

## A Snapshot of Racial and Geographic Distribution of Lung and Bronchus Cancer Incidence and Mortality in Mississippi, 2008-2012

Danielle R. Bogan<sup>1\*</sup>

<sup>1</sup> Jackson State University, MS, USA

\*Corresponding Author: [dbogan05@yahoo.com](mailto:dbogan05@yahoo.com)

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### ABSTRACT

To identify disproportionate burden for lung and bronchus cancer incidence and mortality rates in Mississippi from 2008-2012. Lung and bronchus cancer remains a major public health burden in the United States and Mississippi. We examined data from 2008 to 2012 for lung cancer incidence and mortality rates by demographics (age, sex, race) and geographic (Public Health Districts, and urban/rural) characteristics to identify potential health disparities. Data were extracted from the Mississippi Cancer Registry (MCR). It represents age-adjusted incidence and mortality rates per 100,000 population to the 2000 U.S. standard population and 95% confidence intervals. During 2008-2012, 12,579 people (overall rate of 78.63 per 100,000) were diagnosed with lung cancer in Mississippi. Overall, Whites in urban areas had a higher incidence (80.9) rate and Blacks had a higher mortality (62.94) rate. Based on the findings of age, sex, race, and geographic disparities, it is suggested that there is a need for more effective community-based interventions and preventative measures for cultural sensitive groups to reduce the burden of lung cancer in Mississippi. It also helps to coordinate a more comprehensive approach for the control of cancer planning efforts.

**Keywords:** lung cancer, Mississippi, racial distribution, geographic distribution, health care policy

### INTRODUCTION

Mississippians of various backgrounds have encountered an enormous impact of cancer. Although the burden of cancer affects all who reside in 82 counties and 9 Public Health Districts, the distribution of its impact is not equally dispersed across the entire state. Throughout Mississippi, cancer incidence and mortality continue to despite the advancement of science and technology in cancer prevention, early screening detection, and treatment. Consequently, lung and bronchus cancer remains a major health burden as the leading cause of death and the 2<sup>nd</sup> most frequently diagnosed in the United States and Mississippi (MCR, 2017). Epidemiological studies have reported racial, ethnic, and geographic disparities in lung cancer incidence and mortality rates in the South (Mitchell, et al. 2009; Underwood, 2012; Xiaoling, 2010). Thus, National Program of Cancer Registries (NPCR) has consistently reported low lung cancer incidence and mortality rates among the White population with the rates disproportionately high for the Black population for U.S. and various states. But, when considering all cancer sites, Blacks, particularly Black males have the highest occurrence and death rates per year per 100,000 compared to their counterparts (National Cancer Institute [NCI], 2007). Racial differences in lung cancer incidence patterns reflect secular trends between men and women due to the prevalence of cigarette smoking over the past 50 years. Mississippi is ranked as the 3<sup>rd</sup> highest state in the U.S accounting for 24.8% adults who currently smoke. (Nguyen, Marshall, Hu, & Neff, 2015). Cigarette smoking is the most modifiable risk factor and accounts for 87% lung

cancer deaths and 30% of all cancer-related deaths (Giddens, 2013), but the risk increases with the amount and duration of tobacco use. Consequently, 20-30% of nonsmokers exposed to secondhand environmental tobacco smoke in the environment develop lung cancer (US Department of Health and Human Services [HHS], 2014). While, smoking may primarily be the cause of high rates of lung and bronchus cancer in the U.S. and Mississippi, residing in rural and Appalachian regions have a higher smoking prevalence nationwide (American Lung Association, 2016). In addition to tobacco use, exposures to occupational and environmental toxins, lack of access to healthcare, and socioeconomic status (SES) may influence the lung and bronchus cancer in rural compared to urban areas (Singh, Williams, Siahpush, & Mulhollen, (2011).

However, many local, state, and nationwide initiatives have been implemented to promote awareness in the communities that are affected. Mississippi State Department of Health (MSDH) has worked in collaboration with the Center for Disease Control and Prevention (CDC) to establish a comprehensive cancer control program by conducting several activities to reduce, control, and prevent occurrence and deaths associated with cancer and to improve a substantial quality of life for all Mississippians (MSDH, 2006). Furthermore, public health districts, cancer coalitions, key stakeholders, and various organizations continue to work together to address the gaps and barriers in the entire state. Nevertheless, health care factors affecting these areas may play a pivotal role in cancer prognosis, stage, survival, mortality, and recurrence for minorities and the poor who reside in underserved areas.

Although, the overall cancer incidence and mortality are declining in other states, trends in lung and bronchus cancer are varied throughout 9 Public Health Districts in Mississippi. The purpose of this review will delineate data to address the status of lung and bronchus cancer by describing the incidence and mortality rates among race, age, gender, and Public Health Districts (I-IX) in the state of Mississippi from 2008-2012.

## METHODS

The Mississippi Cancer Registry (MCR) is a gold-certified statewide population-based database which collects all cancer cases and deaths among Mississippi residents. The MCR is registered in the NPCR and North American Association of Central Cancer Registries (NAACCR). Utilizing information collected by the MCR, the Mississippi Department of Health can develop programs to better address Mississippi's cancer program needs.

Lung and bronchus (*includes non-invasive and invasive*) cancer incidence and mortality data were obtained from the MCR for 2008-2012. Incidence and mortality rates are presented as an average annual number of new cases and deaths per 100,000 persons, adjusted to the 2000 U.S. Standard population. Rates less than 15 cases or deaths in each year were not calculated.

Incidence is the number of new cases that have occurred during a specified period (years 2008 to 2012) divided by the population at risk during that period and then multiplied by a multiplier (100,000) (NCI, 2007). Non-invasive cancer describes the disease that has not spread outside the tissue in which it began (NCI, 2007). Invasive cancer is defined as the spread beyond the layer of tissue in which it developed and is growing into surrounding, healthy tissues (NCI, 2007). Mortality is the number of people who died due to cancer during a given period (years 2008 to 2012) divided by the population at risk during that period (NCI, 2007). The result is then multiplied by a multiplier (100,000). Age-adjusted rates ensure that differences in incidence (new cases) and mortality (deaths) from one year to another or between one geographic area and another are not due to differences in the age distribution of the populations being compared. 95% confidence intervals were also used.

## RESULTS

### Incidence

During 2008-2012, 12,579 people (overall rate of 78.63 per 100,000) were diagnosed with lung and bronchus cancer in Mississippi of whom were 9,133 (79.7) Whites, 3,390 (76.1) Blacks 7,490 (107.3) males, and 5,089 (57.4) females. Lung cancer incidence rates were the highest among males (107.3), Whites (79.7), persons aged 75 to 79 years (513.8), and those living in District IX (85.2) The breakdown by race, age, gender, and 9 Public Health Districts in Mississippi were higher among males (107.3); 95 CI (104.78-109.80) than females (57.4); 95 CI (55.77-58.97). **Table 1** shows that Whites (79.7); 95 CI (78.08-81.39) were diagnosed more compared to Blacks (76.1); 95 CI (73.43-78.76). Whites who lived in urban areas are diagnosed at a higher rate (80.96) compared to their counterparts. In regards to race and gender, Black males (116.8); CI (111.46-122.08) had a higher incidence compared to White males (103.7); 95 CI (100.88-106.62). In contrast, White females (61.8); 95 CI (59.82-63.80) had a higher incidence compared to Black females (47.9%); 95 CI (47.27-50.80). By age group, incidence had the highest among persons aged 75-79 (513.8) compared to the other 11 groups. Due to geographic differences, the death rate ranged from a low rate of (365.4) diagnosis per 100,000 (Greene County) to a high rate (617.1) diagnosis per 100,000 (Yalobusha County). When analyzed by Mississippi Public Health Districts, District 9 (Coastal Area-

**Table 1.** Age-Adjusted Demographic Characteristics for Lung & Bronchus Cancer Incidence in Mississippi, 2008-2012

	Total		Blacks		Whites	
	N= 12579	Rate (CI) 78.63(77.24-80.03)	N= 3390	Rate(CI) 76.06(73.43-78.76)	N= 9133	Rate(CI) 79.72(78.08-81.39)
<b>Age</b>						
30-34	14	1.49	6	1.59	8	1.47
35-39	34	3.66	9	2.57	24	4.28
40-44	127	13.35	40	11.58	87	14.79
45-49	459	44.73	172	47.08	282	43.74
50-54	928	89.33	371	100.91	552	84.03
55-59	1324	141.43	478	150.93	842	138.52
60-64	1734	215.84	500	214.48	1227	218.56
65-69	2162	353.65	560	356.71	1593	355.02
70-74	2094	443.53	457	392.49	1630	463.58
75-79	1815	513.78	424	516.60	1381	573.79
80-84	1209	466.15	209	355.56	993	498.62
85+	670	298.19	160	282.94	509	304.58
<b>Gender</b>						
Males	7490	107.27 (104.76-109.80)	2169	116.69 (111.46-122.08)	5291	103.72 (100.88,106.62)
Females	5089	57.35 (55.71-58.97)	1221	47.98 (45.27-50.80)	3842	61.78 (59.82-63.80)
<b>Public Health Districts</b>						
I	1298	81.56 (77.10-86.20)	299	70.10 (62.01-78.88)	998	86.30 (80.95-91.92)
II	1673	81.86 (77.94-85.93)	234	76.87 (68.98-87.85)	1438	82.92 (78.65-87.38)
III	912	78.23 (70.29-83.56)	462	75.87 (68.89-83.34)	448	80.94 (73.43-89.11)
IV	1028	74.83 (70.29-79.60)	323	75.15 (66.96-84.04)	705	74.42 (68.97-80.22)
V	2399	76.15 (73.08-79.31)	869	73.84 (68.80-79.13)	1522	77.02 (73.15-81.05)
VI	1063	75.03 (70.55-79.73)	292	71.06 (62.95-79.89)	768	77.83 (72.36-83.65)
VII	787	73.14 (68.07-78.51)	334	75.42 (75.42-94.24)	452	67.08 (60.94-73.75)
VIII	1259	77.16 (72.91-81.59)	285	79.32 (70.07-89.37)	969	76.52 (71.73-81.57)
IX	2159	85.17 (81.55-88.91)	292	83.97 (74.07-94.75)	1832	85.38 (81.56-89.45)
<b>Geographic Region</b>						
Urban	5289	79.41 (77.24-81.61)	2171	74.30 (69.97-78.81)	4028	80.96 (78.45-83.54)
Rural	7290	78.22 (76.42-80.06)	1219	77.00 (73.71-80.41)	5104	78.96 (76.78-81.19)

MS Cancer Registry, 2017

Pearl River, Stone, George, Hancock, Harrison, and Jackson Counties) and District II (Northeast Area-Alcorn, Benton, Itawamba, Lafayette, Lee, Marshall, Prentiss, Pontotoc, Tippah, Tishomingo, and Union) had higher rates at 85.2;(95 CI 81.55-88.91) and 81.9 (77.94-85.93) respectively compared to the others. The District had the highest incidence was District IX (Coastal Area: Pearl River, Stone, George, Hancock, Harrison, and Jackson Counties) (85.2); 95 CI (81.55-88.91), respectively (**Table 1**).

### Mortality

In Mississippi, 9,688 people (overall rate of 61.13 per 100,000) died with lung and bronchus cancer in Mississippi of whom were 272 (61.5) Whites, 2,638 (60.2) Blacks, 6,000 (88.2) males, and 3,688 (41.26) females. Lung cancer mortality rates were the highest among males (88.7), Whites (61.47), persons aged 80 to 84 years (424.5), those living in District IX (65.6) and rural; (62.3) areas. The breakdown by race, age, gender, and 9 Public Health Districts in Mississippi were higher among males (88.2); 95 CI (85.88-90.50) than females (41.3); 95 CI (39.93-42.62). **Table 2** shows that Whites (61.5); 95 CI (60.03-62.94) died more during this period of time compared to Blacks (60.2); 95 CI (51.89-62.67). However, the Black population who lived in rural areas die at a higher rate (62.9). In regards to race and gender, Black males (97.6); CI (92.79-102.69) died at a higher rate compared to White males (84.8); 95 CI (82.24-87.50). In contrast, White females (44.02); 95 CI (42.38-45.71) had a higher incidence compared to Black females (34.99) 95 CI (47.27-50.80). By age group, incidence had the highest among persons aged 80-84 (424.5) compared to the other 11 groups. Due to geographic differences, the death rate ranged from a low rate (34.4) diagnosis per 100,000 (Franklin County) to a high rate (87.5) diagnosis per 100,000 (Madison).When analyzed by Mississippi Public Health Districts, District IX (Coastal Area- Pearl River, Stone, George, Hancock, Harrison, and Jackson counties) and District I (Northwest Area-Coahoma, Desoto, Grenada,

**Table 2.** Age-Adjusted Demographic Characteristics for Lung & Bronchus Cancer Mortality in Mississippi, 2008-2012

	Total		Blacks		Whites	
	N= 9688	Rate (CI) 61.13 (59.90- 62.37)	N= 2638	Rate(CI) 60.24 (57.89- 62.67)	N= 7011	Rate(CI) 61.47 (60.03- 62.94)
<b>Age</b>						
30-34	6	0.64	NS <sup>a</sup>	NS <sup>a</sup>	NS <sup>a</sup>	NS <sup>a</sup>
35-39	12	1.29	NS <sup>a</sup>	NS <sup>a</sup>	9	1.61
40-44	70	7.36	21	6.08	49	8.33
45-49	310	30.21	136	37.22	172	26.68
50-54	607	58.43	243	66.10	362	55.10
55-59	931	99.45	350	110.51	580	95.42
60-64	1250	155.60	393	168.58	846	150.70
65-69	1544	252.56	418	266.26	1117	248.94
70-74	1605	339.96	357	306.61	1243	353.51
75-79	1490	421.78	333	405.73	1151	428.22
80-84	1101	424.51	212	360.66	888	445.90
85+	761	338.69	170	300.62	589	352.45
<b>Gender</b>						
Males	6000	88.17 (85.88-90.50)	1750	97.7 (92.79-102.69)	4231	84.84 (82.24-87.50)
Females	3688	41.26 (39.93-42.62)	888	34.99 (32.68-37.41)	2780	44.02 (42.38-45.71)
<b>Public Health Districts</b>						
I	1021	65.26 (61.25-69.46)	247	59.48 (51.96-67.71)	771	67.83 (63.07-72.88)
II	1320	65.07 (61.58-68.72)	184	62.18 (53.21-72.16)	1134	65.74 (61.94-69.73)
III	755	64.59 (60.01-69.44)	372	61.37 (55.11-68.13)	383	67.35 (60.65-74.70)
IV	793	57.75 (53.77-61.95)	267	61.56 (54.18-69.62)	524	55.05 (50.40-60.05)
V	1726	55.38 (52.75-58.10)	626	54.48 (50.12-59.10)	1097	55.58 (52.30-59.02)
VI	873	61.94 (57.86-66.24)	240	59.17 (51.76-67.32)	626	63.35 (58.43-68.61)
VII	633	58.94 (54.39-63.78)	264	66.60 (58.62-75.34)	7011	61.47 (60.03-62.94)
VIII	938	58.00 (54.32-61.87)	225	64.68 (56.24-73.95)	71	56.39 (52.29-60.75)
IX	1629	65.61 (67.40-68.94)	213	66.40 (57.25-76.50)	1396	66.01 (62.54-69.63)
<b>Geographic Region</b>						
Urban	3898	59.67 (57.78-61.61)	81	55.70 (51.89-59.69)	2994	61.00 (58.81-63.25)
Rural	5790	62.33 (60.72-63.97)	1757	62.94 (59.95-66.04)	4017	61.99 (60.07-63.96)

MS Cancer Registry, 2017

<sup>a</sup> Counts/Rates are suppressed if less than 5 cases were reported in the specified category

Panola, Quitman, Tate, Tallahatchie, Tunica, and Yalobusha counties) had higher rates at 65.6;(95 CI 62.0-65.9) and 65.3 (61.25-69.46) respectively compared to the others (Table 2).

## DISCUSSION

The data used included the incidence and mortality rates from all 82 counties in the state. We present data from 2008-2012 on lung and bronchus cancer incidence and mortality based on, race, age, sex, and geographic locations. Overall, Whites are more likely to be diagnosed, but Blacks are more likely to die from lung cancer, regardless of gender. But, there is a disproportionate burden by race and gender, Black males are diagnosed and die at a higher rate compared to their counterparts. The increased lung cancer incidence rates observed among Black males may be due to increased susceptibility to smoking. In 2012, the increased rate of smoke prevalence was more than 2 times higher among White females compared to Black females (NCI, 2007). However, several other factors may contribute to the racial and regional variation in incidence and mortality rates; such as the prevalence of certain risk factors (environmental, occupational, and behavioral), socioeconomic status, and lung cancer screening behaviors.

## CONCLUSION

The findings conclude racial, gender, age, and geographic disparities in lung cancer incidence and mortality and it is suggested that there is a need for more effective community-based interventions and preventative measures

for cultural sensitive groups to reduce the burden of lung cancer in Mississippi. Our observations highlight district patterns in racial disparities in cancer incidence and mortality that denotes more extensive collaborations and evaluation to offset potentially district and county-specific determinants. Targeted race and geographic location-specific prevention, treatment, and follow-up practices are needed to address the observed differences. This can be used to guide the cancer control planning efforts of governmental entities, district coalitions, cancer district coalitions, and non-profit health agencies that serve the communities within each underserved geographic location. Further surveillance in lung cancer incidence and mortality within the Public Health Districts are warranted. Effective cancer prevention and control is imperative and these results can be utilized to anchor modified risk factors specific toward high-risk populations at a local level. In addition, the data open the possibility of providing to the state legislature, targeted information in regards to cancer rates among their constituents and to have a better understanding of Mississippi's cancer incidence and mortality rates. For this reason, educational efforts such as public service announcements may serve as vehicles to increase the public's knowledge, awareness, and practices of the enormous toll of lung cancer.

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