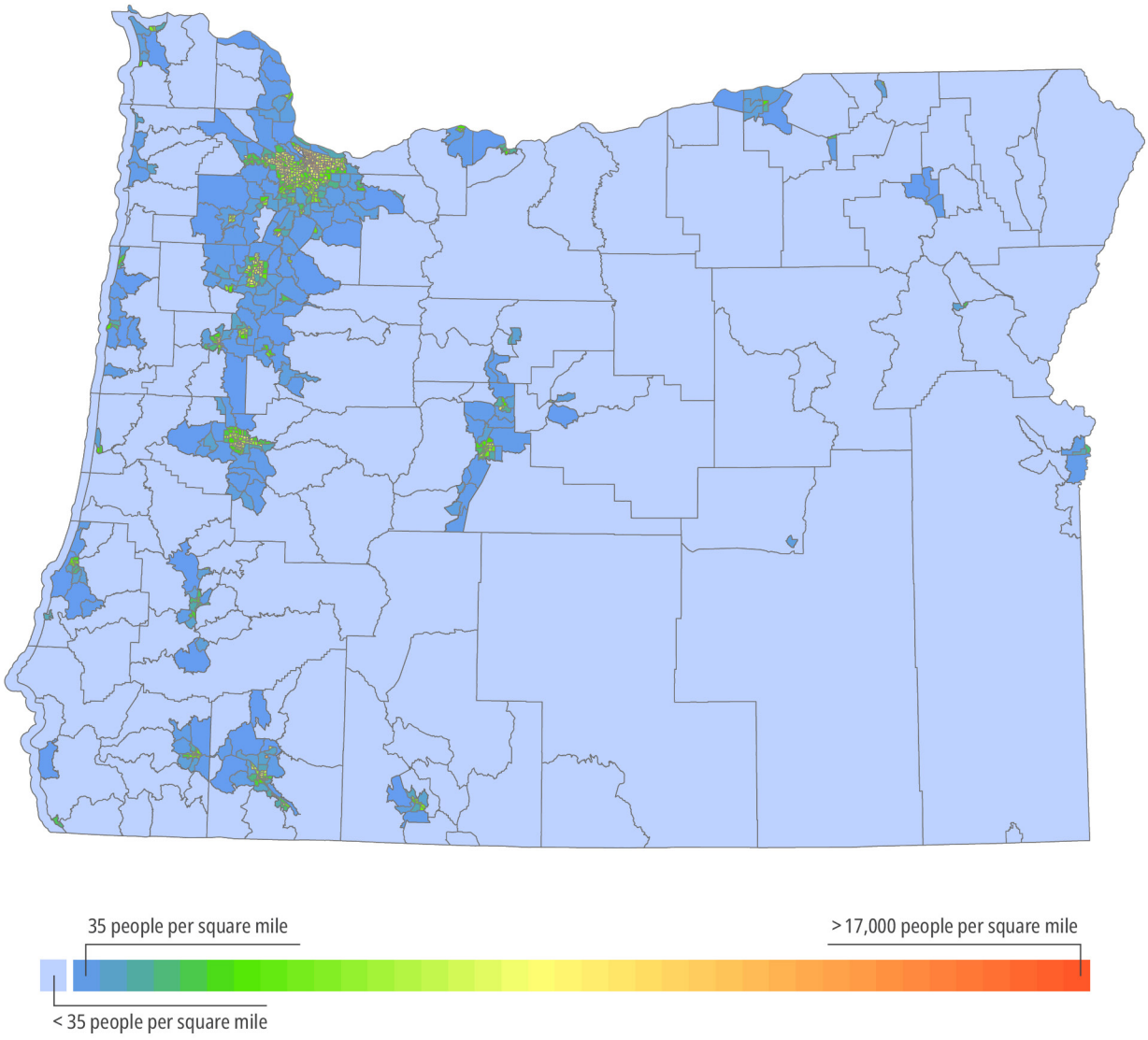
Oregon: The State and Its People

Geography: Rural, Frontier, and Urban

This Plan categorizes rural and frontier counties as 'rural'.

The state of Oregon covers roughly 98,381 sq miles. Over the past 25 years, the population has increased by approximately 24%. [154] As of 2023, 4.2 million people live within its borders. [154] Oregon's geography is overwhelmingly rural and frontier. The designation of a county as rural or frontier is based on ***Rural-Urban Continuum Codes (RUCC)***. Half of Oregon's 36 counties are considered rural and 10 counties are designated as frontier. Image 6.12 is a map of Oregon showing population density throughout the state. Population density is reported utilizing ***census tracts.*** Approximately 76% of Oregon's population lives in or around areas designated as urban and approximately 24% of people live in rural areas. [154]

Image 6.12 Map of Oregon's Population Density



Oregon's Population and Its Demographics

Orientation about How Race and Ethnicity are Collected

Data about the state's racial and ethnic identities are typically collected at the individual level in two steps as standardized by the U.S. Office of Management and Budget.[155] People are first asked to identify themselves by racial categories; AI/AN, Asian, Black or African American, Native Hawaiian and Pacific Islander, and White.[156] People are then asked to identify themselves by ethnicity as either Hispanic or Latino/a or non-Hispanic or non-Latino/a.[155,157]

Racial and Ethnic Demographics

In 2000, 83.5% of Oregon's population characterized themselves as White, non-Hispanic or Latino/a. Since then, all major racial-ethnic groups have seen an increase in population. Image 6.13 demonstrates the state's population growth by racial categories. Native Hawaiian and Pacific Islanders show the greatest population growth (135.9%), followed by Asian (126.8%), Black or African American (92.7%), and AI/AN (90.4%). White, non-Hispanic or Latino/a populations increased by 19.1%.[154]

Image 6.13 Population growth by race, since the 2000 U.S. Census

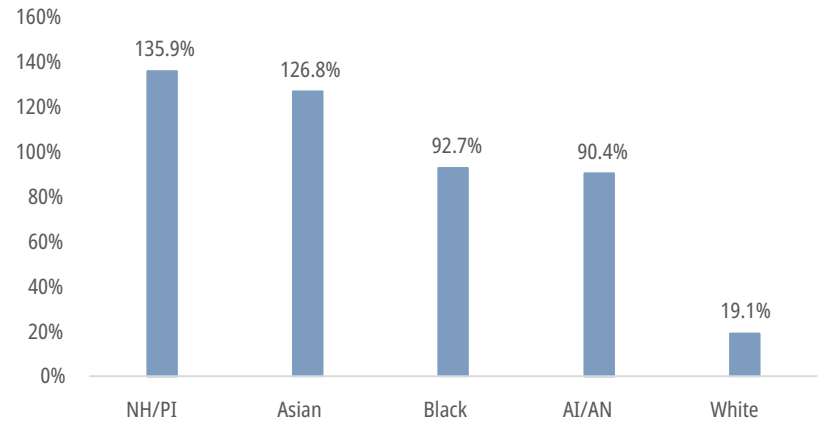
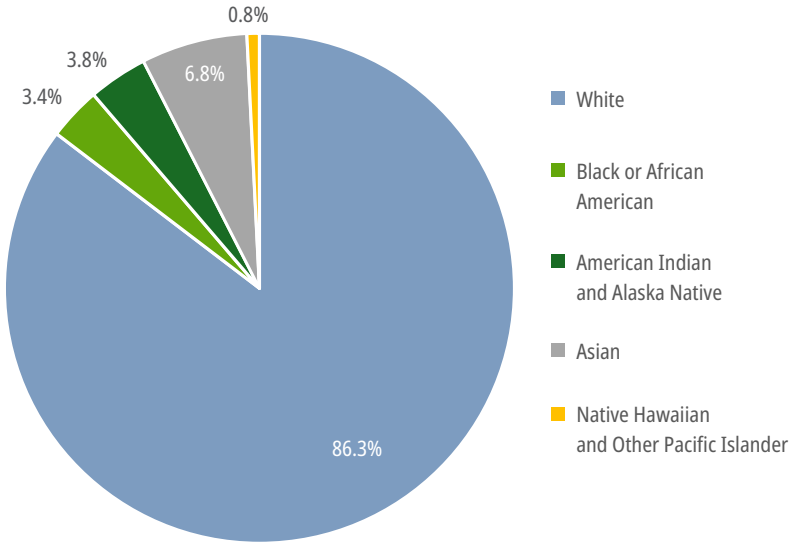


Image 6.14 Oregon Racial Demographics, 2023



Due to the rapid growth in non-White communities, Oregon's White, non-Hispanic or Latino/a population as of 2023 dropped to 70.8% of our total population; from 83.5% in 2000. Oregon's Hispanic or Latino/a population has grown from 8% in 2000 to 14.9% in 2023. When looking at racial identity alone, most Hispanic or Latino/a's identify as White. When including Hispanic or Latino's in our racial categories, Oregon remains overwhelmingly White (86.3%). Of the total number of people who live in Oregon, those identified as Asian represent 6.8% of the population, AI/AN represent 3.8% of the population, Black or African Americans represent 3.4% of the population, and Native Hawaiian or Pacific Islanders represents 0.8% of the population (Image 6.14).

Image 6.15 Image 6.15 Hispanic or Latino Populations in Oregon, 2023

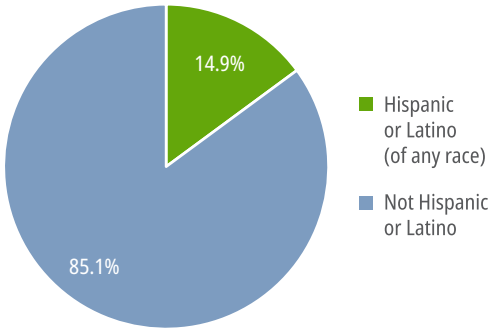


Image 6.16 Hispanic or Latino/a population growth, 2000-2023

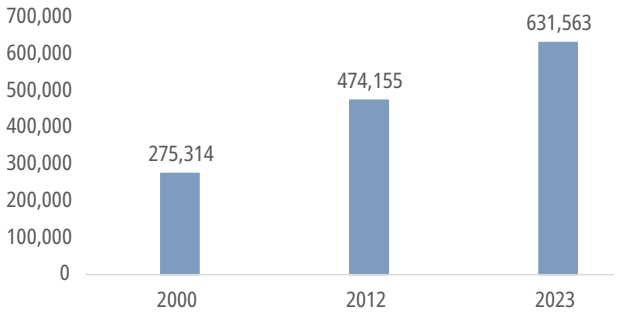
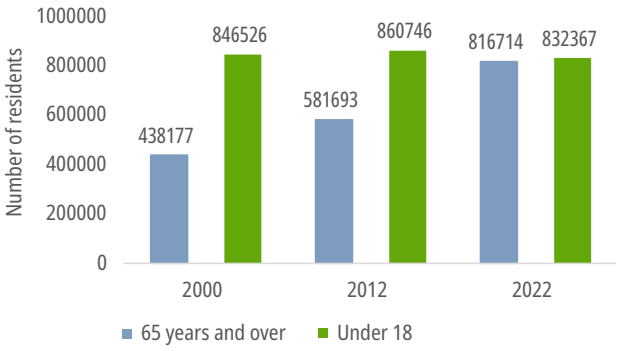


Image 6.17 The number of Oregonians 65 years old or older has nearly doubled in 20 years, whereas the number of children under 18 has plateaued, 2000-2022



The current, fastest growing ethnic minority in Oregon are Hispanic and Latino/a populations. Hispanic or Latino/a populations have more than doubled since 2000 and currently constitute close to 15% of the Oregon population. Nearly all who identify themselves as Hispanic or Latino also identify themselves as White (Images 6.15 and 6.16).

Oregon is an aging state and is the 11th oldest state in the nation.

In 2024, there are fewer residents under the age of 18 than in the year 2000. In the same period, the number of residents aged 65 and over has nearly doubled (Image 6.17).

In 2000, the median age in Oregon was 36.3 but increased to 40.5 years in 2024. The aging trend is not observed in Oregon's Hispanic and Latino populations. In 2022, the median age was 26.9. [154]

Oregon's Access to Care, Insurance, and Socioeconomics

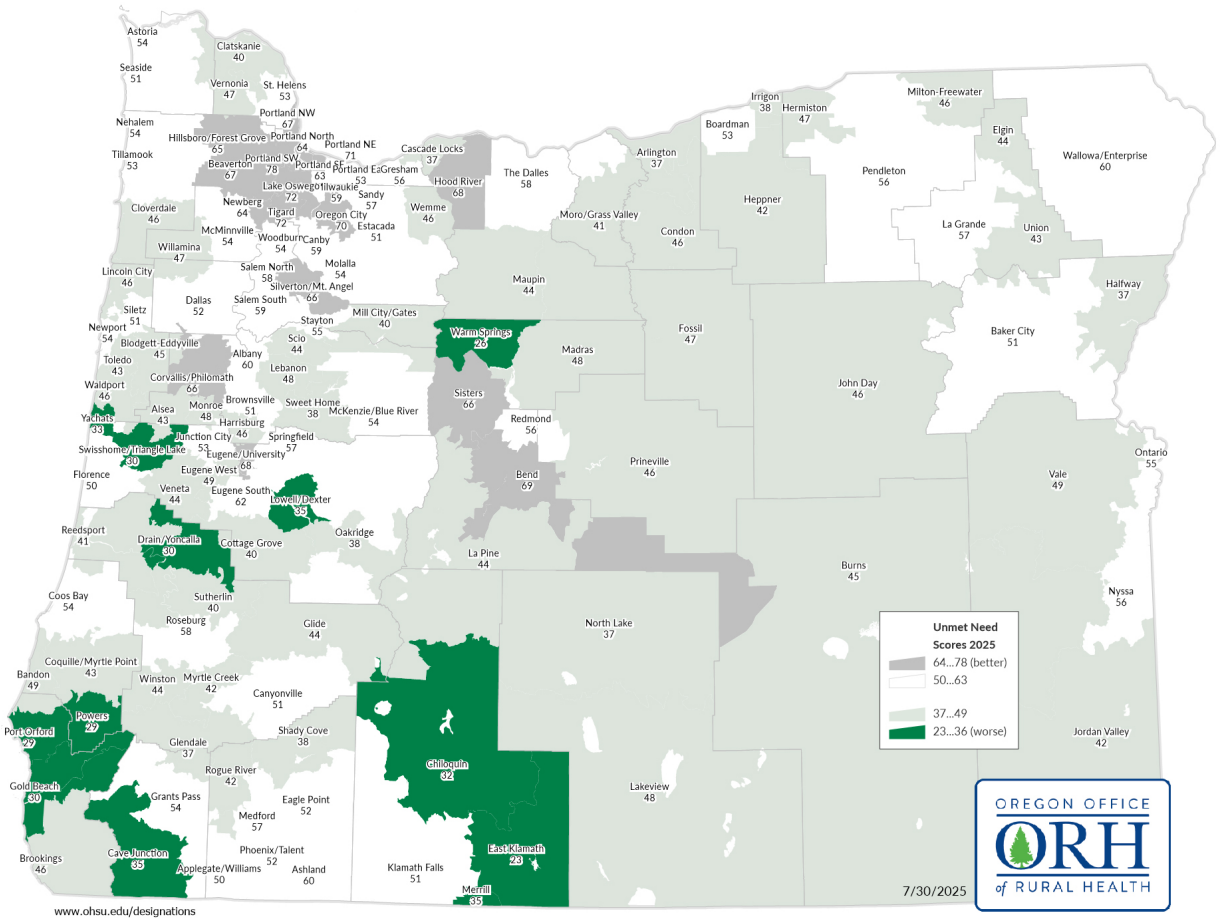
Areas of Unmet Health Care Needs

In 1998, the Areas of Unmet Health Care Need Report was developed in response to the Oregon Legislature's mandate to measure medical underservice in rural areas. The Oregon Office of Rural Health releases this report on an annual basis. (158)

This report is used annually to compare unmet healthcare needs across Oregon's 128 ***primary care service areas***. Unmet healthcare needs are calculated using nine variables that measure access to and utilization of primary physical, mental, and oral health care in each service area. (150) Each of the nine variables are visually represented on separate maps on the **Office of Rural Health's Areas of Unmet Health Care Need webpage**. Image 6.18 is the Oregon Office of Rural Health's 2025 Overall Unmet Need Scores By Service Area Map.

The lowest score possible for demonstrating the highest unmet health care needs is zero while the highest score possible is 90. Lower scores indicate a population's lack of access to healthcare or barriers to care and do not necessarily reflect poorer health or health outcomes. (150)

Image 6.18 Areas of Unmet Health Care Need Scores by Service Area (Avg=49.6), 2025

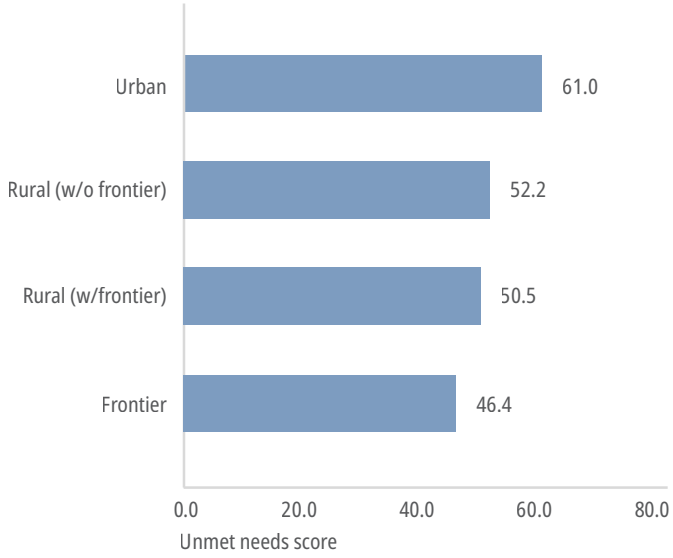


In 2023, Oregon's Unmet Healthcare Needs scores by service area ranged from 22 (worst) to 78 (best). Unmet Healthcare Needs are lowest in Oregon's urban areas, as these service areas score high (61.0). Considering population density (Image 6.12), Unmet Healthcare Needs are more prevalent in the state's rural (52.2) and frontier (46.4) service areas (Image 6.19).

Eighteen of Oregon's 128 service areas are designated as frontier. [150] Barriers faced by residents in these service areas include travel time to care, individuals living at or below the federal poverty line, and a lack of certain types of care providers in their communities. [149]

Travel time to an OHA recognized Patient-Centered Primary Care Home clinic for five of these service areas runs between 22 and 75 minutes, one-way. There are no dentists and/or mental health providers in 13 of these service areas. A lack of access to these types of providers may also increase emergency department visits for dental and mental health care. [150]

Image 6.19 Oregon's per capita Unmet Needs score, 2023



"Part of it is with our rural population that has to travel to Portland for treatment. But it's the cost… rural community members don't have that income or reliable enough transportation to get them out there. So, it's a distance and cost issue."

– Oncology care provider

Insurance Coverage in Oregon

In 2010, the ***Affordable Care Act*** was passed to make "affordable health insurance available to more people." [159] Oregon's healthcare uninsurance rate was 17.1%. [154] In 2012, Oregon executed a five-year extension and amendment to its **1115 Demonstration Medicaid waiver** with the federal Centers for Medicare & Medicaid Services. [160] Under the 2012-2017 waiver, Oregon enrolled most Medicaid members in "coordinated care organizations" (CCOs), Oregon-specific Medicaid managed care organizations; many of the members not enrolled with CCOs were enrolled in Fee For Service plans administered directly by Oregon's Medicaid Office. The newest 1115 Medicaid waiver covers years 2022-2027. [160] By 2023, the number of people who were uninsured dropped to 5.5%. [154]

Despite the state's overall low uninsured rate, not all communities are equitably insured to pay for their expected or unexpected healthcare costs. Almost 50% of rural Oregonians reported being on some kind of ***public insurance*** *(e.g., Medicaid or Medicare)*, either alone or with other insurance, compared to about 37% of urban Oregonians.[†][161] Having public insurance often creates additional ***barriers to care***, especially for rural residents. Some healthcare providers in rural areas do not accept public insurance, Medicaid in particular, because of the administrative burden of billing and low reimbursement rates. [162] Additionally, there are fewer healthcare providers and healthcare facilities in rural areas, which indicates lower ***access to care***. [149] In urban areas, people with public insurance facing this problem are likely to have more options for healthcare and a better chance of finding a clinic that will accept their insurance. [163]

> **"There is a significant provider turn-over in rural areas and patients don't feel like they receive adequate care…".**
>
> **– Oncology care provider**

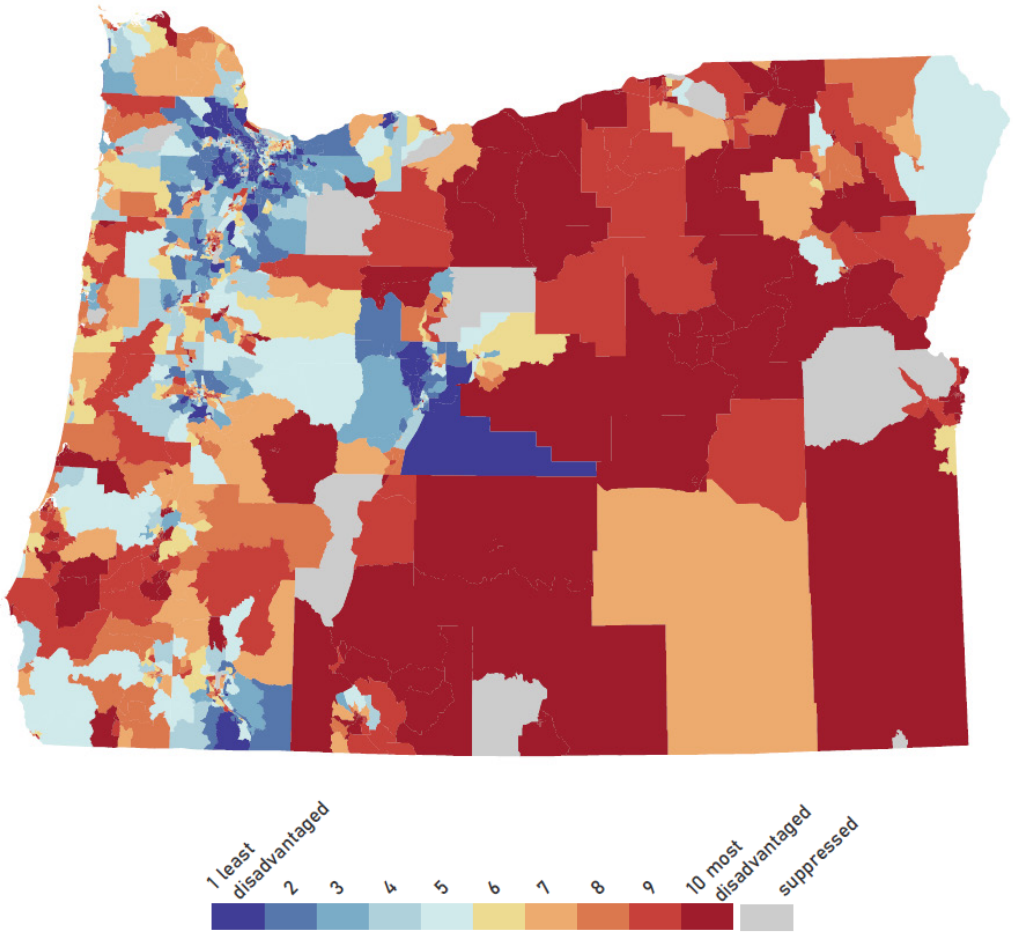
[†] *Health insurance data was analyzed from the American Community Survey (ACS). The ACS is a self-report measure conducted annually. The ACS defines "Public Insurance" as Medicaid, Medicare, and VA health benefits. All three programs can be utilized in alone or in combination with private health insurance. Private health insurance is often subsidized through the State and Federal government but is not considered "Public" despite depending on public dollars. Rural/Urban rates were calculated using ACS data at the census tract-level, using RUCA designations. The most recent data available at the census tract-level were from 2022 and were 5-year rates. All other data are from 2023 1-year rates.*

Oregon's Socioeconomic Landscape

Although most Oregonians have health insurance, most insurance plans require ***co-pays*** and/or have high ***deductibles*** or ***co-insurance***. [164,165] Health insurance costs are generally higher than they have been in the past. [166] Unexpected medical expenses can pose a significant financial strain, often resulting in substantial medical debt and ***financial hardship*** or ***financial toxicity*** [167].

A recent analysis on medical debt by the U.S. Census Bureau found that 1 in 12 Americans have medical debt, 1 in 16 have $1,000 or more in medical debt and 1 in 100 have at least $10,000 in medical debt. [168] Using data from the American Community Survey, researchers at the University of Wisconsin's School of Medicine and Public Health have created an "***Area Deprivation Index***" that quantifies a neighborhood's socioeconomic disadvantage based on common social determinants of health measures, such as: median family income, income disparity, families below the federal poverty level, percent of population without a high school diploma, median home value, median rental cost, percent of population that are single-parent households with children younger than 18. [169,170] This index shows us which communities are the most and least capable of absorbing unexpected costs, such as medical bills. Image 6.20 (the map) is the 'Oregon by Area Deprivation Index,' produced by the University of Wisconsin School of Medicine and Public Health [169].

Image 6.20 Oregon Area Deprivation Index state rankings, 2022



Appendix B: Data

Data Limitations and the Need for Data Equity

Information presented in this report is based on data that have been collected and carefully curated at the federal, state or local level. While these data provide very important insights that help us identify patterns and disparities in cancer incidence, mortality and risk factors, data may also be limited by the data collection methods used to compile the dataset. There is no such thing as "bad data" or "perfect data", however, the usefulness and the impact of a dataset is a product of the collection, interpretation, and the dissemination of that data.

Research protocols used to collect data might utilize data collection tools and methods that were designed decades ago without awareness of or consideration for how to accurately capture underrepresented communities. [171,172] Personal bias, structural bias, and societal bias always influence the different intentional or unintentional choices made at every stage of the process. The choices usually attempt to comply with the established criteria and standards which do not necessarily align with the experiences of the people most affected. Many communities are also hesitant to participate in research due to past or present exploitation or misrepresentation. For those willing to participate, the demographic category choices offered do not always reflect the realities of how people perceive their identities. [173]

Some of the most prevalent concerns are around the collection of race and ethnicity demographics. The data reports produced by standardized collection categories and methods often show differences between racial and ethnic groups. Differences between racial and ethnic minorities may be incorrectly interpreted to be associated with biological differences between groups. Instead, these disparities usually demonstrate the impact of structural racism and other systemic barriers as well as cultural differences across groups. According to the American Medical Association, the "practice of accepting race as a biological construct—known as racial essentialism—exacerbates health disparities and results in detrimental health outcomes for marginalized and minoritized communities." [174]

Significant differences between groups as reported in data reflect current and historic exclusion from opportunities for health, which begin where we live, learn, work and play.

This topic, along with many others not discussed here, point to assertions that the established ways of collecting, analyzing, and reporting data do not align with the concept of health equity because they often lead to incorrect or incomplete descriptions of and conclusions about specific communities, omit some groups altogether, and unintentionally perpetuate harmful and false ideas. ***Data equity*** is needed as a part of achieving health equity. [175,173]

To ensure future action incorporates everyone's voices and identities, all Oregonians will need to work together over time to improve representation in the data and data equity in the state and with publicly available data.

Limitations of Data Used in this Document

The data used in this document includes Oregon State Cancer Registry (OSCaR), Behavioral Risk Factor Surveillance System (BRFSS), Prevention's Chronic Conditions and Chronic Conditions Risk Factors Data Portal, U.S. Census, and OHSU's Office of Rural Health. The availability of cancer data typically lags several years. The occurrence of COVID-19 has impacted the cancer burden and data, and in some cases the most current data available is from 2022. The full impact of the pandemic is not yet known on cancer rates. [176] Data on some of Oregon's smaller demographic groups are often suppressed in order to protect the confidentiality of those individuals. [177]

Despite the concerns around the established methods and limitations of data collection and reporting, data in this document is the best and most recent reliable final data available. Even so, it is important to describe different limitations and choices made in the compilation of this cancer burden report.

- BRFSS Modeled Data: BRFSS data at the county, Zip Code Tabulation Area (ZCTA), and Census tract level is released by the CDC using a statistical model to fill in any gaps due to low response rates. These modeled data will not adequately capture major outliers (particularly high or low values) if present. For this reason, every attempt was made to use rates calculated using raw data released by the CDC as well as data collected by OHA. By calculating our own rates, we can provide more accurate data, but this process often requires aggregating groups of people. For example, Native Hawaiian and Pacific Islanders are often combined with Asians to create the composite group "Asian and Pacific Islander". [178]
- Racial and ethnic "categories", or the way individuals are grouped, is defined by social, geographic, and perceived cultural and physical characteristics. Most data collected by State and Federal agencies, including data collected by U.S. Census and many health-related data collection activities, use racial and ethnic categories established decades ago. [179]

  The Office of Management and Budget released a new set of standards on March 28th, 2024, and federal agencies must update all data collections and programs to be in compliance with these standards by 2029. [180] The new standards include the following:

  - Using one combined question for race and ethnicity and encouraging respondents to select as many options as apply to how they identify themselves.
  - Adding Middle Eastern or North African as a new category. The new set of minimally required race and/or ethnicity categories are: American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Middle Eastern or North African, Native Hawaiian and Pacific Islander, and White.

- Requiring the collection of additional detail beyond the minimum required race and ethnicity categories for most situations, to ensure ability to disaggregate populations in the collection, tabulation, and presentation of data when useful and appropriate.

This is one positive step towards data equity, but there are still many steps needed to create a transformation of established data collection systems and structures.

- Census Data: The U.S. Census (Census) has been the national standard for understanding population trends in the nation since 1790. The current data collection model relies on self-report or door-to-door in-person interviews and adheres to data standards established by the Office of Management and Budget. The Census is required to collect data from all individuals who reside in the U.S., however, due to historic discrimination, exploitation, and efforts to marginalize new arrivals, many individuals from communities of color are reluctant to participate in the Census. When collecting data, we often look to the Census to tell us how many individuals of each group we need to capture to represent the total population. By undercounting communities of color, we are compounding the issue of underrepresentation by leaving large proportions of those groups out of our data collection efforts. [181]

Appendix C: Detailed Explanation of how the Plan's Authors Chose the Priority Cancer Sites

At the beginning of this document, this Plan provides a high-level view about how the four disease sites (liver, breast, colorectal and lung cancers) were chosen. In order to be transparent, this section was created to offer a more detailed explanation of the data-driven and collaborative analysis performed to choose these areas of focus.

Disease site selection process:

To concentrate efforts to support the creation of change, the leadership team chose to limit its focus to four cancer types and one special area of focus. Three criteria were used to determine the four cancer sites:

1. Cancer inequities, or excess cancer burden by group.
2. Lack of measurable progress by cancer type.
3. The extent to which actionable and achievable interventions or efforts already exist that could be harnessed to reduce the cancer burden.

Each criterion considered multiple data points. The data points led to a scoring system. Those scores were normalized across each criterion, combined to create a selection score for each area of focus, and the steering committee voted.

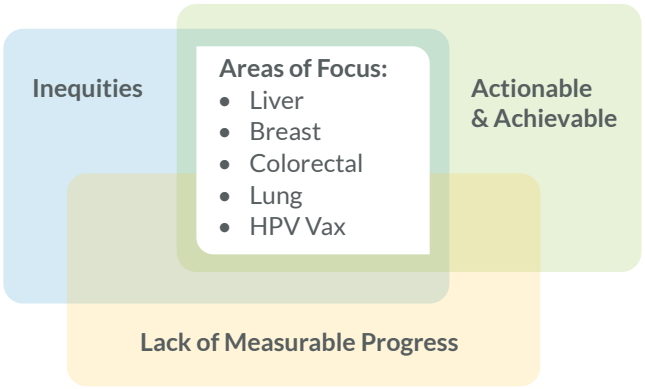
How Were the Priority Cancer Sites Chosen?

Inequity score calculation used:

- Inequities between groups within Oregon compared to their peers across the nation.
- Inequities between groups within Oregon compared to all Oregonians.

Lack of Measurable Progress Score Calculation Used:

- Rate trends: Have rates been going up or down over time?
- Rate trend difference: How do these trends compare to national trends?
- Raw rates: Incidence and Mortality rates
- Mortality over incidence ratios



Actionable and Achievable score used:

- Is there a United States Preventative Services Taskforce guideline for screening?
- Are there treatment trials for this disease site currently enrolling in Oregon?
- Are there early detection trials for this disease site currently enrolling in Oregon?
- Does the disease site include a modifiable behavioral risk factor?
- Does OHA have intact initiatives or activities related to modifiable cancer risk factor and/or screening?
- Are there evidence-based early detection measures?

The bulleted data points led to a scoring system. The resulting scores were normalized across each criterion and combined to create a selection score for each areas of focus. The Steering Committee then voted to approved the cancer sites with the highest scores: liver, breast, colorectal, and lung cancer (Table 5).

Table 5. Cancer Site Scoring		
Cancer Type	**Total Score**	**Rank**
Liver and Intraheptic Bile Duct	2.46	1
Colon and Rectum	2.01	2
Breast	1.92	3
Lung and Bronchus	1.87	4
Pancreas	1.77	5
Prostate	1.72	6
Corpus and Uterus, NOS	1.7	7
Leukemia	1.62	8
Melanoma of the Skin	1.6	9
Kidney and Renal Pelvis	1.52	10
Urinary Bladder	1.49	11
Ovary	1.46	12
Brain and Other Nervous System	1.36	13
Non-Hodgkin Lymphoma	1.15	14

Cancer Inequities

Inequity was assessed using the two types of comparisons:

- Inequities between groups within Oregon compared to their peers across the nation
- Inequities between groups within Oregon compared to all Oregonians

Data from the Oregon State Cancer Registry (OSCaR), the Vital Statistics program, and from CDC's Wonder database were used to make these comparisons. Incidence and mortality rates for the following demographic groups were compiled for these comparisons: Overall, Male, Female, White, Black or African American, AI/AN, Asian Pacific Islander, Hispanic or Latino/a, Urban residents, Rural or Frontier residents, and those under 50 years old.

These comparisons were quantified by calculating a rate difference. Rate differences were calculated by taking each group's incidence or mortality rate, subtracting the comparator rate for that group, then dividing by the comparator rate. For example, the colorectal cancer incidence rate for men in Oregon is 31.5 new cases per 100,000; the colorectal cancer incidence rate for men in the US is 35.6 new cases per 100,000. The rate difference calculation for this example would be: (31.5-35.6)/35.6; giving men in Oregon a colorectal cancer incidence rate difference of: -0.12). Rate differences were calculated for

each group, for both incidence and mortality, as well as for US as the comparator and Oregon's overall rate as the comparator.

In order to calculate an overall "inequity score" we added all rate differences and normalized the data to a "0" to "1" distribution. To do this, we normalized the data by adjusting the range of scores to 0 or above, then we took the highest score and divided each disease site's score from that score, creating a ratio to the highest score. For example, liver cancer had the highest non-normalized "inequity score" at 10.53, colorectal cancer had a non-normalized score of 1.55; the final normalized "inequity scores" for liver cancer and colorectal cancer were 1 and 0.15, respectively.

Lack of Measurable Progress:

Lack of measurable progress was assessed using the following measures:

- Rate trends: Have rates been going up or down over time?
- Rate trend difference: How do these trends compare to national trends?
- Raw rates: Incidence and Mortality rates
- Mortality over incidence ratios

Using the same incidence and mortality data collected for inequities, we calculated rate trends, rate trend differences, mortality over incidence ratios, and we added raw incidence and mortality rates as suggested by the steering committee.

Rate trends were assessed by taking single-year incidence and mortality rates from 1999-2022 and calculating the slope of the trendline. Positive numbers indicated the rates were increasing over time, negative numbers indicated the rates were decreasing over time. We calculated rate trends for all disease sites, for both incidence and mortality, and for Oregon and U.S. data over the same time period.

Rate trend differences were assessed by taking the U.S. rate trend and subtracting the Oregon rate trend. Positive numbers indicated that Oregon's rate is increasing faster than the U.S.'s rate or that Oregon's rate is not improving as fast as the U.S.

The advisory committee strongly recommended that we increase the weighting of both incidence and mortality as disease sites with the highest incidence and mortality disproportionately affect more Oregonians than disease sites with lower rates. In order to add weight to disease sites with higher rates of mortality, we also added mortality over incidence ratios by taking each disease site's overall mortality rate and dividing by that disease site's overall incidence rate.

In order to combine data with drastically different scales, we normalized each component score by adjusting the range of scores to 0 or above, then we took the highest component score and divided each disease site's component score from that score. For example, breast cancer has the highest incidence rate at 123.8, liver cancer had one of the lowest at 8.3, this created an incidence ratio of 1 for breast cancer and 0.07 for liver cancer. After creating a ratio for each component score, we added all component scores together and created an overall "Lack of Measurable Progress" score by calculating a ratio to the top score, just as we did for each component score.

Actionable and Achievable:

Whether a disease site is "actionable" was assessed using the following questions:

- Is there a USPSTF guideline for screening?
- Are there treatment trials for this disease site currently enrolling in Oregon?
- Are there early detection trials for this disease site currently enrolling in Oregon?
- Does the disease site include a modifiable behavioral risk factor?
- Does OHA have intact initiatives or activities related to modifiable cancer risk factor and/or screening?
- Are there evidence-based early detection measures?

Each disease site received a score of "1" for every question we answered "yes" and a "0" if we answered "no". We then added all scores together and created an "actionable ratio" by dividing each score by the highest score.

Total Score:

To create a total score, we summed up each of the three component scores, which have been normalized to a distribution of 0 to 1. Final scores ranged from 1.15 to 2.46. The top 4 disease sites were selected from these final scores (Table 6).

Appendix D: Acknowledgment and Thank You

The creation of this document would not have been possible without the participation and input of the following individuals.

Steering Committee Members	
Char Raunio	American Cancer Society
Eric Vinson	Northwest Portland Area Indian Health Board
Bud Pierce, MD	Oregon Medical Association (Former President)
Ada Catanzarite	Oregon Primary Care Association
Pehr Hartvigson, MD	Columbia Memorial Hospital
Susan Stearns	Pink Lemonade Project
Deb Howes	BridgeBio Pharma, Inc.
Linyee Chang, MD	St. Charles Cancer Institute
Shelley S. Tworoger, PhD	OHSU Knight Cancer Institute
Keri Vartanian, PhD	Providence Health System's Center for Outcomes Research and Evaluation
Janessa Wells	Oregon Coalition of Local Health Officials
Equity Consultant	
Koffi Dessou	Koffi Dessou Consulting
Data Team	
Wesley Stoller	OHSU Knight Cancer Institute's Community Outreach and Engagement
Rodney Garland-Forshee	Oregon Health Authority, Public Health Division, Health Promotion and Chronic Disease Prevention, Comprehensive Cancer Control Program
Sierra Willett	Oregon Health Authority, Public Health Division, Health Promotion and Chronic Disease Prevention, Comprehensive Cancer Control Program
Melania Tolan-Hudson	Oregon State Cancer Registry

Leadership Team	
Steven Blakesley	OHSU Knight Cancer Institute's Community Outreach and Engagement
Lizzie Moore	Oregon Health Authority, Public Health Division, Health Promotion and Chronic Disease Prevention, Comprehensive Cancer Control Program
Paige Farris	OHSU Knight Cancer Institute's Community Outreach and Engagement
Jeff Soule	Oregon Health Authority, Public Health Division, Health Promotion and Chronic Disease Prevention, Comprehensive Cancer Control Program
Wesley Stoller	OHSU Knight Cancer Institute's Community Outreach and Engagement
Jackie Shannon, PhD	OHSU Knight Cancer Institute's Community Outreach and Engagement
Clinical Expert Reviewers	
Liver	Flavio Rocha, MD, FACS, FSSO (OHSU)
Breast	Nathalie Johnson, MD, FACS (Legacy Cancer Institute)
Colorectal	V Liana Tsikitis, MD, MCR, ACS, FASCRAF (OHSU)
Lung	Peter Lee, MD, MHS (OHSU)
HPV Vaccination	Amanda Bruegl, MD (OHSU)
Oregon Health Authority – Public Health Division Programs And Subject Matter Experts	
Comprehensive Cancer Control Program, Health Promotion and Chronic Disease Prevention Section	
Surveillance, Evaluation, and Epidemiology Team, Health Promotion and Chronic Disease Prevention Section	
Colorectal Cancer Screening and Prevention Program, Health Promotion and Chronic Disease Prevention Section	
ScreenWise Breast and Cervical Cancer Screening Program, Adolescent Health, ScreenWise, and Reproductive Health Section	
Tobacco Program, Health Promotion and Chronic Disease Prevention Section	
Alcohol Program, Health Promotion and Chronic Disease Prevention Section	
Oregon Radon Awareness Program, Environmental Public Health Section	
Hepatitis Team, Acute & Communicable Disease Prevention Program and Oregon Immunization Program	
HPV Team, Oregon Immunization Program	

Glossary

The following definitions are quoted directly from the sources linked to or specified below, retrieved August of 2025, unless otherwise specified.

access to care – the timely use of personal health services to achieve the best possible health outcomes. U.S. Department of Health and Human Services, Healthy People 2030

Affordable Care Act – The Patient Protection and Affordable Care Act, referred to as the Affordable Care Act or "ACA" for short, is the comprehensive health care reform law enacted in March 2010 with the goal of making affordable health insurance available to more people, expanding the Medicaid program to additional adults with limited incomes, and supporting innovation in medical care delivery methods to lower health care costs. U.S. Department of Health and Human Services

at-home stool test kits – tests [that] look at the stool (feces) for possible signs of colorectal cancer or polyps, such as small amounts of blood or changes in the DNA or RNA from cells in the stool. These tests can be done at home, and many people find they are more convenient and easier to have than visual tests like a colonoscopy. American Cancer Society

baby boomers – a person born in the U.S. following the end of World War II (usually considered to be in the years from 1946 to 1964) Merriam-Webster Dictionary

barriers to care – barriers to health care include lack of health insurance, poor access to transportation, and limited health care resources, and contribute to disparities in health. U.S. Department of Health and Human Services Office of Disease Prevention and Health Protection

bile - a fluid made by the liver and stored in the gallbladder. Bile is excreted into the small intestine, where it helps digest fat. National Cancer Institute

cancer site – see ***disease site***

cancer burden – the impact of cancer on society, which includes the number of new cases, the number of deaths, the number of people living with cancer, and the financial costs associated with the disease. It encompasses both the physical and emotional challenges faced by patients and their families as well as the economic and social costs to the healthcare system and society at large. Cancer Science

census tracts – small, relatively permanent statistical subdivisions of a county or statistically equivalent entity that can be updated by local participants prior to each decennial census as part of the Census Bureau's Participant Statistical Areas Program. U.S. Census Bureau

co-insurance – the percentage of costs of a covered health care service paid by the patient after paying the deductible. Healthcare.gov

co-pays – copayment is a relatively small, fixed fee that a health insurer requires the patient to pay upon incurring a medical expense (as for a routine office visit, surgical procedure, or prescription drug) covered by the health insurer. **Merriam-Webster Dictionary**

colonoscopy – a procedure a doctor uses to look at the inside of the colon and rectum with a colonoscope, which is a long, flexible tube about the width of a finger with a light and small video camera on the end. It's put in through the anus and into the rectum and colon. Special instruments can be passed through the colonoscope to biopsy (sample) or remove any suspicious-looking areas such as polyps, if needed. **American Cancer Society**

colorectal cancer – cancer that develops in the colon (the longest part of the large intestine) and/or the rectum (the last several inches of the large intestine before the anus). **National Cancer Institute**

completion rates - the proportion of the target population that have received all recommended doses for a particular vaccine series. **MacDonald et al., Human Vaccines & Immunotherapies**

data equity – the consideration, through an equity lens, of the ways in which data is collected, analyzed, interpreted, and distributed. It underscores marginalized communities' unequal opportunities to access data and, at times, their harm from data's misuse. **Hawai'i Data Cooperative**

deductibles – the amount the patient pays for covered health care services before the insurance plan starts to pay. **HealthCare.gov**

disease site – the part of the body where the cancer originated; the primary site, regardless of metastasis. **University of Manitoba Max Rady College of Medicine**

disparities – Cancer affects all population groups in the United States, but due to social, environmental, and economic disadvantages, certain groups bear a disproportionate burden of cancer compared with other groups. Population groups that may experience cancer disparities include groups defined by race, ethnicity, disability, sex, geographic location, income, education, age, sexual orientation, national origin, and other characteristics. **National Cancer Institute**

distant stage - refers to cancer that has spread from the original (primary) tumor [or primary disease site] to distant organs or distant lymph nodes. Also called distant metastasis. **National Cancer Institute**

early stages – "Early-stage cancer" is a term used to describe cancer that is early in its growth and may not have spread to other parts of the body. What is called early stage may differ between cancer types. **National Cancer Institute**

excessive alcohol use – a term used to describe four ways that people drink alcohol that can negatively impact health and includes: binge drinking, heavy drinking, underage drinking (people younger than 21), or drinking while pregnant. **Centers for Disease Control and Prevention**

financial hardship or financial toxicity – problems a patient has related to the cost of medical care. Not having health insurance or having a lot of costs for medical care not covered by health insurance can cause financial problems and may lead to debt and bankruptcy. **National Cancer Institute**

frontier – any county in Oregon with six or fewer people per square mile. **Oregon Office of Rural Health**

genotype - a term that refers to the two alleles present at a specific locus in the genome. Genotype also refers to the entire genetic makeup of an individual. **National Cancer Institute**

hereditary – genetically transmitted or transmittable from parent to offspring. **Merriam-Webster Dictionary**

incidence – the number of new cases of a disease diagnosed each year. **National Cancer Institute**

inequities – Health inequities refer to differences in people's health that are unjust and avoidable and may relate to differences between groups based on, among others, socioeconomic position, race or ethnicity, sex, disability, gender, migration status, or place of residence. **The Cancer Atlas**

initiation rate - the proportion of the target population that have received the first dose in a specified vaccine series. **MacDonald et al., Human Vaccines & Immunotherapies**

intrahepatic bile ducts - a bile duct that passes through and drains bile from the liver. **National Cancer Institute**

late stage – "Late stage cancer" is a term used to describe cancer that is far along in its growth and has spread to the lymph nodes or other places in the body. **National Cancer Institute**

LDCT (low-dose computed tomography) – a procedure that uses a computer linked to an x-ray machine that gives off a very low dose of radiation to make a series of detailed pictures of areas inside the body. **National Cancer Institute**

localized cancer/local stage - cancer that is found only in the tissue or organ where it first began and that has not spread to nearby lymph nodes or to other parts of the body. **National Cancer Institute**

metastatic cancer - having to do with metastasis, which is the spread of cancer from the primary site (place where it started) to other places in the body. **National Cancer Institute**

mortality – the number of deaths, with cancer as the underlying cause of death, occurring in a specified population during a year. Cancer mortality is usually expressed as the number of deaths due to cancer per 100,000 population. **National Cancer Institute**

normalized – In statistics, the term "normalization" refers to the scaling down of the data set such that the normalized data falls between 0 and 1. This normalization technique helps compare corresponding normalized values from two or more data sets. **Wall Street Journal**

obesity – "Overweight" and "obesity" are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese. **World Health Organization.**

polyps - a growth that protrudes from a mucous membrane. **National Cancer Institute**

primary tumor – A term used to describe the original, or first, tumor in the body. Cancer cells from a primary tumor may spread to other parts of the body and form new, or secondary, tumors. This is called metastasis. These secondary tumors are the same type of cancer as the primary tumor. Also called primary cancer. **National Cancer Institute**

primary care service areas – developed to measure primary care resources, utilization, and associated outcomes. PCSAs are used by policymakers and researchers as a standardized system of geographical units through which to assess access to, supply, use, organization, and financing of primary care services. **Goodman et al., Health Services Research**

public insurance – Public health insurance is a program run by U.S. federal, state, or local governments in which people have some or all of their health care costs paid for by the government. The two main types of public health insurance are Medicare and Medicaid. **National Cancer Institute**

regional stage/finding cancer regionally – cancer that has spread beyond the original (primary) site to nearby lymph nodes or organs and tissues. **National Cancer Institute**

relative survival rates – a way of comparing the survival of people who have a specific disease with those who don't, over a certain period of time. This is usually five years from the date of diagnosis or the start of treatment for those with the disease. **National Cancer Institute**

rural – any geographic areas in Oregon ten or more miles from a population center of 40,000 people or more. **Oregon Office of Rural Health**

Rural-Urban Continuum Codes (RUCC) – [codes that] distinguish U.S. metropolitan (metro) counties by the population size of their metro area, and nonmetropolitan (nonmetro) counties by their degree of urbanization and adjacency to a metro area. **USDA Economic Research Service**

social determinants of health (SDOH) - nonmedical factors that influence health outcomes, including the conditions in which people are born, grow, work, live, worship, and age. These conditions include a wide set of forces and systems that shape daily life such as economic policies and systems, development agendas, social norms, social policies, and political systems. **Centers for Disease Control and Prevention (CDC)**

test-to-treat model – For hepatitis C (HCV), this means that a person has been confirmed to be infected with and infectious for the HCV virus (is RNA-positive). This confirmed positive result allows the provider and patient to collaborate in curing HCV with direct-acting antiviral medications received by the patient the same day as diagnosis. This model increases the chances a person will start medication and clear the virus from their body. **Harm Reduction Journal**

triple-negative breast cancer – a type of breast cancer in which the tumor cells do not have estrogen receptors, progesterone receptors, or large amounts of HER2/neu protein on their surface. **National Cancer Institute**

urban – An urban area will comprise a densely settled core of census blocks that meet minimum housing unit density and/or population density requirements. This includes adjacent territory containing non-residential urban land uses. To qualify as an urban area, the territory identified according to criteria must encompass at least 2,000 housing units or have a population of at least 5,000." **U.S. Census Bureau**

USPSTF (U.S. Preventive Services Task Force) – an independent group of national experts in prevention and evidence-based medicine that works to improve the health of all Americans by making evidence-based recommendations about clinical preventive services such as health screenings and preventive medications. **U.S. Preventive Services Task Force**

References

1. Oregon Health Authority. *Leading Causes of Death, 2003-2023*. Center for Health Statistics, Center for Public Health Practice, Public Health Division. https://visual-data.dhsoha.state.or.us/t/OHA/views/LeadingCausesDash/LeadingDash1?%3AisGuestRedirectFromVizportal=y&%3Aembed=y

2. Oregon State Cancer Registry (OSCaR). *OSCaR Incidence 1996-2022*. Surveillance Research Program, National Cancer Institute SEER*Stat software version 8.4.3. https://seer.cancer.gov/seerstat/

3. KFF. (2024, May 28). *Race, inequity, and health*. https://www.kff.org/health-policy-101-race-inequality-and-health/?entry=table-of-contents-what-are-health-and-health-care-disparities

4. Healthy People 2030. (n.d.). *Social Determinants of Health*. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, U.S. Department of Health and Human Services. https://health.gov/healthypeople/objectives-and-data/social-determinants-health

5. Pete, D., Farris, P. E., Adsul, P., Bea, J. W., Decker, D., Ingram, J., Semprini, J., Baker, H., Yellowhair, M., Blackwater, C., Dee, C., Briant, K.J., Parker, M., Zahnd, & Nash, S. H. (2025, March 10). The inclusion of tribes and American Indian and Alaska Native People in State comprehensive cancer control plans. *Cancer Causes & Control*, 36, 819–832. https://doi.org/10.1007/s10552-025-01981-w

6. Hirschey, R., Rohweder, C., Zahnd, W. E., Eberth, J. M., Adsul, P., Guan, Y., Yeager, K.A., Haines, H., Farris, P.E., Bea, J.W., Dwyer, A., Madhivanan, P., Ranganathan, R., Seaman, AT., Vu, T., Wickersham, K., Vu, M., Teal, R., Giannone, K., Hilton, A.... Askelson, N. (2023, February 25). Prioritizing rural populations in state comprehensive cancer control plans: A qualitative assessment. *Cancer Causes & Control, 34*(Suppl 1), 159-169. https://doi.org/10.1007/s10552-023-01673-3

7. Wei, F., Georges, D., Man, I., Baussano, I., & Clifford, G. M. (2024, August 3). Causal attribution of human papillomavirus genotypes to invasive cervical cancer worldwide: A systematic analysis of the global literature. *The Lancet, 404*(10451), 435-444. https://doi.org/10.1016/S0140-6736(24)01097-3

8. Centers for Disease Control and Prevention. (2025, June 11). *Cancers linked with HPV each year*. https://www.cdc.gov/cancer/hpv/cases.html

9. Oregon Health Authority. *Adolescent Immunization Data 2019-2023*. ALERT Immunization Information System (IIS), Public Health Division. https://public.tableau.com/app/profile/oregon.immunization.program/viz/OregonAdolescentImmunizations/D-Landing

10. Centers for Disease Control and Prevention.(2024, August 20). *HPV vaccination*. https://www.cdc.gov/hpv/vaccines/index.html

11. National Cancer Institute. (2022, October 14). *Cancer staging*. https://www.cancer.gov/about-cancer/diagnosis-staging/staging

12. *Kalra, A., Yetiskul, E., Wehrle, C.J., & Tuma, F. Physiology, Liver. (2023 May 1).* In: *StatPearls*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK535438/

13. Centers for Disease Control and Prevention. (2025, June 10). *Liver cancer basics*. https://www.cdc.gov/liver-cancer/about/index.html

14. Singal, A. G., Lampertico, P., & Nahon, P. (2020, February). Epidemiology and surveillance for hepatocellular carcinoma: New trends. *Journal of Hepatology*, 72(2), 250-261. https://doi.org/10.1016/j.jhep.2019.08.025

15. Escutia, G. (2024). *Viral hepatitis burden, Oregon 2013-2023* [Annual Meeting]. Oregon Viral Hepatitis Collective, Annual Meeting. https://hepeliminationroom.org/ovhc-2024

16. Rumgay, H., Shield, K., Charvat, H., Ferrari, P., Sornpaisarn, B., Obot, I., Islami, F., Lemens, V.E.P.P., Rehm, J. & Soerjomataram, I. (2021, August). Global burden of cancer in 2020 attributable to alcohol consumption: A population-based study. *The Lancet Oncology*, 22(8), 1071-1080. https://doi.org/10.1016/S1470-2045(21)00279-5

17. Oregon Health Authority. *Oregon death data: Updated May 1, 2025*. https://www.oregon.gov/oha/ph/birthdeathcertificates/vitalstatistics/death/pages/index.aspx

18. John Hopkins University. (n.d.). *Chronic liver disease/cirrhosis*. https://www.hopkinsmedicine.org/health/conditions-and-diseases/chronic-liver-disease-cirrhosis

19. Rinella, M. E., & Sookoian, S. (2024, January). From NAFLD to MASLD: Updated naming and diagnosis criteria for fatty liver disease. *Journal of Lipid Research, 65*(1). https://doi.org/10.1016/j.jlr.2023.100485

20. Schwimmer, J. B., Celedon, M. A., Lavine, J. E., Salem, R., Campbell, N., Schork, N. J., Schork, N.J., Shiehmorteza, M., Yakoo, T., Chavez, A., Middleton, M.S., & Sirlin, C. B. (2009). Heritability of nonalcoholic fatty liver disease. *Gastroenterology, 136*(5), 1585-1592. https://doi.org/10.1053/j.gastro.2009.01.050

21. Mayo Clinic. (2025, May 12). *Diabetes prevention: 5 tips for taking control.* https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/in-depth/diabetes-prevention/art-20047639

22. United States Cancer Statistics - Incidence: 1999 - 2021, WONDER Online Database. United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2023 submission; 2024 release. Accessed at http://wonder.cdc.gov/cancer-v2021.html

23. Center for Health Statistics, Center for Public Health Practice, Public Health Division, Oregon Health Authority. Oregon Public Health Assessment Tool.

24. United States Cancer Statistics - Mortality: 1999 - 2021, WONDER Online Database. United States Department of Health and Human Services, Centers for Disease Control and Prevention; 2024. Accessed at http://wonder.cdc.gov/cancermort-v2021.html

25. National Cancer Institute. (n.d.). *Relative survival rate*. NCI Dictionary of Cancer Terms. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/relative-survival-rate

26. National Cancer Institute. (n.d.) *Cancer stat facts: Common cancer sites*. https://seer.cancer.gov/statfacts/html/common.html

27. Centers for Disease Control and Prevention. (2025, September 18). *Hepatitis B vaccine*. https://www.cdc.gov/hepatitis-b/vaccination/index.html

28. Centers for Disease Control and Prevention. (2023, December 20). *Treatment of Hepatitis C*. https://www.cdc.gov/hepatitis-c/treatment/index.html

29. Centers for Disease Control and Prevention. (2025, August 29) *Hepatitis B basics*. https://www.cdc.gov/hepatitis-b/about/index.html

30. Centers for Disease Control and Prevention. (2025, January 31). *Hepatitis B prevention and control*. https://www.cdc.gov/hepatitis-b/prevention/index.html

31. Oregon Health Authority. (October 9, 2023). Oregon's 2022 selected reportable communicable disease summary. https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/COMMUNICABLEDISEASE/DISEASESURVEILLANCEDATA/ANNUALREPORTS/Documents/2022-Annual-Communicable-Disease-Report.pdf

32. Hepatitis B Foundation. (n.d.). *Acute vs. chronic hepatitis B*. https://www.hepb.org/what-is-hepatitis-b/what-is-hepb/acute-vs-chronic/

33. Centers for Disease Control and Prevention. (2025, August 29). *Clinical overview of hepatitis B*. https://www.cdc.gov/hepatitis-b/hcp/clinical-overview/index.html

34. Pungpapong, S., Kim, W. R., & Poterucha, J. J. (2007, August). Natural history of hepatitis B virus infection: An update for clinicians. *Mayo Clinic Proceedings*, 82(8), 967-975. Elsevier. https://doi.org/10.4065/82.8.967

35. American Liver Foundation. (2023, August 17). *Hepatitis B*. https://liverfoundation.org/liver-diseases/viral-hepatitis/hepatitis-b/

36. Cleveland Clinic. (2025, February 8). *Hepatitis B*. https://my.clevelandclinic.org/health/diseases/4246-hepatitis-b

37. Chen, T., Borondy-Jenkins, F., Zovich, B., Block, S. J., Moraras, K., Chan, A., & Cohen, C. (2024, June). Existing knowledge, myths, and perceptions about hepatitis B and liver cancer within highly impacted immigrant communities. *Journal of Virus Eradication, 10*(2), 100379. https://doi.org/10.1016/j.jve.2024.100379

38. Oregon Health Authority. (2024, March) *Oregon viral hepatitis elimination plan: 2024-2030*. https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/HIVSTDVIRALHEPATITIS/ADULTVIRALHEPATITIS/SiteAssets/Pages/Viral-Hepatitis-Elim-Plan/ORVHEliminationPlan.pdf

39. Centers for Disease Control and Prevention. (2025, January 31). *Clinical testing and diagnosis for hepatitis B*. https://www.cdc.gov/hepatitis-b/hcp/diagnosis-testing/index.html

40. Ades, A. E., Gordon, F., Scott, K., Collins, I. J., Claire, T., Pembrey, L., Cheppell, E., Mariné-Barjoan, E., Butler, K., Indolfi, G., Gibb, D., & Judd, A. (2023). Overall vertical transmission of hepatitis C virus, transmission net of clearance, and timing of transmission. *Clinical Infectious Diseases, 76*(5), 905-912. https://doi.org/10.1093/cid/ciac270

41. Centers for Disease Control and Prevention. (2025, August 29). *Clinical overview of hepatitis C*. https://www.cdc.gov/hepatitis-c/hcp/clinical-overview/index.html

42. World Health Organization. (2025, July 25). *Hepatitis C*. https://www.who.int/news-room/fact-sheets/detail/hepatitis-c

43. Centers for Disease Control and Prevention. (2024, October 21). *Table 3.7 – Hepatitis C: Death rates by jurisdiction*. https://www.cdc.gov/hepatitis-surveillance-2022/hepatitis-c/table-3-7.html

44. Centers for Disease Control and Prevention. (2025, January 31). *Clinical screening and diagnosis for hepatitis C*. https://www.cdc.gov/hepatitis-c/hcp/diagnosis-testing/index.html

45. Park, H., Brown, C., Wilson, D. L., Huang, P. L., Hernández-Con, P., Horne, P., Goodin, A., Joseph, A., Segal, R., Cabrera, R. & Cook, R. L. (2023, April). Clinician barriers, perceptions, and practices in treating patients with hepatitis C virus and substance use disorder in the United States. *Preventive Medicine Reports, 32*, 102138. https://doi.org/10.1016/j.pmedr.2023.102138

46. Centers for Disease Control and Prevention. (2024, October 7). *Facts about excessive drinking*. https://www.cdc.gov/drink-less-be-your-best/facts-about-excessive-drinking/index.html

47. Ganne-Carrié, N., & Nahon, P. (2019, February). Hepatocellular carcinoma in the setting of alcohol-related liver disease. *Journal of Hepatology, 70*(2), 284-293. https://doi.org/10.1016/j.jhep.2018.10.008

48. The U.S. Surgeon General's Advisory. (2025). *Alcohol and cancer risk*. Office of the U.S. Surgeon General. https://www.hhs.gov/sites/default/files/oash-alcohol-cancer-risk.pdf

49. Sacks, J. J., Gonzales, K. R., Bouchery, E. E., Tomedi, L. E., & Brewer, R. D. (2015, November). 2010 national and state costs of excessive alcohol consumption. *American Journal of Preventive Medicine*, *49*(5), e73-e79. https://doi.org/10.1016/j.amepre.2015.05.031

50. Oregon Health Authority. (n.d.). Oregon Chronic Disease Portal, Oregon Behavioral Risk Factors Surveillance System Adult Prevalence Data. https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/CHRONICDISEASE/DATAREPORTS/Pages/Substance-use.aspx

51. Xu, X., & Chaloupka, F. J. (2011). The effects of prices on alcohol use and its consequences. *Alcohol Research & Health*, 34(2), 236.

52. The Community Guide. (2022, February 28). CPSTF findings for excessive alcohol consumption. U.S. Department of Health & Human Services, The Guide to Community Preventative Services. https://www.thecommunityguide.org/pages/task-force-findings-excessive-alcohol-consumption.html

53. Centers for Disease Control and Prevention. (2025, May 8) *Alcohol screening and brief intervention (SBI)*. https://www.cdc.gov/alcohol-pregnancy/hcp/alcoholsbi/index.html#:~:text=What%20it%20is,to%20those%20who%20need%20it

54. American Cancer Society. (2021, November 19). *What is breast cancer?* https://www.cancer.org/cancer/types/breast-cancer/about/what-is-breast-cancer.html

55. American Cancer Society. (2021, November 19). *Types of breast cancer.* https://www.cancer.org/cancer/types/breast-cancer/about/types-of-breast-cancer.html

56. BreastCancer.org. (2023, February 22). *Age*. https://www.breastcancer.org/risk/risk-factors/age

57. Centers for Disease Control and Prevention. (2025, July 30). *Breast cancer risk factors*. https://www.cdc.gov/breast-cancer/risk-factors/index.html

58. American Cancer Society. (2025, February 20). *Gene changes and cancer.* https://www.cancer.org/cancer/understanding-cancer/genes-and-cancer/gene-changes.html

59. BreastCancer.org. (2023, September 1). *Certain breast changes*. https://www.breastcancer.org/risk/risk-factors/certain-breast-changes

60. Centers for Disease Control and Prevention. (2024, September 11). *About dense breasts*. https://www.cdc.gov/breast-cancer/about/dense-breasts.html

61. National Cancer Institute. (2025, January 31). *Diethylstilbestrol (DES) exposure and cancer.* https://www.cancer.gov/about-cancer/causes-prevention/risk/hormones/des-fact-sheet

62. Centers for Disease Control and Prevention. (2025, June 11). *Obesity and cancer.* https://www.cdc.gov/cancer/risk-factors/obesity.html

63. Centers for Disease Control and Prevention. (2025, June 11). *Alcohol and cancer.* https://www.cdc.gov/cancer/risk-factors/alcohol.html

64. DePolo, J, Uscher, J. & Fox, K., (Ed). (n.d.). *Does HRT (hormone replacement therapy) increase breast cancer risk?* https://www.breastcancer.org/risk/risk-factors/using-hormone-replacement-therapy

65. American Cancer Society. (2025, June 25). *Triple negative breast cancer.* https://www.cancer.org/cancer/types/breast-cancer/about/types-of-breast-cancer/triple-negative.html

66. American Cancer Society. (2021, November 8). *Breast cancer hormone receptor status.* https://www.cancer.org/cancer/types/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-hormone-receptor-status.html

67. American Cancer Society. (2025, January 29). *Breast cancer HER2 status.* https://www.cancer.org/cancer/types/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-her2-status.html

68. Yedjou, C.G., Sims, J.N., Miele, L., Noubissi, F., Lowe, L., Fonseca, D.D., Alo, R.A., Payton, M., & Tchounwou, P.B. (2019, August, 28). Health and racial disparity in breast cancer. In: Ahmad, A. (Ed.), *Breast Cancer Metastasis and Drug Resistance. Advances in Experimental Medicine and Biology* (2nd ed., 1152, 31-49). Springer. https://doi.org/10.1007/978-3-030-20301-6_3

69. U.S. Preventative Services Taskforce. (2024, April 30). *Breast cancer: Screening.* https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/breast-cancer-screening

70. Tomlinson-Hansen, S. E., Budh, D. P., & Sapra, A. (2024, October 3). Breast cancer screening in the average-risk patient. *StatPearls*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK556050/

71. US Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System (BRFSS). PLACES: Local Data for Better Health, 2023.

72. American College of Radiology. (2024, April 30). *Statement on USPSTF breast cancer screening recommendations*. https://www.acr.org/News-and-Publications/Media-Center/2024/ACR-statement-on-final-USPSTF-breast-cancer-screening-recommendations

73. American Society of Breast Surgeons. (2019). *Position statement on screening mammography.* https://www.breastsurgeons.org/docs/statements/asbrs-ppr-screening-mammography.pdf

74. National Cancer Institute. (2025, May 2). *Colorectal cancer prevention (PDQ®)–patient version.* https://www.cancer.gov/types/colorectal/patient/colorectal-prevention-pdq

75. Centers for Disease Control and Prevention. (2025, February 26). *Screening for colorectal cancer.* https://www.cdc.gov/colorectal-cancer/screening/index.html

76. Voss, A. (2024, October 11). Colorectal cancer screening: Where does the shield liquid biopsy fit in? *National Cancer Institute*, *Cancer Current Blog*. https://www.cancer.gov/news-events/cancer-currents-blog/2024/shield-blood-test-colorectal-cancer-screening

77. American Cancer Society. (2025, April 29). *Colorectal cancer risk factors*. https://www.cancer.org/cancer/types/colon-rectal-cancer/causes-risks-prevention/risk-factors.html

78. Centers for Disease Control and Prevention. (n.d.). *Family health history.* https://www.cdc.gov/family-health-history/index.html

79. Centers for Disease Control and Prevention. (2024, June 21). *Inflammatory bowel disease (IBD) basics*. https://www.cdc.gov/inflammatory-bowel-disease/about/index.html

80. Yu, G. H., Li, S. F., Wei, R., & Jiang, Z. (2022, March 7). Diabetes and colorectal cancer risk: Clinical and therapeutic implications. *Journal of Diabetes Research*, 2022(1), 1747326. https://doi.org/10.1155/2022/1747326

81. Centers for Disease Control and Prevention. (2025, June 11). *Obesity and cancer.* https://www.cdc.gov/cancer/risk-factors/obesity.html

82. Centers for Disease Control and Prevention. (2023, December 27). *Physical activity and your weight and health*. https://www.cdc.gov/healthy-weight-growth/physical-activity/index.html

83. Vallis, J., & Wang, P. P. (2022, September 30). The role of diet and lifestyle in colorectal cancer incidence and survival. In J. Andres Morgado-Diaz (Ed.). (pp. 13-24). *Exon Publications*. https://www.exonpublications.com/index.php/exon/article/view/gastrointestinal-cancers-diet-colorectal-cancer

84. Centers for Disease Control and Prevention. (2024, October 17). *Colorectal cancer risk factors*. https://www.cdc.gov/colorectal-cancer/risk-factors/index.html

85. Centers for Disease Control and Prevention. (2025, June 11). *Tobacco and cancer.* https://www.cdc.gov/cancer/risk-factors/tobacco.html

86. Centers for Disease Control and Prevention. (2025, June 11). *Alcohol and cancer.* https://www.cdc.gov/cancer/risk-factors/alcohol.html

87. United States Preventative Services Task Force. (2021, May 18). *Final recommendation statement – Colorectal cancer: Screening.* https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening

88. Centers for Disease Control and Prevention. (2025, August 15). *Health and economic benefits of colorectal cancer interventions.* https://www.cdc.gov/nccdphp/priorities/colorectal-cancer.html

89. American Cancer Society. (2025, July 31). *80% in every community.* https://nccrt.org/our-impact/80-in-every-community/

90. American Lung Association. (2025, July 24). *How lungs work.* https://www.lung.org/lung-health-diseases/how-lungs-work

91. American Lung Association. (2024, October 1). *Lung cancer basics.* https://www.lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer/basics

92. Centers for Disease Control and Prevention. (2025, February 13). *Lung cancer risk factors.* https://www.cdc.gov/lung-cancer/risk-factors/index.html

93. American Cancer Society. (2025, April 1). *What causes lung cancer?* https://www.cancer.org/cancer/types/lung-cancer/causes-risks-prevention/what-causes.html#:~:text=%E2%80%9Cdriver%20mutations%E2%80%9D)-,How%20smoking%20leads%20to%20lung%20cancer,as%20well%20(see%20below)

94. American Cancer Society. (2024, November 19). *Is any type of tobacco product safe?* https://www.cancer.org/cancer/risk-prevention/tobacco/is-any-type-of-smoking-safe.html

95. World Health Organization. (2023, January 25). *Radon.* https://www.who.int/news-room/fact-sheets/detail/radon-and-health#:~:text=Radon%20is%20estimated%20to%20cause,of%20radon%20and%20cigarette%20smoking

96. United States Environmental Protection Agency. (2025, February 27). *Health risk of radon.* https://www.epa.gov/radon/health-risk-radon

97. United States Environmental Protection Agency.(202, November 20). *What is radon?* https://www.epa.gov/radon/what-radon#:~:text=Radon%20is%20a%20radioactive%20gas.gaps%20in%20buildings%20and%20homes

98. Oregon Health Authority. (n.d.). *Radon gas and public health*. https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/HEALTHYNEIGHBORHOODS/RADONGAS/Pages/index.aspx

99. United States Environmental Protection Agency. (2025). *A citizen's guide to radon - The guide to protecting yourself and your family from radon*. https://www.epa.gov/sites/default/files/2016-12/documents/2016_a_citizens_guide_to_radon.pdf

100. Oregon Health Authority. (n.d.). *Oregon indoor radon risk (2024 edition)*. https://experience.arcgis.com/experience/d2bc2214a81040bf8088fa9927363a24/page/Homepage

101. American Cancer Society. (2024, January 29). *Lung cancer risk factors*. https://www.cancer.org/cancer/types/lung-cancer/causes-risks-prevention/risk-factors.html

102. El, W. (1950). Tobacco smoking as a possible etiologic factor in bronchogenic carcinoma. *JAMA*, 143, 329-336.

103. Lee, P. N., Forey, B. A., & Coombs, K. J. (2012, September 3). Systematic review with meta-analysis of the epidemiological evidence in the 1900s relating smoking to lung cancer. *BMC Cancer, 12*(1), 385. https://doi.org/10.1186/1471-2407-12-385

104. National Association of Attorneys General. (n.d.). *The Master Settlement Agreement*. https://www.naag.org/our-work/naag-center-for-tobacco-and-public-health/the-master-settlement-agreement/

105. National Lung Screening Trial Research Team. (2011, August 4). Reduced lung-cancer mortality with low-dose computed tomographic screening. *New England Journal of Medicine*, 365(5), 395-409. https://doi.org/10.1056/NEJMoa1102873

106. De Koning, H., Van Der Aalst, C., Ten Haaf, K., & Oudkerk, M. (2018, October). PL02. 05 effects of volume CT lung cancer screening: mortality results of the NELSON randomised-controlled population based trial. *Journal of Thoracic Oncology, 13*(10), S185. https://doi.org/10.1016/j.jtho.2018.08.012

107. National Cancer Institute. (2025, January 17). *Metastatic cancer: When cancer spreads*. https://www.cancer.gov/types/metastatic-cancer

108. Tamura, T., Kurishima, K., Nakazawa, K., Kagohashi, K., Ishikawa, H., Satoh, H., & Hizawa, N. (2014, September 4). Specific organ metastases and survival in metastatic non-small-cell lung cancer. *Molecular and Clinical Oncology, 3*(1), 217-221. https://doi.org/10.3892/mco.2014.410

109. National Cancer Institute. (2021, December 14). *Biomarker testing for cancer treatment*. https://www.cancer.gov/about-cancer/treatment/types/biomarker-testing-cancer-treatment

110. American Lung Association. (n.d.). *Getting screened for lung cancer.* https://www.lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer/saved-by-the-scan/getting-screened

111. United States Preventative Services Task Force. (2021, March 9). *Full recommendation statement - Lung cancer: Screening.* https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/lung-cancer-screening

112. American Cancer Society. (n.d.). *Best practice guide for building lung cancer early detection programs*. https://nlcrt.org/best-practice-guide-early-detection/

113. Lancaster, H. L., Heuvelmans, M. A., & Oudkerk, M. (2022, March 6). Low-dose computed tomography lung cancer screening: Clinical evidence and implementation research. *Journal of Internal Medicine*, *292*(1), 68-80. https://doi.org/10.1111/joim.13480

114. Fernandes, M., Milla, C., Gubran, A., Barrazueta, S., Altonen, B., DiVittis, A., Woodhull Resident Research Team & Kuperberg, S. (2023, November 23). Assessing the impact of socioeconomic status on incidental lung nodules at an urban safety net hospital. *BMC Pulmonary Medicine, 23*(1), 469. https://doi.org/10.1186/s12890-023-02726-8

115. Osarogiagbon, R. U., Liao, W., Faris, N. R., Meadows-Taylor, M., Fehnel, C., Lane, J., Wiliams, S.C., Patel, A.A., Akinbobola, O.A., Pacheco, A., Epperson, A., Luttrell, J., McCoy, D., McHugh, L., Signore, R., Bishop, A.M., Tonkin, K., Optican, R., Wright, J., Robbins, T., & Smeltzer, M. P. (2022). Lung cancer diagnosed through screening, lung nodule, and neither program: A prospective observational study of the detecting early lung cancer (DELUGE) in the Mississippi Delta cohort. *Journal of Clinical Oncology*, *40*(19), 2094-2105. https://doi.org/10.1200/JCO.21.02496

116. American College of Radiology. (2024). *ACR-STR Practice parameter for the performance and reporting of lung cancer screening thoracic computed tomography (CT).* https://gravitas.acr.org/PPTS/DownloadPreviewDocument?ReleaseId=2&DocId=38

117. RadiologyInfo.org. (2024, September 23). *Lung cancer screening.* https://www.radiologyinfo.org/en/info/screening-lung

118. Healthy People 2030. (2021, March). *Lung cancer: Screening*. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, U.S. Department of Health and Human Services. https://odphp.health.gov/healthypeople/tools-action/browse-evidence-based-resources/lung-cancer-screening

119. American Cancer Society. (2024, April 30). *How to protect against HPV.* https://www.cancer.org/cancer/risk-prevention/hpv/hpv-prevention.html

120. Meites, E., Gee, J., Unger, E., & L.M. (2024, April 23). *Chapter 11: Human papillomavirus*. The Epidemiology and Prevention of Vaccine-Preventable Diseases, a.k.a. the "Pink Book." https://www.cdc.gov/pinkbook/hcp/table-of-contents/chapter-11-human-papillomavirus.html

121. The Cleveland Clinic. (2024, October 21). *HPV (Human papillomavirus).* https://my.clevelandclinic.org/health/diseases/11901-hpv-human-papilloma-virus

122. Centers for Disease Control and Prevention. (2025, June 11). *Cancers linked with HPV each year.* https://www.cdc.gov/cancer/hpv/cases.html

123. National Institute of Dental and Craniofacial Research. (2025, January). *Oral cancer incidence (new cases) by age, race, and sex.* https://www.nidcr.nih.gov/research/data-statistics/oral-cancer/incidence

124. National Cancer Institute. (2025, February Release). *State cancer profiles - Dynamic views of cancer statistics for prioritizing cancer control efforts across the nation.* https://www.statecancerprofiles.cancer.gov/index.html

125. Centers for Disease Control and Prevention. (2024, August 10). *How vaccines are developed and approved for use*. https://www.cdc.gov/vaccines/basics/how-developed-approved.html

126. Kjaer, S. K., Dehlendorff, C., Belmonte, F., & Baandrup, L. (2021, October). Real-world effectiveness of human papillomavirus vaccination against cervical cancer. *JNCI: Journal of the National Cancer Institute*, *113*(10), 1329-1335. https://doi.org/10.1093/jnci/djab080

127. Lehtinen, M., Lagheden, C., Luostarinen, T., Eriksson, T., Apter, D., Bly, A., Gary,m P., Harjula, K., Heikkila, K., Hokkanen, M., Karttunen, H., Kuortti, M., Nieminen, P., Nummela, M., Paavonen, J., Palmrith, J., Petaja, T., Pukkala, E., Soderlund-Strand, A., ... & Dillner, J. (2021). Human papillomavirus vaccine efficacy against invasive, HPV-positive cancers: Population-based follow-up of a cluster-randomised trial. *BMJ Open*, *11*(12), e050669. https://doi.org/10.1136/bmjopen-2021-05066

128. Maldonado, I., Plata, M., Gonzalez, M., Correa, A., Nossa, C., Giuliano, A. R., Joura, E.A., Ferenczy, A., Ronnett, B.M., Stoler, M.H., Zhou, H.J., Joshi, A., Das, R., Bautista, O., Group, T., Luxembourg, A., Saah, A., & Buchwald, U. K. (2022, July 19). Effectiveness, immunogenicity, and safety of the quadrivalent HPV vaccine in women and men aged 27–45 years. *Human Vaccines & Immunotherapeutics*, *18*(5), 2078626. https://doi.org/10.1080/21645515.2022.2078626

129. Goldstone, S. E. (2023, March 13). Human papillomavirus (HPV) vaccines in adults: Learnings from long-term follow-up of quadrivalent HPV vaccine clinical trials. Human Vaccines & Immunotherapeutics, 19(1), 2184760. https://doi.org/10.1080/21645515.2023.2184760

130. Goldstone, S. E., Giuliano, A. R., Palefsky, J. M., Lazcano-Ponce, E., Penny, M. E., Cabello, R. E., Moreira, E.D., Baraldi, E., Jessen, H., Ferenczy, A., Kurman, R., Ronnett, B.M., Stoler, M.H., Bautista, O., Dasm R., Group, T., Luxembourg, A., & Saah, A. (2022, March). Efficacy, immunogenicity, and safety of a quadrivalent HPV vaccine in men: Results of an open-label, long-term extension of a randomised, placebo-controlled, phase 3 trial. *The Lancet Infectious Diseases*, *22*(3), 413-425. https://doi.org/10.1016/S1473-3099(21)00327-3

131. National Cancer Institute. (2025, May 9). *HPV and cancer.* https://www.cancer.gov/about-cancer/causes-prevention/risk/infectious-agents/hpv-and-cancer

132. National Cancer Institute. (n.d.). *High-risk HPV.* NCI Dictionary of Cancer Terms. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/high-risk-hpv

133. Centers for Disease Control and Prevention. (2021, November 16). HPV vaccination recommendations. https://www.cdc.gov/vaccines/vpd/hpv/hcp/recommendations.html

134. Centers for Disease Control and Prevention. (2024, August 22). *Vaccination coverage among adolescents (13 – 17 years).* https://www.cdc.gov/teenvaxview/interactive/index.html#:~:text=At%20a%20glance.%20Find%20national%2C%20regional%2C%20state%2C,trend%20lines%2C%20bar%20charts%2C%20tables%2C%20and%20more

135. Healthy People 2030. (n.d.). *Increase the proportion of adolescents who get recommended doses of the HPV vaccine — IID 08*. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, U.S. Department of Health and Human Services. https://odphp.health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iid-08

136. Bednarczyk, R. A., & Brandt, H. M. (2023, May 3). Descriptive epidemiology of age at HPV vaccination: Analysis using the 2020 NIS-Teen. *Human Vaccines & Immunotherapeutics*, *19*(1), 2204784. https://doi.org/10.1080/21645515.2023.2204784

137. O'Leary, S.T. & Nyquist, A-C. (2019, October 4). *Why AAP recommends initiating HPV vaccination as early as age 9.* American Academy of Pediatrics, AAP News. https://publications.aap.org/aapnews/news/14942/Why-AAP-recommends-initiating-HPV-vaccination-as?autologincheck=redirected

138. Saxena, K., Kathe, N., Sardana, P., Yao, L., Chen, Y. T., & Brewer, N. T. (2023, January 11). HPV vaccine initiation at 9 or 10 years of age and better series completion by age 13 among privately and publicly insured children in the US. *Human Vaccines & Immunotherapeutics*, *19*(1), 2161253. https://doi.org/10.1080/21645515.2022.2161253

139. Isher-Witt, J., Foley, S., Hassan, A., Sloan, A., Nkonga, J., & Fisher-Borne, M. (2023, November 22). Age nine is possible: Improving age 9 HPV initiation through a national quality improvement initiative during the COVID-19 pandemic. *Human Vaccines & Immunotherapeutics, 19*(3), 2284359. https://doi.org/10.1080/21645515.2023.2284359

140. O'Leary, S. C., & Frost, H. M. (2023). Does HPV vaccination initiation at age 9, improve HPV initiation and vaccine series completion rates by age 13? *Human Vaccines & Immunotherapeutics*, *19*(1), 2180971. https://doi.org/10.1080/21645515.2023.2180971

141. Oregon Health Authority. (n.d.). *For immunization providers*. https://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/VACCINESIMMUNIZATION/IMMUNIZATIONPROVIDERRESOURCES/Pages/index.aspx

142. Smulian, E. A., Mitchell, K. R., & Stokley, S. (2016, May 13). Interventions to increase HPV vaccination coverage: A systematic review. *Human Vaccines & Immunotherapeutics*, *12*(6), 1566-1588. https://doi.org/10.1080/21645515.2015.1125055

143. OregonLaws. (n.d.). ORS 109.640: Right to reproductive health care, medical treatment or dental treatment without parental consent. Oregon Revised Statutes. https://oregon.public.law/statutes/ors_109.640

144. KFF. (2024, August 5). The HPV vaccine: Access and use in the U.S. https://www.kff.org/womens-health-policy/the-hpv-vaccine-access-and-use-in-the-u-s/

145. Semprini, J., Devine, J., & Reimer, R. (2025, June). Quantifying the impact of introducing HPV vaccines in 2006 on 25-29-year-old cervical cancer incidence in 2022. *JNCI Cancer Spectrum, 9*(3), pkaf059. https://doi.org/10.1093/jncics/pkaf059

146. Singh, D., Vignat, J., Lorenzoni, V., Eslahi, M., Ginsburg, O., Lauby-Secretan, B., Arbyn, M., Basu, P., Bray, F., & Vaccarella, S. (2023, February). Global estimates of incidence and mortality of cervical cancer in 2020: A baseline analysis of the WHO Global Cervical Cancer Elimination Initiative. *The Lancet Global Health, 11*(2), e197-e206. https://doi.org/10.1016/S2214-109X(22)00501-0

147. Cancer Research Institute. (2025, February 11). Early detection saves lives: The essential cancer screenings you can't afford to skip. *Immune to Cancer: The CRI Blog*. https://www.cancerresearch.org/blog/early-detection-saves-lives-the-essential-cancer-screenings-you-cant-afford-to-skip

148. Marcus, P. M. (2022, April 6). Population measures: Cancer screening's impact. In P.M. Marcus (Ed.), *Assessment of Cancer Screening: A Primer* (pp. 51-66). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-94577-0_5#DOI

149. Rural Health Information Hub (RHIHub). (2024, November 8). Healthcare access in rural communities. https://www.ruralhealthinfo.org/topics/healthcare-access#barriers

150. Oregon Office of Rural Health. (2024, September). *Oregon Areas of Unmet Health Care Need Report*. Oregon Health and Science University. https://www.ohsu.edu/oregon-office-of-rural-health/2024-areas-unmet-health-care-needs-report-published

151. Wang, L. (2022, May 17). Working to close the cancer screening gap caused by COVID. *National Cancer Institute, Cancer Currents: An NCI Cancer Research Blog*. https://www.cancer.gov/news-events/cancer-currents-blog/2022/covid-increasing-cancer-screening

152. Goddard, K. A., Feuer, E. J., Mandelblatt, J. S., Meza, R., Holford, T. R., Jeon, J., Lansdorp-Vogelaar, I., Gulati, R., Stout, N.K., Howlader, N., Knudsen, A.B., Miller, D., Caswel-Jin,m J., Schechter, C.B., Etizoni, R., Trnetham-Dietz, A., Kurian, A.W., Plevritis, S.K., Hampton, J.M.,... & Castle, P. E. (2024, December 5). Estimation of cancer deaths averted from prevention, screening, and treatment efforts, 1975-2020. *JAMA Oncology, 11*(2), 162-167. https://doi.org/10.1001/jamaoncol.2024.5381

153. Alkatout, I., Biebl, M., Momenimovahed, Z., Giovannucci, E., Hadavandsiri, F., Salehiniya, H., & Allahqoli, L. (2021, May 17). Has COVID-19 affected cancer screening programs? A systematic review. *Frontiers in Oncology, 11*, 675038. https://doi.org/10.3389/fonc.2021.675038

154. U.S. Census Bureau, U.S. Department of Commerce. American Community Survey, ACS 2023 5-Year Estimates Data Profiles.

155. Marks, R., Jones, N., & Battle, K. (2024, April 8). What updates to OMB's race/ethnicity standards mean for the Census Bureau. *United States Census Bureau, Census Blogs, Random Samplings*. https://www.census.gov/newsroom/blogs/random-samplings/2024/04/updates-race-ethnicity-standards.html

156. United States Census Bureau. (n.d.). *Why we ask questions about...race*. https://www.census.gov/acs/www/about/why-we-ask-each-question/race/

157. United States Census Bureau. (n.d.). *Why we ask questions about...Hispanic or Latino origin*. https://www.census.gov/acs/www/about/why-we-ask-each-question/ethnicity/

158. Oregon Office of Rural Health. (n.d.). *Rural Health for Oregon.* Oregon Health and Science University. https://www.ohsu.edu/oregon-office-of-rural-health

159. U.S. Department of Health and Human Services. (2022, March 17). *About the affordable care act*. https://www.hhs.gov/healthcare/about-the-aca/index.html

160. Oregon Health Authority. (n.d.). *Oregon Health Plan 1115 Demonstration Waiver.* https://www.oregon.gov/oha/HSD/Medicaid-Policy/Pages/OHP-Waiver.aspx

161. United States Census Bureau. (n.d.). *American Community Survey (ACS).* https://www.census.gov/programs-surveys/acs.html

162. Hsiang, W. R., Lukasiewicz, A., Gentry, M., Kim, C. Y., Leslie, M. P., Pelker, R., Forman, H.P., & Wiznia, D. H. (2019, April 5). Medicaid patients have greater difficulty scheduling health care appointments compared with private insurance patients: A meta-analysis. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 56, 0046958019838118. https://doi.org/10.1177/0046958019838118

163. U.S. Government Accountability Office. (2023, May 16). Why health care Is harder to access in rural America. *WatchBlog: Following the Federal Dollar.* https://www.gao.gov/blog/why-health-care-harder-access-rural-america

164. Centers for Medicare & Medicaid Services. (n.d.). *No surprises: Health insurance terms you should know.* https://www.cms.gov/files/document/nosurpriseactfactsheet-health-insurance-terms-you-should-know508c.pdf

165. HealthCare.gov. (n.d.). *Coinsurance.* https://www.healthcare.gov/glossary/co-insurance/

166. U.S. Government Accountability Office. (2024, December 5) Health insurance costs are increasing as markets become more concentrated with fewer insurance companies (interactive map). *WatchBlog: Following the Federal Dollar.* https://www.gao.gov/blog/health-insurance-costs-are-increasing-markets-become-more-concentrated-fewer-insurance-companies-interactive-map

167. National Cancer Institute. (2024, June 6). *Financial toxicity (financial distress) and cancer treatment (PDQ®)–patient version.* https://www.cancer.gov/about-cancer/managing-care/track-care-costs/financial-toxicity-pdq#:~:text=Financial%20toxicity%20describes%20problems%20a,several%20factors%20in%20your%20household.l

168. United States Census Bureau. (2021, June). *Wealth, asset ownership, & debt of households detailed tables: 2021.* https://www.census.gov/data/tables/2021/demo/wealth/wealth-asset-ownership.html

169. University of Wisconsin School of Medicine Public Health. 2023 Area Deprivation Index v2.0. Downloaded May 22, 2024 from https://www.neighborhoodatlas.medicine.wisc.edu/

170. Maroko, A. R., Doan, T. M., Arno, P. S., Hubel, M., Yi, S., & Viola, D. (2016, September 15). Integrating social determinants of health with treatment and prevention: a new tool to assess local area deprivation. *Preventing Chronic Disease, 13*, E128. https://doi.org/10.5888/pcd13.160221

171. Ruijer, E., Porumbescu, G., Porter, R., & Piotrowski, S. (2022, December 4). Social equity in the data era: A systematic literature review of data-driven public service research. *Public Administration Review, 83*(2), 316-332. https://doi.org/10.1111/puar.13585

172. Pratt, B.M., Hixson, L., Jones,& N.A. (2015, November 2). Measuring race and ethnicity across the decades: 1790-2010. *United States Census Bureau, Census Blogs, Random Samplings*. https://www.census.gov/newsroom/blogs/random-samplings/2015/11/measuring-race-and-ethnicity-across-the-decades-1790-2010.html

173. Sharghi, S., Khalatbari, S., Laird, A., Lapidus, J., Enders, F. T., Meinzen-Derr, J., Tapia, A.L., & Ciolino, J. D. (2024, October 29). Race, ethnicity, and considerations for data collection and analysis in research studies. *Journal of Clinical and Translational Science, 8*(1), e182. https://doi.org/10.1017/cts.2024.632

174. American Medical Association. (2020, November 16). *New AMA policies recognize race as a social, not biological, construct*. https://www.ama-assn.org/press-center/ama-press-releases/new-ama-policies-recognize-race-social-not-biological-construct

175. Panneton, M., Hill, F., & Smith, L. (n.d.). *Principles for using public health data to drive equity*. CDC Foundation. https://www.cdcfoundation.org/data-equity-principles?inline

176. National Cancer Institute. (2024, September 24). *New cancer diagnoses did not rebound as expected following pandemic*. https://www.cancer.gov/news-events/press-releases/2024/covid-pandemic-impact-on-new-cancer-diagnoses

177. Oregon Secretary of State. (n.d.) *Oregon Health Authority, Public Health Division – chapter 333, Division 10, health promotion and chronic disease prevention, 333-010-0000 - Cancer reporting regulations: Definitions*. https://secure.sos.state.or.us/oard/displayDivisionRules.action;JSESSIONID_OARD=AajA3Un2PKiX-yZmqD_bhzPpjasK5vESisCyOUhkVrBWmi_yEdlz!-1969788327?selectedDivision=1225

178. Muramatsu, N., & Chin, M. H. (2024, May 21). Asian, Native Hawaiian, and Pacific Islander populations in the US—moving from invisibility to health equity. *JAMA Network Open, 7*(5), e2411617-e2411617. https://doi.org/10.1001/jamanetworkopen.2024.11617

179. The Leadership Conference on Civil and Human Rights. (2024, March 28). The decades-long fight for accurate race and ethnicity data. *Witness: The Civil Right Blog*. https://civilrights.org/blog/the-decades-long-fight-for-accurate-race-and-ethnicity-data/#:~:text=In%20May%201977%2C%20the%20U.S.,race%20and%20ethnicity%20are%20required

180. Pillai, D., & Artiga, S. (2024, April 30). *Revisions to federal standards for collecting and reporting data on race and ethnicity: What are they and why do they matter?* KFF. https://www.kff.org/racial-equity-and-health-policy/revisions-to-federal-standards-for-collecting-and-reporting-data-on-race-and-ethnicity-what-are-they-and-why-do-they-matter/#:~:text=Adding%20MENA%20as%20a%20new,risk%20to%20privacy%20or%20co

181. Adams, D. (2020, May 18). *Pandemic creates high risk of census undercount in communities of color.* Nonprofit Quarterly (NPQ). https://nonprofitquarterly.org/pandemic-creates-high-risk-of-census-undercount-in-communities-of-color/

182. American Liver Foundation. (2025, July 31). *Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD).* https://liverfoundation.org/liver-diseases/fatty-liver-disease/nonalcoholic-fatty-liver-disease-nafld/

183. Centers for Disease Control and Prevention. (2024, August 20). *HPV vaccination.* https://www.cdc.gov/hpv/vaccines/index.html

184. Wei, F., Georges, D., Man, I., Baussano, I., & Clifford, G. M. (2024, August 3). Causal attribution of human papillomavirus genotypes to invasive cervical cancer worldwide: A systematic analysis of the global literature. *The Lancet, 404*(10451), 435-444. https://doi.org/10.1016/S0140-6736(24)01097-3

185. America Cancer Society. (2024, April 30). *HPV vaccines.* https://www.cancer.org/cancer/risk-prevention/hpv/hpv-vaccines.html

186. Oregon Health Authority. (n.d.). *Human Papilloma Virus (HPV) resources.* https://www.oregon.gov/oha/ph/preventionwellness/vaccinesimmunization/gettingimmunized/pages/hpv.aspx

187. World Health Organization. (2022, September 7). *Uzbekistan achieves high HPV vaccination coverage against cervical cancer.* https://www.who.int/europe/news/item/07-09-2022-uzbekistan-achieves-high-hpv-vaccination-coverage-against-cervical-cancer

188. World Health Organization. (2020, December 17). *Turning the tide: Slovenia's success story of fighting cervical cancer.* https://www.who.int/europe/news/item/17-12-2020-turning-the-tide-slovenia-s-success-story-of-fighting-cervical-cancer

189. Daley, E. M., Vamos, C. A., Thompson, E. L., Zimet, G. D., Rosberger, Z., Merrell, L., & Kline, N. S. (2017, June). The feminization of HPV: How science, politics, economics and gender norms shaped US HPV vaccine implementation. *Papillomavirus Research, 3*, 142-148. https://doi.org/10.1016/j.pvr.2017.04.004

190. Cartmell, K. B., Mzik, C. R., Sundstrom, B. L., Luque, J. S., White, A., & Young-Pierce, J. (2019). HPV vaccination communication messages, messengers, and messaging strategies. *Journal of Cancer Education, 34*(5), 1014-1023. https://doi.org/10.1007/s13187-018-1405-x

191. Hall, M. T., Simms, K. T., Lew, J. B., Smith, M. A., Brotherton, J. M., Saville, M., Frazer, I.H., & Canfell, K. (2019, January). *The projected timeframe until cervical cancer elimination in Australia: A modelling study. The Lancet Public Health, 4*(1), e19-e27. https://doi.org/10.1016/S2468-2667(18)30183-X

192. World Health Organization. (2024, April). *Kosovo* introduces HPV vaccine in immunization schedule: Outreach in schools and beyond to reach every girl*. https://www.who.int/europe/news/item/04-04-2024-kosovo--introduces-hpv-vaccine-in-immunization-schedule--outreach-in-schools-and-beyond-to-reach-every-girl

193. Healthy People 2030. (n.d.). *Reduce current cigarette, cigar, and pipe smoking in adults — TU 03*. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, U.S. Department of Health and Human Services. https://odphp.health.gov/healthypeople/objectives-and-data/browse-objectives/tobacco-use/reduce-current-cigarette-cigar-and-pipe-smoking-adults-tu-03

194. Moriarty, C. (2019, November 19). Hepatitis C: Why screening is important for baby boomers and millennials. Yale Medicine. https://www.yalemedicine.org/news/hepatitis-c-screening

195. Centers for Disease Control and Prevention. Alcohol Related Disease Impact (ARDI) application, 2024. Available at www.cdc.gov/ARDI

196. Centers for Disease Control and Prevention. (2025, January 14). Alcohol use and your health. https://www.cdc.gov/alcohol/about-alcohol-use/index.html