

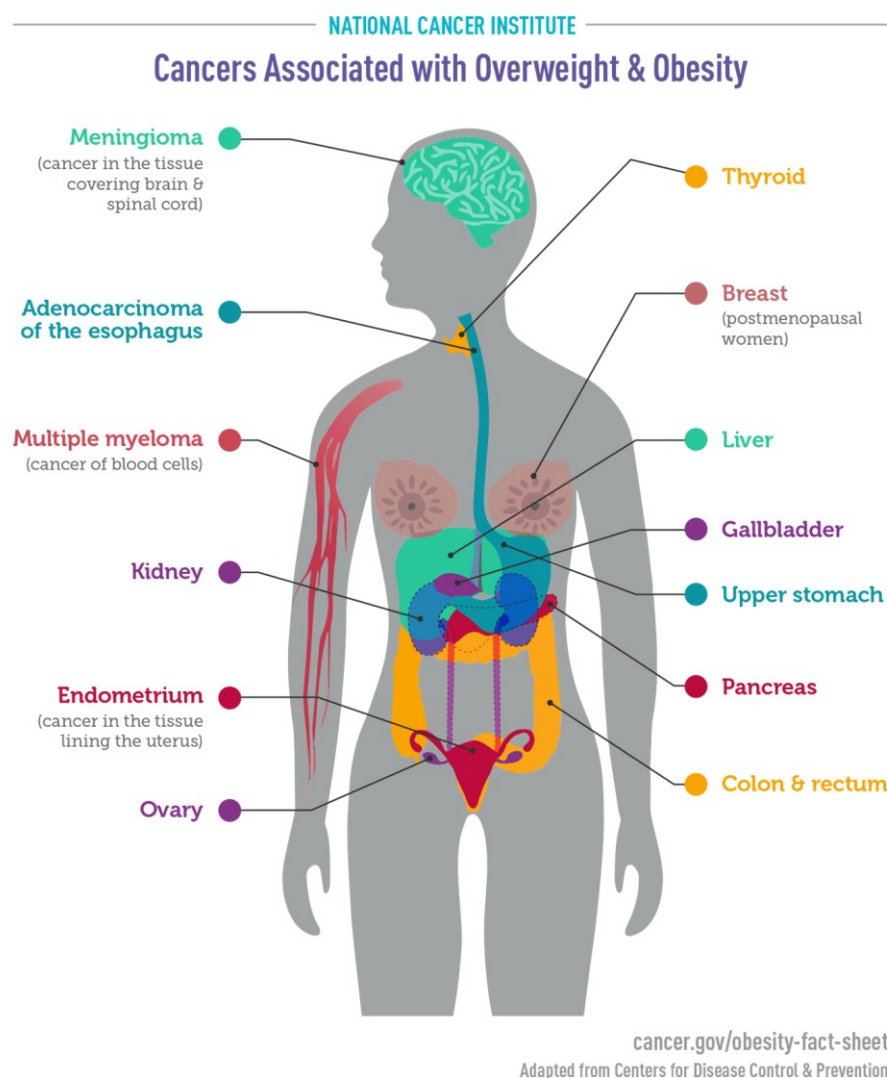
# Obesity-Associated Cancers in Ohio 2023

January 2023

## Obesity and Cancer

Being overweight or having obesity are linked with a higher risk of getting 13 types of cancer. These cancers include adenocarcinoma of the esophagus, breast (in women who have gone through menopause), colon and rectum, endometrium (uterus), gallbladder, upper stomach (gastric cardia), kidney, liver, ovary, pancreas, thyroid, meningioma (a type of brain cancer), and multiple myeloma. These cancer types will be referred to as “obesity-associated” cancers in this report, but this does not imply that all cases of these cancers are caused by obesity. Obesity-associated cancers make up 40% of all cancers diagnosed in the United States each year.

Figure 1. Cancers Associated with Overweight and Obesity



## How Can Obesity Cause Cancer?

Overweight and obesity can cause changes in the body that may lead to cancer. These changes can include long-lasting inflammation and higher than normal levels of insulin, insulin-like growth factor (IGF-1), and sex hormones.

People with obesity often have increased blood levels of insulin and IGF-1, which may promote the development of colon, kidney, and endometrial cancers.

Excess amounts of estrogen produced by fat (adipose) tissue have been associated with increased risks of breast, endometrial, ovarian, and some other cancers.

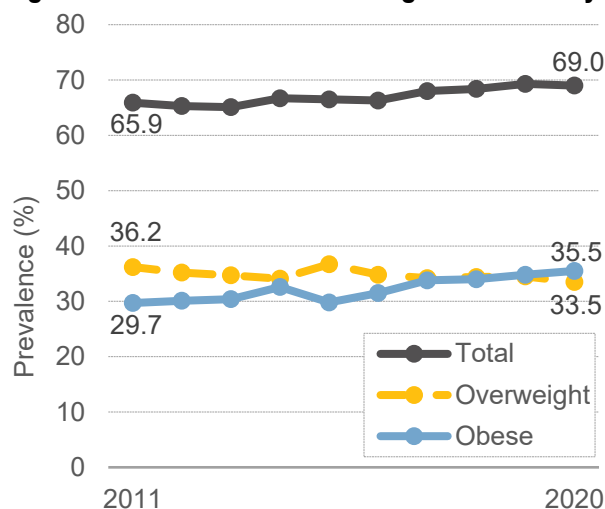
The risk of cancer increases with the more excess weight a person gains and the longer a person is overweight.

Source of Image: National Cancer Institute.

## Overweight and Obesity

A person's weight that is higher than what is considered a healthy weight for a given height is described as overweight or obesity. Body mass index (BMI) is used as a screening tool for overweight and obesity and is defined as a person's weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). For adults, a BMI from 25.0 to 29.9 falls within the overweight range. A BMI that is 30.0 or higher falls within the obesity range. However, it should be noted that BMI may overestimate body fat in those with an athletic build and underestimate body fat in older persons and others who have lost muscle.

**Figure 2. Prevalence of Overweight and Obesity Among Adults (Age 18+) by Year, Ohio, 2011-2020**

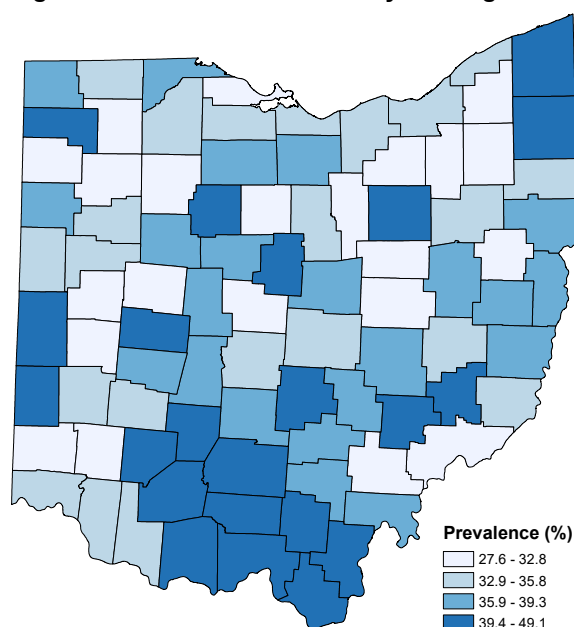


- The prevalence of being overweight among Ohio adults slightly decreased from 2011 to 2020; 36.2% of Ohio adults were overweight in 2011, compared with 33.5% of adults in 2020.
- In contrast, the prevalence of obesity among Ohio adults increased 20% from 2011 to 2020; 29.7% of Ohio adults were obese in 2011, compared with 35.5% of adults in 2020.
- The combined total prevalence of overweight and obesity among Ohio adults increased 5% from 2011 (65.9%) to 2020 (69.0%).

Source: Ohio Behavioral Risk Factor Surveillance System (BRFSS), Ohio Department of Health, 2022.  
BMI is calculated based on self-reported height and weight.

## Obesity by County in Ohio

**Figure 3. Prevalence of Obesity Among Adults (Age 18+) by County, Ohio, 2018-2020**



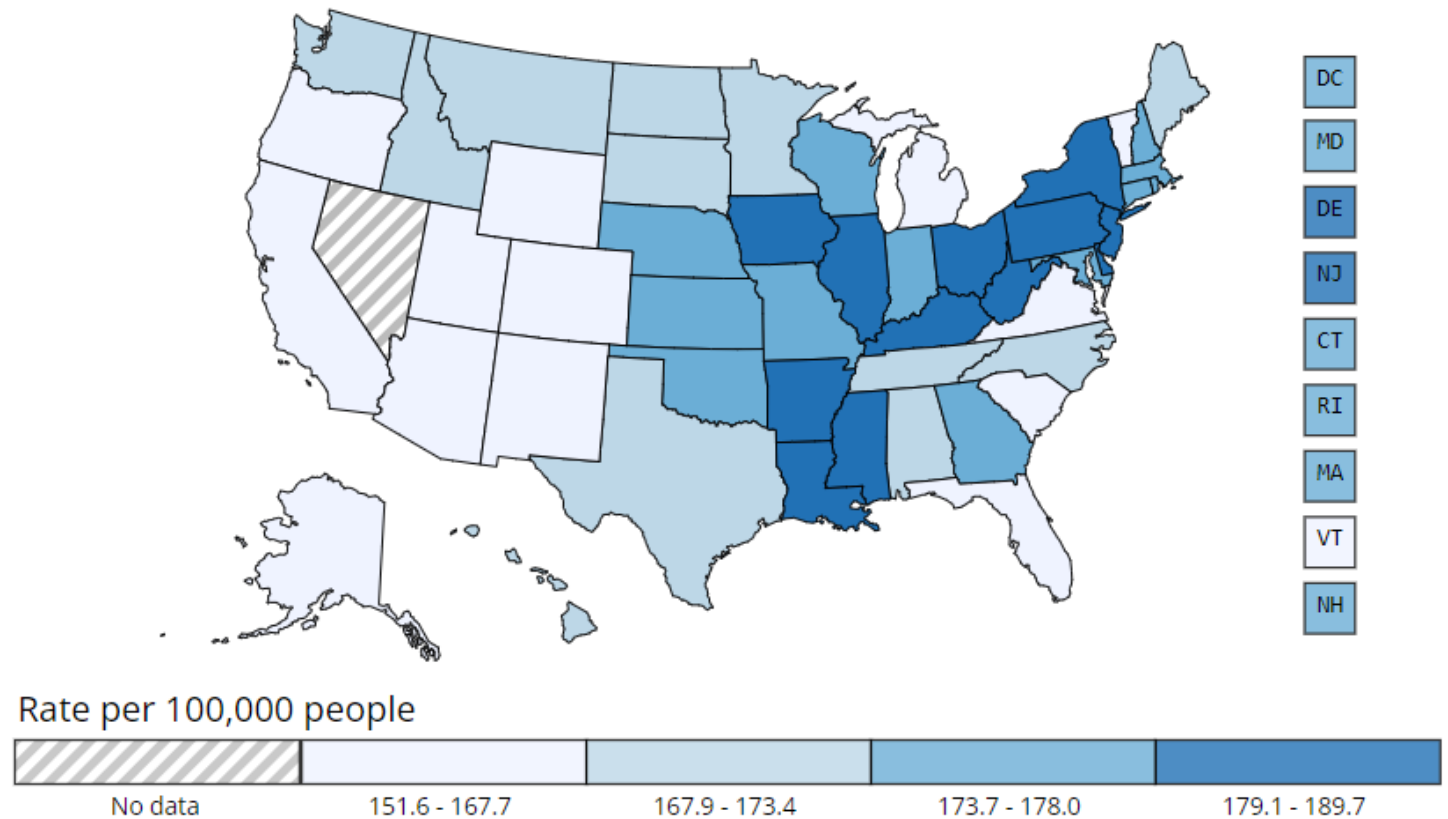
- In Ohio in 2018-2020, the prevalence of obesity among adults ages 18 and older ranged from 27.6% (Athens County) to 49.1% (Fayette County).
- The prevalence of obesity among adults was higher in counties without large cities, including a block of 10 counties in southern Ohio.
- Overall, the prevalence of obesity among Ohio adults was 34.8% in 2018-2020.

Source: Ohio Behavioral Risk Factor Surveillance System (BRFSS), Ohio Department of Health, 2022.

## Obesity-Associated Cancer Rates

Ohio ranked 7<sup>th</sup> among states in all obesity-associated cancers, with an incidence rate of 180.8 per 100,000, compared with a U.S. rate of 172.5 per 100,000 in 2015-2019. During this time period, an estimated 26,789 new cancer cases were diagnosed each year in Ohio that were, in part, associated with obesity.

**Figure 4. Rate of All Obesity-Associated Cancers by State, 2015-2019**



Source: U.S. Cancer Statistics Working Group. U.S. Cancer Statistics Data Visualizations Tool, based on 2021 submission data (1999-2019); U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; <https://www.cdc.gov/cancer/dataviz/>, released June 2022. (Select: Special Analysis/Cancers Grouped by Associated Risk Factors/Obesity/All Obesity-associated Cancers/Male and Female/2015-2019.)

## Proportion of Cancers Attributable to Excess Body Weight

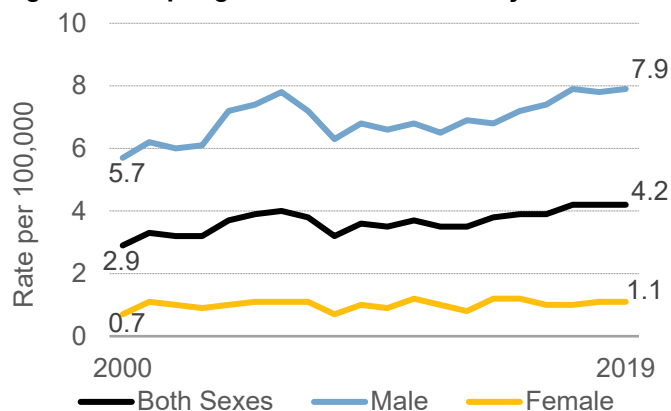
A nationwide study of U.S. adults age 30 years and older found that the percentage of cancers attributable to excess body weight ranged from 3.9% to 6.0% among men, and from 7.1% to 11.4% among women, in 2011-2015. The estimates for Ohio were 4.6% for men, 10.3% for women, and 7.4% overall. (Islami et al., Proportion of Cancer Cases Attributable to Excess Body Weight by U.S. State, 2011-2015, *JAMA Oncol.* 2019; 5(3): 384-392.)

The percentage of cases attributed to excess body weight varied widely across cancer types. Listed below is the relative risk (RR – see Technical Notes for a definition) by type of cancer for a five-point increase in BMI; for example, the RR linked to a BMI of 31 compared with a BMI of 26. Of the 13 cancer types associated with obesity, those cancers with the highest RR were: liver (RR=1.59), corpus uteri (RR=1.50), esophageal adenocarcinoma (RR=1.48), upper stomach (RR=1.31), gallbladder (RR=1.29), and kidney (1.29). Other cancer types had lower risks, including pancreas (1.14), female postmenopausal breast (1.10), multiple myeloma (1.09), thyroid (1.09), ovary (1.08), and colon and rectum (1.04). Meningioma was not included due to sparse data.

## Trends

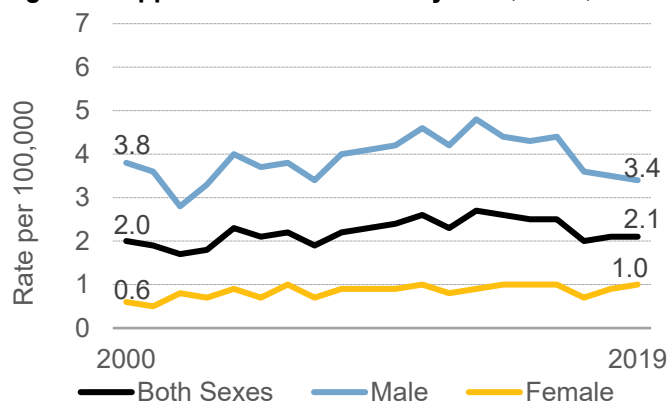
Figures 5 through 10 show trends in incidence rates for six cancers that were most associated with obesity from 2000 to 2019 in Ohio. Please note that the range of incidence rates varies by cancer type; therefore, the scale is different for each figure. Also, increases/decreases in incidence rates over time may appear smaller when using larger scales and larger when using smaller scales. Incidence rates increased from 2000 to 2019 for esophageal adenocarcinoma and kidney, liver, and uterine cancer.

**Figure 5. Esophageal Adenocarcinoma by Year, Ohio, 2000-2019**



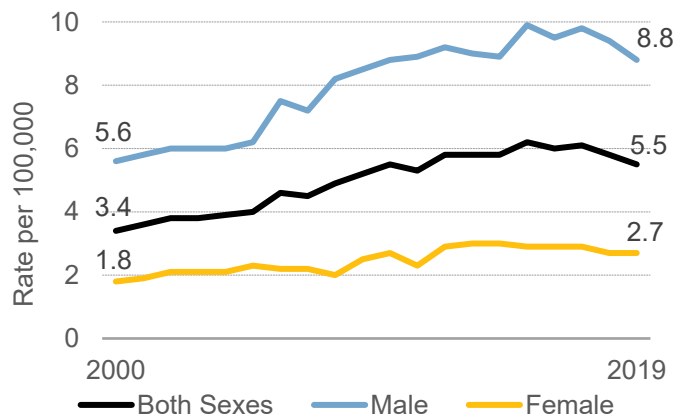
Incidence rates of esophageal adenocarcinoma increased among males, females, and both sexes combined from 2000 to 2019. Males had higher rates of esophageal adenocarcinoma than females each year (Figure 5).

**Figure 6. Upper Stomach Cancer by Year, Ohio, 2000-2019**



Overall, incidence rates of cancer of the upper stomach (gastric cardia) were relatively stable from 2000 to 2019. Males had higher rates than females each year from 2000 to 2019 (Figure 6).

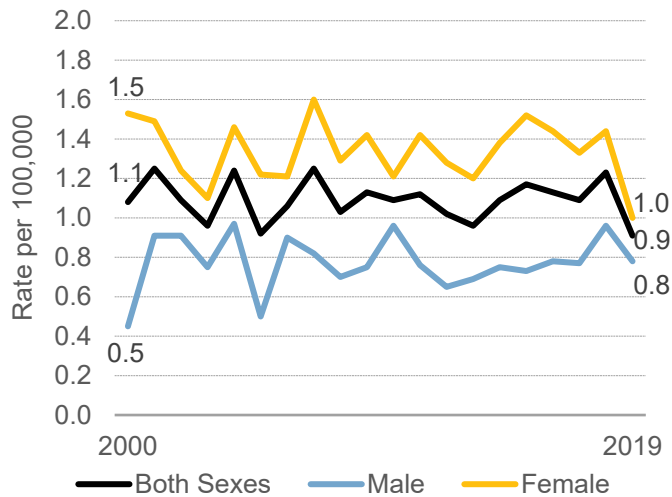
**Figure 7. Liver Cancer by Year, Ohio, 2000-2019**



Incidence rates of liver cancer increased among males, females and both sexes combined in Ohio from 2000 to 2019. Males had higher rates of liver cancer than females each year (Figure 7).

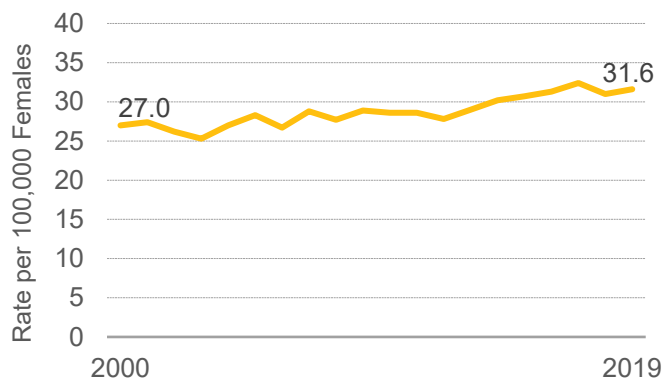
## Trends (continued)

**Figure 8. Gallbladder Cancer by Year, Ohio, 2000-2019**



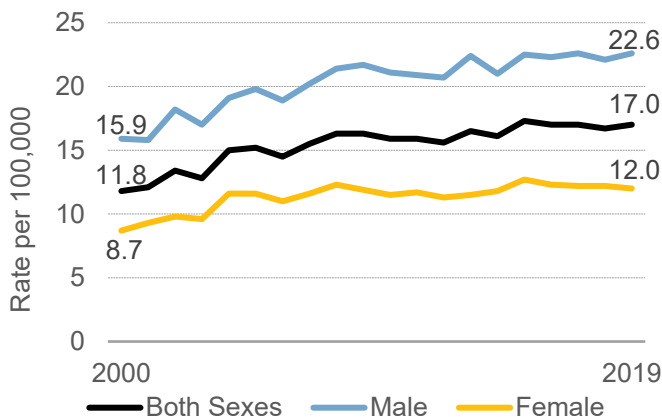
Incidence rates for gallbladder cancer were higher among females than males each year from 2000 through 2019. Although sporadic, there was no apparent trend in incidence rates throughout the period (Figure 8).

**Figure 9. Uterine Cancer by Year, Ohio, 2000-2019**



Incidence rates of uterine cancer increased 17% among females from 2000 to 2019 (Figure 9).

**Figure 10. Kidney Cancer by Year, Ohio, 2000-2019**



Incidence rates of kidney cancer increased from 2000 to 2019 for males, females, and both sexes combined, with males having higher rates than females each year (Figure 10).

## Risk Factors

According to the Mayo Clinic, overweight and obesity usually results from a combination of causes and contributing factors, including:

**Genetics:** Genes may affect the amount of body fat stored and where that fat is distributed. Genetics may also play a role in how efficiently the body converts food into energy, how it regulates appetite, and how it burns calories during exercise.

**Family Influences:** Obesity tends to run in families. This is due in part to the genes they share, but also because family members tend to have similar eating and activity habits.

### **Lifestyle Choices:**

- **Diet.** A diet that is high in calories, saturated fat, and added sugars and lacks adequate fruits, vegetables, whole grains, and lean protein sources contributes to weight gain. Beverages that are high in calories, such as those containing added sugars and alcoholic beverages, can also contribute to weight gain.
- **Activity Level.** A sedentary lifestyle and the number of hours spent in front of a screen (such as a computer, smartphone, or television) is highly associated with weight gain.

**Medications:** Some medications, including some antidepressants, anti-seizure medications, diabetes medications, antipsychotic medications, steroids, and beta blockers, can lead to weight gain.

**Medical Conditions:** Being overweight or obese can sometimes be traced to a medical cause, such as Prader-Willi syndrome, Cushing's syndrome, polycystic ovary syndrome, and other diseases and conditions.

**Sleep:** Not getting enough sleep or getting too much sleep can cause changes in hormones that increase appetite. Lack of sleep may also increase cravings for foods high in calories and carbohydrates, which can contribute to weight gain.

**Quitting Smoking:** Quitting smoking is often associated with weight gain. Often, this happens as people use food to cope with smoking withdrawal. In the long run, however, quitting smoking is still a greater benefit to health than is continuing to smoke. Healthcare providers can help those who have quit smoking prevent weight gain.

**Age:** Obesity can occur at any age, even in young children. But as people age, hormonal changes and a less active lifestyle increases risk of obesity. In addition, the amount of muscle in the body tends to decrease with age which is often associated with a decrease in metabolism. These changes also reduce calorie needs and can make it harder to keep off excess weight.

**Social and Economic Issues:** Social and economic factors are linked to obesity. Avoiding obesity is difficult if people don't have safe areas to walk or exercise. Similarly, many people have not been taught healthy ways of cooking or may not have access to healthier foods close to their homes.

Even if people have one or more of these risk factors, it doesn't mean that they are destined to become overweight or obese. Most risk factors can be counteracted through diet, physical activity and exercise, and behavior changes.

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## Prevention

There are many policy, systems, and environmental changes that can help prevent and reduce obesity. The **Ohio Comprehensive Cancer Control Plan 2021-2030** includes objectives and strategies to prevent and control cancer in Ohio. Objectives in the cancer plan dedicated to obesity include:

- By 2030, increase the percentage of Ohio adults with a healthy weight (BMI 18.5-24.9) from 30% to 32% (baseline: 2018 BRFSS).
- By 2030, increase the percentage of Ohio high school students (grades 9 to 12) with a healthy weight (BMI 18.5-24.9) from 61% to 63% (baseline: Ohio Youth Risk Behavior Survey 2018).

The Ohio Department of Health (ODH) **Early Childhood Obesity Prevention Program** (ECOPP) is a coordinated and comprehensive approach involving families, early childhood education professionals, health professionals, and community organizations working together with consistent messaging and strategies to ensure a sound foundation for health in the future. ECOPP is a program within the [Early Childhood Health Program](#).

The ODH **Creating Healthy Communities** (CHC) program implements sustainable evidence-based strategies in 22 counties across Ohio to activate and engage local partners and community members to improve access to and affordability of healthy food and increase opportunities for physical activity where Ohioans live, work, and play. More information about CHC is available [here](#).

Here are a few examples of what people and communities can do to reduce obesity:

### Eating Patterns

- The *Dietary Guidelines for Americans, 2020-2025* (developed by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services) recommends consuming a variety of fruits, vegetables, grains, protein foods, and dairy or fortified soy alternatives. A person should choose meals, beverages, and snacks that have limited added sugars, saturated fats, and sodium.
- Managers of worksites and public facilities can improve the nutritional quality of food and beverages available in those settings.

### Physical Activity

- The *Physical Activity Guidelines for Americans* (developed by the U.S. Department of Health and Human Services) recommends that children aged 3 through 5 years should be physically active throughout the day. Children aged 6-17 years need at least 60 minutes of moderate to vigorous physical activity every day. Adults need 150 minutes of moderate intensity physical activity a week.
- Communities can create or modify environments to make it easier for people to walk or bike to everyday destinations.

### Sleep

- Newborns need 14 to 17 hours of sleep per day. That amount decreases with age; teenagers need 8 to 10 hours of sleep per day, and adults need 7 or more hours of sleep per day. See [How Much Sleep Do I Need?](#)
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## Technical Notes

**Age-Adjusted Rate:** A summary rate that is a weighted average of age-specific rates, where the weights represent the age distribution of a standard population (direct adjustment). The incidence rates presented in this report were standardized to the age distribution of the 2000 U.S. Standard Population. Under the direct method, the population was first divided into 19 age groups, i.e., <1, 1-4, 5-9, 10-14, 15-19 ... 85+, and the age-specific rate was calculated for each age group. Each age-specific rate was then multiplied by the standard population proportion for the respective age group.

**Average Annual Number:** The number of cases diagnosed per year, on average, for the time period of interest (e.g., 2015 to 2019). Average annual numbers are calculated by summing the number of cases for a given time period, dividing by the number of years that comprise the time period, and rounding to the nearest whole number.

**Body Mass Index (BMI):** A number calculated from a person's weight and height – a person's weight in kilograms divided by the square of height in meters. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems.

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal Weight
25.0 – 29.9	Overweight
30.0 and Above	Obese

**Confidence Interval (CI):** An estimated range of values for a measure (e.g., prevalence) constructed so that the range has a specified probability of including the true value of the measure in the population. Estimates of the prevalence of obesity are presented with 95 percent confidence intervals in Table 1.

**Incidence:** The number of cases diagnosed during a specified time period (e.g., 2015 to 2019). Obesity-associated cancer cases were defined by the International Classification of Diseases for Oncology, Third Edition (ICD-O-3), and categorized in accordance with the SEER Program of the National Cancer Institute by site codes: esophageal adenocarcinoma (C150-C159; types 8140-8575), gastric cardia (C160), colon and rectum (C180-C209, C260), liver (C220), gallbladder (C239), pancreas (C250-C259), multiple myeloma (types 9731-9732; 9734), female breast (C500-C509), uterine cancer (C540-C549; C559), ovary (C569), kidney (C649), meningioma (C700-C701, C709; types 9530-9539), thyroid (C739). For ICD-O-3 codes, histology types include 8000-9049, 9056-9139, 9141-9589 for all cancer sites, except where indicated.

**Invasive Cancer:** A malignant tumor that has infiltrated the organ in which the tumor originated. Invasive cancers consist of those diagnosed at the local, regional, distant, and unstaged/missing stages. Only invasive cancers were included in the calculation of incidence rates in this document.

**Population Data Used to Calculate Rates:** Rates through 2019 were calculated using population estimates from the U.S. Census Bureau and National Center for Health Statistics. Population data were compiled from bridged-race intercensal population estimates for July 1, 1990 to July 1, 1999 (released July 26, 2004); revised bridged-race intercensal population estimates for July 1, 2000 to July 1, 2004 (released Oct. 26, 2012); revised bridged-race intercensal population estimates for July 1, 2005 to July 1, 2009 (released June 26, 2014), and vintage 2020 bridged-race postcensal population estimates for July 1, 2010 to July 1, 2020 (released September 22, 2021).

**Prevalence:** The proportion of people with a certain disease or characteristic at a given time.

**Rate:** The number of cases per unit of population (e.g., per 100,000 persons) during a specified time period (e.g., 2015 to 2019). Rates may be unstable and are not presented when the count is less than five.

**Relative Risk:** A measure of the risk of a certain event happening in one group compared to the risk of the same event happening in another group. A relative risk of 1 means there is no difference between two groups in terms of their risk of cancer. A relative risk of greater than 1 usually means that being exposed to a certain substance or factor increases the risk of cancer. Relative risk is also called risk ratio.



**Table 1: Prevalence of Obesity Among Ohio Adults (Age 18+) by County of Residence, 2018-2020**

County	%	95% CI			County	%	95% CI			County	%	95% CI		
Ohio	34.8	34.0	-	35.5	Harrison	36.4	26.6	-	46.3	Putnam	30.8	24.4	-	37.3
U.S.					Henry	28.9	19.2	-	38.6	Richland	35.7	31.1	-	40.2
Adams	42.7	34.3	-	51.1	Highland	42.6	33.8	-	51.5	Ross	40.0	35.4	-	44.5
Allen	34.2	29.6	-	38.9	Hocking	37.3	27.6	-	47.1	Sandusky	34.8	27.8	-	41.7
Ashland	29.3	20.0	-	38.6	Holmes	27.7	15.4	-	40.1	Scioto	39.4	34.5	-	44.3
Ashtabula	40.5	34.1	-	46.9	Huron	38.9	31.6	-	46.3	Seneca	39.3	32.4	-	46.3
Athens	27.6	22.8	-	32.5	Jackson	45.2	38.6	-	51.8	Shelby	32.2	21.7	-	42.6
Auglaize	33.1	26.6	-	39.6	Jefferson	36.2	31.5	-	41.0	Stark	35.4	31.4	-	39.5
Belmont	36.3	31.6	-	41.1	Knox	38.3	31.8	-	44.9	Summit	30.7	27.3	-	34.1
Brown	34.8	26.1	-	43.4	Lake	33.0	27.0	-	39.1	Trumbull	40.4	35.7	-	45.2
Butler	32.3	27.9	-	36.8	Lawrence	43.1	37.7	-	48.5	Tuscarawas	35.8	30.9	-	40.7
Carroll	30.7	20.9	-	40.5	Licking	34.0	27.2	-	40.8	Union	37.3	29.0	-	45.7
Champaign	44.4	33.9	-	55.0	Logan	29.0	20.4	-	37.6	Van Wert	37.2	30.3	-	44.1
Clark	38.5	31.8	-	45.3	Lorain	33.5	27.9	-	39.0	Vinton	36.2	30.5	-	41.9
Clermont	33.9	27.9	-	39.9	Lucas	36.3	33.1	-	39.5	Warren	29.3	23.3	-	35.2
Clinton	43.7	31.9	-	55.4	Madison	38.0	25.3	-	50.8	Washington	32.8	25.9	-	39.8
Columbiana	36.4	30.3	-	42.5	Mahoning	35.8	31.6	-	40.1	Wayne	41.5	34.7	-	48.3
Coshocton	31.1	24.4	-	37.8	Marion	39.3	33.5	-	45.1	Williams	35.9	24.7	-	47.0
Crawford	32.4	26.1	-	38.8	Medina	31.9	25.2	-	38.7	Wood	34.8	27.2	-	42.3
Cuyahoga	34.6	31.9	-	37.3	Meigs	37.3	30.1	-	44.5	Wyandot	40.9	30.2	-	51.7
Darke	43.5	33.0	-	54.0	Mercer	34.2	27.0	-	41.5					
Defiance	39.6	30.2	-	49.1	Miami	31.8	24.5	-	39.2					
Delaware	29.5	24.4	-	34.6	Monroe	35.0	25.6	-	44.5					
Erie	35.6	29.4	-	41.7	Montgomery	35.0	31.4	-	38.5					
Fairfield	40.1	32.2	-	48.0	Morgan	44.5	33.7	-	55.4					
Fayette	49.1	41.3	-	56.9	Morrow	42.6	33.7	-	51.5					
Franklin	33.4	30.8	-	36.0	Muskingum	36.1	31.7	-	40.5					
Fulton	35.8	26.8	-	44.8	Noble	42.1	31.4	-	52.7					
Gallia	41.1	34.0	-	48.1	Ottawa	28.6	20.8	-	36.4					
Geauga	28.9	20.6	-	37.2	Paulding	32.1	18.8	-	45.4					
Greene	34.3	28.8	-	39.8	Perry	39.3	30.3	-	48.4					
Guernsey	35.7	29.0	-	42.4	Pickaway	36.7	24.4	-	49.0					
Hamilton	33.8	30.7	-	36.9	Pike	46.7	38.2	-	55.2					
Hancock	31.5	26.0	-	36.9	Portage	30.1	24.7	-	35.6					
Hardin	36.3	27.7	-	44.8	Preble	44.1	30.1	-	58.2					

Source: Ohio Behavioral Risk Factor Surveillance System (BRFSS), Ohio Department of Health, 2022.  
95% CI = 95% Confidence Interval

## Sources of Data and Additional Information

**Ohio Cancer Incidence Surveillance System:**

<https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/ohio-cancer-incidence-surveillance-system/welcome-to>

**Ohio Public Health Data Warehouse:**

<http://publicapps.odh.ohio.gov/EDW/DataCatalog>

**National Cancer Institute:**

<https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/obesity-fact-sheet>

**American Cancer Society:**

<https://www.cancer.org/healthy/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk/effects.html>

**To submit comments and information requests:**

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