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Trends of Ovarian Cancer Incidence and Mortality in Mississippi between 2003 and 2020

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Trends of Ovarian Cancer Incidence and Mortality in Mississippi between 2003 and 2020

by

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ABSTRACT

Ovarian cancer is the fifth leading cause of cancer deaths in women, accounting for more deaths than any other gynecologic cancer (Arora et al., 2023). Over the past few decades, there have been several advancements in treating the disease. However, improvements in survival rates for ovarian cancer are not seen equally among women. For White women, the five-year survival rate for ovarian cancer has improved, while for Black women, it has worsened (Karanth et al., 2019). To further understand how ovarian cancer affects women, we aim to describe the trends of ovarian cancer incidence and mortality for White and Black populations in Mississippi, where currently no studies examining ovarian cancer disparities exist. Utilizing the Mississippi Cancer Registry and the National Cancer Institute Joinpoint Linear Regression Analysis Software, we estimate the annual age-standardized rates per 100,000 of ovarian cancer incidence and mortality across race, sex, and geographic locations from 2003 to 2020. Geographic locations were determined based on Appalachian Mississippi, non-Appalachian Mississippi, Delta (not including DeSoto County), and non-Delta (including DeSoto County). Results showcased ovarian cancer incidence being the highest among White women in Mississippi, yet Black women disproportionally dying at higher rates from the disease. Results also showcased ovarian cancer incidence and mortality rates decreasing substantially for Black and White women in all geolocations, with exception for mortality rates in the Delta for White women. Further studies are needed to determine potential contributors so that ovarian cancer disparities can be addressed in Mississippi,

Keywords: ovarian cancer disparities, Mississippi, ovarian cancer incidence, and mortality

DEDICATION

First, I would like to thank my family and friends for their love, support, and encouragement during my time at The University of Southern Mississippi. Secondly, to my grandmother, Martha Walker-Davis, thank you for believing in me. You will forever be missed and cherished.

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LIST OF ABBREVIATIONS

AAPC	Average Annual Percent Change
ACS	American Community Survey
AMR	Annual Mortality Rate
ASR	Annual Standardized Rates
CI	Confidence Interval
MIR	Mortality-to-Incidence Ratio
US	United States

CHAPTER I: INTRODUCTION

In the United States (US), ovarian cancer is the fifth leading cause of cancer deaths and the most lethal among gynecologic cancers (Arora et al., 2023). The disease is caused by abnormal growth in the ovaries, which is the female reproductive organ that produces eggs. Early detection of ovarian cancer is often difficult due to its vague symptoms and ineffective screening methods. The disease is, thus, frequently discovered in its advanced stage (Arora et al., 2023).

While ovarian cancer continues to impact the lives of women from various racial and ethnic backgrounds, the burden of the disease is unevenly distributed among American women. For example, between 1975 and 2010, the five-year survival rate for White ovarian cancer patients increased from 33% to 47%; however, the rate decreased from 44% to 36% in Black ovarian cancer patients during the same period (Karanth et al., 2019). These statistics and others have assisted researchers and health professionals in understanding ovarian cancer racial disparities in the US. However, more studies are needed to understand further how these disparities may vary according to statewide populations.

For the state of Mississippi, there are currently no studies for ovarian cancer disparities. To understand how ovarian cancer affects women in Mississippi, this study aims to examine the trends of ovarian cancer incidence and mortality for White and Black women in Mississippi from 2003 to 2020. Trends are analyzed based on Appalachian Mississippi, non-Appalachian Mississippi, Delta (not including DeSoto County), and non-Delta counties (including DeSoto County). The selection for these geolocations is to

understand how women are affected by ovarian cancer in socioeconomically advantaged and disadvantaged locations of Mississippi.

CHAPTER II: LITERATURE REVIEW

Appalachian Mississippi

The Appalachian region of the US (also known as the Appalachians) is a heavily forested and mountainous area comprising approximately 25 million people, 420 counties, and eight independent cities (Vanderpool et al., 2019). The region is 42% rural and covers land in the thirteen states of West Virginia, Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia (Marshall et al., 2017). Most of the population in the Appalachians consists of racial and ethnic minority groups, with 19% living in southern Appalachia, 7% in northern Appalachian, and 4% in central Appalachia (Appalachian Regional Commission, n.d.). Thus, the region is not racially homogeneous. However, with most of the Appalachian region being rural, many Appalachian residents, regardless of racial and ethnic identity, experience several health and socioeconomic crises. These crises are due to a lack of insurance or underinsurance, geographic isolation, high tobacco use, obesity, limited public transportation, and limited access to physicians, clinics, hospitals, and other clinical resources (Paskett et al., 2011).

In 2017, the Appalachian Region Commission found that the states within the Appalachians had higher mortality for the nation's leading causes of death than remaining US areas (Marshall et al., 2017). These causes of death are heart disease, cancer, chronic obstructive pulmonary disease (COPD), injury, stroke, diabetes, and suicide (Marshall et al., 2017). Concerning cancer specifically, the Appalachian population has a cancer mortality rate of 184 per 100,000 population, exceeding the national rate by 10 percent (Marshall et al., 2017). For Southern Appalachia, cancer

mortality affects 177 per 100,000 population, which is five percent higher than the national rate (Marshall et al., 2017).

When considering the Appalachian region in Mississippi (Figure 1), otherwise known as Appalachian Mississippi, it is a heavily forested and mountainous area comprising approximately 24 counties. The region includes Alcorn, Benton, Calhoun, Chickasaw, Choctaw, Clay, Itawamba, Kemper, Lee, Lowndes, Marshall, Monroe, Montgomery, Noxubee, Oktibbeha, Panola, Pontotoc, Prentiss, Tippah, Tishomingo, Union, Webster, Winston, and Yalobusha counties (Appalachian Regional Commission, n.d.). See Figure 1 for a detailed visual of the Appalachian Mississippi region.

Cancer statistics in Appalachian Mississippi are a concern. Located in Southern Appalachia, Mississippi is one of four states (Kentucky, Tennessee, and West Virginia included) with the highest state-level cancer mortality in the Appalachian Region. The region has a cancer mortality rate 17% higher than the national rate but 2% lower than the rate in non-Appalachian Mississippi (Appalachian Regional Commission, n.d.). The number of primary physicians per 100,000 population in Appalachian Mississippi is 44% lower than the national average and 26% lower than the average in non-Appalachian Mississippi. As for specialty physicians, there is a greater need (Appalachian Regional Commission, n.d.). Per 100,000 population, the supply of specialty physicians in Appalachian Mississippi is 59% lower than the national average and 44% lower than the average in non-Appalachian Mississippi (Appalachian Regional Commission, n.d.). The critical need to improve individuals' health in Appalachian Mississippi has influenced the growth of health programs and businesses annually. Focus on the region regarding health disparities has also led to increased studies on the region. With such attention and

implementation of resources, there is hope that Appalachian Mississippi residents' livelihood and health will improve.

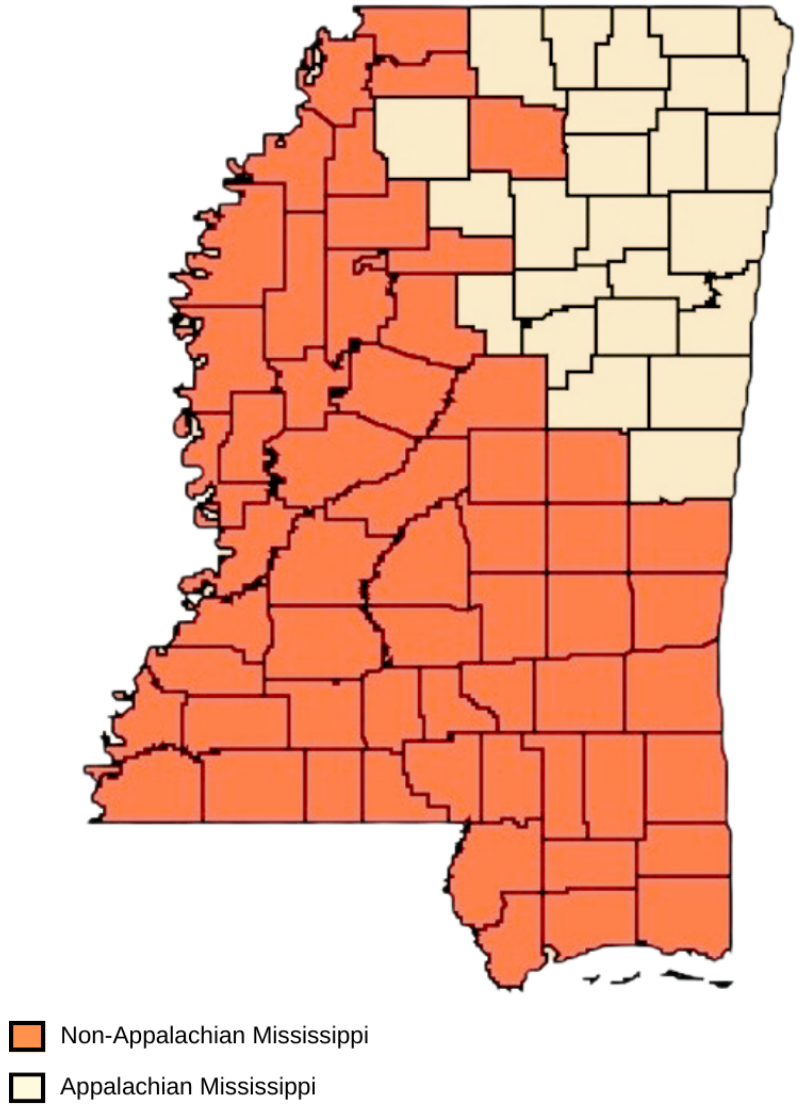

Figure 1. Appalachian Mississippi. Appalachian regions within the state of Mississippi.

Mississippi Delta

The Mississippi Delta, otherwise known as the Delta, is a large, fertile region along the Mississippi River and Alabama Black Belt that encompasses 10 million

residents (Whitney et al., 2017). It comprises 252 counties and spans across the following eight states: Alabama, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee (Whitney et al., 2017). Nationally, the region is ranked amongst the most socioeconomically disadvantaged areas. Approximately 20.4% of the Delta's residents live in poverty, a rate which is greater than the national rate (14.9%), and of its total population, most of the region's residents are racially Black, consisting of 32.4% of the population (Whitney et al., 2017). Compared to other areas of the US, residents of the Delta are 16% more likely to die from cancer than residents in other regions (Whitney et al., 2017). Additionally, regions within the rural Delta have higher cancer rates than those within the urban Delta (Whitney et al., 2017).

In addition to the national Delta region, Mississippi has a Delta region of its own. Located in the northwest area of the state, the geolocation is located between the Mississippi and Yazoo Rivers and holds a population of approximately 555,000 Mississippians in 18 counties (Mendy & Vargas, 2015). These counties include Bolivar, Carroll, Coahoma, DeSoto, Holmes, Humphreys, Issaquena, Leflore, Panola, Quitman, Sharkey, Sunflower, Tallahatchie, Tate, Tunica, Warren, Washington, and Yazoo (Mendy & Vargas, 2015). Figure 2 provides a detailed visual of the Delta region. The Delta is quite limited in available medical resources. As a result, the region, which covers 11,000 square miles, consists of a population battling high rates of high blood pressure, high cholesterol, diabetes, obesity, physical inactivity, and tobacco use (Mendy & Vargas, 2015).

Racially, the Mississippi Delta comprises a majority of White and Black Mississippians. Approximately 50% to 83% of the population are Black in the following

counties: Bolivar, Coahoma, Holmes, Humphreys, Issaquena, Leflore, Quitman, Sharkey, Sunflower, Tallahatchie, Tunica, Warren, Washington, and Yazoo (Mendy & Vargas, 2015). In Carroll, DeSoto, and Tate counties, approximately 65% to 72% of the population are White, and in Panola County, the population percentage for both racial groups is equal (Mendy & Vargas, 2015).

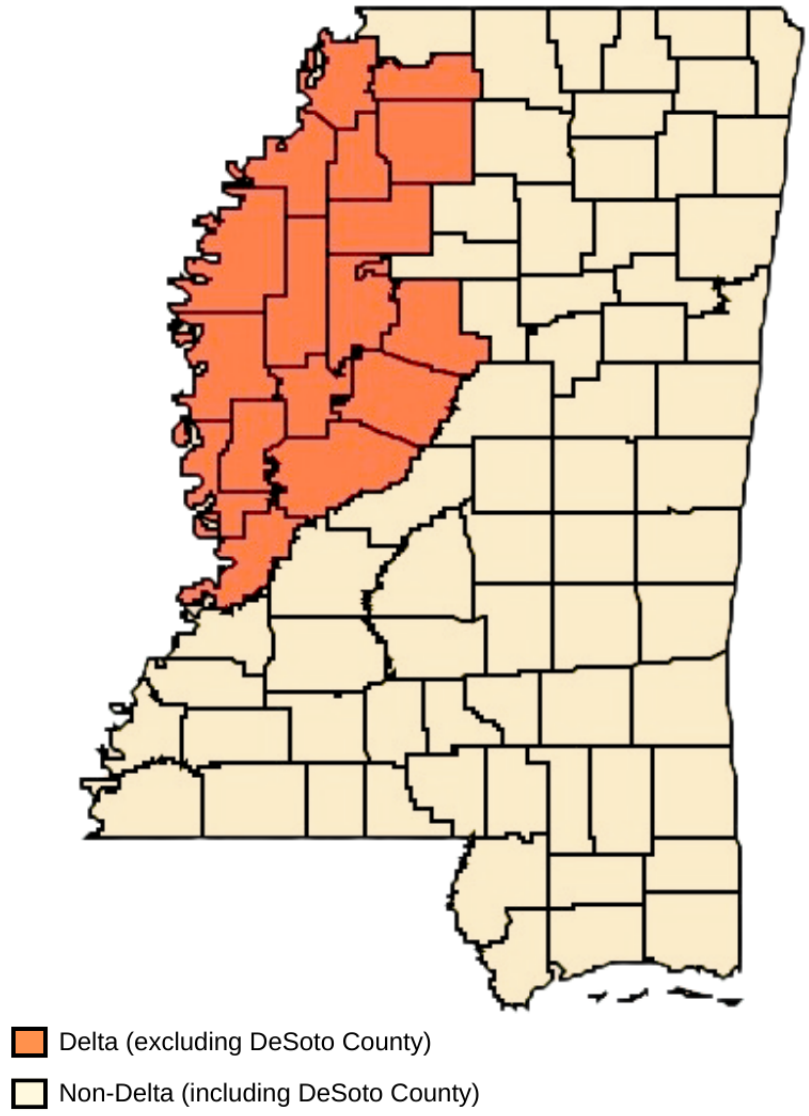

Figure 2. Mississippi Delta regions within the state of Mississippi.

CHAPTER III: METHODS

We extracted the annual number of invasive ovarian cancer cases, the annual number of ovarian cancer deaths, and the corresponding population data from the Mississippi Cancer Registry. Each data source was generated from 2003 to 2020, and all included information on race (Black female/White female) and the following geolocations: Appalachian Mississippi, non-Appalachian Mississippi, Delta (not including DeSoto County), and non-Delta (including DeSoto County). For the Delta, DeSoto County was excluded from the region and included as a county under the non-Delta region. The change was done because DeSoto County is one of the highest-earning counties in Mississippi. Thus, it does not align with the average rural profile of other Delta counties. By excluding Desoto County from the remaining Mississippi Delta region, the impact of location on ovarian cancer incidence and mortality trends can be appropriately assessed.

After data collection, we estimated the age-standardized ovarian cancer incidence rate (ASR) and annual mortality rate (AMR), which were stratified by race and geolocation using the US population in 2000 for standardization. We then calculated the mortality-to-incidence rate ratio (MIR). The MIR was utilized as a population-based indicator of survival. In addition, we estimated the average annual percent change (AAPC) in rates utilizing the National Cancer Institute Joinpoint Linear Regression Analysis Software. Lastly, the data concerning the 2020 ACS five-year estimates was also collected from the US Census Bureau.

With the study only involving the analysis of de-identified data from a public domain, it was considered exempt from ethics review.

CHAPTER IV: RESULTS

From 2003 to 2020, a total of 2,981 ovarian cancer cases and 2,171 ovarian cancer deaths occurred in the state of Mississippi. Black women accounted for 27% (n= 811) of the cases and 29% (n= 625) of the deaths, while White women accounted for 73% (n= 2170) of the cases and 71% (n= 1546) of the deaths. Considering the two racial groups of women, White women had a higher ovarian cancer incidence (ASR_{2020} = 7.08, AMR_{2020} = 5.65 per 100,000) than Black women (ASR_{2020} = 6.93, AMR_{2020}= 5.74 per 100,000), yet Black women led in ovarian cancer mortality (Tables 1 & 2). Despite these rates, White women had a significant reduction in both incidence and mortality for ovarian cancer ($AAPC_{incidence}$= 1.82*% /year, P= 0.001; $AAPC_{mortality}$ = -1.70*%/year, P= 0.002) with the most significant reduction being in incidence (Tables 1 & 2). Black women also had a significant reduction in both incidence and mortality for the disease, with the most significant reduction being in mortality ($AAPC_{incidence}$ = -1.57*%/year, P= 0.011; $AAPC_{mortality}$ = -2.16*%/year, P= 0.006) (Table 1 & 2).

In 2020, Black women comprised approximately 40% of the state's population (n=563,382) (Table 3). Contrarily, White women comprised approximately 60% of the state's population (n=834,730) (Table 3). The MIR from 2003 to 2020 in Black women remained constant. For White women, however, the MIR increased within the state for the population.

Appalachian Mississippi

In Appalachian Mississippi, Black women accounted for 25% (n= 190) of ovarian cancer cases and 27% (n= 154) of ovarian cancer deaths. Conversely, White women

accounted for 74% (n= 567) of ovarian cancer cases and 73% of ovarian cancer deaths (Table 1). During the study period, ovarian cancer incidence rates in Black and White women were generally high for this region. Despite these rates, a reduction in incidence was observed in both Black (ASR_{2003}= 10.06 vs. ASR_{2020} = 5.7 per 100,000; $AAPC_{incidence}$= -1.59%/year, P= 0.251) and White (ASR_{2003}= 13.75 vs. ASR_{2020} = 5.31 per 100,000; $AAPC_{incidence}$= -4.24*%/year, P = <0.001) women (Table 1). As for ovarian cancer mortality, rates were also high in both racial groups. However, a slight reduction in mortality ($AAPC_{mortality}$= -0.76%/year, P= 0.556) was observed for Black women, while a significant reduction in mortality ($AAPC_{mortality}$= -3.20*%/year, P= 0.007) was observed for White women (Table 1).

In 2020, the population of Appalachian Mississippi was majority comprised of White women (Table 3), yet the same trend in the MIR was observed in both populations. For White women, the ratio increased from 0.56 in 2003 to 1.41 in 2020, whereas for Black women, the ratio increased from 0.93 in 2003 to 1.47 in 2020 (Table 1).

Non-Appalachian Mississippi

Regarding non-Appalachian Mississippi, Black women accounted for 28% (n= 615) of ovarian cancer incidence and 29% (n= 471) of ovarian cancer mortality. Both ovarian cancer incidence ($AAPC_{incidence}$= -0.82%/year, P= 0.118) and mortality ($AAPC_{mortality}$= -1.20%/year, P = 0.057) slightly declined in White women (Table 1). Yet, for Black women, only a slight decline was observed in incidence rates ($AAPC_{incidence}$= -1.19%/year, P = 0.143), while a significant decline was observed in mortality rates ($AAPC_{mortality}$= -2.74*%/year, P = 0.006) (Table 1).

The population in non-Appalachian Mississippi was comprised of 37% (n= 478,594) Black women and 63% (n= 673,765) White women (Table 3). Unlike the MIR for Appalachian Mississippi, the ratio for White women in non-Appalachian Mississippi remained relatively stable, while the ratio for Black women in the exact geolocation improved from 0.91 in 2023 to 0.71 in 2020 (Table 1).

Delta

In the Delta (excluding DeSoto County), Black women accounted for 49% (n= 199) of ovarian cancer cases and 55% (n= 178) of ovarian cancer deaths. In contrast, White women accounted for 51% (n= 208) of ovarian cancer cases and 45% (n=147) of ovarian cancer deaths (Table 2). For Black women, both ovarian cancer incidence ($AAPC_{incidence}$= -0.51/year, P= 0.672) and mortality slightly decreased ($AAPC_{mortality}$= -0.92/year, P= 0.637) (Table 2). However, for White women in the Delta, ovarian cancer incidence decreased significantly ($AAPC_{incidenc}$= -4.0/year, P= 0.366), while an increase occurred in mortality ($AAPC_{mortality}$= 1.62/year, P= 0.266) (Table 3).

In 2020, the population for the Delta was comprised of 47% (n= 56,481) Black women and 53% (n= 63,223) White women (Table 3). For Black women in the region, the MIR increased from 1.10 in 2003 to 1.20 in 2020 (Table 2). Like the MIR for Black women, the ratio for White women increased from 0.84 in 2023 to 0.93 in 2020 (Table 2).

Non-Delta

In the non-Delta (including DeSoto County) region in Mississippi, Black women accounted for 24% (n= 606) of ovarian cancer cases and 24% (n= 447) of ovarian cancer deaths, while White women accounted for 76% (n= 1946) of ovarian cancer cases and

76% (n=1399) of ovarian cancer deaths (Table 2). For Black women, a significant decrease was observed in both incidence ($AAPC_{incidence}$= -1.49*/year, P= 0.039) and mortality ($AAPC_{mortality}$= -2.50*/year, P= 0.034). Furthermore, a significant decrease was observed in incidence ($AAPC_{incidence}$= -1.69*/year, P= 0.002) and mortality ($AAPC_{mortality}$= -2.06*/year, P= 0.001), as well, for White women in the non-Delta region (Table 3).

The population of the non-Delta region in Mississippi was comprised of 37% (n= 478,594) Black women and 63% (n= 815,170) White women (Table 3). The MIR in both Black and White women improved (Table 2).

Group	Index	2003	2020	2003-2020	AAPC, 2003-2019, %/year (95% CI)
Statewide					
Black Women	Cancer cases, #	48	45	811	
	Deaths, #	37	38	625	
	Incidence (95% CI)	10.24 [7.53, 13.58]	6.93 [5.00, 9.37]	8.19 [7.62, 8.78]	-1.57*
	Mortality (95% CI)	8.16 [5.73, 11.22]	5.74 [4.01, 7.98]	6.52 [6.01, 7.06]	-2.16*
	MIR	0.80	0.83	0.80	
White Women	Cancer cases, #	131	84	2170	
	Deaths, #	76	77	1546	
	Incidence (95% CI)	11.7 [9.76, 13.94]	7.08 [5.56, 8.92]	10.35 [9.90, 10.81]	-1.82*
	Mortality (95% CI)	6.57 [5.16, 8.27]	5.65 [4.42, 7.17]	6.79 [6.45, 7.15]	-1.70*
	MIR	0.56	0.80	0.66	
Appalachian Mississippi					
Black Women	Cancer cases, #	9	8	190	
	Deaths, #	8	11	154	
	Incidence (95% CI)	10.06 [4.58, 19.01]	5.7 [2.38, 11.81]	10.16 [8.75, 11.74]	-1.59
	Mortality (95% CI)	9.33 [4.01, 18.20]	8.4 [4.08, 15.53]	8.48 [7.18, 9.95]	-0.76
	MIR	0.93	1.47	0.83	
White Women	Cancer cases, #	37	17	576	
	Deaths, #	21	22	414	
	Incidence (95% CI)	13.75 [9.60, 19.19]	5.31 [3.05, 8.87]	11.20 [10.28, 12.19]	-4.24*
	Mortality (95% CI)	7.73 [4.73, 12.03]	7.5 [4.53, 11.82]	7.55 [6.82, 8.34]	-3.20*
	MIR	0.56	1.41	0.67	
Non-Appalachian Mississippi					
Black Women	Cancer cases, #	33	37	615	
	Deaths, #	29	27	471	
	Incidence (95% CI)	8.62 [5.92, 12.11]	7.20 [5.01, 10.02]	7.63 [7.03, 8.27]	-1.19
	Mortality (95% CI)	7.84 [5.24, 11.24]	5.11 [3.31, 7.53]	6.05 [5.51, 6.63]	-2.74*
	MIR	0.91	0.71	0.79	
White Women	Cancer cases, #	80	67	1578	
	Deaths, #	55	55	1132	
	Incidence (95% CI)	9.54 [7.54, 11.93]	7.55 [5.74, 9.78]	9.97 [9.47, 10.50]	-0.82
	Mortality (95% CI)	6.23 [4.69, 8.16]	5.13 [3.83, 6.80]	6.56 [6.17, 6.96]	-1.20
	MIR	0.65	0.68	0.66	

*Indicates statistical significance

Table 1. Appalachian Mississippi and Non-Appalachian Mississippi. Age standardized ovarian cancer incidence and mortality per 100,000, mortality incidence rate ratio, and average annual percent change in rate (AAPC) by race and Appalachian regions of Mississippi, 2003 to 2020.

Group	Index	2003	2020	2003-2020	AAPC, 2003-2019, %/year (95%CI)
Statewide					
Black Women	Cancer cases, #	48	45	811	
	Deaths, #	37	38	625	
	Incidence (95% CI)	10.24 [7.53, 13.58]	6.93 [5.00, 9.37]	8.19 [7.62, 8.78]	-1.57*
	Mortality (95% CI)	8.16 [5.73, 11.22]	5.74 [4.01, 7.98]	6.52 [6.01, 7.06]	-2.16*
	MIR	0.80	0.83	0.80	
White Women	Cancer cases, #	131	84	2170	
	Deaths, #	76	77	1546	
	Incidence (95% CI)	11.7 [9.76, 13.94]	7.08 [5.56, 8.92]	10.35 [9.90, 10.81]	-1.82*
	Mortality (95% CI)	6.57 [5.16, 8.27]	5.65 [4.42, 7.17]	6.79 [6.45, 7.15]	-1.70*
	MIR	0.56	0.80	0.66	
Delta (excluding DeSoto County)					
Black Women	Cancer cases, #	10	8	199	
	Deaths, #	11	10	178	
	Incidence (95% CI)	8.57 [4.07,15.76]	6.41 [2.65, 13.00]	9.11 [7.87, 10.49]	-0.51
	Mortality (95% CI)	9.41 [4.67, 16.80]	7.73 [3.59, 14.60]	8.25 [7.07, 9.58]	-0.92
	MIR	1.10	1.20	.91	
White Women	Cancer cases, #	7	5	208	
	Deaths, #	6	6	147	
	Incidence (95% CI)	5.99 [2.41, 13.13]	5.11 [2.41, 13.13]	10.77 [9.27, 12.46]	-4.0
	Mortality (95% CI)	5.04 [4.67, 16.80]	4.76 [4.67, 16.80]	6.83 [5.74, 8.12]	1.62
	MIR	0.84	0.93	0.63	
Non- Delta (including DeSoto County)					
Black Women	Cancer cases, #	32	37	606	
	Deaths, #	26	28	447	
	Incidence (95% CI)	8.89	7.1	7.84 [7.22, 8.50]	-1.49*
	Mortality (95% CI)	7.74 [5.04, 11.30]	5.26 [5.04, 11.30]	6.0 [5.48, 6.63]	-2.50*
	MIR	0.87	0.74	0.77	
White Women	Cancer cases, #	110	79	1946	
	Deaths, #	70	79	1946	
	Incidence (95% CI)	11.04 [2.41, 13.13]	7.24 [5.64, 9.17]	10.21 [9.75, 10.69]	-1.69*
	Mortality (95% CI)	6.74 [5.24, 8.57]	5.7 [4.40, 7.30]	6.78 [6.42, 7.16]	-2.06
	MIR	0.61	0.79	0.66	

*Indicates statistical significance

Table 2. Delta and Non- Delta. Age standardized ovarian cancer incidence and mortality per 100,000, mortality incidence rate ratio, and average annual percent change in rate (AAPC) by race and Delta regions in Mississippi, 2003 to 2020.

Group	Total Population (Black and White Women)	2020	Percentage of Population
Statewide			
Black Women	1,398,112	563,382	40%
White Women		834,730	60%
Appalachian Mississippi			
Black Women	309,807	105,179	34%
White Women		204,628	66%
Non-Appalachian Mississippi			
Black Women	1,164,668	490,903	42%
White Women		673,765	58%
Delta			
Black Women	119,704	56,481	47%
White Women		63,223	53%
Non-Delta			
Black Women	1,293,764	478,594	37%
White Women		815,170	63%

Table 3. Population Size. 2020 ACS five-year estimates of Black and White women for Appalachian and Delta regions in Mississippi, 2020.

CHAPTER V: CONCLUSION

From 2003 to 2020, ovarian cancer incidence was highest among White women in Mississippi, yet Black women were disproportionately dying at higher rates from the disease. This finding aligns with national studies stating that Black women have poorer survival from advanced epithelial ovarian cancer than White women (Howell et al., 2013). However, with ovarian cancer incidence and mortality rates decreasing substantially for Black and White women within Mississippi, the current study also aligns with the nationwide analysis that ovarian cancer incidence and mortality rates for women are declining (Siegel et al., 2023).

Improvement in ovarian cancer incidence and mortality for Black and White women living in Mississippi was driven, in part, by lower incidence and mortality rates in multiple areas. Among Black women, incidence and mortality significantly decreased in non-Delta areas, while for White women, incidence and mortality significantly decreased in Appalachian Mississippi. In addition, a significant decline in incidence rates was also observed in White women in the non-Delta region. The declining incidence of ovarian cancer in Mississippi can be attributed to preventive measures, health education, and early detection in Black and White women. Preventive measures may include utilizing oral contraceptives and maintaining an exercise regime, a healthy diet, and annual gynecologic visits. For ovarian cancer mortality, the decline may be a consequence of improvements in treatment, a reduced number of cases, or a reduction in the proportion of ovarian cancer patients in Mississippi.

Contrarily, there was limited improvement in ovarian cancer incidence and mortality for Black and White women in several areas of Mississippi. For Black women,

insignificant decreases in incidence and mortality were observed in Appalachian Mississippi and the Delta. Insignificant decreases in incidence were also noted in Black women for non-Appalachian Mississippi. For White women, insignificant decreases in incidence were observed in non-Appalachian Mississippi, while insignificant decreases in mortality were observed in non-Appalachian Mississippi and non-Delta regions. In addition, mortality in the Delta insignificantly increased for White women.

The regions with little improvement indicate that even with declines in ovarian cancer incidence and mortality for Black and White women, more health resources for the disease are still needed within Mississippi. These resources are especially needed for Black women residing in the Appalachian Mississippi and the Delta. Black women in these regions experience greater societal and health barriers than other racial groups due to the result of historically significant systemic inequality. The effects of such barriers in Appalachian Mississippi and the Delta are evident in the current study, with ovarian cancer incidence and mortality rates remaining high in Black women, even with declines in both factors from 2003 to 2020. In addition, resources are also needed for White women residing in the Delta due to the increasing trend observed in ovarian cancer mortality rates. The increasing trend is likely attributed to the growing incidence of smoking, obesity, and limited access to medical resources in the Delta (Mendy & Vargas, 2015).

There are limitations to this study. Histologic subtypes of ovarian cancer were not made available to the public by the Mississippi Cancer Registry. Such information would have aided in assessing trends based on specific types of ovarian cancer. In addition, information specific to the Appalachian and Delta region in Mississippi was limited for

the following: ovarian cancer statistics, genetic testing population results, number of current preventative regional programs, environmental risk factors for ovarian cancer, and regional socioeconomic crises for Black and White women. Another limitation was that the US Census Bureau did not provide the ACS one-year estimates for 2003 and 2020 for the following counties under Appalachian Mississippi, non-Appalachian Mississippi, the Delta, and non-Delta. 2020 ACS five-year estimates were, thus, utilized to provide some context for the population size of the regions mentioned in the current study. However, without the 2003 and 2020 ACS one-year estimates, the population change from 2003 to 2020 could not be assessed. Therefore, future studies are needed to understand the distribution of histologic subtypes, genetic factors, access to care, and environmental cancer risks, among many other factors. More statistical information and cancer research are also needed concerning Appalachian Mississippi, non-Appalachian Mississippi, the Delta, and non-Delta. With the requested information, researchers and physicians can better understand and explain the difference in ovarian cancer trends by race and geolocations within Mississippi.

APPENDIX A: IRB APPROVAL LETTER

ORI | Office of Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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Nov. 29, 2022

To Whom It May Concern,

Acting on behalf of The University of Southern Mississippi Institutional Review Board, in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University guidelines, I have reviewed the following project and have determined that review by USM's IRB is not necessary.

Principal Investigator: Angel Walker

Honors Thesis Project: "Trends of Ovarian Cancer Incidence and Mortality in Mississippi between 2003 and 2019."

Date Submitted: Nov. 29, 2022

Formal IRB review is not required in this instance, as the project does not meet federal or institutional definitions of "human subjects research."

Sincerely,

Samuel V. Bruton

Director of the Office of Research Integrity

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