Lung Cancer Burden in the Natural State

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BACKGROUND

Arkansas historically grades poorly for lung cancer measures with 3.7% screenings performed among high-risk groups and a low 5-year overall survival rate of 22.6%.[1-3] In 2021, the state had the 5th highest lung cancer mortality rate of 44.0 deaths per 100,000 population.[4] The State of Lung Cancer 2023 Report did not have Arkansas cancer incidence data at the time of its publication, prompting a need to evaluate the burden considering the state went from 'Below Average' tier for 2020-2021 reports falling to 'Bottom' tier in 2022. [5-7] Furthermore, cigarette smoking is linked to 80-90% of lung cancer.[8] The 2022 Behavioral Risk Factor Surveillance System showed 45.6% of Arkansas adults reported ever smoking 100 cigarettes, the 2nd highest age-adjusted prevalence in the US. [9] As such, the cancer surveillance manager identified a need to develop a brief report on lung cancer for the state. **The purpose of this study is to provide an overview of early and late lung and bronchus cancer incidence rates and trends for Arkansas.**

METHODOLOGY

Data were used from the Arkansas Central Cancer Registry ranging from 2011-2020 for all primary lung cancers. Caution is suggested in the interpretation of 2020 cancer cases due to the COVID-19 impact halting cancer related health services. Age-adjusted incidence rates (AAIR) were calculated using the National Cancer Institute's SEER*Stat program. Data were stratified by race and sex, year of diagnosis, geographic areas (urban, rural), and SEER Summary Stage. This study also performed a trend regression for the annual percent change (APC) and average annual percent change (AAPC) using Joinpoint software. Data were utilized for 1997-2019 record cases comparing early and late-stage lung cancer trends and for a late-stage diagnosis by race and sex. County maps were created using SAS 9.4.

RESULTS

There were 26,668 lung cancer record cases with a total of 26,291 lung cancer patients diagnosed in Arkansas. Approximately 43% of patients had a family history of cancer, 29% were current cigarette smokers at the time of diagnosis, and 44% were former tobacco users (**Table 1**). Among the lung cancer record cases diagnosed in Arkansas, distant lung cancer staging had a higher overall trendline than localized and regional for 2011 through 2020. The age-adjusted incidence rate for late-stage lung cancer diagnosis was higher than early-stage diagnosis (Late-Stage AAIR=64.8, 95%CI: 63.9-65.7; Early-Stage AAIR=22.8, 95%CI: 22.2-23.3) with higher rates observed in northeast counties (**Figures 1, 2a-b**). For SEER Summary Stage, distant lung cancer staging had a higher overall trendline AAIR compared to localized and regional (**Figure 3**). Black males had the highest AAIR for lung cancer diagnosed at a distant stage for both urban and rural areas (Urban AAIR=47.8, 95%CI: 43.4-52.5), Rural AAIR=54.5, 95%CI: 49.3-60.1) (**Figures 4a-b**). For the Joinpoint regression, late-stage lung cancer had a statistically significantly higher overall trend with an overall 0.82% AAPC decrease (95% CI: -1.16, -0.41, p-value < 0.001) while early-stage had a 0.15% AAPC increase (95% CI: -0.51,0.800) (**Figure 5**). Black males had the highest AAPC decrease for late-stage diagnosis (AAPC= -2.02, 95% CI: -2.65, -1.40, p-value < 0.001), followed by White males (AAPC= -1.97, 95% CI: -2.40, -1.53) (**Figure 6**). Among females, Black females had a higher AAPC increase (AAPC= 1.22, 95% CI: 0.04, 2.45, p-value < 0.05) than White females (AAPC= 0.77, 95% CI: 0.37, 1.22, p-value<0.05) (**Figure 6**).

Table 1. Lung cancer cohort size and percentages for patients with family history of cancer and tobacco status, Arkansas, 2011-2020

2011-2020 Cohort Size	
Total # lung cancer patients	26,291
Total # lung record cases	26,668

Family history of cancer	
No	23.9%
Yes	42.9%
Unknown	33.2%

Tobacco Status	
Never used	6.9%
Cigarette smoker	28.3%
Cigar/pipe smoker	0.3%
Snuff/chew/smokeless	1.9%
Combination use	0.3%
Previous use	44.0%
Unknown	19.6%

(Current: Cigarette smoker, Cigar/pipe smoker, Snuff/chew/smokeless, Combination use)

Source: Arkansas Central Cancer Registry. Data exported 5/8/2024

Figure 1. AAIR of Lung Cancer by Early, Late and Unstaged, Arkansas, 2011-2020
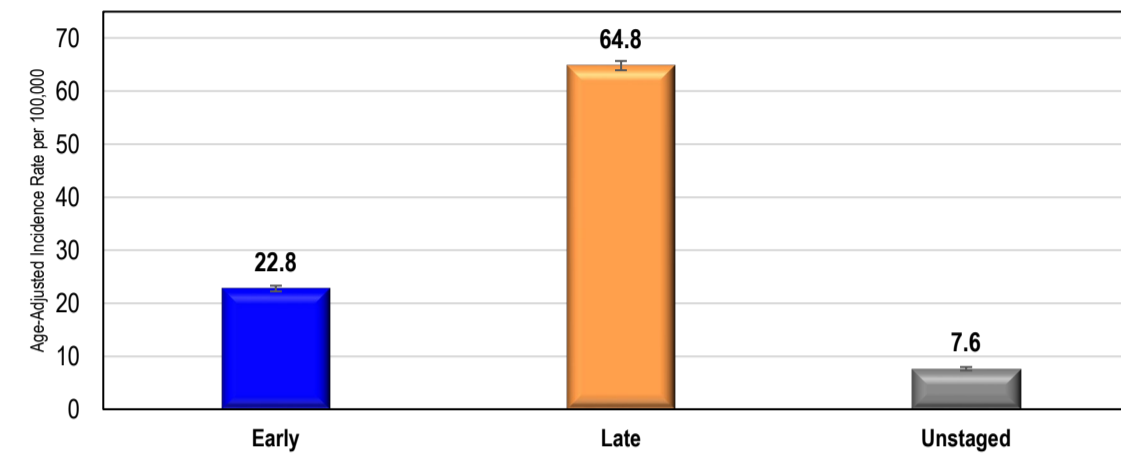
Source: Arkansas Central Cancer Registry. Data exported 5/8/2024

Figures 2a-b. AAIR of Lung Cancer Early and Late-Stage Lung Cancer by Counties, Arkansas, 2011-2020

2a. Early-Stage Lung Cancer   2b. Late-Stage Lung Cancer

Early-Stage AAIR
10.7 - 15.5
15.6 - 18.1
18.2 - 21.9
22.0 - 33.6

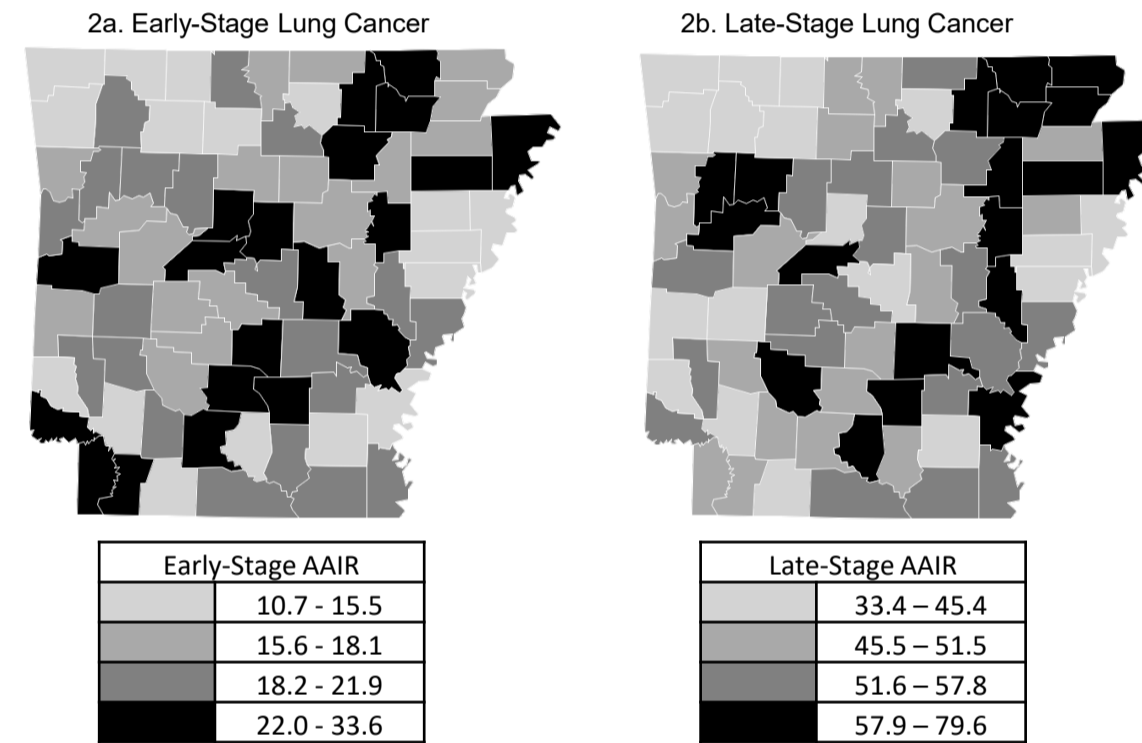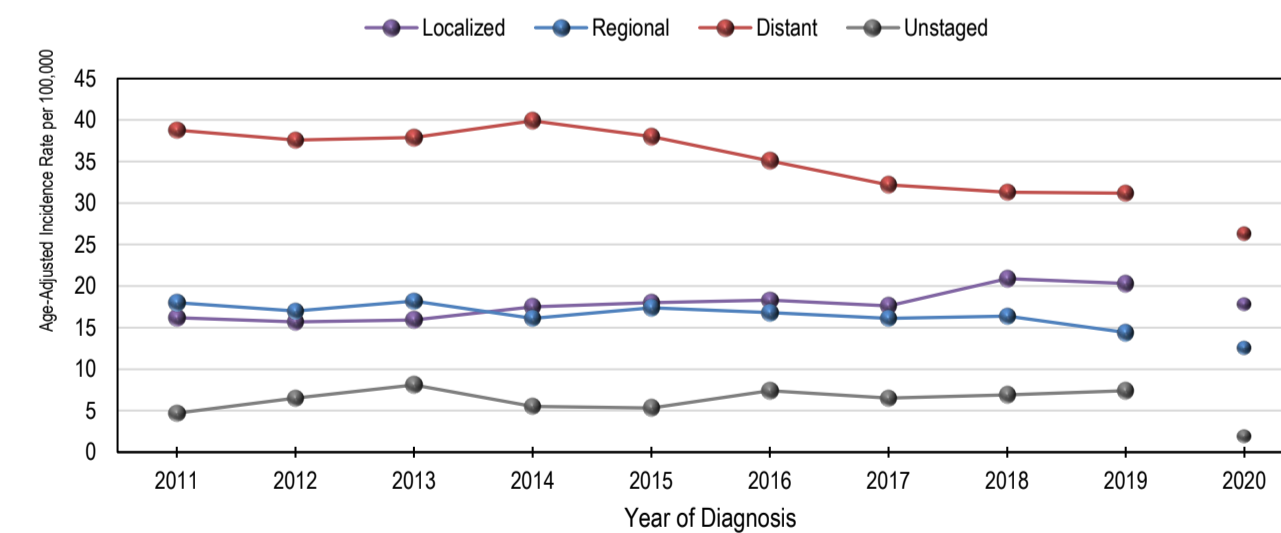| Late-Stage AAIR |
| --- |
| 33.4 – 45.4 |
| 45.5 – 51.5 |
| 51.6 – 57.8 |
| 57.9 – 79.6 |

Figure 3. AAIR of Lung Cancer by SEER Summary Staging, Arkansas, 2011-2020

Figures 4a-b. AAIR of Lung Cancer for Urban and Rural Areas by SEER Summary Stage, Race and Sex, Arkansas, 2011-2020
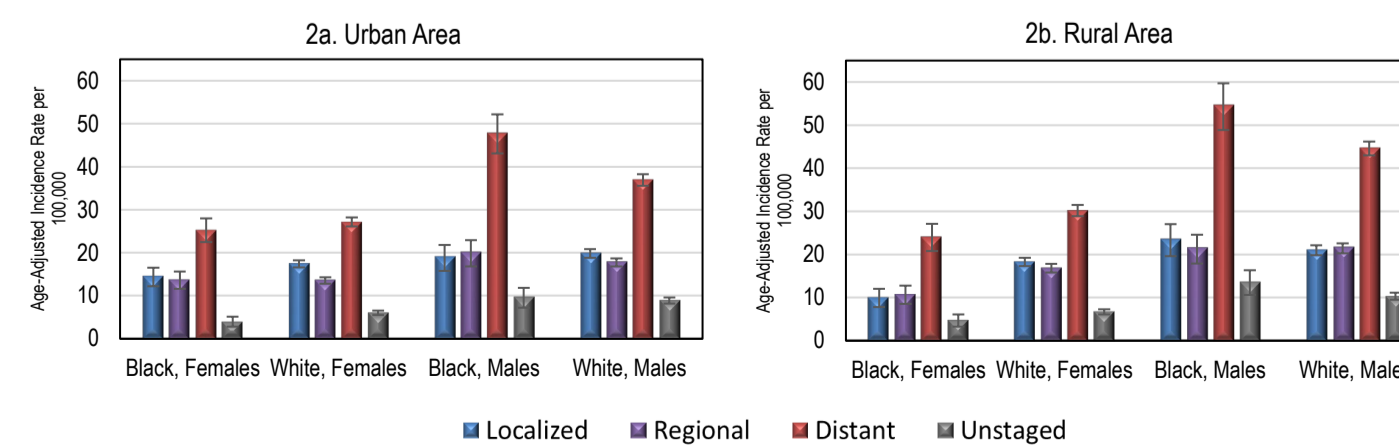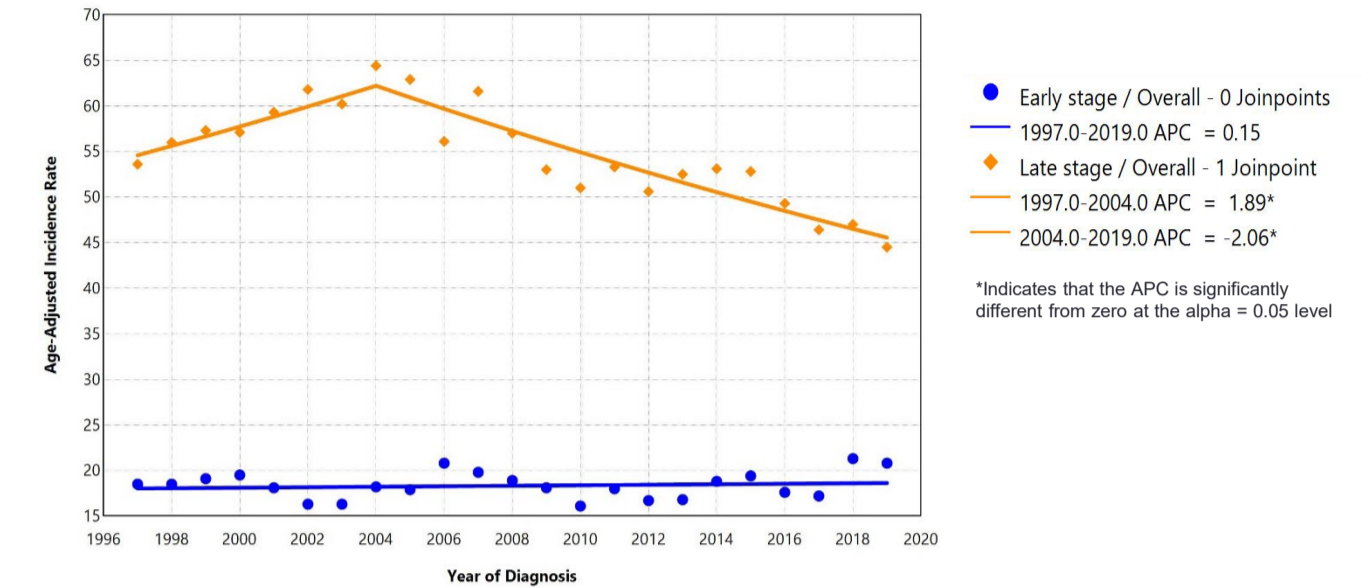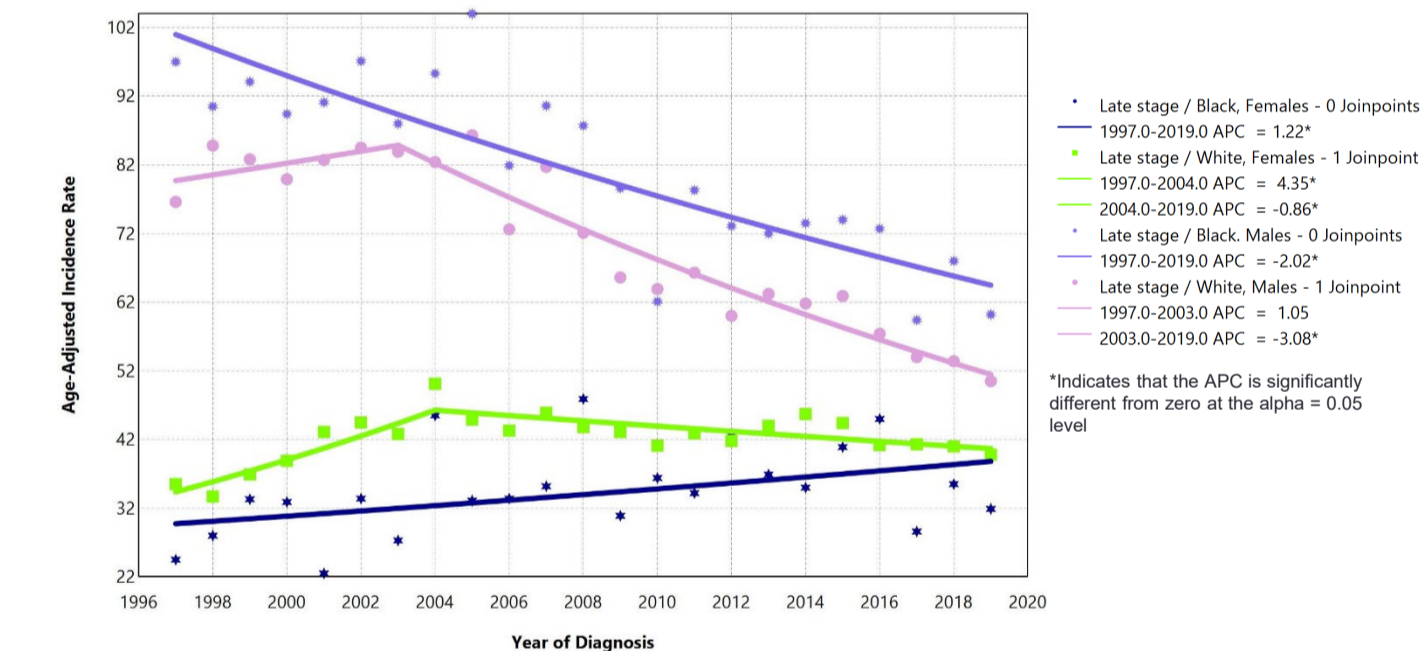

2a. Urban Area   2b. Rural Area

Figures 5. Joinpoint Trend Regression for Early and Late-Stage Lung Cancer, Arkansas, 1997-2019

Early stage / Overall - 0 Joinpoints
1997.0-2019.0 APC = 0.15
Late stage / Overall - 1 Joinpoint
1997.0-2004.0 APC = 1.89*
2004.0-2019.0 APC = -2.06*

*Indicates that the APC is significantly different from zero at the alpha = 0.05 level

Average Annual Percent Change (AAPC)								
Cohort	Range	Lower Endpoint	Upper Endpoint	AAPC	Lower CI	Upper CI	Test Statistic	P-Value
Early stage / Overall - 0 Joinpoints	Full Range	1997	2019	0.1482	-0.5127	0.8031	--	0.610678
Late stage / Overall - 1 Joinpoint	Full Range	1997	2019	-0.8188*	-1.1576	-0.4075	--	0.001600

Source: Arkansas Central Cancer Registry. Data exported 5/8/2024

Figure 6. Joinpoint Trend Regression for Late-Stage Lung Cancer Diagnosis by Race and Sex, Arkansas, 1997-2019

Late stage / Black, Females - 0 Joinpoints
1997.0-2019.0 APC = 1.22*
Late stage / White, Females - 1 Joinpoint
1997.0-2004.0 APC = 4.35*
2004.0-2019.0 APC = -0.86*
Late stage / Black Males - 0 Joinpoints
1997.0-2019.0 APC = -2.02*
Late stage / White, Males - 1 Joinpoint
1997.0-2003.0 APC = 1.05
2003.0-2019.0 APC = -3.08*

*Indicates that the APC is significantly different from zero at the alpha = 0.05 level

Average Annual Percent Change (AAPC)								
Cohort	Range	Lower Endpoint	Upper Endpoint	AAPC	Lower CI	Upper CI	Test Statistic	P-Value
Late stage / Black, Females - 0 Joinp...	Full Range	1997	2019	1.2188*	0.0432	2.4544	--	0.043191
Late stage / White, Females - 1 Join...	Full Range	1997	2019	0.7689*	0.3722	1.2161	--	0.001200
Late stage / Black, Males - 0 Joinpoi...	Full Range	1997	2019	-2.0187*	-2.6507	-1.3953	--	< 0.000001
Late stage / White, Males - 1 Joinpo...	Full Range	1997	2019	-1.9674*	-2.3807	-1.5332	--	< 0.000001

CONCLUSIONS

The Arkansas Central Cancer Registry is a valuable resource in Arkansas as it is able to provide descriptive statistics for cancer surveillance. For lung cancer, registry data shows lung cancer rates and trends have improved in Arkansas since 1997 for males, although females have a slightly increasing AAPC (**Figure 6**). Despite late-stage lung cancer trends closing the gap by race and sex, it continues to be an issue due to the survival rate decreasing in advanced stage (regional and distant). Cancer programs and advocates can use this information to identify geographic regions and groups with a higher late-stage lung cancer diagnosis who may benefit from lung cancer biomarker testing for a more targeted treatment approach (**Figures 2b, Figures 4a-b**). Caution is suggested in the interpretation as the data includes 2020 diagnosis and potential record duplicates in the dataset. Additionally, research is needed to examine if and how lung cancer screening is promoted for current and former smokers, and potential barriers accessing screenings or lung cancer biomarker testing.

References:

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