CANCER:

RISK FACTORS AND PREVENTION

THE UTAH ENVIRONMENTAL
PUBLIC HEALTH
TRACKING NETWORK

State of Utah

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Cancer: Risk Factors and Prevention is another installment of educational reports produced by the Utah Environmental Epidemiology Program. This report seeks to provide an overview of risk factors, statistics, and prevention strategies that are associated with cancer.

In addition to what is provided in this report, you can find more information through Utah's Indicator-Based Information System for Public Health (IBIS-PH) and the Utah Environmental Public Health Tracking Network (UEPHTN). These resources provide a wealth of important information about the public health of Utah. If you have any other questions, please do not hesitate to contact us at the Utah Department of Health.

I would like to thank all of the agencies within Utah who share data, maintain public information sources, and promote public and environmental health. Protecting the public health of Utah is a collaborative effort that requires the input of many to achieve a common goal. I hope that you will read this report and use it to promote health in your home and community.

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TABLE OF CONTENTS

Foreword.....4

Acknowledgments.....5

Cancer Risk Factors.....6

Alcohol.....7

Arsenic.....9

Benzene.....12

Excess Weight.....14

Lack of Physical Activity.....16

Radon.....19

Smoking.....21

Social Determinants of Health.....25

Vinyl Chloride.....28

Risk Factor Tables.....30

Behavior and Environment.....31

Medical Conditions.....37

Genetics and Other.....43

Cancer Statistics.....52

Table 1. Lifetime Odds of Diagnosis and Lifetime Odds of Death.....53

Table 2. Five- and 10-year Survival Rates.....54

Table 3. Prevalence and Age-Adjusted Incidence Rates.....55

Table 4. Mortality Rates.....56

Appendices.....57

A. Body Mass Index Table.....58

B. Contact your Local Health Department.....59

References.....61

ACRONYMS

AML – Acute myeloid leukemia

BMI – Body mass index

CDC – Centers for Disease Control and Prevention

DNA – Deoxyribonucleic acid

EPA – U.S. Environmental Protection Agency

mg/L – Milligrams per liter

OSHA – Occupational Safety and Health Administration

pCi/L – Picocuries per liter

PPB – Parts per billion

PVC – Polyvinyl chloride

UDEQ – Utah Department of Environmental Quality

FORWARD

In 2010, cancer was the second leading cause of death in the United States, accounting for 574,743 deaths.[1] Different factors and complex interactions all play a role in developing cancer. These factors fall under different categories: the environment, genetics, individual behaviors, and certain medical conditions.

Cancer diagnosis, treatment procedures, and outcomes have improved over time because of medical advances. Despite these advances, the risk of cancer is still very real: 1 in 2 men and 1 in 3 women will be diagnosed at some point during their lives. Fortunately, there are many things that can be done to reduce the risk of cancer, individually and globally, and all areas in between. Individuals can replace unhealthy behaviors with ones that promote health; policymakers can support health-promoting legislation; and educators can inform students about ways to reduce their risk.

This booklet is designed to describe the overall risk of cancer. Inside, readers will find detailed information about certain risk factors, maps, and cancer statistics. All readers are invited to find more environmental and public health data at the Utah Environmental Public Health Tracking website (http://epht.health.utah.gov) and the National Public Health Tracking website (http://ephtracking.cdc.gov).

The Environmental Epidemiology Program hopes that this publication will provide valuable information to everyone involved in public health and cancer prevention, including policymakers; public health and environmental professionals; educators; health care providers; and the general public. We hope all community members find this booklet engaging and that it motivates them to reduce the risk of cancer in our state.

ACKNOWLEDGEMENTS

The Utah Environmental Public Health Tracking Program would like to thank all the people who helped in creating this book. Countless individuals within these agencies generously provided their time and expertise to ensure that this book contains the most accurate and pertinent data and information.

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CANCER RISK FACTORS

A risk factor is "any attribute, characteristic, or exposure […] that increases the likelihood of developing a disease or injury."[1] This booklet focuses on risk factors that increase the risk of cancer. It is important to remember that the presence of a risk factor does not mean an individual will inevitably develop cancer.

It is possible that individuals without risk factors will develop cancer and individuals with risk factors will not develop cancer. Despite this, it is still highly recommended that individuals avoid exposure to risk factors in order to help lower their risk of cancer and improve their overall health.

This section provides specific information about the following risk factors:

- Alcohol
- Arsenic
- Benzene
- Excess weight
- Lack of physical activity
- Radon
- Smoking
- Social determinants of health
- Vinyl chloride

ALCOHOL

Heavy alcohol drinking has been linked to developing certain cancers, such as cancer of the esophagus, liver, breast, and mouth. Worldwide, it is estimated that 3.6% of all cancers are attributed to alcohol consumption.[1] In 2009, alcohol was responsible for about 19,000 cancer deaths in the United States and 26% - 35% of those deaths occurred in people who drank no more than 1½ drinks of alcohol per day.[3]

Alcohol Consumption

If you drink alcohol, it is important to only consume alcohol in moderation. Moderate alcohol consumption is considered to be one drink per day for women and two drinks per day for men.[5] One standard drink contains 14 grams of pure alcohol (see Figure 1).[4]

People who consistently consume high amounts of alcohol over a long period of time have an increased risk of cancer.[2, 3] Standard alcohol consumption definitions help people gauge their drinking patterns. Heavy alcohol consumption for men is defined as having four or more drinks on any day or more than 14 drinks per week. For women it is defined as having three or more drinks on any day or seven drinks per week. Heavy alcohol consumption is also known as "high risk drinking."[4]

What is a standard drink of alcohol?

One standard drink contains 14 grams of pure alcohol, or approximately:

- 12 oz. of beer
- 8-9 oz. of malt liquor
- 5 oz. of wine
- 1.5 oz. of 80-proof spirits

Different brands or types of alcoholic drinks may have different alcohol content.

Source: U.S. Department of Health and Human Services

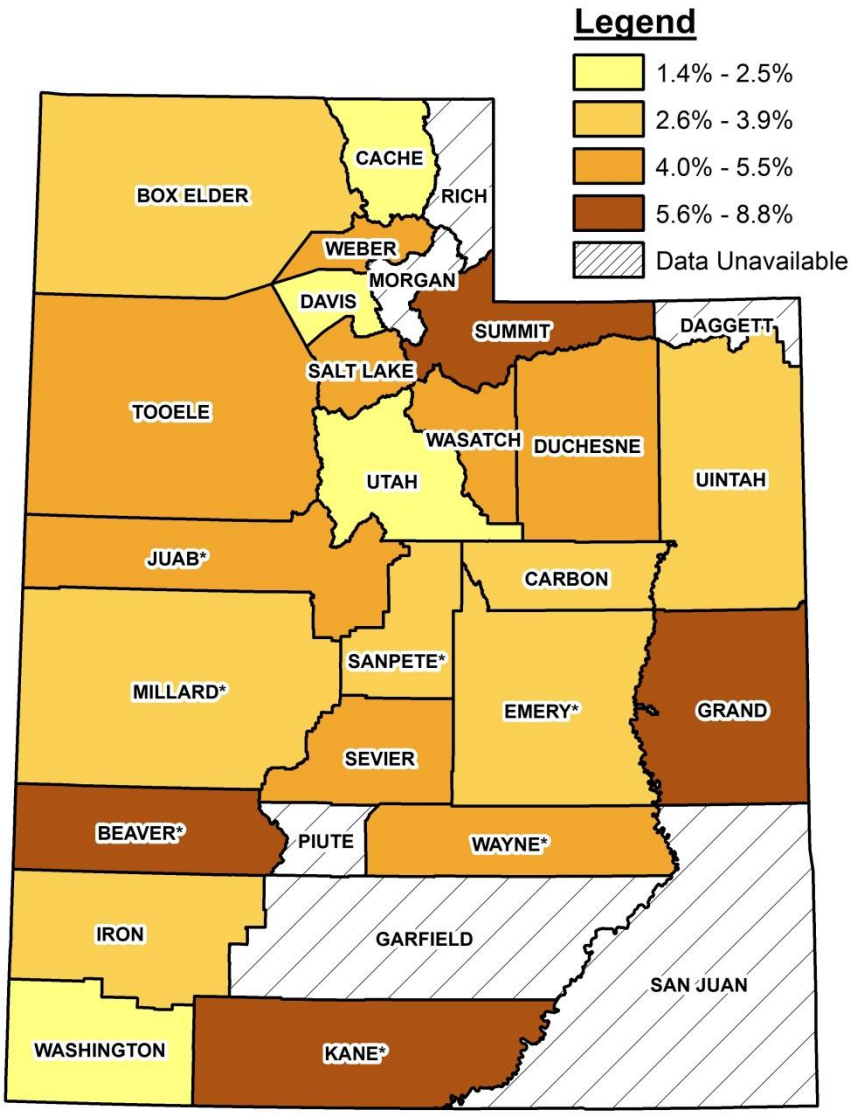
Between 2009 and 2012, 3.5% of the adult population in Utah (age-adjusted rate) engaged in chronic drinking, which is defined as drinking more than 30 drinks per month for women or drinking more than 60 drinks per month for men.[6] The percentage of the population who engaged in chronic drinking in Utah is presented in Figure 1.

Alcohol and Cancer Risk

When alcohol is digested, it results in certain changes in the body that can increase the risk of cancer. After consuming alcohol, the body produces a certain chemical that can damage a person's DNA.[2] Damaged DNA can then lead to abnormal cells multiplying improperly. As the abnormal cells continue to grow, they form a tumor. Researchers have found that alcohol makes it difficult for the body to use important vitamins and minerals.[2] When the body is unable to properly process these minerals, it may increase the risk of cancer.

Alcohol also makes the body produce higher amounts of estrogen, which is a hormone that has been linked to breast cancer.[2] People who use both tobacco and alcohol have a greater risk of developing cancer of the oral cavity, throat, larynx, and esophagus. In this case, the risk of cancer is even greater than the risk posed by tobacco and alcohol separately.

Figure 1. Age-Adjusted Percent of Adult Population who engaged in Chronic Drinking, by County, Utah, 2009-2012



Source: Utah Behavioral Risk Factor Surveillance System. Retrieved June 20, 2014 from Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http://ibis.health.utah.gov.
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed unreliable by UDOH standards.*

ARSENIC

Arsenic is a metal-like element that occurs naturally in the soil and is common throughout the environment (though in small quantities). It can appear as a greyish metallic solid, but when it bonds with other elements, it can also appear as a pale powder. Different forms of arsenic are created when it bonds with different elements. When arsenic bonds with carbon or hydrogen, it is called organic arsenic. When it bonds with other elements like oxygen, chlorine, or sulfur, it is called inorganic arsenic.[2] The toxicity between organic and inorganic arsenic is very different: inorganic arsenic is very toxic and is mainly responsible for harm to human health whereas organic arsenic is hardly toxic at all.[3]

Arsenic Sources and Exposure

People are exposed to arsenic through the environment and through human activities. There is a small amount that everyone is exposed to through air, soil, drinking water, and food because arsenic occurs naturally in the environment. Of these four exposure sources, drinking water and food are responsible for most arsenic exposure. To protect public drinking water sources, the U.S Environmental Protection Agency's (EPA) maximum arsenic contamination level is 10 parts per billion (ppb) for all public water systems.[4] Testing is based on total arsenic levels, which includes both organic and inorganic arsenic.

Common sources of arsenic in food are seafood (primarily organic arsenic), rice and rice cereal, mushrooms, and poultry.[2] As plants grow, they uptake some arsenic that is already in the soil. When people consume the plants, they are exposed to arsenic. In places where inorganic arsenic pesticides were once used, soil arsenic levels may be higher and consequently lead to more arsenic uptake by plants. However, this is not a major source of arsenic exposure.[1]

Human activities contribute to arsenic exposure too. Copper and lead smelting and leaching from hazardous waste sites are other sources of arsenic exposure. In the past, other sources included pressure-treated wood, some animal feed, and pesticides that used inorganic arsenic. With regards to pressure-treated wood, a voluntary phasing out of wood treated with arsenic in residential building began in 2003. Even though arsenic is being replaced with other chemicals, there is still an arsenic exposure risk in homes built with pressure-treated wood prior to the phasing out.

Water Quality Testing and Private Drinking Wells

Drinking water contamination is a common source of inorganic arsenic exposure. Water that is contaminated with arsenic does not have a unique smell or taste. The only way to determine contaminant levels is through testing the water. In order to protect the public's drinking water,

water quality is tested at the source of the water well. The average arsenic levels for all source water wells and groundwater testing from 1978 to 2013 before treatment is shown in Figure 1. It does not reflect the levels of arsenic in the public drinking water system. Figure 1 can be used to estimate areas in Utah that have higher levels of arsenic in the groundwater.

If a water well tests higher than the maximum contaminant level allowed by the EPA, then the well owner and the Utah Department of Environmental Quality (UDEQ) establish a treatment plan to make sure the water is safe before the public consumes it. However, this is only true for those who receive their water from a public water system. Private wells are not regulated by the EPA or the UDEQ. The Utah Administrative Code defines a nonpublic water system as one that has less than 15 connections or serves fewer than 25 people.[5] Because private wells are not regulated, it is important that people who use them regularly test their water to protect themselves from high levels of arsenic (and other harmful contaminants). If you have questions or concerns, or want more information about private wells and private well testing, contact your local health department (see Appendix B).

If you get your drinking water from a private well, you can protect your health by doing the following:

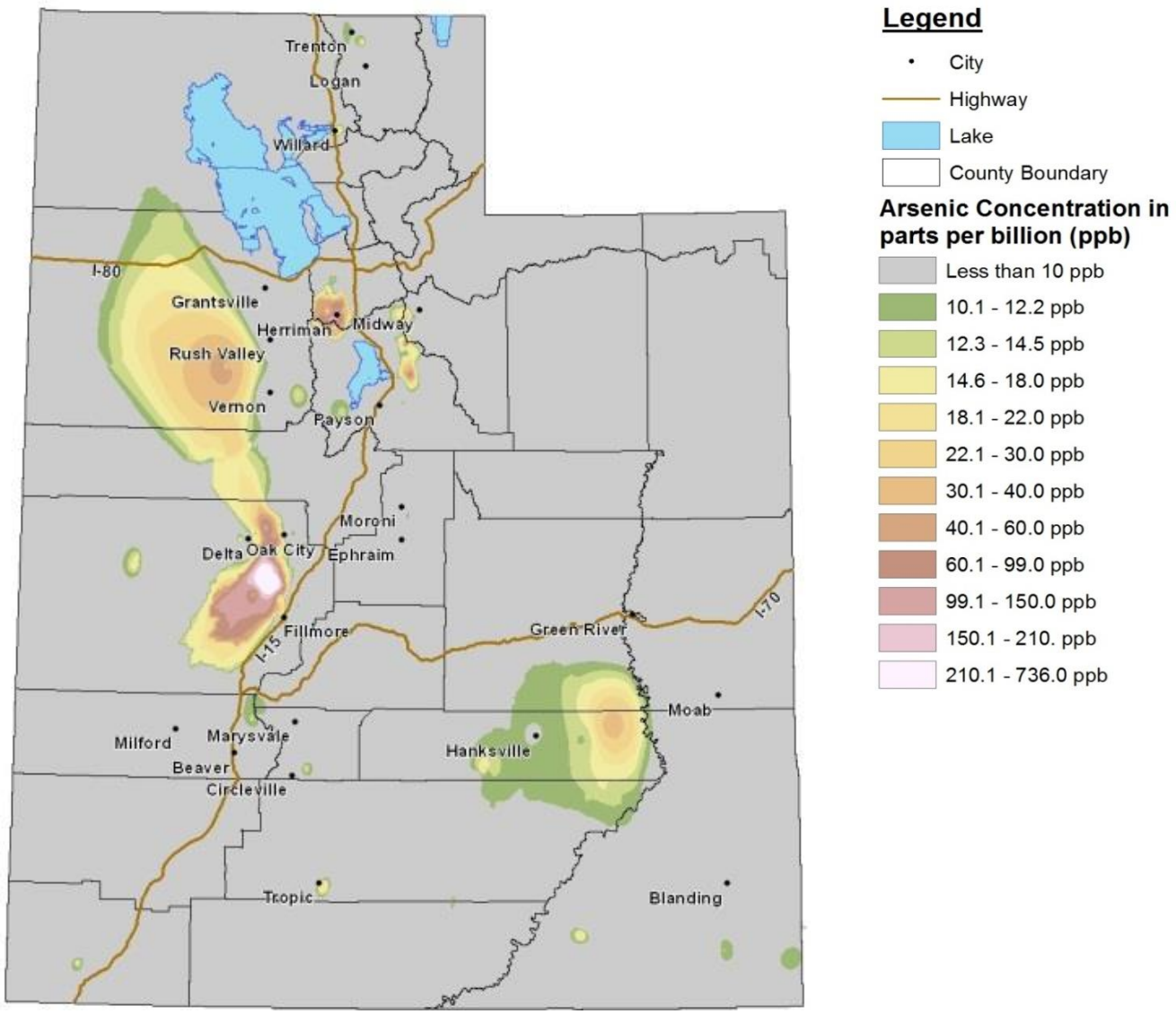
- *Test for contaminants once a year*
- *Use a well cap or other protective seal*
- *Check for broken or corroded well caps or well casings*
- *Keep specific records of all well maintenance and testing, including test results*
- *Do not mix any chemical or pollutant near the well; they may leach into the ground and contaminate the water*
- *Do not dump waste or chemicals in or near dry or unused wells*

Source: U.S. Environmental Protection Agency

Effects of Arsenic on Human Health

The negative health effects of arsenic depend on how much arsenic a person is exposed to and the duration of that exposure. Exposure to extremely high levels of arsenic over a short period of time is called acute arsenic exposure, or arsenic poisoning. Exposure to lower levels of arsenic over a long period of time is called chronic arsenic exposure. Acute and chronic arsenic exposures manifest themselves in different ways. Signs of acute exposure include abdominal pain, diarrhea, and vomiting. Signs of chronic exposure include changes in the skin, such as warts on the soles of the feet and palms of the hand.[2] Long term arsenic exposure has been linked to cancer of the lung, liver, bladder, and prostate cancer, as well as nonmelanoma skin cancer. For this reason, the EPA set a maximum contamination level in drinking water to make sure long-term exposure to arsenic is at levels low enough to not harm human health.

Figure 1. Arsenic Levels Above the EPA Limit of 10 ppb for All Source Water Wells and Ground Water Testing from 1978 – 2013, Utah*



*This map does not show the levels of arsenic in public drinking water systems. All water that passes through a public drinking water system must meet EPA requirements before public consumption.

Source: U.S Geological Survey

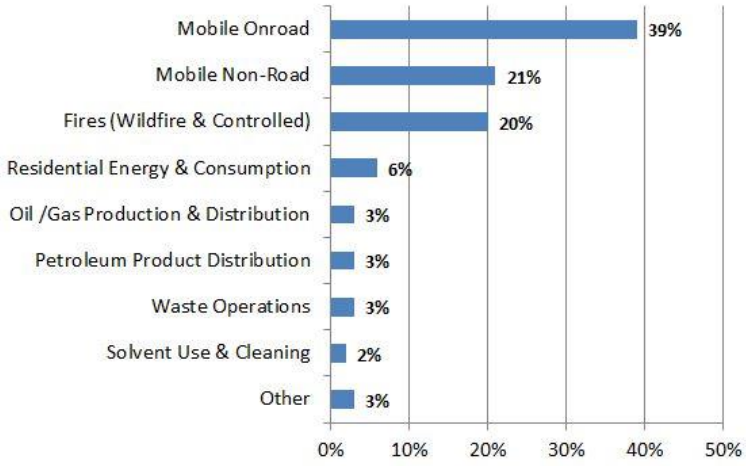
BENZENE

Benzene is a liquid chemical that has a sweet scent and no color.[1] It is not only harmful to human health because it is very flammable, but because it quickly evaporates into the air, which makes it easier to breathe in.[1] Benzene is commonly used to manufacture different chemicals and products.[1, 2]

Benzene Emission and Exposure

Both natural and man-made sources can cause benzene to get in to the air. Volcanoes and forest fires are major natural sources. Automobile exhaust, coal and oil burning, gasoline evaporation from gas stations, and industrial solvents are common man-made sources.[1, 4] Emissions from human activities account for the majority of exposure to benzene.[2] The percent contribution from different sectors to overall benzene emissions in the United States is shown in Figure 1. Total benzene emissions by county in Utah are shown in Figure 2.

Figure 1. Percent Contribution to Overall Benzene Emissions in the United States, 2005



Source: U.S. Environmental Protection Agency. (2011). 2005 National-Scale Air Toxics. Retrieved on December 2, 2013 from http://www.epa.gov/nata2005/.

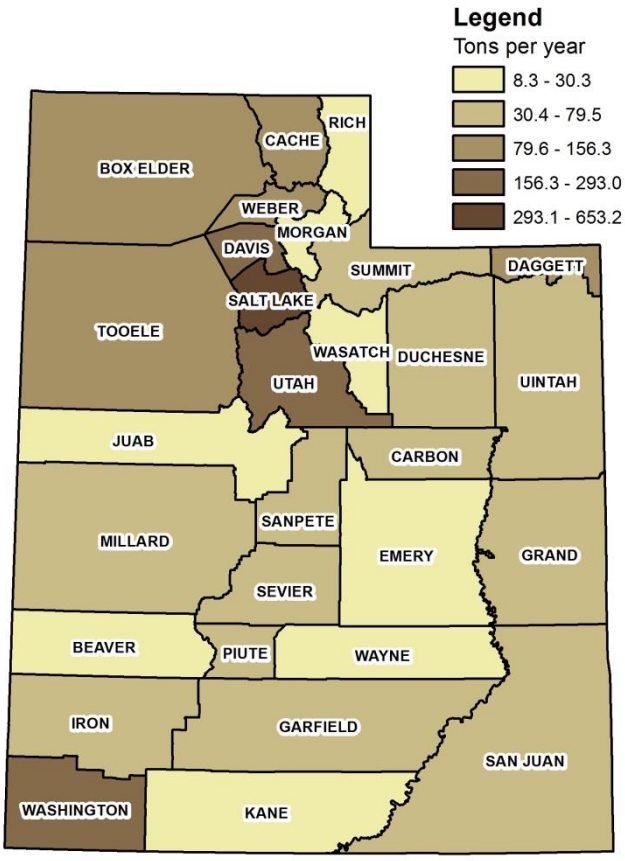
People are often exposed to benzene by breathing air that is contaminated with benzene. One can be exposed by having skin contact with chemicals that contain benzene or contact with water contaminated with benzene.[1]

Gasoline and tobacco smoke are primarily responsible for the benzene-contaminated air that people breathe. For this reason, it is important that people avoid exposure to these substances as much as possible. It is especially important to avoid smoking: smokers are exposed to about 10 times more benzene than nonsmokers on a daily basis.[1] Benzene is used as an additive to gasoline; however, the amount of benzene in gasoline has decreased over the years. As of 2011, the EPA decreased the annual average of benzene allowed in gasoline to 0.62% (with a maximum average of 1.3%).[5]

People who work in industries that use benzene can be exposed to higher amounts of benzene. Some of these industries include petroleum refining, coal chemical manufacturing, rubber tire production, and other industries involving the production, storage, or transport of products

that contain benzene. There are other occupations that may expose workers to benzene, such as gas station employees, rubber workers, firefighters, coal oven workers, printers, shoemakers, and lab technicians.[1] Because of the health risks involved with benzene, the Occupational Safety and Health Administration (OSHA) enforces benzene limits in the workplace to protect workers.

Figure 2. Total Benzene Emissions* in Tons per Year, by County, Utah, 2005



* Total Benzene Emissions refers to the combined output, in tons, from major point sources, nonpoint area sources, wildfires, prescribed burnings, all on- and off-road emissions, commercial marine vessels, locomotives, and airports.

Source: U.S. Environmental Protection Agency. (2011). 2005 National-Scale Air Toxics Assessment. Retrieved on December 2, 2013 from http://www.epa.gov/nata2005/.

Benzene and Human Health

Benzene is a carcinogen, which means it is capable of causing cancer in humans. Regardless of the way a person is exposed, benzene is dangerous to human health. The amount of benzene a person is exposed to and the length of time of that exposure both impact potentially negative health effects.[1] Exposure to high levels of benzene over a short period of time is called acute, or short-term, exposure; consistent exposure over a long period of time is called chronic, or long-term, exposure. Long-term benzene exposure is associated with developing leukemia.[1] Leukemia is a cancer of bone marrow or organs that form blood. This leads the body to produce abnormal blood cells. Benzene exposure is specifically associated with a type of leukemia called acute myeloid leukemia (AML).[1] This type of leukemia is fast-acting and gets worse faster than chronic leukemia.[3] AML affects the myeloid cells, which are the tissues in the bone marrow that make blood. Aside from cancer, there are numerous health hazards associated with exposure to benzene. Short-term exposure effects include vomiting, dizziness, drowsiness, headaches, and skin, eye, and upper respiratory tract irritation.[1, 4] Long-term exposure effects include reproductive and developmental effects, blood disorders, chromosome abnormalities, immune system damage, and excessive bleeding.[1, 4]

EXCESS WEIGHT

A person's body weight greatly impacts his or her health. Being overweight or obese increases the risk of many chronic diseases, such as heart disease, stroke, Type 2 diabetes, osteoarthritis, high blood pressure, gallstones, sleep apnea, and reproductive issues.[4, 6]

Body mass index (BMI) is a measure that is used to track and describe people's weight. It is used as a surrogate measure for body fat because it is a simple calculation that uses a person's height and weight. BMI ranges and associated categories for adults are shown in Table 1. Use the BMI chart in Appendix A to estimate your personal BMI.

Table 1. Adult Weight Categories and BMI Ranges

Weight Category	BMI range
Underweight	Less than 18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obese	30.0 and above

Source: National Cancer Institute.

Excess weight is a serious health concern in Utah. From 2009-2012, 60.2% of all adults (age-adjusted) in Utah were overweight or obese.[9] The percentage of Utah adults who are overweight or obese is shown in Figure 1.

Obesity and Cancer

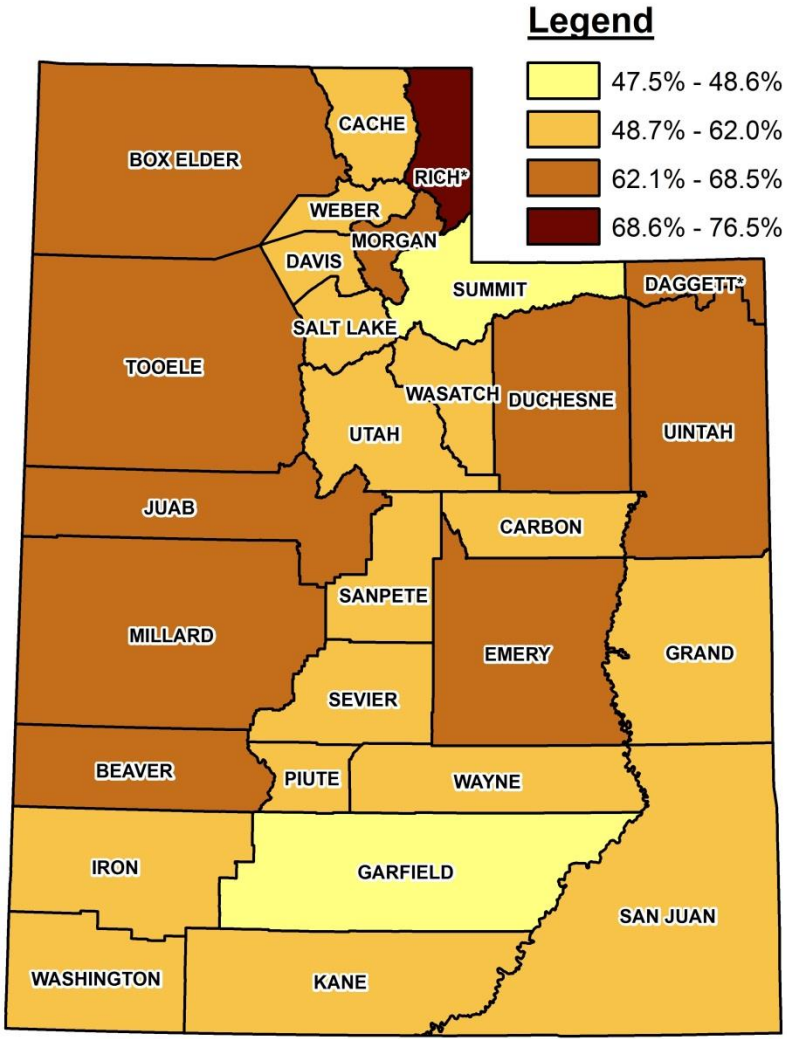
Obesity is associated with an increased chance of developing cancer, such as cancer of the esophagus, pancreas, colon, uterus, kidney, thyroid, gallbladder, and breast (after menopause).[5, 8, 12, 10] It has been estimated that being overweight or obese is responsible for 15-20% of all cancer deaths.[2] Despite this increased risk, researchers do not completely understand the exact reasons why this is so. It may be that obesity represents other cancer risk factors, such as poor diet (high fat and calorie, and low fiber) and lack of physical activity.[3] Other evidence suggests that obesity increases the amount of certain hormones and proteins that may make it easier for tumors to grow.[5] Losing weight may reduce the risk of cancer, but there is currently not enough evidence to definitively support that conclusion.[1, 11] However, losing weight improves health in many other ways and does reduce the risk of other weight-related disease, such as high blood pressure and diabetes.[7]

Excess Weight and Disease Prevention

The World Cancer Research Fund and the American Institute for Cancer Research recommend the following behaviors as ways for people to lower their risk for excess weight-related disease.[12]

1. Maintain body weight within the "Normal" BMI category
2. Exercise at least 30 minutes per day
3. Avoid energy-dense foods (like fast food) and drinks with lots of sugar
4. Eat more plant-based foods
5. Limit red meat and processed meat consumption
6. Limit alcohol consumption
7. Limit salt consumption and avoid preserving foods with salt
8. Try to get all daily nutrients without using dietary supplements

Figure 1. Age-Adjusted Percent of Adult Population who are Overweight or Obese (BMI 25 or over), by County, Utah, 2009-2012



Source: Utah Behavioral Risk Factor Surveillance System. Retrieved June 20, 2014 from Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http:/ibis.health.utah.gov
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed*

LACK OF PHYSICAL ACTIVITY

Consistent physical activity is a vital component of maintaining good health and well-being. It also plays a role in reducing the risk of certain cancers, such as cancer of the colon, breast, and uterus (endometrium).[1, 2, 5] Physical activity has been shown to reduce the risk of colon cancer by 30%-40%.[5] Furthermore, physical activity reduces the risk of developing and dying from breast cancer, regardless of whether physical activity began before or after diagnosis.[1, 4] The risk of uterine cancer can be reduced 20%-40%.[5]

Other research shows that physical activity could lower the risk of other cancers as well, but results are less conclusive.[5] Aside from lowering the risk of certain cancers, other health benefits of physical activity include weight control; healthy bones, joints, and muscles; and psychological health. It also lowers the risk of high blood pressure, diabetes, heart disease, and early death.[5, 6]

Physical Activity Recommendations

To reduce the risk of cancer and other diseases, it is important to be physically active on a regular basis. The Centers for Disease Control and Prevention (CDC) makes the following physical activity recommendations.[3]

- *Children ages 6 to 17*
    1. At least 60 minutes per day of a combination of aerobic, muscle strengthening, and bone strengthening activities.
- *Adults ages 18 to 64*
    1. At least 2 hours and 30 minutes of *moderate*-intensity aerobic activity *or* 1 hour and 15 minutes of *vigorous*-intensity aerobic activity every week **and**
    2. Muscle-strengthening activities on at least 2 days of the week.
- *Older adults age 65 and older who are generally fit and without any limiting health conditions*
    1. At least 2 hours and 30 minutes of *moderate*-intensity aerobic activity *or* 1 hour and 15 minutes of *vigorous*-intensity aerobic activity every week and muscle-strengthening activities on at least 2 days of the week, **and**
    2. Muscle-strengthening activities on at least 2 days of the week.

What does "moderate" and "vigorous" intensity mean?

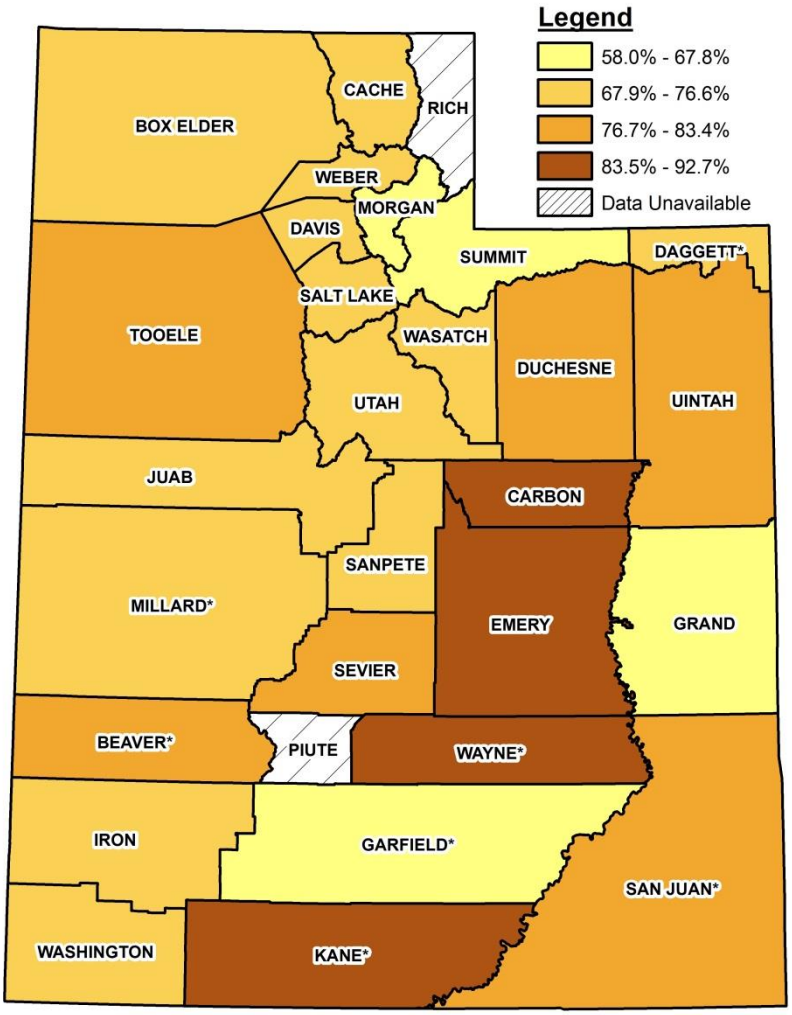
The CDC says that a good way to differentiate between the two is by talking. With moderate-intensity, you can talk but not sing. With vigorous-intensity activity, you will not be able to say more than a few words without needing a breath.

Source: Centers for Disease Control and Prevention

For more detailed information about the CDC's physical activity recommendations, visit http://cdc.gov/physicalactivity.

During 2011-2012, 74.5% of adults in Utah (age 18 and older) do not meet the recommended aerobic activity and muscle strengthening recommendations.[7] The percentage of Utah adults (age 18 and older) who did not meet the recommendations for both aerobic activity and muscle strengthening, aerobic activity, and muscle strengthening are presented in Figures 1, 2, and 3, respectively.

Figure 1. Age-Adjusted Percent of Adults (age 18 and older) who did not meet both the Aerobic Activity and Muscle Strengthening Recommendations, by County, Utah, 2011-2012



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Note: Age-adjusted to the U.S. 2000 standard population
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed unreliable by UDOH standards.*

Figure 2. Age-Adjusted Percent of Adults (age 18 and older) who did not meet the Aerobic Activity Recommendations, by County, Utah, 2011-2012

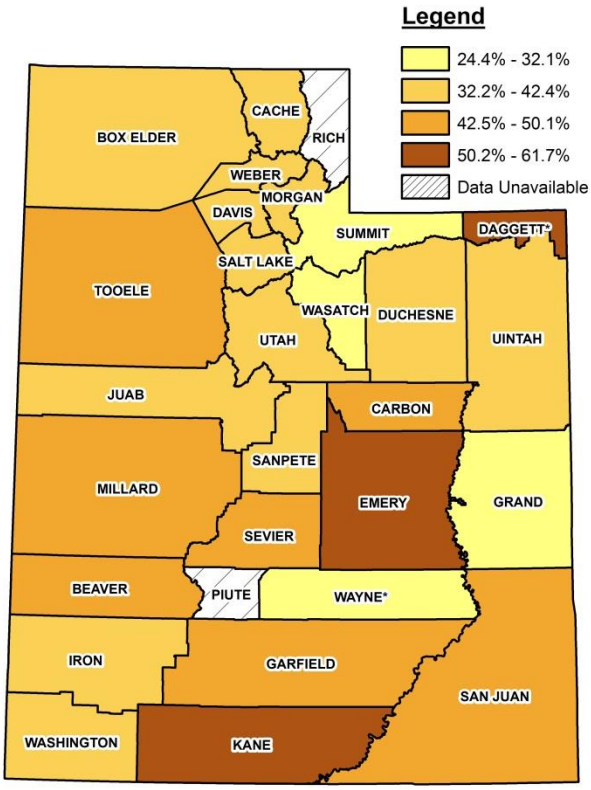
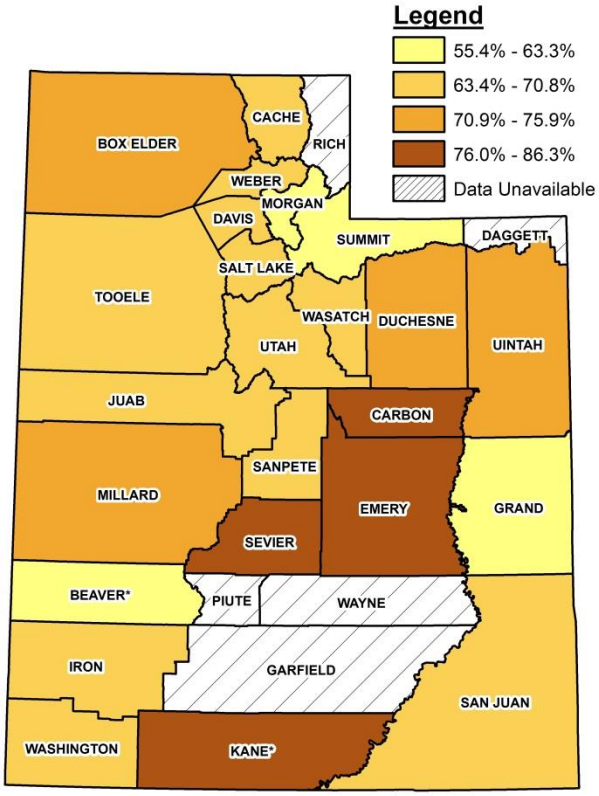


Figure 3. Age-Adjusted Percent of Adults (age 18 and older) who did not meet the Muscle Strengthening Recommendations, by County, Utah, 2011



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Note: Age-adjusted to the U.S. 2000 standard population.
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RADON

Uranium and thorium are radioactive elements that occur naturally in the soil. When they decay, they produce a radioactive gas called radon. Radon is the leading cause of lung cancer in nonsmokers; about 15,000 to 22,000 deaths of radon-induced lung cancer occur each year in the United States.[1, 4] Outside air naturally has small amounts of radon, but its biggest threat is when it gets trapped inside homes and buildings. As it gets trapped inside, radon air concentration increases, increasing the risk of lung cancer.[2, 3]

Radon Testing

Because radon has no color, odor, or taste, the only way to be certain of its presence in your home or building is through proper testing. The most common way to test for radon is the short-term, self-administered test. The test lasts between 48 to 96 hours, and test results are returned within one to two weeks. Test kits can be purchased through the UDEQ Utah Radon Program website (http://radon.utah.gov) or at home improvement stores. After properly following the test instructions, the kit is sent to a laboratory for analysis.

Radon is measured by picocuries per liter of air (pCi/L). A curie is a unit of measurement used to describe radioactive decay. A picocurie is one-trillionth of a curie. Average radon levels for short-term tests in Utah are shown in Figure 1. The EPA established 4.0 pCi/L as the action level threshold for radon levels in homes. Homes or buildings that measure 4.0 pCi/L or above should take prompt action to lower radon levels.[5] Even though 4.0 pCi/L is the established action threshold, any radon level is harmful to human health.[4] The percentage of short-term radon test results in Utah that are at or above 4.0 pCi/L is shown in Figure 2.

Radon and Lung Cancer

Radon is not a region-specific or state-specific problem. The best way to prevent exposure to radon is to properly test your home and take action if necessary. Even though underlying geologic factors play a role in radon risk, an individual's home plays the greatest role in radon exposure. Older homes, homes with a walk-in or encapsulated basement, or individuals living in a basement all have a higher risk of radon exposure.

The other way to reduce the risk of lung cancer from radon is by not smoking. If you do smoke, stopping now will greatly decrease your risk for lung cancer. People who smoke and who are exposed to radon face a higher risk of lung cancer than from either radon or smoking alone.[4, 6] Quitting will greatly reduce your risk for lung cancer.

If test results are above 4.0 pCi/l, take action to mitigate the problem. This usually requires making some sort of home renovation to remove radon before it can get into your home. A common method is a vent pipe system and a fan. As radon rises beneath the foundation of a house, the pipe and fan expel the radon outside the house before it gets trapped inside. Contact a certified radon mitigator in your area to discuss options and ensure quality work. The Utah Radon Program provides a list on their website at http://radon.utah.gov.

Figure 1. Average Radon Levels from Home Radon Tests by County, Utah, 1992-2013

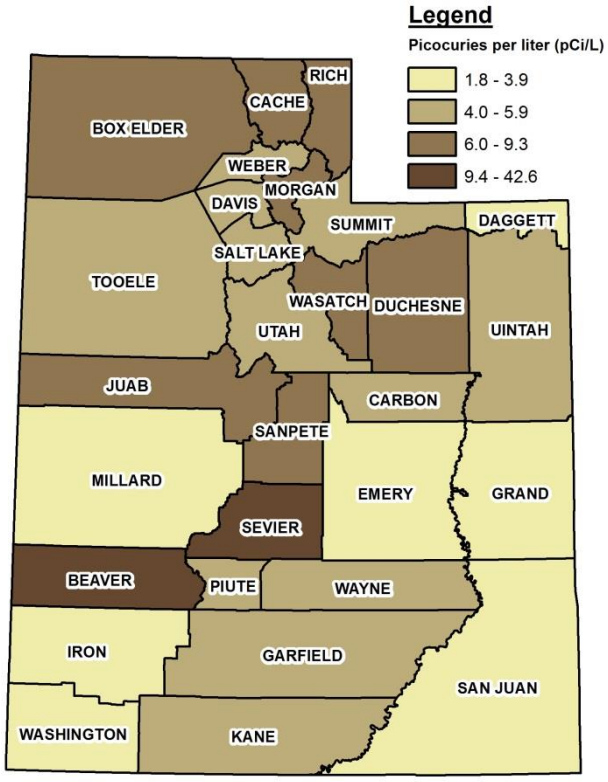
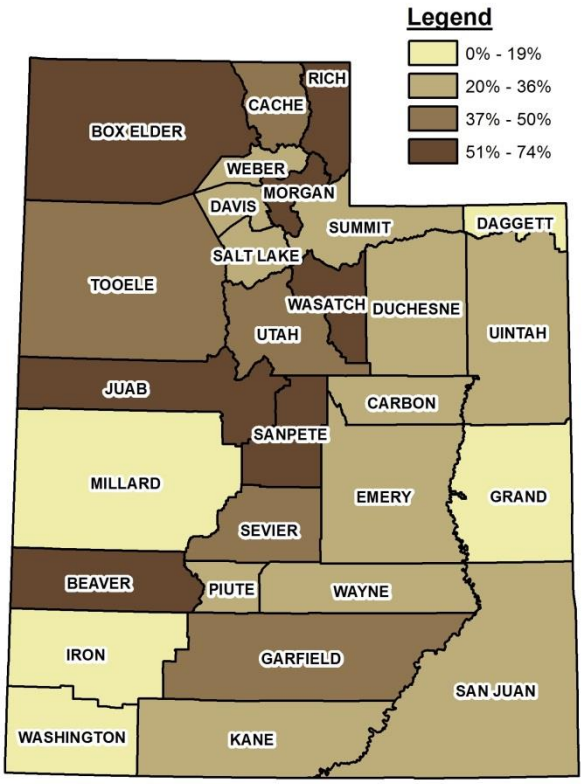


Figure 2. Percent of all Radon Home Tests above 4.0 pCi/L by County, Utah, 1992-2013



Source: Utah Department of Environmental Quality at http://www.radon.utah.gov/docs/2013/June/Radon%20Short%Term%202013%20version%205.pdf.

SMOKING

Tobacco use is a serious public health concern because it is the worldwide leading cause of preventable death. In the United States, about 19% of adults use tobacco products.[3] Each year, tobacco use is responsible for 1 out of every 5 deaths in the United States.[3] Utah has the lowest adult smoking rate in the nation at only 10.6% (in 2012).[3] The percent of adult smokers in each county is shown in Figure 1. The good news is that smoking rates are dropping not only in Utah, but nationwide as well.

Health Effects

Tobacco use has been linked to numerous health problems and diseases. People who smoke face a much higher risk of many different diseases.

Cardiovascular Disease. Tobacco is a large contributor to cardiovascular disease because it damages red blood cells, blood vessels, and the heart. This leads to a condition called atherosclerosis, which occurs when plaque forms in the arteries.[7] As more plaque forms, it makes it difficult to transport blood around the body and increases the risk of heart attack, stroke, peripheral vascular disease, and aortic aneurysm.

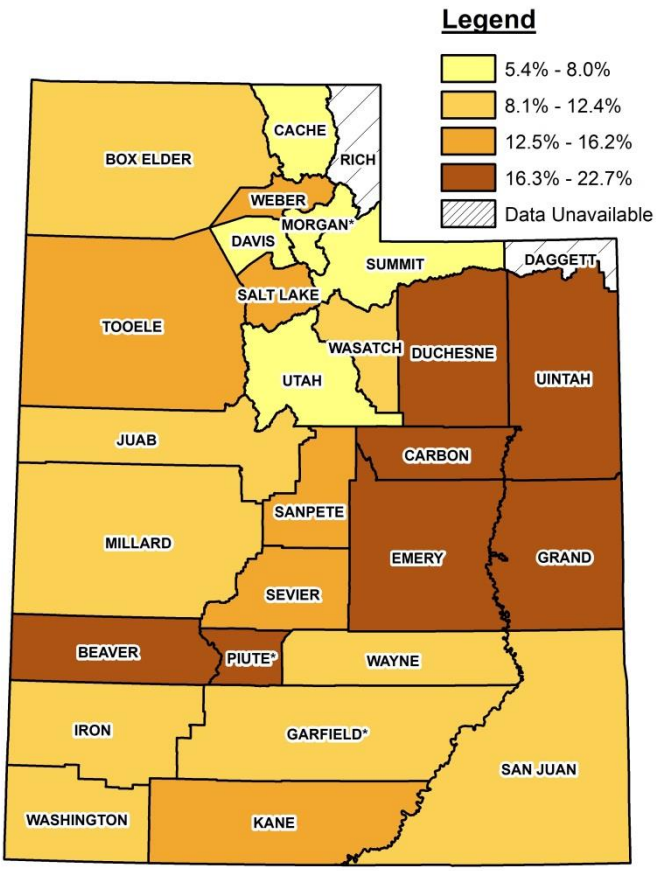
Cancer. Tobacco smoke contains as many as 7,000 different chemicals, many of which are harmful to human health. Dozens of these harmful chemicals are known to be carcinogenic (cancer-causing). These include arsenic, benzene, beryllium, cadmium, chromium, ethylene oxide, nickel, polonium-210, and vinyl chloride.[10, 11] Long-term exposure to these chemicals greatly increases DNA damage, which increases the risk of developing cancer. Furthermore, people who use both tobacco and alcohol have an even higher risk of developing cancer of the oral cavity, throat, larynx, and esophagus. The risk of these cancers is even greater than the risk posed by tobacco and alcohol separately.[9]

Lung Disease. Smoking greatly increases the risk of lung diseases, such as pneumonia, asthma, chronic obstructive pulmonary disease, bronchitis, and emphysema. Even though smoking negatively affects the whole body, the lungs are particularly susceptible.

Pregnancy and Reproductive Health. Pregnant women who smoke have an increased risk of disease, not only for the baby, but for themselves as well. The developing baby has a higher risk for stillbirth, premature birth, sudden infant death syndrome, low birth weight, cleft lip, and cleft palate.[4, 12] As for the mother, she faces a higher risk for infertility, placenta previa (placenta blocking the cervix), ectopic pregnancy (pregnancy that occurs outside of the uterus) and placental abruption (placenta that detaches from the uterus).[5] If you are pregnant and currently smoke, stopping now will greatly reduce the risk of disease for you and your baby.

Secondhand smoke (sometimes called passive smoking or environmental tobacco smoke) is also an important health concern. No amount of secondhand smoke is considered "safe." Nonsmokers who are exposed to secondhand smoke still face a higher risk for coronary heart disease and lung cancer.[1, 8, 11] Aside from at-home exposure by living with a smoker, other places of secondhand smoke exposure include the workplace, bars, restaurants, and public facilities. For this reason, smoke-free legislation is an important step in protecting the public's health.

Figure 1. Age-Adjusted Percent of Adults who Currently Smoke Cigarettes, by County, Utah, 2009-2012



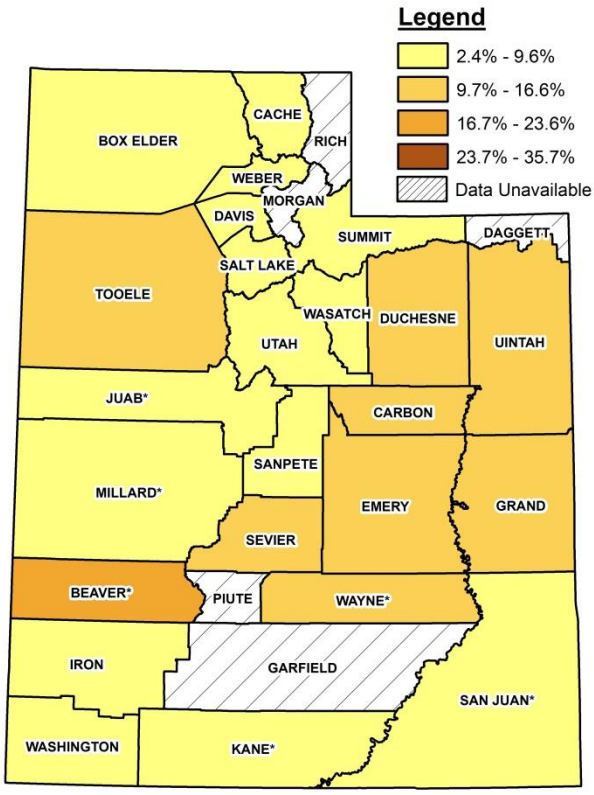
Source: Utah Behavioral Risk Factor Surveillance System, Retrieved on June 20, 2014, from the Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http://www.ibis.health.utah.gov
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed unreliable by UDOH standards.*

There are distinct demographic divisions among those who use tobacco. In Utah, Blacks and American Indians/Native Alaskans have the highest cigarette smoking rates at 19.7% and 20.2%, respectively.[13] Asians have the lowest rate at 8.5%.[13] People with less education have higher smoking rates: 25.0% of people with less than a high school diploma smoke, whereas 8.3% of people with some post-high school education smoke.[13] The differences between education levels and smoking rates are shown in Figure 2. Males are also more likely to smoke than females.[6] In Utah, 11.4% of males and 9.0% of females use cigarettes.[13] To view all of the demographic tables, see Figure 3.

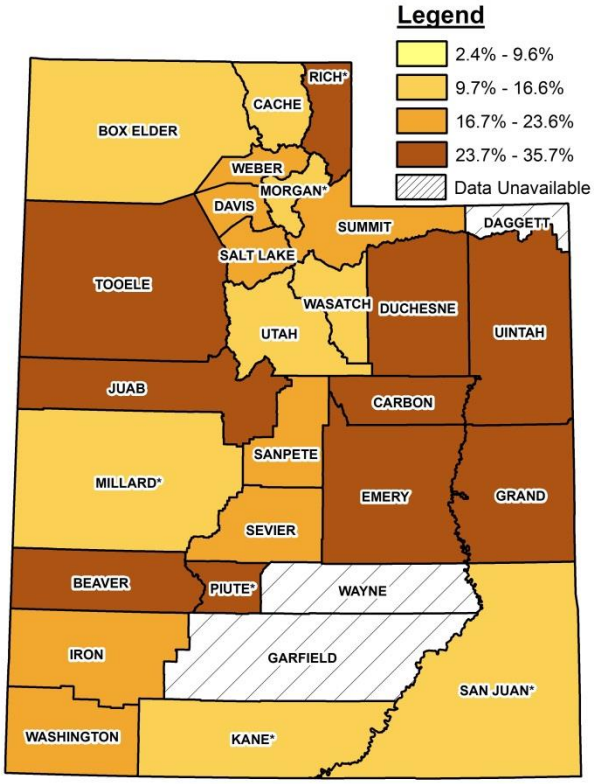
If you are trying to quit smoking or thinking about quitting, there are many resources available to help you. The Tobacco Prevention and Control Program and its partners provide many services to help smokers quit. You can call the Utah Tobacco Quit Line toll-free at **1-800-QUIT-NOW (784-8669)** or visit their website at www.tobaccofreeutah.org.

Figure 2. Age-Adjusted Percent of Adults Age 25+ who Currently Smoke Cigarettes, by Education Level, by County, Utah, 2009-2012

Education Level: **Some Post-High School or College Graduate**



Education Level: **Less than High School/High School Diploma or GED**



Source: Utah Behavioral Risk Factor Surveillance System, Retrieved on June 20, 2014, from the Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http://www.ibis.health.utah.gov
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed unreliable by UDOH standards.*

Figure 3. Age-Adjusted Rates of Cigarette Use in Utah, by Age, Education, Race, and Sex 2012

Age	Percent who smoke cigarettes
18 – 34 years	12.7%
35 – 49 years	10.0%
50 – 64 years	11.3%
65+ years	4.7%
Total	10.6%

Education (Adults Aged 25 and Older)	Percent who smoke cigarettes
Less than a high school degree	25.0%
High school degree or GED	16.9%
Some Post-High School	8.3%
College Graduate	2.5%

Race	Percent who smoke cigarettes
Black	15.7%*
American Indian/Native Alaskan	21.2%
Pacific Islander	9.8%*
White	10.2%
Asian	10.4%*
Other	10.0%

Sex	Percent who smoke cigarettes
Male	11.4%
Female	9.0%

Source: Utah Behavioral Risk Factor Surveillance System, Retrieved on June 25, 2014, from the Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http://www.ibis.health.utah.gov
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed*

SOCIAL DETERMINANTS OF HEALTH

The term *social determinants of health* refer to the "conditions in which people are born, grow, live, work, and age," and how they impact people's health.[9] This includes factors such as education, occupation, income, transportation, nutrition, area of residence, living conditions, and poverty.[3, 7] Sometimes different terms are used to refer to the inequalities that result from the social determinants, such as socioeconomic status and social class.[4] The social determinants of health interact in ways that increase a person's risk for cancer (and many other diseases). Common consequences of these factors make it difficult for people to have health insurance, receive proper medical care, and gain educational opportunities. Additionally, poorer living conditions can subject people to harmful environmental exposures.[7]

For example, consider the impact of income, occupation, and education. The available income an individual or family has directly impacts their access to food, shelter, and health services;[4] a reduced ability to access proper health care services and basic survival needs only negatively impacts health. Occupation directly affects income, which can impact health for the previously mentioned reasons. Occupation can provide benefits such as health insurance or educational opportunities that may not be typically provided to people in a lower social standing.[4, 6] Certain working environments can expose workers to chemicals or other toxins that are known to cause cancer.[4] Education can impact health by affecting both income and occupation potential.

Examples of these types of inequalities in Utah can be seen in Figures 1 and 2. In Figure 1, respondents to a health survey were asked if there was a time during the last 12 months that they needed to see a doctor, but could not do so because of the cost. The results are divided by income level. In Figure 2, respondents were asked if they had any type of health care coverage. The results are divided by education level.

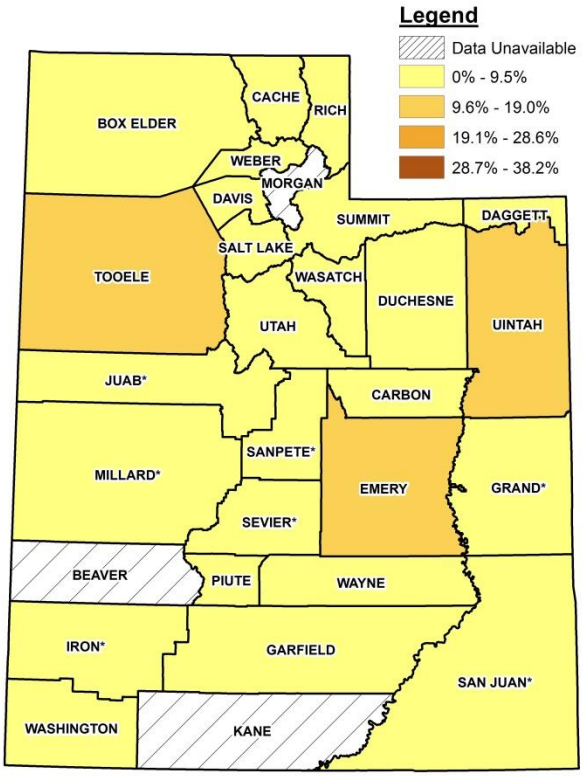
Social Determinants of Health and Cancer Risk

Over the past two decades, rates for cancer diagnosis and cancer mortality have decreased. However, this reduction is not equal among all social classes.[2] People from underprivileged groups are more likely to be diagnosed with cancer at a later stage.[1, 7, 8] Cancer stage diagnosis is an important aspect used to assess the outcome of a cancer diagnosis and late-stage diagnosis makes treatment more difficult and decreases the chance of survival. It has been estimated that the five-year survival rate of cancer is 10% lower for people who live in poorer areas when compared with wealthier areas.[8] It may be that people from a lower socioeconomic standing may be less prompt in seeking health care, which increases the chance of finding a cancer at a later stage, leading to a poorer outcome.[6]

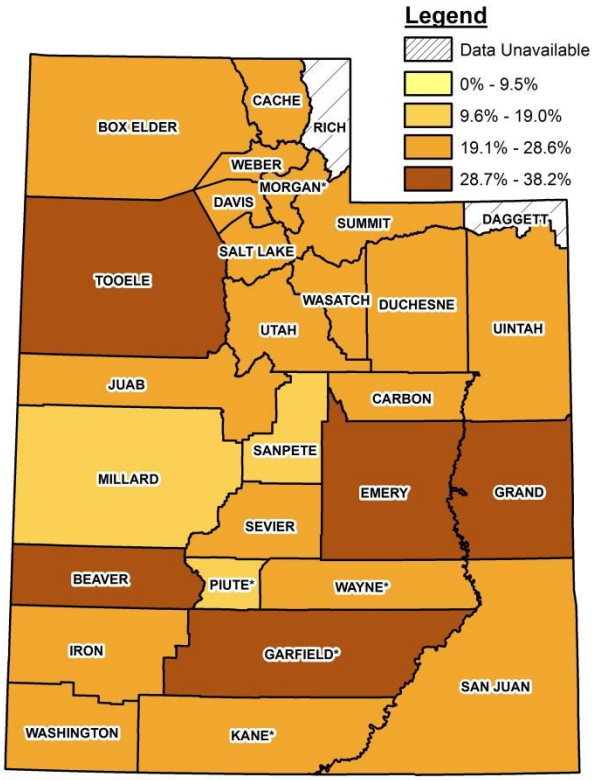
Further disparities are seen across education levels. A 2008 study examined colorectal, lung, breast, and prostate cancer death rates in people with different levels of education. Over an eight-year period, mortality rates from these cancers decreased in individuals who were college graduates or had some college education. However, during the same time period, mortality rates from these cancers stayed the same or even increased in individuals who did not finish high school or only completed high school.[5] All of these types of inequalities can interact in ways that increase the risk of cancer for underprivileged groups.

Figure 1. Age-Adjusted Percent of Adults Unable to Access Health Care Due to Cost, by Annual Income Level, by County, Utah, 2009-2012

***Income Level:* $50,000 or more**



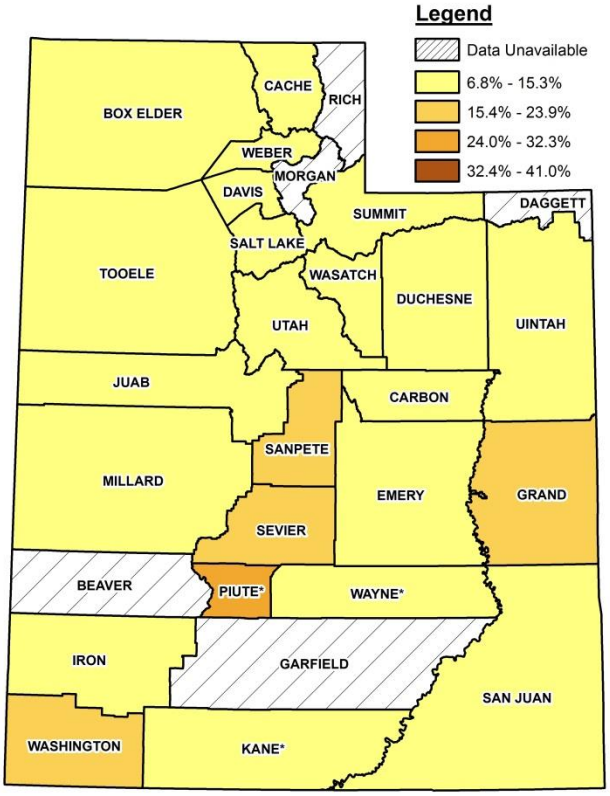
***Income Level:* $0 - $49,999**



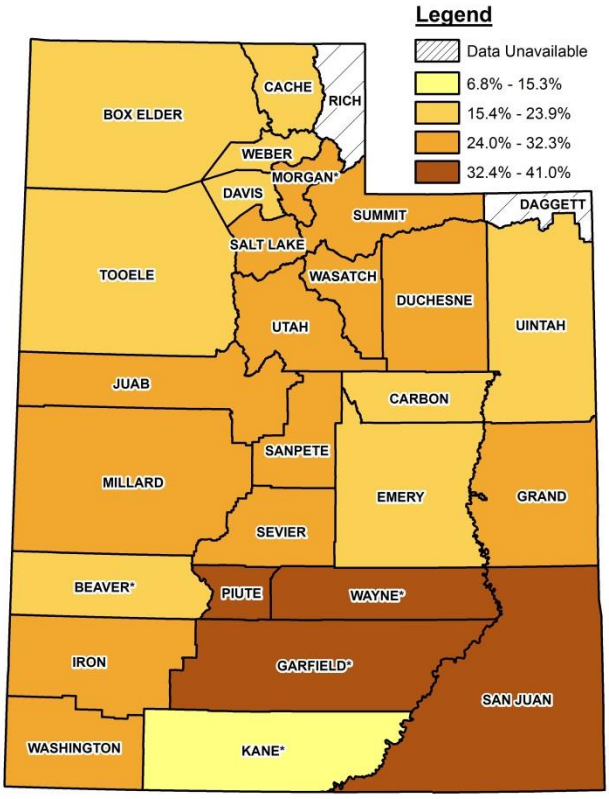
Source: Utah Behavioral Risk Factor Surveillance System, Retrieved on June 20, 2014, from the Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http://www.ibis.health.utah.gov
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed unreliable by UDOH standards.*

Figure 2. Age-Adjusted Percent of Adults (Age 25 and above) without Insurance Coverage, by Education Level, by County, Utah, 2009-2012

***Education:* Some Post High School or College Graduate**



***Education:* Below High School, High School, or GED**



Source: Utah Behavioral Risk Factor Surveillance System, Retrieved on June 20, 2014, from the Utah Department of Health, Center for Health Data, Indicator-Based Information System for Public Health website: http://www.ibis.health.utah.gov
Note: Age-adjusted to the U.S. 2000 standard population.
**Use caution interpreting. Estimates have a coefficient of variation >30% and therefore deemed unreliable by UDOH standards.*

VINYL CHLORIDE

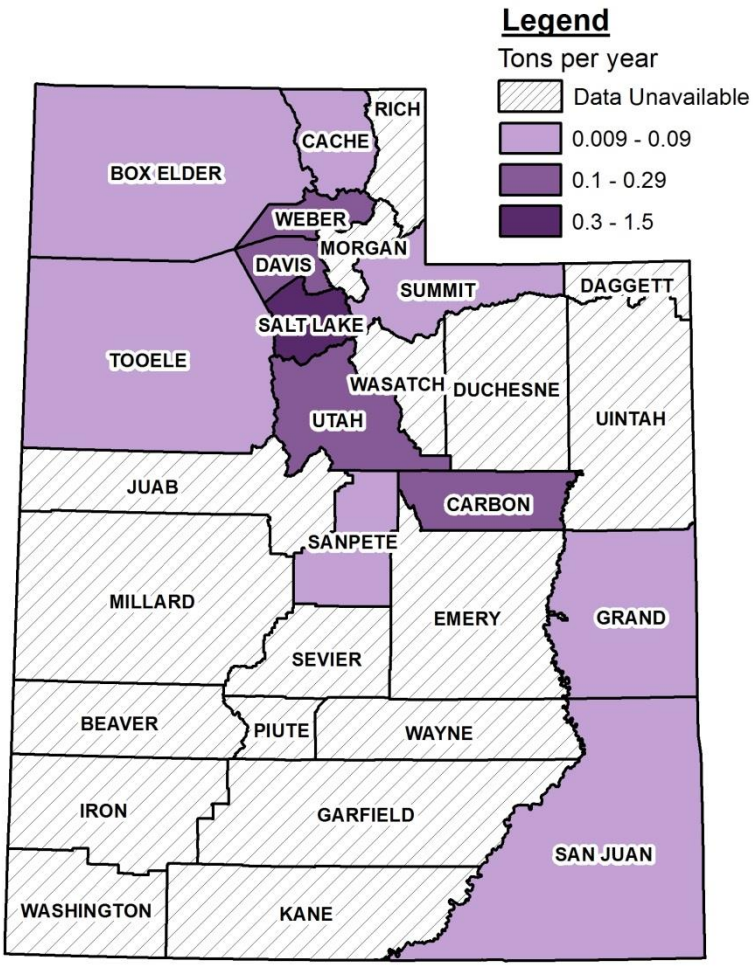
Vinyl chloride is a chemical used in the plastics industry. It is a colorless gas that has a sweet smell, but is only detectable by smell at certain levels. It is flammable and can dissolve into water, but only in small amounts.[2] Vinyl chloride is typically used to make polyvinyl chloride (PVC), which is used to make many different plastic products, such as pipes, packaging, and wire and cable coatings.[2, 4]

Vinyl Chloride Emissions and Exposure

The primary way that vinyl chloride enters the environment is through industrial emissions into the air and waste water. It is possible to be exposed to vinyl chloride through skin contact if it is in a liquid state.[2] The most common way to be exposed to vinyl chloride is by breathing it in.[1]

Total vinyl chloride emissions by county in Utah are presented in Figure 1. Even though vinyl chloride is typically not found in the air in urban, suburban, and rural areas, it has been found in the air near industries that use vinyl chloride.[2]

Figure 1. Total Vinyl Chloride Emissions, in Tons per Year, by County, Utah, 2005



Source: U.S. Environmental Protection Agency. (2011). 2005 National-Scale Air Toxics Assessment. Retrieved on December 2, 2013 from http://www.epa.gov/nata2005/.

People who work in industries that make vinyl chloride or PVC are exposed to higher amounts of vinyl chloride than the rest of the general population.[2] In order to protect the workers in

these industries, OSHA sets strict guidelines pertaining to how much workers are allowed to be exposed to vinyl chloride.[3]

It is possible for vinyl chloride to enter drinking water as the water passes through polyvinyl pipes or it can be found in contaminated wells.[1,2] If this is the case, levels are likely to be very low. To protect people from exposure to vinyl chloride from drinking water, the EPA enforces a maximum contaminant level at 0.002 milligrams per liter (mg/L) of water (which is also 2 ppb).[5]

People who use private drinking wells as a source of drinking water should regularly test the well for contaminants and ensure that it is properly sealed.

Vinyl Chloride and Human Health

Vinyl chloride is a known human carcinogen, which means it is capable of causing cancer. Regardless of the way a person is exposed to vinyl chloride, it is dangerous to human health. The amount of vinyl chloride a person is exposed to and the length of time of that exposure both impact potentially negative health effects.[2] Exposure to high levels of vinyl chloride over a short period of time is called acute, or short-term, exposure; consistent exposure over a long period of time is called chronic, or long-term, exposure.

Long-term exposure to vinyl chloride increases the risk of cancer of the liver, brain, lung, and soft tissues. Despite this risk, the studies that evaluated the risk of cancer involved levels of vinyl chloride that exceed what is typically found in the air or water.[2, 4]

Aside from cancer, there are numerous health hazards associated with exposure to vinyl chloride. Short-term exposure effects include dizziness; drowsiness; headaches; lung and kidney irritation; and loss of consciousness.[1, 2, 4] Long-term exposure effects include liver damage; peripheral neuropathy; Raynaud's phenomenon; joint and muscle pain; and changes in the skin.[2, 4] Peripheral neuropathy refers to damage to the nerves that connect to the brain.[6] Raynaud's phenomenon is a disorder that typically affects blood vessels in the toes, fingers, ears, and nose. Stress and cold temperatures cause the blood vessels to narrow and restrict blood flow to these areas.[7] Chronic vinyl chloride exposure may also have reproductive effects, such as increased risk of birth defects, miscarriages, and decreased male fertility. [1, 2, 4] However, more research needs to be done in this area.

RISK FACTOR TABLES

The tables in this section organize cancer risk factors into five categories:

- Behavior
- Environment
- Medical Conditions
- Genetic
- Other

The cancer sites to which a risk factor is associated are listed on the left column, with the risk factor on the top. Along with the tables are a series of notes that provide more explanation of different risk factors.

Cancer site	Behavior								Environment											
	Heavy alcohol consumption	Lack of physical activity	Poor diet/nutrition	Oral contraceptive use	Overweight/Obesity	Sexual activity	Smoking	Tanning bed use	Aflatoxins	Air pollution	Arsenic	Asbestos	Benzene	Cadmium	Radiation	Radon	Secondhand smoke	UV light lifetime exposure	Vinyl chloride	Other chemical exposures
Oral cavity, pharynx	x		x				x											x		
Esophagus	x				x		x													x
Stomach			x		x		x		x											x
Small intestine							x													
Colorectal	x	x	x		x		x													
Anus, anal canal, anorectum						x	x													
Liver, intrahepatic bile duct	x				x				x		x								x	
Gallbladder, biliary ducts					x															
Pancreas	x				x		x													x
Larynx	x		x				x					x								x
Lung, bronchus							x			x	x	x		x	x	x	x		x	x
Bones, joints															x					
Soft tissues (incl. heart)															x				x	
Cutaneous melanoma								x							x			x		
Other non-melanoma skin							x	x			x				x			x		
Breast	x	x		x	x										x					
Cervix			x	x	x	x	x													
Uterus		x	x		x										x					
Ovary					x															
Prostate			x		x															
Testis																				
Bladder			x				x				x				x					x
Kidney, renal pelvis					x		x					x	x	x						x
Eye and orbit																				
Brain															x				x	
Thyroid			x												x					
Hodgkin's lymphoma																				
Non-Hodgkin's lymphoma															x					
Multiple myeloma					x										x					
Lymphocytic leukemia													x		x					
Myeloid leukemia							x						x		x					
Kaposi sarcoma																				
Mesothelioma												x			x					

BEHAVIOR

- **Heavy alcohol consumption:** See page 7 for more information.
  - Oral cavity, pharynx[31, 88]
  - Esophagus[15, 46, 99]
  - Colorectal[13, 48]
  - Liver, intrahepatic bile duct[24, 50, 84, 103]
  - Pancreas[33, 90]
  - Larynx[82, 114]
  - Breast[11, 58, 95]
- **Lack of physical activity:** See page 16 for more information.
  - Colorectal[13, 48]
  - Breast[11, 58, 95]
  - Uterus[14]
- **Poor diet/nutrition:** Having a poor diet can increase the risk for certain types of cancer.
  - Oral cavity: Low in fruits and vegetables, and chewing betel nut, a common practice in Asia.[31, 88]
  - Stomach: High in smoked, salted, and pickled food and low in fruits and vegetables.[39, 47, 91, 111]
  - Colorectal: High in beef, lamb, liver and processed meats.[13, 48, 79, 97]
  - Larynx: Vitamin deficiencies.[114]
  - Cervix: Low in fruit and vegetables.[12]
  - Uterus: High in fat.[14]
  - Prostate: High in red meat or high-fat dairy products.[34]
  - Bladder: Not consuming enough fluids leads to chemicals and other contaminants staying in the bladder for longer periods of time.[9]
  - Thyroid: Lacking iodine.[41, 112]
- **Oral contraceptive pills:** Birth control pills temporarily increase the risk of cancer.
  - Breast: Only recent use increases a woman's risk.[11, 95]
  - Cervix: Risk decreases once a woman stops use.[12, 96]
- **Overweight/obesity:** See page 14 for more information.
  - Esophagus[15, 46, 99]
  - Stomach[39, 91, 111]
  - Colorectal[13, 48]
  - Liver, intrahepatic bile duct[24, 50, 84, 103]
  - Gallbladder, biliary ducts[17]
  - Pancreas[33, 90, 108]
  - Breast[11, 58, 95]

- Cervix[12]
- Uterus[14, 92]
- Ovary[32]
- Prostate[34, 62]
- Kidney, renal pelvis[19, 65, 81, 101]
- Multiple myeloma[29, 71]

- **Sexual activity:** Refers to having multiple partners, which increases the risk of HIV and HPV infection.
  - Anus, anal canal, anorectum: Risk of anal cancer is higher for men and women who participate in anal intercourse.[8, 49]
  - Cervix[96]
- **Smoking:** See page 21 for more information.
  - Oral cavity, pharynx[31, 88]
  - Esophagus[15, 46, 99]
  - Stomach[39, 47, 91, 111]
  - Small intestine[38]
  - Colorectal[13, 48, 79]
  - Anus, anal canal, anorectum[8, 49]
  - Pancreas[33, 90, 108]
  - Larynx[82, 114]
  - Lung, bronchus[25, 26, 27, 51, 104]
  - Other nonmelanoma skin[36]
  - Cervix[12, 59, 78, 96]
  - Bladder[9, 64, 76, 93]
  - Kidney, renal pelvis[19, 65, 81, 101]
  - Myeloid leukemia[21]
- **Tanning bed use:** The light bulbs used in tanning beds and tanning lamps emit ultraviolet (UV) light
  - Cutaneous melanoma[36]
  - Other non-melanoma skin[37]

ENVIRONMENT

- **Aflatoxin:** A fungus that produces a harmful toxin. Aflatoxins can be found in corn products, peanut products, pecans, pistachios, walnuts, cottonseed, and milk. There have been no reported aflatoxin outbreaks in the United States and screening procedures are in place to protect the food supply.[44]

- Stomach[47]
- Liver, intrahepatic bile duct[24, 50, 84]

- **Air pollution:** The presence of a foreign substance that contaminates the air. It has the potential to be harmful to people if inhaled over certain duration of time.
  - Lung, bronchus[25, 26]
- **Arsenic:** A natural element found in the soil, water, and air. It can enter the environment through industrial processes like burning coal and dumping waste.[2] See page 9 for more information.
  - Liver, intrahepatic bile duct[24]
  - Lung, bronchus[25, 26, 51, 104]
  - Other nonmelanoma skin[36, 54, 85]
  - Bladder[9, 64, 76, 93]
- **Asbestos:** A fiber-like mineral that naturally occurs in the environment. People are most likely to be exposed to asbestos by working in or living near industries that use asbestos. When older buildings that used asbestos building materials are partially or completely destroyed, asbestos can enter the air.[3]
  - Larynx[114]
  - Lung, bronchus[25, 26, 51, 104]
  - Kidney, renal pelvis[19]
  - Mesothelioma[28]
- **Benzene:** A liquid chemical that is very flammable. It is commonly used in certain industrial processes like crude oil, gasoline, and plastics. Furthermore, it is used to make certain types of rubber, detergents, pesticides, drugs, lubricants, and dyes.[4] See page 12 for more information.
  - Kidney, renal pelvis[19]
  - Lymphocytic leukemia[20]
  - Myeloid leukemia[21, 74]
- **Cadmium:** A metal that is commonly found in soil and rock. It is used in producing batteries, pigments, metal coatings, and plastics. The most likely forms of exposure are through smoking, drinking contaminated water, breathing contaminated air, or living close to industries that release cadmium. Even though all food products are slightly contaminated with cadmium, shellfish, liver, and kidney meats are the most contaminated.[5]
  - Lung, bronchus[25, 26]
  - Kidney, renal pelvis[19]
- **Radiation:** People can be exposed to radiation through x-rays, radiation therapy to treat cancer, or fallout (nuclear weapons or nuclear power plants).

- Lung, bronchus[25, 26, 104]
- Bones, joints[10, 52]
- Soft tissues (including heart)[35, 53]
- Cutaneous melanoma[106]
- Other-non melanoma skin[36, 54, 85]
- Breast: Radiation therapy to the chest when young (child or young adult).[11, 58, 95]
- Uterus: Radiation therapy to the pelvis.[42, 92]
- Bladder: Radiation therapy to the pelvis.[9, 64, 76, 93]
- Brain[67, 77, 94]
- Thyroid[41, 68, 112]
- Non-Hodgkin's lymphoma[30]
- Multiple myeloma[29, 107]
- Lymphocytic leukemia[20, 73]
- Myeloid leukemia[21, 23]
- Mesothelioma[28]

- **Radon:** A radioactive gas that is released when uranium decays in rocks. Because it is colorless, odorless, and tasteless, it can only be detected through proper testing measures. Radon is of particular concern when it gets trapped inside buildings and houses.[6] See page 19 for more information.
  - Lung, bronchus[25, 26, 51, 104]
- **Secondhand smoke:** See page 21 for more information.
  - Lung, bronchus[25, 26, 51, 104]
- **UV (ultraviolet) light lifetime exposure:** UV light is primarily released from the sun, but can also come from certain types of lamps. The risk of cancer from UV light depends on the length and frequency of exposure, and whether proper skin protection was used or not.
  - Oral cavity, pharynx[31, 88]
  - Cutaneous melanoma[37, 55, 66, 85, 106]
  - Other nonmelanoma skin[36, 54, 85]
- **Vinyl chloride:** A gas that is commonly used to manufacture rubber, piping, paper, automobiles, cables, and glass. Breathing in vinyl chloride is the most common way to be exposed; sometimes, it can contaminate water supplies as well.[7] See page 28 for more information.
  - Liver, intrahepatic bile duct[24]
  - Lung, bronchus[25, 26]
  - Soft tissues (including heart)[35, 53]
  - Brain[94]

- **Other workplace or chemical exposures:**
  - Esophagus: Dry cleaning solvents may increase risk; accidently consuming lye increases risk as well.[15]
  - Stomach: People who work in the coal, metal, and rubber industries may have a higher risk.[39]
  - Pancreas: Metal refining chemicals and other pesticides and dyes.[33]
  - Larynx: Long-term exposure to wood dust, paint fumes, metalworking chemicals, petroleum, plastics, and textile businesses.[114]
  - Lung: Radioactive ores, beryllium, silica, nickel and chromium compounds, coal products, mustard gas, chloromethyl ethers, and diesel exhaust.[25, 26, 51]
  - Bladder: Chemicals used in the following industries: dye, rubber, chemical, metal, textile, leather, printing, machinists, hairdressers, painters, and truck driving.[9, 64, 76]
  - Kidney, renal pelvis: Organic solvents, especially trichloroethylene.[19]

Medical Conditions

Cancer site	Achalasia	Acid reflux (chronic)	Actinic keratosis	AIDS	Atypical moles	Barrett's esophagus	Bladder infection (chronic)	Celiac disease	Choledochal cysts	Cirrhosis	Crohn's disease	Cryptorchidism	Damaged lymph nodes	Diabetes	Endometrial hyperplasia	Epstein-Barr virus	Esophageal web	Gallstones	Goiters	Graft v. host disease	Hemochromatosis	Hepatitis B and C	High blood pressure	Human herpes virus 8
Oral cavity, pharynx																				x				
Esophagus	x	x				x											x							
Stomach																								
Small intestine								x			x													
Colorectal											x			x										
Anus, anal canal, anorectum																								
Liver, intrahepatic bile duct										x				x							x	x		
Gallbladder, biliary ducts									x									x						
Pancreas										x				x										
Larynx																								
Lung, bronchus																								
Bones, joints																								
Soft tissues (incl. heart)													x											
Cutaneous melanoma					x																			
Other non-melanoma skin			x																					
Breast																								
Cervix																								
Uterus															x									
Ovary																								
Prostate																								
Testis												x												
Bladder							x																	
Kidney, renal pelvis																							x	
Eye and orbit					x																			
Brain																								
Thyroid																			x					
Hodgkin's lymphoma																x								
Non-Hodgkin's lymphoma																x								x
Multiple myeloma																								
Lymphocytic leukemia																x								
Myeloid leukemia																								
Kaposi sarcoma				x																				x
Mesothelioma																								

Medical Conditions (continued)

Cancer site	*H. pylori* infection	HIV infection	HPV infection	HTLV-1	Inflammatory bowel syndrome	KSHV	Lichen planus	MALT	Menetrier disease	MGUS	Paget's disease	Pancreatitis	Pernicious anemia	Plummer-Vinson syndrome	Polycystic ovarian syndrome	Polyps	Sexually transmitted infections	Stomach inflammation	Ulcerative colitis	Weak immune system
Oral cavity, pharynx			x				x													x
Esophagus			x											x						
Stomach	x							x	x				x			x		x		x
Small intestine																				
Colorectal					x											x			x	
Anus, anal canal, anorectum		x	x																	x
Liver, intrahepatic bile duct																				
Gallbladder, biliary ducts					x											x			x	
Pancreas	x											x								
Larynx			x																	
Lung, bronchus																				
Bones, joints											x									
Soft tissues (incl. heart)																				
Cutaneous melanoma																				x
Other non-melanoma skin			x																	x
Breast																				
Cervix		x	x														x			
Uterus															x					
Ovary																				
Prostate																				
Testis		x																		
Bladder																				
Kidney, renal pelvis																				
Eye and orbit																				x
Brain																				
Thyroid																				
Hodgkin's lymphoma		x																		x
Non-Hodgkin's lymphoma	x	x		x																x
Multiple myeloma										x										
Lymphocytic leukemia				x																
Myeloid leukemia																				
Kaposi sarcoma		x				x														x
Mesothelioma																				

MEDICAL CONDITIONS

- **Achalasia:** When the muscle in the esophagus does not work properly, food can get stuck instead of passing into the stomach. Over time, those food particles in the esophagus irritate the cells and increase the risk for cancer.[15]
- **Acid reflux:** Risk of esophageal cancer increases depending on how often acid reflux occurs and how severe it is.[15]
- **Actinic keratosis:** Patches of skin that become rough or crusty after being in the sun for a long time. Treatment is needed to prevent these spots from becoming cancerous.[54, 85]
- **AIDS (acquired immunodeficiency syndrome):** Caused by the human immunodeficiency virus (HIV); AIDS is the final phase of HIV infection that weakens the immune system.
    - Kaposi sarcoma[100]
- **Atypical moles:** Moles that have irregular characteristics and may become cancerous. These types of moles may be caused by a genetic condition called dysplastic nevus syndrome.[37, 55, 66, 85, 106]
    - Cutaneous melanoma[55,85,106]
    - Eye and orbit[16]
- **Barrett's esophagus:** Cells in the esophagus become damaged and abnormal after long-term acid reflux problems.[15]
- **Bladder infection:** Bacteria reaches the bladder through the urethra causing the bladder to become inflammed.[9, 64]
- **Celiac disease:** People with this disease are unable to digest gluten, a protein found in many grains. Avoiding gluten in the diet will lower the risk of small intestine cancer.[38]
- **Choledochal cysts:** Pouches filled with bile that form in the bile duct. The cells on the outside of these pouches change and can become cancerous.[17]
- **Cirrhosis:** A condition where the liver cells become so damaged, that they are replaced with scar tissue. Cirrhosis is most often caused by heavy alcohol use and hepatitis B and C infections.
    - Liver, intrahepatic bile duct[24, 50, 84, 103]
    - Pancreas[33]
- **Crohn's disease:** Chronic inflammation in the digestive tract, especially in the lower small intestine.
    - Small intestine[38]
    - Colorectal[48, 79]
- **Cryptorchidism:** Condition when one or both of the testes does not fully descend.[40]
- **Damaged lymph nodes:** The lymph system carries a fluid that transports cells of the immune system throughout the body.[35]

- **Diabetes:** A condition that results in high blood sugar levels. Type 1 diabetes results from the body's inability to produce insulin. Type 2 diabetes results from the body's resistance to insulin.
    - Colorectal: Type 2 diabetes.[13, 48]
    - Liver: Type 2 diabetes.[24, 50, 84, 103]
    - Pancreas: Type 2 diabetes is linked to higher risk; the link with Type 1 diabetes is uncertain.[33, 90, 108]
- **Endometrial hyperplasia:** An abnormal overgrowth of cells in the uterine lining.[14, 92, 98]
- **Epstein-Barr virus:** A very common virus in the herpes family; known to cause "mono."
    - Hodgkin's lymphoma[18, 69]
    - Non-Hodgkin's lymphoma[30, 70, 87]
    - Lymphocytic leukemia[20]
- **Esophageal web:** A thin layer of tissue that can block food from passing through the esophagus. An esophageal web may be a part of Plummer-Vinson syndrome, which increases the risk for esophagus cancer.[15]
- **Gallstones:** Clumps of hardened cholesterol that develop in the gallbladder.[17]
- **Goiter:** Enlargement of the thyroid.[112]
- **Graft-vs.-host disease:** After disease or radiation treatment, some people need a stem cell, tissue, or organ transplant. Graft-versus-host disease occurs when the immune system attacks the newly transplanted material, thinking it is a foreign contaminant.[31]
- **Hemochromatosis:** A condition that results in the body storing too much iron, which can lead to cirrhosis.[24, 50]
- **Hepatitis B & C:** A condition that causes liver inflammation and can lead to cirrhosis of the liver.
    - Liver, intrahepatic bile duct[24, 50, 84, 103]
- **High blood pressure:** Also called hypertension, high blood pressure is when a person's blood pressure is at 140/90 mmHg or above a lot of the time.[115]
    - Kidney, renal pelvis[19, 65, 81, 101]
- **Human herpes virus 8**
    - Non-Hodgkin's lymphoma[30]
    - Kaposi sarcoma[30]
- ***H. pylori* (*Helicobacter pylori*):** A bacteria that causes ulcers and inflames the stomach and small intestine.
    - Stomach[39, 47, 91, 111]
    - Pancreas[33]
    - Non-Hodgkin's lymphoma[30, 70, 87]

- **HIV (human immunodeficiency virus):** The virus that causes AIDS (acquired immunodeficiency syndrome).
    - Anus, anal canal, anorectum[8, 49]
    - Cervix[12, 96]
    - Testis[40]
    - Hodgkin's lymphoma[18, 69]
    - Non-Hodgkin's lymphoma[30, 70, 87]
    - Kaposi sarcoma[100]
- **HPV (Human Papilloma Virus):** HPVs refer to a group of over 100 similar viruses, some of which can be spread by sexual intercourse or direct contact with the skin. Low risk HPVs cause warts and high risk HPVs have been linked to certain types of cancer.
    - Oral cavity, pharynx[31, 88]
    - Esophagus: About one-third of esophagus cancers in Asia and South Africa are linked to HPV. However, this has not been found in the United States.[15]
    - Anus, anal canal, anorectum[8, 49]
    - Larynx[82, 114]
    - Other nonmelanoma skin[36]
    - Cervix[12, 59, 78, 96]
- **HTLV-1 (human T-cell leukemia/lymphoma virus):** Increases risk of developing T-cell lymphoma.
    - Non-Hodgkin's lymphoma[30, 87]
    - Lymphocytic leukemia[20]
- **Inflammatory bowel syndrome (IBS):** Inflammatory conditions of the colon and small intestines.
    - Colorectal[13, 48]
- **KSHV (Kaposi sarcoma-associated herpesvirus):** A virus that causes Kaposi sarcoma.[100]
- **Lichen planus:** A skin disease that results in skin rashes and white spots in the mouth and throat.[31]
- **MALT (mucosa-associated lymphoid tissue):** A type of stomach lymphoma caused by the *H. pylori* bacteria.[39]
- **Menetrier disease:** A rare disease which results in excess folds in the stomach lining. Also called hypertrophic gastropathy.[39]
- **MGUS (monoclonal gammopathy of undetermined significance):** A pre-cancerous condition in which there are irregular proteins in the bloodstream.[29, 71, 86, 107]
- **Paget's disease:** A condition that causes the bones to abnormally grow and become malformed. Only about 1% of people with this disease get bone cancer.[10, 52]

- **Pancreatitis**: Having chronic pancreatitis (inflammation of the pancreas) increases risk.[33, 90, 108]
- **Pernicious anemia:** Anemia refers to having a low red blood cell count. Pernicious anemia is caused by not being able to absorb vitamin B12 and is associated with stomach inflammation.[39, 47, 91]
- **Polycystic ovarian syndrome:** A condition when a woman does not have a proper balance of female sex hormones.[14, 60, 116]
- **Plummer-Vinson syndrome:** A rare condition that is associated with esophageal webs, difficulty swallowing, tongue irritation, enlarged spleen, and iron deficiency. About 10% of people with this syndrome develop esophagus cancer.[15]
- **Polyps:** Irregular growths of tissue that may or may not become cancerous
    - Stomach: Not all stomach polyps are cancerous; a type of polyp called adenomas may become cancerous.[39, 47]
    - Colorectal: Polyps that form in the colon increase the risk of colorectal cancer; most polyps are not cancerous, but a certain type, called adenomas, may become cancerous.[13, 48, 79, 97]
    - Gallbladder: Polyps that form in the gallbladder may be cancerous.[17]
- **Sexually transmitted infections (STIs):** Sexually transmitted infections (such as chlamydia, syphilis, or gonorrhea) increase the risk of getting an HPV infection, which in turn can increase the risk of cancer.[59]
- **Stomach inflammation:** Long-term inflammation of the stomach increases the risk of cancer under certain conditions.[39, 47, 91]
- **Ulcerative colitis:** Long-term inflammation of the colon in which small cuts or sores appear.
    - Colorectal[13, 48, 79]
    - Gallbladder[17]
- **Weak immune system:** The body's immune system can be weakened by AIDS, other autoimmune diseases, chemotherapy, or drugs that suppress the immune system.
    - Oral cavity, pharynx[31]
    - Stomach[39]
    - Anus, anal canal, anorectum[8, 49]
    - Cutaneous melanoma[37, 55, 85]
    - Other nonmelanoma skin[36, 54, 85]
    - Eye and orbit[16]
    - Hodgkin's lymphoma[18, 69, 87]
    - Non-Hodgkin's lymphoma[30, 70, 87]
    - Kaposi sarcoma[100]

Genetic

Cancer site	Sex	Race/Ethnicity	Birt-Hogg-Dube syndrome	*BRCA1* & *BRCA2* mutation	Chondrosarcoma	Cowden syndrome	Cystic Fibrosis	Down syndrome	Dyskeratosis congenita	FAP	Fanconi anemia	Gardner syndrome	Gorlin syndrome	Hereditary diffuse gastric cancer	HNPCC	Li-Fraumeni syndrome	Lobular carcinoma in situ
Oral cavity, pharynx	x								x		x						
Esophagus	x																
Stomach	x	x		x						x				x	x	x	
Small intestine	x						x			x					x		
Colorectal		x								x		x			x		
Anus, anal canal, anorectum	x	x															
Liver, intrahepatic bile duct	x																
Gallbladder, biliary ducts	x	x															
Pancreas		x		x											x		
Larynx		x							x		x						
Lung, bronchus																	
Bones, joints					x											x	
Soft tissues (incl. heart)												x	x			x	
Cutaneous melanoma	x	x															
Other non-melanoma skin		x											x				
Breast		x		x		x								x		x	x
Cervix																	
Uterus															x		
Ovary				x											x		
Prostate		x															
Testis																	
Bladder	x	x				x									x		
Kidney, renal pelvis			x														
Eye and orbit		x															
Brain																	
Thyroid						x				x							
Hodgkin's lymphoma																	
Non-Hodgkin's lymphoma																	
Multiple myeloma	x	x															
Lymphocytic leukemia	x							x			x						
Myeloid leukemia	x							x			x						
Kaposi sarcoma	x																
Mesothelioma																	

	Genetic (continued)											Other								
Cancer site	Multiple endocrine neoplasia	MUTYH-associated polyposis	Neurofibromatosis	Peutz-Jeghers syndrome	Retinoblastoma	Rothman-Thomson syndrome	Tuberous sclerosis	Turcot syndrome	Tylosis	Von-Hippel-Lindau syndrome	Xeroderma pigmentosum	Age	Chemotherapy	Dense breast tissue	DES exposure	Family history	Hormone therapy	Menstrual and reproductive history	Other personal medical history	*Tamoxifen* use
Oral cavity, pharynx												x							x	
Esophagus									x			x							x	
Stomach				x								x				x			x	
Small intestine		x		x								x							x	
Colorectal		x		x				x				x				x				
Anus, anal canal, anorectum												x							x	
Liver, intrahepatic bile duct																				
Gallbladder, biliary ducts												x				x				
Pancreas	x		x	x						x		x				x				
Larynx												x								
Lung, bronchus																x			x	
Bones, joints					x	x														
Soft tissues (incl. heart)			x		x		x													
Cutaneous melanoma											x	x				x			x	
Other non-melanoma skin											x	x							x	
Breast				x								x		x	x	x	x	x	x	
Cervix																		x		
Uterus																x	x	x		x
Ovary												x				x	x	x	x	
Prostate												x				x				
Testis																			x	
Bladder					x							x	x			x			x	
Kidney, renal pelvis										x						x				
Eye and orbit																				
Brain																x				
Thyroid	x											x								
Hodgkin's lymphoma												x				x				
Non-Hodgkin's lymphoma												x								
Multiple myeloma												x				x				
Lymphocytic leukemia			x									x	x			x				
Myeloid leukemia												x	x							
Kaposi sarcoma																				
Mesothelioma												x								

GENETIC

- **Sex**: Sometimes, one sex has a higher risk for certain cancers.
  - Oral cavity and pharynx: About twice as many men get oral cancers. The reason for this may be due to men's tendency to smoke and drink alcohol more than women. At the present time, oral cancers that are linked to HPV infection still occur more often in men than women.[31]
  - Esophagus: Rates are three times higher in men.[15, 46, 99]
  - Stomach: More common in men.[39, 111]
  - Small intestine: Rates are slightly higher in men.[38]
  - Anal, anal canal, anorectum: Rates are higher for women, but African American men have higher rates than African American women.[8]
  - Liver: Occurs more in males.[24]
  - Gallbladder: Rates are twice as high in women.[17]
  - Cutaneous melanoma: Risk of cancer is higher for women under age 40 and men over age 40.[37, 106]
  - Bladder: More common in men.[9, 64]
  - Hodgkin lymphoma: Risk is slightly higher in men.[18, 69]
  - Multiple myeloma: Men have a higher risk.[29, 71, 86, 107]
  - Lymphocytic leukemia: Men have a slightly higher risk.[20, 22, 72]
  - Myeloid leukemia: Men have a slightly higher risk.[21, 23]
  - Kaposi sarcoma: More common in men.[100]
- **Race/Ethnicity:** Sometimes, certain races or ethnicities have a higher risk for certain cancers.
  - Stomach: More common in Hispanic Americans, African Americans and Asian/Pacific Islanders than in non-Hispanic whites.[39, 111]
  - Colorectal: African Americans have the highest rates in the United States and Ashkenazi Jews have the highest rates in the world. Hispanics, Asians, and Pacific Islanders have the lowest rates.[13, 48] However, rates are decreasing in all racial and ethnic groups except for Alaska Natives and American Indians.[97]
  - Anus, anal canal, anorectum: African Americans have overall higher rates.[8]
  - Gallbladder: Mexican Americans and Native Americans have the highest risk.[17]
  - Larynx: More common in African Americans and Whites.[114]
  - Cutaneous melanoma & other nonmelanoma skin: Whites have a significantly greater risk than African Americans, especially those with skin that burns easily, red or blond hair, or blue or green eyes.[36, 37, 54, 55, 85]
  - Breast: White women have a higher risk of diagnosis.[11, 95]

- Prostate: African American men have higher rates and are also more likely to be diagnosed with advanced stage prostate cancer.[34, 62, 109]
- Bladder: More common in Whites.[9, 64, 93]
- Eye and orbit: More common Whites.[16]
- Multiple myeloma: Risk is highest among African Americans and lowest among Asian Americans.[29, 71, 86]

- **Birt-Hogg-Dube syndrome:** Condition that causes multiple small, noncancerous tumors to develop in the skin; other noncancerous or cancerous tumors may develop elsewhere in the body as well.[19]
- ***BRCA1* and *BRCA2* mutations:** Mutations in these genes are linked with breast cancer and may be linked with stomach cancer.
  - Stomach[39]
  - Pancreas: Only the *BRCA2* mutation.[33]
  - Breast[11, 58, 95]
  - Ovary[32, 61]
- **Chondrosarcoma:** A type of cancer that affects bones and joints.[10]
- **Cowden syndrome:** Results in cancerous and noncancerous tumor growths.
  - Breast[11]
  - Bladder[9]
  - Thyroid[41]
- **Cystic Fibrosis:** Results in excess mucous in the lungs and digestive tract, making it difficult to breathe and digest food.[38]
- **Down syndrome:** Results from an extra copy of chromosome 21.
  - Lymphocytic leukemia[20, 73]
  - Myeloid leukemia[21]
- **Dyskeratosis congenita:** A genetic disorder present at birth that causes skin rashes, abnormal fingernail and toenail growth, and causes the bone marrow to fail.
  - Oral cavity, pharynx[31]
  - Larynx[114]
- **Dysplastic nevus syndrome:** A genetic disorder that results in atypical moles that have irregular characteristics and may become cancerous.
- **FAP (familial adenomatous polyposis):** Mutation in the *APC* gene; results in polyps forming in the colon; polyps may form in the stomach, intestines, and thyroid too.[39]
  - Stomach[39]
  - Small intestine[38]
  - Colorectal[13, 48, 79]
  - Thyroid[41, 68]

- **Fanconi anemia:** A genetic disorder that disrupts a person's ability to repair DNA and leads to certain problems with the blood.
    - Oral cavity, pharynx[31]
    - Larynx[114]
    - Lymphocytic leukemia[20]
    - Myeloid leukemia[21]
- **Gardner syndrome:** Results in many polyps forming in the colon and intestines.[35]
    - Colorectal[13]
    - Soft tissues (including heart)[35]
- **Gorlin syndrome:** Increases the risk for cancer in the skin, muscle, and connective tissue; it is also called basal cell nevus syndrome.
    - Soft tissues (including heart)[35]
    - Other nonmelanoma skin[36]
- **Hereditary diffuse gastric cancer:** A rare condition associated with the CDH1 gene. Those affected have a 70% to 80% increased risk of stomach cancer.[39]
    - Stomach[39]
    - Breast[11, 39]
- **HNPCC (hereditary nonpolyposis colorectal cancer):** Mutations in certain genes hinder the repair of damaged DNA, which increases the risk of cancer. It is also known as Lynch syndrome.[39]
    - Stomach[39]
    - Small intestine[38]
    - Colorectal[13, 79]
    - Pancreas[33]
    - Uterus[14]
    - Ovary[61]
    - Bladder[9]
- **Li-Fraumeni syndrome:** Increases the risk of breast cancer, brain cancer, and sarcomas, including osteosarcomas.
    - Stomach[39]
    - Bones, joints[10, 51]
    - Soft tissues (including heart)[35]
    - Breast[11]
- **Lobular carcinoma in situ:** Condition that results in abnormal cells forming in the milk glands.[117]
    - Breast[11]

- **Multiple endocrine neoplasia (MEN):** A group of conditions that result in tumor growth in the endocrine glands.
    - Pancreas: MEN type 1.[33]
    - Thyroid: MEN type 2.[41]
- ***MUTYH*-associated polyposis:** Causes polyps that may be cancerous to form in the colon and small intestine.
    - Small intestine[38]
    - Colorectal[13]
- **Neurofibromatosis:** Results in tumors forming in the nervous system, which are generally noncancerous; sometimes these tumors may become cancerous.
    - Pancreas[33]
    - Soft tissues (including heart)[35]
    - Lymphocytic leukemia[20]
- **Peutz-Jeghers syndrome:** Results in polyps that develop in the stomach, intestines, nose, bladder, and lung airways.[39]
    - Stomach[39]
    - Small intestine[38]
    - Colorectal[13]
    - Pancreas[33]
    - Breast[11]
- **Retinoblastoma:** A form of eye cancer that can be hereditary or nonhereditary.
    - Bones, joints[10, 52]
    - Soft tissues (including heart)[35]
    - Bladder[9]
- **Rothmund-Thomson syndrome:** A rare condition that affects the skin and bones, resulting in rashes that deteriorate the skin tissue and bones that are not properly formed or missing.
    - Bones, joints[10]
- **Tuberous sclerosis:** A condition that affects many different parts of the body, including noncancerous tumors that can grow in multiple organs.
    - Soft tissues (including heart)[35]
- **Turcot syndrome:** Increases risk of colorectal polyps.
    - Colorectal[13]
- **Tylosis:** An hereditary disorder that causes more skin to grow in parts of the body, including the esophagus.
    - Esophagus[15]

- **Von-Hippel-Lindau syndrome:** A rare condition that results in the growth of many cancerous and noncancerous tumors in the body.
    - Pancreas[33]
    - Kidney, renal pelvis[19, 65, 81]
- **Xeroderma pigmentosum:** A rare condition that makes it difficult for the body to repair DNA that is damaged by sunlight.
    - Cutaneous melanoma[37, 85]
    - Other nonmelanoma skin[36, 85]

OTHER

- **Age**: A person's age is often the most common and serious risk factor in developing cancer.
    - Oral cavity and pharynx: Most diagnoses occur over age 55; people with HPV-linked diagnoses are usually younger.[31]
    - Esophagus: 85% of diagnoses occur over age 55; risk increase with age.[15, 46, 99]
    - Stomach: The majority of diagnoses are between age 60 and 80.[39]
    - Small intestine: Risk increases with age, with an average of age 60.[38]
    - Colorectal: About 90% diagnoses are in people over age 50.[13, 48, 79]
    - Anus, anal canal, anorectum: Risk increases with age; majority of diagnoses are in people over age 50.[49]
    - Gallbladder: The average age of diagnosis is 72; most people diagnosed are 65 years old or older.[17]
    - Pancreas: About 70% of diagnoses are in people 65 years or older, with an average age of 71.[33]
    - Larynx: More than half of people who are diagnosed are age 65 or older.[114]
    - Cutaneous melanoma: Risk increases with age, but may occur in younger people too. Using tanning beds before age 30 increases risk as well.[37, 85]
    - Other nonmelanoma skin: Risk generally increases with age, but depends on overall amount of UV light exposure.[36, 85]
    - Breast: Risk increases with age; about two-thirds of diagnoses are in women over age 55.[11, 58]
    - Ovary: Risk increases with age; most diagnoses occur after menopause.[32, 61, 89]
    - Prostate: Risk increases with age**;** about 60% of cases are diagnosed after age 65.[34, 62, 109]
    - Testis: Rates are highest in men between age 15 and 34; however, it can occur at any age.[38, 63]
    - Bladder**:** Risk increases with age; 90% of diagnoses are in people over age 55.[9, 64]

- Thyroid: Risk is highest between age 25 and 65.[112]
- Hodgkin lymphoma: Most common between age 15 and 35 and after age 55.[18, 69]
- Non-Hodgkin lymphoma: Risk increases with age, especially after age 60.[30, 70, 87]
- Multiple myeloma: The majority of diagnoses are in people over age 65.[29, 71, 86]
- Lymphocytic leukemia**:** The majority of diagnoses are in people age 60 and older.[72]
- Myeloid leukemia: Risk increases with age.[23]
- Mesothelioma: Two-thirds of diagnoses are in people age 65 or older.[28]

- **Chemotherapy:**
  - Bladder: Being treated with anticancer drugs.[9, 93]
  - Lymphocytic leukemia[20, 73]
  - Myeloid leukemia: Only certain types of chemotherapy.[21]
- **Dense breast tissue:** Breasts are comprised of three types of tissue: fatty, glandular, and fibrous. Dense breast tissue has more glandular and fibrous tissue and less fatty tissue. It also decreases the accuracy of mammograms.[11, 95]
- **DES (diethylstilbestrol) exposure:** DES was a drug that was sometimes used from 1940 to 1971 to prevent miscarriage. Women who took it have a slightly higher risk of breast and cervical cancer. Also, women whose mothers took it while they were still pregnant have a slightly higher risk. [11, 95]
- **Family history:** Family members who have previously been diagnosed with cancer often increase the risk of certain types of cancer.
  - Stomach[39, 47, 91]
  - Colorectal[13, 48, 79, 97]
  - Gallbladder[17]
  - Pancreas[33, 90]
  - Lung[25, 26]
  - Cutaneous melanoma[37, 55, 85]
  - Breast[11, 58, 95]
  - Uterus[14, 92]
  - Ovary[32, 61, 89]
  - Prostate[34, 62, 109]
  - Bladder[9, 64, 76]
  - Kidney, renal pelvis[19, 81]
  - Brain[67, 77]
  - Hodgkin lymphoma[18, 69]
  - Multiple myeloma[29, 86]
  - Lymphocytic leukemia[20, 22, 72, 73]

- **Hormone therapy:**
  - Breast: Using combined hormone therapy after menopause (estrogen and progesterone) for more than five years.[11, 58, 95]
  - Uterus: Taking estrogen without progesterone for many years.[92]
  - Ovary: Taking estrogen without progesterone for 10 years.[32, 89]
- **Menstrual and reproductive history:**
  - Breast: Began menstruation before age 12 or ended after age 55; never had a full-term pregnancy, or whose first pregnancy was after age 30, have a higher risk.[11, 58, 95]
  - Cervical: Having three or more full-term pregnancies or having first full-term pregnancy before age 17.[12]
  - Uterus: Began menstruation before age 12 or ending after age 55; never having a full-term pregnancy.[14, 92]
  - Ovary: Never having been pregnant.[32, 61, 89]
- **Personal medical history:** Previous personal medical history may increase risk.
  - Oral: Previously having an oral cancer.[88]
  - Esophagus: Previously having lung, mouth, or throat cancer increases risk.[15]
  - Stomach: Having stomach surgery to remove an ulcer or treat a noncancerous stomach condition increases risk for stomach cancer.[39]
  - Small intestine: Previously having colon cancer increases risk.[38]
  - Anus, anal canal, anorectum: Previously having cervical, vaginal, or vulva cancer increases risk, probably because these cancers are associated with HPV infection.[8]
  - Lung: Previously having lung cancer increases your risk.[25, 26]
  - Cutaneous melanoma: Previous diagnosis increases the risk of getting it again; having blistering sunburns increases risk as well.[37, 55, 85]
  - Other nonmelanoma skin: Being diagnosed with basal cell or squamous cell cancer increases the risk for developing it again. Also, previous scars and burned or inflamed skin increases risk.[54, 85] Those who are diagnosed with psoriasis are sometimes treated with PUVA, a type of UV light treatment, which can increase the risk of skin cancers.[36]
  - Breast: Previous breast cancer diagnosis increases a woman's risk of developing it again. Also, having some noncancerous breast conditions increases risk.[11, 58, 95]
  - Ovary: Previous breast, uterine, or colorectal cancer diagnosis.[32, 61, 89]
  - Testis: Previous testicular cancer diagnosis.[40]
  - Bladder: Previous bladder cancer diagnosis increases risk.[9, 64]
- ***Tamoxifen*:** A drug used to prevent and treat breast cancer.[14, 92]

CANCER STATISTICS

The data tables in this section describe the risk of cancer for all major cancer sites. Data is available for males, females, and both sexes combined.

- *Table 1*: Odds of cancer diagnosis and dying from cancer for each major cancer site.

- *Table 2*: 5- and 10-year survival rates for each major cancer site. Survival rates refer to the percentage of people who are alive five and 10 years after a cancer diagnosis.

- *Table 3*: Prevalence and incidence for each major cancer site. Prevalence refers to the number of people who already have a certain disease. Incidence refers to the number of new cases of a certain disease over a period of time.

- *Table 4*: The mortality rates for each major cancer site. Mortality rate refers to the number of deaths in a population from a certain disease.

TABLE 1. **LIFETIME ODDS OF DIAGNOSIS AND LIFETIME ODDS OF DEATH BY CANCER SITE FOR BOTH SEXES, MALES, AND FEMALES.**

. = No data available

* = No data; sex specific cancer

	Odds of diagnosis (1 in…)			Odds of death (1 in…)		
Cancer site	Both sexes	Male	Female	Both sexes	Male	Female
All sites	2	2	3	5	4	5
Oral cavity, pharynx	95	69	149	357	263	556
Esophagus	196	127	417	204	127	476
Stomach	115	91	149	238	192	294
Colon, rectum	20	19	20	49	47	50
Liver, intrahepatic bile duct	125	88	204	167	127	238
Pancreas	69	69	69	78	77	78
Larynx	278	167	714	769	455	1667
Lung, bronchus	14	13	16	17	15	20
Cutaneous melanoma	51	41	64	333	244	500
Breast	.	769	8	68	3333	36
Cervix	*	*	147	*	*	417
Uterus	*	*	38	*	*	185
Ovary	*	*	71	*	*	98
Prostate	*	6	*	*	36	*
Testis	*	270	*	*	5000	*
Bladder	41	26	87	175	116	294
Kidney, renal pelvis	64	51	84	213	167	286
Brain, other central nervous system	164	147	189	233	204	263
Thyroid	103	200	69	1667	2000	1429
Hodgkin's lymphoma	435	400	476	2500	2000	2500
Non-Hodgkin's lymphoma	47	43	52	127	114	139
Multiple myeloma	154	133	179	244	217	270
Lymphocytic leukemia (acute)	769	714	909	2500	2000	2500
Lymphocytic leukemia (chronic)	200	164	250	526	417	667
Myeliod leukemia (acute)	256	233	278	313	270	370
Myeliod leukemia (chronic)	625	500	714	2500	2000	3333
Kaposi sarcoma	2000	1250	10000	.	.	.
Mesothelioma	833	500	1667	.	.	.

Source: Howlader N, Noone AM, Krapcho M, Neyman N, Aminou R, Waldron W, Altekruse SF, Kosary CL, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Eisner MP, Lewis DR, Chen HS, Feuer EJ, Cronin KA, Edwards BK (eds). SEER Cancer Statistics Review, 1975-2008, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2008, based on November 2010 SEER data submission, posted to the SEER web site, 2011.

TABLE 2. **FIVE- AND 10-YEAR SURVIVAL RATES BY CANCER SITE FOR BOTH SEXES, MALES, AND FEMALES, UNITED STATES.**

. = No data available

* = No data; sex specific cancer

	Both Sexes		Male		Female	
Cancer site	**5 year**	**10 year**	**5 year**	**10 year**	**5 year**	**10 year**
All sites	63.80%	58.30%	63.60%	58.20%	64.20%	58.40%
Oral cavity, pharynx	59.4%	49.0%	58.1%	47.6%	62.2%	52.0%
Esophagus	15.6%	11.0%	15.5%	11.1%	15.8%	10.8%
Stomach	23.7%	19.0%	21.8%	17.0%	26.7%	22.2%
Small intestine	58.2%	46.9%	58.0%	46.5%	58.5%	47.3%
Colon	63.2%	57.8%	63.6%	57.8%	62.8%	57.9%
Rectum, rectosigmoid junction	64.1%	56.4%	64.0%	55.9%	64.3%	57.1%
Anus, anal canal, anorecctum	65.4%	56.9%	60.3%	51.1%	69.0%	61.0%
Liver, intrahepatic bile duct	11.4%	8.0%	11.3%	8.0%	11.5%	8.1%
Gallbladder, biliary ducts	14.5%	12.3%	13.2%	10.3%	15.0%	13.1%
Pancreas	4.9%	3.4%	4.8%	3.1%	5.1%	3.7%
Larynx	64.1%	50.7%	65.1%	52.2%	60.1%	45.0%
Lung, bronchus	15.2%	10.2%	13.3%	8.7%	17.7%	12.1%
Bones, joints	68.5%	62.5%	66.7%	59.2%	70.8%	66.7%
Soft tissues (incl. heart)	66.7%	61.0%	66.8%	60.5%	66.4%	61.5%
Cutaneous melanoma	91.5%	89.3%	89.5%	87.0%	93.8%	92.1%
Breast	.	.	84.0%	71.8%	88.2%	81.6%
Cervix	*	*	*	*	71.1%	81.6%
Uterus	*	*	*	*	83.6%	66.3%
Ovary	*	*	*	*	42.6%	80.9%
Vagina	*	*	*	*	48.3%	34.2%
Vulva	*	*	*	*	75.6%	41.4%
Prostate	*	*	96.9%	93.7%	*	*
Testis	*	*	96.0%	95.6%	*	*
Bladder	79.8%	72.8%	81.5%	74.2%	74.8%	68.7%
Kidney, renal pelvis	66.0%	57.8%	65.7%	57.2%	66.4%	58.8%
Eye and Orbit	83.2%	73.1%	82.6%	73.5%	83.9%	72.7%
Brain & Other central nervous system	32.7%	27.4%	31.8%	26.1%	33.9%	29.0%
Thyroid	96.4%	95.5%	93.2%	91.3%	97.4%	96.8%
Hodgkin's lymphoma	84.2%	79.0%	82.4%	76.4%	86.5%	82.2%
Non-Hodgkin's lymphoma	61.1%	51.5%	58.6%	49.6%	64.0%	53.8%
Multiple myeloma	34.8%	16.8%	36.3%	18.2%	33.1%	15.3%
Lymphocytic leukemia (acute)	63.1%	59.6%	61.5%	57.7%	65.3%	62.2%
Lymphocytic leukemia (chronic)	77.8%	58.1%	77.0%	55.8%	79.0%	61.4%
Myeloid leukemia (acute)	18.8%	16.5%	17.3%	15.3%	20.6%	17.9%
Myeloid leukemia (chronic)	42.6%	29.4%	42.3%	29.8%	43.1%	28.9%
Monocytic leukemia (acute)	20.0%	16.4%	20.5%	16.9%	19.2%	15.7%
Kaposi sarcoma	24.3%	20.0%	23.3%	19.1%	61.9%	52.6%
Mesothelioma	7.7%	4.3%	5.3%	2.2%	16.3%	11.3%

Source: Fast Stats: An interactive tool for access to SEER cancer statistics. Surveillance Research Program, National Cancer Institute. http://seer.cancer.gov/faststats. (Accessed on 2-8-2013)

TABLE 3. PREVALENCE AND AGE-ADJUSTED INCIDENCE RATES BY CANCER SITE FOR BOTH SEXES, MALES, AND FEMALES, UNITED STATES.

. = No data avilable

* = No data; sex specific cancer

	PREVALENCE			INCIDENCE *(per 100,000 people)*		
Cancer site	**Both sexes**	**Male**	**Female**	**Both Sexes**	**Male**	**Female**
All sites	12,553,337	5,811,097	6,742,240	456.4	522.2	411.5
Oral cavity, pharynx	264,442	172,708	91,734	10.9	16.3	6.3
Esophagus	31,861	24,679	7,182	4.4	7.6	1.9
Stomach	69,986	39,707	30,279	7.5	10.4	5.3
Small intestine	37,036	19,286	17,750	2.0	2.4	1.8
Colon	.	.	.	31.0	34.6	28.1
Rectum, rectosigmoid junction	.	.	.	9.3	11.7	7.3
Colon and Rectum	1,140,161	558,684	581,477	.	.	.
Anus, anal canal, anorecctum	37,845	14,120	23,725	1.8	1.6	2.0
Liver, intrahepatic bile duct	35,557	24,622	10,935	7.9	12.3	4.1
Gallbladder, biliary ducts	7,459	1,824	5,635	1.2	0.9	1.4
Pancreas	38,308	18,589	19,719	12.1	13.9	10.7
Larynx	89,142	71,608	17,534	3.2	5.8	1.1
Lung, bronchus	387,762	178,490	209,272	60.2	72.6	51.3
Bones, joints	41,723	21,486	20,237	0.9	1.1	0.8
Soft tissues (incl. heart)	106,520	55,565	50,955	3.3	3.9	2.8
Cutaneous melanoma	876,344	427,810	448,534	20.8	27.1	16.4
Breast	.	14,290	2,747,459	*	1.2	125.7
Cervix	*	*	247,711	*	*	7.9
Uterus	*	*	589,887	*	*	25.1
Ovary	*	*	182,758	*	*	12.1
Vagina	*	*	.	*	*	0.7
Vulva	*	*	.	*	*	2.4
Prostate	*	2,496,784	*	*	145.0	*
Testis	*	211,209	*	*	5.5	*
Bladder	554,347	411,234	143,113	20.0	35.3	8.7
Kidney, renal pelvis	320,182	188,359	131,823	15.5	21.4	10.7
Eye and Orbit	42,670	21,095	21,575	0.7	0.8	0.6
Brain & Other central nervous system	135,402	70,825	64,577	6.4	7.6	5.4
Thyroid	496,901	108,920	387,981	13.2	6.5	19.8
Hodgkin's lymphoma	174,908	90,425	84,483	2.7	3.0	2.4
Non-Hodgkin's lymphoma	484,336	252,111	232,225	19.3	23.4	16.0
Multiple myeloma	71,213	38,414	32,799	5.8	7.3	4.6
Lymphocytic leukemia (acute)	66,194	36,579	29,615	1.6	1.8	1.4
Lymphocytic leukemia (chronic)	113,499	64,165	49,334	3.8	5.3	2.7
Myeloid leukemia (acute)	35,455	17,378	18,077	3.5	4.3	3.0
Myeloid leukemia (chronic)	29,438	16,901	12,537	1.6	2.1	1.2
Monocytic leukemia (acute)	2,604	1,359	1,245	0.2	0.3	0.2
Kaposi sarcoma	.	.	.	0.5	1.0	0.1
Mesothelioma	.	.	.	1.0	2.0	0.4

Source: Fast Stats: An interactive tool for access to SEER cancer statistics. Surveillance Research Program, National Cancer Institute. http://seer.cancer.gov/faststats. (Accessed on 2-8-2013)

TABLE 4. MORTALITY RATES BY CANCER SITE FOR BOTH SEXES, MALES, AND FEMALES, PER 100,000 PEOPLE, UNITED STATES, 2009.

. = No data available

* = No data; sex specific cancer

Cancer site	Both sexes	Male	Female
All sites	173.1	211.9	146.4
Oral cavity, pharynx	2.4	3.7	1.3
Esophagus	4.2	7.5	1.5
Stomach	3.4	4.7	2.4
Small intestine	0.4	0.4	0.3
Colon	.	.	.
Rectum, rectosigmoid junction	.	.	.
Colon and Rectum	15.7	19.1	13.1
Anus, anal canal, anorecctum	0.2	0.2	0.3
Liver, intrahepatic bile duct	5.8	8.6	3.4
Gallbladder, biliary ducts	0.6	0.5	0.7
Pancreas	10.8	12.5	9.5
Larynx	1.1	2.0	0.4
Lung, bronchus	48.5	62.0	38.6
Bones, joints	0.4	0.5	0.4
Soft tissues (incl. heart)	1.3	1.5	1.1
Cutaneous melanoma	2.8	4.2	1.8
Breast	*	0.3	22.2
Cervix	*	*	2.3
Uterus	*	*	4.2
Ovary	*	*	7.8
Vagina	*	*	0.2
Vulva	*	*	0.5
Prostate	*	22.0	*
Testis	*	0.2	*
Bladder	4.3	7.6	2.1
Kidney, renal pelvis	3.9	5.8	2.5
Eye and Orbit	0.1	0.1	0.1
Brain & Other central nervous system	4.4	5.3	3.6
Thyroid	0.5	0.5	0.5
Hodgkin's lymphoma	0.4	0.5	0.3
Non-Hodgkin's lymphoma	6.3	8.1	4.9
Multiple myeloma	3.3	4.2	2.6
Lymphocytic leukemia (acute)	0.5	0.6	0.4
Lymphocytic leukemia (chronic)	1.4	2.0	0.9
Myeloid leukemia (acute)	2.9	3.8	2.2
Myeloid leukemia (chronic)	0.3	0.4	0.2
Monocytic leukemia (acute)	0.03	0.05	0.02
Kaposi sarcoma	.	.	.
Mesothelioma	.	.	.

Fast Stats: An interactive tool for access to SEER cancer statistics. Surveillance Research Program, National Cancer Institute. http://seer.cancer.gov/faststats. (Accessed on 2-8-2013)

APPENDICIES

A. BODY MASS INDEX (BMI) TABLE

How to use this table: First, find your height in the left-hand column, and then move to the right until you find your appropriate weight. Move up and the corresponding number is your body mass index. For example, a person who is 70 inches tall and weighs 188 pounds has a BMI of 27.

BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Height (inches)	Weight (pounds)																	
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295

BMI	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Height (inches)	Weight (pounds)																	
58	177	181	186	191	196	201	205	210	215	220	224	229	234	239	244	248	253	258
59	183	188	193	198	203	208	212	217	222	227	232	237	242	247	252	257	262	267
60	189	194	199	204	209	215	220	225	230	235	240	245	250	255	261	266	271	276
61	195	201	206	211	217	222	227	232	238	243	248	254	259	264	269	275	280	285
62	202	207	213	218	224	229	235	240	246	251	256	262	267	273	278	284	289	295
63	208	214	220	225	231	237	242	248	254	259	265	270	278	282	287	293	299	304
64	215	221	227	232	238	244	250	256	262	267	273	279	285	291	296	302	308	314
65	222	228	234	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324
66	229	235	241	247	253	260	266	272	278	284	291	297	303	309	315	322	328	334
67	236	242	249	255	261	268	274	280	287	293	299	306	312	319	325	331	338	344
68	243	249	256	262	269	276	282	289	295	302	308	315	322	328	335	341	348	354
69	250	257	263	270	277	284	291	297	304	311	318	324	331	338	345	351	358	365
70	257	264	271	278	285	292	299	306	313	320	327	334	341	348	355	362	369	376
71	265	272	279	286	293	301	308	315	322	329	338	343	351	358	365	372	379	386
72	272	279	287	294	302	309	316	324	331	338	346	353	361	368	375	383	390	397
73	280	288	295	302	310	318	325	333	340	348	355	363	371	378	386	393	401	408
74	287	295	303	311	319	326	334	342	350	358	365	373	381	389	396	404	412	420
75	295	303	311	319	327	335	343	351	359	367	375	383	391	399	407	415	423	431
76	304	312	320	328	336	344	353	361	369	377	385	394	402	410	418	426	435	443

Source: National Heart, Lung, and Blood Institute with The National Institute of Diabetes and Digestive and Kidney Disease. (1998). Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. NIH Publication No. 98-4083. Retrieved on February 20, 2014 from http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.pdf/.

B. CONTACT YOUR LOCAL HEALTH DEPARTMENT

Local Health Department	County Coverage	Telephone	Website
Bear River	Box Elder, Cache, Rich	Logan main office: (435) 792-6500 Brigham City office: (435) 734-0845 Tremonton office: (435) 257-3318 Randolph office: (435) 793-2445 Garden City office: (435) 881-3383	brhd.org
Central Utah	Juab, Millard, Piute, Sanpete, Sevier, Wayne	(435) 896-5451	centralutahpublichealth.com
Davis County	Davis	(801) 525-5000	daviscountyutah.gov/health
Salt Lake County	Salt Lake	(385) 468-4100	slcohealth.org
Southeastern Utah	Carbon, Emery, Grand, San Juan	Price office: (435) 637-3671 Castle Dale office: (435) 381-2252 Moab office: (435) 259-5602 Monticello office: (435) 587-2021 Blanding office: (435) 678-2723	southeastuthealth.org

B. CONTACT YOUR LOCAL HEALTH DEPARTMENT (CONTINUED)

Local Health Department	County Coverage	Telephone	Website
Southwest Utah	Beaver, Garfield, Iron, Kane, Washington	Beaver county: (435) 438-2482 Garfield county: (435) 676-8800 Iron county: (435) 586-2437 Kane county: (435) 644-2437 Washington county: (435) 673-3528	swuhealth.org
Summit County	Summit	Park City office: (435) 333-1500 Coalville office: (435) 336-3234 Kamas office: (435) 783-4351 ext. 3071	summitcountyhealth.org
Tooele County	Tooele	(435) 277-2300	tooelehealth.org
TriCounty	Daggett, Duchesne, Uintah	Vernal office: (435) 247-1177 Roosevelt office: (435) 722-6300	tricountyhealth.com
Utah County	Utah	(801) 851-7000	utahcountyonline.org/Dept2/Health
Wasatch County	Wasatch	(435) 654-2700	wasatchcountyhd.org
Weber-Morgan	Weber, Morgan	(801) 399-7100	webermorganhealth.org

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