

2019 Community Health Assessment

Knox County, Tennessee



KNOX COUNTY
TENNESSEE
HEALTH DEPARTMENT

Letter to the Community



**Dr. Martha
Buchanan**

Strategically addressing health issues requires reliable data; it is the foundation of any effort to understand or improve a community’s health status. This report provides that foundation. To create the Community Health Assessment, Knox County Health Department (KCHD) team members collected data from the community, pulled additional information from dozens of sources and brought it all together with context and analysis to provide a full picture of health in our county. The process is based on a nationally recognized strategic planning model and is an important pillar of KCHD’s voluntary accreditation process.

It is important to note that this report was compiled before the COVID-19 pandemic began in early 2020. As such, the data in this report represent the pre-COVID-19 baseline for our community.

The first section in this report covers the drivers of health, those larger external factors like education and housing that exert influence on individual health outcomes. Throughout the report, you’ll see references to drivers of health as a way to understand differences in health outcomes based on race, ethnicity, socioeconomic status and other social factors. These differences are known as health disparities. Understanding both health disparities and the larger factors that drive them will help us improve the health of our whole community.

This document is the report of Knox County’s third Community Health Assessment; previous assessments were completed approximately every five years. The Community Health Council uses data from these Assessments to draft a Community Health Improvement Plan, which lists priority health issues for Knox County. We hope our partners in the community will also see the Assessment as a resource for planning and policy making. If you have any questions or suggestions, please contact Jennifer Valentine, our Director of Organizational Planning and Development, at 865-215-5096.

Sincerely,

A handwritten signature in blue ink, appearing to read 'M Buchanan', with a long horizontal flourish extending to the right.

Dr. Martha Buchanan
Senior Director and Public Health Officer
Knox County Health Department

Table of Contents

3	Letter from the Director
4	Introduction
6	Drivers of Health
8	Access to Health Care
14	Active and Healthy Living
22	Chronic Disease
32	Environmental Health
38	Infectious Disease
44	Injury and Violence
52	Maternal and Child Health
58	Mental Health
64	Sexual Health
70	Substance Use and Misuse
78	References
82	Acknowledgments

Introduction

The 2019 Community Health Assessment was conducted by the Knox County Health Department (KCHD) as a service to the community. The Assessment provides a comprehensive view of health in Knox County, across ten topic areas, combining data from multiple sources. The ten topic areas are based on a health improvement planning resource model of the National Association of County and City Health Officials (NACCHO) called Mobilizing for Action through Planning and Partnerships (MAPP). The ten topic areas were chosen from a list provided in the MAPP model and then modified to fit Knox County's unique needs.

METHODOLOGY

Collaborative Approach

In 2018, as primary data collection for the 2019 Community Health Assessment was ongoing, KCHD staff prepared to structure the Assessment report. They consulted with partners from non-profit, hospital and government sectors on the strengths and weaknesses of their last Community Health Assessment from 2015. In 2019, KCHD hosted the Knox County Data Roundtable, a community event to raise awareness of the public data resources that KCHD and other agencies provide, and to build relationships between those agencies as a basis for a collaborative process to continually enhance the Community Health Assessment.

Data Sources

The Community Health Assessment report draws from many different data sources, both numerical (for example, disease rates) and narrative (for example, focus groups), to present a comprehensive picture of health in Knox County. The report synthesizes official data reported to KCHD and the Tennessee Department of Health from hospitals and other organizations, self-reported survey data and information about how the community perceives health issues. KCHD is the local repository of public health data and partners with state and national public health organizations on data collection and analysis. Integrating all of these different data sources provides a more comprehensive picture of population health than any one source on its own. Sometimes community members perceive that a health issue is not a major problem, but other data show that the health issue may be more widespread, or have more of an impact, than most community members realize. Data collection and analysis were completed in 2018 and 2019, and the final report was released in December 2020.

In the fall of 2018, KCHD contracted with the University of Tennessee to conduct a community survey (642 responses), interviews with ten community leaders knowledgeable about health, and ten focus groups (66 participants overall). In order to draw statistically valid conclusions about the population of Knox County, the survey called for a sample size of at least 600 respondents. The community survey asked respondents to choose the most important health problems in Knox County and indicate their satisfaction with current efforts to address these issues. Across all 29 health issues included in the community survey, the average satisfaction level with current efforts was 2.4 stars out of five. The demographic characteristics of survey participants closely matched the demographic profile of Knox County, according to census data (American Communities Survey, 2013-2017). The interviews and focus groups provided a more in-depth understanding of how Knox County adults perceive health problems and potential solutions. Recruitment strategies for the focus groups were targeted so that each focus group represented an area of the county; a racial or ethnic group; or an age group.

Two of the most important numerical data sources for the Assessment are KCHD's local Behavioral Risk Factor Survey (BRFS) and the Youth Risk Behavior Survey (YRBS), which collect self-reported data from Knox County adults and youth, respectively, about risky health behaviors and other health factors. The YRBS is conducted under a partnership between the Knox County Health Department, Knox County Schools and Metro Drug Coalition. Both reports are modeled after national surveys. When interpreting BRFS data, it is important to remember that this telephone survey used only landlines until 2014. Starting in 2014, both landlines and cell phones were used. While data from previous Knox County BRFS reports will sometimes be presented alongside 2014 and 2018 results to help uncover trends in health behaviors, the reader is urged to make comparisons with great caution due to the differences in sampling techniques. The data in the YRBS are collected via paper surveys from students in randomly selected classrooms at Knox County middle and high schools. Data from both these surveys (BRFS and YRBS) is broken down by factors such as race, ethnicity and income in this report, when possible and when differences are statistically significant.* For many indicators, breakdowns by ethnicity or sexual orientation are often not available because the numbers of respondents were not large enough for statistically valid analysis.



Throughout this report, the magnifying glass symbol highlights the indicators that best show the scale and scope of health issues in Knox County.

This report utilizes Healthy People 2020 targets as benchmarks for many health outcomes. Healthy People provides science-based, ten-year national objectives for improving the health of all Americans. It is an initiative of the U.S. Department of Health and Human Services.

Public Feedback

KCHD released a summary of initial Community Health Assessment findings to the public in June 2019. Feedback was solicited via presentations to community groups and an online and paper survey. From the 324 responses received, respondents had the most concern about substance misuse, mental health and obesity. On average, two-thirds of respondents were dissatisfied or very dissatisfied with current efforts in the community to address these three issues.

COMMUNITY DESCRIPTION

Based on 2018 census estimates, approximately 465,289 individuals reside in Knox County, an increase of nearly 7% since 2010. The average Knox County resident is 37 years old and 13.1% of the population is over the age of 65. The population of Knox County is 86% white, 9% Black, 2% Asian, and 2% two or more races. Hispanic or Latino individuals of any race make up 4% of Knox County's population.** The median annual household income for Knox County residents is \$52,458, with 15.8% of all residents living below the poverty level. About one in five children in Knox County (19.9%) live below the poverty level. More than 90% of Knox County residents age 25 and over have attained a high school diploma or higher, and 36.5% hold a bachelor's degree or higher. Approximately 13% of Knox County residents live with a disability.¹ The average commute is 22 minutes¹ and the cost of living index is 83 (compared to a U.S. average of 100)² Knox County is home to six hospitals including the region's Level 1 Trauma Center, Comprehensive Regional Pediatric Center, and two major hospital systems.

*For these surveys, significance is set at a 95% confidence level, which means that if a survey were conducted 100 times, it would produce the same results at least 95 times.

**The Census Bureau considers race and ethnicity to be separate concepts. Race describes a person's identification with one or more social groups (such as white, Black or Asian), while ethnicity describes whether a person is Hispanic or not.

Drivers of Health

Despite spending more per person on health care than any other developed nation, the United States continues to see poorer health outcomes and greater differences in health across communities. Public health research indicates that factors other than health care contribute to these differences. Global and national health authorities including the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) recognize that external factors such as education and income drive health. These factors are sometimes called the social determinants of health. KCHD refers to them as drivers of health, a phrase also used by the Nashville-based nonpartisan public policy research center, the Sycamore Institute. The drivers of health can be broken down into four categories: socioeconomic factors, physical environment, health behaviors and health care.^{3,4} There are marked differences in drivers of health along racial and ethnic lines, and these differences can contribute

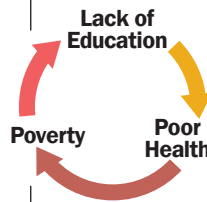


Disparities symbol

to poor health outcomes among minority populations.⁵ In this report, these “health disparities” (differences in health by race, income, education or other factors) are marked with a disparities symbol (left). Genetic factors are not included in this analysis, since they are not modifiable community-level drivers of health.

SOCIOECONOMIC FACTORS

Education



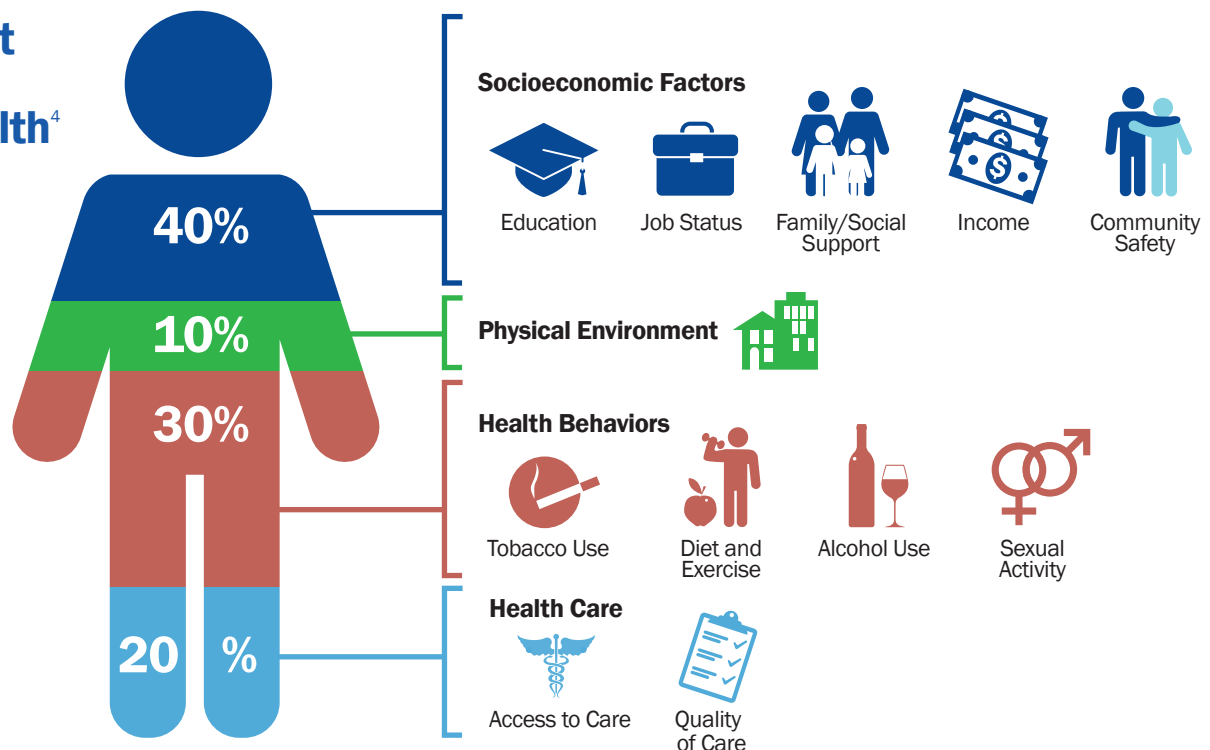
- Individuals with more education are more likely to have jobs, higher incomes, health insurance and engage in more health-promoting behaviors.⁶
- Education, along with income, are the greatest predictors of a person’s health status.³
- Income and education tend to correlate with health outcomes in the same way, for example, high rates of chronic disease are correlated with low income and low education.
- Education and health influence each other – higher education outcomes tend to translate to better health outcomes, but children also need to be healthy before they can learn and succeed.

Income/Job Status



- People with higher income tend to live longer, healthier lives.
- Greater income generally allows for better access to medical care, nutritious food, safe neighborhoods, opportunities for physical activity and high-quality education.⁷
- Poverty is a root cause of many poor health outcomes.⁸
- Research shows that poverty influences health behaviors in many ways, such as by limiting access to healthy foods and safe neighborhoods for playing, exercise and social interaction.⁹

Factors that Drive Our Overall Health⁴



Drivers of Health

- The interaction between socioeconomic status and health is mutually influential and complex, with effects that can accumulate over generations.⁷

Family/Social Support

- Social support includes both emotional and practical support from family, friends and community.
- Research shows that discrimination and racism, on both the individual and institutional levels, are drivers of physical and mental health.¹⁰
- Discrimination and racism can impact health in several ways:¹⁰
 - Reducing access to employment, housing or education
 - Encouraging unhealthy behaviors as a way of coping with stress
 - Provoking a long-term hormonal “toxic stress” response in the individual that can increase the risk of health problems such as depression, heart disease and diabetes
- Adverse childhood experiences, or ACEs, are stressful or traumatic experiences that disrupt the safe, nurturing environment that children need to thrive. ACEs can include abuse, neglect, family dysfunction, racism and poverty.¹¹
- ACEs can lead to toxic stress, in which the body’s stress systems are consistently engaged over a long period of time. This stress response releases chemicals that damage cells in the brain and other parts of the body, changing the way a child’s brain and body develop.¹¹
- The more ACEs a child is exposed to, the higher their risk later in life for many physical and mental health problems, such as diabetes, heart disease, depression and substance misuse.¹¹
- According to the CDC, preventing ACEs could reduce the number of adults with depression by as much as 44%.¹²

Community Safety

- Crime and violence are also drivers of health.
- Exposure to crime and violence in one’s community can lead to premature death, non-fatal injuries and negative long-term health outcomes.¹³
- Children and adolescents exposed to violence are at risk for poor long-term behavioral and mental health outcomes, regardless of whether they are victims, direct witnesses, or hear about the crime from others.¹³
- Low-income neighborhoods are more likely to be affected by crime than high-income neighborhoods.¹³



PHYSICAL ENVIRONMENT

Housing

- Housing affordability and quality both influence health in important ways.
- Unaffordable housing is typically defined as housing expenses that are more than 30% of household income.¹⁴
- Affordable housing leaves people more resources for other needs such as medical care and food.¹⁴
- The stress of unaffordable housing costs can negatively impact health. Adults living in unaffordable housing are more likely to report fair or poor health than other adults.¹⁴
- Safe, quality housing minimizes exposure to pollutants, pests, allergens and toxic chemicals that can lead to health problems, such as infections and asthma.¹⁴



Transportation

- Transportation affects health in several ways: providing access to needed resources and services; affecting time and opportunity for physical activity; pollution; and motor vehicle-related injuries and deaths.¹⁵
- A lack of efficient alternatives to automobile travel disproportionately affects vulnerable populations such as the poor, the elderly, children and people who have disabilities by limiting access to jobs, health care, social interaction and healthy foods.¹⁵

HEALTH BEHAVIORS

- Our health behaviors are the choices we make that influence our health and quality of life.³
 - A person’s environment, such as their neighborhood or workplace, can encourage or discourage healthy behaviors.³
 - Look for more information in the following sections of this report: Active and Healthy Living, Sexual Health, and Substance Use and Misuse.



HEALTH CARE

- Access to health care is a complex concept that encompasses more than just adequate numbers of facilities and professionals.¹⁶
- Access also means services are affordable, physically accessible and culturally acceptable.¹⁶
- Look for more information in the Access to Health Care section of this report.



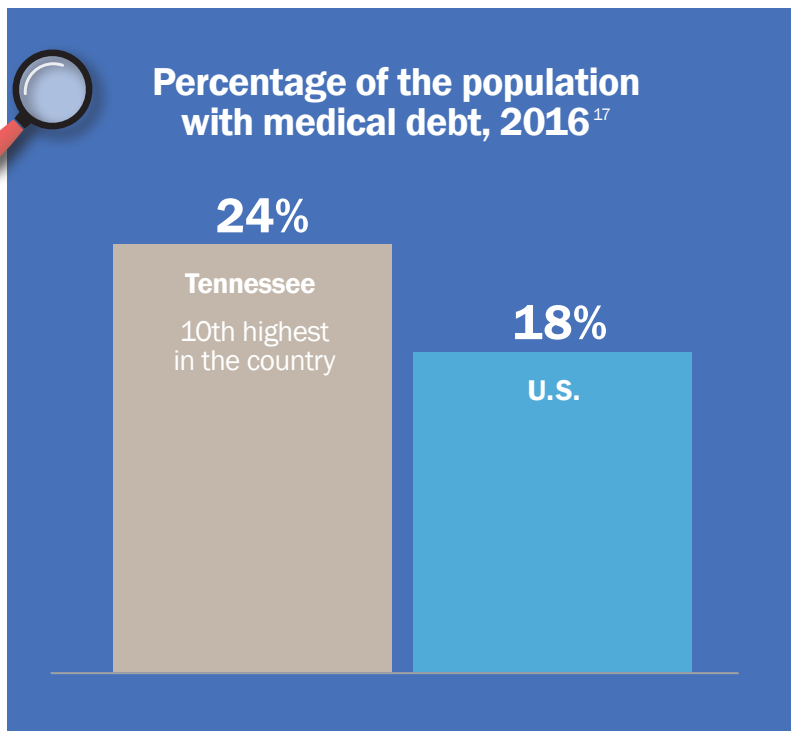
Access to Health Care

Access to comprehensive, quality health care services is important for promoting and maintaining health; preventing and managing disease; reducing unnecessary hospitalization, disability and premature death; and helping ensure that all Knox County residents have the opportunity to be healthy. Access to health care impacts overall physical, social and mental health status, and quality of life.

Potential barriers to health services include high cost of care; inadequate insurance or no insurance; lack of services; and lack of care that meets patients' social, cultural and linguistic needs. One measure of access to care is medical debt. According to the Sycamore Institute, medical debt is common in Tennessee, and



even more common among the uninsured, those with lower incomes or education levels, and people of color. Medical debt is connected to health circumstances that individuals often cannot predict or control, making it unique among other types of debt.¹⁷



► Data on access to mental health care can be found in the Mental Health section of this document.



Nationally, medical debt contributed to 58.5% of personal bankruptcy filings between 2013 and 2016.¹⁸

People with medical debt are more likely to be in poor health and less likely to access needed medical care. Medical debt can be an obstacle to economic mobility by reducing access to jobs, housing and types of credit that build wealth.¹⁷

INSURANCE AND PRIMARY CARE PROVIDER



Among Knox County adults ages 18-64, 8% reported they had no health insurance in 2018.¹⁹

Healthy People 2020's target is 100% insurance coverage. Census data indicate that more than half of insured adults purchase their insurance through an employer/union.²⁰

What do Knox County residents think about access to health care?



38%
identified as a
Major Problem

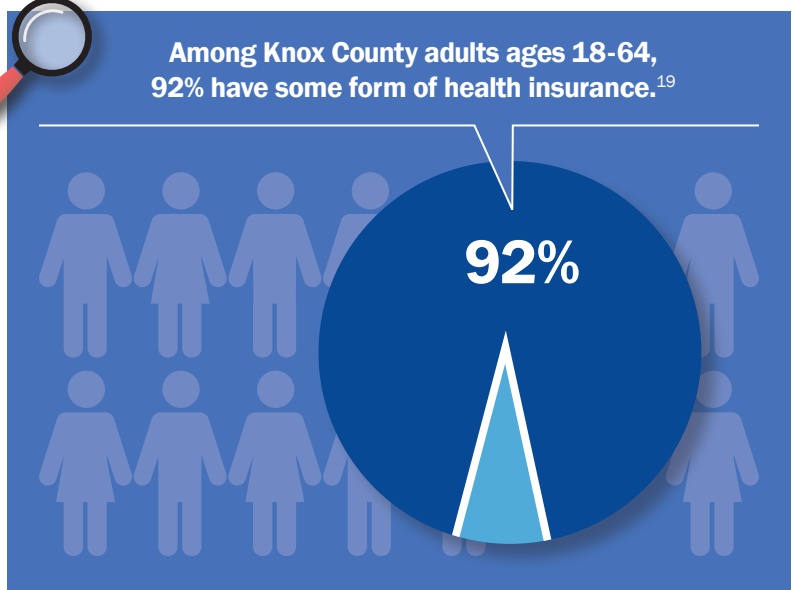


2.2
Satisfaction Level
with current efforts

- Many focus group and interview participants discussed a lack of access to affordable health care; and a lack of health care providers.
- Lack of health care providers was largely a concern voiced by residents living outside of West Knoxville and West Knox County.

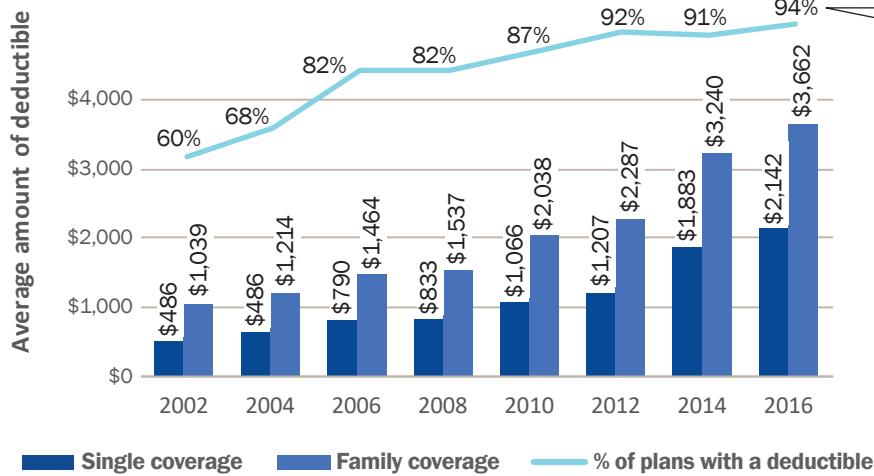


Among Knox County adults ages 18-64, 92% have some form of health insurance.¹⁹



Access to Health Care

Employer-sponsored health insurance deductibles in Tennessee ²¹



The sudden increase from 2004 to 2006 in the percentage of employer-sponsored health insurance plans with deductibles coincided with, and may be related to, the creation of health savings accounts in federal law in 2004. Health savings accounts are afforded preferential tax treatment but may only be offered alongside high-deductible health insurance plans.²²

Knox County adults who have a primary care provider, 2018¹⁹



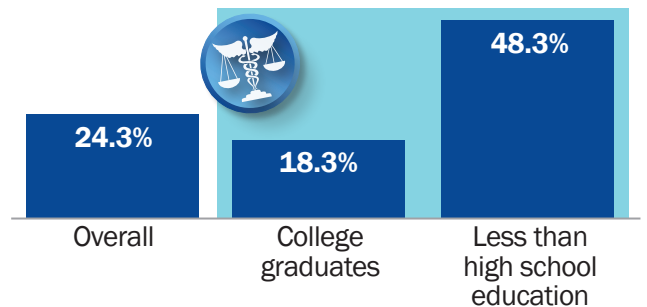
Knox County adults ages 18-64 who had a checkup in the year prior to survey, 2018¹⁹



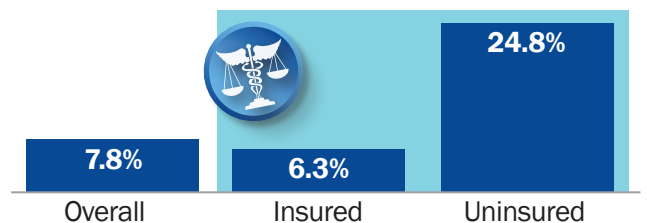
Knox County adults ages 18-64 who could not afford to see a doctor in the past year, by income and insurance status, 2018¹⁹



Knox County adults ages 18-64 with medical debt, 2018¹⁹



Knox County adults ages 18-64 who could not afford their prescribed medications at some point in the year prior to survey, 2018¹⁹

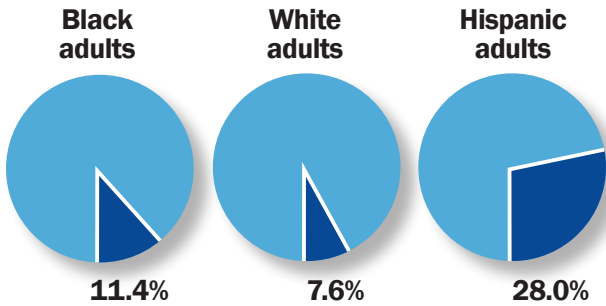


Access to Health Care



Census data show statistically significant differences in the uninsured rate by race and ethnicity in Knox County, with Black and Hispanic adults lacking insurance at a higher rate than white adults.

Uninsured, by race and ethnicity²⁰

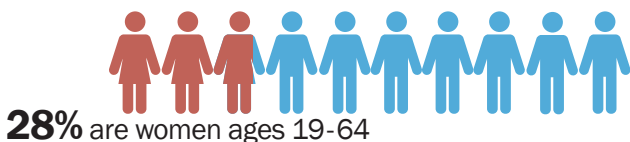


TennCare enrollment, 2018²⁴

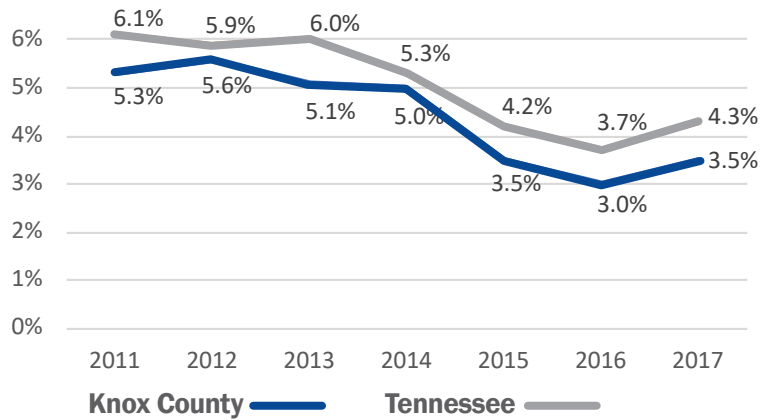
Knox County



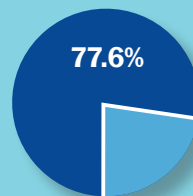
Tennessee



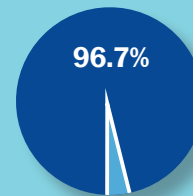
Percentage of children and youth under age 19 who are uninsured²³



Knox County adults ages 18-64 with health insurance, by education, 2018¹⁹

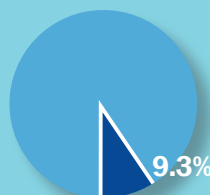


Less than high school

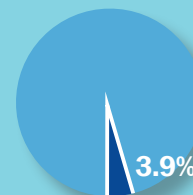


College graduates

Knox County seniors ages 65+, 2018¹⁹

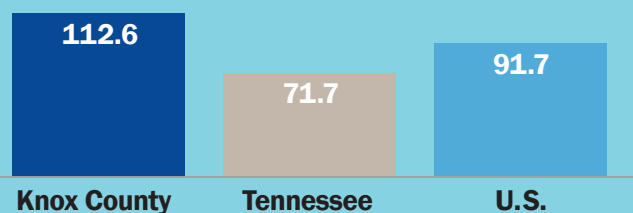


Currently have medical debt



Could not afford their prescribed medications at some point in the past year

Number of primary care physicians per 100,000 people, 2017²⁵

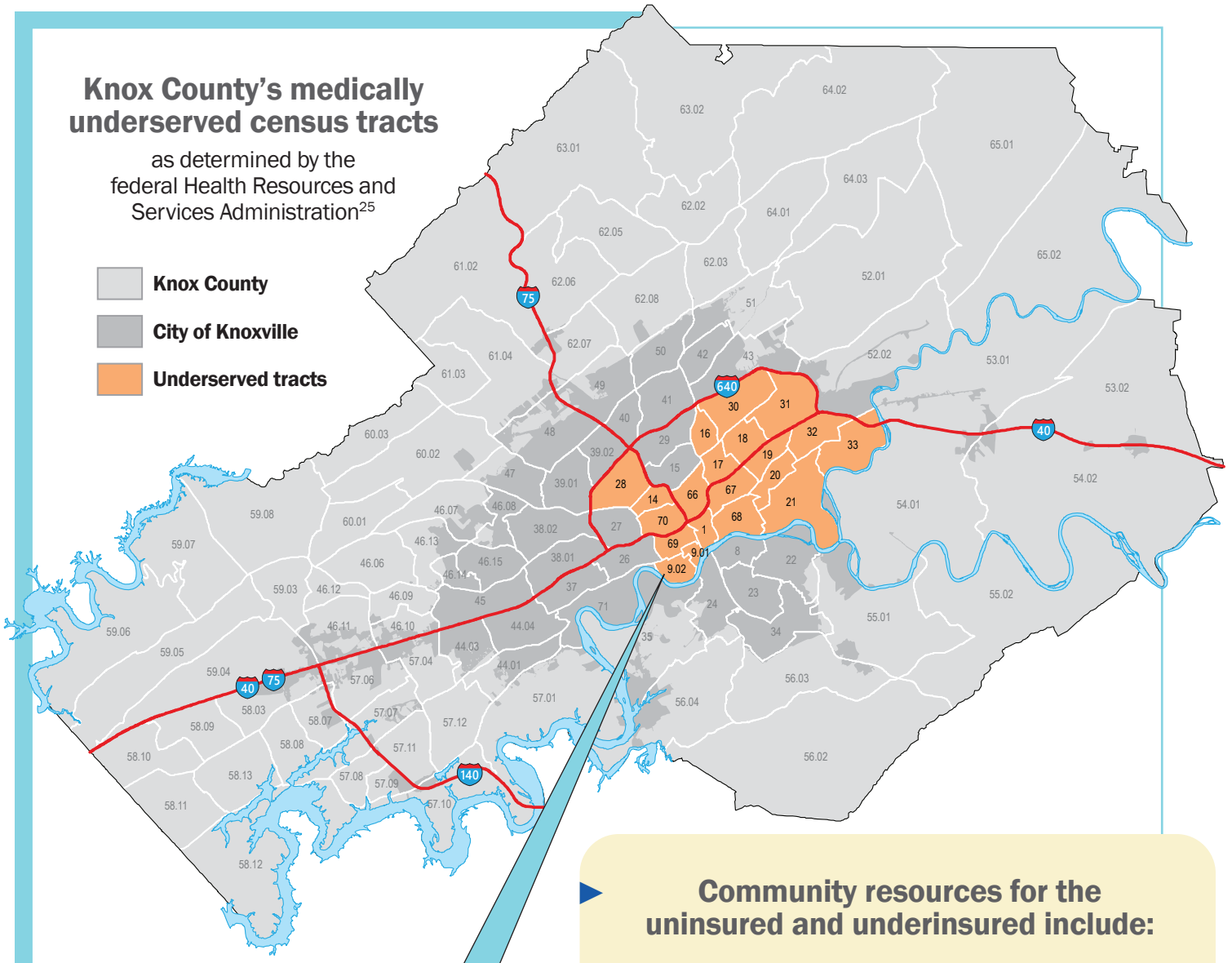


Access to Health Care

Knox County's medically underserved census tracts

as determined by the federal Health Resources and Services Administration²⁵

- Knox County
- City of Knoxville
- Underserved tracts



Despite its relatively large number of primary care physicians per 100,000 people, Knox County contains 20 census tracts that are designated by the federal Health Resources and Services Administration (HRSA) as “medically underserved areas” (MUAs).²⁵ MUAs are geographic areas with a lack of access to primary care services.²⁵



In addition, all of Knox County is designated by HRSA as a “health professional shortage area” (HPSA) for primary, mental health and dental care for the low-income population, meaning that there are not enough health care resources in Knox County to provide the low-income segment of the population with adequate primary, mental health and dental care.²⁵

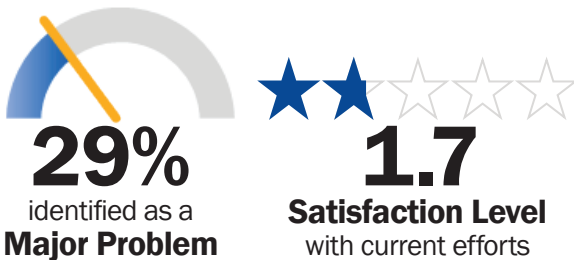
Community resources for the uninsured and underinsured include:

- Cherokee Health Systems
- East Knox Free Medical Clinic
- Free Medical Clinic of America
- Haslam Sansom Ministry Complex Health Center
- InterFaith Health Clinic
- Knox Area Project Access
- Knox County Health Department
 - Centers of Excellence
 - CHANT (Community Health Access and Navigation in Tennessee)
 - Communicable Disease Clinic
 - Immunization Project
 - Parents as Teachers Program
 - Women’s Health Clinic
- Remote Area Medical

ACCESS TO ORAL HEALTH CARE

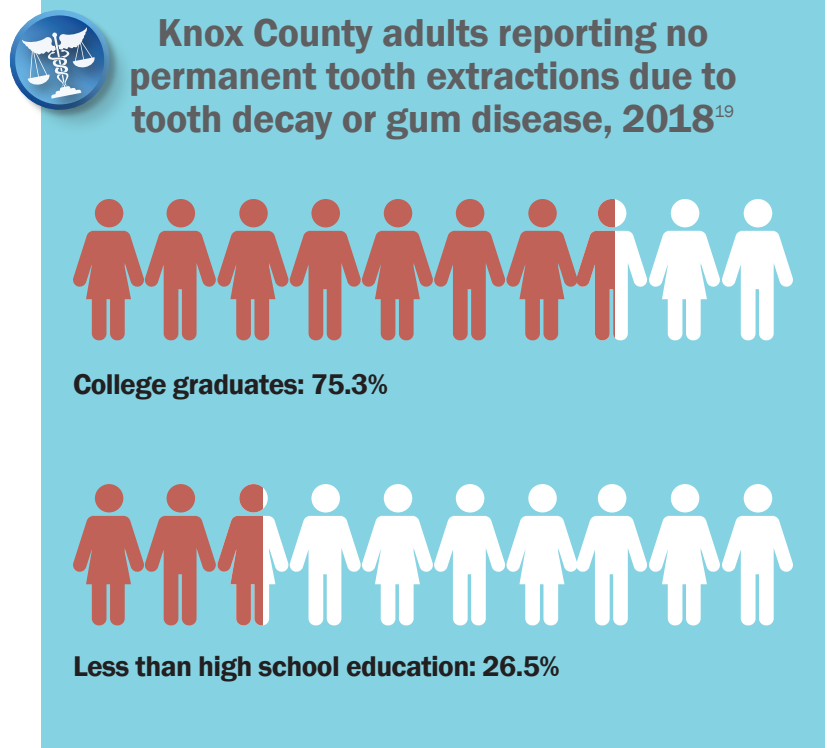
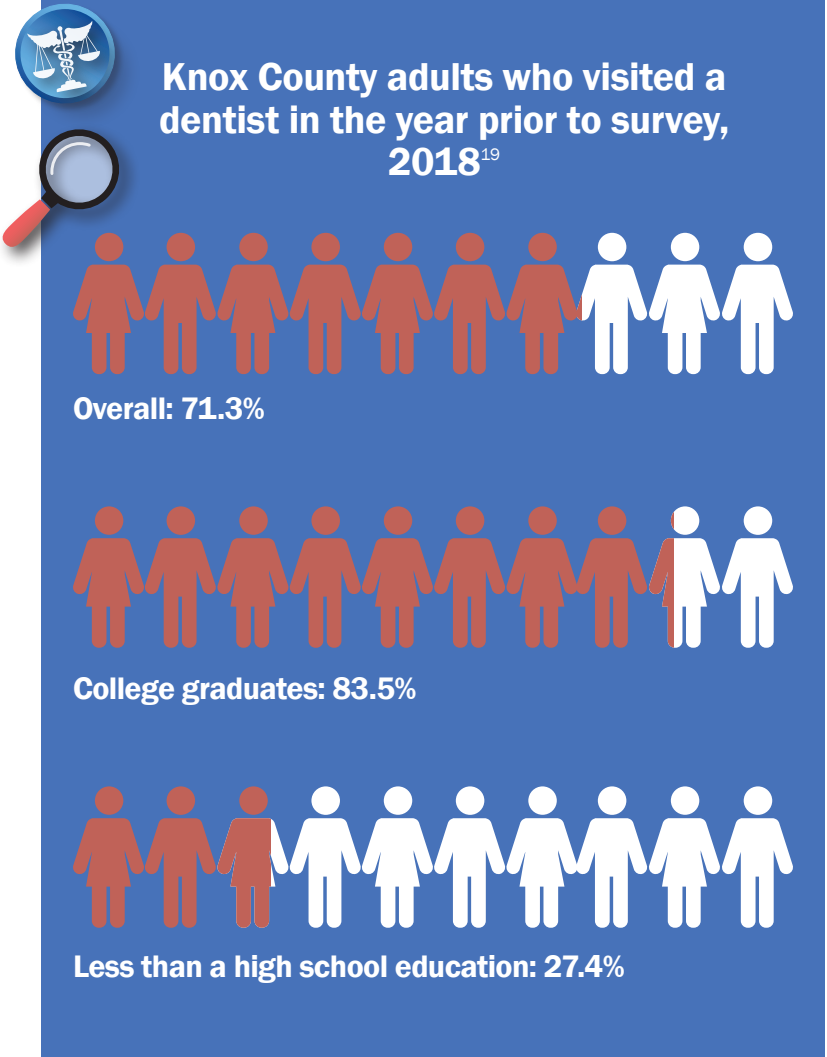
Dental caries, or tooth decay, is a common chronic disease that can cause pain, suffering and diminished quality of life throughout one’s lifespan. Left untreated, tooth decay can progress and lead to infection, tooth loss, and more complex and expensive treatments. Untreated tooth decay can affect essential aspects of daily living, including eating, speaking and performing at home, school, or work. Children with poor oral health miss more school and receive lower grades than those with better oral health, while adults lose more school or work hours for urgent, unplanned dental visits.²⁶ Severe dental caries is associated with feelings of embarrassment, withdrawal and anxiety.²⁷ Chronic oral infections are associated with chronic pain, low self-esteem, diabetes, stroke, heart and lung diseases, low birth weight, and premature births.²⁸

What do Knox County residents think about access to dental care?



- Fewer than a third of survey respondents identified access to dental care as a major problem. However, it was mentioned in most focus groups and interviews.
- This issue received one of the lowest satisfaction scores for how the problem is being addressed.
- Lack of access was attributed to people not being able to afford dental care and the lack of providers who will see patients on TennCare or without insurance.

Although the community survey did not indicate access to dental care is perceived as a major issue overall, health data indicate it is an issue for people with lower income or education.



Access to Health Care



Knox County adults who have had all their permanent teeth extracted due to tooth decay or gum disease, 2018¹⁹



College graduates: 1.5%



Less than high school education: 28.9%



Barriers to accessing oral health care²⁸

- Geography, lack of oral health professionals
- Low income
- Lack of transportation
- Lack of dental insurance
- Lack of understanding and awareness of the importance of oral health

► **Community resources for access to oral health care include:**

- Free Medical Clinic of America (services coming in 2021)
- InterFaith Health Clinic
- Knox County Health Department, Dental Clinic
- Knoxville-Knox County Community Action Committee, Gift of Sight, Hearing and Dentures Program
- Oral health care providers
- Remote Area Medical
- Volunteer Ministry Center

Active and Healthy Living

PHYSICAL ACTIVITY

Regular physical activity positively contributes to overall health and fitness. It is one of the most effective ways to improve health, and active people generally live longer.



Meeting physical activity guidelines could prevent one in ten premature deaths.

The lack of physical activity is a common risk factor for many chronic diseases, including several top causes of death such as heart disease and cancer. Even for people who have a chronic disease already, routine physical activity can help manage the condition and its complications.²⁹ It is estimated that lack of physical activity accounts for 10.8% of all deaths in the U.S.³⁰

Benefits of physical activity²⁹

Adults

- Improves quality of life
- Lowers risk of chronic disease, including heart disease, hypertension, diabetes, cancer and dementia
- Improves fitness
- Improves mental health, sleep and cognitive function
- Prevents weight gain

Children

- Reduces risk of depression
- Improves bone health and fitness
- Promotes healthy body composition
- Improves sleep, attention and some measures of academic performance

Physical activity guidelines³¹

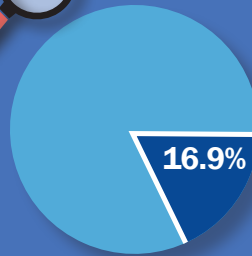
Children (ages 6-17)

- One hour or more of moderate-to-vigorous physical activity per day (for example, running or playing sports)
- Muscle-strengthening activities at least three days per week (for example, climbing playground equipment)
- Bone-strengthening activities at least three days per week (for example, jumping rope)

Adults (ages 18-64)

- 2 ½ hours moderate aerobic activity, or one hour and fifteen minutes of vigorous aerobic activity, per week
- Muscle-strengthening activities twice a week (for example, weight-lifting)

Four out of five Knox County adults (79.1%) report getting at least some physical activity outside of work, which meets and exceeds the Healthy People 2020 target of 67.4%.¹⁹



Even though a majority of adults report some physical activity in Knox County and Tennessee, only 16.9% of Tennessee adults get enough activity to meet federal guidelines and achieve long-term health benefits (no county-level data available).³²



Knox County adults reporting at least some physical activity outside of work in the past month¹⁹

By Education



By Employment Status

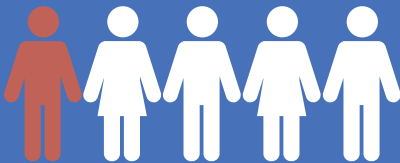


By Gender



Local data do not indicate a statistically significant difference in physical activity levels by race: 79.9% of white individuals, and 77.5% of Black individuals, report some physical activity outside of work.¹⁹ In other words, it appears a Knox County resident's race does not have an effect on their physical activity level outside of work.

Active and Healthy Living



One out of five Knox County high school students (19.2%) is physically active for an hour a day, which does not meet the Healthy People 2020 target of at least 24.1%.³³

Knox County middle and high school students meeting federal physical activity guidelines (one hour of physical activity per day)³³

Middle school students: 33.9%



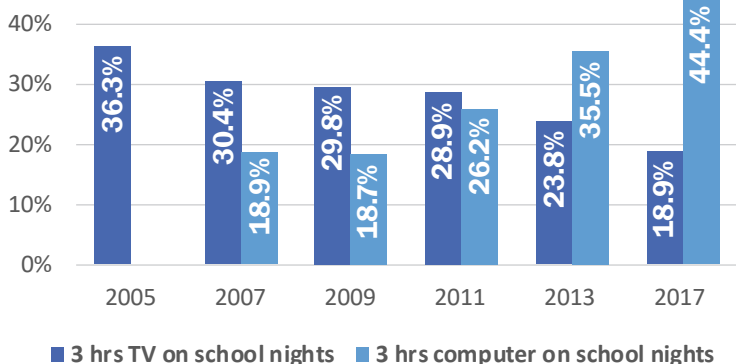
High school students: 19.2%



Healthy People 2020: at least 24.1% (high school only)

In 2017, 44.4% of Knox County high school students used their computers or other devices for something other than homework for more than three hours on an average school day, which is in line with rates in Tennessee (44.4%) and the U.S. (43.1%) but does not meet the Healthy People 2020 target of no more than 17.4%. Also in 2017, 18.9% of Knox County high school students watched TV for more than three hours on an average school day, which was below the rate in Tennessee (23.7%) and the U.S. (20.6%), and met the Healthy People 2020 target of no more than 26.1%.³³

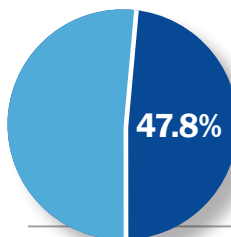
Non-school-related screen time among Knox County high school students³³



BUILT ENVIRONMENT

According to the Environmental Protection Agency (EPA), the built environment includes the physical makeup of where we live, learn, work and play — our homes, schools, businesses, streets and sidewalks, open spaces, and transportation options. The built environment can influence overall community health and individual behaviors such as physical activity.³⁴

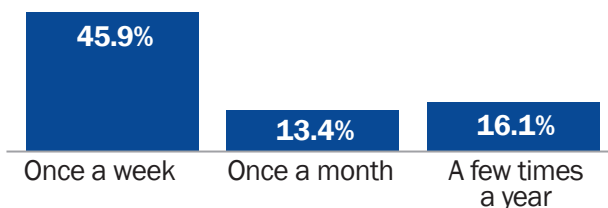
The CDC supports strategies to make moving more and sitting less a part of everyday life.³¹ Creating or modifying neighborhood environments to make it easier for people to walk or bike increases residents' physical activity levels and can decrease residents' body weight.^{35,36} The EPA and the CDC both recommend targeting the built environment as a strategy for improving public health, expanding transportation options, and providing access to critical services and amenities.³⁴



47.8% of Knox County adults live in neighborhoods with trails, greenways, bike paths or sidewalks for walking, biking or other activities¹⁹

Trail, greenway, bike path or sidewalk usage in Knox County, 2018¹⁹

Among adults whose neighborhoods have trails, greenways, bike paths or sidewalks; they use them:



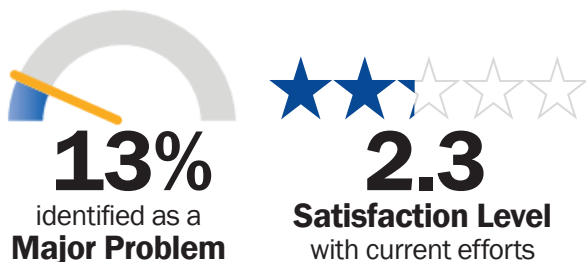
A recent scientific study of park usage in the City of Knoxville concluded that parks are well-maintained and distributed equitably but are underutilized by some residents. Knoxville residents, especially in the east park planning sector, do not perceive the park system to be distributed equitably. Safe access to parks using active transportation such as walking or biking and public transit is lacking. Perceptions of safety while traveling to and using a park is the greatest personal barrier to park use in the City of Knoxville.³⁷

Active and Healthy Living

The Trust for Public Land uses a half-mile as the standard for defining a location as “close” to a park. Most people can walk a half-mile in ten minutes.³⁸ Within the City of Knoxville, 42.1% of residents live within a ten-minute walk to a park. For the whole county, that number is 25.9%.³⁹

An individual’s ability to be physically active is shaped by both physical resources such as parks and greenways, but also by their social and cultural environment. A culture that promotes being active enhances social support among community members for physical activity, increases feelings of safety and promotes active transportation.⁴⁰

What do Knox County residents think about opportunities for physical activity?



- Some focus group participants felt that opportunities for outdoor activity (rivers, parks, greenways, mountains) are a main benefit of living in Knox County.
- Some focus group participants specifically mentioned the important role of the built environment in encouraging physical activity: parks, greenways, sidewalks and bike ways.
- Community survey participants living in the 37914 ZIP code were significantly more likely (31% compared to 12% from other ZIP codes) to report that a lack of opportunities for physical activity was a major problem.
- Focus group participants who live in East Knoxville shared that they did not have access to safe places for their children to play, leading one participant to say, “I don’t want a phone call or a knock on my door that my child is deceased or has been shot because they were in the wrong place at the wrong time.”

Community resources for physical activity include:

- BikeWalk Knoxville
- East Tennessee Wellness Roundtable and employers’ worksite wellness initiatives
- Farragut’s, Knox County’s and the City of Knoxville’s park and greenway systems (including senior centers, recreation centers, sports leagues and facilities, dog parks, playgrounds, beaches, boat launches, and others)
- Gyms, fitness centers, health clubs
- Legacy Parks Foundation
- Outdoorknoxville.com
- Physical activity groups or clubs (track clubs, hiking clubs, etc.)
- YMCA of East Tennessee

NUTRITION

Good nutrition is essential for good health. The availability of healthy, affordable foods contributes to a person’s diet and affects their risk of related chronic diseases. Poor nutrition contributes to many of the top causes of death, including diabetes, heart disease and some cancers.⁴¹ Access to healthy foods is affected by numerous factors, such as socioeconomic status, cooking knowledge, family and community culture, food environment, and availability of transportation. Evidence shows that healthy eating patterns, as outlined in the Dietary Guidelines for Americans⁴², are associated with positive health outcomes. Nationally in 2015, 12.2% of adults ate enough fruit and 9.3% ate enough vegetables to meet intake recommendations.⁴³

From Dietary Guidelines for Americans, 2015-2020⁴²

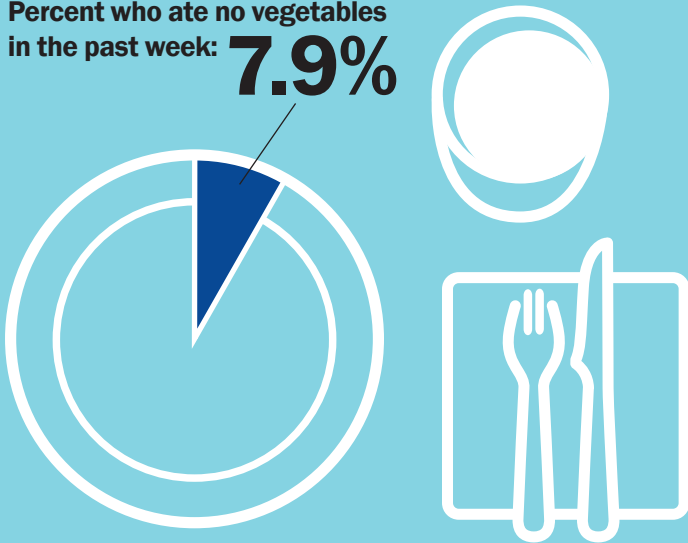
A healthy eating pattern includes:

- A variety of vegetables from all the subgroups — dark green, red and orange, legumes (beans and peas), starchy, and other
- Fruits, especially whole fruits
- Grains, at least half of which are whole grains
- Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages
- A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), nuts, seeds, and soy products
- Healthy fats such as olive oil
- A healthy eating pattern limits saturated fats and trans fats, added sugars, and sodium

Active and Healthy Living

Vegetable consumption among Knox County high school students³³

Percent who ate no vegetables in the past week: **7.9%**



Soda consumption among Knox County high school students³³

15% drank two or more cans, bottles or glasses of soda per day in the past week

The Dietary Guidelines for Americans recommend no more than 10% of daily calories come from added sugar. For a 2,000-calorie diet, this is 200 calories. A can of soda generally contains 126 calories from added sugar, so two cans (252 calories from added sugar) would put an average person over the recommended daily amount of added sugar.⁴²



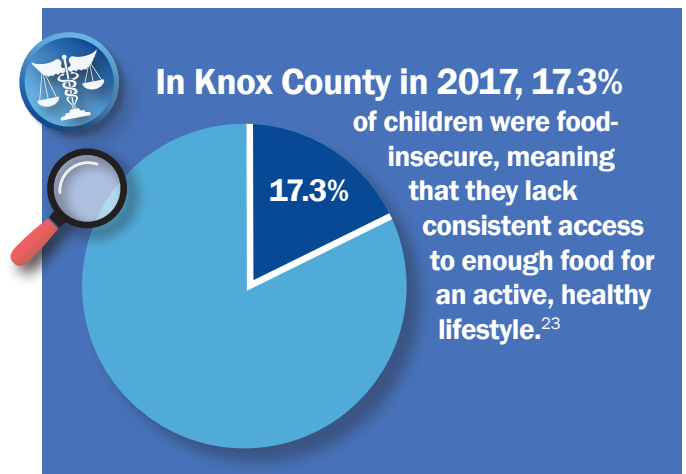
Just two cans of soda per day put most people over the limit of recommended added sugar.

FOOD INSECURITY

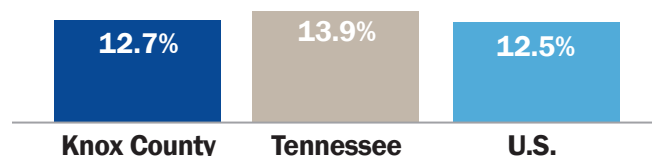


Food insecurity refers to the inability to afford nutritionally adequate and safe foods.⁴⁴ Food insecurity may be influenced by a number of factors, including income, employment, neighborhood conditions, race/ethnicity and disability. The risk for food insecurity increases when money to buy food is limited or not available. Adults and children who are food insecure may be at an increased risk for a variety of negative health outcomes such as obesity and chronic disease.⁴⁵

During episodes of food insecurity, dietary variety tends to decrease and consumption of high-calorie foods tends to increase. These energy-dense foods, including refined grains, added sugars and added saturated/trans fats, tend to be of poor nutritional quality and less expensive calorie-for-calorie than alternatives. U.S. adults living in food-insecure households consume fewer weekly servings of fruits, vegetables, and dairy and lower levels of micronutrients, including the B complex vitamins, magnesium, iron, zinc and calcium. These dietary patterns are linked to the development of chronic disease, including high blood pressure, high cholesterol and diabetes. A number of studies have found associations between food insecurity and obesity among children and women (but not men), though results among children have been inconsistent.⁴⁴



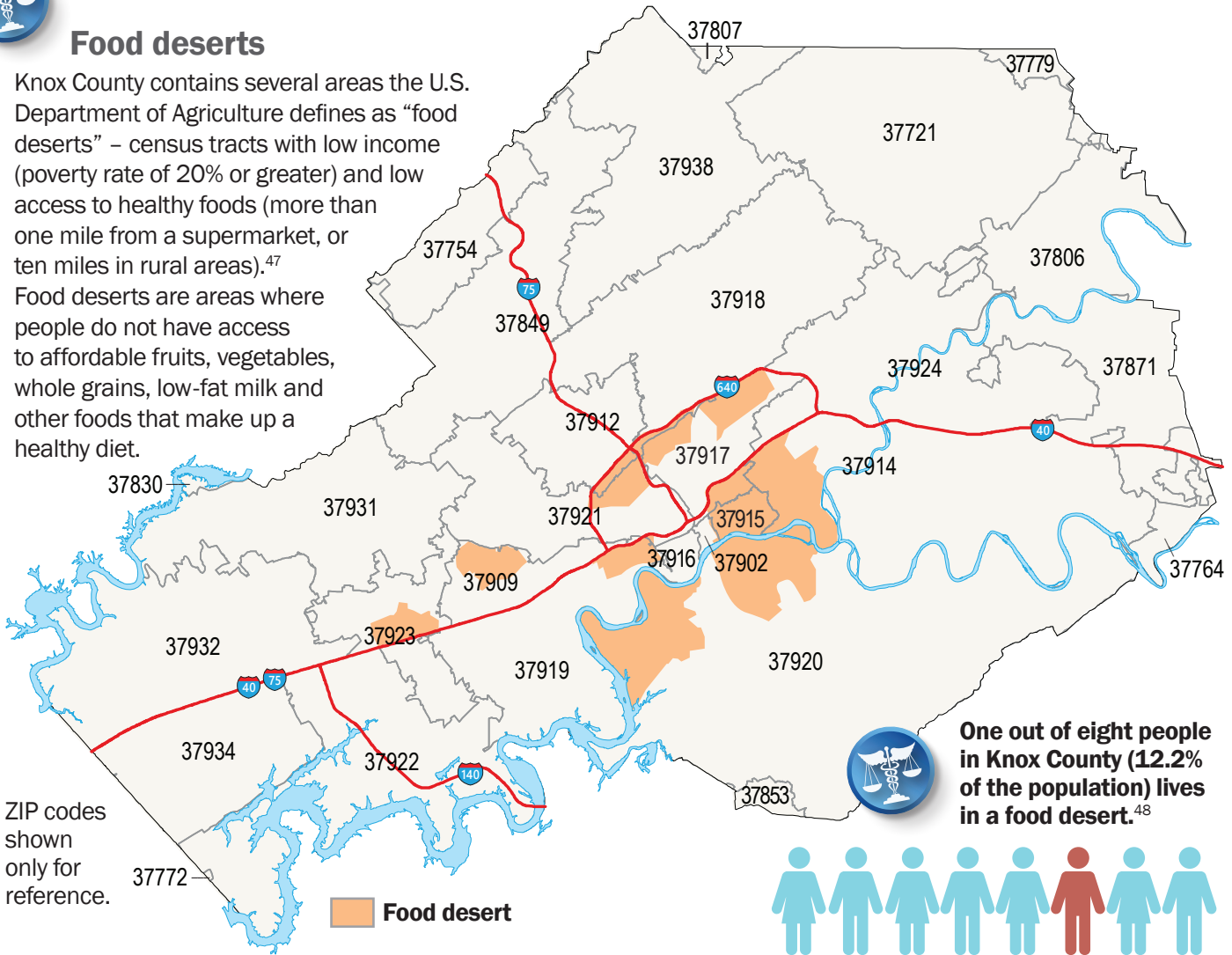
Percentage of the population that is food insecure, 2017⁴⁶



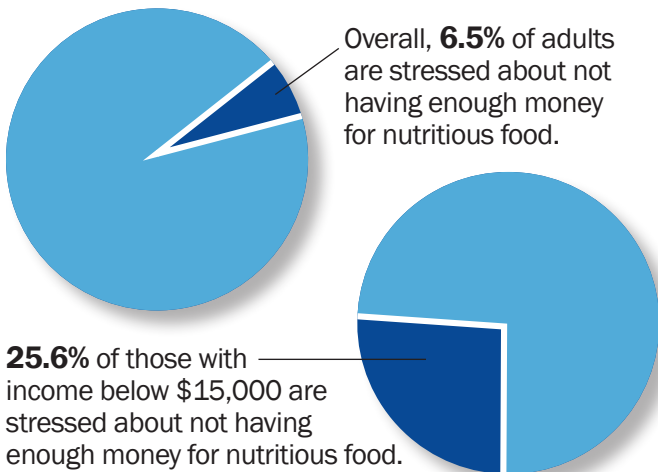


Food deserts

Knox County contains several areas the U.S. Department of Agriculture defines as “food deserts” – census tracts with low income (poverty rate of 20% or greater) and low access to healthy foods (more than one mile from a supermarket, or ten miles in rural areas).⁴⁷ Food deserts are areas where people do not have access to affordable fruits, vegetables, whole grains, low-fat milk and other foods that make up a healthy diet.

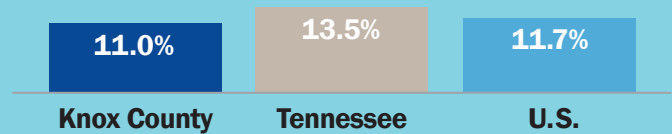


Knox County adults ages 18+ who are stressed about not having enough money for nutritious food¹⁹

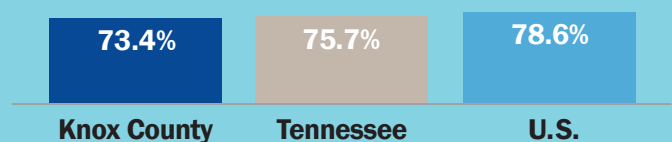


SNAP participation in Knox County and Tennessee²⁰

SNAP is the Supplemental Nutritional Assistance Program, formerly known as food stamps.



Percentage of households participating in SNAP with at least one member employed in past year²⁰



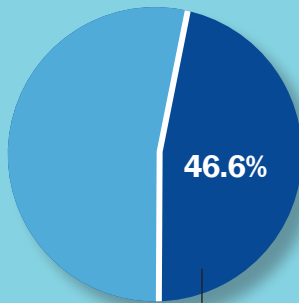
Active and Healthy Living



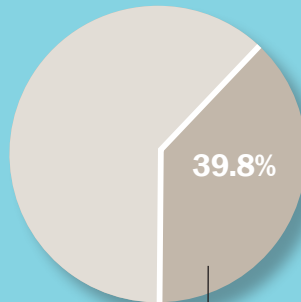
According to the CDC, farmers markets can serve as an effective way to offer healthier food options in underserved areas. Access can be further improved when farmers markets are able to accept federal nutrition assistance program benefits including SNAP.⁴⁹

Knox County has eight farmers markets, half of which accept benefits including SNAP and WIC.⁵⁰

Children eligible for free or reduced-price school lunches, 2018²³



Eligible **Knox County** school-age children



Eligible **Tennessee** school-age children.

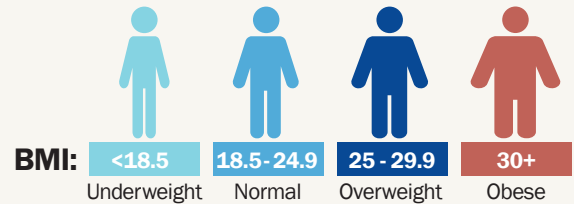
Community resources for access to and information about healthy foods include:

- Farmers markets
- Knoxville-Knox County Community Action Committee
- Knoxville-Knox County Food Policy Council
- Knox County Health Department
 - Healthy Weight Program
 - Women, Infants and Children (WIC) Program.
- Mobile Meals
- Nourish Knoxville
- Second Harvest and other food banks
- Supermarkets
- Supplemental Nutritional Assistance Program (SNAP)

OBESITY

Obesity is a risk factor for many of the leading causes of death, chronic diseases and poor mental health.⁵¹ Overweight and obese statuses are defined using body mass index (BMI). While not a perfect measure, a high BMI can indicate a person is overweight or obese.⁵¹

Adult weight categories based on body mass index⁵¹



Example: A 5'8" person weighing 165 lbs. would have a BMI of 25, indicating they are considered overweight.

Children who are obese are more likely to become adults who are obese.⁵¹

The costs of obesity

Obesity raises medical care costs for obese adults by an average of **\$3,429** per person.⁵²

As of 2013, **28.2%** of total health care spending in the U.S. was devoted to treating obesity-related illness. (Up from 20.6% in 2005)⁵²

Obesity costs employers **\$506** per obese worker per year through lower productivity.⁵³

Obesity is associated with job absenteeism, costing approximately **\$4.3 billion** annually in the U.S.⁵⁴

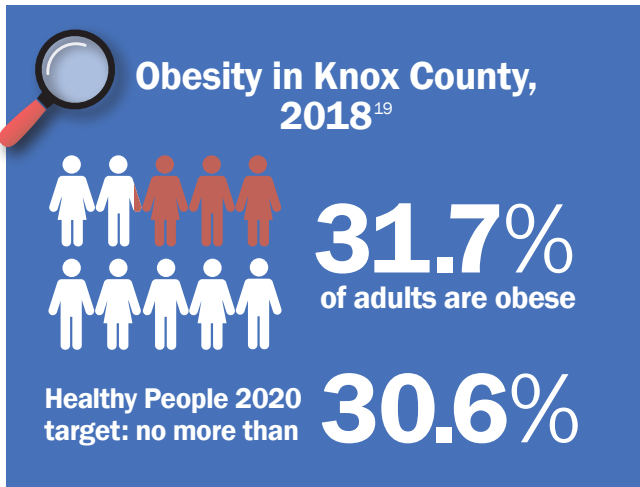


What do Knox County residents think about obesity?

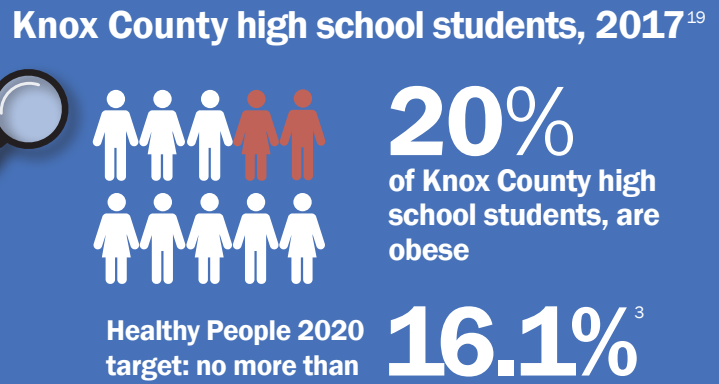
- Obesity was identified as a major problem in most focus groups and interviews. It did not appear in survey results because it was not included as a separate health outcome to be evaluated.
- Participants linked obesity to lack of access to healthy foods, lack of knowledge about nutrition, smoking, lack of exercise and poor mental health.

Active and Healthy Living

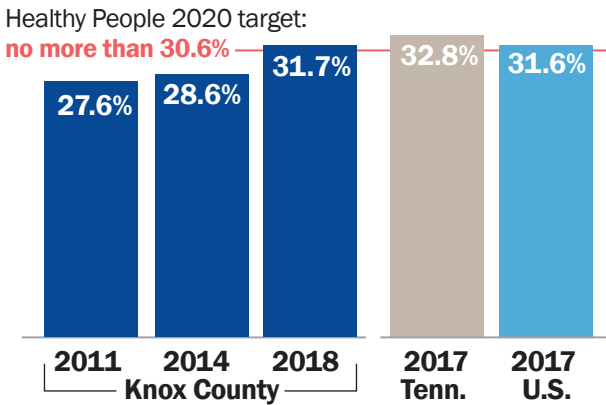
Adult obesity



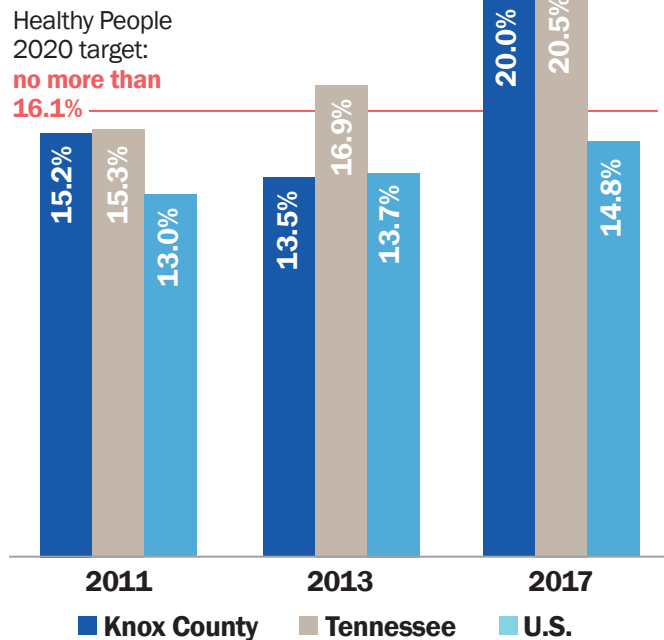
Youth obesity



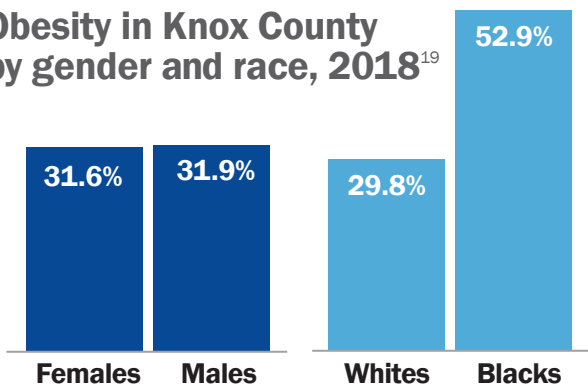
Percentage of adults who are obese (by self-reported height and weight)^{19, 32}



Percentage of high school students who are obese (by self-reported height and weight)^{33, 56}



Obesity in Knox County by gender and race, 2018¹⁹

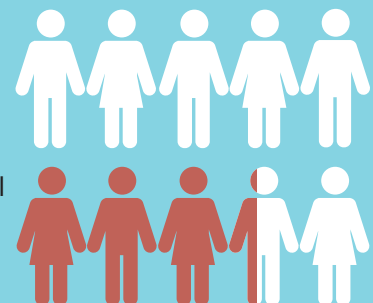


According to the CDC, although the exact causes of racial disparities in obesity are not known, they likely in part reflect differences in social and economic advantages related to race or ethnicity.⁵⁵

See the Drivers of Health section of this document.

Overweight high school students

While 20% of Knox County high school students were obese in 2017, an additional 14.1% were overweight, for a total of **34.1%** above recommended weight.³³



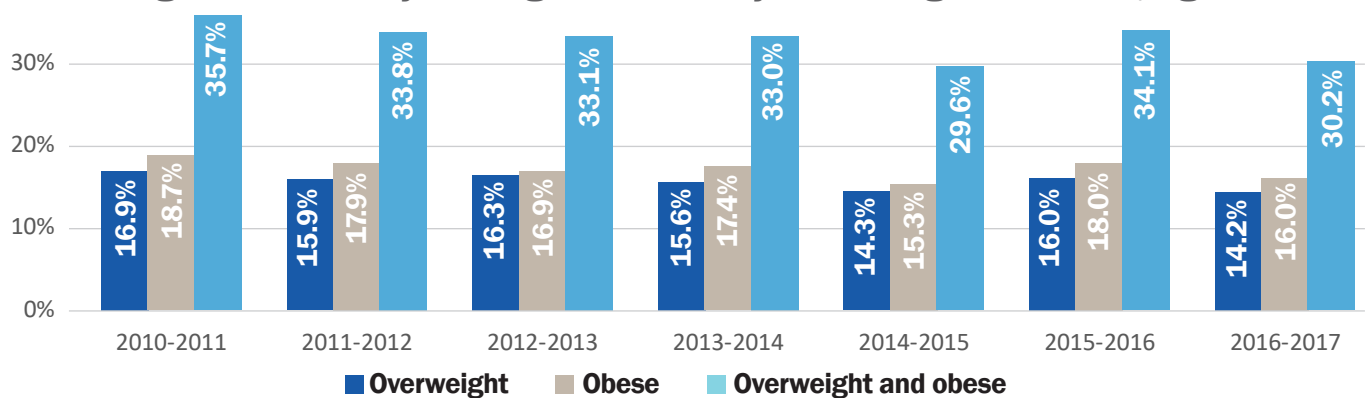
Active and Healthy Living

Obesity among Knox County school-aged children⁵⁷

	Obese in 2016-17 school year	Healthy People 2020 targets	Exceeding target
2-5 years	12.3%	9.4%	2.9%
6-11 years	14.9%	15.7%	Target met
12-19 years	19.2%	16.1%	3.1%
2-19 years	16.0%	14.5%	1.5%

Of the 16,410 Knox County Schools students screened for height and weight over the 2016-17 school year (grades kindergarten, 2, 4, 6 and 9), **16% were obese.**⁵⁷

Overweight and obesity among Knox County school-aged children, ages 2-19⁵⁷



Notes: Comparisons between the school years should be undertaken with extreme caution due to varying sample design. See details under Data Sources on page 9 of this report.

Children who are obese are more likely to have high blood pressure, high cholesterol, increased risk of diabetes, depression and other health issues.⁵¹

Obesity results from:⁵¹

- Genetics
- Eating patterns
- Physical inactivity
- Medication use
- Adverse childhood experiences (ACEs)
- Food environment/culture
- Lack of access to safe, well-maintained places for physical activity
- Education and skills
- Food marketing and promotion

Community resources for obesity include:

- East Tennessee Childhood Obesity Coalition
- Knox County Health Department
 - Healthy Weight Program
 - Women, Infants and Children (WIC) Program
- Medical providers who can advise patients about weight loss methods
- Resources for physical activity and nutrition listed earlier in this section
- Tennessee Department of Health

Chronic Disease

Of the top ten causes of death in Knox County from 2015 to 2017, seven are chronic diseases. A chronic disease is a condition that lasts one year or more, and requires ongoing medical attention or limits activities of daily living or both. Many chronic diseases can be prevented by living a healthy lifestyle.

Six in ten U.S. adults have a chronic disease⁵⁹

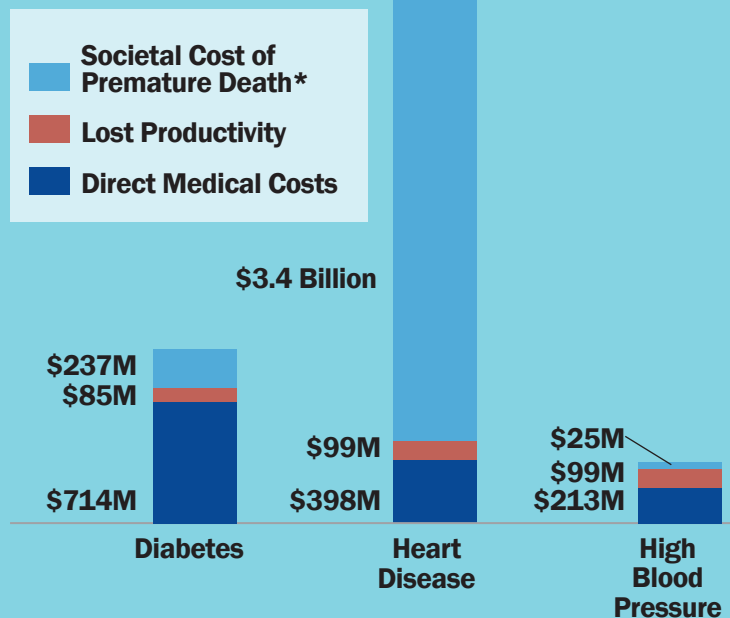


Top ten causes of death in Knox County, 2015-2017⁵⁸

Cause	Average annual deaths	Percent of total deaths
All causes	4,420	100.0
1. Heart diseases	922	20.9
2. Cancer	889	20.1
3. Unintentional injury*	334	7.6
4. Chronic lower respiratory diseases	286	6.5
5. Cerebrovascular diseases	184	4.2
6. Alzheimer's disease	179	4.0
7. Influenza and pneumonia*	111	2.5
8. Diabetes	90	2.0
9. Kidney disease	80	1.8
10. Suicide*	74	1.7

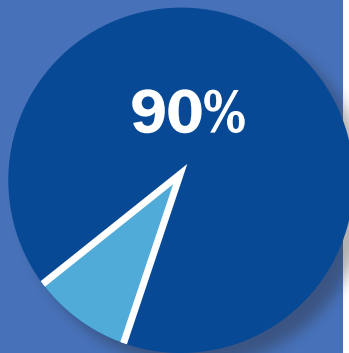
*For information on these health outcomes, go to the following sections of this report: Injury and Violence (for unintentional injury), Infectious Disease (for influenza and pneumonia) and Mental Health (for suicide).

Annual economic impact of excess burden of selected chronic diseases in Tennessee, 2015⁶⁰



*Quantifies lost economic contributions and family and community involvement.

Chronic diseases (including mental health conditions) account for 90% of the nation's \$3.3 trillion in annual health care expenditures.⁵⁹



The population of Tennessee suffers from higher rates of chronic disease compared to the average in the rest of the U.S. According to the Sycamore Institute, the additional disease burden of just three chronic diseases (diabetes, heart disease and high blood pressure) cost \$5.3 billion statewide in 2015, over and above the costs already incurred by average rates of these chronic diseases.⁶⁰

Chronic Disease

Chronic diseases vary in cause and symptoms, but many share common risk factors.

Risk factors for chronic diseases⁶¹⁻⁶⁴

	Hypertension/ Heart Disease	Cancer	Asthma	COPD	Stroke	Diabetes	Dementia
Lack of physical activity	X	X			X	X	X
Poor nutrition	X	X			X	X	X
Obesity	X	X	X		X	X	X
Smoking/secondhand smoke exposure	X	X	X	X	X	X	X
Adverse childhood experiences	X	X	X	X	X	X	X



According to the CDC, poverty affects health by limiting access to healthy foods and safe neighborhoods.⁶⁵ The risk factors and health behaviors listed in the table above are dramatically influenced by the challenges of living in poverty.⁶⁵ Each of the chronic diseases in this section occurs at higher rates among people in Knox County with lower incomes and lower educational attainment. See the Drivers of Health section at the beginning of this report.



Heart disease

No. 1

cause of death in Knox County⁵⁸

922

deaths per year on average⁵⁸

20.9%

of all deaths⁵⁸

Those who die of heart disease lose

13.7 years

of their lives to the disease, on average.⁶⁶

HEART DISEASE AND HYPERTENSION

The term “heart disease” refers to several types of heart conditions. The most common type is coronary artery disease, which affects blood flow to the heart and can cause a heart attack. Angina, a symptom of coronary heart disease, is chest pain or discomfort that occurs when the heart muscle is not getting enough blood.⁶⁷

Similar to the state and the nation, heart disease is the leading cause of death in Knox County. Heart disease causes one in four deaths nationally. Half of all Americans have at least one of the three key risk factors for heart disease: smoking, high blood pressure and high cholesterol.⁶⁷ The U.S. has a higher mortality rate from heart disease than most other developed countries.⁶⁸

Men are more likely to be diagnosed with heart disease than women.

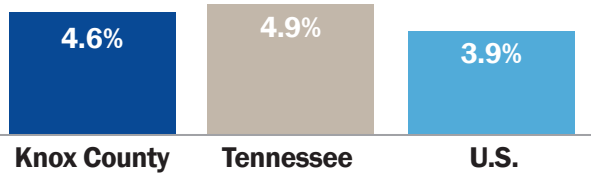


Higher income and educational attainment are associated with lower rates of heart disease and heart attacks.

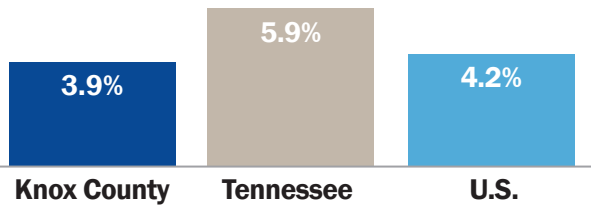
In 2015, Tennessee’s additional cases of heart disease over and above the national average cost \$3.9 billion in direct medical care, lost productivity and premature death.⁶⁰ Individuals who die of heart disease lose an average of 13.7 years to the disease, years they could be spending with their families, working and contributing to the economy.

Chronic Disease

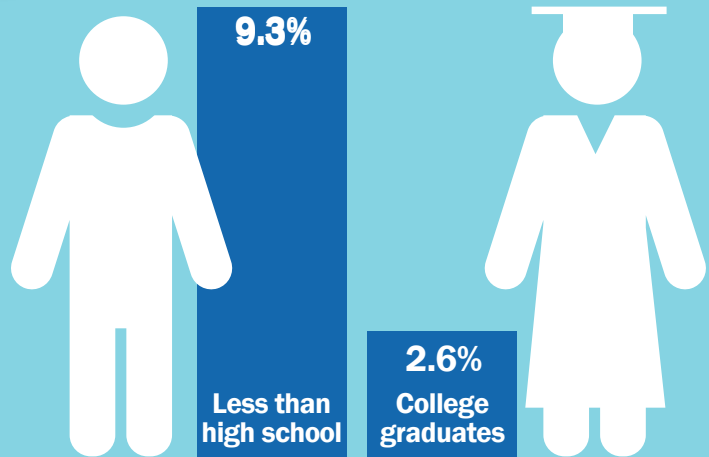
Percent of adults with angina or coronary heart disease¹⁹



Percent of adults who have had a heart attack¹⁹

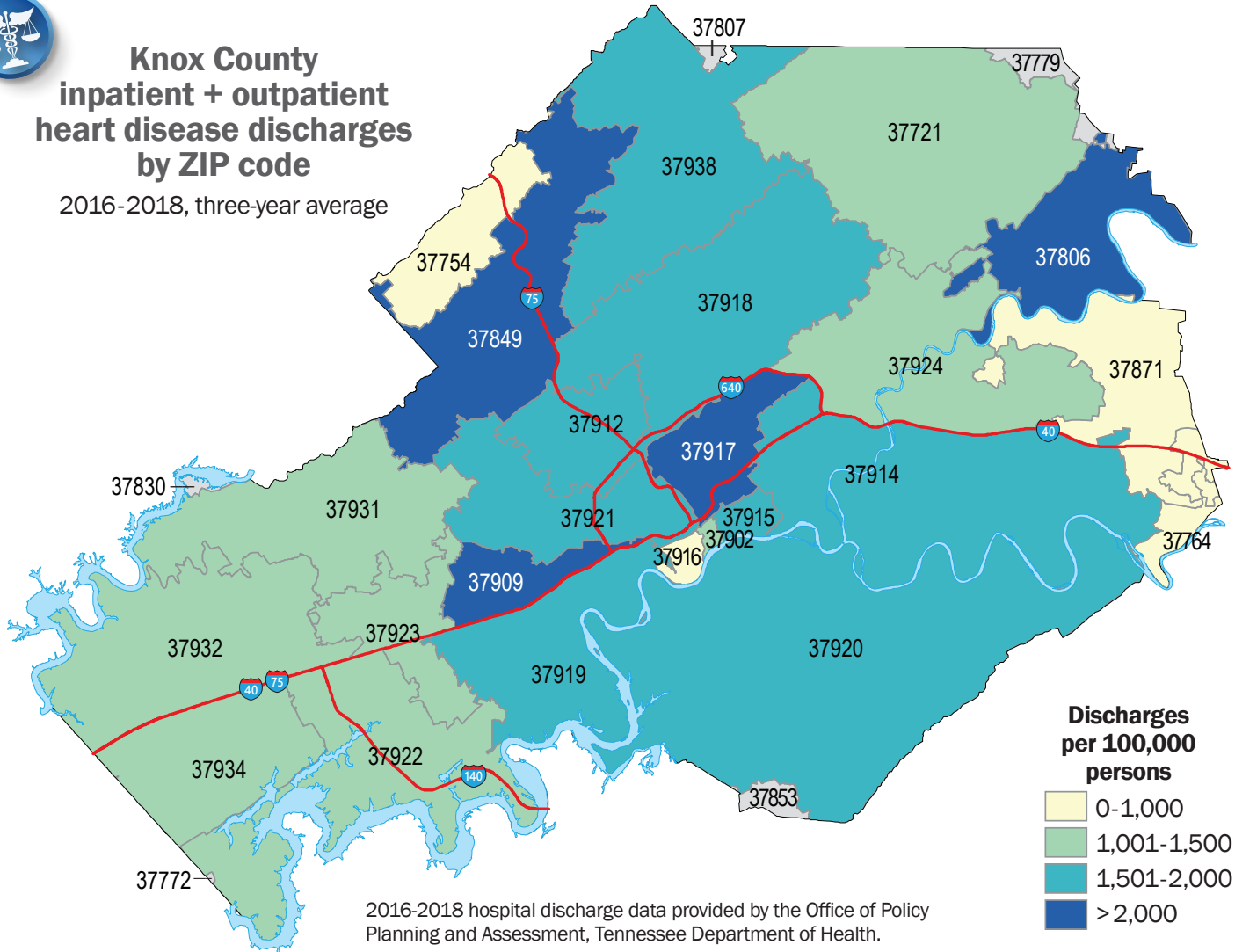


Percentage of Knox County adults who have had a heart attack, by education¹⁹

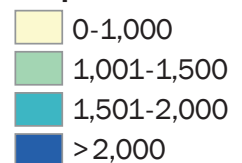


Knox County inpatient + outpatient heart disease discharges by ZIP code

2016-2018, three-year average



Discharges per 100,000 persons



Chronic Disease

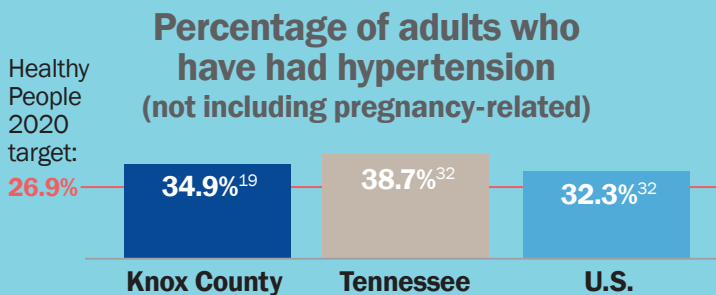
In Knox County, data indicate that neither race nor ethnicity has an effect on rates of coronary heart disease or heart attacks.¹⁹

Hypertension, or high blood pressure, increases the risk for both heart disease and stroke. Risk factors for hypertension (in addition to the ones listed in the beginning of this section) include family history, sleep apnea, heavy alcohol use and excessive stress.



Nationally, Black individuals are more likely to get high blood pressure than white individuals.⁶⁹

In 2015, Tennessee's additional cases of hypertension over the national average cost \$336 million in direct medical care, lost productivity and premature death.⁶⁰



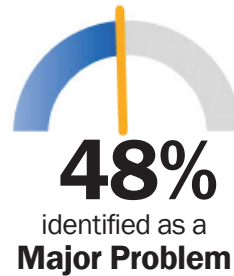
Percentage of Knox County adults with hypertension, by Education¹⁹



Community resources for heart disease and hypertension include:

- American Heart Association's local chapter
- East Tennessee Cardiovascular Research Foundation
- Fort Sanders Regional Medical Center, Heart Center
- North Knoxville Medical Center, Chest Pain Center
- Primary care providers and heart specialists
- Turkey Creek Medical Center, Chest Pain Center
- University of Tennessee Medical Center, Heart Lung Vascular Institute

What do Knox County residents think about heart disease?



- Just less than half of survey respondents identified heart disease as a major problem. Among survey respondents over the age of 35, more than half (56%) identified heart disease as a major problem.
- When heart disease was discussed in focus groups and interviews, participants grouped it with other chronic diseases that are linked to unhealthy lifestyle choices.

CANCER/MALIGNANT NEOPLASMS



Cancer⁵⁸

No. 2 cause of death in Knox County

889 deaths per year on average

20.1% of all deaths

Those who die of cancer lose

13.3 years

of their lives to the disease, on average.⁶⁶

Cancer, or malignant neoplasms, is the name given to a group of related diseases in which the body's cells begin to multiply without stopping and may spread into surrounding tissues. Many cancers form solid masses of tissue called tumors.⁷⁰

From 2010 to 2014, there were about 2,000 new cases of cancer in Knox County per year (age-adjusted rate of 464.9 per 100,000 people).⁷¹

Chronic Disease



In Knox County, men are more likely to be diagnosed with cancer than women, and the most common cancers are of the breast (women) and prostate (men). Men are diagnosed with significantly more cancers of the lung and bronchus, bladder, and skin (melanoma). Women are diagnosed with more thyroid cancer by a statistically significant margin.⁷¹ There are not statistically significant differences in rates of most cancers by race, with the exception of prostate cancer. Black individuals have a significantly higher rate of new diagnoses (177.2 per 100,000 people) than white individuals (120.8 per 100,000 people) in Knox County.⁷¹

Knox County's diagnosis rates are higher than both Tennessee and U.S. rates for cancers of the lung and bronchus, prostate, and skin (melanoma).

What do Knox County residents think about cancer?



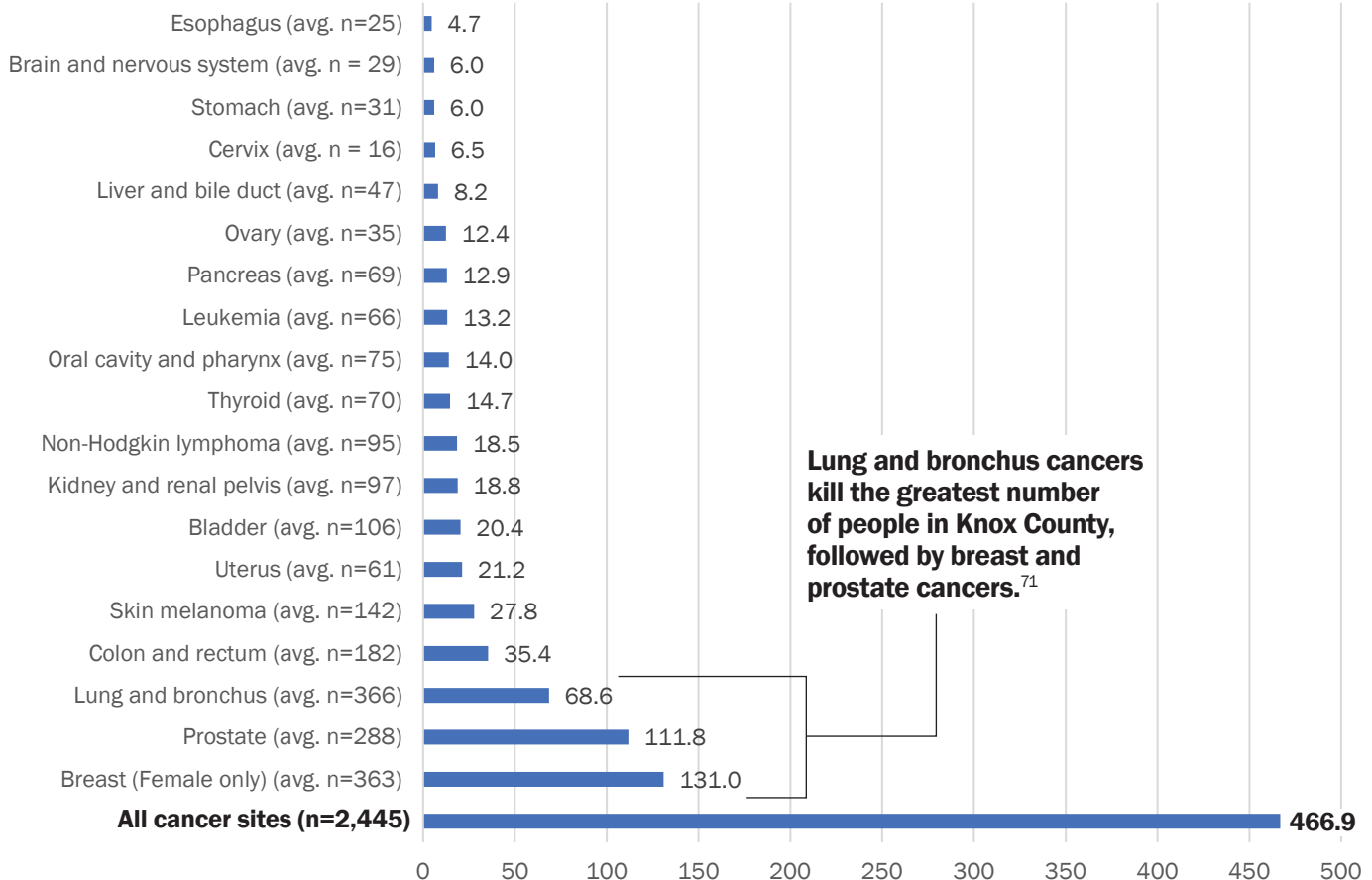
54%
identified as a
Major Problem



3.2
Satisfaction Level
with current efforts

- Cancer was identified as a major problem by over half of respondents to the community survey.
- Those over the age of 45 were more likely to see it as a major problem than those under 45.
- Focus group participants discussed the correlation of cancer with unhealthy lifestyles, and the high cost of treatment.

New cancer diagnoses per 100,000 people among Knox County adults, 2013-17⁷¹



Chronic Disease

Cancer screening behaviors reported by Knox County adults, 2018^{19*}

Screening	Percent	Healthy People 2020 Target
Adults ages 50-75, had colonoscopy in the past ten years	71.6%	70.5%
Women ages 21-65, had cervical cancer screening in the past three years	87.4%	93.0%
Women ages 50-74, had mammogram in the past two years	84.2%	81.1%
Women ages 21-65, had HPV test in the past three years	51.6%	No historical data to compare

*Colonoscopy and mammogram are tests used to detect various types of cancer.

HPV, or human papillomavirus, causes 91% of cervical cancers, as well as cancers in other parts of the body in both men and women. The HPV vaccine prevents these cancers.

Among Knox County adults ages 18-49, 21.3% report they have gotten at least one dose of the HPV vaccine.¹⁹



Percentage of Knox County adults who have had a colonoscopy or sigmoidoscopy, by income, 2018¹⁹



Higher income and education are associated with significantly higher rates of cancer screening.

Community resources for screening and treatment for cancer include:

- American Cancer Society's local chapter
- Cancer Support Society of East Tennessee
- East Tennessee Children's Hospital, Pediatric Hematology/Oncology Clinic
- Knox County Health Department, Women's Health Clinic
- Screening services usually available from primary care providers
- Susan G. Komen Knoxville (specific to breast cancer)
- Tennessee Cancer Specialists
- Thompson Cancer Survival Center
- University of Tennessee Medical Center, Cancer Institute
- YMCA of East Tennessee, LiveStrong program

CHRONIC LOWER RESPIRATORY DISEASES



Chronic lower respiratory diseases⁵⁸

No. 4 cause of death in Knox County
286 deaths per year on average
6.5% of all deaths

Those who die of chronic lower respiratory diseases lose **10.2 years** of their lives to the disease, on average.⁶⁶

Chronic lower respiratory diseases affect the airway and other structures of the lung. Some of the most common are asthma and chronic obstructive pulmonary disease (COPD).⁷² Asthma causes repeated episodes of wheezing, breathlessness, chest tightness and coughing. Chronic obstructive pulmonary disease causes airflow blockage and other breathing-related problems.

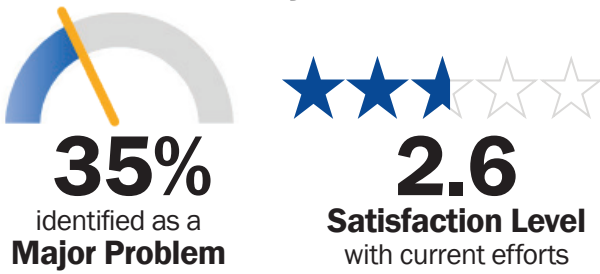
Percentage of adults who have ever been diagnosed with asthma, 2018



Percentage of adults who have been diagnosed with COPD, 2018



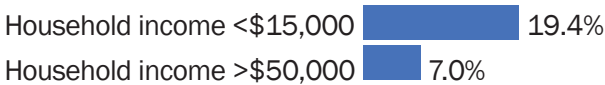
What do Knox County residents think about asthma and other respiratory diseases?



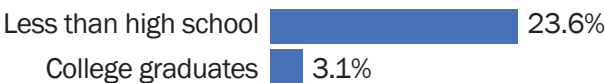
The most common risk factors for developing asthma are having a parent with asthma, having a severe respiratory infection as a child, having an allergic condition, or being exposed to certain chemical irritants or industrial dusts in the workplace.⁷³ The most significant risk factors for COPD are smoking and exposure to large amounts of secondhand smoke.⁷³ Lower income and educational attainment are associated with higher rates of chronic lower respiratory diseases.



Percentage of adults who currently have asthma, by income, 2018¹⁹



Percentage of Knox County adults with COPD, emphysema or chronic bronchitis, by education, 2018¹⁹



Community resources around respiratory diseases include:

- American Lung Association Tennessee chapter (located in Nashville)
- Primary care providers
- Various respiratory clinics, providers and specialists

STROKE/CEREBROVASCULAR DISEASE



Stroke/Cerebrovascular disease⁵⁸

- No. 5** cause of death in Knox County
- 184** deaths per year on average
- 4.2%** of all deaths
- Those who die of strokes/cerebrovascular disease lose **11.3 years** of their lives to the disease, on average⁶⁶

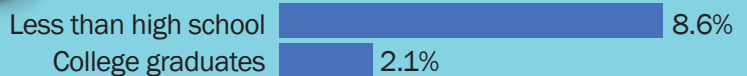
A stroke occurs when something blocks the blood supply to part of the brain, or when a blood vessel in the brain bursts. In either case, parts of the brain become damaged or die. Strokes can cause lasting brain damage, long-term disability or even death.⁷⁴

High blood pressure, or hypertension, is the most significant risk factor for stroke. As with most other chronic diseases, lower income and educational attainment are associated with higher risk.

Percentage of adults who have had a stroke, 2018



Percentage of Knox County adults who have had a stroke, by education, 2018¹⁹



Community resources around stroke/cerebrovascular disease include:

- American Stroke Association's local chapter
- Fort Sanders Regional Medical Center, Comprehensive Stroke Center
- North Knoxville Medical Center
- Parkwest Medical Center
- Turkey Creek Medical Center
- University of Tennessee Medical Center, Comprehensive Stroke Center
- Various rehabilitation centers

Chronic Disease

ALZHEIMER'S DISEASE



Alzheimer's disease⁵⁸

No. 6 cause of death in Knox County

179 deaths per year on average

4.0% of all deaths

Alzheimer's is a degenerative brain disease and the most common form of dementia. Dementia refers to the loss of memory and other cognitive abilities serious enough to interfere with daily life.⁷⁵

In 2014, an estimated five million Americans over the age of 65 had Alzheimer's disease. Age and family history are strong risk factors for Alzheimer's. Other risk factors include head injuries, heart disease, hypertension, diabetes, stroke and high cholesterol.

As they age, Latino and Black individuals are more likely than white individuals to develop Alzheimer's.⁷⁵



What do Knox County residents think about dementia and Alzheimer's disease?



40%

identified as a **Major Problem**



2.9

Satisfaction Level
with current efforts

Community resources for Alzheimer's and other dementias include:

- Alzheimer's Tennessee's local chapter
- Area caregiver support groups
- Genesis Neuroscience Clinic
- Parkwest Medical Center, Senior Behavioral Health Unit
- University of Tennessee Medical Center, Pat Summitt Clinic
- Various behavioral health and neurology departments at local hospitals
- Various memory care units and long-term care units at local hospitals and facilities

DIABETES



Diabetes⁵⁸

No. 8 cause of death in Knox County



90 deaths per year on average

2.0% of all deaths

Those who die of diabetes lose **14.5 years** of their lives to the disease, on average.⁶⁶

Diabetes affects how the body turns food into energy, specifically making it harder for the body's cells to use sugar for energy. Over time, this can cause serious health problems such as heart disease, kidney disease, eye problems and limb amputations.⁷⁶

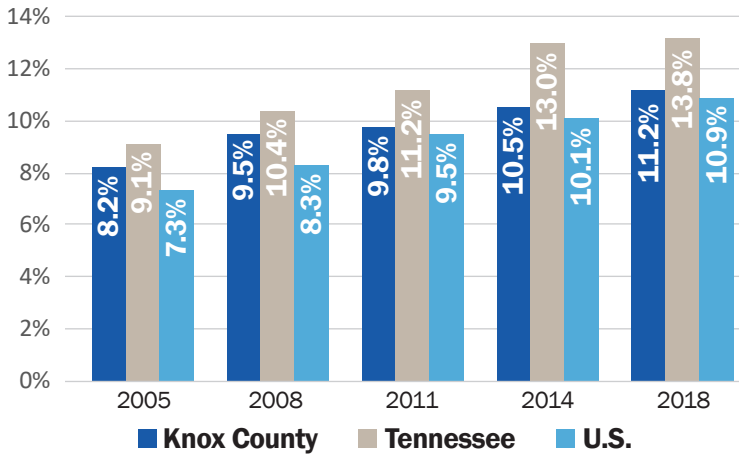
In addition to the risk factors mentioned at the beginning of this section, other factors for diabetes include family history, being 45 years old or older, and a history of depression.



In Knox County and the U.S. as a whole, lower income and educational attainment are associated with higher rates of diabetes. Race and ethnicity can also be a factor: Black, Hispanic, American Indian or Alaska Native individuals are more likely to get diabetes.^{19, 76}

Chronic Disease

Percentage of adults with diabetes*^{19, 32}



*Not including pregnancy-related



Percentage of Knox County adults with diabetes, by education, 2018¹⁹
(not including pregnancy-related)

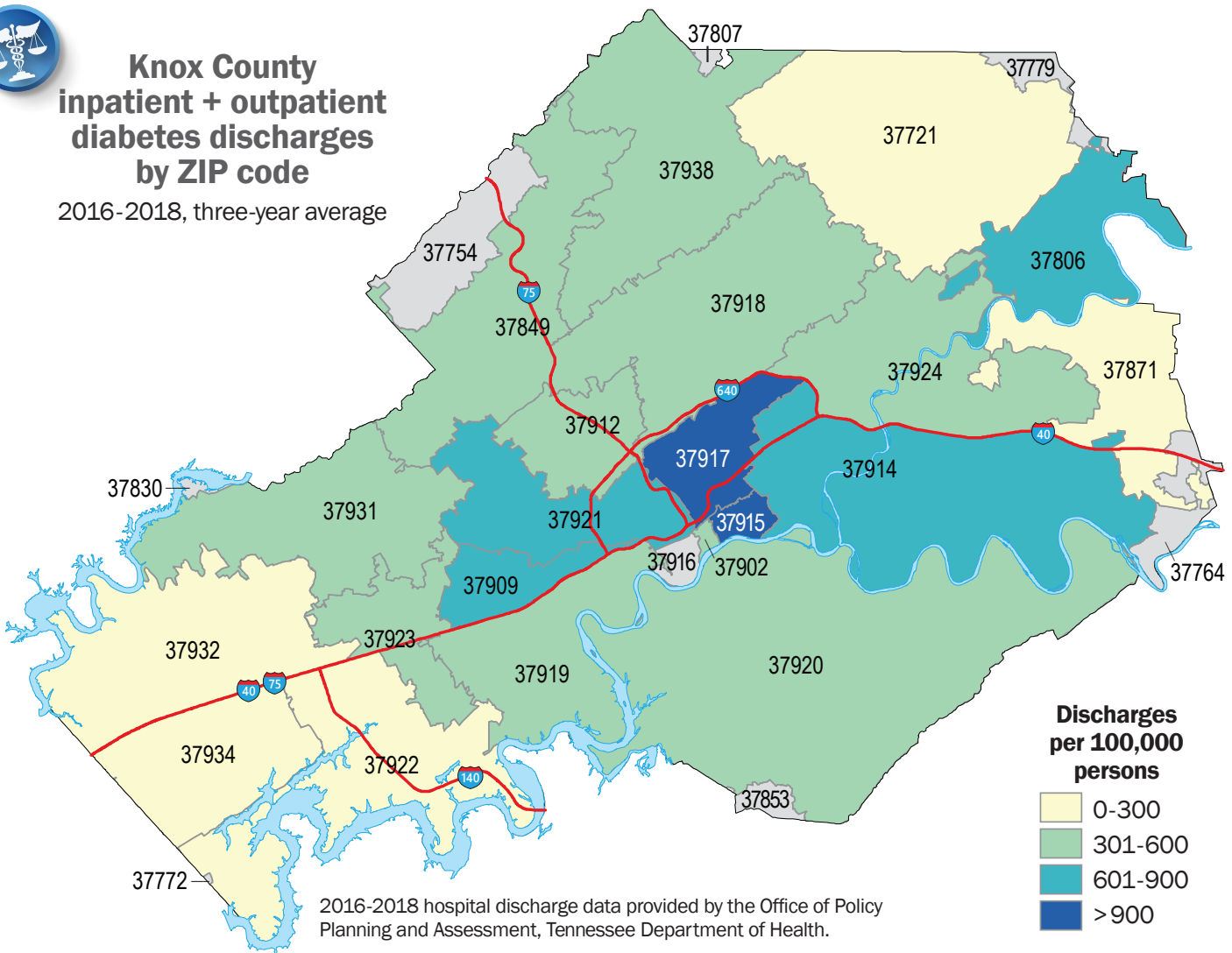


Percentage of adults with diabetes, by race, 2018¹⁹
(not including pregnancy-related)



Knox County inpatient + outpatient diabetes discharges by ZIP code

2016-2018, three-year average

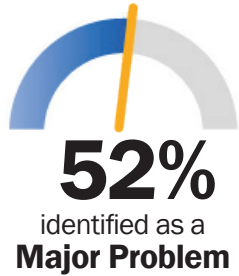


Discharges per 100,000 persons



Chronic Disease

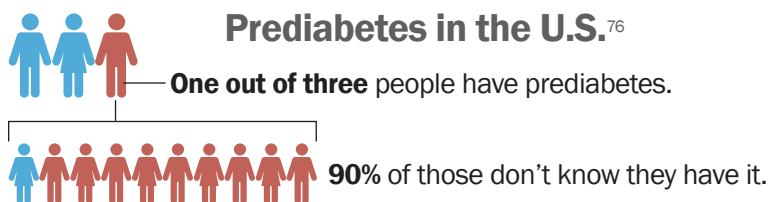
What do Knox County residents think about diabetes?



- Over half (52%) of respondents identified diabetes as a major problem in the community survey, and it was mentioned often in focus groups and interviews.
- Participants often linked diabetes to obesity as a result of poor eating habits and lack of physical activity.
- Interviewees indicated needs for better education about prevention and treatment, and for programs in Spanish.

One of every seven dollars spent on health care in the U.S. is spent treating diabetes and its complications. Health care costs for Americans with diabetes are 2.3 times greater than for those without diabetes.⁷⁷ In 2015, Tennessee's additional cases of diabetes over the national average cost more than \$1 billion. A third of those costs stemmed from lost productivity (\$85 million) and the societal cost of premature death (\$237 million).⁶⁰

Prediabetes is a serious health condition where blood sugar levels are higher than normal, but not high enough yet to be diagnosed as diabetes. Prediabetes puts a person at increased risk of diabetes, heart disease and stroke.⁷⁶



KIDNEY DISEASE



Kidney disease⁵⁸

No. 9 cause of death in Knox County

80 deaths per year on average

1.8% of all deaths

Chronic kidney disease is a condition in which the kidneys are damaged and cannot filter blood as well as they should. As a result, excess fluid and waste from blood accumulate in the body and may cause other problems such as heart disease or stroke.⁷⁸

Early chronic kidney disease may have no noticeable symptoms, so screening is important. More than one in seven American adults are estimated to have chronic kidney disease.



Non-Hispanic Black individuals and Hispanic individuals of any race are more likely to develop kidney disease than non-Hispanic white individuals.⁷⁸

Risk factors for kidney disease include family history, diabetes, high blood pressure, heart disease and obesity.⁷⁸

Community resources for kidney disease include:

- East Tennessee Kidney Foundation
- Screening services usually available from primary care providers
- Various dialysis clinics

Community resources for diabetes prevention and management include:

- Chronic disease self-management classes (Knox County Health Department, Summit Medical Group, and others)
- Infrastructure and resources for outdoor activity (parks, greenways, bike lanes, etc.)
- Knox County Health Department
 - Healthy Weight Program
 - Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
- Screening services available from primary care providers
- Worksite Wellness initiatives and programs
- YMCA
- See resources for physical activity and nutrition in the Active and Healthy Living section of this report.

Environmental Health

The environment refers to the places, both natural and man-made, where people live, work and play. Exposures to environmental factors, including chemicals, microbes and physical forces, can profoundly influence an individual's health. Human health is affected by environmental issues such as availability of affordable housing, air and water quality, and exposure to toxic chemicals.

AFFORDABLE HOUSING



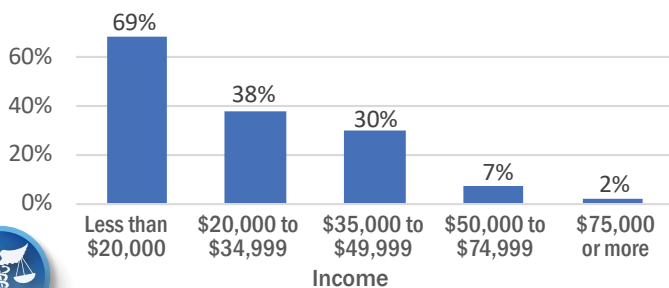
Housing affordability and housing quality both influence health in important ways. When people have affordable housing, they have more resources available for other needs including medical care and food. The financial burden of high housing costs is also a source of stress that can negatively impact health. Unaffordable housing is typically defined as housing expenses that are more than 30% of household income.¹⁴



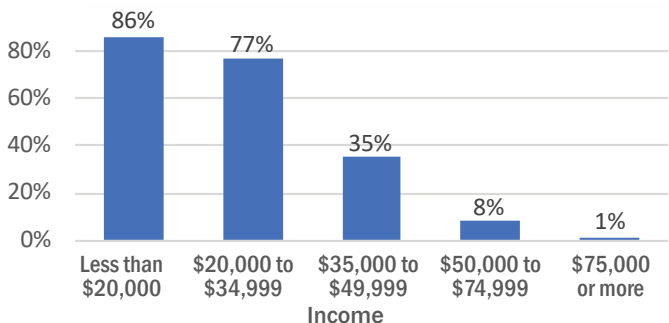
In Knox County in 2017:

- 21% of homeowners with a mortgage,
- 10% of homeowners without a mortgage, and
- 47% of renters **spent more than 30% of their income on housing**²⁰

Homeowners in Knox County paying more than 30% of income on housing²⁰



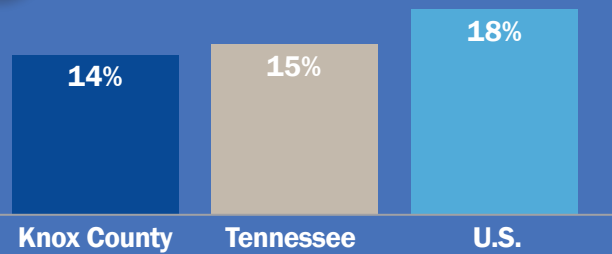
Renters in Knox County paying more than 30% of income on housing²⁰



Housing quality is another important driver of health. Poor housing conditions are associated with respiratory infections, asthma, lead poisoning and injuries. For example, research shows that areas with a high concentration of housing code violations (such as water damage, cockroaches and rodents) are associated with increased rates of children with asthma-related emergency department visits and hospitalizations.⁷⁹



Percentage of households with at least one serious housing problem (overcrowding, high housing costs, or lack of kitchen or plumbing facilities), 2011-2015 average⁸⁰



What do Knox County residents think about lack of affordable housing?



37%
identified as a
Major Problem



2.0
Satisfaction Level
with current efforts

Although a lack of affordable housing was not identified as a major problem by a majority of respondents to the community survey, homelessness was frequently discussed in the focus groups.



The lack of affordable housing, along with poverty and stagnation of wages, are key contributing factors to housing instability and homelessness, nationally and in Knox County.⁸¹

Individuals experiencing homelessness in Knox County, 2018⁸¹

9,183 people **3%** increase from 2017 Trend is **stable***

Characteristics of individuals experiencing homelessness in Knox County, 2018⁸¹

- 69%** report Knox County as their most recent permanent address
- 64%** report a history of mental health treatment
- 79%** report having used alcohol or drugs at some point in their lives
- 30%** report earning income (separate from disability benefits or other government payments)
- 22%** have health insurance
- 43%** report having a disability
- 61%** are white
- 29%** are Black

*Average annual number of people experiencing homelessness in Knox County since 2014 is 9,213.

Community resources for homelessness include:

- Catholic Charities
- City of Knoxville's Office on Homelessness
- Family Promise of Knoxville
- Helen Ross McNabb Center
- HUD Homeless Services
- Knox Area Rescue Ministries
- Knoxville Homeless Management Information System
- Knoxville-Knox County Homeless Coalition
- Salvation Army
- Volunteer Ministry Center
- YWCA

Community resources for affordable housing include:

- Affordable/public housing complexes
- City of Knoxville's Community Development Department
- East Tennessee Housing Development Corporation
- HomeSource east tennessee
- Knox County Community Development Department
- Knoxville-Knox County Community Action Committee
- Knoxville's Community Development Corporation
- Knoxville Habitat for Humanity
- Knoxville Leadership Foundation
- Neighborhood Housing, Inc.
- Southeastern Housing Foundation

AIR QUALITY

Air pollution from traffic, coal-fired power plants, and other industrial sources can have a negative effect on human health. Standards for air pollution levels are based on the known health effects of pollution and quantified in the National Ambient Air Quality Standards (NAAQS). Rolling three-year averages of pollution levels are used to determine whether a community's air is meeting NAAQS. The Knox County Health Department's Air Quality Management Division is responsible for achieving and maintaining outdoor air quality in Knox County that meets NAAQS standards.

Knox County's air quality has improved substantially since 2007. These improvements stem mostly from the installation of additional control devices to reduce emissions at coal-burning facilities such as power plants, and more stringent federal vehicle emission standards.⁸²

PARTICLE POLLUTION

Particle pollution, also called particulate matter (PM), is made up of tiny particles of solids or liquids such as dust or smoke that are in the air. Very small particles (called PM 2.5 because they are 2.5 microns or less in width) are dangerous because they can get into the deepest parts of a person's lungs or even into their blood.⁸³ Particle pollution has been linked to eye, lung and throat irritation; trouble breathing; and lung cancer.

Average PM 2.5 levels in Knox County fell by 51% from 2007 to 2018.⁸² Levels of PM 2.5 pollution in Knox County are at the healthiest levels since measurement began in 1999, and have been meeting NAAQS since 2017.⁸²

Community resources for outdoor air quality

- Airnow.gov
- Knox County Health Department

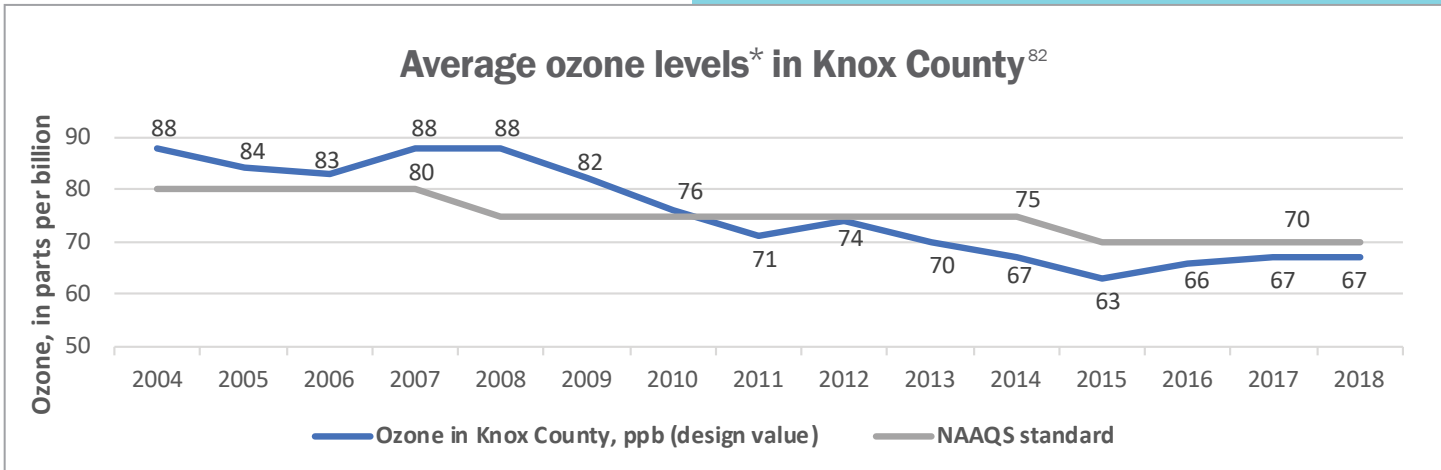
Environmental Health

OZONE

Ozone is a harmful air pollutant, and the main ingredient in smog. Smog is formed when pollutants from vehicle emissions and other sources react with one another in the presence of heat from sunlight. Ozone has been linked to coughing and pain when taking a deep breath, lung and throat irritation, wheezing, and trouble breathing during exercise or outdoor activities.⁸⁴ The graph below shows a rolling three-year average of ozone levels in Knox County, and how this average compares to NAAQS.⁸²

Community resources around respiratory diseases include:

- American Lung Association Tennessee chapter (located in Nashville)
- Primary care providers
- Various respiratory clinics, providers and specialists

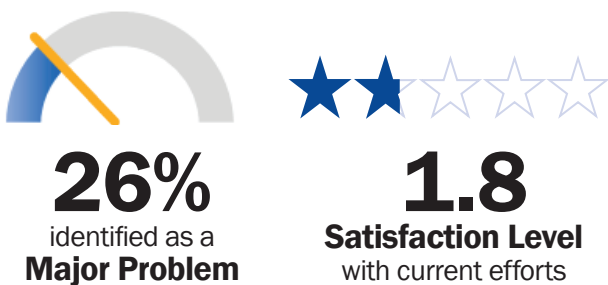


*Three-year rolling average

Both ozone and particle pollution can affect anyone, but they are especially dangerous for people with heart or lung diseases, older adults, children and babies.

For daily air quality updates and forecasts, visit airnow.gov, which features the Air Quality Index (AQI) and map, searchable by ZIP code. The AQI is a reporting tool that classifies current and forecasted levels of air pollution based on its effects on human health. The AQI reports daily air quality from a value of 0-500. Values greater than 100 indicate unhealthy levels of air pollution. Under these standards, pollutant levels deemed 'good' (AQI of 0-50) or 'moderate' (AQI of 50-100) do not have known significant health effects on humans.

What do Knox County residents think about air quality?



Although a majority of survey respondents did not identify air quality as a major problem, respondents from downtown Knoxville and south Knox County were more likely to indicate it is a major problem.

Category	AQI Value	Concentrations	
		PM 2.5 (µg/m3)	Ozone (ppb)
Good	0-50	0-12.0	0-54
Moderate	51-100	12.1-35.4	55-70
Unhealthy for Sensitive Groups	101-150	35.5-55.4	71-85
Unhealthy	151-200	55.5-150.4	86-105
Very Unhealthy	201-300	150.5-250	106-200
Hazardous	301-500	>251	n/a

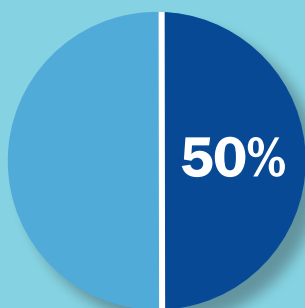
Environmental Health

WATER QUALITY

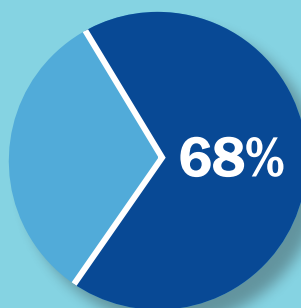
Tennessee has over 60,000 miles of rivers and streams and more than 580,000 lake and reservoir acres. The Tennessee Department of Environment and Conservation (TDEC) is charged with monitoring and protecting these resources. As of 2016, almost half of the stream miles and nearly all the large reservoirs had been monitored and assessed to determine if they are supporting their designated uses.⁸⁵

There are seven designated uses for Tennessee waterways, including fish and aquatic life, recreation, and irrigation. Waterbodies can be classified for multiple uses. Waters are impaired (polluted) when water quality criteria – Tennessee’s clean water goals – are violated often and badly enough that the designated uses are no longer possible.⁸⁵

Water bodies in Tennessee fully supporting of their designated uses, 2014⁸⁵



Assessed streams and rivers



Assessed reservoir acres

What do Knox County residents think about water quality?



14%
identified as a
Major Problem



1.6
Satisfaction Level
with current efforts

The most common causes of pollution in rivers and streams are pathogens (mostly E. coli from human and animal waste), habitat alteration (changes to the physical structure of river and stream beds and banks), sedimentation (soil particles that clog waterways) and nutrients (such as phosphorus from fertilizers and human and animal waste). The main sources of these pollutants are hydrologic modifications (such as building dams), municipal dischargers (such as failing septic systems and municipal storm sewer systems) and agriculture.

The leading causes of pollution in reservoirs and lakes are toxic chemicals such as PCBs (polychlorinated biphenyls) and heavy metals. The primary sources of these pollutants are the historical discharge of pollutants that have accumulated in sediment and the atmospheric deposition of mercury.⁸⁶ PCBs were extensively used in the U.S. for industrial and commercial applications until they were banned in 1976, and it is not known how many tons ended up in the sediment lining the bottoms of waterways in Tennessee.⁸⁶ Atmospheric mercury comes from coal-burning power plants, and to a lesser extent, incinerators and industrial facilities.⁸⁷

Community resources for water quality include:

- City of Knoxville Stormwater Engineering Division
- Knox County Health Department
 - Environmental Health division
- Knox County Stormwater Division
- Local utilities
- Tennessee Department of Environment and Conservation
- Tennessee Valley Authority

Environmental Health

LEAD

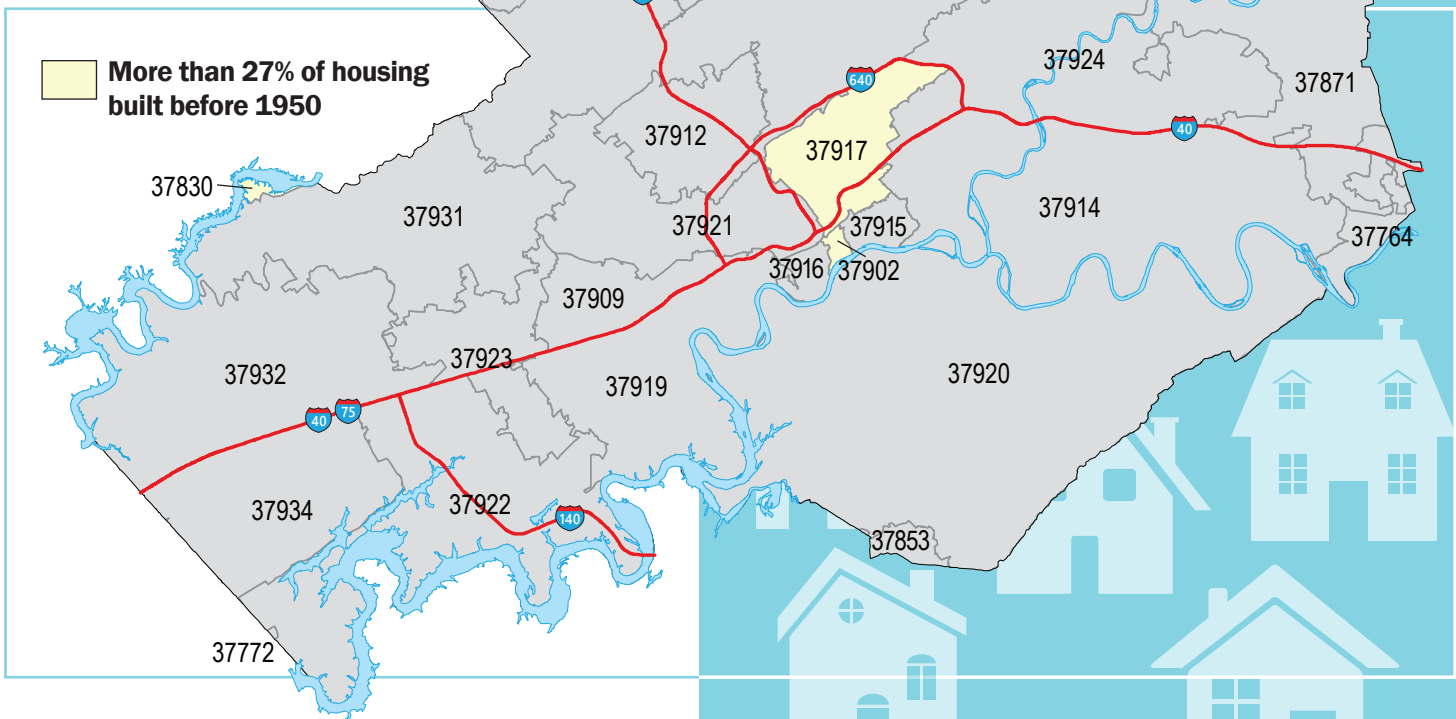
Lead poisoning is when a person's health or body functions are negatively affected by lead contamination in their environment. Children are at especially high risk for lead exposure because of their small size and developing brains. The majority of lead exposure happens in the home, stemming from lead-based paint. Even low levels of lead in the blood of children age 6 and under have been shown to affect a child's IQ, ability to pay attention and academic achievement.⁸⁸

A blood lead level of more than 5 micrograms per deciliter in a child under the age of 6 is considered elevated, and the CDC recommends that all children be screened at 12 and 24 months of age. They also recommend universal screening among children under age 6 who live in communities where more than 27% of the housing stock was built before 1950.⁸⁹

In Knox County, 11.6% of the housing stock was built prior to 1950.

Lead-based paint (usually in houses built before 1978) and lead-contaminated dust are the most widespread and hazardous sources of lead exposure for young children the U.S., though lead can also sometimes be found in soil; older water pipes and plumbing systems; and products such as toys or jewelry.⁸⁸

ZIP codes with the highest risk of lead exposure have at least 27% of housing stock built before 1950.

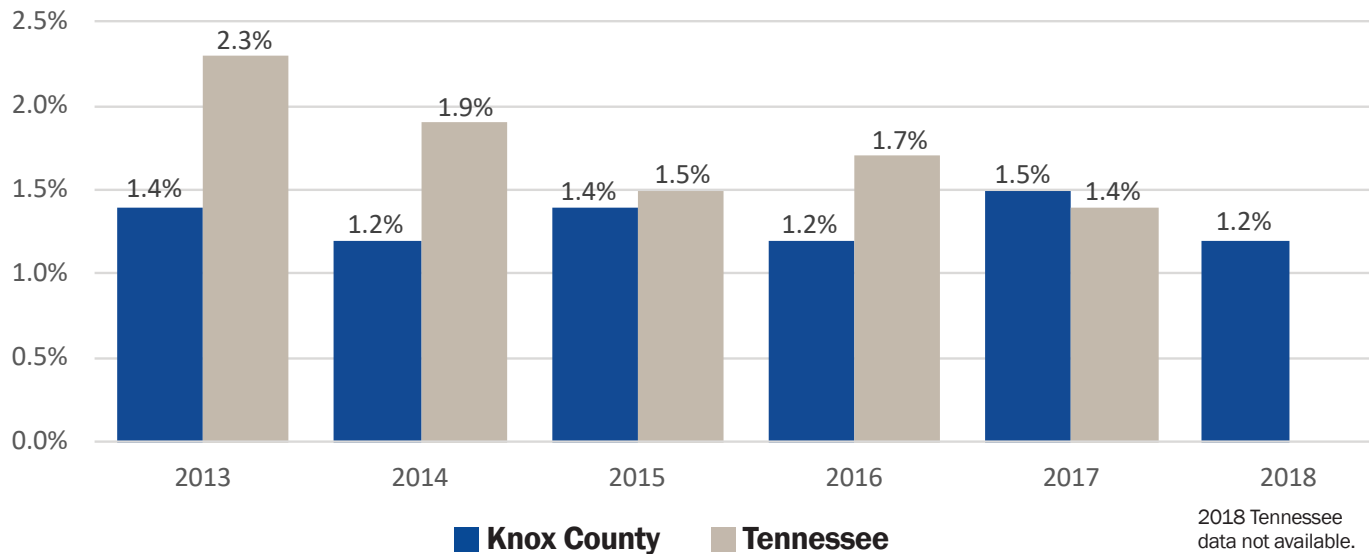


Community resources for lead exposure treatment and prevention include:

- Tennessee Department of Environment and Conservation's Lead Hazard Reduction Program, and Lead Line: 888-771-LEAD (5323)
- Tennessee Department of Health

Environmental Health

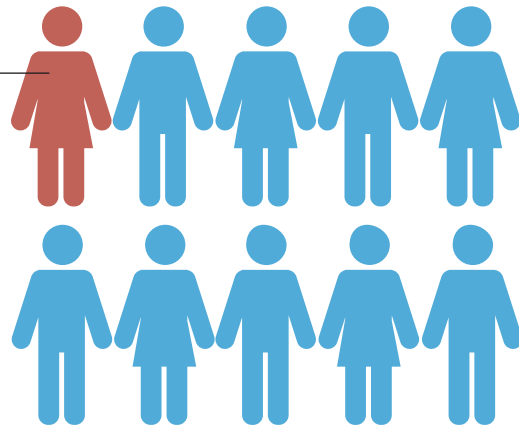
Children under age 6 with elevated blood lead levels*⁹⁰



*As a percentage of children screened

LEGIONELLA

Illness caused by the bacteria Legionella can present in several ways but most commonly leads to a severe pneumonia known as Legionnaires' disease. This illness is serious and has a high mortality rate. **Approximately one in 10 people who get Legionnaires' disease will die.** The bacteria live naturally in freshwater environments and can become a health concern when it grows and spreads in water systems such as hot tubs, plumbing systems, and cooling towers. Special considerations are taken during construction projects requiring a water stoppage within health care facilities to ensure the bacteria are not allowed to grow in the water system and therefore pose a risk to patients or residents through uses of showers, faucets, etc. Prevention with water management programs and risk evaluations during construction events is required in a health care setting using an infection control risk assessment or ICRA. If an outbreak is identified in a setting such as a hotel, environmental health assessments are done in order to remedy the underlying issue and prevent further illness.¹⁰⁵ From 2014 to 2018, Knox County had an average of 15 cases of Legionellosis each year.⁹³



Infectious Disease

Infectious diseases are illnesses caused by germs (such as bacteria, viruses and fungi) that enter the body, multiply and cause an infection. Some infectious diseases are contagious, that is, spread from one person to another, while others can be spread through air, water, food or soil. Still others can be spread by insects or animals. Many infectious diseases can be prevented through vaccination.

Note: Information on sexually transmitted diseases can be found in the Sexual Health section of this document.

OUTBREAKS

As the local public health authority, KCHD investigates an average of 11 outbreaks per year. Health care providers are required by law to report cases of more than 80 specific infectious diseases to KCHD. An outbreak occurs when two or more unrelated individuals experience the same symptoms and share a common exposure such as an event, meal or activity within a specified timeframe. The majority of outbreaks KCHD investigates involve diseases transmitted person-to-person, such as respiratory and gastrointestinal infections, in congregant settings such as long-term care and child care facilities.

In 2019, the Knox County Health Department investigated and responded to more than

8,000

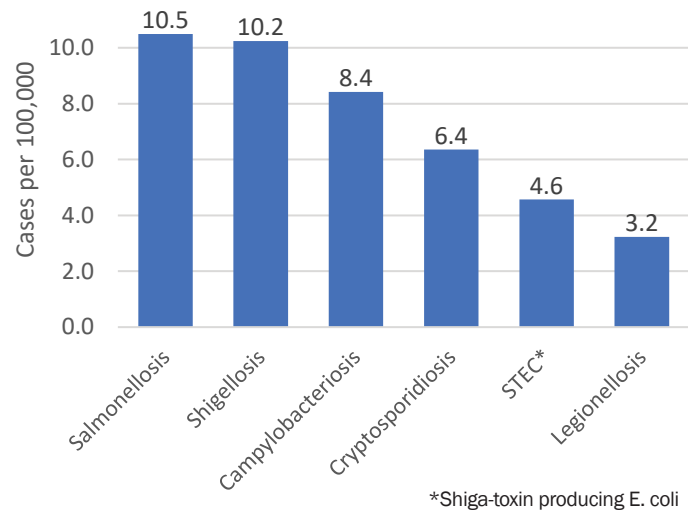
individual cases of infectious disease.

FOODBORNE AND WATERBORNE DISEASE

Foodborne diseases are the result of ingesting food products that are contaminated with bacteria, viruses or parasites, and cause diarrhea, vomiting, stomach cramps, nausea and sometimes fever. Salmonellosis is the most commonly reported foodborne illness with more than 50 cases reported each year in Knox County. Illness from a foodborne disease can be prevented through appropriate food preparation, cleaning and cooking, as well as proper hand-washing to avoid cross-contamination.⁹¹

Water contaminated with bacteria or parasites can lead to waterborne illness if a person drinks it, inhales droplets or if the contaminated water comes into contact with mucous membranes such as skin, eyes or ears. Potential sources of outbreaks include drinking water, recreational water or other water in the environment such as flood water.⁹² Cryptosporidiosis, a diarrheal illness, is the most commonly reported waterborne disease in Knox County and Tennessee.

Average rates of reportable foodborne and waterborne diseases in Knox County, 2014-18⁹⁵



RESPIRATORY DISEASE TRANSMISSION

Influenza/flu is separate from other vaccine-preventable diseases in this section because of its relatively high incidence.

Influenza (flu) is a contagious respiratory illness that causes fever, cough, sore throat, runny or stuffy nose, muscle or body aches, headaches, and fatigue. Flu season typically spans from October through March of each year. While individual cases of flu are not usually reportable to public health, pediatric deaths, pregnancy-associated deaths and novel (new) strains of the flu virus are reported. While exact numbers of seasonal flu cases are not available, public health officials across the country partner with a select group of providers who voluntarily report positive flu tests during the season in an effort to estimate disease numbers in the community, a sampling method otherwise known as sentinel surveillance.

Infectious Disease



According to the CDC, **12,000-79,000 people have died** from flu each year in the U.S. since 2010.⁹⁴

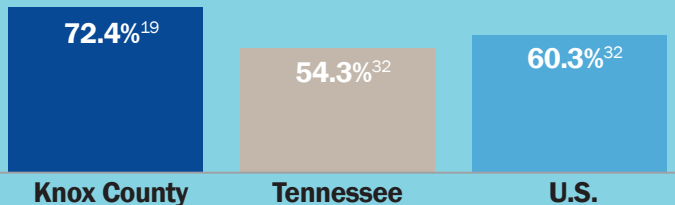
During the 2017-18 flu season, flu vaccination prevented an estimated 6.2 million influenza illnesses, 3.2 million influenza-associated medical visits, 91,000 influenza-associated hospitalizations and 5,700 influenza-associated deaths.⁹⁴



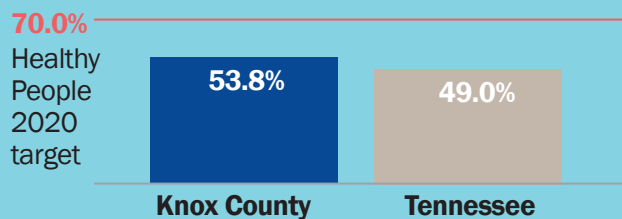
However, in 2018, only half of adults ages 18 and over in Knox County (50.2%) reported they had a flu shot or flu vaccine in the past 12 months.¹⁹

The best way to prevent seasonal influenza is to get an influenza vaccine every year. Vaccination is available for all persons six months old and older. Vaccination is particularly important for people who are at risk of developing serious flu complications including people 65 and older, people with chronic medical conditions, pregnant women and children younger than 5.⁹⁴

Rate of influenza vaccination among adults ages 65 and older, 2018



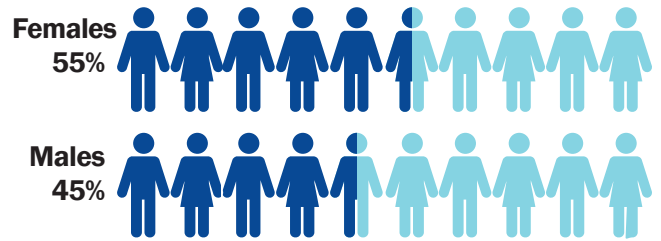
Children ages 2 and younger who have received the recommended two doses* of flu vaccine, 2018⁹⁵



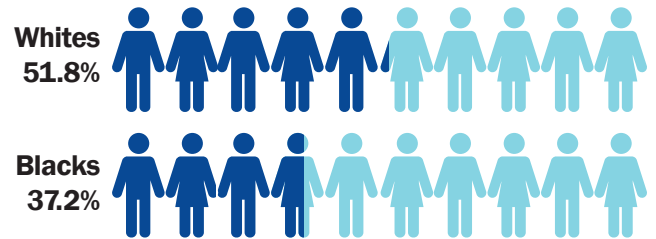
*The CDC recommends that children getting the flu vaccine for the first time get two doses of vaccine.



Knox County adults who received the flu vaccine, by gender, 2018¹⁹



Knox County adults who received the flu vaccine, by race, 2018¹⁹



More than four out of five (84.1%) adults ages 65 years and older reported they have had at least one pneumococcal pneumonia vaccine in their lifetime, and there were no statistical differences by race, education or income.¹⁹ This falls short of the Healthy People 2020 target of 90%.

What do Knox County residents think about flu and pneumonia?



23%
identified as a
Major Problem



4.0
Satisfaction Level
with current efforts

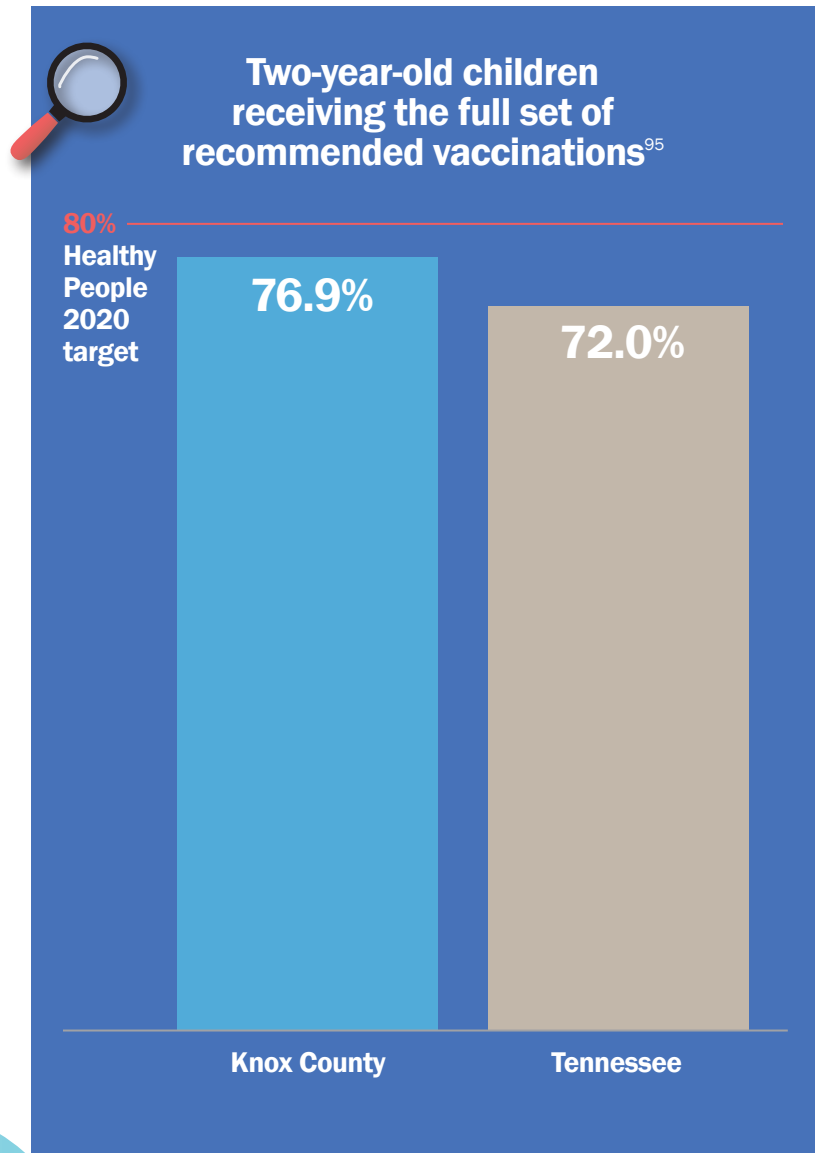
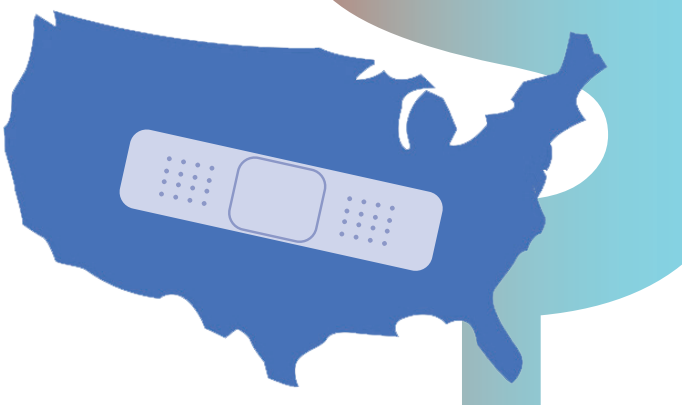
- About a quarter of survey respondents identified flu and pneumonia as major problems.
- Flu was mentioned in the focus groups, which occurred just after Knox County Schools were closed for several days due to illness.
- Survey respondents reported a comparatively high level of satisfaction with how these problems are being addressed.

VACCINE-PREVENTABLE DISEASES

Vaccine-preventable diseases include any disease that may be controlled, in full or in part, by vaccination. Most vaccine-preventable diseases are spread person-to-person, though some – such as tetanus – are not. Diseases that used to be common and sometimes deadly in the U.S., such as polio and whooping cough, can now be prevented by vaccination. According to the CDC, vaccinations work on the principle of “herd immunity” – when a large percentage of the population is vaccinated against a disease, it’s harder for the disease to spread.⁹⁶ Outbreaks of vaccine-preventable diseases still happen, largely due to low vaccination rates in specific populations.⁹⁶ Vaccination protects the person receiving the vaccine, and also helps to keep diseases from spreading to others, such as family members, neighbors, classmates and other members of the community. Vaccination is a highly effective, safe and easy way to stay healthy.⁹⁶

Annual economic benefit of vaccination in the U.S.⁹⁷

- Saves **33,000** lives
- Prevents **14 million** cases of disease
- Reduces direct health care costs by **\$9.9 billion**
- Saves **\$33.4 billion** in indirect costs such as work absenteeism



In 2018, 2-year-old children in Knox County exceeded the Healthy People 2020 target for completion of the following vaccinations: measles, polio, hepatitis B, varicella/chicken pox and hepatitis A.⁹⁵

Two-year-old children in Knox County did not meet the Healthy People 2020 targets for completing the following vaccinations (2018):⁹⁵

- DTaP (diphtheria-tetanus-acellular pertussis)
- Full series of Hib (Haemophilus influenza type B)
- PCV (pneumococcal conjugate vaccine)
- Influenza
- Full series of rotavirus

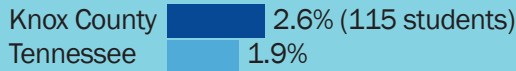
Infectious Disease

Knox County Schools kindergarten immunization compliance, 2019^{98, 99}

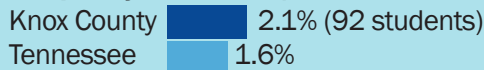
• Fully immunized



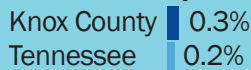
• Religious exemption



• Temporary certificate (indicates intent to vaccinate)



• Medical exemption

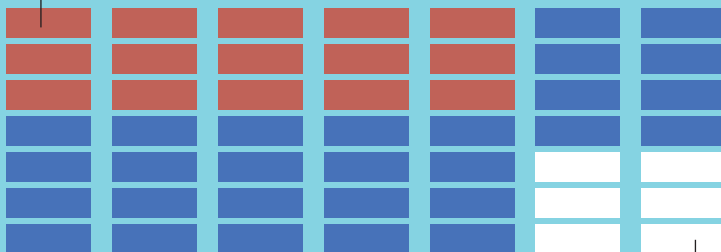


• Missing/incomplete record



Of 49 elementary schools in Knox County ...

15 schools had less than a 94% vaccination rate.



Six schools had a vaccination rate of 100%.⁹⁸

Statewide HPV vaccination rate

56.1% of youth ages 13-17 in Tennessee have had at least one dose (of the recommended three dose series) of the HPV vaccine, compared to 65.5% in the U.S. as a whole.¹⁰¹



Tennessee

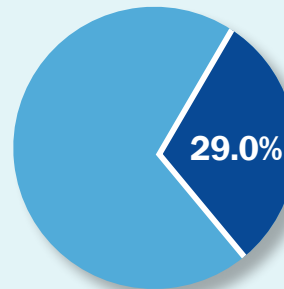


U.S.

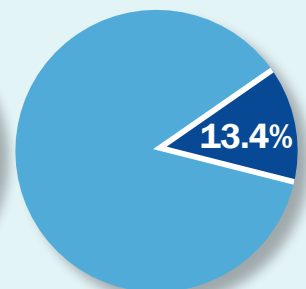
The vast majority of kindergarteners in Knox County and Tennessee are immunized.

Human Papillomavirus (HPV) is responsible for 91% of all cervical cancers, as well as other types of cancer, and the HPV vaccine prevents these cancers. HPV vaccination is routinely recommended at age 11 or 12, and for anyone up to age 26 who has not had the vaccine series.

Knox County adults ages 18-49 who have had the HPV vaccine¹⁹



Females



Males

Community resources for immunizations include:

- Cherokee Health Systems
- Free Medical Clinic of America
- Haslam Sansom Ministry Complex Health Center
- InterFaith Health Clinic
- Knox Area Project Access
- Knox County Health Department
- Primary care providers
- Retail pharmacies
- Walk-in clinics

HEPATITIS

Hepatitis means inflammation of the liver. It can be caused by heavy alcohol use, some medications and certain medical conditions. However, hepatitis is often caused by a virus. In the United States, the most common types of viral hepatitis are hepatitis A, hepatitis B and hepatitis C. Vaccines are available for hepatitis A and B. Hepatitis B and C are leading causes of liver cancer. East Tennessee has a higher rate of hepatitis C infections compared to the U.S. as a whole, at least partially because of East Tennessee's comparatively high rate of injection drug use.¹⁰²

Hepatitis A is transmitted via the fecal-oral route. This means that when an infected person uses the restroom, does not properly wash their hands, and then touches food or other objects, they can contaminate it and spread hepatitis A to other people.¹⁰²

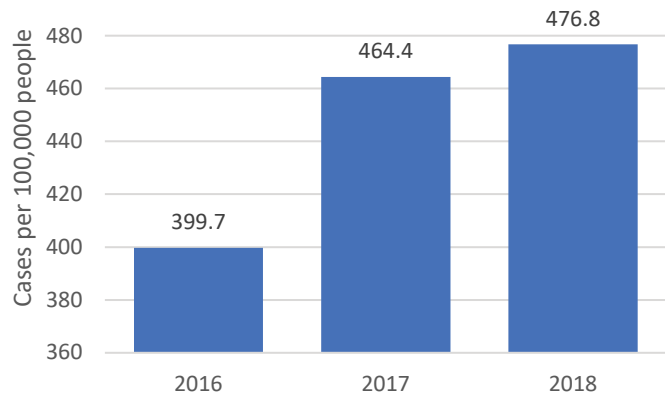
Hepatitis B is transmitted when blood, semen or other body fluids from an infected person enters the body of someone who is not infected. Additionally, a mother may transmit hepatitis B to her baby during birth; therefore, immunization after birth is extremely important to prevent the baby from becoming chronically infected. Babies who don't get vaccinated against hepatitis B have a higher chance of chronic infection.¹⁰²

Hepatitis C is transmitted when blood from an infected person enters the body of someone who is not infected. Those who use or have used injection or intranasal drugs and recipients of blood transfusions or organ transplants before 1992 are at increased risk for hepatitis C. While there is a high prevalence of hepatitis C among adults born from 1945 to 1965, today, hepatitis C is most commonly transmitted by sharing needles or other equipment to use drugs.¹⁰² All equipment used to prepare and inject or snort drugs can spread hepatitis C when contaminated and shared.¹⁰² The highest rates of hepatitis C infection are in states that are deeply affected by the opioid crisis, particularly western and Appalachian states compared with other areas of the U.S.¹⁰³

Hepatitis B and C may cause chronic conditions, such as cirrhosis and liver cancer, whereas hepatitis A does not.¹⁰²

There are an estimated 850,000 to 2.2 million cases of chronic hepatitis B in the U.S. and an estimated 3.5 million (1% of the population) cases of chronic hepatitis C.¹⁰²

Cases of chronic hepatitis C* per 100,000 people in Knox County¹⁰⁴

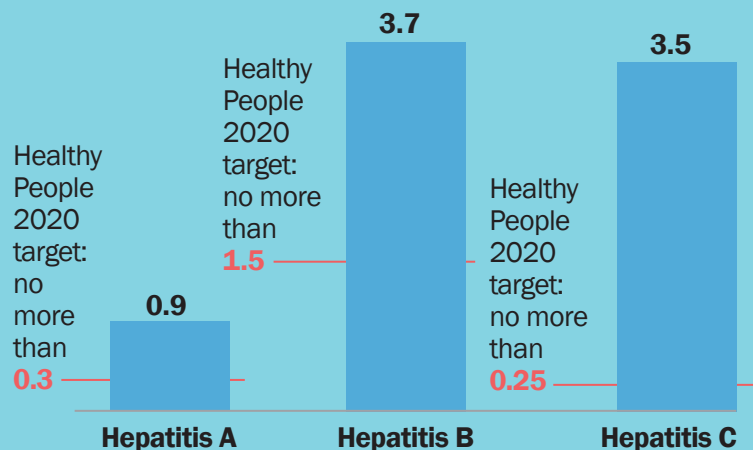


*Includes confirmed and probable cases.



From 2016 to 2018, the number of **chronic hepatitis C** cases per 100,000 people in Knox County increased by **16.8%**¹⁰⁴

New hepatitis cases in Knox County, per 100,000 people, 2018¹⁰⁴



From 2017 to early 2020, Knox County, as well as Tennessee and the U.S., were responding to an outbreak of hepatitis A among people who are homeless and/or use drugs.¹⁰² Historically, risk factors for hepatitis A included foreign travel, consuming contaminated food and water, or coming in contact with someone who has an acute case of hepatitis A. In 2019, traditional risk factors were expanded to include recreational drug use.¹⁰²

VECTOR-BORNE DISEASE

Vector-borne diseases are transmitted to humans by vectors such as fleas, ticks and mosquitoes. Historically, rates of these diseases in Knox County are low. The most common vector-borne disease in Knox County is Rocky Mountain spotted fever, spread through the bite of infected ticks, most often in the summer months.

Average annual number of cases of select vectorborne diseases, 2014-2018¹⁰⁵

	Knox County	Tennessee
Rocky Mountain spotted fever	5.0	611.8
La Crosse encephalitis virus	3.2	10.2
Zika virus disease, non-congenital	2.2	14.2
Chikungunya virus	1.2	11.6
Dengue	1.0	7.2
Lyme disease	1.0	28.4
Malaria	1.0	16.8
Ehrlichiosis	0.8	98.6
West Nile virus	0.4	14.6

LA CROSSE ENCEPHALITIS VIRUS (LACV)

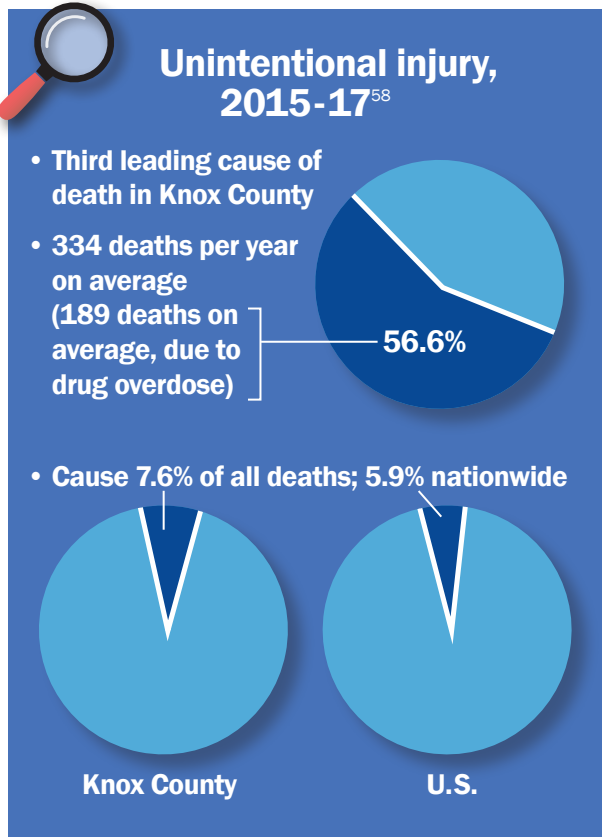
La Crosse encephalitis virus (LACV) is transmitted through the bite of an eastern treehole mosquito (*Aedes triseriatus*). Disease caused by LACV affects, on average, 1-5 people every year in Knox County, primarily from late spring through early fall. On average, cases in Knox County account for approximately 30% of the reported cases in Tennessee each year. While crude rates of LACV may be low compared to other reported illnesses, this illness disproportionately affects children under the age of 16. While it is thought that this condition is underreported due to lack in diagnosis in milder illness, neuroinvasive disease reported in children can consist of headache, nausea, vomiting, meningoencephalitis and seizures. Barrier spraying around individual properties can help control *Aedes triseriatus* mosquitoes, which transmit La Crosse encephalitis virus. But large scale spraying is difficult since these mosquitoes dwell in forest habitats. Removing tires and other debris that accumulate standing water around the property is helpful, as well as using mosquito repellants during the daytime when these mosquitoes are active.¹¹³



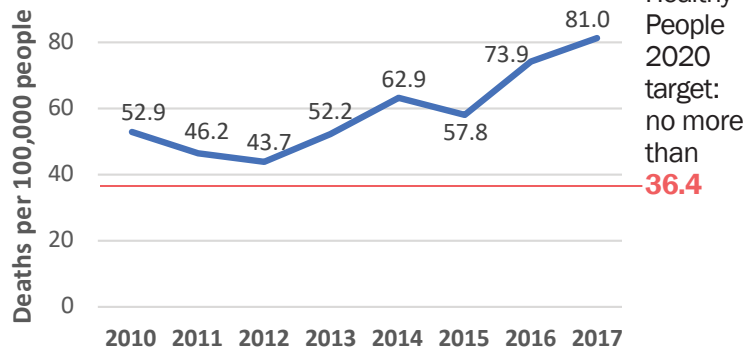
Injury and Violence

UNINTENTIONAL INJURY

The most common types of fatal injuries are poisoning, motor vehicle accidents and falls. Recent increases in poisonings are driven mainly by drug overdose, which is covered in-depth in the Substance Use and Misuse section of this report.



Death rate from unintentional injuries in Knox County⁵⁸ *



*Calculated, in part, using overdose death data compiled by the CDC, which differs from local counts of overdose deaths.

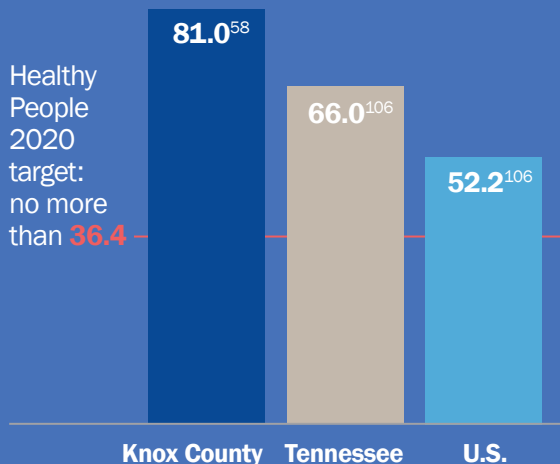
For more information, see the Substance Use and Misuse section of this report.

MOTOR VEHICLE ACCIDENTS

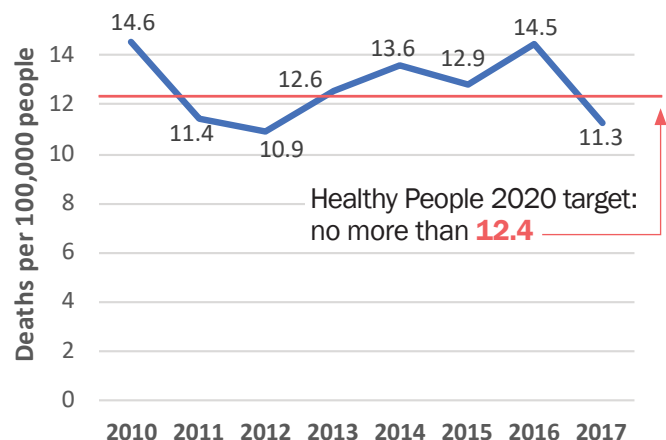
Knox County's rate of motor vehicle accident deaths in 2017 was **11.26** per 100,000 people, which meets the Healthy People 2020 target of **12.4** per 100,000 people.⁵⁸

In Tennessee, crash-related deaths cost an estimated \$1.25 billion in one year. The vast majority of that cost is lost productivity.¹⁰⁷

Rate of deaths from unintentional injuries per 100,000 people, 2017



Death rate from motor vehicle accidents in Knox County⁵⁸



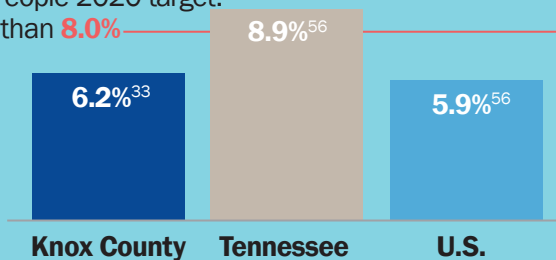
Injury and Violence

SEAT BELT USE

Seat belt use is one of the most effective ways to save lives and reduce injuries in car crashes. Nationally, 86% of drivers and front seat passengers wear seat belts. In Tennessee, that number is 84%.¹⁰⁷

Percentage of high school students who rarely or never wear a seat belt, 2017

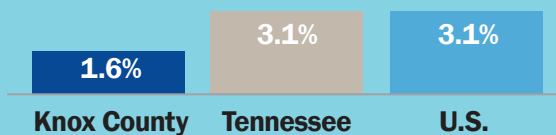
Healthy People 2020 target: no more than **8.0%**



DRUNK DRIVING

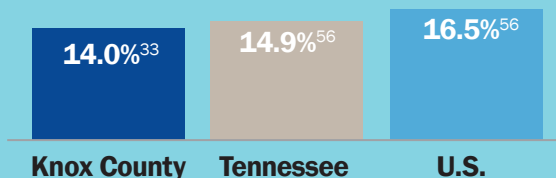
Nationally, about one in three traffic deaths involve a drunk driver. Drivers with a blood alcohol concentration of 0.08% or higher are considered alcohol-impaired (drunk drivers) by law.¹⁰⁷

Percentage of adults ages 18 and older who report driving after drinking too much in the past 30 days, 2018^{32, 19}



Percentage of high school students who have ridden in a car in the past 30 days driven by someone who had been drinking alcohol, 2017

Healthy People 2020 target: no more than **25.5%**



Percentage of high school students who have driven a vehicle at least once in the past month when they had been drinking alcohol, 2017



DISTRACTED DRIVING

Types of Distraction¹⁰⁷

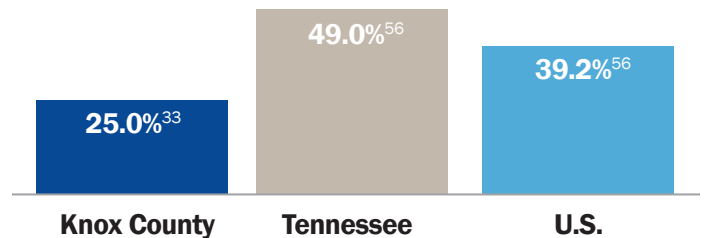
Visual: taking your eyes off the road

Manual: taking your hands off the wheel

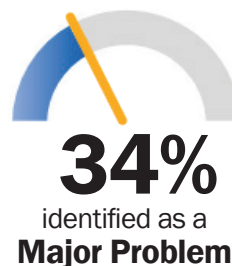
Cognitive: taking your mind off driving

Each day in the U.S., nine people are killed in crashes reported to involve a distracted driver. Drivers under the age of 20 have the highest proportion of distraction-related fatal crashes.¹⁰⁷

Percentage of high school students who have texted or emailed while driving in the past 30 days, 2017



What do Knox County residents think about motor vehicle accidents?



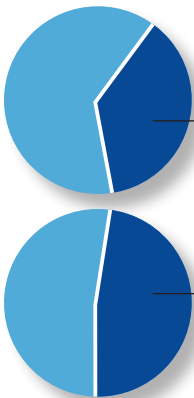
Injury and Violence

BICYCLE AND PEDESTRIAN SAFETY

Nationally, most bicyclist and pedestrian deaths occur in urban areas, at non-intersection locations and at night.¹⁰⁷ Bicycle helmets and rider/pedestrian visibility both reduce the risk of injury and death. There were 143 bicyclist and pedestrian crashes with cars in Knox County in 2017. The number of crashes has remained stable since detailed measurement began in 2011.¹⁰⁸

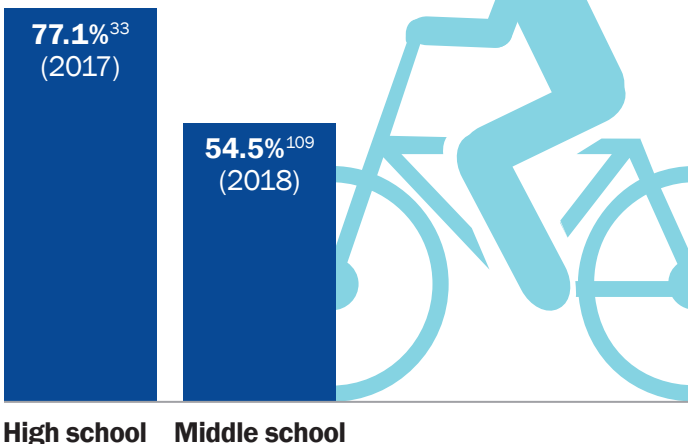
Within the City of Knoxville from 2007 to 2018, the most common factor involved in pedestrian and bicycle crashes with cars was drivers failing to yield while turning (46% of crashes). In the areas of Knox County outside the City of Knoxville, from 2011 to 2018, the most common factor was a pedestrian walking along a road without sidewalks (34% of crashes).¹⁰⁸

Alcohol and bicyclist/pedestrian deaths in the U.S.¹⁰⁷



- **Among bicyclist deaths,** 37% involved alcohol for either the driver or the bicyclist
- **Among pedestrian deaths,** 48% involved alcohol for either the driver or the pedestrian

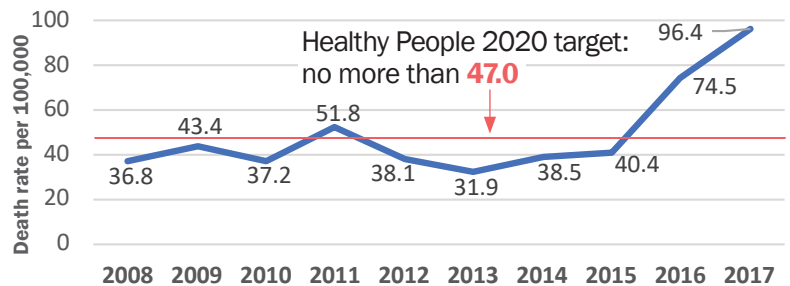
Knox County students who ride bikes but rarely or never wear a helmet when they ride



FALLS

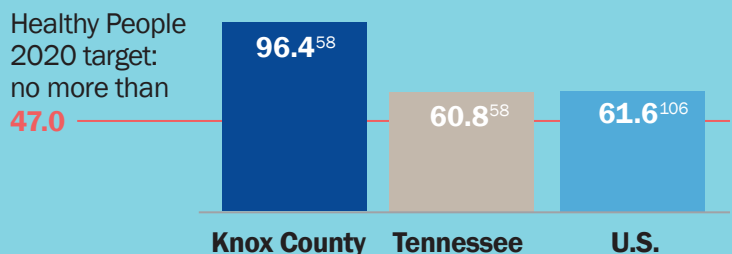
In 2017, falls caused 68 deaths and 4,938 hospital visits among adults ages 65 and over in Knox County.⁵⁸ Nationally, more than one in four adults ages 65 and over fall each year. Falls are the most common cause of both hip fractures and traumatic brain injuries. These injuries profoundly affect independence and quality of life.¹¹⁰ One of the major risk factors for falls is medications and their side effects, such as dizziness.¹¹⁰ Nationally, the average hospital cost for a fall injury is \$30,000. The estimated medical cost of falls across the U.S. health care system is \$50 billion per year, 75% of which is paid by Medicare and Medicaid.¹¹⁰

Death rate from falls, adults ages 65 and older, Knox County⁵⁸



Knox County's death rate from falls among adults ages 65 and older more than doubled from 2015 to 2017. Reasons for the increase are unclear.

Death rate from falls per 100,000 adults ages 65 and older



Community resources for fall prevention include:

- Knox County Health Department, Senior Fall Prevention Program
- Senior centers

VIOLENCE

BULLYING AND SAFETY

Bullying is unwanted, aggressive behavior that involves a real or perceived power imbalance. The behavior is repeated, or has the potential to be repeated, over time. This section will focus on bullying among youth because there are local data on youth but not adult bullying. Bullying does not happen only at school. Many of the issues that contribute to a child's potential to bully, or to be bullied, are family and community issues such as viewing violence in a positive way, or a lack of parental involvement.¹¹¹

Cyberbullying is bullying that takes place over digital devices such as cell phones, computers or tablets. Cyberbullying can occur on social media such as Instagram or Snapchat, via text or email, or on instant messaging apps. Cyberbullying is harder for adults to recognize, since they usually do not see or hear it happening.¹¹¹

Risk factors for being bullied^{111, 112}

- Depression, anxiety or low self-esteem
- Adverse childhood experiences
- Social isolation



Kids who are bullied are more likely to experience:¹¹¹

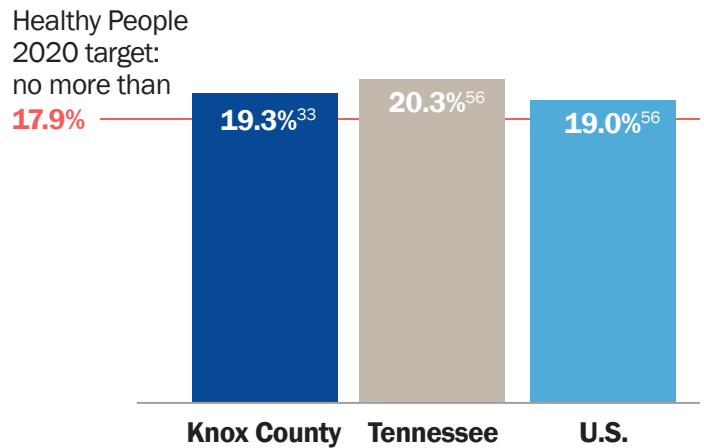
- Depression and anxiety, which may persist into adulthood
- Health complaints, such as frequent headaches or stomachaches
- Decreased academic achievement

Kids who bully others are more likely to:^{111, 112}

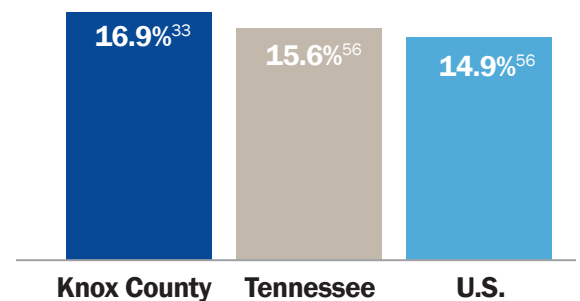
- Have adverse childhood experiences
- Abuse alcohol and other drugs in adolescence and as adults
- Drop out of school
- Engage in early sexual activity
- Have criminal convictions as adults
- Be abusive toward their partners, spouses or children as adults

In Knox County, **19.3%** of high school students have been bullied on school property in the last year.³³ This does not meet the Healthy People 2020 target of no more than **17.9%** of high school students being bullied.

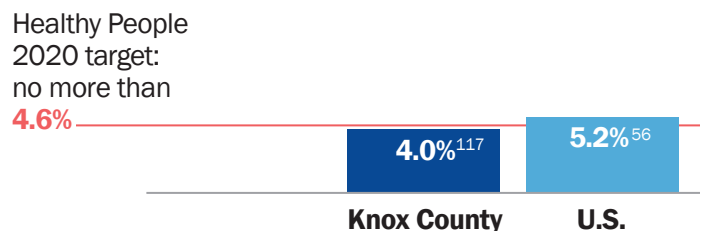
High school students who have been bullied on school property in the past 12 months, 2017



High school students who have been cyberbullied in the past 12 months, 2017

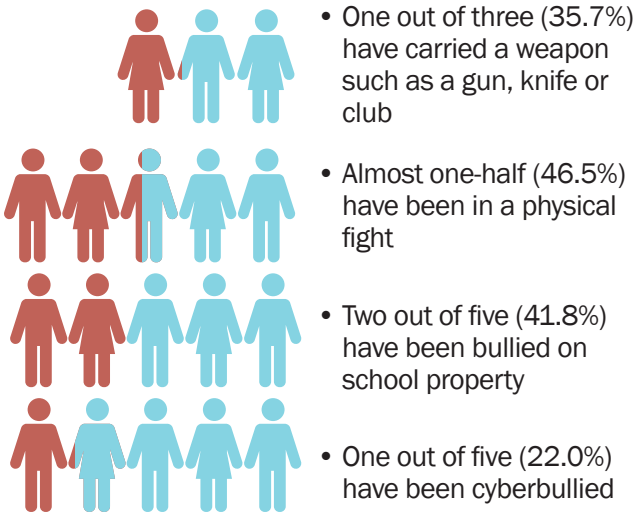


High school students who carried a weapon on school property at least once in the past 30 days, 2013



Injury and Violence

Knox County middle school students, 2018¹⁰⁹



CRIME

Exposure to crime and violence in one's community is an adverse childhood experience (ACE), and can increase the risk of serious health effects, from premature death and non-fatal injuries to negative long-term health outcomes. Some research indicates that fear of crime in one's community is associated with lower levels of physical activity and higher levels of obesity.¹³ For more information see the Drivers of Health section of this report.

This section focuses on violent crime because it is a significant public health issue with many individual and societal costs.

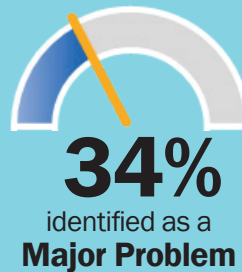
The Federal Bureau of Investigation (FBI) strongly discourages the ranking of jurisdictions or law enforcement agencies by crime statistics. Demographic and socioeconomic differences, as well as differences in enforcement patterns and other factors, can contribute to unfair depictions and comparisons.¹⁴³



Knox County middle school students who have carried a weapon, by race, 2018¹⁰⁹

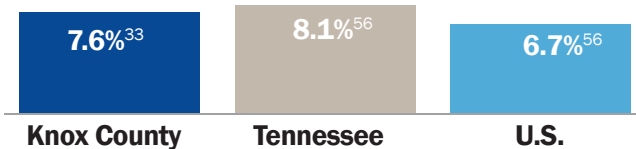


What do Knox County residents think about crime?

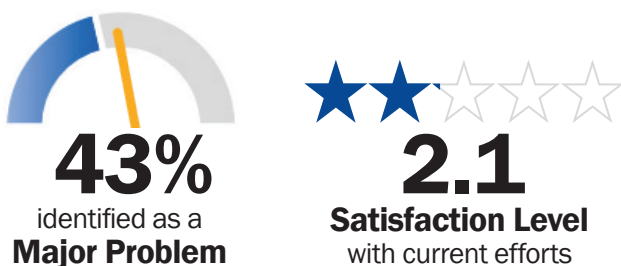


- Overall, crime was identified as a major problem by one-third of survey respondents.
- Black participants in the community survey listed it as one of the top three problems facing their community.
- Black focus group participants said crime is a major source of stress and a contributor to poor physical health.

High school students who did not go to school because they felt unsafe at school or on the trip to or from school, 2017



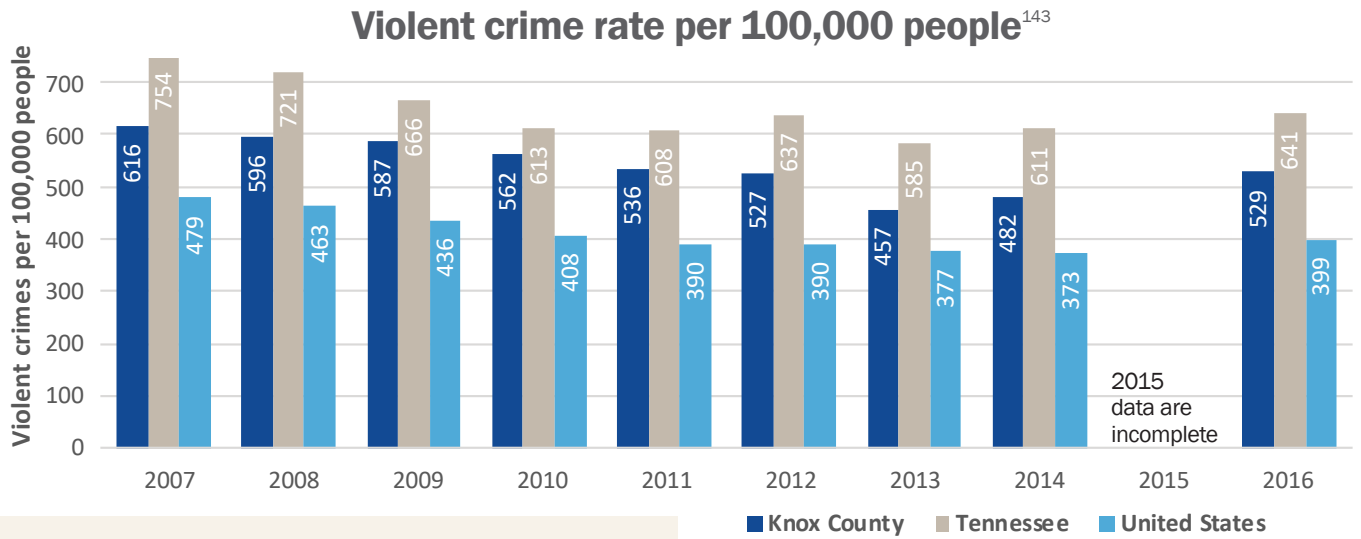
What do Knox County residents think about bullying?



Community resources for victims of crimes include:

- Knox County District Attorney General's Office
- Knoxville-Knox County Community Action Committee Office on Aging
- Law enforcement agencies
 - Knox County Sheriff's Office
 - Knoxville Police Department
- Legal Aid of East Tennessee

Injury and Violence



The FBI defines violent crimes as offenses that involve face-to-face confrontation between a victim and perpetrator, including homicide, rape, robbery and aggravated assault. Data from the FBI's Uniform Crime Reporting system is generally regarded as a valid and reliable index of the types of crimes residents view as serious events. In Knox County, Tennessee and the U.S., violent crime rates have generally been going down over the past ten years.¹⁴³



Have experienced severe physical violence from an intimate partner, in the U.S., 2015¹¹⁴



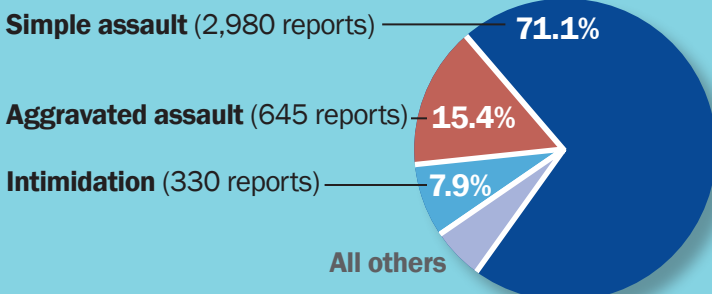
Data from U.S. crime reports suggest that 16% of murder victims are killed by an intimate partner, and that more than 40% of female homicide victims in the U.S. are killed by an intimate partner.¹¹⁵

DOMESTIC VIOLENCE



In 2018, there were **4,189** complaints of domestic violence in Knox County reported by the Knoxville Police Department and Knox County Sheriff's Office.¹¹⁶

Most commonly reported domestic violence crimes in Knox County, 2018¹¹⁶



Community resources for survivors of domestic violence include:

- Family Justice Center
- Law enforcement agencies
 - Knox County Sheriff's Office
 - Knoxville Police Department
- Legal Aid of East Tennessee
- Sexual Assault Center of East Tennessee
- YWCA

Injury and Violence

SEXUAL VIOLENCE

Sexual violence refers to sexual activity when consent is not obtained or not given freely. Anyone can experience sexual violence, but most victims are female. The person responsible for the violence is typically male and usually someone known to the victim.¹¹⁵



Sexual violence in the U.S., 2015¹¹⁴

Experienced sexual violence involving physical contact



Age of first assault for rape survivors in the U.S., 2015¹¹⁴

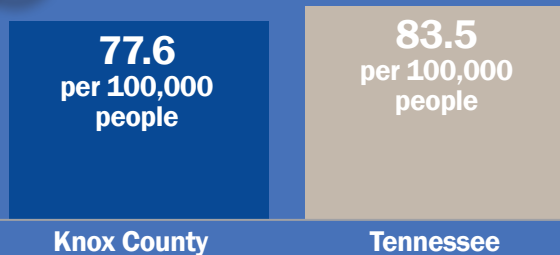
Females



Males



Non-consensual sexual offenses* reported to law enforcement, 2018¹¹⁶

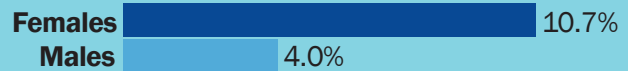


*Non-consensual sexual offenses include rape and forcible fondling, and also crimes such as incest and statutory rape in which the act may be consensual but is prohibited by law or one participant is under the statutory age of consent.

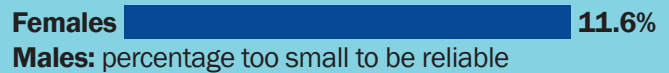
The majority of victims of non-consensual sexual offenses in Knox County and Tennessee were under the age of 18.¹¹⁶ These rates should be interpreted with caution, since sexual assault is consistently underreported.

Sexual violence among Knox County youth (2013, latest data available)¹¹⁷

7.3% of Knox County high school students have been physically forced to have unwanted sexual intercourse one or more times during their life.



8.7% of Knox County high school students have been physically forced to do unwanted sexual acts in a dating relationship



Survivors of sexual violence are more likely to experience:¹¹⁵

- Psychological impacts:** depression, anxiety, suicidal thoughts and post-traumatic stress disorder
- Physical impacts:** gynecological, gastrointestinal, cardiovascular and sexual health problems
- Risky behaviors:** smoking, substance misuse and unsafe sexual behavior
- Other forms of violence** such as intimate partner violence

Risk factors for committing sexual violence include:¹¹⁵

- Alcohol and drug use
- Early sexual initiation
- General aggressiveness and acceptance of violence
- Gender-related attitudes (such as hostility toward women)
- Exposure to sexually explicit media
- Adverse childhood experiences including physical, sexual or emotional abuse
- Community factors such as poverty and lack of employment opportunities

Injury and Violence

Protective factors that reduce the likelihood of sexual violence include:¹¹⁵

- Parental use of reasoning to resolve family conflict
- Emotional health and connectedness
- Academic achievement
- Empathy and concern for how one's actions affect others

Community resources for survivors of sexual violence include:

- Community Coalition Against Human Trafficking
- Family Justice Center
- Law enforcement agencies
 - Knox County Sheriff's Office
 - Knoxville Police Department
- Sexual Assault Center of East Tennessee
- Street Hope TN
- Tennessee Coalition to End Domestic and Sexual Violence

Maternal and Child Health

Maternal health is defined as the health of mothers during pregnancy, childbirth and in the postpartum period. It is heavily dependent on a woman's health before pregnancy. Child health is the health of children from birth through adolescence with a focus on the health of children under age five. Maternal and child health are considered important public health indicators for a community, because the well-being of mothers, infants and children determines the health of the next generation and can help predict future public health challenges.



The health outcomes described in this section vary by race, income and other factors.

At the national level, racial differences in adequate prenatal care, low birth weight, prematurity, and fetal and infant mortality are driven by many factors. Black mothers are less likely than white mothers to receive adequate prenatal care, and Black infants are at a higher risk of low birth weight and prematurity, all of which increase the risk for infant death. Low birth weight has been associated with several community-level factors, including poverty, unemployment, residential instability and segregation, and crime, that tend to disproportionately affect racial minority populations.^{118, 119} Chronic diseases associated with increased risk for pregnancy complications are more prevalent and less well-controlled in Black women, and Black women are more likely than white women to receive obstetric care in hospitals that provide lower quality of care.¹²⁰ For more information see the Drivers of Health section of this report.

Note: Childhood immunizations are covered in the Infectious Disease section of this report.

ADEQUATE PRENATAL CARE

Adequate prenatal care for a healthy, low-risk pregnancy is defined as care that begins by the fourth month of pregnancy, and in which at least 80% of the recommended health care visits are made. Adequate prenatal care can reduce the risk of complications for mother and infant.¹²¹

Babies of mothers who do not get prenatal care are:¹²²

3 times more likely to have a low birth weight

5 times more likely to die in their first year of life

What do Knox County residents think about lack of adequate prenatal care?



17%
identified as a
Major Problem



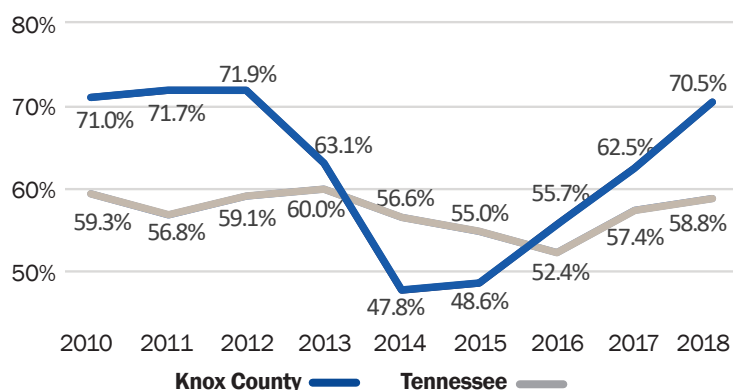
2.3
Satisfaction Level
with current efforts

Intensive prenatal care for high-risk pregnancies reduces the chances a newborn must be admitted to the hospital or Neonatal Intensive Care Unit (NICU). Estimates show a cost savings ranging from \$1,768 to \$5,560 per birth.¹²³

In women with high-risk pregnancies, appropriate prenatal care saves \$1.37 for every \$1 spent.¹²³

Percentage of births receiving adequate prenatal care²³

Healthy People 2020 target: at least **83.2%**



From 2013 to 2015 there was a 63% increase in infant mortality in Knox County. This coincides with (and may have been related to) a 33% drop in the percentage of births in Knox County receiving adequate prenatal care from 2012 to 2014. The reasons for these changes are not clear.

In 2018, 29.5% of mothers giving birth in Knox County did not receive adequate prenatal care during their pregnancy.²³



Adequate prenatal care in Knox County by race, 2018¹²³

White pregnant women 72.2%
Black pregnant women 61.1%

MATERNAL SUBSTANCE USE AND MISUSE

Maternal use and misuse of substances during pregnancy can have profound effects on the developing fetus. This section will focus on substances whose effects are most thoroughly researched: tobacco, alcohol, opioids (including prescription drugs) and cocaine.

Potential risks of maternal substance use and misuse	Methamphetamine	Opioids	Alcohol	Tobacco
Low birth weight		X	X	X
Prematurity		X	X	X
Infant and fetal mortality		X	X	X
Neonatal abstinence syndrome (NAS)*		X		
Fetal alcohol spectrum disorders (FASD)			X	
Congenital anomalies (such as cleft lip)		X	X	X
Reduced female fertility			X	X
Increased risk of sudden infant death syndrome (SIDS)		X	X	X

Sources of table¹²⁴⁻¹²⁷

*NAS is a group of conditions caused when a newborn withdraws from certain drugs, often opioids, used during pregnancy.

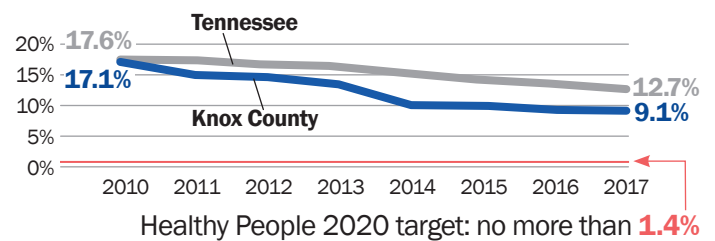
It is difficult to estimate the specific risks of particular substances to the fetus because multiple factors interact to influence maternal and child outcomes: amount and number of all substances used or misused, physiological factors, extent of prenatal care, maternal nutrition, exposure to sexually transmitted infections, and drivers of health such as socioeconomic status and exposure to violence.

TOBACCO

Smoking tobacco during pregnancy increases many risks for developing fetuses and infants, including premature birth, low birth weight, birth defects of mouth and lip, and the risk of sudden infant death syndrome (SIDS).¹²⁴

Each dollar invested in smoking cessation programs for pregnant women saves \$3 in health care costs.¹²³

Percentage of births that were to mothers who smoked during pregnancy²³



ALCOHOL

Alcohol use during pregnancy can cause miscarriage, stillbirth and a range of lifelong disabilities known as fetal alcohol spectrum disorders (FASD).¹²⁸

Children with FASD are at higher risk for:¹²⁸

- Learning disabilities and difficulty with attention, memory or speech
- Intellectual disability or low IQ
- Poor reasoning and judgment skills
- Vision or hearing problems
- Problems with the heart, kidneys or bones

In the U.S. from 2015 to 2017, 11.5% of pregnant women reported drinking, and 3.9% reporting binge drinking in the past thirty days before the survey.¹²⁹

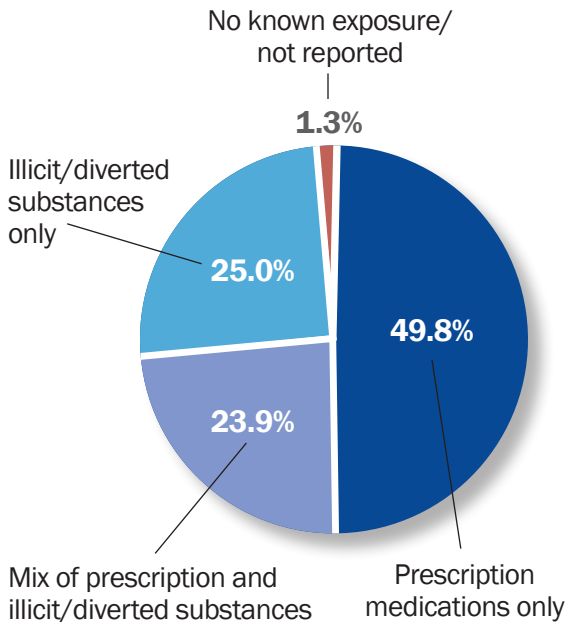
Maternal and Child Health

OPIOIDS

Neonatal abstinence syndrome (NAS) is a condition in which an infant has withdrawal symptoms after being exposed to certain substances in utero. Exposure may occur when the mother uses prescription medications or illicit/diverted drugs during pregnancy. After birth, the infant goes through withdrawal because the substance(s) are no longer in their system.¹³⁰ This usually leads to a longer hospital stay after birth.

The most common substances causing NAS are opioid drugs, including prescription pain medications such as morphine, illicit substances such as heroin, and medication-assisted treatment (MAT) drugs such as buprenorphine and methadone. MAT is the use of medications in combination with counseling and behavioral therapies for the treatment of substance use disorders.¹³¹ Because some MAT drugs can cause NAS, birth control access and education are important for women in medication-assisted recovery.¹³²

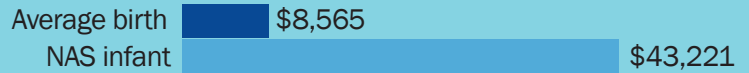
Type of drug exposure in NAS cases in Tennessee, 2018¹³³



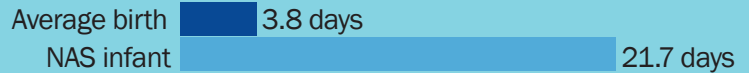
Note: Diverted substances are prescription medications being taken by someone other than the person to whom they were prescribed.¹³³

Cost and length of hospital stay for births under TennCare, 2017¹³⁴

Cost



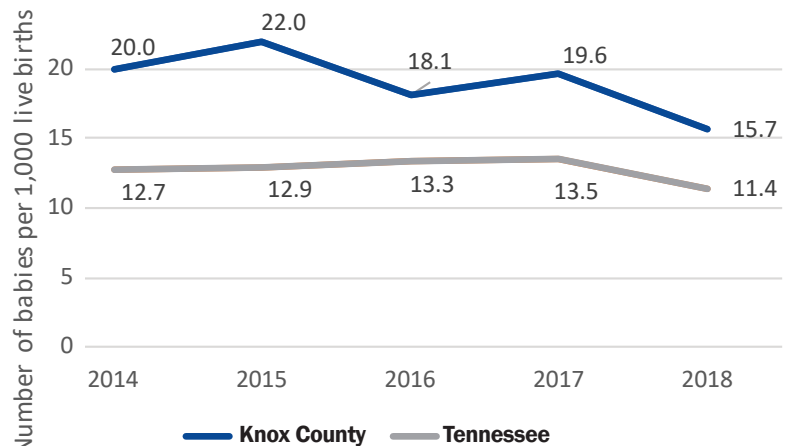
Length of Stay



The Tennessee Department of Health documented a ten-fold rise in the incidence of NAS in Tennessee over the past decade and made it reportable in 2013, meaning medical providers must, by law, report cases of NAS to public health authorities.

From 2013 to 2018, Knox County had an average of 106 reported NAS cases annually. This peaked in 2015 with 122 cases and came down to 79 cases in 2018.¹³³

Babies born with NAS, per 1,000 live births¹³³



MAT drugs and NAS in Tennessee, 2018¹³³

- 67.5% of infants with NAS had been exposed to MAT drugs (either alone or in combination with other substances)
- Of infants with NAS who had been exposed only to prescription drugs, nearly all (92.8%) were exposed to MAT drugs

Maternal and Child Health

The percentage of infants with NAS who are exposed to prescribed medication-assisted treatment drugs has been steadily increasing, indicating that more pregnant women who struggle with substance use disorder are seeking help.¹³³

Community resources for NAS include:

- East Tennessee Children's Hospital's Neonatal Intensive Care Unit
- Helen Ross McNabb Center
- Metro Drug Coalition
- Treatment and recovery centers that focus on women
- University of Tennessee Medical Center's Neonatal Intensive Care Unit

METHAMPHETAMINE

Current knowledge of the effects of methamphetamine misuse during pregnancy is limited. Available research indicates increased rates of low birth weight, prematurity, some birth defects, and potentially fatal complications among fetuses and infants exposed to methamphetamine prenatally. Research also indicates higher rates of delayed motor development, attention impairment, and other cognitive and behavioral issues.¹²⁷

LOW BIRTH WEIGHT

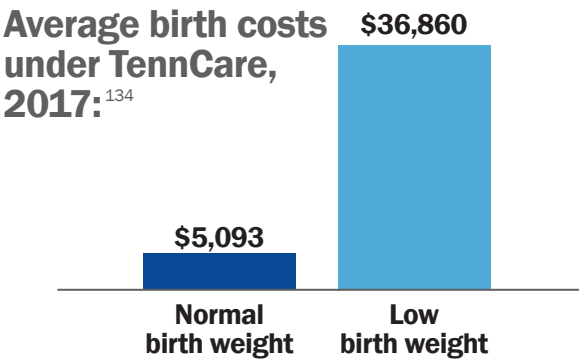
Infants born weighing less than 5 pounds, 8 ounces, are considered low birth weight. Some of these infants are healthy, but infants with low birth weight are at increased risk for serious health complications, such as trouble eating or gaining weight and fighting off infections.¹³⁵ Low birth weight is not always preventable.

Serious health problems that may result from low birth weight:¹³⁵

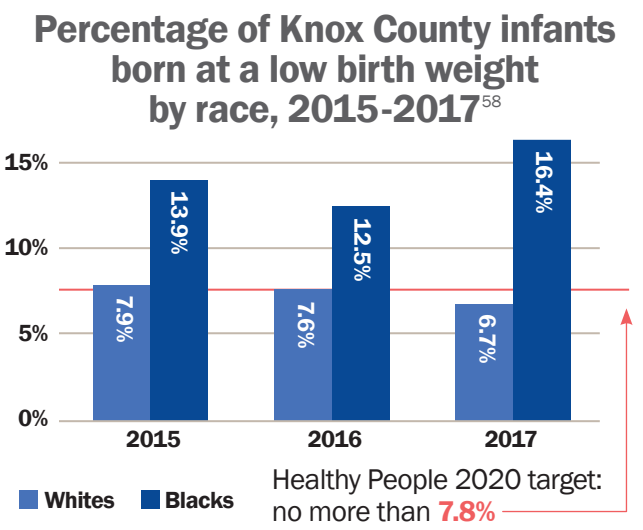
- Respiratory distress syndrome (underdeveloped lungs and difficulty breathing)
- Intraventricular hemorrhage (bleeding in the brain)
- Patent ductus arteriosus (when an opening between two major blood vessels leading from the heart does not close properly)
- Necrotizing enterocolitis (an intestinal infection that can destroy parts of the intestine)
- Retinopathy of prematurity (an eye disease that can result in blindness)
- Jaundice (high levels of bilirubin that occur when the liver isn't fully developed or isn't working)

Infants born at a low birth weight also have a higher risk later in life of:¹³⁵

- Diabetes
- Heart disease
- High blood pressure
- Intellectual and developmental disabilities
- Metabolic syndrome
- Obesity



In 2017, 7.7% of infants born in Knox County had a low birth weight, a number which has tended to remain stable over the past ten years.²³ This meets the Healthy People 2020 target of less than 7.8%, **though the disparity between white and Black infants worsened from 2015 to 2017.**



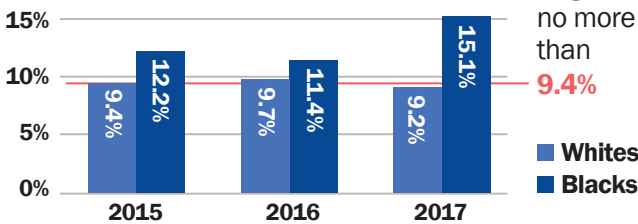
PREMATURITY

Preterm infants are born before 37 weeks of pregnancy. Prematurity and its complications are the number one cause of death of infants locally and nationwide. Premature infants may have to spend time in a neonatal intensive care unit (NICU) at birth and may also have long-term health problems similar to low birth weight infants. Prematurity is closely related to low birth weight in both its risks and outcomes, and like low birth weight, is not always preventable.

In 2017, 9.8% of infants born in Knox County were born premature, a number which has tended to remain stable over the past ten years.²³ This does not meet the Healthy People 2020 target of less than 9.4%, **and the disparity between white and Black infants worsened from 2015 to 2017.**



Percentage of Knox County infants born premature by race, 2015-2017⁵⁸



FETAL AND INFANT MORTALITY

Fetal mortality is defined as the death of a fetus prior to birth, regardless of gestational age. Only fetal deaths at 20 or more weeks' gestation, also called stillbirths, are generally reported to public health authorities.

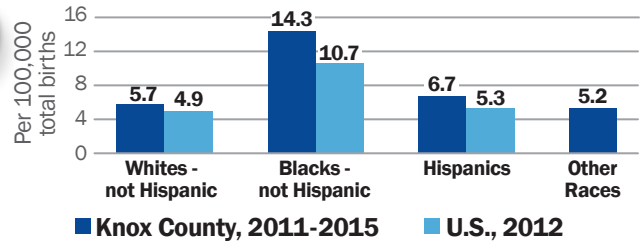


From 2011 to 2015, an annual average of 6.6 fetal deaths per 1,000 total births (live births plus stillbirths) occurred among Knox County residents.¹³⁶ During that time, Black mothers were more than twice as likely as white mothers in Knox County to experience a fetal loss.



In 2017, there were 30 infant deaths in Knox County, a rate of 5.8 infant deaths per 1,000 live births. Black infants were four times more likely than white infants to die in their first year of life.¹³⁶

Fetal mortality rate by race, ethnicity¹³⁶

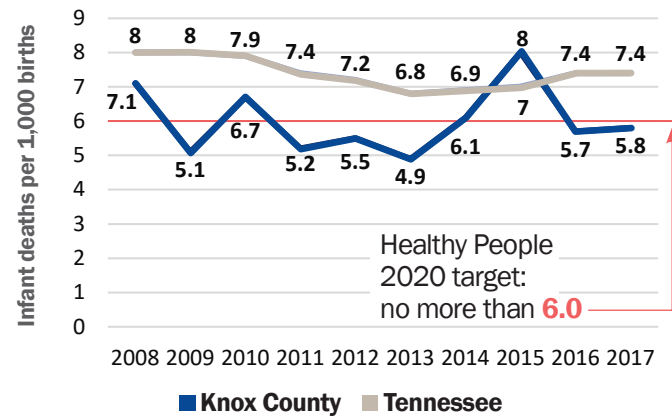


Infant mortality is defined as a death of an infant before their first birthday. An infant mortality rate is the number of deaths in children under the age of one per 1,000 live births.

Leading causes of infant death¹³⁷

- Birth defects
- Preterm birth and low birth weight
- Maternal pregnancy complications
- Sudden Infant Death Syndrome (SIDS)
- Injuries (e.g. accidental suffocation from unsafe sleep environments)

Infant mortality rate, 2008-2017¹³⁶

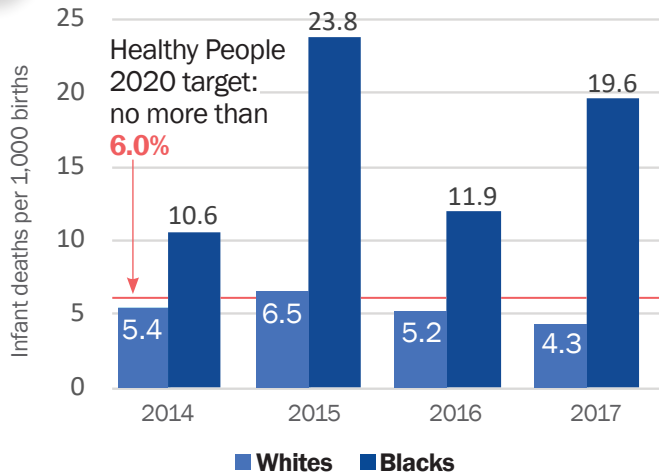


From 2013 to 2015 there was a 63% increase in infant mortality in Knox County. This coincides with (and may have been related to) a 33% drop in the percentage of births in Knox County receiving adequate prenatal care from 2012 to 2014. The reasons for these changes are not clear.

Maternal and Child Health



Infant mortality rate by race, Knox County¹³⁶



Note: The actual numbers of fetal and infant deaths in Knox County are small, meaning that a small change in number can produce a large change in the rate. This is an important consideration, especially when looking at the breakdown by race.

CHILD ABUSE AND NEGLECT

In 2018, there were 4,632 reported child abuse cases in Knox County. Of those, 479 cases were substantiated, a rate of 4.9 per 1,000 children under the age of 18 in Knox County.²³ Of substantiated Department of Children's Services confirmed cases of maltreatment statewide, 61% are from physical abuse, 28% are from sexual abuse and 26% are from neglect (some cases involve multiple charges, meaning that the percentages add up to more than 100%).

What do Knox County residents think about child abuse and neglect?



37%
identified as a
Major Problem



2.4
Satisfaction Level
with current efforts

Child abuse and neglect are included on the recognized list of adverse childhood experiences (ACEs).¹³⁸ See the Drivers of Health section of this report.

Community resources for child abuse and neglect include:

- Childhelp Children's Center of East Tennessee
- Community Coalition to Protect Children
- Community Coalition Against Human Trafficking
- Family Justice Center
- Helen Ross McNabb Center
- Kids First Child Advocacy Center of the Ninth Judicial District of Tennessee
- Law enforcement agencies
 - Knox County Sheriff's Office
 - Knoxville Police Department
- Tennessee Department of Children's Services

CHILDREN IN POVERTY



According to the census, on average from 2013 to 2017, 19% of families with children under five years old in Knox County were living below the poverty level.²⁰



Poverty can make it harder for children to learn, and can contribute to social, emotional and behavioral problems. Children living in poverty experience more abuse and neglect.¹³⁸ Research shows that children who grow up in poverty have higher risk of many physical and mental health problems as adults.¹³⁹ See the Drivers of Health section of this report.

Mental Health

Mental health includes emotional, psychological and social well-being. It affects how a person handles stress, relates to others and whether they make healthy choices. Mental illnesses such as depression and schizophrenia are diagnosable conditions that affect a person's thinking, feeling, mood or behavior. Mental illnesses may be occasional or long-lasting (chronic).¹⁴⁰

Mental and physical health are equally important to overall health. Mental illness, especially depression, is a risk factor for many physical health problems and chronic diseases such as stroke, diabetes and heart disease. Similarly, chronic conditions are also a risk factor for mental illness.

By age 14

Chronic mental illness

By age 24

Half of all chronic mental illness begins by age 14, and three-quarters begin by age 24.¹⁴⁰

Premature death

U.S. adults living with serious mental illness die on average 25 years earlier than others, largely due to untreated medical conditions.¹⁴⁰

-25
years

The majority of people with a mental illness delayed seeking care or treatment for an average of ten years from the first onset of symptoms. People whose mental illness began in childhood tend to delay seeking care for longer than those whose illness began in adulthood, though the reasons for this difference are not well understood.¹⁴¹

Americans and mental illness¹⁴⁰



One in two people in the U.S. will be diagnosed with a mental illness or disorder at some point in their lifetime.



One in five people will experience a mental illness in a given year.



One in 25 Americans has a serious mental illness, such as schizophrenia, bipolar disorder or major depression.

Factors contributing to a person's risk for mental illness include:¹⁴⁰

- Adverse childhood experiences (ACEs), such as trauma or a history of abuse
- Chronic medical conditions, such as cancer or diabetes
- Biological factors including genetics or chemical imbalances in the brain
- Alcohol and recreational drug use
- Having few friends, feeling lonely or isolated

What do Knox County residents think about access to mental health care?



identified as a
Major Problem



1.8

Satisfaction Level
with current efforts

- Access to mental health care was identified as a major problem by half of survey respondents.
- The need for more mental health care services was a major theme in the focus groups.
- Current efforts to meet mental health needs in Knox County received some of the lowest satisfaction ratings in the community survey.
- Participants said mental illness is linked with substance misuse and homelessness, impacts overall well-being, and reduces life expectancy.
- Special concern was voiced regarding two key topics: poor mental health among Knox County youth and lack of Spanish-speaking providers.

Mood disorders

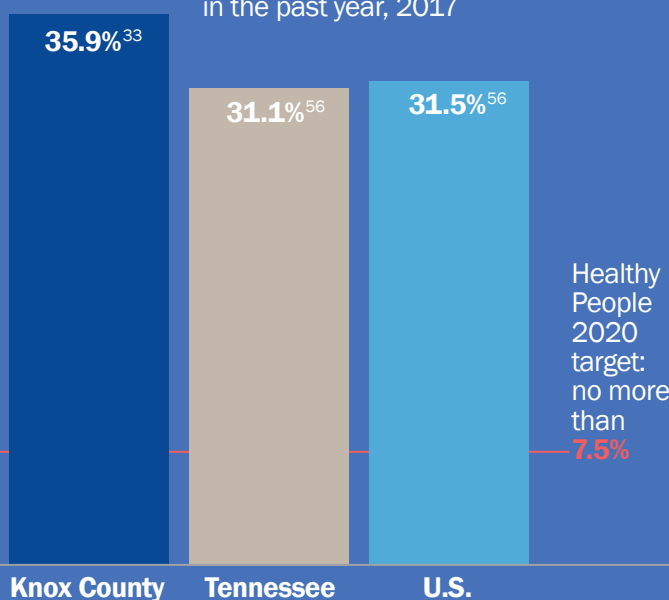
Mood disorders, a category of mental illness that includes major depression, persistent depressive disorder and bipolar disorder, are the third most common cause of hospitalization in the U.S. for both youth under 18 and people ages 18-44.¹⁴⁰

Mental Health

Major depression is the second most common mental illness in the U.S., second only to phobias (including social phobias and phobias of specific things such as heights and spiders).¹⁴²

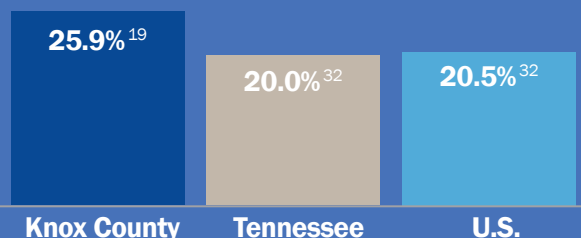
Over one-third (35.9%) of Knox County high school students experienced a depressive episode* in the past year.³³

High school students who have experienced a depressive episode* in the past year, 2017



*They felt so sad or hopeless for two or more weeks in a row that they stopped doing normal activities

Adults with a depressive disorder, 2018

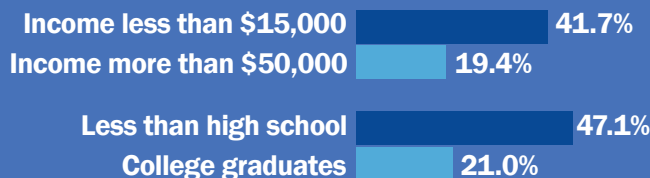
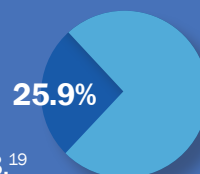


Depressive disorders in Knox County by gender, 2018¹⁹

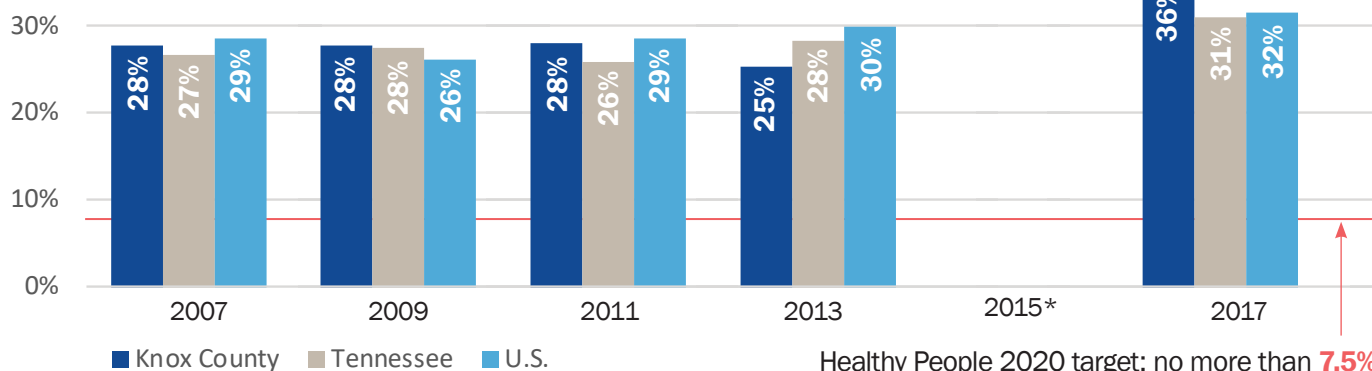


Depressive disorders

One-quarter of Knox County adults (25.9%) have a depressive disorder, a percentage that varies by income and education, 2018.¹⁹



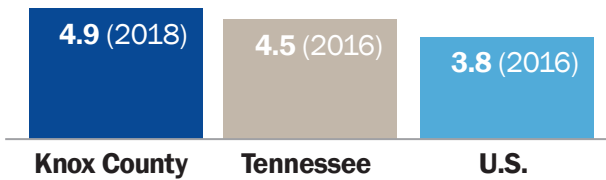
Percentage of high school students who have experienced a depressive episode in the last year^{33, 56}



*2015 sample size not sufficient for statistical analysis.

Mental Health

Average number of poor mental health days in past month among adults^{19, 143}



2018 data not available for Tennessee or U.S.



Average number of poor mental health days in the past month in Knox County, by income, 2018¹⁹



Mental health by sexual orientation, Knox County, 2018¹⁹

Adults who have a depressive disorder



Adults who had 6 to 30 poor mental health days in the past month



Note: Numbers of respondents identifying as bisexual and transgender were too small to report.

Treatment, counseling, medications¹⁹

15.5% or one out of six Knox County adults reported currently receiving treatment/medicine for mental health problems.

7.2% of Knox County adults needed mental health treatment or counseling in the past year but did not receive it.



Mental health treatment, counseling by gender¹⁹

Females were almost twice as likely than males to report they did not get the mental health treatment or counseling they needed.



Knox County adults who reported they are currently receiving treatment and/or medicine for mental health problems, by income, 2018¹⁹



Knox County adults who reported they are currently receiving treatment and/or medicine for mental health problems, by gender, 2018¹⁹



According to the Nashville-based Sycamore Institute, Knox County has more mental health providers per resident than many other counties in Tennessee, with one provider for every 294 residents (includes both inpatient and outpatient).¹⁴⁴ However, this does not mean that all populations are adequately served. The federal Health Resources and Services Administration designates Knox County as a mental health professional shortage area for the low-income population.¹⁴⁵ This means Knox County does not have enough mental health care providers to provide adequate mental health care for the low-income population.

Also, the number of staffed inpatient psychiatric care beds in Knox County has fallen from 189 in 2010 to 16 in 2019. Notable decreases in the number of beds occurred when the state-run Lakeshore Mental Health Institute closed in 2011, a loss of more than 100 beds, and when Physicians Regional Medical Center closed in 2018, a loss of 19 beds.¹⁴⁶ At the time this report was written, Certificates of Need had been approved and at least two local health care providers were planning to build dedicated behavioral health care facilities in Knox County.

In Knox County from 2015 to 2016, an average of about 8,500 people were seen each year in emergency departments for a mental health diagnosis.¹⁴⁷ When people experiencing urgent mental health problems visited emergency departments in the Knox County region (Knox, Blount, Monroe, Sevier and Loudon counties) in 2018, adults waited on average 40 hours for placement in inpatient care.




Youth waited longer, an average of 43 hours. In 2019 the wait for adults was 38 hours, and 42 hours for youth. For those adults who were placed in the state-run psychiatric facility Moccasin Bend, the average wait was 83 hours (3.4 days) in 2018 and 78 hours (2.9 days) in 2019.¹⁴⁸

Mental Health

SUICIDE

Suicide is death caused by injuring oneself with the intent to die. A suicide attempt is when someone harms themselves with the intent to end their life, but they do not die as a result of their actions. Suicide is a serious issue that has lasting harmful effects on individuals, families and communities. When people die by suicide, their family and friends often feel shock, anger, guilt and depression.¹¹⁵

Suicide is the tenth leading cause of death in the U.S. and the second leading cause of death among people ages 15-34. In 2016, one person died by suicide every 12 minutes in the U.S.¹¹⁵ In Tennessee, suicide is the ninth leading cause of death for all age groups.¹⁴⁹



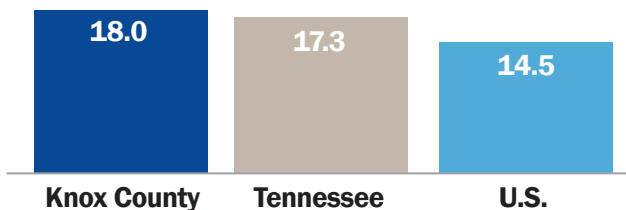
Suicide in Knox County⁵⁸

Tenth leading cause of death in Knox County among all age groups

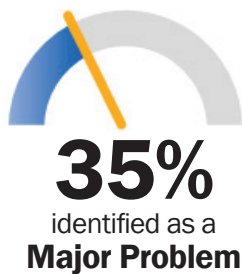
74 deaths per year on average

1.7% of all deaths

Suicide rates per 100,000 people, 2017¹⁴⁹

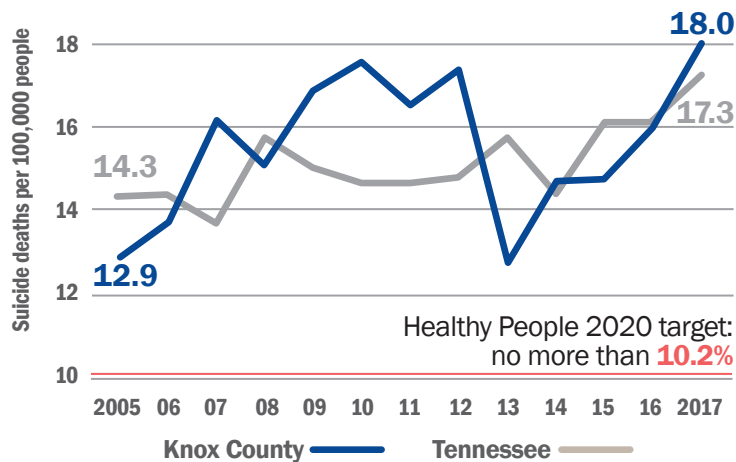


What do Knox County residents think about suicide?



- Suicide was identified as a major problem by one third (35%) of survey respondents, and was only briefly discussed in focus groups and interviews, though access to mental health care was identified as a major issue.

Suicide rates in Knox County and Tennessee¹⁴⁹



Nationally, higher suicide rates are seen in non-Hispanic American Indian/Alaska Native populations, and non-Hispanic white populations. Veterans and other military personnel are also at increased risk for suicidal thoughts and behavior.



Though children who are bullied are at risk of suicide, bullying alone is not the cause. Many issues contribute to suicide risk, including depression, problems at home and a history of trauma. Some specific groups have an increased risk of suicide, including children with disabilities and lesbian, gay, bisexual and transgender (LGBT) youth. This risk can be increased further when these children are not supported by parents, peers and those who work with youth. Bullying can make an unsupportive situation worse.¹¹¹ More information on bullying can be found in the Injury and Violence section of this report.

Risk factors for suicide include:¹¹⁵

- Family history of suicide
- Adverse childhood experiences such as child abuse
- Previous suicide attempt(s)
- History of mental health disorders, especially clinical depression
- History of alcohol and substance misuse
- Barriers to accessing mental health treatment
- Loss (relational, social, work or financial)
- Easy access to lethal methods
- Unwillingness to seek help because of the stigma attached to mental health disorders

Mental Health

Protective factors for suicide¹¹⁵

- Effective clinical care for mental, physical and substance use disorders
- Easy access to a variety of clinical mental health interventions and support for help seeking
- Family and community support
- Support from ongoing medical and mental health care relationships
- Skills in problem solving and nonviolent conflict resolution
- Cultural and religious beliefs that discourage suicide and support instincts for self-preservation



Knox County middle school students and suicide, 2018¹⁰⁹

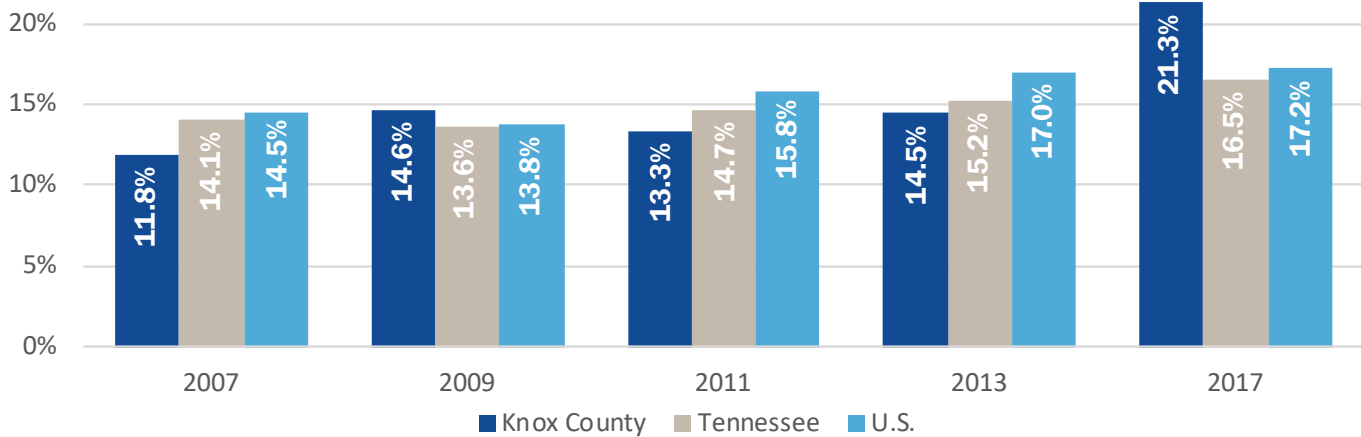
19.8% Seriously thought about suicide

11.5% Made a plan for suicide

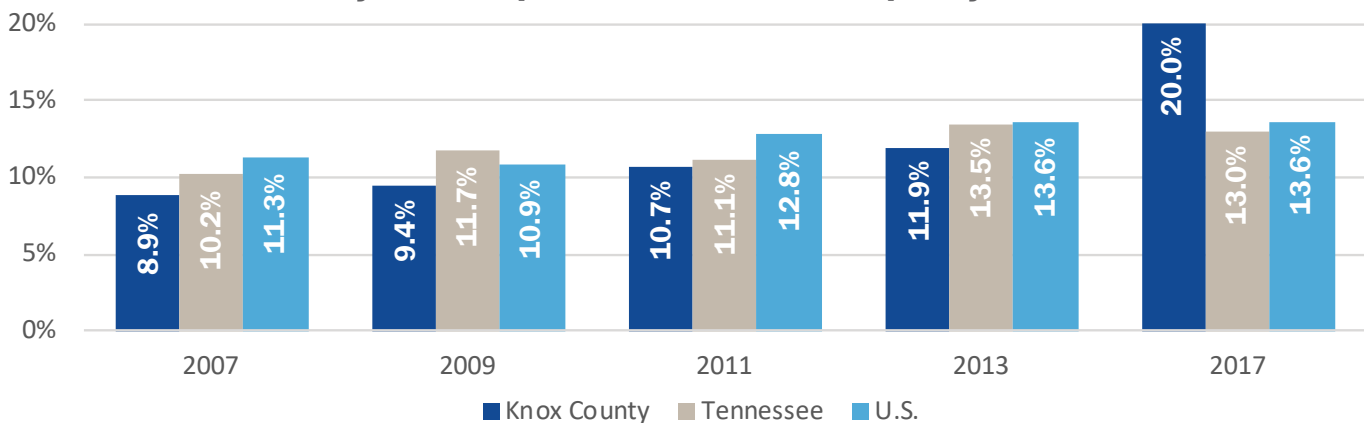
6.3% Say they attempted suicide

Note: There is no state or national data for middle school students for comparison

Percent of high school students who reported they seriously considered suicide in the past year^{33, 56}

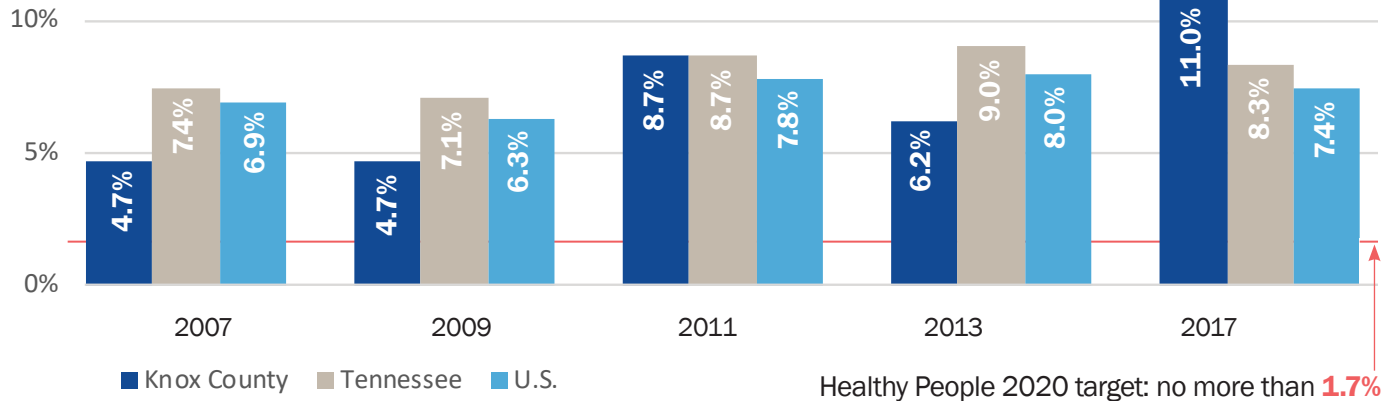


Percent of high school students who reported they made a plan for suicide in the past year^{3, 4}



Mental Health

Percent of high school students who reported they attempted suicide in the past year^{3,4}



11%

of high school students in Knox County reported they had attempted suicide in the past year in 2017.

Death by suicide among youth under the age of 18 in Knox County is rare, and no rate is available because the numbers are too few to be statistically reliable.

Community resources for suicide prevention and mental health include:

- Behavioral Health Urgent Care Center (jail diversion for low-level offenders)
- Cherokee Health Systems
- Helen Ross McNabb's Mobile Crisis Unit
- Mental Health Association of East Tennessee
- Tennessee Suicide Prevention Network
- Other mental health care providers

National Suicide Prevention Lifeline

If you are struggling with thoughts of suicide, please call the free, confidential National Suicide Prevention Lifeline at

1-800-273-TALK (8255)



Or text **"TN"** to **741741**

You will be connected to a skilled, trained counselor at a crisis center in your area, anytime.

Sexual Health

According to the World Health Organization, sexual health is a state of physical, emotional, mental and social well-being in relation to sexuality, not just the absence of disease or dysfunction.¹⁵⁰ Sexual health is an important part of overall health.

Untreated sexually transmitted infections (STIs) can lead to serious long-term health consequences, especially for adolescent girls and young women. Detecting and treating STIs during pregnancy can prevent or reduce health impacts, including stillbirths and infant deaths.¹⁵¹ Untreated STIs increase a person's risk of contracting human immunodeficiency virus (HIV) and can cause infertility in women.

Sexual health includes preventing unintended pregnancies, which can reduce community-level rates of low birth weight and postpartum depression. Preventing unintended pregnancies also helps increase educational attainment and financial stability, both of which affect health.

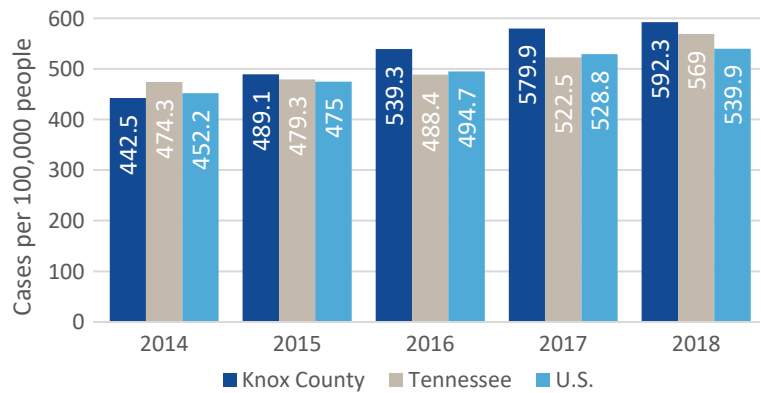
Note: Information on sexual violence can be found in the Injury and Violence section of this report. Information on prenatal care and reproductive outcomes can be found in the Maternal and Child Health section of this report.

STIs AND SEXUAL BEHAVIOR

STIs are caused by bacteria or viruses that are passed from person to person through sexual contact. In Tennessee, health care providers must report cases of chlamydia, gonorrhea, syphilis and HIV to public health authorities by law. Statistics for other STIs such as herpes and HPV (human papillomavirus) are not available on the county level, since they are not reportable. Public health authorities in Knox County conduct contact tracing for every diagnosed case of any reportable STI. **There is variation across metropolitan areas in Tennessee in methods of investigating reportable STIs. Knox County's policy of following up with sexual contacts for all four reportable STIs leads to the testing of more individuals and rates of chlamydia and gonorrhea that may appear higher than those of other communities in Tennessee.**

Research has found that STI-related stigma and shame are associated with failure to test for STIs, delays in seeking health care, and reduced likelihood of discussing STIs with partners or health care providers.¹⁵²

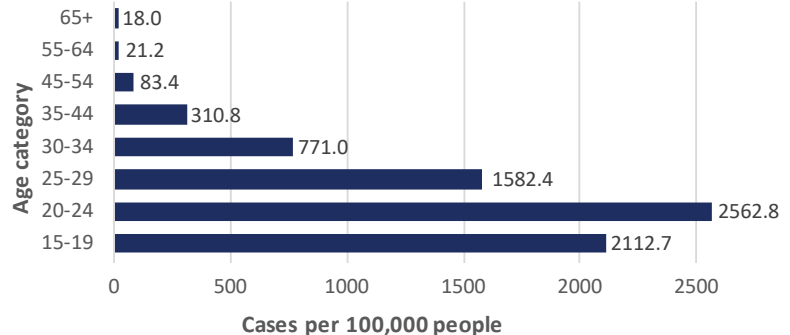
Chlamydia cases per 100,000 people^{150, 154}



Chlamydia incidence in Knox County in 2018 (592.3 cases per 100,000 people) is higher than that of Tennessee (569.0 cases per 100,000 people) and the U.S. (539.9 cases per 100,000 people).^{150, 154}



Chlamydia cases per 100,000 people, by age, in Knox County, 2018¹⁵⁴



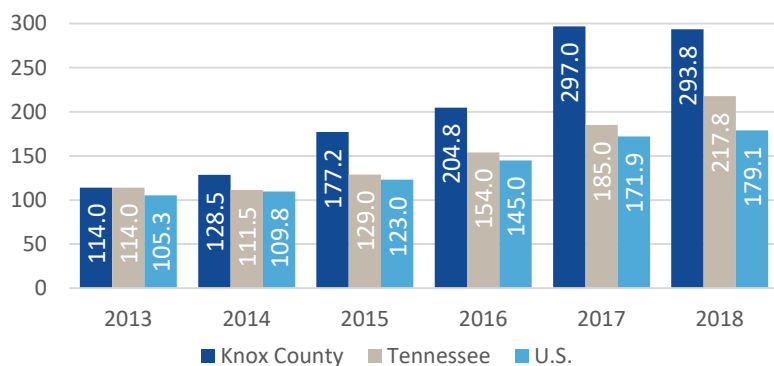
Chlamydia in persons ages 15-29 in Knox County, by race, 2018¹⁵⁴



*Includes patients reporting any race other than white or Black.

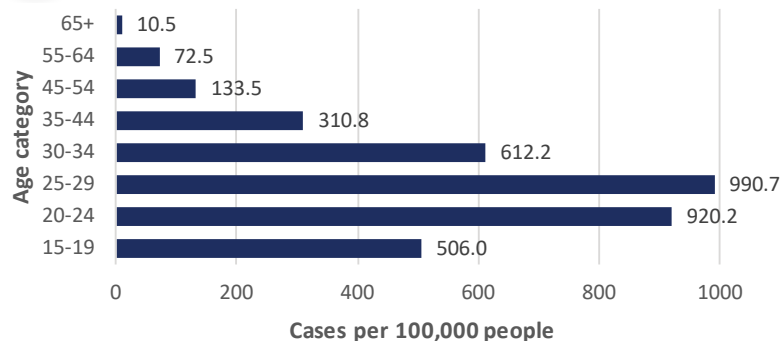
Sexual Health

Gonorrhea cases per 100,000 people^{150, 154}



The incidence of gonorrhea in Knox County in 2018 is 35% higher than the incidence in Tennessee, and 64% higher than that of the U.S.^{150, 154}

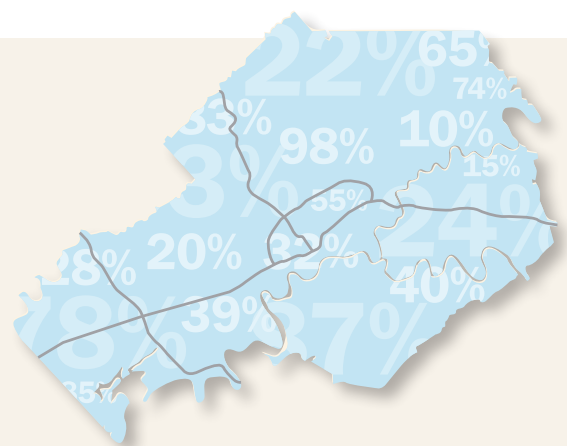
Gonorrhea cases per 100,000 people, by age, in Knox County, 2018¹⁵⁴



Gonorrhea in persons ages 15-29 in Knox County, by race, 2018¹⁵⁴



*Includes patients reporting any race other than white or Black.

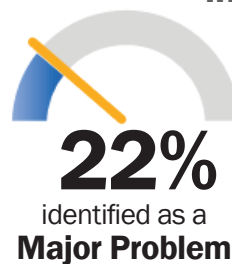


In Knox County, STI rates can vary widely by age, gender and race. People below age 30 are far more likely than people in any other age group to get chlamydia and gonorrhea, and both infections are more common among Black individuals than white individuals.

While the majority of STIs occur among white teens, the percentage of people affected is greater in the Black community, a statistical pattern that persists on the national level as well. Multiple factors may drive this disparity, including income, education, discrimination and racism, access to health care, and transportation. See the Drivers of Health section in this report.

According to the CDC, in communities where STIs are more common, people may experience difficulties reducing their risk for STIs. With each sexual encounter, they face a greater chance of infection than those in communities with lower STI prevalence, regardless of similar sexual behavior patterns.¹⁵³

What do Knox County residents think about sexually transmitted infections?



Sexual Health

Ways to lower the risk of an STI¹⁵⁰

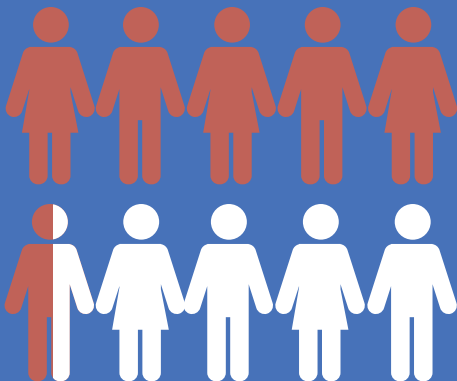
- Abstinence from sex
- Reduce number of sexual partners
- Correct and consistent condom use
- Refrain from sex with anonymous partners
- Vaccination against human papillomavirus (HPV)



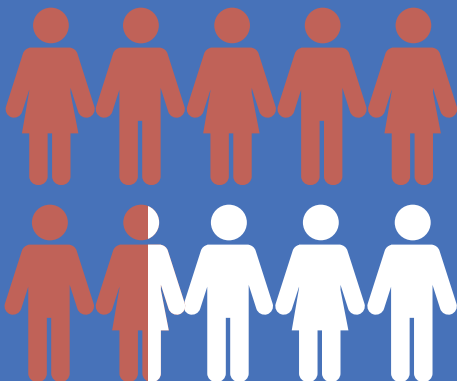
HPV vaccine rates

56.1% of youth ages 13-17 in Tennessee have had at least one dose (of the recommended three dose series) of the HPV vaccine, compared to **65.5%** in the U.S. as a whole.¹⁵⁵

TENNESSEE

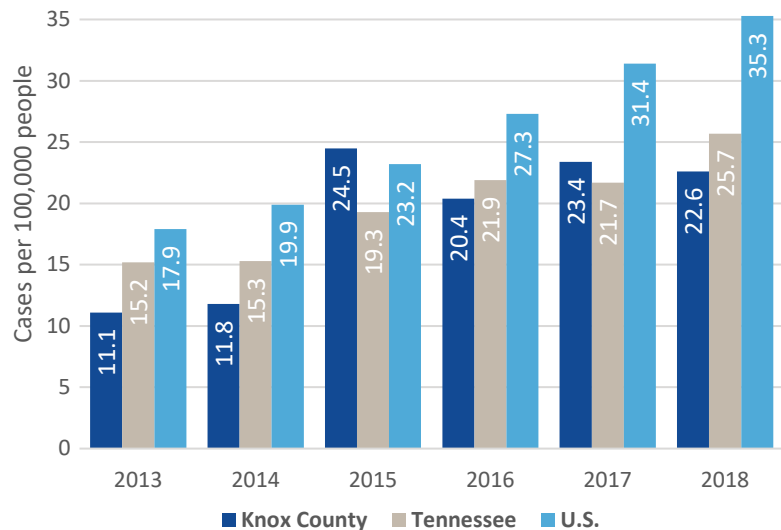


UNITED STATES



HPV is responsible for 91% of all cervical cancers, and the HPV vaccine prevents these cancers. HPV vaccination is routinely recommended at age 11 or 12, and for anyone up to age 26 who has not had the vaccine series.¹⁵⁶

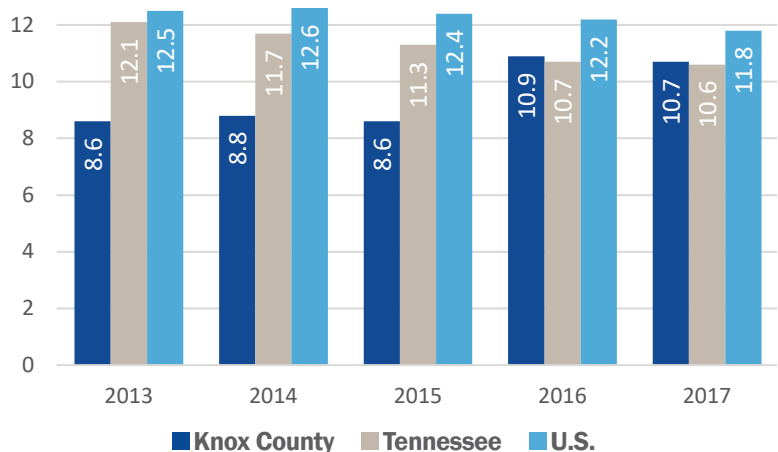
Syphilis cases per 100,000 people^{150, 154}



All stages of syphilis include primary, secondary, early latent and late latent cases.

The incidence of syphilis in Knox County in 2018 is 12% lower than the incidence in Tennessee, and 36% lower than that of the U.S.^{150, 154}

New HIV cases per 100,000 people^{150, 154}

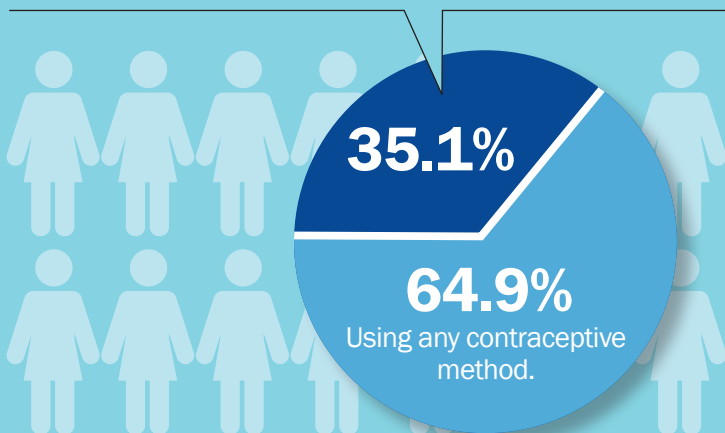


The incidence of HIV in Knox County in 2017 is nearly the same as in Tennessee, and 9% lower than the incidence in the U.S. Though Knox County's incidence is available for 2018, 2017 is the last year for which comparison data is currently available.^{150, 154}

Sexual Health

Current use of contraceptive methods among U.S. women ages 15-49, 2015-2017¹⁵⁷

Not currently using contraception (includes those who are currently pregnant, postpartum, trying to get pregnant, not having sex, etc.).



Condom use, 2013*

Healthy People 2020 target for males:
81.5%

61.7%

Male students

Healthy People 2020 target for females:
55.6%

46.4%

Female students

Among Knox County high school students who were sexually active, **54.4%** used a condom the last time they had sexual intercourse.

54.4%

All students

*Most recent data available.



Knox County high school students who have never had sexual intercourse, 2013^{117*}

Healthy People 2020 target for males:
79.2%

61.2%

Male students

Healthy People 2020 target for females:
80.2%

63.3%

Female students

*Most recent data available

High school students in Knox County who received formal education on STIs before they were 18 years old¹¹⁷

Healthy People 2020 target for males:
93.8%

89.1%

Healthy People 2020 target for females:
95.8%

90.8%

It is recommended that all those who are sexually active, regardless of age, be tested for STIs. Some STIs are curable and all are treatable.

Community resources for STI testing and referral include:

- Cherokee Health Systems
- Choice Health Network
- Knox County Health Department, Communicable Disease Clinic
- Knoxville Center for Reproductive Health
- Hope Resource Center (women only)
- Planned Parenthood
- Primary care and gynecologic providers
- University of Tennessee's Student Health Center (University of Tennessee students only)

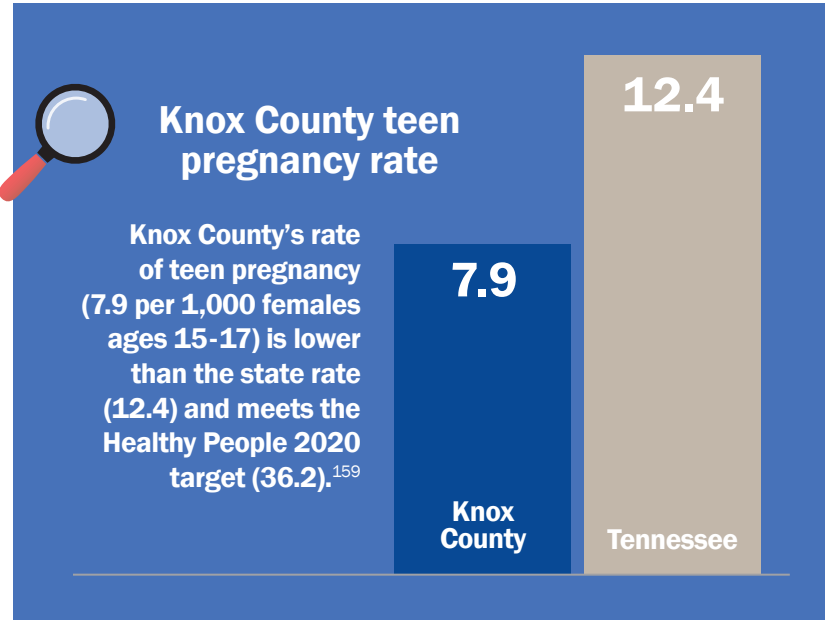
Sexual Health

TEEN PREGNANCY AND BIRTHS

In the U.S. in 2017, the annual birth rate for women aged 15 to 19 years was 18.8 babies per 1,000 women. Birth rates to teen mothers have been decreasing nationally, and the 2017 rate of 18.8 is a record low. Reasons for the decline in the national teen birth rate are not clear, but evidence suggests that teens are abstaining more from sexual activity and that more sexually active teens are using birth control.¹⁵⁸



Despite these gains, racial, ethnic, geographic and socioeconomic differences in teen birth rates persist. According to the CDC, certain drivers of health such as high unemployment, low education and low income have been associated with higher teen birth rates in communities.¹⁵⁸ These drivers both influence and are influenced by teen pregnancy. Teen pregnancy and childbearing are significant contributors to high school dropout rates among girls, and children of teen mothers are more likely to drop out of high school themselves.¹⁵⁸ While the majority of teen pregnancies occur among white teens, the burden is greater in the Black community, a pattern that persists on the national level as well.

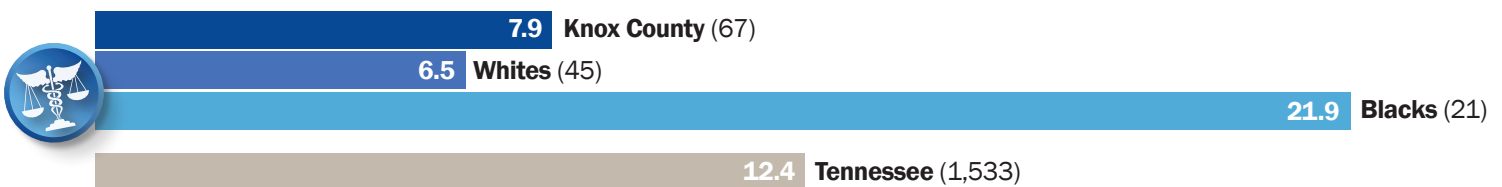


According to the CDC, teens from families with low educational attainment and low income are more likely to become pregnant, and young women living in foster care are more than twice as likely to become pregnant than those not in foster care.¹⁵⁸ Adverse childhood experiences are also a risk factor for teen pregnancy.¹³⁸ For more information, see the Drivers of Health section of this report.

Teen Pregnancies in Knox County and Tennessee, 2017¹⁵⁹

Teens ages 15-17

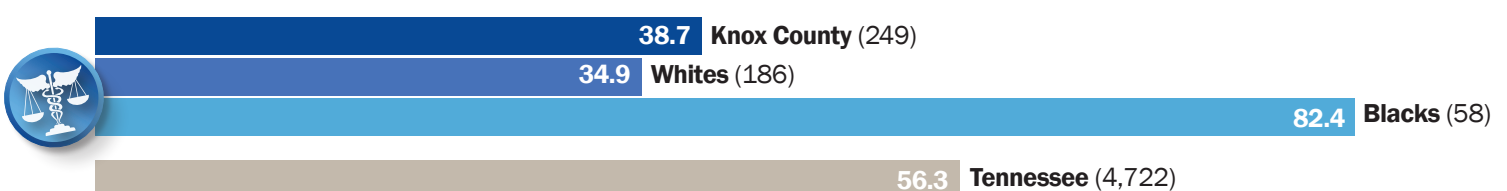
Pregnancy rate per 1,000 females (total number of pregnancies)



Meets Healthy People 2020 target of no more than 36.2 pregnancies per 1,000 teen women ages 15-17.

Teens ages 18-19

Pregnancy rate per 1,000 females (total pregnancies)

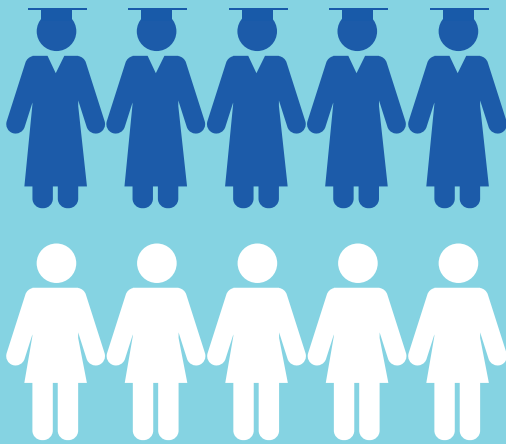


Meets Healthy People 2020 target of no more than 104.6 pregnancies per 1,000 teen women ages 18-19.

Sexual Health



In the U.S., half of teen mothers receive a high school diploma by age 22, compared to about 90% of women who do not give birth during adolescence.¹⁵⁸



Children of teenage mothers are more likely to:¹⁵⁸

- Drop out of high school
- Have lower academic achievement
- Have more health problems
- Be incarcerated at some time during adolescence
- Give birth as a teenager
- Face unemployment as a young adult

Community resources for teen pregnancy include:

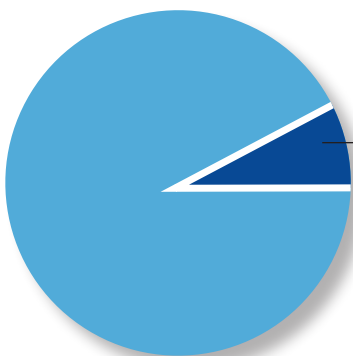
- Catholic Charities of East Tennessee
- Cherokee Health Systems
- Choice Health Network
- Hope Resource Center
- Knox County Health Department
 - Knox Adolescent Partners in Prevention Initiative (KAPPI)
 - Women's Health Clinic
- Knoxville Center for Reproductive Health
- Planned Parenthood
- Primary care and gynecologic providers
- University of Tennessee's Student Health Center (University of Tennessee students only)

Substance Use and Misuse

SUBSTANCE USE DISORDER

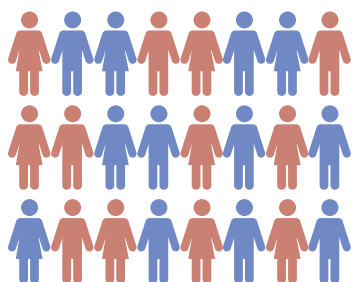
Substance use disorders occur when the habitual use of alcohol and/or drugs causes clinically significant impairment, including health problems, disability and failure to meet major responsibilities at work, school or home.¹⁶⁰ Addiction is the most severe form of substance use disorder. Addiction is a complex, relapsing disease that affects both the brain and the body. It can be chronic, which means it can persist over a long period of time, require ongoing medical attention and limit the activities of daily living. If left untreated, it damages families, relationships, schools, workplaces and neighborhoods.¹⁶¹

Risky use of drugs or alcohol can change the brain in ways that make it very hard to quit, even for those who want to do so, and can lead to a substance use disorder.¹⁶² Substance use disorders can be prevented, treated and managed by health care professionals in combination with family or peer support.



Nationwide numbers

7.4% of people ages 12 and over in the U.S. had a substance use disorder in 2018, based on self-reported data.¹⁶³



Mental health

For individuals with a substance use disorder, around half have a co-occurring mental health diagnosis.¹⁶⁴

Suicide

Suicide is the primary cause of death for individuals with substance use disorders, who face a level of risk for suicide that is 10-14 times higher than average.¹⁶⁵

Symptoms

The most common symptoms of addiction are:¹⁶¹

- Severe loss of control
- Continued substance use despite serious consequences
- Preoccupation with substance use
- Failed attempts to quit
- Increased tolerance to the substance
- Social withdrawal

Risk factors

Risk factors for substance use disorders include:^{161, 162}

- Genetic predisposition
- Psychological factors such as stress, high impulsivity, depression, anxiety, eating disorders, personality and other psychiatric disorders
- Environmental influences such as trauma, adverse childhood experiences, substance use in the family or among peers, and the availability of addictive substances
- Starting substance use at an early age

Protective factors

Protective factors for substance use disorders include:¹⁶²

- Parental support and supervision
- Psychological factors such as strong coping skills and self-control
- Positive relationships
- Academic achievement
- Environmental influences such as anti-drug use policies and neighborhood resources

Most adults who develop a substance use disorder report having started drug use in adolescence or young adulthood, so many protective factors for substance use disorders are youth-focused.¹⁶⁶

Substance Use and Misuse

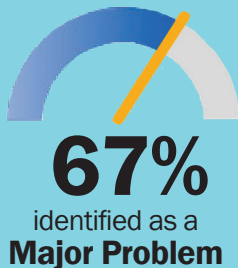
ILLICIT AND PRESCRIPTION DRUGS

Illicit drugs are illegal substances generally thought to have no legitimate medical uses, such as marijuana, methamphetamine and heroin.

Prescription drugs are legal substances that require a prescription to access, such as OxyContin and Xanax.

Opiates are a special class of pain-killing drugs that includes both illicit drugs such as heroin, and legal prescription drugs such as morphine and hydrocodone.

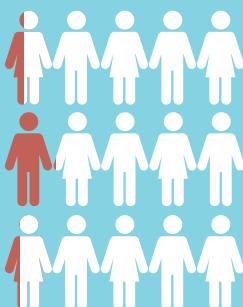
What do Knox County residents think about substance misuse?



- Out of all health issues, drug misuse was most commonly identified as a major problem in the community survey, focus groups and interviews.
- There was wide recognition that mental illness and substance misuse often occur together.
- Participants indicated a lack of treatment options for those suffering from substance use disorder, and mentioned the devastating impact of the disorder on families and communities.
- “I have heard of people being on a waiting list for six months to get into treatment. You have to get someone in when they are willing – not tell them they have to wait. They may be dead by then.” – Focus group participant

MARIJUANA

Marijuana use in Knox County



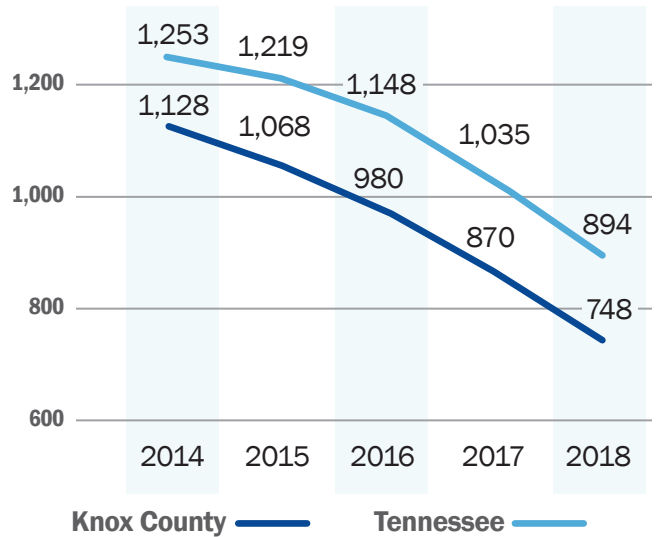
8.2% of middle school students have used marijuana.¹⁰⁹

20.7% of high school students have used marijuana at least once during the past thirty days.³³

6.4% of adults have used marijuana at least once during the past thirty days.¹⁹

OPIOIDS

Opioid prescriptions per 1,000 people¹⁶⁷



Adults' misuse of prescribed drugs

0.8% of Knox County adults (about 2,700 people) report they have used prescription pain medications at least once in the past thirty days without a doctor's prescription.¹⁹

Knox County youth who report they have taken a prescription pain medicine without a doctor's prescription

Middle school students 6.4%¹⁰⁹
High school students 13.0%³³

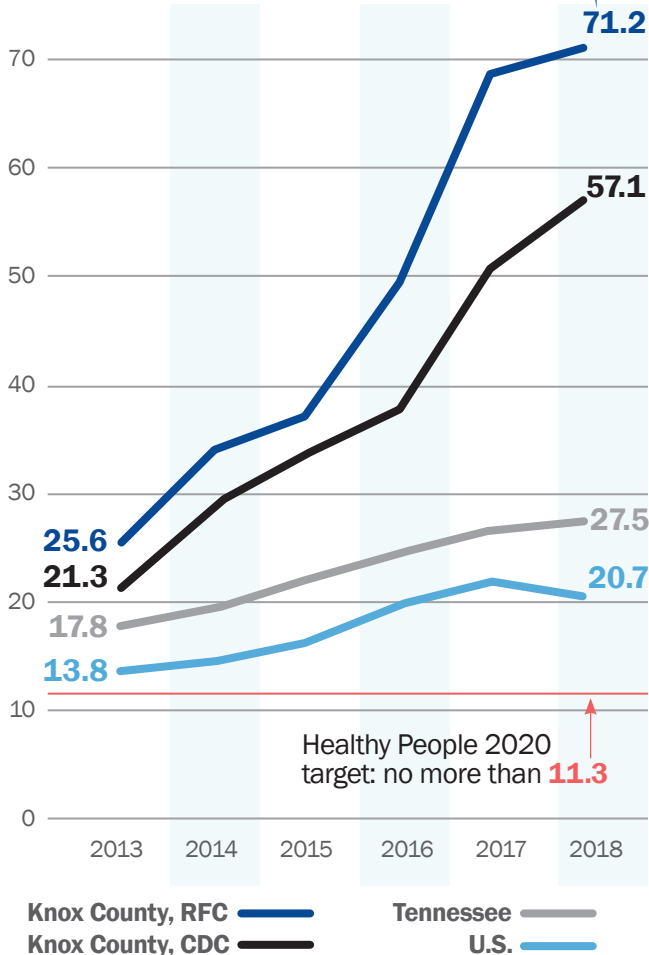
Even as opioid prescriptions have become more tightly regulated and opioid prescription rates in Knox County and Tennessee have declined since 2013, overdose death rates continue to climb. This may indicate that people struggling with substance use disorder are shifting from prescription to illicit drugs.

Note: Neonatal Abstinence Syndrome is discussed in the Maternal and Child Health section of this report.

Substance Use and Misuse

In 2018, 326 people in Knox County died from overdoses, an age-adjusted overdose death rate of 71.2 per 100,000.¹⁶⁸

Overdose deaths per 100,000 people (age-adjusted rate)^{168, 170}



This graph shows two different sets of annual rates for Knox County overdose deaths – one from the Knox County Regional Forensic Center (RFC) and one from the CDC. While the RFC’s data provide a high level of detail, they do differ from counts provided by the CDC. Not all deaths that were identified by the RFC as overdose-related were coded by the CDC as drug-related overdose deaths, and so Knox County’s official CDC count of overdose deaths is lower than the RFC’s.¹⁶⁸

Racial disparities in overdose deaths in Knox County¹⁶⁹

146 2014 **298** 2018
Overdose deaths among white individuals increased by 104% from 2014 to 2018, 146 deaths to 298.

9 2014 **27** 2018
Overdose deaths among Black individuals increased by 200% over the same time period, from 9 deaths to 27.

Since the Knox County Regional Forensic Center (RFC) began keeping detailed records on overdose deaths in 2010, oxycodone was the drug found most often in fatal overdoses. In 2016, fentanyl became the drug most often found, with prescription opioids oxycodone and oxycodone in second and third place. Fentanyl does have legitimate medical uses, but the majority of fentanyl and fentanyl analogues involved in overdose deaths is illicitly manufactured and sold. Fentanyl analogues are synthetic opioids similar in chemical structure to fentanyl, but they are not routinely detected because they require specialized toxicology testing. In 2017 a major shift toward additional illicit drugs occurred. While fentanyl and fentanyl analogues remained at the top, methamphetamine and cocaine moved into the top three. As of 2018, the most common drugs identified in drug-related deaths are synthetic opioids (such as fentanyl and fentanyl analogues), methamphetamine, heroin, cocaine and alcohol. However, controlled substances available by prescription continue to be found in overdose toxicology results, and the majority of overdose deaths investigated by the RFC result from combinations of multiple legal and illegal drugs.¹⁶⁸

Inpatient and outpatient hospitalizations¹⁶⁷

In Knox County in 2017:

- There were 1,469 nonfatal outpatient visits for overdose (328 per 100,000)
- There were 528 inpatient stays for overdose (111 per 100,000)

Statewide in 2017:

- There were 15,949 nonfatal outpatient visits for overdose (246 per 100,000)
- There were 7,708 inpatient stays for overdose (111 per 100,000)

Outpatient hospital visits for nonfatal overdose in Knox County have risen by **71.6%** since 2013.¹⁶⁷

Substance Use and Misuse



From October 2016 to September 2018:

- 2,742 individuals received naloxone to reverse a suspected opioid overdose
- An average of four people per day received naloxone

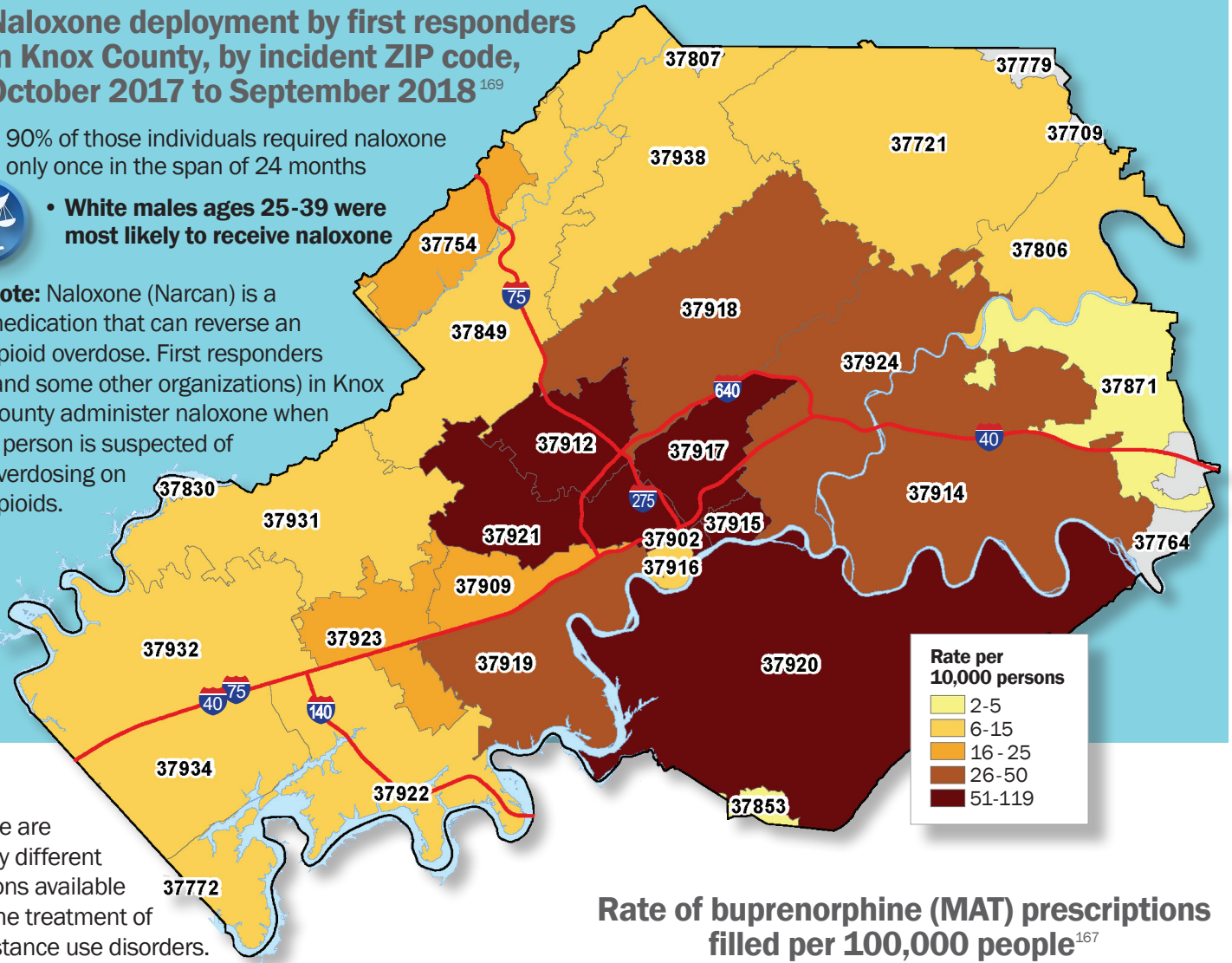
Naloxone deployment by first responders in Knox County, by incident ZIP code, October 2017 to September 2018¹⁶⁹

• 90% of those individuals required naloxone only once in the span of 24 months



• White males ages 25-39 were most likely to receive naloxone

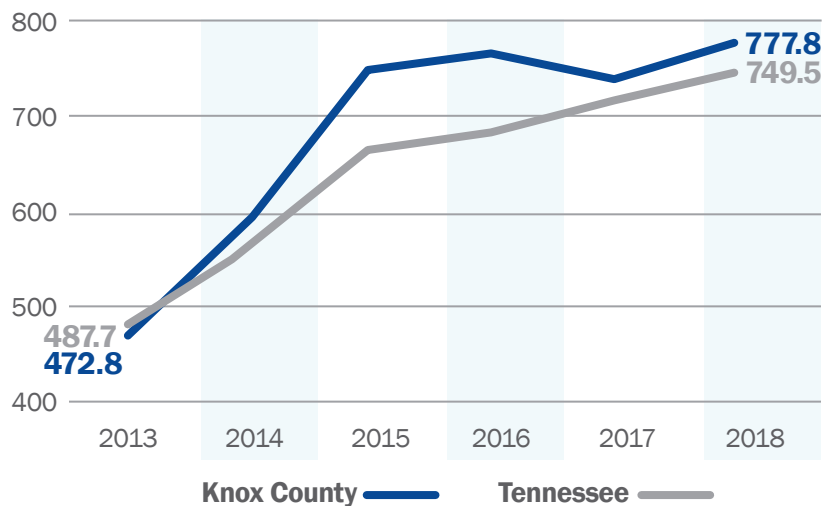
Note: Naloxone (Narcan) is a medication that can reverse an opioid overdose. First responders (and some other organizations) in Knox County administer naloxone when a person is suspected of overdosing on opioids.



There are many different options available for the treatment of substance use disorders. Some may be abstinence-based and others may include using medications. Medication-assisted treatment (MAT) is the use of FDA-approved medications, in combination with counseling and behavioral therapies, to provide a whole-patient approach to the treatment of substance use disorders.¹⁷¹ Three medications are commonly used to treat severe opioid use disorder: methadone, buprenorphine (Suboxone and Subutex) and naltrexone (Vivitrol).

In Knox County in 2018, 3,619 people received buprenorphine for medication-assisted treatment.¹⁶⁷ Similar measures for methadone and naltrexone are unavailable.

Rate of buprenorphine (MAT) prescriptions filled per 100,000 people¹⁶⁷



Substance Use and Misuse

ALCOHOL

Alcohol is an intoxicating ingredient found in beer, wine and liquor. It has the potential to be misused and can adversely affect health.



Excessive alcohol use¹⁷²

- **Heavy drinking:** 15 drinks or more per week for men, eight drinks or more per week for women
- **Binge drinking:** Five or more drinks within 2 hours for men, four or more drinks within 2 hours for women

Excessive alcohol use is associated with:¹⁷²

- Chronic diseases, such as liver cirrhosis and cancers
- Unintentional injuries, such as motor vehicle crashes, falls and firearm injuries
- Violence, including child abuse, homicide and suicide
- Harm to a developing fetus if a woman drinks while pregnant
- Alcohol use disorders

What do Knox County residents think about alcohol misuse?



43%
identified as a
Major Problem

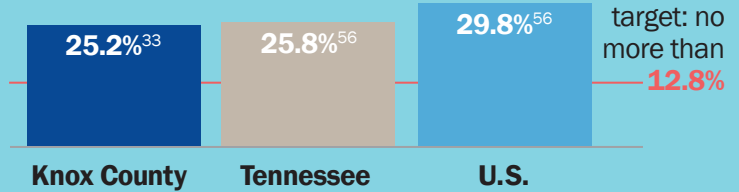


2.5
Satisfaction Level
with current efforts

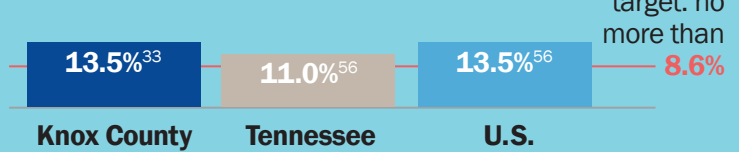
- Participants in the survey, focus groups and interviews did not consider alcohol misuse to be as large a problem as drug misuse.
- Survey participants had a slightly higher than average level of satisfaction with how alcohol misuse is being addressed in Knox County, as compared with other health issues.

High school students

Reported being current alcohol users



Reported binge drinking in the past 30 days



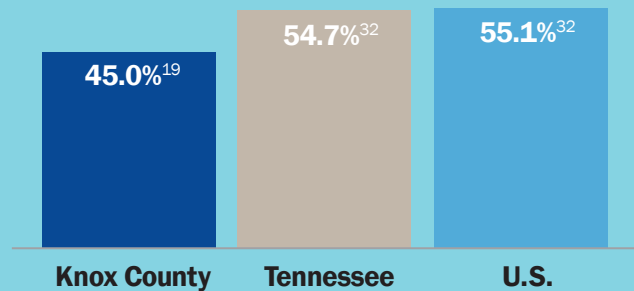
In Knox County, **11.1%** of high school students reported they had their first drink of alcohol before age 13.³³



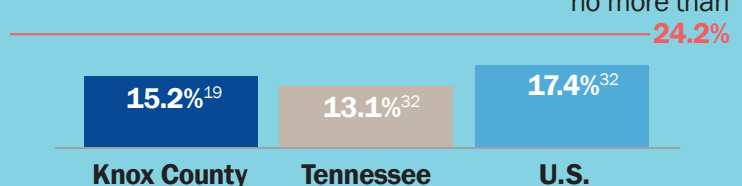
One out of four Knox County high schoolers are current alcohol users.³³

Adults

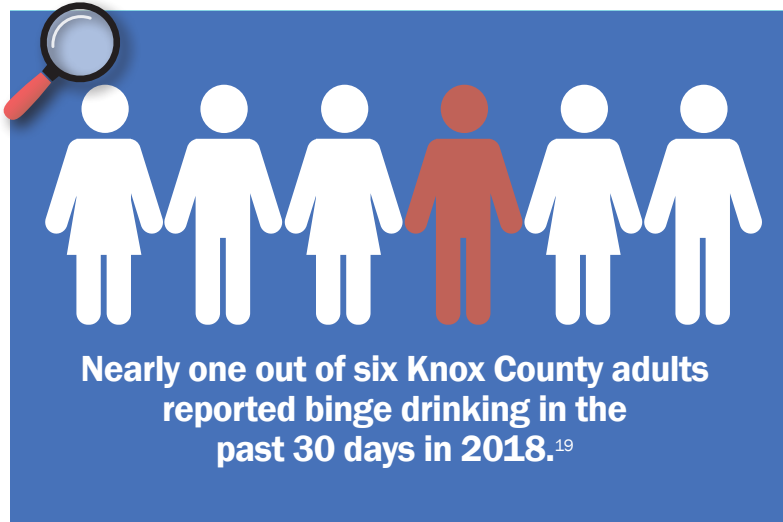
Reported being current alcohol users



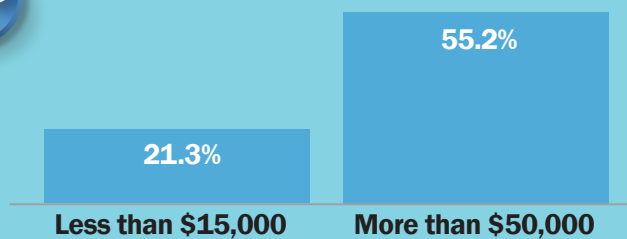
Reported engaging in binge drinking in the past month



Substance Use and Misuse



Current alcohol use among Knox County adults by income, 2018¹⁹



Unlike many other risky health behaviors identified in this report, which tend to be more prevalent among individuals with lower income, Knox County adults with higher incomes are more likely to use alcohol and to binge drink.

In Tennessee, the total cost of excessive alcohol consumption in 2010 was \$4.7 billion, well above the median cost across all states.¹⁷³ Most of this cost came from lost productivity and health care expenditures.

Community resources for the prevention and treatment of substance misuse include:

- Joint Knox County/City of Knoxville All4Knox Initiative
- Metro Drug Coalition
- Tennessee Redline (1-800-889-9789)
- Various treatment facilities

TOBACCO

Tobacco use includes smoking combustible products such as cigarettes, cigarillos and cigars. Tobacco products also include hookahs and smokeless tobacco such as spit tobacco and snus. The U.S. Food and Drug Administration (FDA) classifies electronic cigarettes and vapor products such as Juul as tobacco products as well.

Smoking combustible tobacco products is the leading cause of preventable death in the U.S., accounting for one in five deaths. It leads to disease and disability and harms nearly every organ of the body.

Every year, \$170 billion is spent in the U.S. on direct medical care due to smoking. Productivity losses from smoking are estimated at \$156 billion.⁶² Nearly nine out of ten cigarette smokers first try cigarettes before age 18.⁶² The tobacco industry spends billions of dollars each year on marketing cigarettes.

What do Knox County residents think about tobacco use?



51%
identified as a
Major Problem

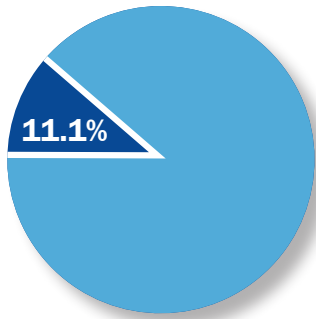


2.4
Satisfaction Level
with current efforts

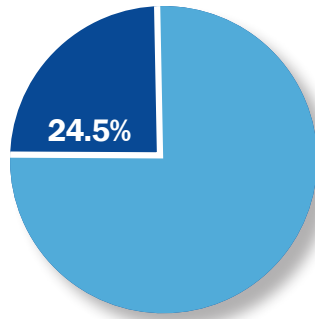
- Tobacco use was identified as a major concern in Knox County by over half of survey respondents, and was discussed in focus groups and interviews.
- Participants discussed the ways that local culture contributes to the problem.
- Focus group and interview participants often discussed vaping as a type of tobacco use.
- “Vaping – teenagers are getting on those. It has nicotine in it. She was buying it at school from another kid and we don’t know what the long-term effects are.” – Focus group participant

Substance Use and Misuse

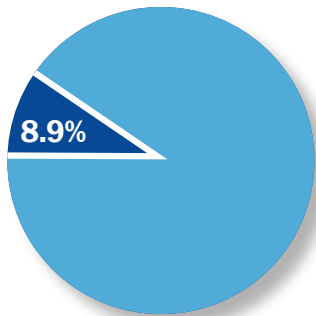
Knox County student tobacco* and e-cigarette use, 2017³³



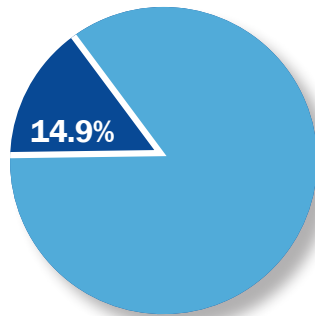
Middle school students who reported current tobacco use



High school students who reported current tobacco use



Middle school students who reported current e-cigarette use



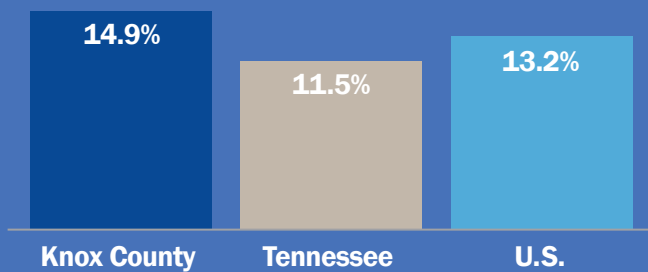
High school students who reported current e-cigarette use

*Cigarettes, cigars, e-cigarettes and smokeless tobacco³³



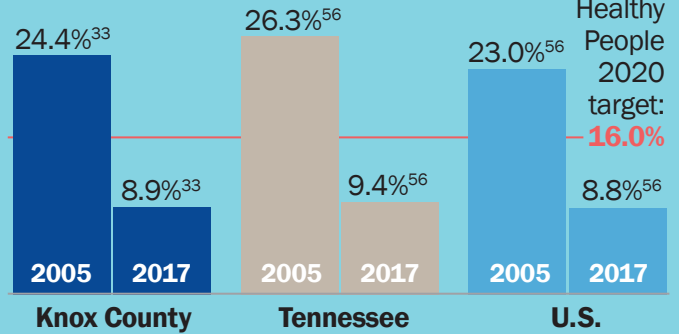
Current cigarette use among high school students in Knox County has declined by half since 2013, but rates of e-cigarette use in this age group are higher than state and national rates.

High school students who reported using e-cigarettes, 2017³³



The Knox County Youth Risk Behavior Survey began collecting data on e-cigarette use among youth in 2017. The CDC reports that e-cigarette use among high school students in the U.S. increased from 11.7% to 20.8% from 2017 to 2018.¹⁷⁴

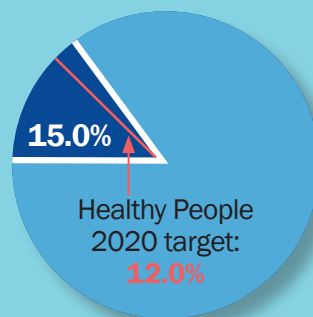
Percentage of high school students who smoke cigarettes



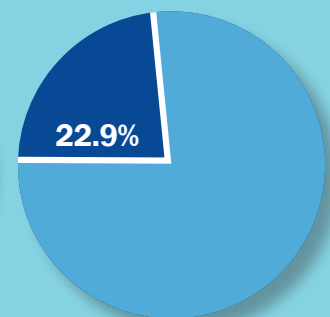
Adolescent risk factors for starting smoking include:⁶²

- Being white and male
- Lacking college plans
- Having parents who do not have a college degree
- Adverse childhood experiences

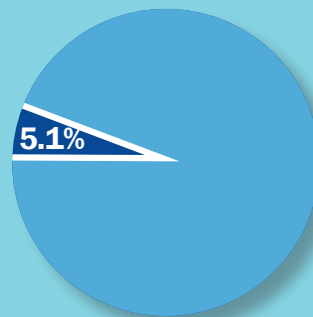
Tobacco use, Knox County, 2018¹⁹



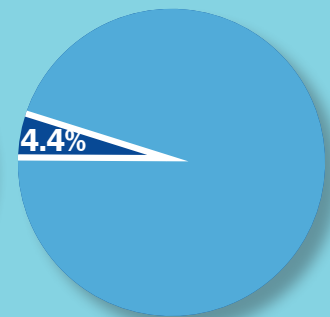
Adults who reported current **tobacco** use



Adults who reported having **quit smoking**



Adults who reported current **e-cigarette** use



Adults who reported current **smokeless tobacco** use



Knox County residents with lower income and lower educational attainment are more likely to smoke.¹⁹

Substance Use and Misuse

E-cigarettes are not safe for youth, young adults, pregnant women or adults who do not currently use tobacco products.⁶²

Using e-cigarettes is especially unsafe for kids, teens and young adults. Most e-cigarettes contain nicotine, which is highly addictive and can harm the developing adolescent brain, especially areas of the brain that control attention, learning, mood and impulse control. Young people who use e-cigarettes may be more likely to smoke cigarettes or misuse other substances in the future.⁶²

At the time this report was written, the CDC, the FDA, state and local health departments and other clinical and public health partners were investigating a national outbreak of e-cigarette, or vaping, product use associated lung injury (EVALI). A total of 2,807 hospitalized cases of EVALI had been reported, and 68 deaths confirmed, as of February 18, 2020.⁶² Laboratory data show that vitamin E acetate, an additive in some THC-containing e-cigarette products is strongly linked to the EVALI outbreak. THC is tetrahydrocannabinol, the psychoactive compound in marijuana. Emergency department visits related to e-cigarette products continue to decline after peaking in September 2019. The reasons for the decline are likely related to increased public awareness of the risk associated with THC-containing e-cigarette use, the removal of vitamin E acetate from some products and law enforcement actions related to illicit products.

Community resources for tobacco prevention and cessation include:

- Knox County Health Department, Tobacco Use Prevention and Control Program
- Metro Drug Coalition
- Smoke-Free Knoxville
- Tennessee Department of Health
- Tennessee Tobacco Quitline (1-800-QUIT NOW, or www.tnquitline.org)

References

1. [United States Census QuickFacts](#), Knox County, Tennessee. United States Census website. Accessed Jan 29, 2020.
2. [Knoxville Area Facts & Figures 2019](#). Knoxville-Knox County Planning Commission website. Accessed Jan 29, 2020.
3. Sycamore Institute. [The Drivers of Health: 4 factors that influence individual and population health](#). Published Jul 18, 2018. Accessed Jan 29, 2020.
4. Booske B, Athens J, Kindig D, et al. [County Health Rankings Working Paper: Different Perspectives for Assigning Weights to Determinants of Health](#). Published Feb 2010. Accessed Jan 29, 2020.
5. United States Department of Health and Human Services. [HHS Action Plan to Reduce Racial and Ethnic Health Disparities](#). Accessed Jan 29, 2020.
6. Sycamore Institute. [How Education Influences Health in Tennessee](#). Published Dec 21, 2017. Accessed Jan 29, 2020.
7. Sycamore Institute. [How Socioeconomic Factors Affect Health in Tennessee](#). Published Jun 6, 2018. Accessed Jan 29, 2020.
8. Health Affairs and Robert Wood Johnson Foundation. [Health Policy Brief: Health, Income, & Poverty: Where We Are & What Could Help](#). Published Oct 4, 2018. Accessed Jan 29, 2020.
9. [Social Determinants of Health: Know What Affects Health](#). Centers for Disease Control and Prevention (CDC) website. Updated Jan 29, 2018. Accessed Jan 29, 2020.
10. Paradies Y, Ben J, Denson N, et al. [Racism as a Determinant of Health: A Systematic Review and Meta-Analysis](#). PloS One. 2015; 10(9), e0138511. <https://doi.org/10.1371/journal.pone.0138511>
11. Tennessee Department of Health. [ACEs Fact Sheet](#). Published Jun 2018. Accessed Jan 29, 2020.
12. [Vital Signs: Adverse Childhood Experiences \(ACEs\)](#). CDC website. Updated Nov 5, 2019. Accessed Jan 29, 2020.
13. [Crime and Violence](#). Healthy People website. Updated Jan 29, 2020. Accessed Jan 29, 2020.
14. Sycamore Institute. [The Housing and Health Connection](#). Published Apr 20, 2017. Accessed Jan 29, 2020.
15. Sycamore Institute. [How Transportation Impacts Public Health](#). Published Feb 21, 2017. Accessed Jan 29, 2020.
16. Gulliford M, Figueroa-Munoz J, Morgan M. [What does 'access to health care' mean?](#). Journal of Health Services Research and Policy. 2002; 7(3): 186-188. <https://doi.org/10.1258/135581902760082517>
17. Sycamore Institute. [Medical Debt in Tennessee: Who Has It and Why Does It Matter?](#) Published May 8, 2019. Accessed Jan 30, 2020.
18. Himmelstein D, Lawless R, Thorne D, et al. [Medical Bankruptcy: Still Common Despite the Affordable Care Act](#). American Journal of Public Health. Mar 2019. 109 (3): 431-433. Doi: 10.2105/AJPH.2018.304901
19. Knox County Health Department. [2018 Behavioral Risk Factor Survey](#). Published 2020. Accessed pre-publication Jan 30, 2020.
20. [American Community Survey](#). United States Census data website. Accessed Jan 30, 2020.
21. Sycamore Institute. [Employer-Sponsored Health Insurance Deductibles in Tennessee](#). Published Jul 25, 2017. Accessed Jan 30, 2020.
22. Correspondence between KCHD Health Planner Erin Read and Sycamore Institute Policy Director Mandy Pellegrin. Dec 19, 2019.
23. Annie E. Casey Foundation. [Kids Count Data Center](#). Accessed Jan 30, 2020.
24. Tennessee Division of TennCare. [TennCare 2018 Enrollment Report](#). Accessed Jan 30, 2020.
25. United States Health Resources and Services Administration. [Data and Maps](#). Accessed Jan 30, 2020.
26. CDC. [Oral Health Surveillance Report, 2019](#). Published 2019. Accessed Jan 30, 2020.
27. Seirawan H, Faust S, Mulligan R. [The impact of oral health on the academic performance of disadvantaged children](#). American Journal of Public Health. 2012 Sep; 102(9): 1729-34. Doi: 10.2105/AJPH.2011.300478
28. United States Department of Health and Human Services. [Oral Health in America: A Report of the Surgeon General](#). Published 2000. Accessed Jan 30, 2020.
29. [About Physical Activity](#). CDC website. Updated Feb 4, 2019. Accessed Jan 31, 2020.
30. Lee I, Shiroma E, Lobelo F, et al. [Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy](#). The Lancet. Jul 2012, 380(9838): 219-229. doi: 10.1016/S0140-6736(12)61031-9
31. United States Department of Health and Human Services. [Physical Activity Guidelines for Americans, 2nd Edition](#). Published 2018. Accessed Jan 31, 2020.
32. CDC. [Behavioral Risk Factor Surveillance System](#). Accessed Jan 31, 2020.
33. Knox County Health Department. [2017 Knox County High School Youth Risk Behavior Survey](#). Published 2017. Accessed Jan 31, 2020.
34. United States Environmental Protection Agency. [Creating Equitable, Healthy, and Sustainable Communities: Strategies for Advancing Smart Growth, Environmental Justice, and Equitable Development](#). Published Feb 2013. Accessed Jan 31, 2020.
35. [Physical Activity: Community Strategies](#). CDC website. Updated Jan 20, 2020. Accessed Jan 31, 2020.
36. Smith, K; Brown, B; Yamada I; et al. [Walkability and Body Mass Index](#). American Journal of Preventive Medicine. Sep 2008, 35(3): 237-244. <https://doi.org/10.1016/j.amepre.2008.05.028>
37. Fitzhugh E, Barroso C. [Physical Activity in the City of Knoxville Parks: Findings and Recommendations for Public Health](#). Published Nov 2019. Accessed Jan 31, 2020.
38. Harnik P, Martin A. [Close-to-Home Parks: A Half-Mile or Less](#). Trust for Public Land website. Accessed Jan 31, 2020.
39. Calculations by Dr. Gene Fitzhugh, Department of Kinesiology, University of Tennessee, Knoxville, using data from the 2018 Knox County Behavioral Risk Factor Survey.
40. Belon A; Nieuwendyk L; Vallianatos H; et al. [Community Lenses Revealing the Role of Sociocultural Environment on Physical Activity](#). American Journal of Health Promotion. Jan-Feb 2016, 30(3): e92-100. Doi: 10.4278/ajhp.140428-QUAL-169
41. [Nutrition](#). CDC website. Updated Jan 23, 2020. Accessed Jan 31, 2020.
42. United States Department of Agriculture. [Dietary Guidelines for Americans, 2015-2020, Eighth Edition](#). Published Dec 2015. Accessed Jan 31, 2020.

43. Lee-Kwan S, Moore L, Blanck H, et al. [Disparities in State-Specific Adult Fruit and Vegetable Consumption—United States, 2015](#). Morbidity and Mortality Weekly Report, Nov 17, 2017. 66(45): 1241-1247.
44. Seligman H, Laraia B, Kushel M. [Food Insecurity is Associated with Chronic Disease among Low-Income NHANES Participants](#). The Journal of Nutrition. Feb 2010, 140(2): 304-310. <https://doi.org/10.3945/jn.109.112573>
45. [Food Insecurity](#). Healthy People website. Updated Jan 31, 2020. Accessed Jan 31, 2020.
46. [Food Insecurity in the United States](#). Feeding America website. Accessed Jan 31, 2020.
47. Ver Ploeg M, Nulph D, Williams R. [Mapping Food Deserts in the United States](#). United States Department of Agriculture website. Published Dec 1, 2011. Accessed Jan 31, 2020.
48. [Food Desert Locator](#). United States Department of Agriculture website. Accessed Jan 31, 2020.
49. CDC. [Current Practices in Developing and Supporting Farmers' Markets](#). Accessed Jan 31, 2020.
50. Nourish Knoxville. [East Tennessee Local Food Guide, Spring 2019-Spring 2020](#). Published Apr 9, 2019. Accessed Jan 31, 2020.
51. [Overweight and Obesity](#). CDC website. Updated Jan 23, 2020. Accessed Jan 31, 2020.
52. Biener A, Cawley J, Meyerhoefer C. [The High and Rising Costs of Obesity to the US Health Care System](#). Journal of General Internal Medicine. 2017 Apr; 32 (Suppl1 1): 6-8. Doi: 10.1007/s11606-016-3968-8
53. Gates D, Succop P, Brehm B, et al. [Obesity and presenteeism: the impact of body mass index on workplace productivity](#). Journal of Occupational Environmental Medicine. Jan 2008; 50(1): 39-45. doi: 10.1097/JOM.0b013e31815d8db2
54. Cawley J, Rizzo J, Haas K. [Occupation-specific absenteeism costs associated with obesity and morbid obesity](#). Journal of Occupational Environmental Medicine. Dec 2007; 49(12): 1317-1324. doi: 10.1097/JOM.0b013e31815b56a0
55. Petersen R, Pan L, Blanck H. [Racial and Ethnic Disparities in Adult Obesity in the United States: CDC's Tracking to Inform State and Local Action](#). Preventing Chronic Disease 2019; 16:180579. Doi: <http://dx.doi.org/10.5888/pcd16.180579>
56. CDC. [Youth Risk Behavior Surveillance System \(YRBSS\)](#). Accessed Jan 31, 2020.
57. Knox County Health Department and Knox County Schools. [Body Mass Index Estimates for Knox County Schools Children: 2016-2017](#). Published Dec 2017. Accessed Jan 31, 2020.
58. Knox County vital records and hospital discharge data provided by the Tennessee Department of Health, Division of Population Health Assessment
59. [Health and Economic Costs of Chronic Diseases](#). CDC website. Updated Oct 23, 2019. Accessed Jan 31, 2020.
60. Sycamore Institute. [The Economic Impact of Chronic Disease in Tennessee](#). Published Nov 15, 2017. Accessed Jan 31, 2020.
61. [Childhood adversity increases risk for long-term health and behavioral issues](#). Center for Youth Wellness website. Accessed Jan 31, 2020.
62. [Smoking and Tobacco Use](#). CDC website. Updated Nov 15, 2019. Accessed Feb 6, 2020.
63. [Physical Activity Basics](#). CDC website. Updated Jan 16, 2020. Accessed Jan 31, 2020.
64. [About Chronic Diseases](#). CDC website. Updated Oct 23, 2019. Accessed Jan 31, 2020.
65. [Social Determinants of Health: Know What Affects Health](#). CDC website. Updated Jan 29, 2018. Accessed Jan 31, 2020.
66. [Years of Potential Life Lost Statistics](#). Tennessee Department of Health website. Accessed Jan 31, 2020.
67. [About Heart Disease](#). CDC website. Updated Dec 9, 2019. Accessed Jan 31, 2020.
68. [How do mortality rates in the U.S. compare to other countries?](#). Peterson-KFF Health System Tracker website. Published Feb 14, 2019. Accessed Jan 31, 2020.
69. [Know Your Risk for High Blood Pressure](#). CDC website. Updated Jan 28, 2020. Accessed Jan 31, 2020.
70. [What is Cancer?](#). National Cancer Institute website. Accessed Jan 31, 2020.
71. Knox County Health Department. [The Impact of Cancer on Knox County, Tennessee Residents from 2010 to 2014](#). Published Dec 2017. Accessed Jan 31, 2020.
72. [Chronic Obstructive Pulmonary Disease \(COPD\)](#). CDC website. Updated Jun 6, 2018. Accessed Jan 31, 2020.
73. [Asthma Risk Factors](#). American Lung Association website. Updated Apr 29, 2019. Accessed Jan 31, 2020.
74. [About Stroke](#). CDC website. Updated Jul 25, 2019. Accessed Jan 31, 2020.
75. [Alzheimer's Disease](#). CDC website. Updated Sep 20, 2019. Accessed Jan 31, 2020.
76. [Diabetes](#). CDC website. Updated Jan 30, 2020. Accessed Jan 31, 2020.
77. American Diabetes Association. [Economic Costs of Diabetes in the U.S. in 2017](#). Diabetes Care. 2018 May; 41(5): 917-928. <https://doi.org/10.2337/dci18-0007>
78. [Chronic Kidney Disease Basics](#). CDC website. Updated Dec 12, 2019. Accessed Jan 31, 2020.
79. Beck A, Huang B, Kahn R. [Housing Code Violation Density Associated with Emergency Department and Hospital Use by Children with Asthma](#). Health Affairs. Nov 2014, 33(11): 1993-2002. Doi: [10.1377/hlthaff.2014.0496](https://doi.org/10.1377/hlthaff.2014.0496)
80. [County Health Rankings website](#). Accessed Jan 31, 2020.
81. Knoxville Homeless Management Information System. [Annual Report 2018](#). Published Jul 2019. Accessed Jan 31, 2020.
82. Data provided by Knox County Health Department, Air Quality Management Division
83. [Air Quality](#). CDC website. Updated May 4, 2018. Accessed Jan 31, 2020.
84. [Air Quality System](#). Environmental Protection Agency website. Updated Jan 15, 2020. Accessed Jan 31, 2020.
85. [Tennessee Assessment Data for 2016](#). Environmental Protection Agency website. Accessed Jan 31, 2020.
86. Tennessee Department of Environment and Conservation. [2014 305\(b\) Report: The Status of Water Quality in Tennessee](#). Published Dec 2014. Accessed Jan 31, 2020.
87. Butler T, Likens G, Cohen M, et al. [Final Report: Mercury in the Environment and Patterns of Mercury Deposition from the NADP/MDN Mercury Deposition Network](#). Published Jan 2007. Accessed Jan 31, 2020.
88. [Childhood Lead Poisoning Prevention](#). CDC website. Updated Dec 18, 2019. Accessed Jan 31, 2020.

89. [Lead Poisoning](#). Tennessee Department of Health website. Accessed Jan 31, 2020.
90. Data provided by the Childhood Lead Poisoning Prevention Program, Tennessee Department of Health
91. [Foodborne Germs and Illnesses](#). CDC website. Updated Oct 23, 2019. Accessed Jan 31, 2020.
92. [Waterborne Disease Prevention Branch](#). CDC website. Updated Apr 24, 2019. Accessed Jan 31, 2020.
93. [Interactive Disease Data](#). Tennessee Department of Health website. Accessed February 10, 2020.
94. [Influenza \(Flu\)](#). CDC website. Updated Jan 31, 2020. Accessed Jan 31, 2020.
95. Tennessee Department of Health. [Results of the 2018 Immunization Status Survey of 24-month-old Children in Tennessee](#). Published Feb 2019. Accessed Jan 31, 2020.
96. [Vaccines and Immunizations](#). CDC website. Updated May 26, 2016. Accessed Jan 31, 2020.
97. Whitney C, Zhou F, Singleton J, et al. [Benefits from Immunization During the Vaccines for Children Program Era—United States, 1994-2013](#). Morbidity and Mortality Weekly Report. Apr 25, 2014, 63(16): 352-355.
98. Tennessee Department of Health. [Kindergarten Immunization Compliance Assessment](#). Accessed Jan 31, 2020.
99. [2018-2019 School Year Vaccination Coverage Report](#). CDC website. Updated Sep 10, 2019. Accessed Jan 31, 2020.
100. Meites E, Szilagyi P, Chesson H, et al. [Human Papillomavirus Vaccination for Adults: Updated Recommendations of the Advisory Council on Immunization Practices](#). Morbidity and Mortality Weekly Report. Aug 16, 2019, 68(32): 698-702.
101. Walker T, Elam-Evans L, Yankey D, et al. [National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13-17 Years—United States, 2017](#). Morbidity and Mortality Weekly Report. Aug 24, 2018, 67(33): 909-917.
102. [Viral Hepatitis](#). CDC website. Updated Dec 30, 2019. Accessed Feb 3, 2020.
103. Rosenberg E, Rosenthal E, Hall E, et al. [Prevalence of hepatitis C virus infection in US states and the District of Columbia, 2013 to 2016](#). JAMA network Open. 2018; 1(8): e186371. Doi: 10.1001/jamanetworkopen.2018.6371
104. Data from the 2018 Viral Hepatitis Frozen Dataset, provided by the Tennessee Department of Health, Viral Hepatitis Program
105. [Legionella](#). CDC website. Updated Apr 30, 2018. Accessed Oct 20, 2020.
106. Kochanek K, Murphy S, Xu J, et al. [Deaths: Final Data for 2017](#). National Vital Statistics Reports, 68(9). Published Jun 24, 2019. Accessed Feb 3, 2020.
107. [Motor Vehicle Safety](#). CDC website. Updated Oct 28, 2019. Accessed Feb 3, 2020.
108. Knoxville Regional Transportation Planning Organization. [Bicycle and Pedestrian Crash Map](#). Updated 2019. Accessed Feb 3, 2020.
109. Knox County Health Department. [2018 Knox County Middle School Youth Risk Behavior Survey](#). Published 2019. Accessed Feb 3, 2020.
110. [Home and Recreational Safety: Older Adult Falls](#). CDC website. Updated Feb 10, 2017. Accessed Feb 3, 2020.
111. United States Department of Health and Human Services. [Stop Bullying website](#). Accessed Feb 3, 2020.
112. Forster M, Gower A, McMorris B, et al. [Adverse Childhood Experiences and School-Based Victimization and Perpetration](#). Journal of Interpersonal Violence, 2017 Jan 1. Doi: 10.1177/0886260517689885
113. [La Crosse encephalitis](#). CDC website. Updated Aug 19, 2019. Accessed Oct 27, 2020
114. CDC. [National Intimate Partner and Sexual Violence Survey: 2015 Data Brief](#). Published Nov 2018. Accessed Feb 3, 2020.
115. [Violence Prevention](#). CDC website. Updated Aug 8, 2018. Accessed Feb 3, 2020.
116. Tennessee Bureau of Investigation. [Crime Insight page](#). Accessed Feb 3, 2020.
117. Knox County Health Department. 2013 High School Youth Risk Behavior Survey. Published Oct 2013. Available upon request from Knox County Health Department.
118. Finch B, Thomas K, Beck A. [The Great Recession and adverse birth outcomes: Evidence from California, USA](#). SSM Population Health. Dec 2019; 9: 100470. Doi: 10.1016/j.ssmph.2019.100470
119. Frieden T. [CDC Health Disparities and Inequalities Report—United States, 2011](#). Morbidity and Mortality Weekly Report. Jan 14, 2011. Vol 60 Supplement, 1-116.
120. Petersen E, Davis N, Goodman D, et al. [Racial/Ethnic Disparities in Pregnancy-Related Deaths—United States, 2007-2016](#). Morbidity and Mortality Weekly Report. Sep 6, 2019. 68(35); 762-765.
121. Kotelchuck, M. [An evaluation of the Kessner adequacy of prenatal care index and a proposed adequacy of prenatal care utilization index](#). 1994. American Journal of Public Health 84(9): 1414-1420. Doi: 10.2105/ajph.84.9.1414
122. United States Department of Health and Human Services, Office on Women's Health. [Prenatal Care](#). Updated Apr 1, 2019. Accessed Feb 3, 2020.
123. March of Dimes. [Prevention Works in Maternal and Child Health](#). Published Feb 2012. Accessed Feb 3, 2020.
124. [Substance Use During Pregnancy](#). CDC website. Updated Jul 24, 2019. Accessed Feb 3, 2020.
125. [Smoking During Pregnancy](#). CDC website. Updated Jan 25, 2018. Accessed Feb 3, 2020.
126. [Is It Safe?](#). March of Dimes website. Accessed Feb 3, 2020.
127. [Methamphetamine: What are the risks of methamphetamine misuse during pregnancy?](#). National Institute on Drug Abuse website. Updated Oct 2019. Accessed Feb 3, 2020.
128. [Alcohol Use in Pregnancy](#). CDC website. Updated Mar 27, 2018. Accessed Feb 3, 2020.
129. Denny C, Acero C, Naimi T, et al. [Consumption of Alcoholic Beverages and Binge Drinking Among Pregnant Women Aged 18-44 Years—United States, 2015-2017](#). Morbidity and Mortality Weekly Report. Apr 26, 2019. 68(16); 365-368.
130. [Neonatal Abstinence Syndrome](#). Tennessee Department of Health website. Accessed Feb 3, 2020.
131. [Medication Assisted Treatment](#). SAMHSA-HRSA Center for Integrated Health Solutions website. Accessed Feb 3, 2020.
132. Meschke L, McNeely C, Brown K, et al. [Reproductive Health Knowledge, Attitudes, and Behaviors Among Women Enrolled in Medication-Assisted Treatment for Opioid Use Disorder](#). Journal of Women's Health. Oct 27, 2018 (10): 1215-1224. Doi: 10.1089/jwh.2017.6564
133. Tennessee Department of Health. [Neonatal Abstinence Syndrome Surveillance Annual Report 2018](#). Published 2019. Accessed Feb 3, 2020.

134. Tennessee Division of TennCare. [Neonatal Abstinence Syndrome \(NAS\) among TennCare enrollees—2017 data](#). Updated May 20, 2019. Accessed Feb 3, 2020.
135. [Low Birthweight](#). March of Dimes website. Updated Mar 2018. Accessed Feb 3, 2020.
136. Data provided by Tennessee Department of Health, from Fetal Death Statistical System.
137. [Infant Mortality](#). CDC website. Updated Mar 27, 2019. Accessed Feb 3, 2020.
138. [Adverse Childhood Experiences \(ACEs\)](#). CDC website. Updated Apr 2, 2019. Accessed Feb 3, 2020.
139. Evans, G. [Childhood poverty and adult psychological well-being](#). Proceedings of the National Academy of Sciences. 2016; 113 (52): 14949 Doi: 10.1073/pnas.1604756114
140. [Mental Health](#). CDC website. Updated Jan 26, 2018. Accessed Feb 3, 2020.
141. Wang P, Berglund P, Olfson M, et al. [Delays in initial treatment contact after first onset of a mental disorder](#). Health Services Research, 2004 Apr; 39(2): 393-415. Doi: 10.1111/j.1475-6773.2004.00234.x
142. [What are the current costs and outcomes related to mental health and substance use disorders?](#). Peterson-KFF Health System Tracker. Posted Jul 31, 2017. Accessed Feb 3, 2020.
143. County Health Rankings and Roadmaps. [2019 Tennessee Report](#). Accessed Feb 3, 2020.
144. [Tennessee Health Care Capacity Dashboard](#). Sycamore Institute website. Updated May 2, 2019. Accessed Feb 3, 2020.
145. [HPSA Find](#). United States Health Resources and Services Administration website. Accessed Feb 3, 2020.
146. [Joint Annual Reports \(JAR\)](#). Tennessee Department of Health website. Accessed Feb 3, 2020.
147. Knox County Health Department. Mental Health Patient Flow Analysis Results and Recommendations. Published Feb 2020. Accessed Feb 3, 2020.
148. Data provided by regional partnership of mental health care providers
149. Tennessee Suicide Prevention Network. [Status of Suicide in Tennessee 2019](#). Accessed Feb 3, 2020.
150. [Sexual Health](#). CDC website. Updated Jun 25, 2019. Accessed Feb 4, 2020.
151. [Reproductive and Sexual Health](#). Healthy People website. Updated Feb 4, 2020. Accessed Feb 4, 2020.
152. Morris J, Lippman S, Philip S, et al. [Sexually Transmitted Infection Related Stigma and Shame Among African American Male Youth: Implications for Testing Practices, Partner Notification, and Treatment](#). AIDS Patient Care and STDs. Sep 1, 2014; 28(9): 499-506. Doi: [10.1089/apc.2013.0316](#)
153. [Sexually Transmitted Disease Surveillance 2018: STDs in Racial and Ethnic Minorities](#). CDC website. Updated Jul 30, 2019. Accessed Feb 4, 2020.
154. Data provided from Knox County Patient Reporting Investigation Surveillance Manager (PRISM)
155. Walker T, Elam-Evans L, Yankey D, et al. [National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13-17 Years—United States, 2017](#). Morbidity and Mortality Weekly Report. Aug 24, 2018. 67(33): 909-917.
156. Meites E, Szilagyi P, Chesson H, et al. [Human Papillomavirus Vaccination for Adults: Updated Recommendations of the Advisory Committee on Immunization Practices](#). Morbidity and Mortality Weekly Report. Aug 16, 2019. 68(32); 698-702.
157. Daniels K, Abma J. [Current Contraceptive Status Among Women Aged 15-49: United States, 2015-2017](#). Dec 2018. NCHS Data Brief No. 327.
158. [Reproductive Health: Teen Pregnancy](#). CDC website. Updated Sep 9, 2019. Accessed Feb 4, 2020.
159. [Pregnancy Statistics](#). Tennessee Department of Health website. Accessed Feb 4, 2020.
160. [Mental Health and Substance Use Disorders](#). United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration website. Updated Apr 13, 2019. Accessed Feb 4, 2020.
161. The National Center on Addiction and Substance Abuse at Columbia University. [Addiction Medicine: Closing the Gap between Science and Practice](#). Published Jun 2012. Accessed Feb 4, 2020.
162. National Institute on Drug Abuse. [Drugs, Brains and Behavior: The Science of Addiction](#). Updated Jul 2018. Accessed Feb 4, 2020.
163. United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. [Key Substance Use and Mental Health Indicators in the United States: Results from the 2018 National Survey on Drug Use and Health](#). Published Aug 20, 2019. Accessed Feb 4, 2020.
164. [DrugFacts: Comorbidity: Substance Use Disorders and Other Mental Illnesses](#). National Institute on Drug Abuse website. Updated Aug 2018. Accessed Feb 4, 2020.
165. United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. [Substance Use and Suicide: A Nexus Requiring a Public Health Approach](#). Published 2016. Accessed Feb 4, 2020.
166. National Institute on Drug Abuse. [Principles of Adolescent Substance Use Disorder Treatment: A Research-Based Guide](#). Updated Jan 2014. Accessed Feb 4, 2020.
167. Tennessee Department of Health. [Tennessee Drug Overdose Dashboard](#). Accessed Feb 4, 2020.
168. Knox County Regional Forensic Center. [2018 Drug-Related Death Report](#). Accessed Feb 4, 2020.
169. Knox County Health Department and the Harm Reduction Coalition. [Knox County Naloxone Deployment by First Responders, Oct 1, 2016—Sep 30, 2018](#). Accessed Feb 4, 2020.
170. Hedegaard H, Minino A, Warner M. [Drug Overdose Deaths in the United States, 1999-2018](#). National Center for Health Statistics Data Brief No. 356, Jan 2020. Accessed Feb 5, 2020.
171. [Medication-Assisted Treatment \(MAT\)](#). United States Department of Health and Human Services, Substance Abuse and Mental Health Services Administration website. Updated Sep 9, 2019. Accessed Feb 5, 2020.
172. [Alcohol and Public Health](#). CDC website. Updated Aug 10, 2017. Accessed Feb 6, 2020.
173. Sacks J, Gonzales K, Bouchery E, et al. [2010 National and State Costs of Excessive Alcohol Consumption](#). American Journal of Preventive Medicine. Nov 2015, Vol 49, Issue 5, pp e73-e79. <https://doi.org/10.1016/j.amepre.2015.05.031>
174. Cullen K, Ambrose B, Gentzke A, et al. [Notes from the Field: Use of Electronic Cigarettes and Any Tobacco Product Among Middle and High School Students—United States, 2011-2018](#). Morbidity and Mortality Weekly Report. Nov 16, 2018. 67(45); 1276-1277.

Acknowledgments

Knox County Health Department Team:

Martha Buchanan, MD, *Senior Director and Public Health Officer*

Katharine Killen, *Chief Strategy Officer*

Angela Allred

Liliana Burbano Bonilla

Sarah Hall, MPH

Charity Menefee, MA

Becky Meyer, MPH, CIC

Michelle Moyers

Mark Prather, PhD

R. Daniel Proctor

Erin Read

Roberta Sturm, MPH

Jennifer Valentine, MSN, RN

Alicia Verlinde, MPH

Kelsey Wilson

Office of the Knox County Mayor Glenn Jacobs

And:

Covenant Health

East Tennessee Children's Hospital

Helen Ross McNabb Center

Knox County Regional Forensic Center

Knoxville Homeless Management Information System

Knoxville-Knox County Harm Reduction Coalition

Knoxville-Knox County Planning Commission

Knoxville Regional Transportation Planning Organization

Knoxville, Knox County, Knoxville Utilities Board Geographic Information System

Regional partnership of mental health care providers

Sycamore Institute

Tennessee Bureau of Investigation

Tennessee Department of Environment and Conservation

Tennessee Department of Health

Tennessee Suicide Prevention Network

Tennova Healthcare

University of Tennessee Medical Center

University of Tennessee, Center for Applied Research and Evaluation

University of Tennessee, Departments of Public Health and Kinesiology



KNOX COUNTY
TENNESSEE

HEALTH DEPARTMENT