# Cancer in Oklahoma Data Brief Series:

# Lung Cancer in Oklahoma

**Shayla R. Morin, Ami E. Sedani, Ayesha B. Sambo, Janis E. Campbell, and Mark P. Doescher**

Community Outreach and Engagement, a program of OU Health Stephenson Cancer Center

## Introduction

Lung cancer is the leading cause of cancer death and the second most frequently diagnosed cancer in both men and women in the United States (US).[1] Nationally, Oklahoma (OK) ranks 8th worst in overall age-adjusted cancer incidence rate, and 5th worst for overall age-adjusted cancer mortality rate.[1] The majority of lung cancer cases are attributable to cigarette smoking.[2] Although smoking rates in the US have decreased over the past two decades, a large portion of current and former smokers remain at-risk for lung cancer.[2, 3] Lung cancer has an overall 5-year survival rate of only 22.9%, primarily because diagnosis usually occurs at a late stage, by which this time disease has spread to other regions of the body.[1] Because treatment for early-stage lung cancer greatly improves the likelihood of survival (e.g., five-year survival for individuals with early-stage lung cancer is 56.6%),[1] interventions to shift diagnosis to early-stage disease are needed. In 2013, the United States Preventive Services Task Force (USPSTF) issued a Grade B recommendation, which required health insurance plans to cover annual lung cancer screening with low-dose computed tomography (LDCT) for high-risk individuals.[4, 5] In 2021, the USPSTF broadened the recommendation of high-risk individuals to include adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years.[4] This brief focuses on lung cancer incidence, mortality and screening rates in Oklahoma and concludes with a discussion of the significance of findings on clinical practice and public health policy.

## Methods

Data for Lung Cancer incidence were obtained from the Oklahoma Central Cancer Registry (OCCR), the Centers for Disease Control's (CDC) National Program of Cancer Registries (NPCR), and the NCI's Surveillance, Epidemiology, and End Results (SEER) program. Cancer mortality data were from Oklahoma Vital Statistics and the CDC's National Vital Statistics System (NVSS). Information on lung cancer screening was obtained from the Behavioral Risk Factor Surveillance System (BRFSS) accessed through CDC BRFSS. Five items in 2018 BRFSS were used to estimate lung cancer screening LDCT eligibility and included respondent's age (55-80), a composite measure of smoking history (i.e., "Every day smoker", "Someday smoker", "Former smoker", and "Non-smoker), age when regular smoking began, age last smoked regularly, average number of cigarettes smoked when the respondent smoked regularly (converted to pack years), and never diagnosed with cancer. Lung cancer screening was assessed by asking respondents if they had had a CT scan in the last 12 months. All data sources used in this brief were publicly available.

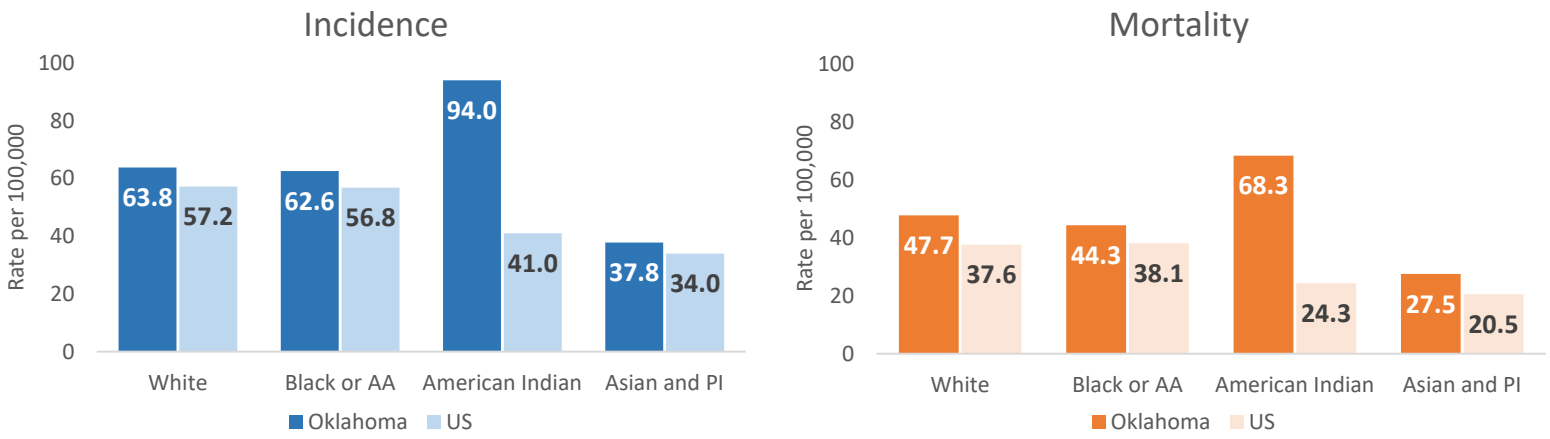
In this brief, Hispanic persons were categorized as being Hispanic regardless of race. All individuals in the sample were categorized into one of the following ethnic and racial groups: Hispanic, Non-Hispanic (NH) White, NH Black or African American, NH American Indian or Alaska Native, or NH Asian or Pacific Islander.

This data brief defines lung cancer as the following cancer sites: Lung and bronchus (ICD C34.0 – C34.9). To ensure the stability of estimates and confidentiality, CDC and SEER rates were suppressed if fewer than 16 counts were reported in a specific category and all rates were age-adjusted to the 2000 US standard population. BRFSS estimates were suppressed for stability if the unweighted sample size was less than 50. For all analyses, except stage at diagnosis, unknown values were excluded and resulting percentages were weighted averages estimated from the sample and population sizes. All incidence and mortality rates are per 100,000 population. Staging for this data brief used the SEER summary staging classification and excludes the unknown stage.

## Results

Overall, there were 1,116,081 cases of lung cancer diagnosed between 2015 and 2019 in the US. Of these cancers, 15,670 (1.4%) cases were in Oklahoma. For mortality in the US, there were 730,117 lung cancer deaths between 2015 and 2019. Of these cancer deaths, 11,525 (1.6%) deaths were in Oklahoma. The age-adjusted lung cancer incidence rate in the US was 56.3 per 100,000 population compared to 65.7 in Oklahoma. During this timeframe, the age-adjusted lung cancer death rate for the US was 36.7 per 100,000 compared to 48.7 per 100,000 for Oklahoma.

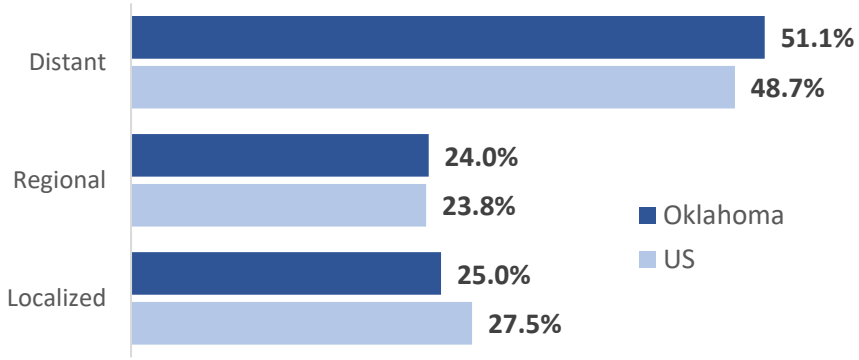
**Figure 1: Age-Adjusted Lung Cancer Incidence and Mortality by Race and Ethnicity in Oklahoma and the US, 2015-2019**




**Source:** SEER and CDC (NPCR and NVSS)
**Abbreviations**: AA: African American; AI: American Indian; AN: Alaska Native, PI: Pacific Islander

**Figure 1** shows the age-adjusted lung cancer incidence and mortality rates per 100,000 population by race and ethnicity in Oklahoma and the US from 2015 to 2019. Incidence rates in Oklahoma are higher for all groups, compared to incidence rates for the US. Similarly, Oklahoma has higher mortality rates among all groups compared to the US. American Indians or Alaskan Native in Oklahoma had disproportionately higher rates of incidence and mortality than all other racial or ethnic groups. In Oklahoma, Whites and Blacks have higher incidence and mortality rates compared to rates for those in the US.

**Figure 2: Lung Cancer Percent Stage at Diagnosis in Oklahoma and the US, 2015-2019**

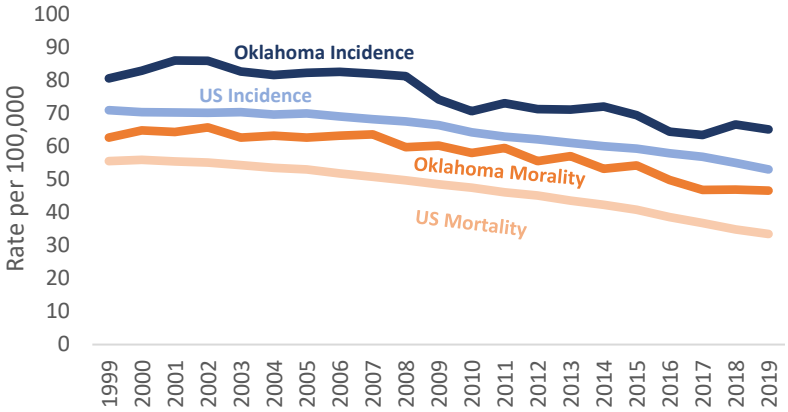



**Source:** OCCR
**Missing**: US 4.7%; Oklahoma 8.1%

**Figure 2** shows the percent stage at diagnosis for lung cancer in Oklahoma and the US from 2015 to 2019. The largest percentage in both Oklahoma and the US are at the distant stage, almost twice the amount of regional and localized stage. Oklahoma shows higher percentages for distant and slightly higher regional stage, which suggests a lower proportion of early screening. See **Appendix 1, Table 1** for trends in rates of percent stage at diagnosis in Oklahoma.

**Figure 3** shows yearly trends of lung cancer incidence and mortality for Oklahoma and the US between 1999 and 2019. Overall, trends for both the US and Oklahoma decrease over time; however, Oklahoma maintains consistently higher incidence and mortality rates than the US. Over the interval, the absolute decline in lung cancer incidence for Oklahoma was 15.4%, compared to 17.9% for the US. The absolute decline in lung cancer mortality for Oklahoma was 16.0% compared to 22.0% for the US. The finding that compared to the US, Oklahoma had similar declines in incidence but slightly slower decline in mortality suggests that Oklahoma population has a higher proportion of late-stage diagnosis, inadequate treatment or both.

**Figure 3: Yearly Trends of Age-Adjusted Lung Cancer Incidence and Mortality in OK and the US, 1999-2019**




**Source:** SEER and CDC (NPCR and NVSS)

**Figure 4. Age-adjusted Lung Cancer Incidence and Mortality in Oklahoma by Sex, 2019**

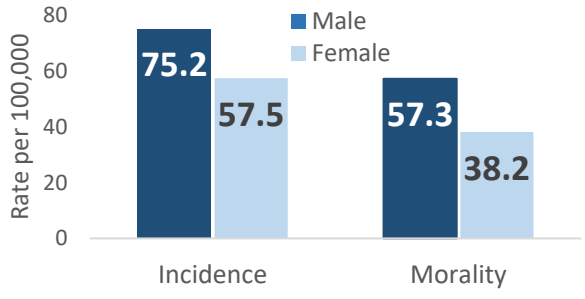
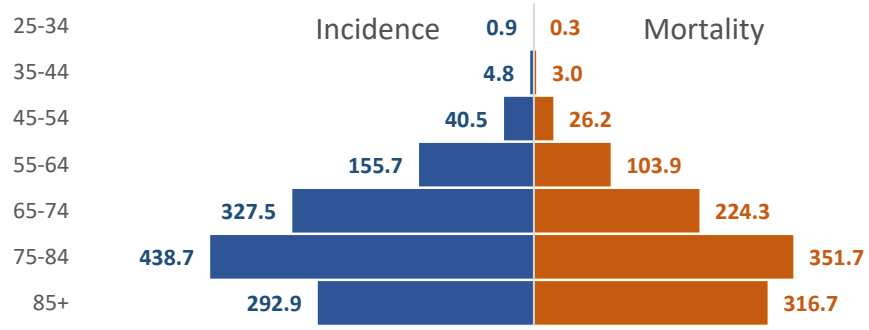



**Figure 4** shows age-adjusted lung cancer incidence and mortality in Oklahoma by sex in 2019. Males have both higher rates of incidence and mortality compared to females. More detailed trends in incidence and mortality rates by sex in Oklahoma can be seen in **Appendix 1, Figure 2**.

**Figure 5** shows lung cancer incidence and mortality rates by 10-year age groups in Oklahoma between 2015 and 2019. Generally, lung cancer incidence and mortality rates increase with age. Those in the youngest age group (25-44 years of age) have relatively low lung cancer rates.

**Figure 5: Lung cancer incidence and mortality rates by 10-year age group in Oklahoma, 2015-2019**



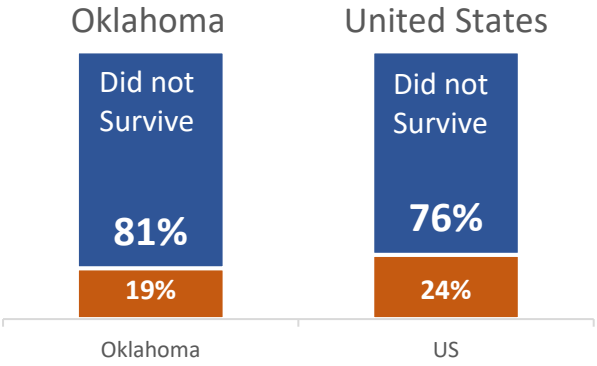

**Source:** OCCR and Oklahoma Vital Statistics

Substantial increases in rates for both incidence and mortality are seen for those 45-54 years old increases from youngest age group. The highest mortality and incidence rates are seen for those 75-84 years old (351.7 and 438.7 per 100,000, respectively). A sharp decline in rates is seen for those 85 years and older.

**Figure** 6 shows the five-year survival of Oklahoma and the US. Oklahoma at 19% compared to 24% in the US overall. Oklahoma is 7% lower rates of survival compared to the US overall.

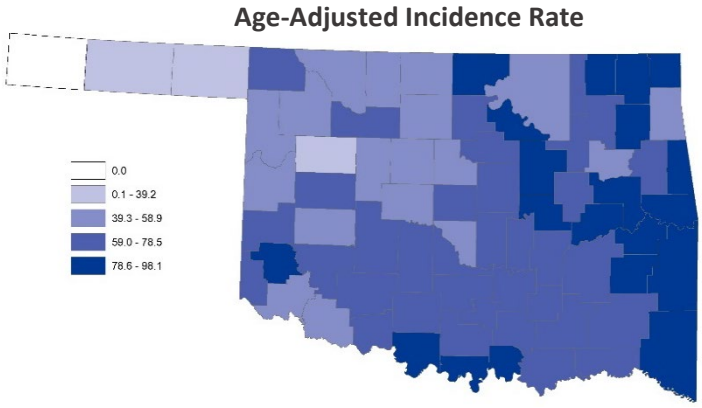
**Figure 7** shows maps of age-adjusted lung cancer incidence and mortality rates by county for Oklahoma. Dark shading indicates high rates of lung cancer, whereas light shading indicates lower rates. As seen in the maps above, both incidence and mortality rates are highest within the eastern and southwestern counties of Oklahoma. Notably, within these same regions of the state the prevalence of cigarette smoking is highest. The underlying number of incident cases, incidence rates, number of deaths, and mortality rates of lung cancer for each county in Oklahoma can be found in Tables 1 and 2 of **Appendix 2**, respectively. A map of tobacco use estimates by county is shown in **Appendix 1, Figure 3**.

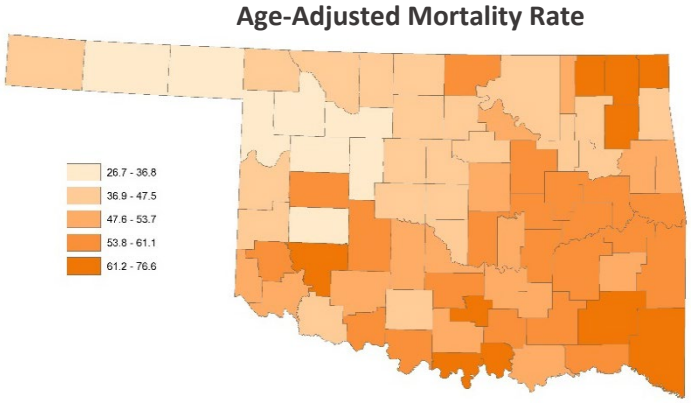
**Figure 6: Lung cancer survival in Oklahoma and the United States, 2015-2019**




Source: SEER and CDC (NPCR and NVSS)

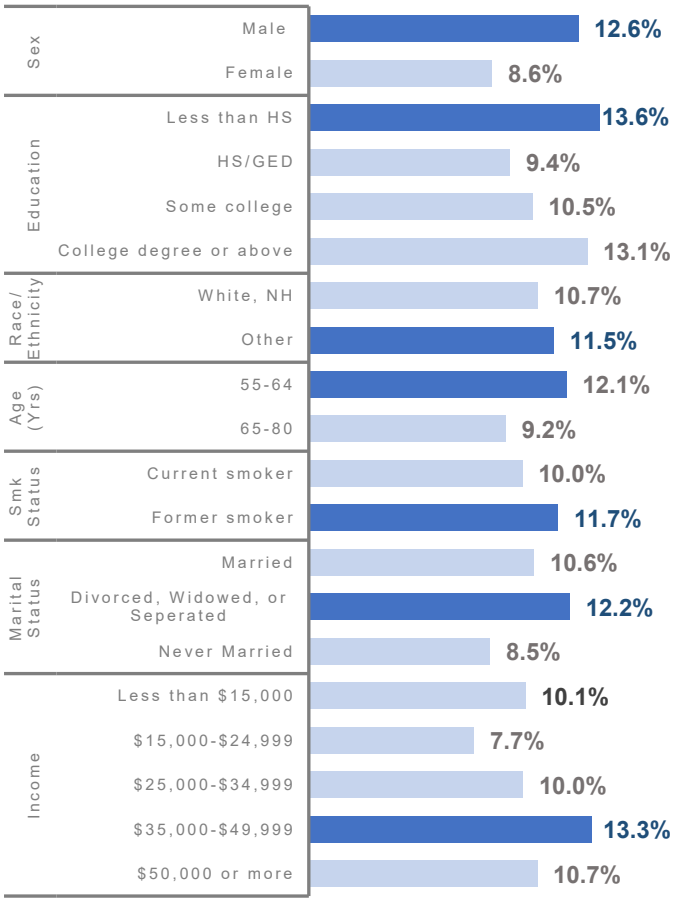
**Figure 7: Age-Adjusted Lung Cancer Incidence and Mortality by County in Oklahoma, 2015-2019**




**Source:** OCCR and Oklahoma Vital Statistics

**Figure 8: Percent participation of lung cancer screening in Oklahoma by demographic variables, 2017-2018**




**Source:** Oklahoma BRFSS, 2017-2018
**Abbreviations:** HS: High school; NH: Non-Hispanic, Yrs: Years; Smk: Smoke

**Figure 8** shows lung cancer screening participation in Oklahoma by various demographic variables from 2017 to 2018. Only 10.8% (95 % CI: 7.7, 14.0) of eligible individuals in Oklahoma reported having a CT scan to check for lung cancer within the past 12 months.

The variables assessed included sex, level of education, race/ethnicity ("White, NH" or "Other"), age, smoking status, marital status, and income. In which, the highest percentages of screening participation were seen among men, those with less than a high school education, individuals of "Other" race/ethnicity, those 55-64 years of age, former smokers, those widowed/divorced/separated, and those with income between $35,000 and $49,999.

## Conclusions and Implications for Practice and Policy

Lung cancer incidence and mortality rates are improving gradually in Oklahoma but remain higher than the corresponding US rates and the mortality gap between Oklahoma and the US is widening. Findings from this brief suggest several recommendations that could be used to reduce the disproportionate burden of lung cancer in Oklahoma.

First, there is a pressing need to support tobacco prevention and cessation programs and policies: Oklahoma Tobacco Helpline, a program funded by the Oklahoma Tobacco Settlement Endowment Trust (TSET), provides free services and customized plans to help individuals quit smoking. Free services include counseling and nicotine replacement therapy. Also, the Helpline queries individuals to determine if they are eligible for no-cost lung cancer screening and may start assisting with referrals to potentially eligible for screening. In 2021, 29,591 Oklahomans used the Helpline for quitting cigarettes and other tobacco products.

Second, there is a need to increase public awareness of annual lung cancer screening with LDCT. Since the initial lung cancer screening guideline was issued by the USPSTF in 2013, uptake has remained remarkably low.[6] Because many high-risk individuals may not be aware of this efficacious test, media campaigns and community health education efforts could be used to raise public awareness of and demand for this test. Activities to increase awareness need to reach individuals who are at greatest risk of developing lung cancer, including men, American Indian and Alaska Native persons, persons living in rural locations, and those who have low educational attainment or income levels. Notably, individuals with the lowest incomes (<$15,000) had a higher screening rate of than those with slightly higher income ($15,000-24,999). This may because persons in the $15,000 to $24,000 income bracket may not be able to afford private insurance coverage but also may not qualify for Medicaid coverage. In 2021, Medicaid in Oklahoma began covering lung cancer screening, and in the summer of 2021, Oklahoma became the most recent state to expand Medicaid eligibility through the Affordable Care Act. These changes should enable more low-income Oklahomans who currently cannot

afford the test to receive evidence-based lung cancer screening. Medicaid expansion is particularly important for lung cancer screening because rates of smoker are high in the state's lower income populations.[7]

Third, there is a need to increase lung cancer screening capacity. As demand for lung cancer screening grows, the need for accredited lung cancer screening centers providing LDCT will increase. Among the states, Oklahoma currently has among the lowest per capita supply of lung cancer screening with LDCT.[7] Increased local availability of screening services could improve incidence and mortality within rural areas of Oklahoma where high lung cancer rates occur and where hospital closures are reducing the availability of CT scanning equipment. Mobile units that provide lung cancer screening with LDCT may be one option to increase access in our highly rural state.

Fourth, there is a need to increase clinician performance on lung cancer screening with LDCT. Activities are needed to educate clinicians and their health care systems on the current lung cancer screening guideline, which as updated in 2021. In addition, providing regular feedback to clinician, clinics, and healthcare systems on lung cancer screening performance is an evidence-based approach to increasing screening rates.

Fifth, there is a need to ensure that all Oklahomans diagnosed with lung cancer have access to the newest treatments, as lung cancer treatment is improving. This can be accomplished by providing funds to help patients address the financial challenges of treatment and funds to help defray the costs of traveling for care, including transportation and lodging costs. Also, patients who participate in clinical trials tend to have the best outcomes. Efforts to help increase clinical trials awareness and increase participation in clinical trials, especially among members of high-risk groups, will ultimately improve lung cancer outcomes.

Finally, there is a need to coordinate lung cancer preventive and treatment services. For example, tobacco cessation services need to be linked to lung cancer screening services. Local community and tribal health systems need to be connected with treatment centers that perform state-of-the-art lung cancer treatment. Community partners, including the American Lung Association, American Cancer Society, tribal partners, faith-based organizations, primary care clinics, oncology practices and hospitals could coordinate efforts to increase lung cancer screening, diagnostic follow-up and treatment services. These types of statewide partnerships are critical for reducing the heavy weight lung cancer currently places on Oklahomans.

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For more information, please contact: Community Outreach and Engagement, Stephenson Cancer Center, OU Health. Email: SCC-surveillance@ouhsc.edu

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