# Cancer in Oklahoma Data Brief Series:

# Cancer in Rural Oklahoma-Update 2025

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## Introduction

In 2022, compared to Oklahoma, 18 states had higher all-cause cancer incidence rates, but in 2023, only three states had higher all-cause cancer mortality rates.[1] Given this troubling gap between Oklahoma's cancer incidence and mortality rankings, an in-depth examination of cancer incidence and mortality rates among the state's high-risk populations, including rural areas, is warranted.

In 2023, Oklahoma's 1,301,826 rural residents accounted for 32.1% of the state's 4,053,824 population, roughly 2.3 times the national average of 13.7%.[2] Of the 77 counties in Oklahoma, 59 counties are designated as rural based on the U.S. Department of Agriculture (USDA) Economic Research Service's (ERS) 2023 Rural-Urban Continuum Codes (RUCC).[3] The USDA's ERS has developed several multi-level county classifications to measure rurality in more detail and to assess the economic and social diversity of nonmetro America. Among these, the RUCC county-level classification scheme is widely used because it distinguishes metropolitan (urban) counties by population size and nonmetropolitan (rural) counties by degree of urbanization and adjacency to a metropolitan area.

Rural areas in the U.S. are generally associated with multiple socioeconomic and healthcare challenges. In 2023, the poverty rate in rural Oklahoma was 18.5%, compared to 14.5% in urban Oklahoma and 12.5% nationwide. Additionally, in 2024, 16.5% of rural Oklahoma adults reported current smoking, compared to 14.1% of adults in the entire state, and 10.9% adults in the United States (US).[4] In that same year, 37.4% of rural Oklahoma adults were obese, compared to 36.8% of adults in the state and 33.1% adults in the US.[4] High rates of poverty, tobacco use, obesity, and other factors are compounded by long distances required to access cancer care.[5] These factors can subsequently impact overall cancer incidence and mortality rates.

This data brief presents information on overall and cause-specific cancer incidence and mortality for the rural and urban populations of Oklahoma classified by RUCC status. It also examines cancer screening rates for the rural and urban populations and concludes with a brief discussion of the significance of findings on clinical practice and public health policy.

## Methods

Cancer incidence data were obtained from the Oklahoma Central Cancer Registry (OCCR), and cancer mortality data were from Oklahoma Vital Statistics. Information about cancer screening was obtained from the 2024 Oklahoma Behavioral Risk Factor Surveillance System (BRFSS). All data sources used in this brief were publicly available and provided de-identified data.

To ensure the stability of estimates and confidentiality, Oklahoma Central Cancer Registry and Oklahoma Vital Statistics rates were suppressed if fewer than five counts were reported in a specific category, and rates were age-adjusted to the

2000 US standard population. Incident cancers for all sites include *in situ* cancers, except breast cancer, which only includes invasive cancers.

BRFSS estimates were suppressed for stability if the unweighted sample size for the denominator was less than 50 or if the Relative Standard Error was above 0.3. All unknown values were excluded, and the resulting percentages were weighted averages estimated from the sample and population sizes.

To analyze different levels of rural Oklahoma, in this brief, "Rural Overall" refers to counties in the RUCC 4-9 group, "Large Rural" counties in the RUCC 4-6 group, and "Small Rural" counties in the RUCC 7-9 group. "Urban" refers to counties in the RUCC 1-3 group (Figure 1). Additionally, Hispanic persons were categorized as being Hispanic regardless of race. All individuals in the sample were classified into one of the following ethnic and racial groups: Hispanic, Non-Hispanic (NH) White, NH Black/African American, NH American Indian/Alaska Native, and NH Asian and Pacific Islander.

**Figure 1:** Map of Urban and Rural Counties in Oklahoma, RUCC 2023

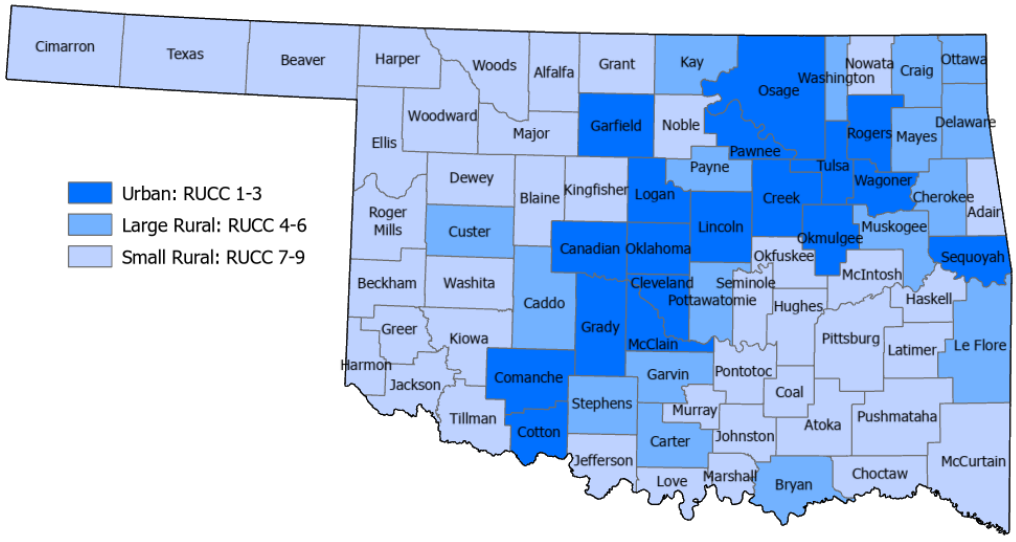


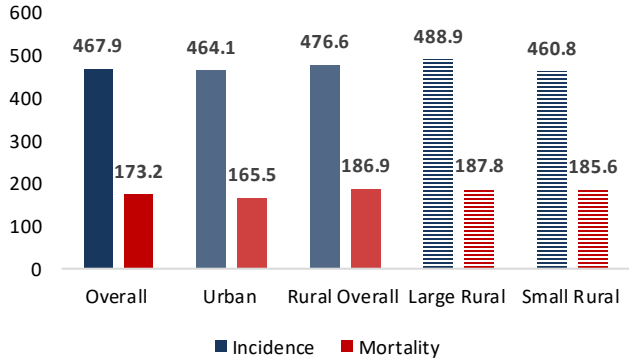

**Figure 1** maps counties in Oklahoma according to the 2023 RUCC classification system. Among the 77 counties in Oklahoma, 18 were urban counties (RUCC 1-3), 17 were large rural counties (RUCC 4-6), and 42 were small rural counties (RUCC 7-9). For more information, refer to **Appendix 1** for definitions of every RUCC category and a summary table of Oklahoma counties by RUCC.

## Results:

Overall, 9,105,227 cancer cases were diagnosed in the US between 2018 and 2022, and 106,884 in Oklahoma. During 2019 and 2023, there were 3,028,857 cancer deaths in the US, and 41,703 deaths in Oklahoma. Between 2018 and 2022, there were 70,068 cancer cases and 24,307 cancer deaths in urban Oklahoma and 39,368 cancer cases and 16,414 cancer deaths in rural Oklahoma.

**Figure 2** shows overall age-adjusted cancer incidence and mortality rates for the entire state of Oklahoma, as well as for urban and rural areas. The age-adjusted incidence rate is higher in rural Oklahoma than in urban Oklahoma, and within rural Oklahoma, incidence is higher in larger rural counties than in smaller ones. Similarly, for mortality, the age-adjusted mortality rate is lower in urban Oklahoma than in rural Oklahoma. Within rural Oklahoma, virtually no difference in mortality was observed between large rural and small rural counties.

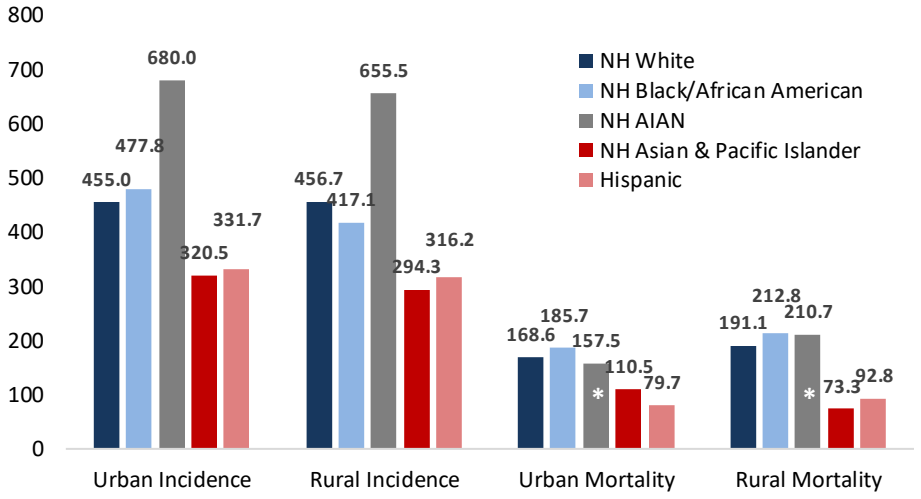
**Figure 2:** Overall Age-adjusted Cancer Incidence and Mortality Rates for Urban and Rural Populations in Oklahoma, 2018-2022




**Source:** OK2SHARE

**Figure 3** shows age-adjusted incidence and mortality rates by race and ethnicity for both urban and rural populations in Oklahoma. For each racial and ethnic group, the NH Black/African American, NH American Indian/Alaska Native (AIAN), and Hispanic groups had an age-adjusted incidence rate that was higher among the urban population than in the rural one. The NH AIAN group had the highest incidence rates among all groups in both urban and rural Oklahoma. Mortality rates were higher among the rural populations than the urban ones for the NH White, NH Black/African American, Hispanic, and NH AIAN groups, but lower for the NH Asian/Pacific Islander groups. Among all groups, the NH Black/African American group had the highest mortality rate in both urban and rural counties. It is important to note that the mortality rates presented for NH AI/AN persons in Oklahoma are likely to be underestimated. Analyses that used data from prior years linking Indian Health Service data to the national death index revealed higher mortality for this group. However, the Indian Health Service-linked mortality data for the years presented here have not been released. We estimate about a 29% increase when adjusting for misclassification in Oklahoma.[6]

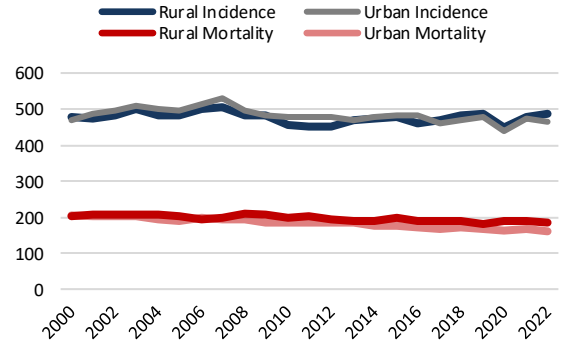
**Figure 3:** Overall Age-adjusted Cancer Incidence and Mortality Rates for the Urban and Rural Populations by Race and Ethnicity in Oklahoma, 2018-2022




**Source:** OK2SHARE;
* Estimates suggest a 29% high rate of AIAN mortality not accounted for in this chart

**Figure 4** shows trends in overall cancer incidence and mortality for the urban and rural populations in Oklahoma. For incidence, the urban population in Oklahoma has slightly higher rates for most periods. Incidence rates trended lower in both the urban and rural populations in 2020. In contrast, cancer mortality rates have been slightly but persistently higher in the rural population than in the urban one. However, mortality rates have gradually decreased in both urban and rural populations.

**Figure 4:** Trend of Overall Age-Adjusted Cancer Incidence and Mortality Rates for the Urban and Rural Populations in Oklahoma, 2000-2022

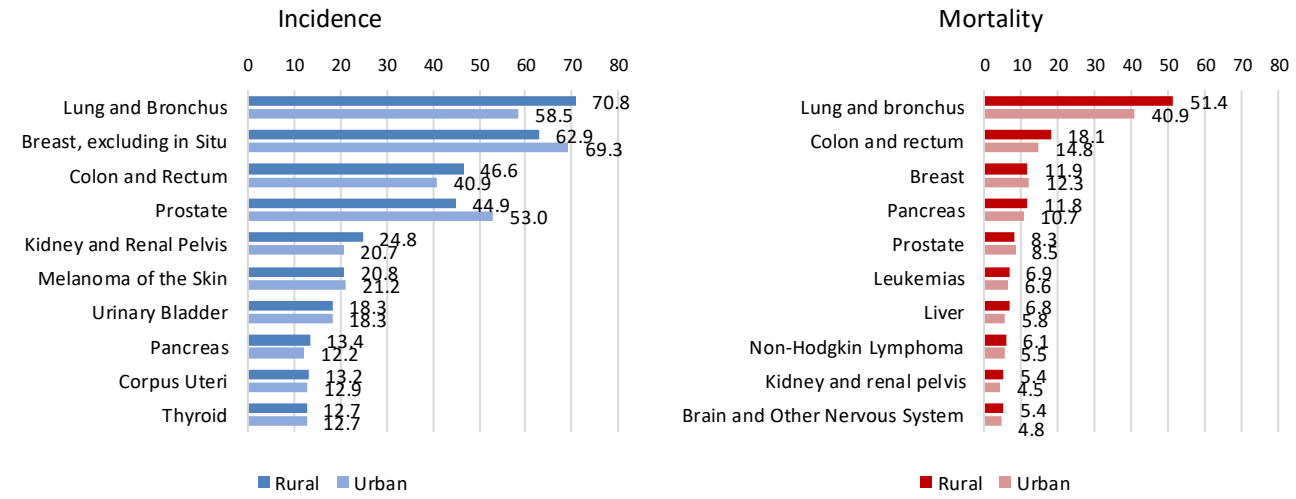



**Source:** OK2SHARE

**Figure 5** ranks the top 10 cancers by incidence and mortality for the rural population in Oklahoma and compares these rates to the corresponding rates for the urban population. For incidence, the rural population in Oklahoma has higher incidence rates than the urban population for two of the top three cancers -- lung and bronchus (70.8 vs. 58.5) and colon and rectum (46.6 vs. 40.9) with breast being lower (62.9 vs. 69.3). Notably, rural populations have slightly higher

incidence rates for kidney and renal pelvis (24.8 vs. 20.7) and pancreatic cancer (13.4 vs. 12.2). The incidence gap is especially wide for prostate cancer, with urban rates being higher than rural rates (53.0 vs. 44.9). However, for mortality, the rural populations show consistently higher death rates across all cancer types except breast (11.9 vs. 12.3), with the most striking disparities seen in lung and bronchus (51.4 vs. 40.9) and colon and rectum (18.1 vs. 14.8).

**Figure 5:** Top 10 Cancers for Incidence and Mortality for the Urban and Rural Populations in Oklahoma, 2018-2022

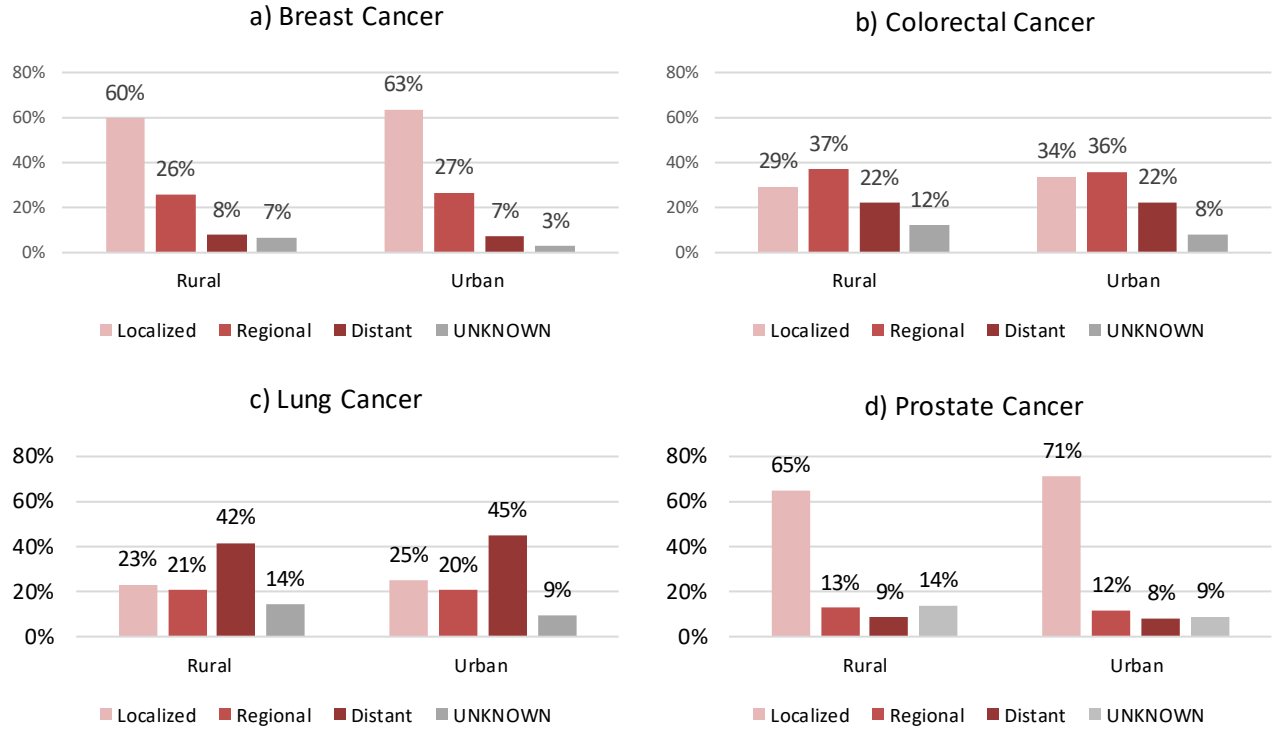



**Source:** OK2SHARE

**Figure 6** presents the stage at diagnosis for the top four cancers in urban and rural Oklahoma. Staging varies considerably by cancer site, but there are notable differences between rural and urban areas in Oklahoma. Most breast cancers are diagnosed at the localized stage, but the percentage of unknown stage for breast cancer is higher in the rural Oklahoma population than in the urban one. For colorectal cancer, the percentage of cancers diagnosed at the localized stage is lower and the percentage of those diagnosed with an unknown stage is higher in the rural Oklahoma population than in the urban population. For lung cancer, most cancers are diagnosed at a distant stage. Still, the percentage of unknown stages at the time of diagnosis is higher in the rural Oklahoma population than in the urban one. Lastly, for prostate cancer, the percentage of cancers diagnosed at the localized stage is lower, and the percentage diagnosed at an unknown stage is higher in the rural Oklahoma population than in the urban one. Studies have shown that survival for cancers with an unknown stage is significantly poorer than for those with earlier stages, such as the localized stage.[7]

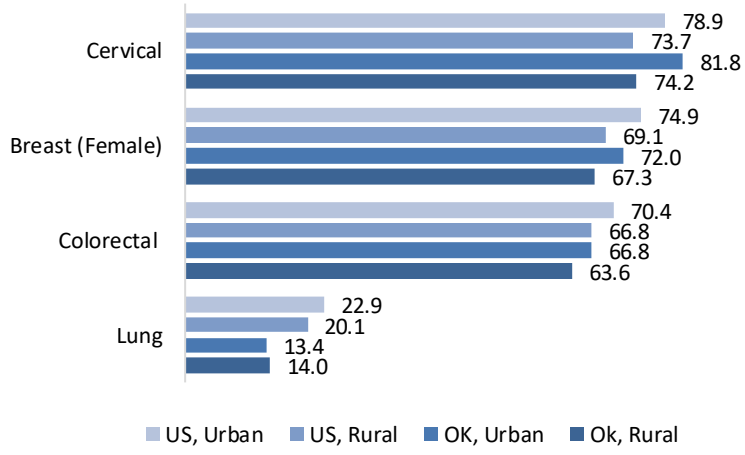
**Figure 7** shows the percentage of up-to-date cancer screening for the urban and rural populations in Oklahoma and the US. When comparing rural women to urban women in Oklahoma and the US, rural women in Oklahoma are the least likely to be up to date with breast cancer screening, but do well in cervical cancer screening, with both urban and rural women in Oklahoma being higher than the US. When reviewing colorectal screening coverage, Oklahoma does worse than the nation, with rural Oklahoma being the lowest of all groups. Finally, Oklahoma is well behind the nation in lung cancer screening for both the rural and urban populations. Nonetheless, rural Oklahomans are more likely than their urban counterparts to be up to date on lung cancer screening.

**Figure 6:** Stage at Diagnosis for the Top 4 Cancers, Urban and Rural Populations in Oklahoma, 2018-2022




Source: OK2SHARE

**Figure 7:** Cancer Screening for the Urban and Rural Populations in Oklahoma and the United States, 2024




Source: BRFSS

**BRFSS Cancer Screening Definitions:**

**Cervical**: Female respondents with an intact cervix, aged 21-65 that have had a pap test in last 3 years or aged 30-65 that have had an HPV test in last 5 years

**Breast:** Women respondents aged 40-74 that have had a mammogram in the past two years

**Colorectal:** Respondents aged 45-75 who have fully met the USPSTF recommendations (blood stool test in the past year, and/or sigmoidoscopy in the past 5 years, and/or colonoscopy in the past 10 years, and/or stool DNA test within the past 3 years, and/or virtual colonoscopy within the past 5 years)

**Lung**: Meet USPSTF Lung Cancer Screening Guidelines (among those eligible for screening)

## Conclusions and Implications for Practice and Policy

Findings from this brief demonstrate the need to address the higher overall cancer mortality rate documented for the rural population of Oklahoma. The state's rural population has higher mortality rates for seven of the top 10 cancers. In particular, the rural population experienced high incidence rates and even higher mortality rates for cancers of the lung and bronchus, colon and rectum, and kidney and renal pelvis.

To improve cancer outcomes and mitigate disparities, one approach is to increase the receipt of evidence-based cancer screenings. Compared to their national counterparts, both the rural and urban populations of Oklahoma reported lower screening rates for breast cancer and lung cancer. Screening rates for breast cancer were especially low in the rural population of Oklahoma. For rural populations, barriers to accessing cancer screening include a lack of education, financial and health insurance barriers[8, 9] and transportation barriers, such as the need to travel long distances to receive screening tests.[10 11] Financial barriers to screening for many rural (and urban) residents have been reduced because Oklahoma voters passed Initiative 802 to expand Medicaid coverage through the Affordable Care Act, which went to effect in 2021. However, many rural residents in Oklahoma still face barriers to screening due to distance. The recent spate of rural hospital and clinic closures across the state has likely exacerbated this.[12] To address distance barriers, mobile outreach to rural communities, such as is currently being done statewide for mammography, and being implemented for lung cancer, should be expanded. Likewise, at-home colorectal cancer screening tests, a home-based cervical cancer screening kit could be mailed directly to individuals' homes, allowing them to complete the test privately and return it by mail for laboratory analysis.

Furthermore, the rural-urban gap in cancer mortality can be explained at least in part by delays in diagnosis, leading to late-stage presentation and an unknown stage at the time of diagnosis for many cancers. Reduced access to care and specialist services increases the risk of being diagnosed with advanced or unknown stage disease.[13] Financial concerns cause many individuals with symptoms to delay health care, which can be devastating in terms of cancer outcomes.[14] Importantly, the aforementioned expansion of Medicaid coverage in Oklahoma for individuals between the ages of 19-64 through the Affordable Care Act reduces financial barriers to cancer-related care for many low-income individuals in the state, and particularly in rural areas where poverty rates are highest. Additionally, campaigns to increase public awareness of when to seek health care when specific cancer related symptoms arise could be directed towards rural populations to reduce late or unknown stage at the time of initial diagnosis.

Also, efforts to improve the quality of cancer treatment in rural populations are warranted. For example, clinical trials advance cancer treatment, and people participating in clinical trials have been shown to receive high-quality care.[15] This is why clinical trials must enroll participants from diverse backgrounds, including those who live in rural areas. Funding for research should be directed in a way that ensures diversity among patients enrolled in cancer clinical trials. One way to increase clinical trial participation among cancer patients from rural areas is to develop and support partnerships between academic centers with expertise in clinical trial research and community oncology practices.

These and additional actions are necessary to achieve the ambitious yet worthy goal of eliminating cancer disparities among Oklahoma's rural population.

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## References:


1. U.S. Cancer Statistics Data Visualizations Tool [Internet]. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. 2025 [cited October 1, 2025]. Available from: https://www.cdc.gov/cancer/dataviz, .
2. U.S. Department of Agriculture ERS. State Fact Sheets - State Data 2025 [updated 03/11/202510/29/2025]. Available from: https://data.ers.usda.gov/reports.aspx?ID=4035.
3. Economic Research Service, U.S. Department of Agriculture. Rural-Urban Continuum Codes 2023 [cited 2025 04/05]. Available from: https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.
4. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Survey Data. Atlanta, GA: U.S. Departm ent of Health and Human Services; 2024.
5. Lam O, Broderick B, Toor S. How far Americans live from the closest hospital differs by community type2018.
6. Dougherty TM, Janitz AE, Williams MB, Martinez SA, Peercy MT, Wharton DF, Erb-Alvarez J, Campbell JE. Racial Misclassification in Mortality Records Among American Indians/Alaska Natives in Oklahoma From 1991 to 2015. J Public Health Manag Pract. 2019;25 Suppl 5, Tribal Epidemiology Centers: Advancing Public Health in Indian Country for Over 20 Years(Suppl 5 TRIBAL EPIDEMIOLOGY CENTERS ADVANCING PUBLIC HEALTH IN INDIAN COUNTRY FOR OVER 20 YEARS):S36-S43. Epub 2019/07/28. doi: 10.1097/PHH.0000000000001019. PubMed PMID: 31348189; PMCID: PMC6690744.
7. Luo Q, Yu XQ, Cooke-Yarborough C, Smith DP, O'Connell DL. Characteristics of cases with unknown stage prostate cancer in a population-based cancer registry. Cancer Epidemiol. 2013;37(6):813-9. Epub 20131006. doi: 10.1016/j.canep.2013.09.008. PubMed PMID: 24103424.
8. Wang H, Roy S, Kim J, Farazi PA, Siahpush M, Su D. Barriers of colorectal cancer screening in rural USA: a systematic review. Rural Remote Health. 2019;19(3):5181. Epub 20190809. doi: 10.22605/RRH5181. PubMed PMID: 31394041.
9. Charlton M, Schlichting J, Chioreso C, Ward M, Vikas P. Challenges of Rural Cancer Care in the United States. Oncology (Willi ston Park). 2015;29(9):633-40. PubMed PMID: 26384798.
10. Shete S, Deng Y, Shannon J, Faseru B, Middleton D, Iachan R, Bernardo B, Balkrishnan R, Kim SJ, Huang B, Millar MM, Fuemmler B, Jensen JD, Mendoza JA, Hu J, Lazovich D, Robertson L, Demark-Wahnefried W, Paskett ED, Rural Workgroup of the Population Health Assessment in Cancer Center Catchment Areas I. Differences in Breast and Colorectal Cancer Screening Adherence Among Women Residing in Urban and Rural Communities in the United States. JAMA Netw Open. 2021;4(10):e2128000. Epub 20211001. doi: 10.1001/jamanetworkopen.2021.28000. PubMed PMID: 34605915; PMCID: PMC8491105.
11. Chandak A, Nayar P, Lin G. Rural-Urban Disparities in Access to Breast Cancer Screening: A Spatial Clustering Analysis. J Rural Health. 2019;35(2):229-35. Epub 20180610. doi: 10.1111/jrh.12308. PubMed PMID: 29888497.
12. McCarthy S, Moore D, Smedley WA, Crowley BM, Stephens SW, Griffin RL, Tanner LC, Jansen JO. Impact of Rural Hospital Closures on Health-Care Access. J Surg Res. 2021;258:170-8. Epub 20201001. doi: 10.1016/j.jss.2020.08.055. PubMed PMID: 33011448.
13. Tracey E, McCaughan B, Badgery-Parker T, Young J, Armstrong B. Distance from accessible specialist care and other determinants of advanced or unknown stage at diagnosis of people with non-small cell lung cancer: A data linkage study. Lung Cancer. 2015;90(1):15-21. Epub 20150731. doi: 10.1016/j.lungcan.2015.07.018. PubMed PMID: 26275475.
14. Hanna TP, King WD, Thibodeau S, Jalink M, Paulin GA, Harvey-Jones E, O'Sullivan DE, Booth CM, Sullivan R, Aggarwal A. Mortality due to cancer treatment delay: systematic review and meta-analysis. Bmj-Brit Med J. 2020;371. doi: ARTN m4087 10.1136/bmj.m4087. PubMed PMID: WOS:000585739500014.
15. Weber JS, Levit LA, Adamson PC, Bruinooge S, Burris HAt, Carducci MA, Dicker AP, Gonen M, Keefe SM, Postow MA, Thompson MA, Waterhouse DM, Weiner SL, Schuchter LM. American Society of Clinical Oncology policy statement update: the critical role of phase I trials in cancer research and treatment. J Clin Oncol. 2015;33(3):278-84. Epub 20141215. doi: 10.1200/JCO.2014.58.2635. PubMed PMID: 25512456; PMCID: PMC4516884.


## Data Sources:

Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2020.

Oklahoma State Department of Health (OSDH), Center for Health Statistics, Health Care Information, Vital Statistics, on Oklahoma Statistics on Health Available for Everyone (OK2SHARE). https://www.health.state.ok.us/stats/Registries/cancer/Final/mortality.shtml

Oklahoma State Department of Health (OSDH), Disease, Prevention, & Preparedness Service, Chronic Disease Service, Oklahoma Central Cancer Registry (OCCR), on Oklahoma Statistics on Health Available for Everyone (OK2SHARE). https://www.health.state.ok.us/stats/Registries/cancer/Final/Statistics.shtml