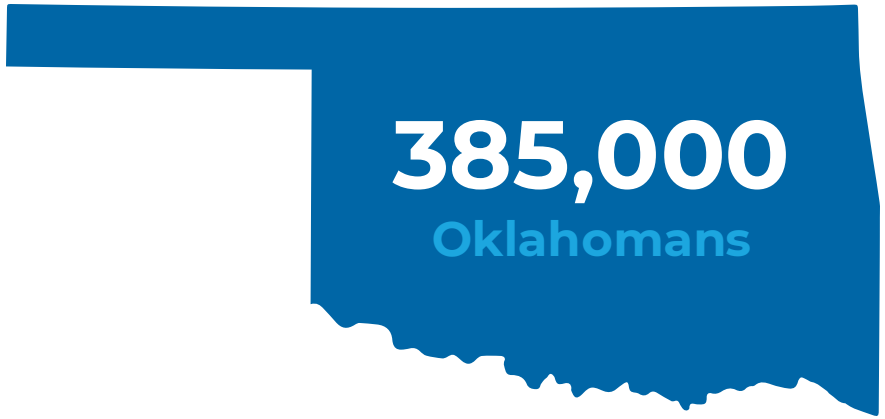
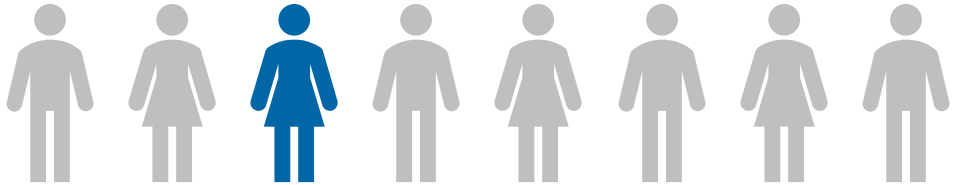
FOOD ADDITIVES – RESEARCH SUMMARY

OKLAHOMA
State Department
of Health

Burden of Diabetes in Oklahoma Adults



Over 385,000 Oklahoma adults reported having been diagnosed with diabetes* in 2023

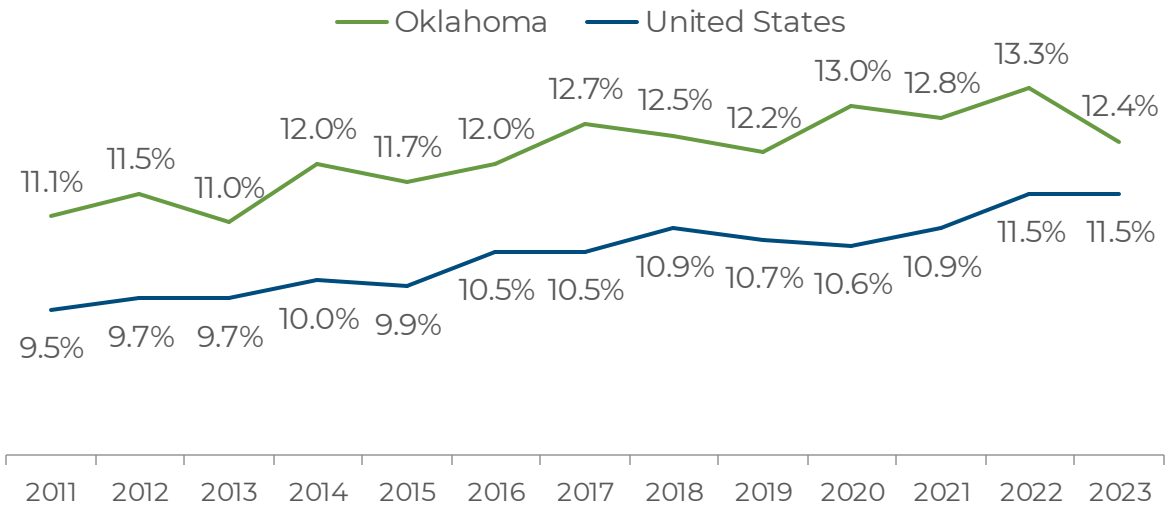


That's about 1 out of every 8 adults

In 2023, Oklahoma had the

15th

highest diabetes prevalence in the nation



* Type 2 diabetes accounts for 90% to 95% of all diabetes cases

Source: Centers for Disease Control and Prevention. (2023). *Behavioral Risk Factor Surveillance System*. Available at https://www.cdc.gov/brfss/brfssprevalence/index.html

Burden of Obesity in Oklahoma Adults

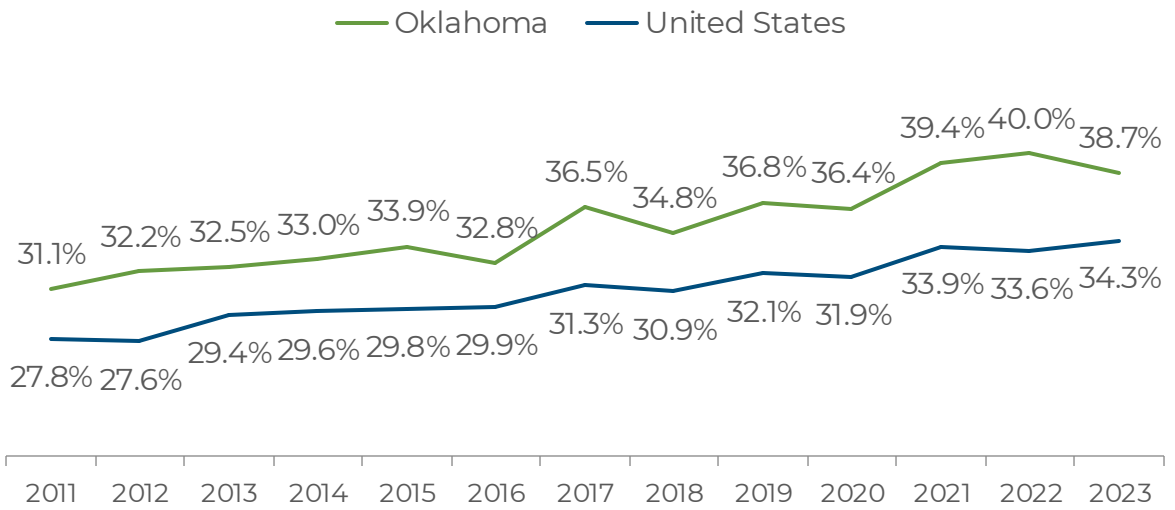
Obesity affected over 1.1 million Oklahoma adults

That's almost 2 out of every 5 adults

In 2023, Oklahoma had the

6th

highest obesity prevalence in the nation



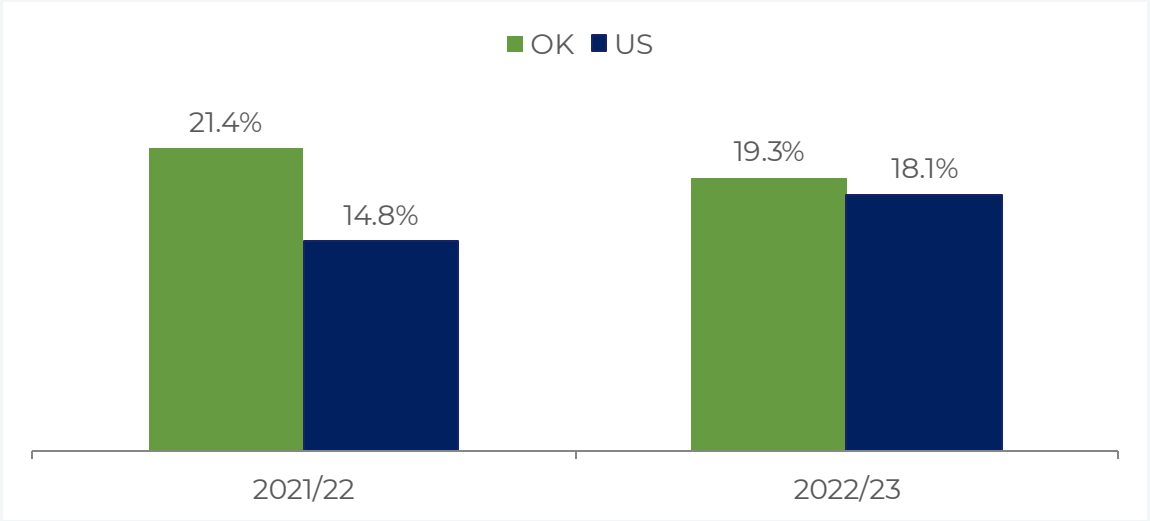
Source: Centers for Disease Control and Prevention. (2023). *Behavioral Risk Factor Surveillance System*. Available at https://www.cdc.gov/brfss/brfssprevalence/index.html

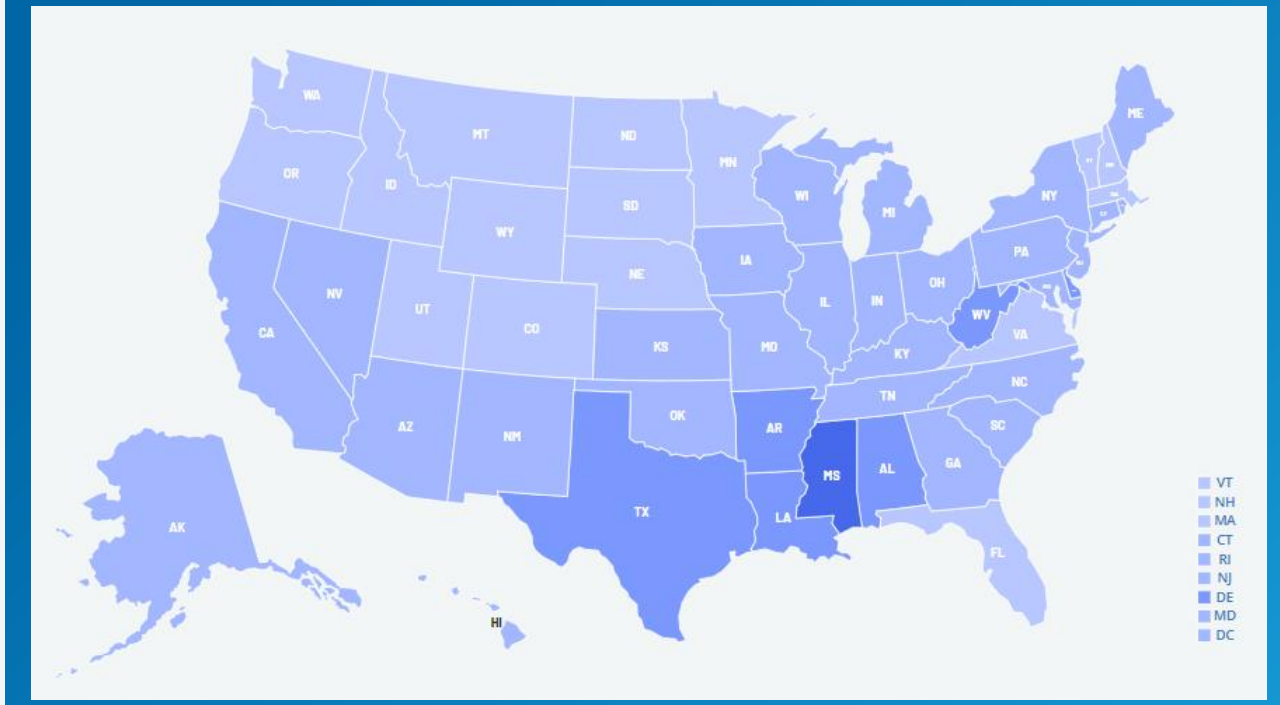
Burden of Obesity in Oklahoma Children: 6-17 Years

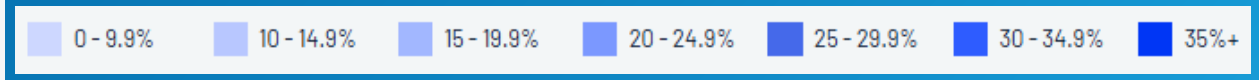
19.3%
Oklahoma (2022-23)

17.0%
United States (2022-23)

9th
highest obesity prevalence in the nation

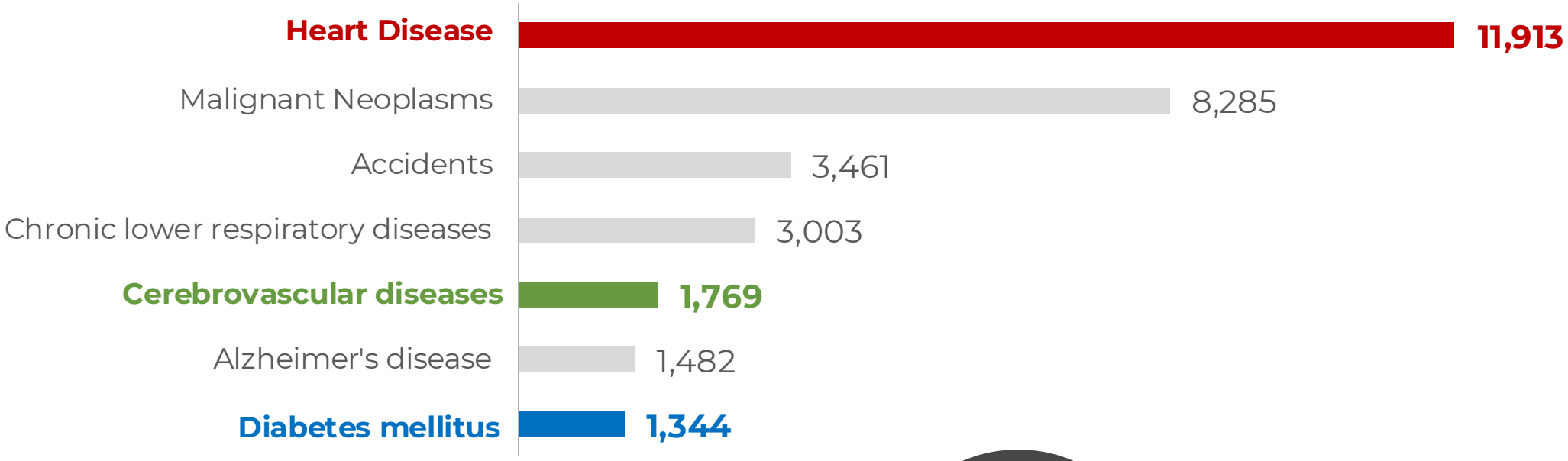






Data Source: 2021-2022 and 2022-2023 National Survey of Children's Health (NSCH) data query. U.S. Department of Health and Human Services, Health Resources and Services Administration's Maternal and Child Health Bureau (HRSA MCHB). Available at www.childhealthdata.org.

Leading Causes of Death in Oklahoma

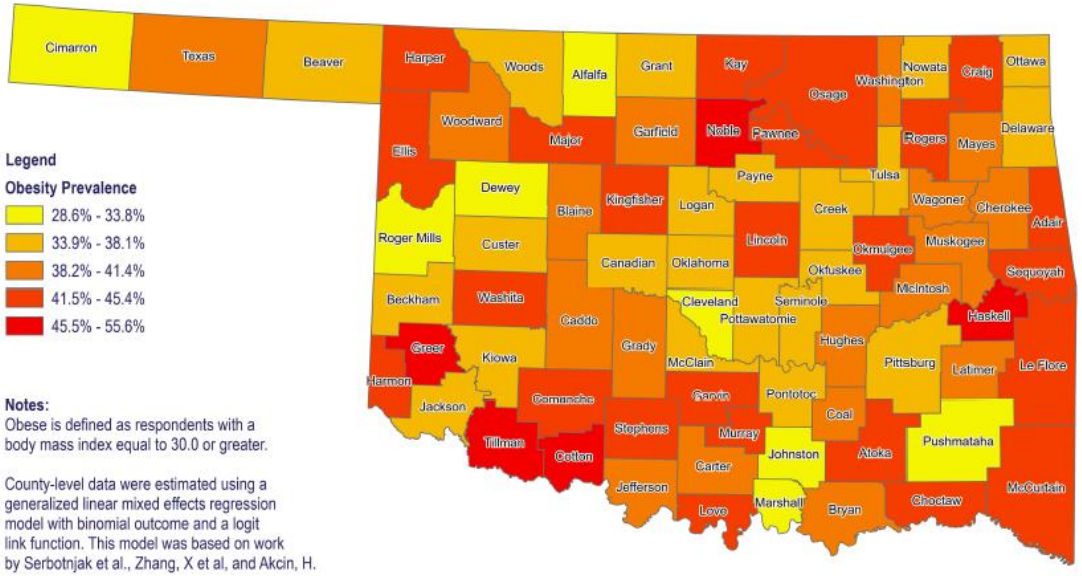


Heart Disease + Stroke + Diabetes = 15,026

In 2023, **heart disease**, **stroke** and **diabetes** was determined to be the underlying **cause of death** in **15,000 people.**

Data source: Centers for Disease Control and Prevention, National Center for Health Statistics. National Vital Statistics System, Mortality 2018-2023 on CDC WONDER Online Database, released in 2024. Data are from the Multiple Cause of Death Files, 2018-2023, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program.

Estimated Prevalence of Obesity, 2023



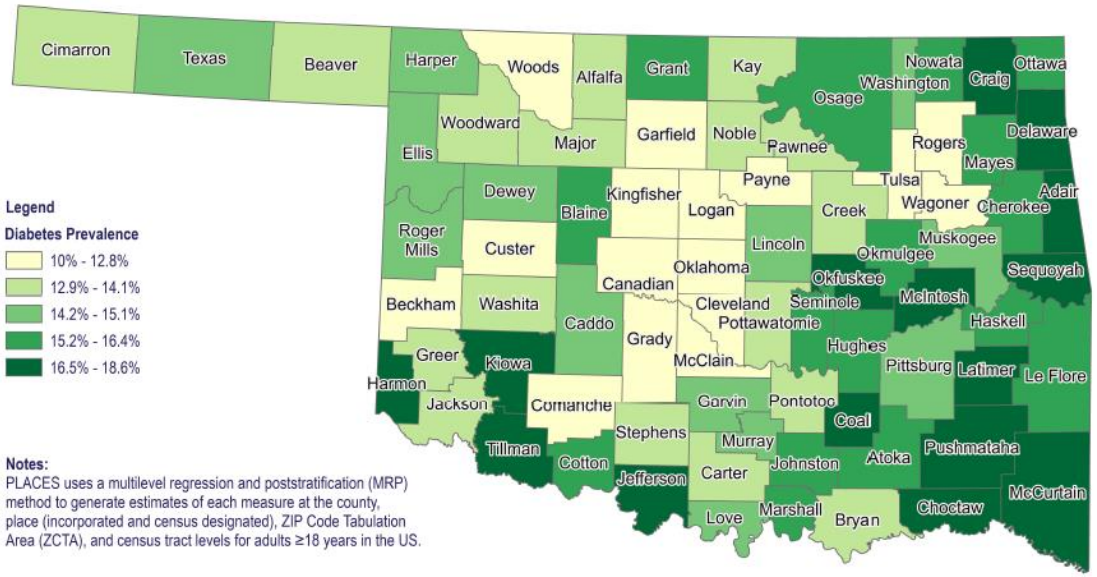
Notes:
Obese is defined as respondents with a body mass index equal to 30.0 or greater.

County-level data were estimated using a generalized linear mixed effects regression model with binomial outcome and a logit link function. This model was based on work by Serbotnjak et al., Zhang, X et al, and Akcin, H.

Data Source:
2023 Behavioral Risk Factor Surveillance System, Oklahoma State Department of Health

Projection/Coordinate System: Albers Equal Area Conic USGS **Created:** 05.27.2025

Estimated Prevalence of Diabetes, 2022

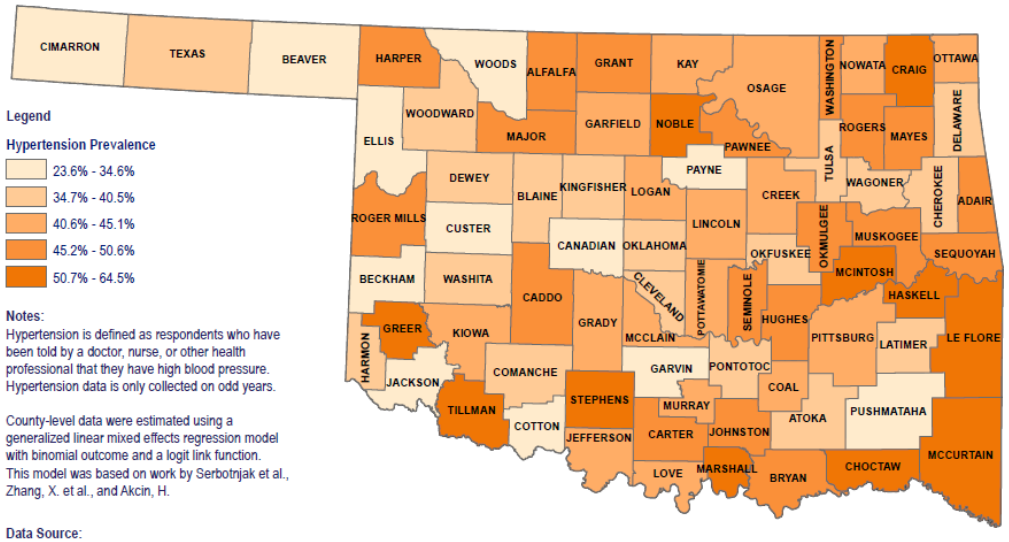


Notes:
PLACES uses a multilevel regression and poststratification (MRP) method to generate estimates of each measure at the county, place (incorporated and census designated), ZIP Code Tabulation Area (ZCTA), and census tract levels for adults ≥18 years in the US.

Data Source:
2022 Behavioral Risk Factor Surveillance System. CDC Places. Available at: https://www.cdc.gov/places/index.html

Projection/Coordinate System: USGS Albers Equal Area Conic **Created:** 08.08.2025

Estimated Prevalence of Hypertension, 2021



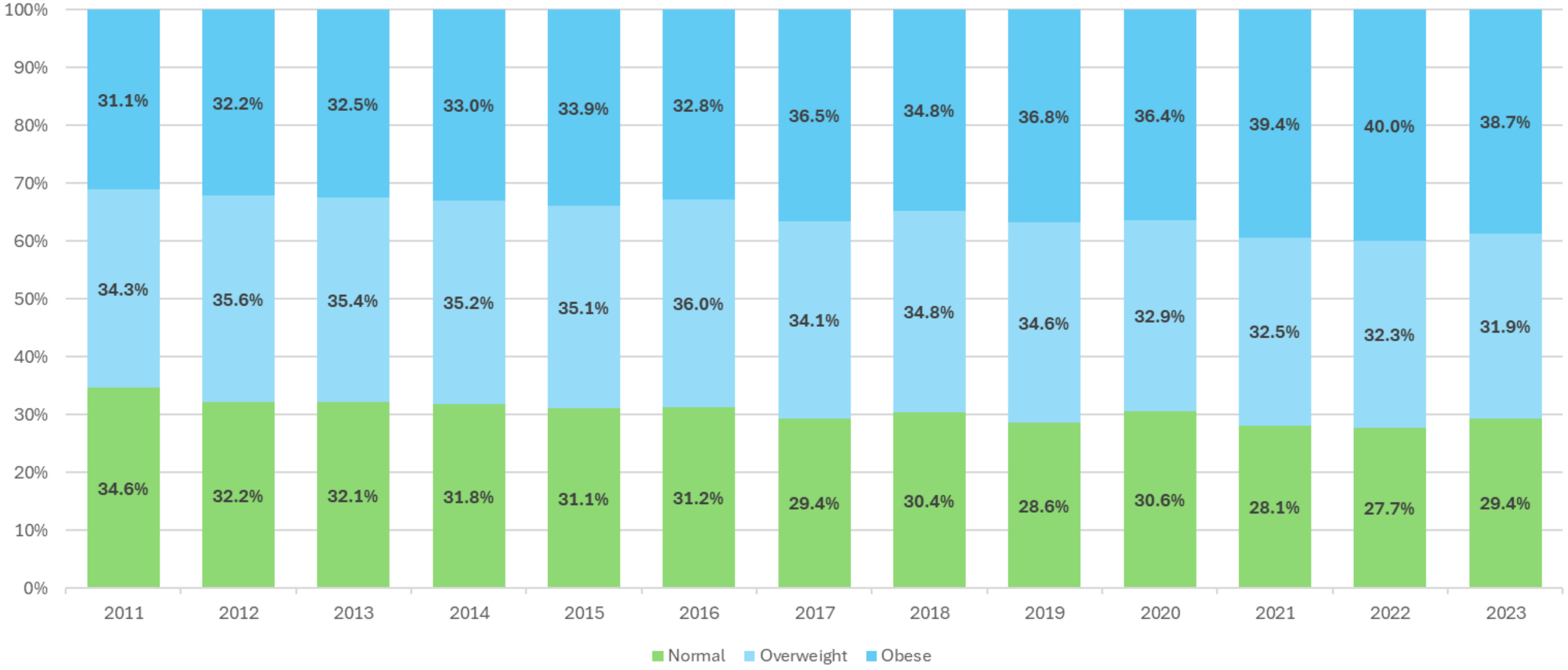
Notes:
Hypertension is defined as respondents who have been told by a doctor, nurse, or other health professional that they have high blood pressure. Hypertension data is only collected on odd years.

County-level data were estimated using a generalized linear mixed effects regression model with binomial outcome and a logit link function. This model was based on work by Serbotnjak et al., Zhang, X. et al., and Akcin, H.

Data Source:
2021 Behavioral Risk Factor Surveillance System, Oklahoma State Department of Health

Projection/Coordinate System: USGS Albers Equal Area Conic **Created:** 08.25.2023

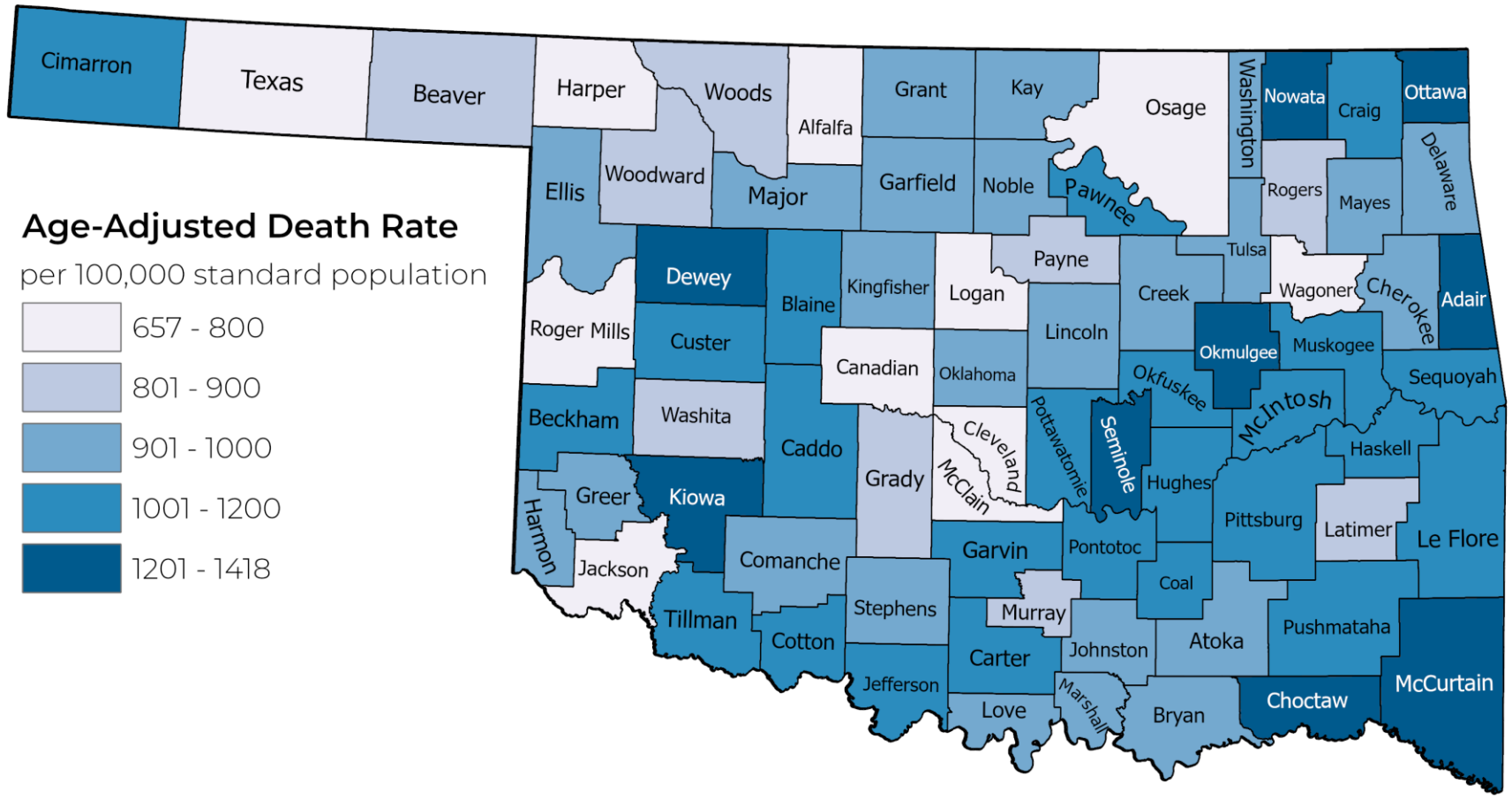
Prevalence Estimates of BMI Categories (Normal, Overweight, and Obese) Among Oklahoma Adults, BRFSS, 2011 - 2023



Oklahoma State Department of Health (OSDH), Center for Health Statistics, Health Care Information, Behavioral Risk Factor Surveillance System 2011 to 2023, on Oklahoma Statistics on Health Available for Everyone (OK2SHARE). Accessed at http://www.health.ok.gov/ok2share on 21AUG2025:17:14:23.

All Cause Mortality

Oklahoma, 2010-2023



Age-Adjusted Death Rate

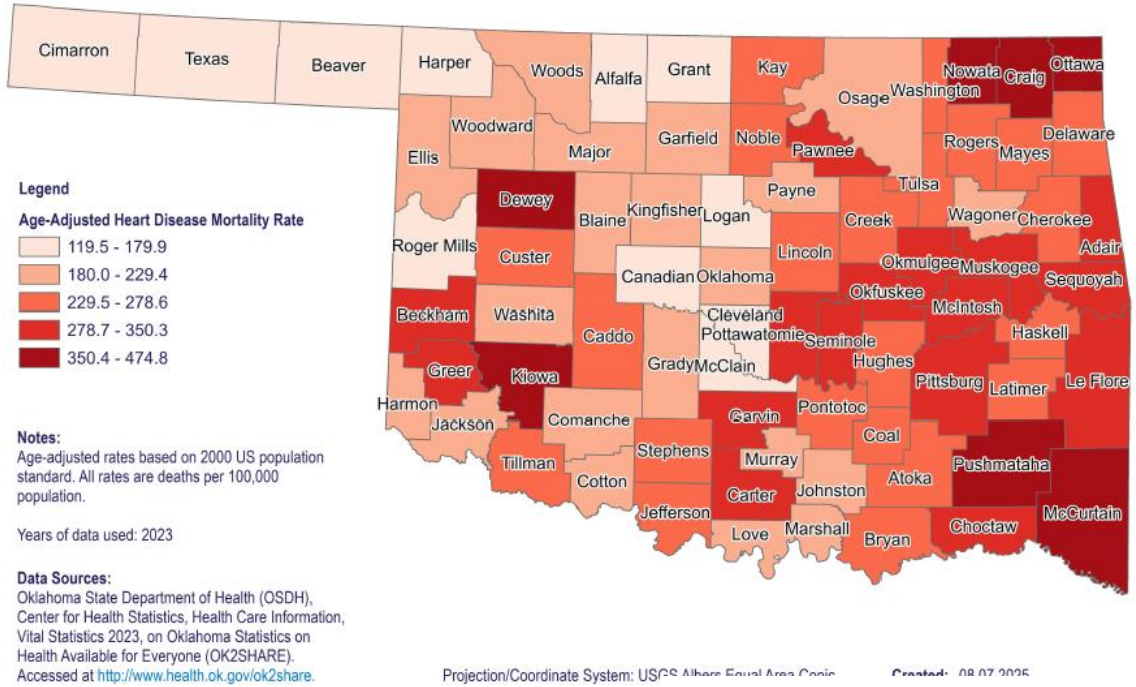
per 100,000 standard population

- 657 - 800
- 801 - 900
- 901 - 1000
- 1001 - 1200
- 1201 - 1418

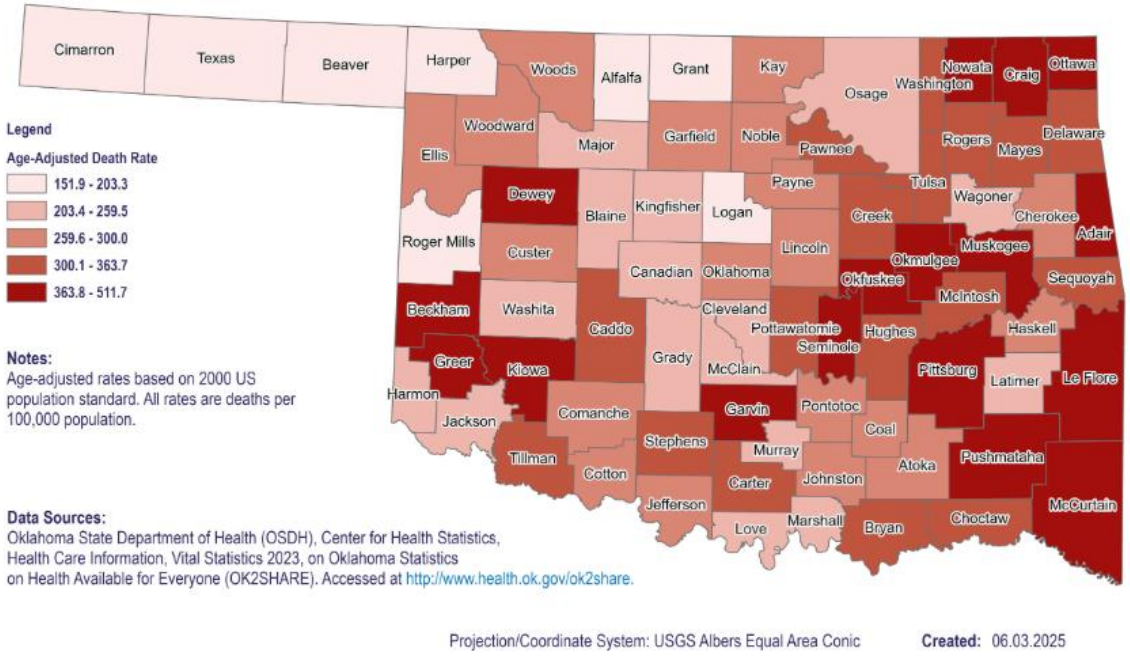
OKLAHOMA State Department of Health

Oklahoma State Department of Health (OSDH), Center for Health Statistics, Vital Statistics (mortality data) on Oklahoma Statistics on Health Available for Everyone (OK2SHARE). Accessed at http://www.health.ok.gov/ok2share on August 2025.

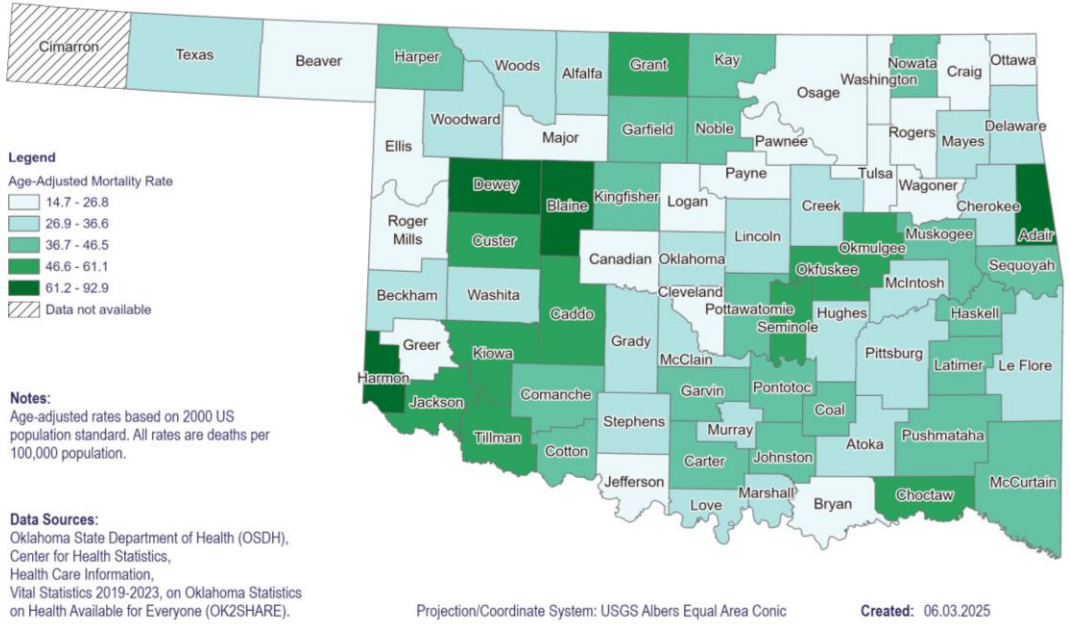
Age-Adjusted Heart Disease Mortality, 2023



Age-Adjusted Cardiovascular Disease Mortality, 2023

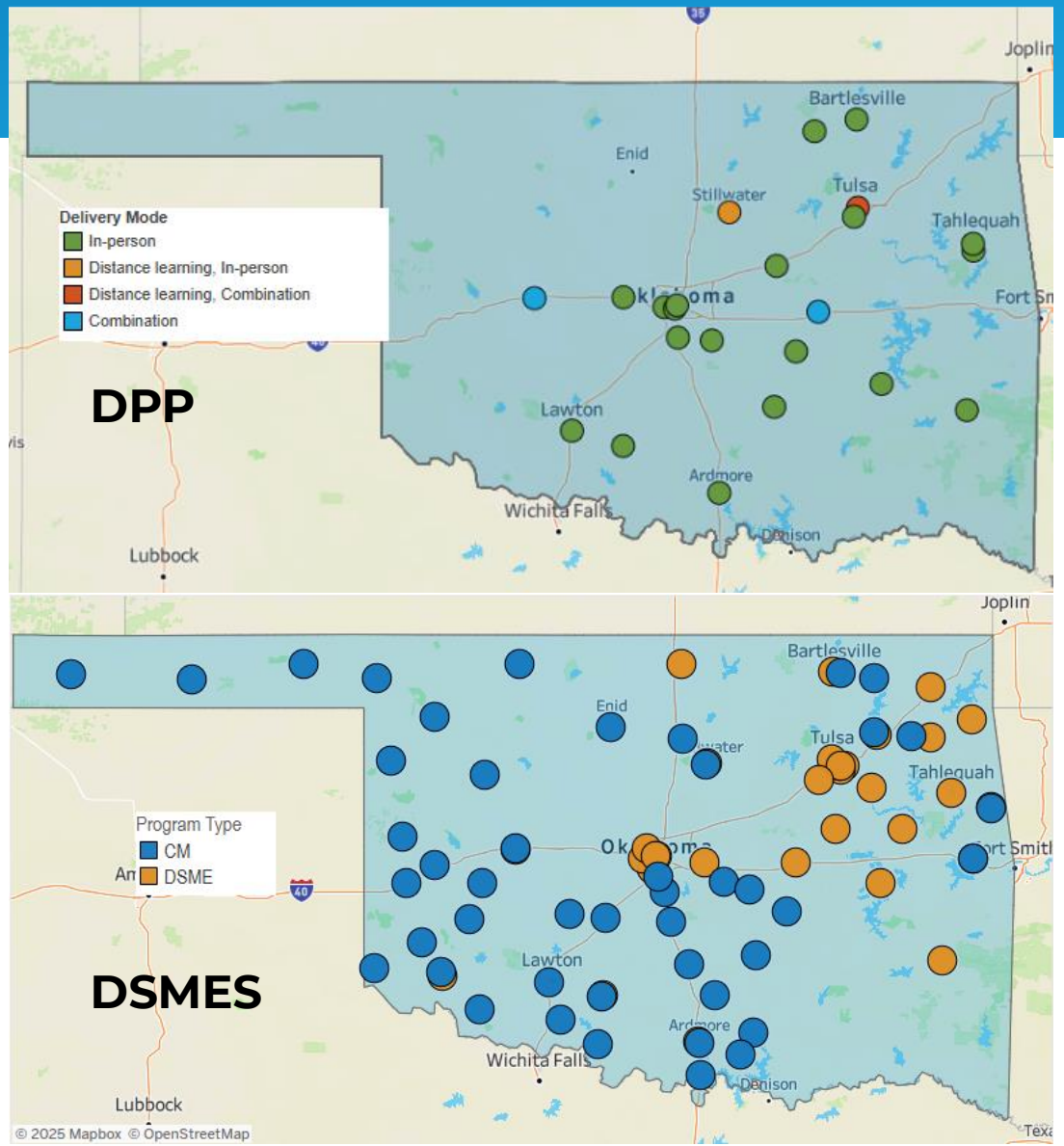


Age-Adjusted Diabetes Mortality, 2019-2023



Diabetes Programs

- **A Way to Wellness**: 8-week lifestyle change program focusing on prevention and management of diabetes, heart disease and obesity. The program also touches on tobacco, cancer, mental health, and dental health.
  - Pilot program in Cleveland County
  - Working to expand this program other counties
- **Diabetes Prevention Program (DPP)**: Year-long lifestyle change program focusing to prevent or delay the onset of type 2 diabetes.
- **Diabetes Self Management Education and Support Program (DSMES)**: program for those living with diabetes to learn how to manage diabetes better
  - **Conversation Maps** is one example of an 8-week program offered in Oklahoma.



Diabetes Campaign Reach

Display Campaign

755,643
impressions

49,378
clicks to the website

Streaming TV

420,000
impressions

98.39%
view through rate

Digital Audio Streaming

216,000
impressions

210,000
complete listens

Facebook & Instagram

2.4 million
impressions

4,100
clicks

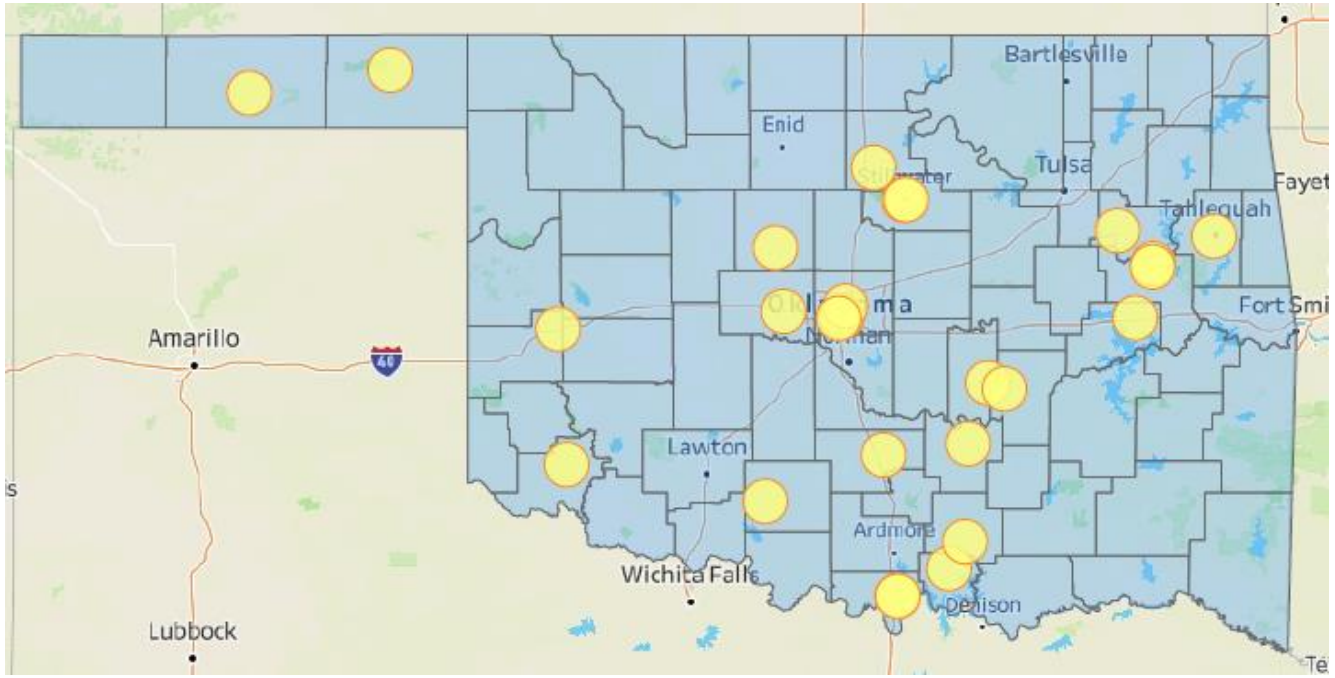
Over 4.8 million TOTAL IMPRESSIONS

Assets Created

Heart Programs

Healthy Heart Ambassador Blood Pressure Self-Monitoring Program

- 4-month, community-based lifestyle change program for adults 18 years or older that have been diagnosed with high blood pressure and/or are taking medication to help lower their blood pressure
  - Learn the proper way to measure their blood pressure at home
  - Learn how to make heart-healthy food choices



Cardiovascular Campaign Reach

Display Campaign

516,500 impressions

36,860 clicks to the website

Streaming TV

234,800 impressions

98.3% view through rate

Digital Audio Streaming

83,400 impressions

81,300 complete listens

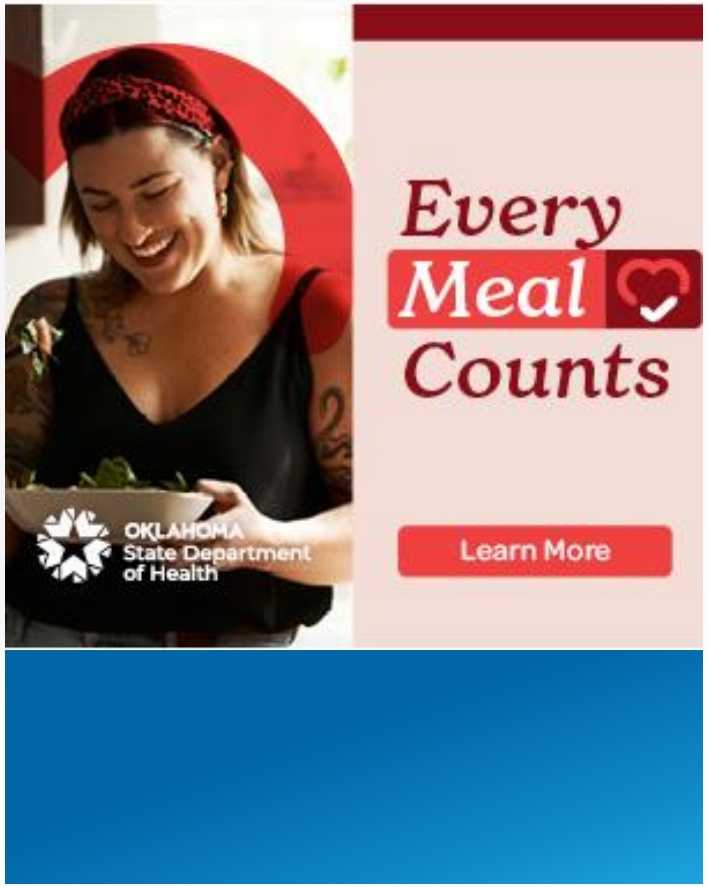
Facebook & Instagram

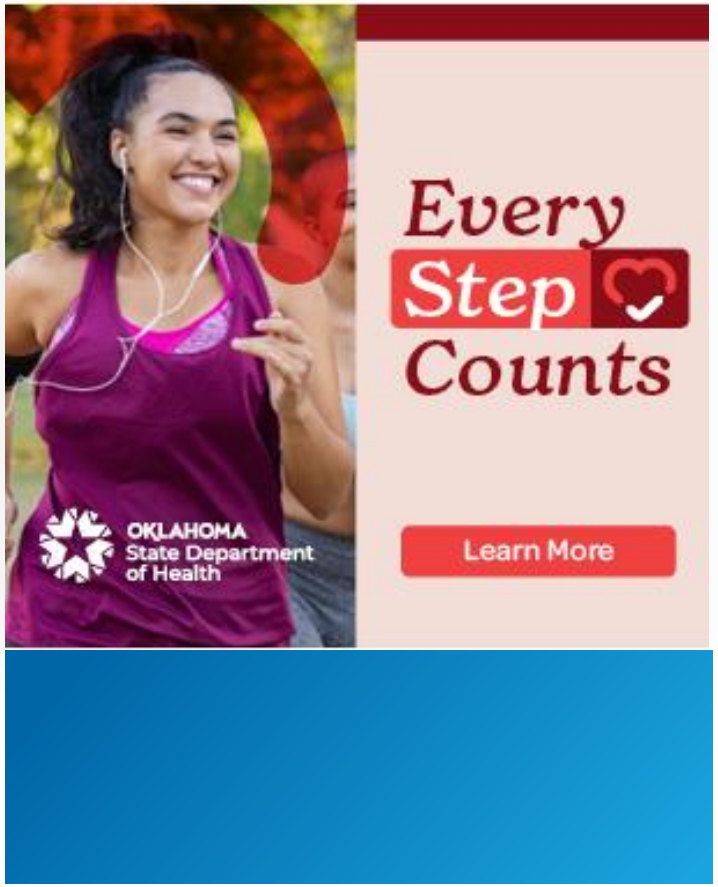
2.9 million impressions

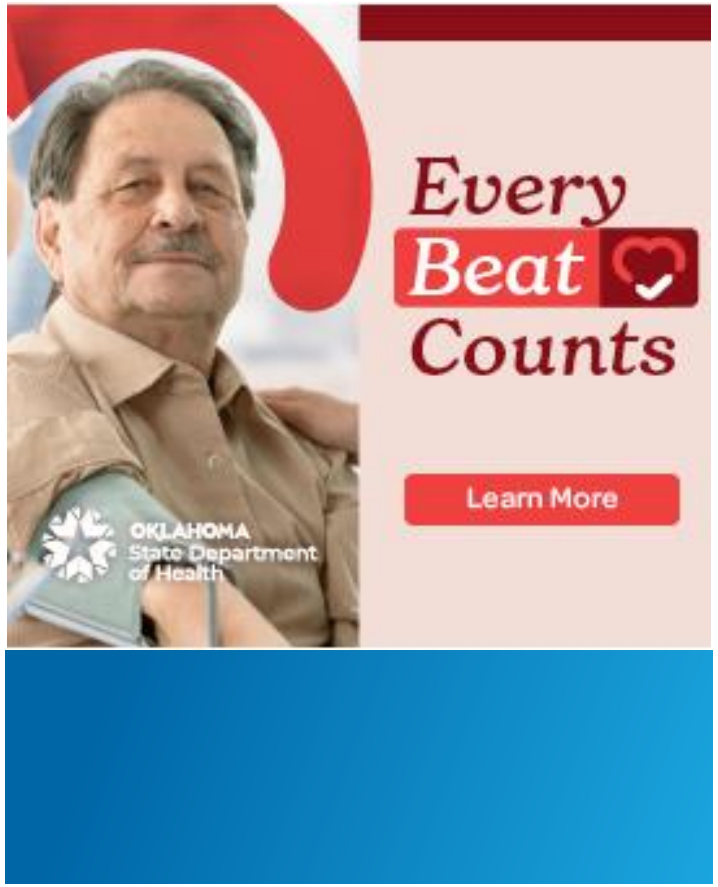
4,800 clicks

Over 4.6 million TOTAL IMPRESSIONS

Assets Created







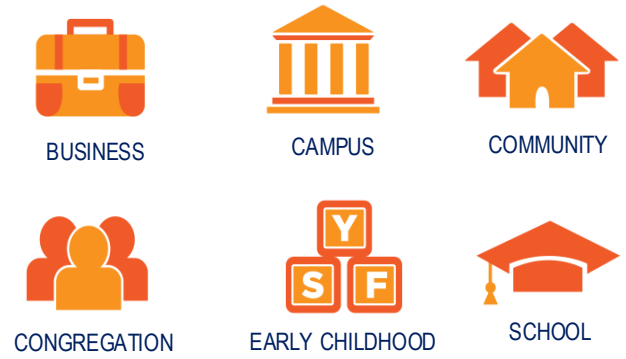
Certified Healthy Oklahoma (CHO)

OKLAHOMA State Department of Health

Vision:
Leading Oklahoma to prosperity through health

Mission:
To protect and promote health, to prevent disease and injury, and to cultivate conditions by which Oklahomans can thrive

CHO recognizes **organizations**



who foster an environment that supports health where people **live**, **work**, **learn**, and **play.**

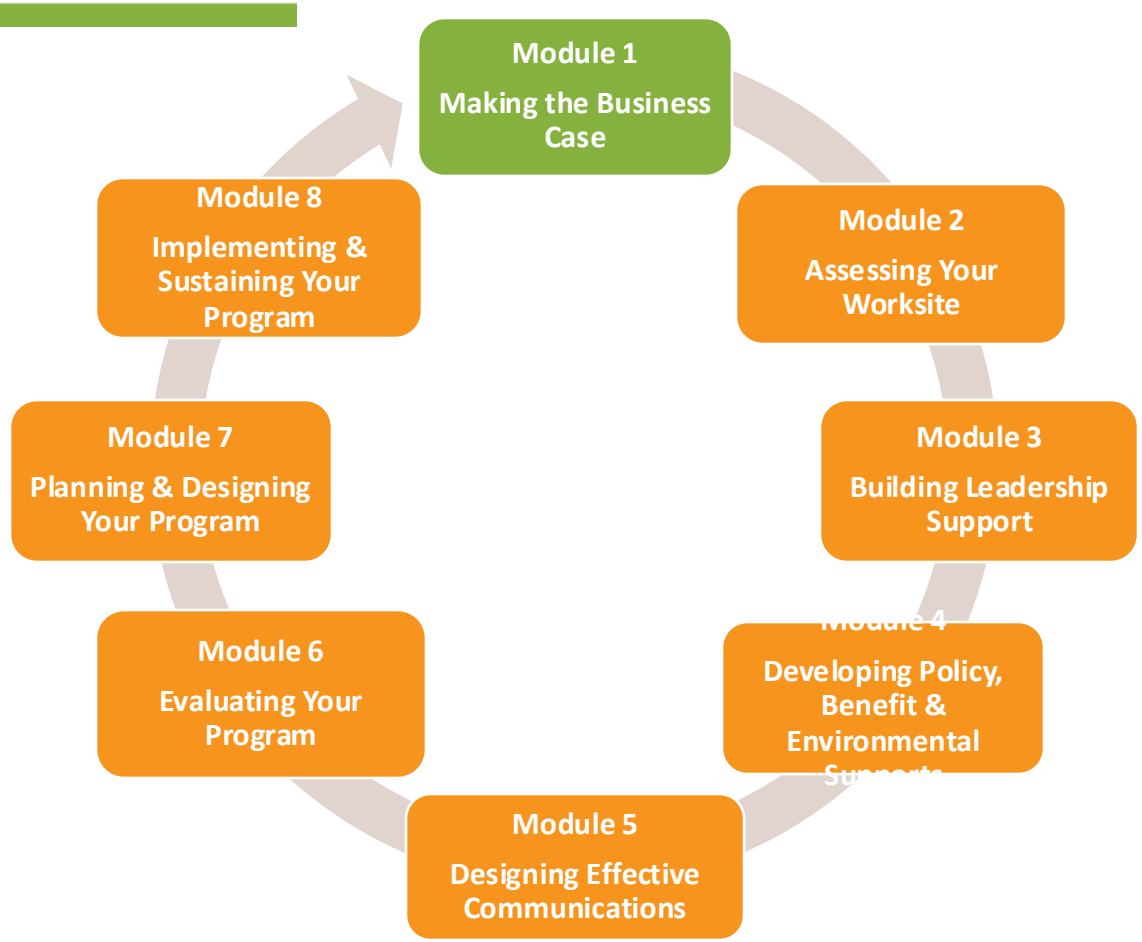
work@health

Training Employers | Promoting Health | Maximizing Performance

75 Employers Training since 2019

Employers trained in 21 counties

Over 40,000 employee impacted



State Obesity Plan

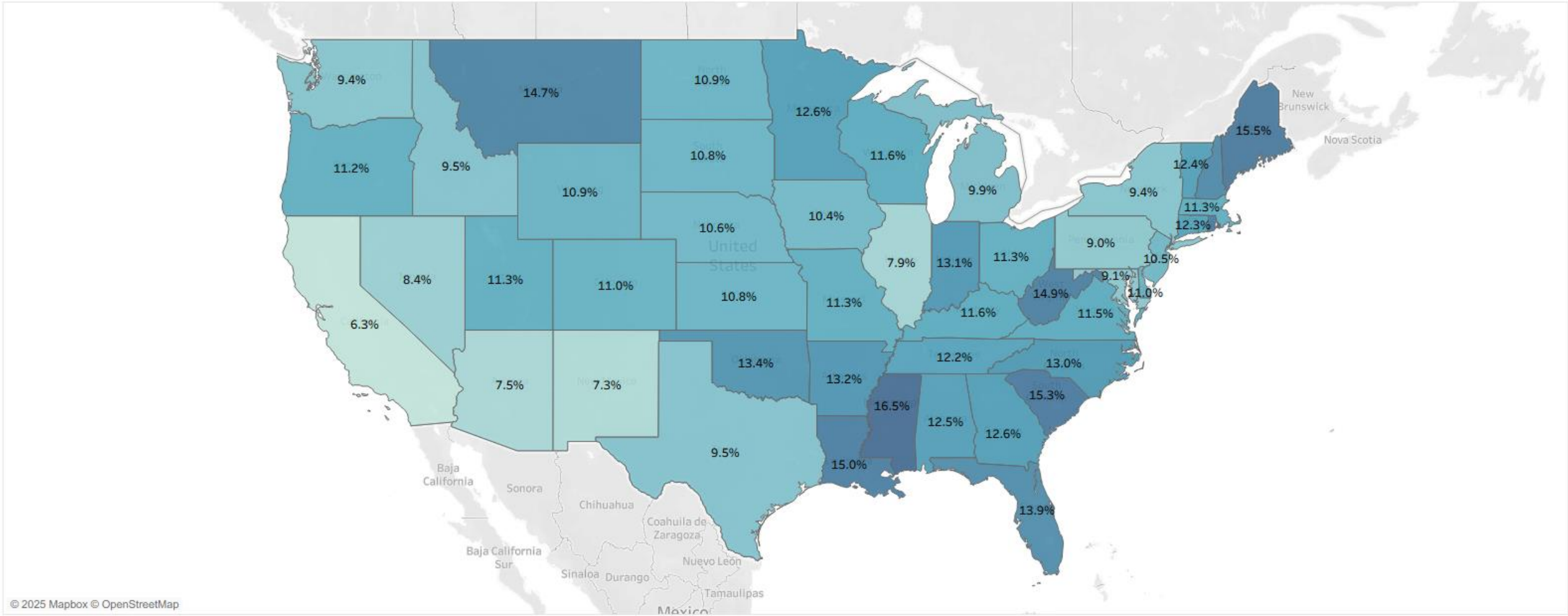
5 Subcommittees:

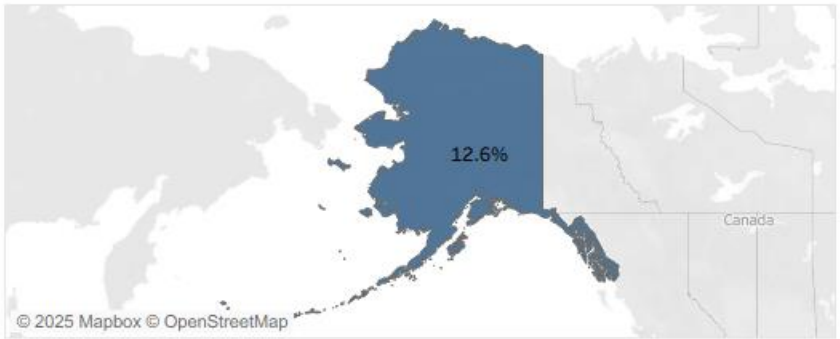
- All Ages
- Adults/Older Adults
- Early Childhood
- School
- All Stakeholders

- 30 Goals and 107 Objectives
- Objectives are being worked on by partners across the state
- Objectives focus on nutrition, physical activity, screening, and environments that influence obesity
- **Action Plan Progress**

OKLAHOMA STATE OBESITY PLAN STAKEHOLDERS GROUP

Estimated Prevalence of ADD/ADHD, age 3-17 by State 2022-2023



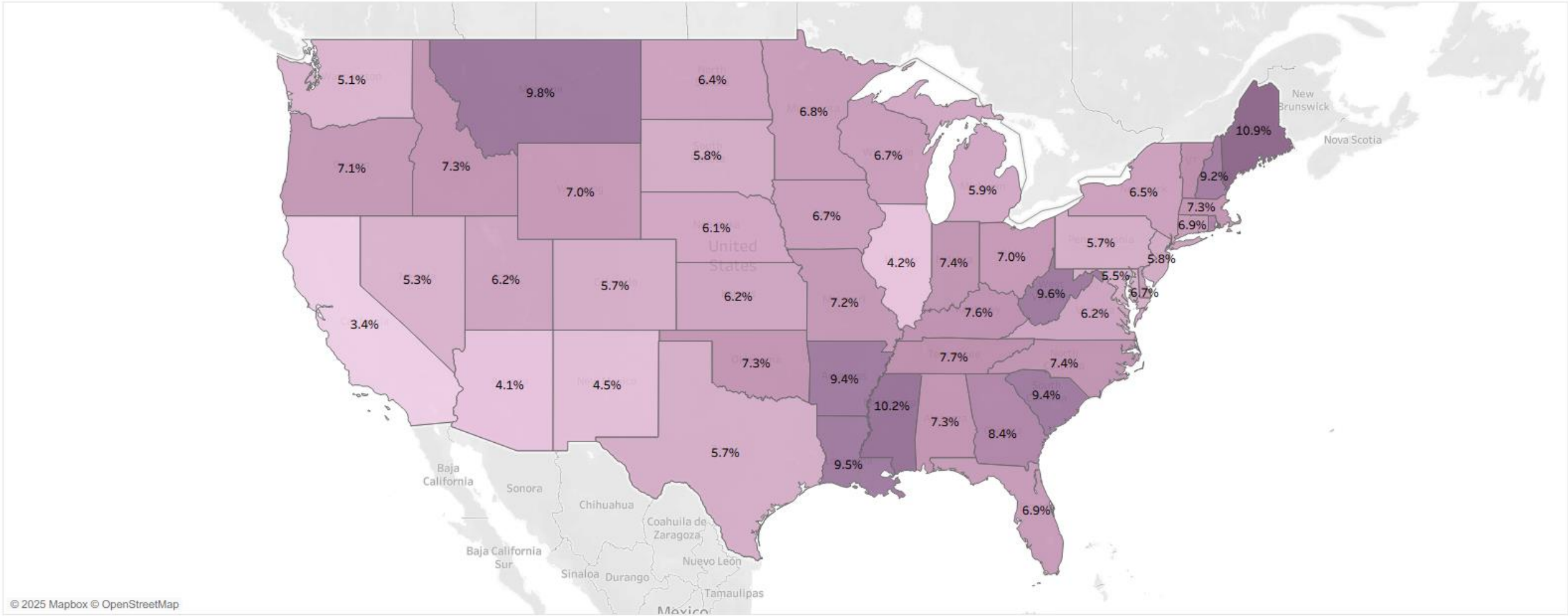


Percent of the population (age 3-17)

6.3% — 16.5%

Citation: Child and Adolescent Health Measurement Initiative. 2022-2023 National Survey of Children's Health (NSCH) data query. Data Resource Center for Child and Adolescent Health supported by the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB). Retrieved [08/21/2025] from [www.childhealthdata.org].

Estimated Percent of the Popualtion with Moderate or Severe ADD/ADHD, age 3-17 by State 2022-2023



Percent of the population (age 3-17)

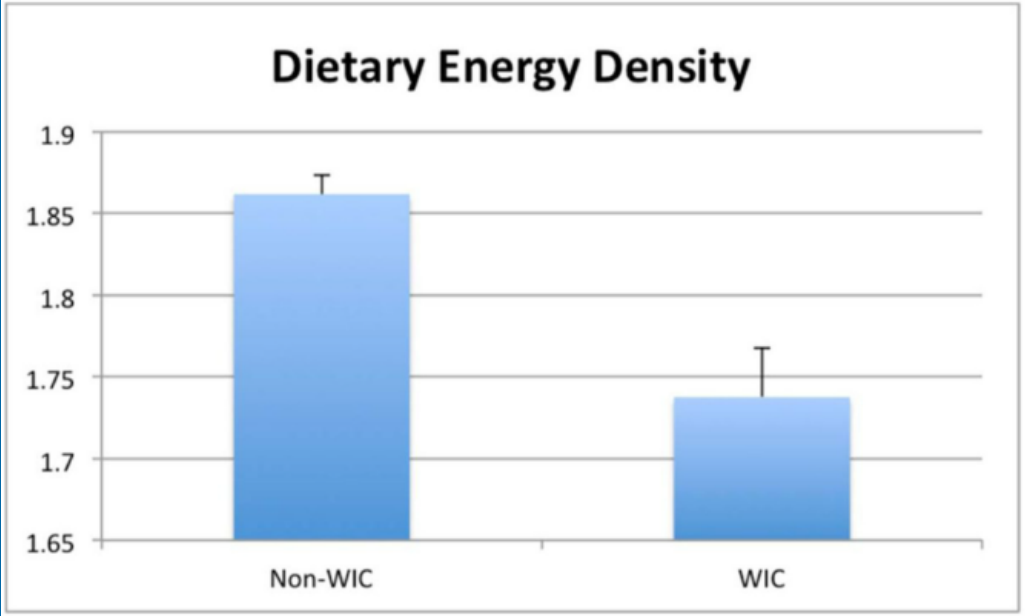
3.4% 10.9%

Citation: Child and Adolescent Health Measurement Initiative. 2022-2023 National Survey of Children's Health (NSCH) data query. Data Resource Center for Child and Adolescent Health supported by the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB). Retrieved [08/21/2025] from [www.childhealthdata.org].

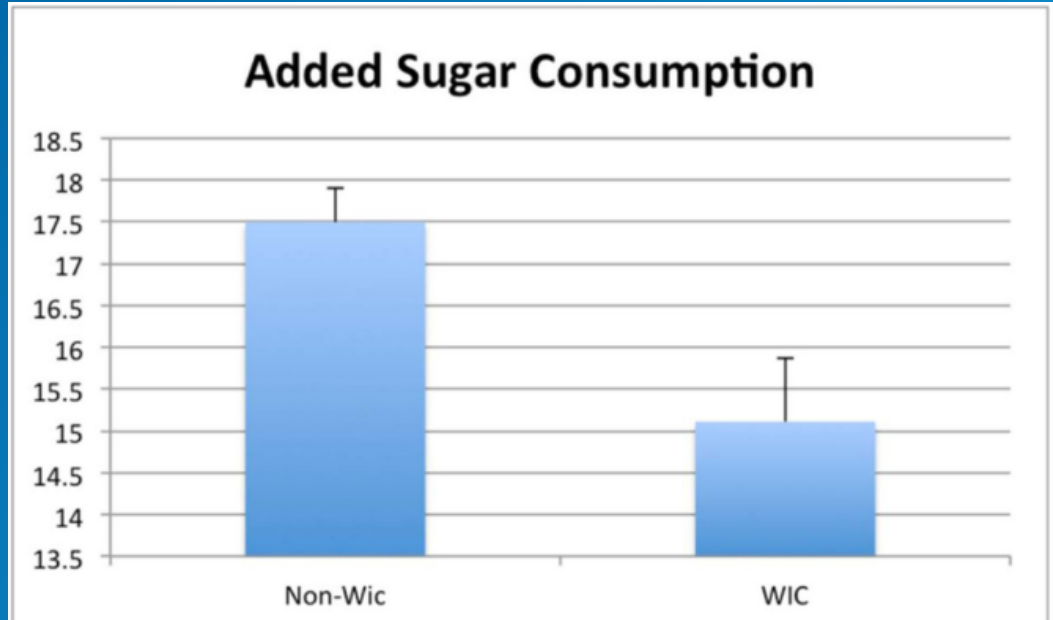
WIC's Positive Impact

WIC Participation Improved Diet Quality

- Children in WIC households had higher quality diets than non-participants
  - **Lower dietary energy density:** WIC: **1.73** vs Non-WIC: **1.86** ***(p = 0.0001)***



Mean dietary energy density (kcal/g) in WIC participants and income-eligible non-participants. LS are Means adjusted for age, sex, race, and household income.



Added sugar consumption for WIC participants vs. income-eligible non-participants. Mean intake is adjusted for age in years, sex, race, and household income level.

WIC Works! Positive Influence of the Special Supplemental Nutrition Program for Women, Infants, and Children

WIC's Supplemental Foods

- WIC provides a monthly food package of healthy foods, redeemable at various OK grocery stores.
- WIC foods help fill nutrition gaps:
  - Calcium and vitamin D: milk, cheese, yogurt
  - Iron: beans, peanut butter, enriched whole grains
  - Fiber - fruits, vegetables, and enriched whole grains, whole grain cereals
  - Vitamin A - fruits, vegetables, juice, and eggs
  - Vitamin C - fruits, vegetables, juice

WIC Nutrition Education

The CORE of WIC:

- Employs registered dietitians and degreed nutritionists
- Focus on healthy eating & physical activity
- Available individually, in groups, online, or self-paced in the WIC Shopper App

Synthetic Food Dyes & Food Additives

Research on Artificial Food Dyes

- Dynamic, evolving & continuously developing

- Exploring link between artificial food dyes and:
  - Neurobehavioral issues in children
  - Hyperactivity in children
  - Other potential health impacts

Challenges in Research

Mixed Results: Varied outcomes

Study Limitations:

- **Animal Studies:** Primarily focused on direct exposure
- **Human Data:** Largely limited to self-reported dietary information from population studies

Causal Relationship: Difficult to establish without more comparative studies

Lack of Comprehensive Data: Makes it complex to draw firm conclusions about health risks

Challenges in Research

Mixtures vs. Single Dyes: Challenging to compare dye mixture results to Acceptable Daily Intake (ADI) for single dyes due to:

- Difficulty isolating effects of one additive
- Varied daily diets & multiple dyes in foods

Long-term Cumulative Effects: Highly complex to assess due to:

- Variations in body processing of different dyes
- Individual susceptibility

Confounding Factors: Other potential health risk factors include:

- High sodium & sugar intake
- Food processing
- Insufficient fiber & fortifying nutrients

Potential Health Concerns: ADHD & Behavioral Issues - Children

Correlation, Not Causation: Research suggests correlation between synthetic food dyes & increased hyperactivity in some children, particularly those with ADHD

Worsening Symptoms: While not definitively proven to cause ADHD, some studies indicate dyes may exacerbate symptoms like hyperactivity & inattention in susceptible children

Mechanisms Under Investigation:

- Impact on gut microbiome
- Neurotransmitters
- Potential allergic reactions

OEHHA Study (2022):

- Comprehensive California EPA report reviewed research
- Found a correlation between food dye consumption & increased behavioral problems, including ADHD symptoms, even in children without prior diagnoses
- Suggested indications from both animal & human studies that artificial food dyes might affect behavior in children

Potential Health Concerns: Cancer Risk

Limited Human Evidence: While animal studies show potential links (e.g., Red No. 3), this has not been consistently replicated in human studies

FDA Ban on Red No. 3:

- Banned in food, beverages & ingested drugs based on animal studies
- Mechanism in rats might not apply to humans

Link to Ultra-Processed Foods:

- Artificial food dyes often found in ultra-processed foods
- Ultra-processed foods linked to increased risks for chronic diseases, including certain cancers

Potential Health Concerns: Allergies & Sensitivities

Individual Sensitivity: While relatively rare, certain dyes can cause allergic reactions in sensitive individuals

Common Dyes suggested:

- **Carmine:** (Natural, not artificial, but mentioned in context of sensitivities)
- **Red 40**
- **Yellow 5 (Tartrazine):**
  Specifically linked to hives & asthma symptoms in some people
  Especially noted in those with aspirin sensitivities

Reaction Range: Mild skin issues to more severe respiratory problems or anaphylaxis

Potential Health Concerns: Gut Microbiome Disruption

Early Research: Emerging research, primarily from animal studies, suggests artificial food dyes (e.g., Red No. 40, Yellow No. 5) may disrupt gut microbiome

Potential Contributions: Disruption could potentially contribute to inflammation

More Human Research Needed: Further research necessary to fully understand impact on human gut microbiome & broader health implications

Current Understanding

Full impact of artificial food dyes still being understood

Key Findings:

- **Serious Health Problems (e.g., Cancer):** Evidence limited in humans
- **Hyperactivity in Children:** Potential for contribution warrants caution
- **Gut Health Disruption (Animal Models):** Observed disruption could warrant caution

FDA transitioning from petroleum-based synthetic dyes to natural alternatives in U.S. food supply

Limiting intake of artificial food dyes, especially in children, may be beneficial as part of a healthy diet focused on whole, unprocessed foods

Ultra-Processed Foods

Relationship between UPFs & health - complex & multifaceted

Limitations: differing definitions, dietary assessment tools & food composition databases

Research is under way to learn more about how ultra-processed foods impact health

Ultra-Processed Foods

American Heart Association Guidelines - Ultra-Processed Foods (UPFs)

Reviews current evidence about UPFs and their impact on adverse health outcomes & outlines opportunities to improve dietary intake & overall health

Most UPFs - poor nutritional quality, excessive calories, typically high in saturated fats, added sugars and sodium (salt) - contribute to adverse cardiometabolic health outcomes, including heart attack, stroke, obesity, inflammation, Type 2 diabetes & vascular complications

Vadiveloo MK et al. Ultraprocessed Foods and Their Association With Cardiometabolic Health: Evidence, Gaps, and Opportunities: A Science Advisory From the American Heart Association. *Circulation*. 2025 Aug 8

Ultra-Processed Foods

Observational studies found links between higher amounts of UPFs & increased risk of cardiovascular disease, chronic illness & mortality

Emerging evidence also suggests certain additives & industrial processing techniques may have negative health effects

Not all UPFs junk foods or have poor nutritional quality

Some UPFs - better nutritional value & can be part of an overall healthy dietary pattern

Ultra-Processed Foods

Meta-analysis of prospective studies - dose-response relationship between UPF consumption & cardiovascular events - heart attack, transient ischemic attack & stroke, Type 2 diabetes, obesity & all-cause mortality

High versus low UPF intake - linked to a 25%-58% higher risk of cardiometabolic outcomes & 21%-66% higher risk of mortality

More research needed to understand appropriate thresholds for daily consumption of UPFs - what a safe amount is & the incremental risks of eating more UPFs

Lane MM, Gamage E, Du S, Ashtree DN, McGuinness AJ, Gauci S, Baker P, Lawrence M, Rebholz CM, Srour B, et al.
Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses. *BMJ*. 2024

Ultra-Processed Foods

Research has also found that there may be underlying mechanisms that affect eating behaviors & obesity for some people, & that UPFs may promote obesity

UPFs frequently contain combinations of ingredients & additives uncommon in whole foods to enhance palatability & reduce cost, & these may influence reward-related brain activity

Ingredients like artificial flavors may mimic sweetness without sugar & this disruption in flavor-nutrient relationships often leads to irregular eating habits & results in weight gain

Ultra-Processed Foods

Experts recommend multilevel strategies.

- More research to uncover how UPFs specifically impact body
- Clarifying impact of limited number of UPFs with more favorable nutrition profiles
- More research on health impacts of food additives & evidence-based policies to evaluate & regulate food additives

Ultra-Processed Foods

Further research needed to learn whether ultra-processed foods are harmful to health - apart from poor nutritional value

Scientists examining whether certain additives, certain processing techniques that change food structure, a specific amount of ultra-processed foods consumption or some combination of all of these are harmful to health

In short - is it the lack of nutrients or the processing itself (or both) that may be the cause for concern?

Summary

In the meantime, the American Heart Association continues to urge people to cut back on the most harmful UPFs that are high in saturated fats, added sugars & sodium, & excessive calories & instead follow a diet rich in vegetables, fruits, nuts, seeds and whole grains, low-fat-low-sugar dairy, and lean proteins like fish, seafood or poultry - for better short- and long-term health

THANK YOU

OKLAHOMA
State Department
of Health