

University of North Carolina at Asheville

Cancer Disparities in Buncombe County, North Carolina

Hailey Johnston  
POLS 490: Senior Research Capstone  
Professor Dwight Mullen, PhD  
May 7, 2018

## **Abstract**

Buncombe County, North Carolina releases a community health assessment every few years outlining priority health related issues in the county. However, Buncombe County does not release a community health report specifically on cancer. Cancer is the leading cause of death in Buncombe County. Empirical data regarding cancer disparities in Buncombe County, North Carolina show disparities in cancer incidence, mortality, and cancer related healthcare in the county and state. The findings of this study reveal a disparity between black and white female incidence and mortality rates for cervical cancer in North Carolina and a disparity between black and white male incidence and mortality rates for prostate cancer in Buncombe County. Due to little data available on cancer incidence and mortality for the Buncombe County black population, conclusions for this research are limited. The purpose of this thesis, is push the development of advances in the area of cancer public health in Buncombe County.

## Table of Contents

Introduction .....	3
Literature Review .....	5
Research Questions .....	10
Methodology .....	11
Findings .....	15
Discussion .....	22
Additional Findings: Predictions .....	24
Conclusions and Suggestions .....	28
Appendix .....	33
All Cancer Sites .....	34
Lung and Bronchus Cancer .....	38
Colon and Rectum Cancer .....	42
Breast Cancer .....	46
Pancreatic Cancer .....	48
Prostate Cancer .....	52
Cervical Cancer .....	54
Annotated Reference Appendix .....	56
Bibliography .....	59

## Introduction

This paper explores disparities in cancer incidence and mortality across different races and sexes in Buncombe County as well as initiatives to close these disparities. Health disparity is defined by the National Institutes of Health as “...the differences in incidence, prevalence, mortality, and burden of disease and other adverse health conditions that exist among specific population groups in the United States.” (NIH, 2002) Population studies (Brawley, Moore, 2006) demonstrate racial and gender based disparities among people in cancer incidence and mortality. Narrowing and eliminating these disparities is one of the largest challenges in cancer prevention and control. Study of the variation in cancer rates among populations provide insight into the causes, risk factors, and forces that influence the development and progression of cancer as well as the interventions necessary to control the disease and decrease the disparities. (Brawley, Moore, 2006, p. 197).

This research was conducted over the course of five months with assistance from data provided by the North Carolina Central Cancer Registry (NCCCR), the National Cancer Institute (NCI), the National Cancer Institute’s Surveillance Epidemiology and End Results (SEER) Program, and African-American individuals directly affected by cancer in Buncombe County.

National cancer incidence and mortality rates are higher in males than in females. (Dorak and Karpuzoglu, 2012) Among the United States population, black males have the highest overall cancer rates and non-Hispanic white males have the second highest. The most predominant causes of cancer death among United States

males are from cancers of the lung, prostate, colon, and rectum. (Siegel, et al, 2018, p. 26) Among females, racial and ethnic cancer disparities are not as extreme as among males. Among United States females, cancers of the lung, breast, colon, and rectum are major causes of cancer death.

North Carolina statewide and Buncombe County data show consistency with the national patterns. In North Carolina, the primary diagnoses resulting in cancer death among males are lung/bronchus, colon/rectum, pancreatic, and prostate cancer. For black males, North Carolina data reflect the national statistics. Black males have significant disparities in incidence and mortality compared to white non-Hispanic males. In North Carolina, the primary diagnoses resulting in cancer death among females are lung/bronchus, colon/rectum, breast, pancreatic, and cervical cancer. Black females in North Carolina show a similar trend to black males when compared to white non-Hispanic females. However, unlike black males, while the cancer mortality rate for black females is higher than white non-Hispanic females, statistics often show black females have a lower cancer incidence rate than white non-Hispanic females.

This paper analyses Buncombe County level and North Carolina statewide data to determine if patterns at the state level are also reflected in the county. The analyses will include at the Buncombe County level calculations of mortality/incidence ratios as a proxy measure for quality of care. Then finally, this paper will explore Buncombe County level initiatives specific to cancer public health policy and health care.

## Literature Review

Cancer is not a monolithic disease, and cancer research often focuses on a specific type of cancer. Therefore, finding information on the disparities that are prevalent among all cancers is nearly impossible. All variations of cancer have causes specific to the individual subtype. Furthermore, cancer subtypes (e.g. breast, prostate, lung, etc.) have different levels of funding for research. (Mukherjee and Siddhartha, 2011) (Anderson, Bulatao, Cohen, 2004) (Carter and Nguyen, 2012)

Research has demonstrated that genetics, environmental causes, race, nutrition, socioeconomic status (SES), employment (US census classification), transportation to access healthcare, health insurance, biologic sex, gender identity, sexual orientation, life expectancy, and education all define some cancer health disparities. The causal influence of these factors is poorly understood and varies across cancer subtypes. (Fine, Ibrahim, Thomas, 2005) (Department of Health and Human Services, 2018) (Satia, 2009) (Burgard, Lin, 2013) (Syed, et al, 2013) (Sohn, 2017) (Regitz-Zagrosek, 2012) (Hafeez, 2017) (Olshansky, Antonucci, Berkman, Binstock, Boersch-Supan, Cacioppo, and Jackson, 2012)

Some factors influence metastasis of a cancer more than other factors. (National Cancer institute, Risk Factors) For instance, smoking can most often be attributed to the etiology of lung cancer while genetic and environmental factors can be attributed to the metastases of breast cancer. (Center for Disease Control and Prevention, 2017) (U.S. Department of Health and Human Services, 2017) Because of the variance in the

causes for cancer, there is no specific reason for the disparities in cancer incidence and mortality. There are a multitude of factors that contribute to the incidence and mortality of each individual cancer subtype.

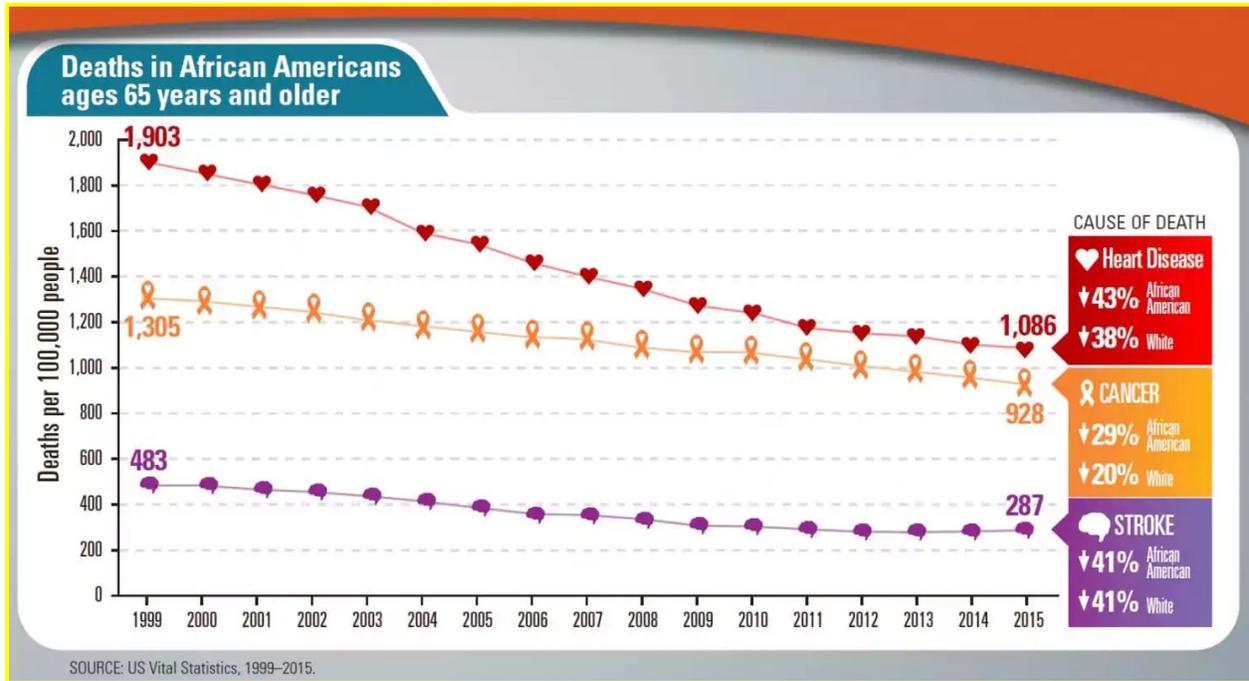
Data on race and cancer incidence and mortality in the black population are recent, as the only categories for race were “white” and “other” until 1970. (Pew Research Center, 2015) Since 1970, advances in data collection have been made and implemented into research methods. According to the NIH website: “The National Institute of Health adopted the 1997 Office of Management and Budget (OMB) revised minimum standards for maintaining, collecting, and presenting data on race and ethnicity for all grant applications, contract and intramural proposals, active research grants, cooperative agreements, contracts, and intramural projects, which went into effect on January 10, 2002. The 1997 OMB revised minimum standards include two ethnic categories (Hispanic or Latino, and Not Hispanic or Latino) and five racial categories (American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White). (National Institutes of Health, 2001)

When one evaluates how North Carolina measures race and ethnicity data, the SCHS typically only publishes estimates for race as the categories of “white” and “minority.” The census publishes detailed race data every ten years, but unfortunately, that causes for inaccurate statistics-- especially for the years in between census in regards to the rapidly growing hispanic and latino population in North Carolina. (North Carolina State Center for Health Statistics, 2000) Due to the disparities in data

collection for North Carolina based on reliance of the US Census, there may be inconsistencies with population estimates for Buncombe County.

In the Buncombe County and North Carolina State Cancer Profiles provided by the State Center for Health Statistics, potential causes of cancer incidence and mortality among the black population are due to a long list of social, economic, and environmental factors. These discussions fail to include that one of the primary causes for the increase in cancer incidence and mortality is due to an increase in life expectancy among the black population. Black individuals have experienced a twenty-five percent drop in death rate compared to a fourteen percent decrease in death for white individuals between 1999 and 2015. Deaths from heart disease, cancer and stroke have dramatically declined among black individuals sixty-five and older, and according to the CDC, black individuals in this age group now have a lower death rate than whites. The decline in death and increase in life expectancy for the black population is exemplified below in chart 1. (Director, SCHS, 2018, North Carolina Cancer Profile) (Director, SCHS, 2018, North Carolina Prostate Cancer Profile) (Director, SCHS, 2018, North Carolina Pancreatic Cancer Profile) (Director, SCHS, 2018, Buncombe County Cancer Profile) (Tavernise, 2018) (Center for Disease Control and Prevention, 2017, July 03)

**Chart 1: Deaths in African-Americans ages 65 years and older**



Source: US Vital Statistics, 1999-2015.

Literature regarding disparities in breast cancer provide an opportunity to explore the complexity of any discussion of cancer. Breast cancer is more prevalent in high income areas than in low income areas, but it is not clear that this is due to the biology of cancer or as an artifact of health insurance among high income people. In contrast, African-American females with comparable education and income have lower incidence of breast cancer. Delay of pregnancy and having fewer children are associated with higher income and education and incidence of breast cancer. (Palmer, et al,2012) Disparities associated with race are inevitably influenced by education, income, and many other factors. (Mackillop, Zhang-Salomons, Boyd, 2000) (Devesa, Diamond,

1980) (Liu, Deapen, Bernstein, 1998) (Yost, Perkins, Cohen, et al, 2001) (Harper, Lynch, Meersman, 2009)

Cancer research and cancer diagnostic technology, plus the availability of diagnostic testing, have all grown exponentially over the last twenty years. Traditionally, black females were diagnosed with breast cancer less often than white females. But this has changed over time. By 2012, black female's frequency of breast cancer diagnosis at the national level caught up with white females'. These technological changes and issues of access inevitably affect the meaning of health statistics including those regarding cancer. (Chavez, 2016) (Ahmed, Abedalthagafi, 2016) (Susan G. Komen, Comparing Breast Cancer Screening Rates Among Different Group) (Institute of Medicine (US) Committee on Assuring the Health of the Public in the 21st Century, 2002)

## **Research Questions**

The following questions were derived from the literature review. Do disparities at the Buncombe County level reflect the disparities at the North Carolina State Level? Do cancer incidence and mortality rates in Buncombe County demonstrate race and/or sex disparities? Are there disparities in health care provision? What are the programs and initiatives helping to close these disparities? These questions will be pursued with secondary data published by Buncombe County and the State of North Carolina.

## Methodology

For performance of two different sets of calculations on disparities in cancer incidence and mortality between white non-Hispanic and black (includes Hispanic) populations in Buncombe County and North Carolina state, two data sources are used: the North Carolina Central Cancer Registry (NCCCR) and The National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) Program. The NCCCR gathers, processes and analyzes data on all cancer cases diagnosed among North Carolina residents to inform the organization and assessment of cancer control efforts. (NCCCR, About) The NCI's SEER Program provides information on cancer statistics for the U.S. population. (National Cancer Institute. About the SEER Program) The NCI's tables for incidence and mortality allow for one to search for incidence and mortality of a specific sex, race, ethnicity, and age. However, while one can search for the incidence and mortality of the white non-Hispanic population, the only category for the United States black population available is "black (includes Hispanic)," thus skewing data results. The white non-Hispanic population represents individuals who are of the white race, but do not have a Hispanic ethnicity, while the black (includes Hispanic) population include both people of the black race and black individuals who have a Hispanic ethnicity.

Researchers, policy makers, organizations, and program managers face many issues when seeking to analyze disparities in cancer incidence and mortality and develop effective strategies to reduce and eliminate disparities in the cancer community.

These issues begin with limited research and restricted access to quality data exemplifying the disparities among race, ethnicity, gender identity, sexual orientation, employment, and SES. The primary problem is bridged data, meaning that the categories combine race and sex. For example, the Census Bureau releases statistics with the categories of “white” and “minority,” making it nearly impossible to know exactly the rates at which people in individual minority categories are diagnosed and die from cancer. Furthermore, when one studies the disparities in the cancer community or needs for new medicine, survival rates for five and ten years play a crucial role in truly knowing exactly what this population needs in terms of care. Unfortunately, unbridged data rates of survival are not easily accessible for public use, thus making it extremely difficult to contextualize what is needed to close the disparities in cancer care and detection. (North Carolina State Center for Health Statistics, 2000)

Health statistics are a function of statutory laws at the state level. State departments of public health are obligated to collect vital statistics and communicate disease morbidity because of constitutional expectations, national data are gleaned from the states. Because the data originate all health data collection, the reliability, operational meanings and definitions, data management and other technical aspects of the process often vary state-by-state. This can call some aggregated mentioned data into question or some states literally do a better job than others. Rarely do states require providers to report diagnostic morbidity for chronic diseases with the same legal colut or with commerable diseases. Chronic diseases rarely pose an epidemic threat to the state. The voluntary compliance with chronic disease reporting by hospitals and

individual physicians can be viewed as a flaw in the system. If the purpose of the data collection is to conduct research. County level health departments play an integral role in state level data collection. The county health department has exclusive authority in most states to certify health statistics that come from the county. If county level data have missing elements, such as racial identity, it is at the county level that such data flaws must be corrected. (R. Torres-Zeno, 1995)

Complete statistics of North Carolina state cancer incidence and mortality provide for exact disparity ratios of incidence/mortality and incidence and mortality percents at the state level between black and white North Carolina residents. However, incomplete data for Buncombe County black residents make it impossible to infer the same disparities at the county level. And to use the North Carolina statistics to suggest that Buncombe County disparities are similar, would be unfair to the county. Due to the differences in available incidence and mortality data between North Carolina and Buncombe County, conclusions on what cancer disparities exist in Buncombe County are limited.

The first calculations of data from NCCCR and NCI's SEER program are percent comparisons of the incidence and mortality rates between the white and black populations in Buncombe County and North Carolina state. Incidence and mortality rate percent comparisons are calculated through dividing the average of the two variables (white and black mortality or incidence), and then multiplying all by one hundred. The second calculations are mortality/incidence ratios as a proxy measure for quality of care. Mortality/incidence ratios are calculated by dividing the mortality by the incidence

for the white and black populations. The two sets of calculations provide a means for making conclusions on the questions presented in this paper.

For one to make comparisons of the Buncombe County white and black cancer incidence and mortality rates, data for both race variables are needed. The exact measures of Buncombe County black population cancer incidence and mortality rates have not been uniformly applied across all cancer sites. Because of the minimal information available on black Buncombe County resident's cancer incidence and mortality rates, the ability to conduct the following data analysis is limited.

## Findings

This study uses All Cancer Sites, Lung/Bronchus Cancer, Colon/Rectum Cancer, Pancreatic Cancer, Prostate Cancer, Breast Cancer, and Cervical Cancer to compare cancer incidence and mortality between the white and black populations in Buncombe County, North Carolina and the state of North Carolina. Tables for incidence and mortality rates and percent comparisons and tables for incidence and mortality rate ratios will be presented in the following order: North Carolina 2010-2014 Cancer Incidence and Mortality Rates, Buncombe County 2010-2014 Incidence and Mortality Rates, North Carolina 2010-2014 Incidence and Mortality Rate Ratios, and Buncombe County 2010-2014 Incidence and Mortality Rate Ratios.

Table 1 shows the incidence and mortality rates for North Carolina and percent comparisons of the incidence and mortality rates between the white and black populations in North Carolina state. For example, in North Carolina, the black population has a colon/rectum cancer incidence rate is 19% higher than the white population and a colon/rectum cancer mortality rate 40.5% higher than the white population. The incidence and mortality rate percent comparisons are calculated through dividing the average of the two variables (white and black mortality or incidence), and then multiplying all by one hundred.

**Table 1: North Carolina 2010-2014 Cancer Incidence and Mortality Rates**

Disease	All	NH White	Black	Difference
<b>NC Total Population Cancer Incidence Rates</b>				
All Cancer Sites	457	459.5	465.1	1% Higher for Black
Lung/Bronchus	70	71.6	67.9	5.3% Lower for Black
Colon/Rectum	37.7	36.5	44.2	19% Higher for Black
Pancreatic	12.4	11.7	16	31% Higher for Black
<b>NC Total Population Cancer Mortality Rates</b>				
All Cancer Sites	172	169.8	198.2	15% Higher for Black
Lung/Bronchus	50.7	52	50.4	3.1% Lower for Black
Colon/Rectum	14.1	13.2	19.9	40.5% Higher for Black
Pancreatic	10.8	10.3	13.9	30% Higher for Black
<b>NC Male Cancer Incidence Rates</b>				
All Cancer Sites	517.9	512	562.6	9% Higher for Black
Lung/Bronchus	88.5	87.8	99.4	12.4% Higher for Black
Colon/Rectum	43.7	42.1	52.8	22.5% Higher for Black
Pancreatic	14.3	13.9	17.4	22.3% Higher for Black
Prostate	125	109	190	54% Higher for Black
<b>NC Male Cancer Mortality Rates</b>				
All Cancer Sites	215.1	209.9	266.7	24% Higher for Black
Lung/Bronchus	67.9	67.4	78.7	15.5% Higher for Black
Colon/Rectum	17.3	16.2	26	46.6% Higher for Black
Pancreatic	12.6	12.2	16.2	28.1% higher for Black
Prostate	21.6	17.9	44.4	84% Higher for Black
<b>NC Female Cancer Incidence Rates</b>				
All Cancer Sites	415	423	401	5.3% Lower for Black
Lung/Bronchus	56	59	47.2	22.2% Lower for Black
Colon/Rectum	33	32	38.2	17.6% Higher for Black
Pancreatic	10.9	9.9	14.9	40.3% Higher for Black
Breast	129	130	133	2.3% Higher for Black
Cervical	7.2	6.8	8.1	17.4% Higher for Black
<b>NC Female Cancer Mortality Rates</b>				
All Cancer Sites	142.1	141	157.9	11.3% Higher for Black
Lung/Bronchus	37.9	40.4	31.9	22.5% Lower for Black

Colon/Rectum	11.6	10.8	16.1	39.4% Higher for Black
Pancreatic	9.2	8.7	12.1	32.7% Higher for Black
Breast	21.6	20.2	28.6	36.7% Higher for Black
Cervical	2.1	1.8	3.4	62% Higher for Black

Table 2 shows the incidence and mortality rates for Buncombe County and percent comparisons of the incidence and mortality rates between the white and black populations in Buncombe County. The methodology and interpretation of the percent comparisons for table two are the same as table one, however, no black incidence and mortality data are available for many cancer sites, as shown above. However, when one analyzes the data that are available, there is a disparity in prostate cancer incidence and mortality when compared to the Buncombe County white population.

**Table 2: Buncombe County 2010-2014 Incidence and Mortality Rates**

Disease	All	NH White	Black	Difference
<b>BC Total Population Cancer Incidence Rates</b>				
All Cancer Sites	455.7	453.7	523.8	14% Higher for Black
Lung/Bronchus	66.1	65.9	82.8	22.7% Higher for Black
Colon/Rectum	32	31	51.6	50% Higher for Black
Pancreatic	9.8	9.1	*	Data Not Available
<b>BC Total Population Cancer Mortality Rates</b>				
All Cancer Sites	160.8	160.2	215.9	30% Higher for Black
Lung/Bronchus	45.8	46.1	59.9	26% Higher for Black
Colon/Rectum	11	10.6	22.7	72.6% Higher for Black
Pancreatic	8.6	8.5	*	Data Not Available
<b>BC Male Cancer Incidence Rates</b>				
All Cancer Sites	505.1	498.6	655.1	27.1% Higher for Black
Lung/Bronchus	79.3	78.2	109.3	33.2% Higher for Black
Colon/Rectum	38.3	37.3	67.2	57.2% Higher for Black

Pancreatic	11.4	9.8 *		Data Not Available
Prostate	127	122	202	49.3% Higher for Black
<b>BC Male Cancer Mortality Rates</b>				
All Cancer Sites	195.8	193.6	300.6	43.3% Higher for Black
Lung/Bronchus	58.2	58.4	81.4	33% Higher for Black
Colon/Rectum	12.7	12.6 *		Data Not Available
Pancreatic	9.9	9.6 *		Data Not Available
Prostate	18	16.5	53	103% Higher for Black
<b>BC Female Cancer Incidence Rates</b>				
All Cancer Sites	424.2	425.4	441	3.6% Higher for Black
Lung/Bronchus	57.1	57.5	65.5	13% Higher for Black
Colon/Rectum	26.7	25.6	39.8	43.4% higher for Black
Pancreatic	8.9	8.7 *		Data Not Available
Breast	144	145	132	9.3% Higher for Black
Cervical	7.1	7.1 *		Data Not Available
<b>BC Female Cancer Mortality Rates</b>				
All Cancer Sites	136.9	137.4	161.8	16.3% Higher for Black
Lung/Bronchus	36.7	37	46.8	23.3% Higher for Black
Colon/Rectum	9.8	9.1 *		Data Not Available
Pancreatic	7.8	8 *		Data Not Available
Breast	18	17.8 *		Data Not Available
Cervical	2.7	2.9 *		Data Not Available

Table 3 shows the mortality/incidence ratios for the white and black populations in North Carolina. Mortality/incidence ratios are calculated by dividing the mortality by the incidence for the white and black populations. By dividing the incidence into the mortality for the black population and dividing the incidence into the mortality for the white population, the data show a significant difference in the mortality and incidence in the female black population for cervical cancer when compared to the female white population. One could suggest the 0.15 difference could be attributed to a difference in

quality cervical cancer screening and care. Furthermore, the higher mortality/incidence number for the white female breast cancer population could be attributed to worse access to cancer screenings for the black population. These data raise the questions: can higher incidence rates for the black population be attributed to biology or better medical screenings? Is higher cancer mortality in the black population due to diagnosis at a later cancer stage, worse access to treatment, being diagnosed with more aggressive types of cancer lacking effective treatment options, or a combination of all three?

**Table 3: North Carolina 2010-2014 Incidence and Mortality Rate Ratios**

Disease	Black:White	Differences
<b>NC Total Population Cancer Incidence and Mortality Rate Ratios</b>		
All Cancer Sites	0.42:0.35	0.06
Lung/Bronchus	0.74:0.72	0.02
Colon/Rectum	0.45:0.36	0.09
Pancreatic	0.87:0.88	-0.01
<b>NC Male Cancer Incidence and Mortality Rate Ratios</b>		
All Cancer Sites	0.47:0.41	0.06
Lung/Bronchus	0.79: 0.76	0.03
Colon/Rectum	0.49:0.38	0.11
Pancreatic	0.93:0.88	0.05
Prostate	0.23:0.17	0.06
<b>NC Female Cancer Incidence and Mortality Rate Ratios</b>		
All Cancer Sites	0.39:0.33	0.06
Lung/Bronchus	0.68:0.68	0
Colon/Rectum	0.42:0.34	0.08
Pancreatic	0.81:0.87	-0.06
Breast	0.21:0.15	0.06
Cervical	0.41:0.26	0.15

Table 4 shows the mortality/incidence ratios for the white and black populations in Buncombe County. Due to lack of available data for black individuals diagnosed with a cancer subtype in Buncombe county, analysis of colon/rectum, pancreatic, breast, and cervical cancer incidence and mortality could not be conducted. Mortality/incidence ratios are calculated by dividing the mortality by the incidence for the white and black populations. When dividing the mortality by the incidence for the black population and dividing the mortality by the incidence for the white population, the data show a significant mortality and incidence difference in the black male population for prostate cancer when compared to the white male population. One could suggest the 0.12 difference in numbers could be attributed to a difference in quality prostate cancer screening and care.

**Table 4: Buncombe County 2010-2014 Incidence and Mortality Rate Ratios**

Disease	Black:White	Difference
<b>BC Total Population Cancer Incidence and Mortality Rate Ratios</b>		
All Cancer Sites	0.41:0.35	0.06
Lung/Bronchus	0.72:0.67	0.05
Colon/Rectum	0.43:0.34	0.09
Pancreatic	Data Not Available	*
<b>BC Male Cancer Incidence and Mortality Rate Ratios</b>		
All Cancer Sites	0.46:0.39	0.07
Lung/Bronchus	0.74:0.75	0.01
Colon/Rectum	Data Not Available	*
Pancreatic	Data Not Available	*
Prostate	0.26:0.14	0.12
<b>BC Female Cancer Incidence and Mortality Rate Ratios</b>		
All Cancer Sites	0.36:0.32	0.04

Lung/Bronchus	0.71:0.64	0.07
Colon/Rectum	Data Not Available	*
Pancreatic	Data Not Available	*
Breast	Data Not Available	*
Cervical	Data Not Available	*

## Discussion

The findings raise more questions than answers. Are the higher incidence and mortality rates due to better detection care, but the black population is simply being diagnosed with more aggressive forms of cancer than the white population? Is the mortality rate due to differences in access to cancer treatment?

Tables 2 and 4 show disparities in cancer incidence and mortality between the black and white non-Hispanic populations in Buncombe County. These disparities in cancer incidence and mortality could be due to socioeconomic status, poor and hazardous living conditions, the absence and lack of referral to cancer specialists, and chemotherapy and other cancer drugs being tailored to treat white genetics and not the genetics minority populations. Additionally, there is a lack of cancer information and financial resources for black Buncombe County residents.

The two most noteworthy organizations working to close the cancer disparities in Buncombe County are: Asheville Buncombe Institute of Parity Achievement (ABIPA) and The Buncombe County Health Department. ABIPA is a local initiative to provide health education and support to African-Americans in Buncombe County and Asheville City. ABIPA's program PACE (Parity Achievement through Community Empowerment) provides services to medicaid recipients through collaboration with community organizations, groups, and individuals in an effort to address and improve health conditions for African-Americans, with a particular emphasis on breast and prostate cancer.

The Buncombe County Health Department provides free breast and cervical

exams, pap smears, mammograms and other health screenings for women age 21-64 without health insurance. Furthermore, they assist in hosting a Ladies Night Out program on the first Thursday of every month, offered by Mission Health, ABIPA, Asheville Radiology Breast Center and other partners. Free physicals, mammograms and health education for qualifying uninsured or underinsured women. Free child care and transportation, refreshments, blood pressure checks, cholesterol screening and pap smears are provided.

While these are the most visible programs working towards closing cancer disparities in Buncombe County, there are other grassroot organizations and church and community programs specifically aimed toward Buncombe County and Asheville City African-American residents that promote healthy living and how to detect the early signs of cancer. However, they are limited in their outreach due to lack of funding and/or 501(c)3 status.

### Additional Findings: Predictions

The following findings are based on the literature review.

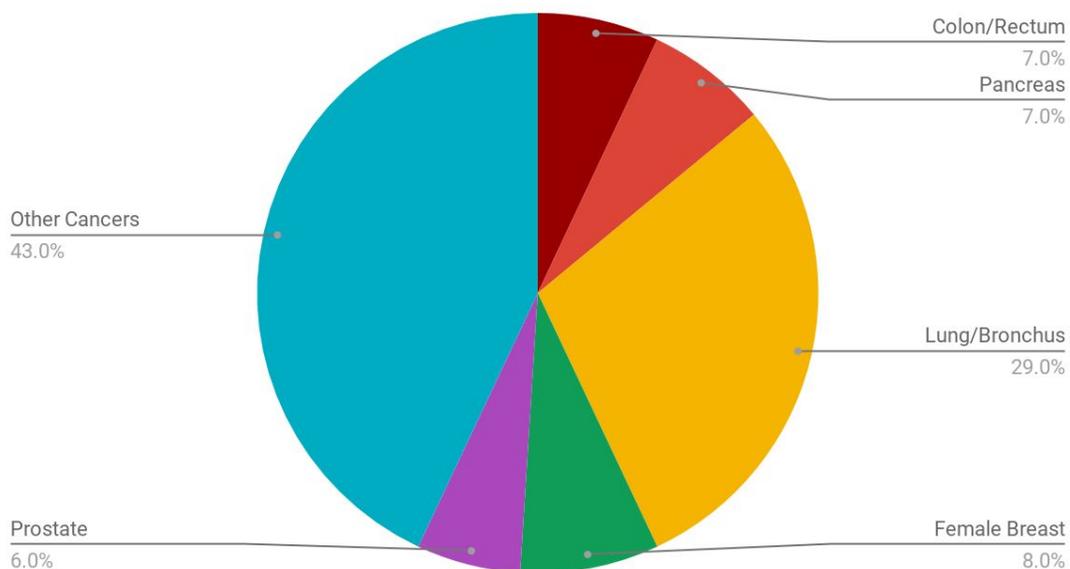
In 2015, cancer was the second leading cause of death in the United States according to the Centers for Disease Control and Prevention (CDC), while it was the leading cause of death in North Carolina. In 2015, 19,309 persons in North Carolina died from cancer, 524 in Buncombe County (Table 5). (NC SCHS Cancer Profile, 2017)

**Table 5: 2015 Percent of Cancer Deaths in Buncombe County Compared to 2015 Percent of Cancer Deaths in North Carolina**

Buncombe County: 19.7%	North Carolina: 21.7%
------------------------	-----------------------

The majority of cancer deaths occur at five sites: colon/rectum, pancreas, lung/bronchus, female breast and prostate (Figure 31). (NC SCHS Cancer Profile, 2017)

Figure 31. Buncombe County 2015 Cancer Deaths by Site



In 2014, 1,536 cancer cases were reported for Buncombe County residents. These numbers will increase as the population ages (Table 6). (NC SCHS Cancer Profile, 2017)

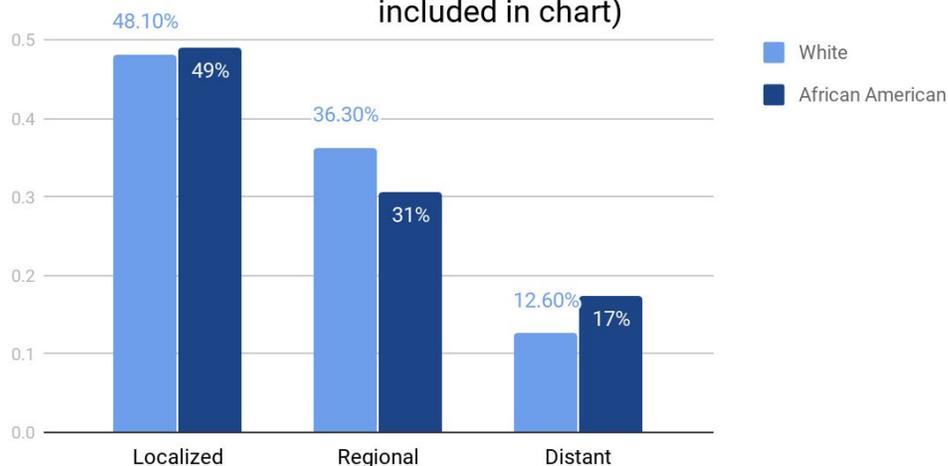
**Table 6: 2017 Projected Cancer Cases for Buncombe County and North Carolina**

	Buncombe County	North Carolina
<b>Lung/Bronchus</b>	<b>266</b>	<b>8,888</b>
<b>Colon/Rectum</b>	<b>135</b>	<b>4,602</b>
<b>Female Breast</b>	<b>295</b>	<b>10,279</b>
<b>Prostate</b>	<b>221</b>	<b>7,577</b>
<b>Pancreas</b>	<b>47</b>	<b>1,551</b>
<b>All Cancers</b>	<b>1,732</b>	<b>59,345</b>

## Cervical Cancer 2014 Statistics

Cervical cancer was ranked 21st for cancer incidence and mortality cases in North Carolina between 2010 and 2014. Cervical cancer occurs most frequently in females over the age of 30. Cervical cancer incidence and mortality are higher among African-American females. African-American females also have a greater percentage of cases diagnosed in the advanced stages (Figure 32). (NC SCHS Cervical Cancer Profile, 2017)

Figure 32: Stage of Disease at Diagnosis for Cervical Cancer in North Carolina Diagnosed in 2014 (Total Cervix Uteri Incidence: White=270 cases, African American=98 cases; cases with unknown stage not included in chart)



## Prostate Cancer 2014 Statistics and 2017 Prediction:

Prostate cancer is the most frequently diagnosed cancer among males in North Carolina. In 2014, 6,197 males were diagnosed with and 900 died from prostate cancer. The North Carolina Central Cancer Registry estimated that in 2017, about 7,577 new

cases of prostate cancer would be diagnosed and 990 males would die of prostate cancer in North Carolina. African American males have greater prostate cancer incidence and greater mortality than white males. (NC SCHS Prostate Cancer Profile, 2017)

**Female Breast Cancer 2017 Prediction:**

Cancer of the female breast was the most frequently occurring and the third leading cause of cancer death in North Carolina from 2010 to 2014. It was predicted that 10,279 females in North Carolina would be diagnosed with and 1,428 females would die of breast cancer in 2017. (NC SCHS, 2017 Breast Cancer Profile)

## **Conclusions and Suggestions**

Cancer is the leading cause of death in Buncombe County, North Carolina. Addressing cancer, including measurable disparities in Buncombe County is limited because of the complexity of the disease and lack of available information on cancer incidence and mortality for the county's black population. The most significant discovery from this study reveals the disparity found between black and white female incidence and mortality rates for cervical cancer in North Carolina and the disparity found between black and white male incidence and mortality rates for prostate cancer in Buncombe County. Unfortunately, the exact measures of Buncombe County's cancer incidence and mortality rates for the black population have not been uniformly applied across all cancer sites, and the structure needed to take it to the next level, where effective solutions can be found, is limited. The discoveries from this analysis may assist both public and private organizations to improve cancer health disparity research, and eventually eradicate identified disparities in Buncombe County cancer incidence and mortality.

Many short- and long-term solutions could address the disparities in cancer incidence and mortality in Buncombe County, North Carolina. While short-term initiatives have proved ineffective in the long-term, they can address the immediate needs of the black population in Buncombe County. Long-term solutions are what will continue to merge the gap in cancer incidence and mortality over time, but they are often harder to implement quickly.

## **Short-term solutions for closing the cancer disparities in Buncombe**

### **County:**

Many of the short-term solutions are behavioral. Behavior is the way in which a person acts or conducts themselves, toward themselves or others. By providing services to assist individuals in treating themselves or others better, the closure of disparities in cancer incidence, mortality, and cancer-care is possible.

- Maintaining a balanced diet and physical activity is crucial to reducing the risk of cancer. (American Cancer Society, 2018) Access to education on maintaining a healthy lifestyle that is budget friendly is limited. However, organizations like ABIPA are hosting educational forums and workshops that provide transportation and childcare for individuals in the community who could benefit from information on healthy living practices that can be balanced with an already established work-life dynamic. (ABIPA, PACE Program)
- Food Security is a significant problem among low-income Buncombe County residents. (Buncombe County, 2015 Community Health Assessment) Expansion of community gardens and places where low-income Buncombe County residents can obtain affordable or free nutrient rich food is a short term solution that could increase the well-being of hundreds in the community.
- Black females are typically diagnosed at a later stage of cancer than white females. (Alcaraz, et al, 2018) Forums that address and stress the importance of early detection and provide information on institutions that offer free cancer

screenings could help close the gap in cancer incidence and mortality. (Allicock, et al, 2013)

- Distrust of the healthcare system is prominent in the black population. Having a medical team a patient trusts is crucial to cancer survival. (Natale-Pereira, Enard, Nevarez, Jones, 2011) A digital and physical list of doctors who have a strong and deep knowledge base of racial disparities in healthcare, and physicians who are known for their success in treating minority patients will help merge the gap between minority populations in Buncombe County and the medical sphere. (Correspondence with Dr. Mullen, 2018)
- A easily accessible digital and physical list of cancer support services in Buncombe County and North Carolina could help alleviate the financial and emotional burden of a cancer diagnosis.
- Cancer can be an emotional and socially isolating disease, and when one is a racial minority, a cancer diagnosis can be far more isolating than it is for a white individual. (American Cancer Society, 2018, Minority Cancer Awareness) Safe spaces within the cancer community for minorities such as cancer support groups could assist in lessening feelings of isolation and provide a positive support community of people who can empathize with each other in a way white cancer patients cannot.
- A medical professional's job is to provide patient-centered care to the best of their ability. (Greiner, Knebel, 2003) Medical professional needs to have a broad understanding of diversity to effectively do their job. Diversity training for medical

professionals and then continued demonstration of learned information is critical to patients receiving quality care. Diversity training requires time, may need diagnostics, and can be difficult to implement, as those who would be in charge of setting up and requiring diversity training would need to first recognize that it is needed at their establishment. The training would need to target awareness and skill development and take place over a significant period of time through a diversity training program proven to work. (Lindsey, King, Membere, 2017) The purpose of this training would be to educate medical professionals on diversity and how they can better assist and meet the needs of all of their patients.

(Wilson-Stronks, Lee, Cordero, Kopp, Galvez)

**Long-term solutions:**

- Buncombe County developing a data collection standard for exact counts for the local cancer incidence and mortality rates for all races and ethnicities would provide a means of understanding the local cancer incidence and mortality disparities.
- Public health problems that are never measured do not exist in the public consciousness. Such “non-problems” can be ignored by policy makers, the health care system, and the general public. Disparities have been revealed by the current analysis because race variables are not available. This suggests that these measures should be mandatory for all cancer diagnoses that are reported, initially, at the county level where health statistics begin. Buncombe County should take initiative to start this

mandate in order to determine if additional disparities exist and to set an example of public health leadership.

- In North Carolina, there are currently 244,000 people who have no viable access to health insurance. Expansion of Medicaid through the Affordable Care Act could fix this problem. North Carolina choosing to expand Medicaid would provide care to over 244,000 people and 39.6 billion dollars of federal funding for North Carolina. Expansion of Medicaid would inevitably help close disparities in health coverage between the white and black populations. (Healthinsurance.org, North Carolina and the ACA's Medicaid expansion)

By implementing these recommendations in Buncombe County, further research and progress regarding local cancer health disparities can be made. Cancer is a disease of many subtypes, and the best way to understand cancer incidence and mortality disparities is by having accurate information on race and ethnicity across all cancer sites.

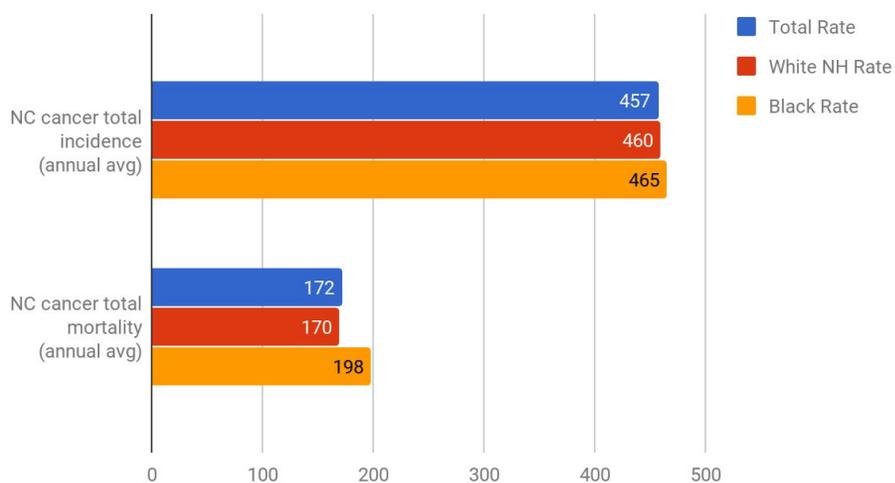
## Appendix

Charts for cancer incidence and mortality in North Carolina and Buncombe County will be presented in the following order: total population in North Carolina and Buncombe County, total male population in North Carolina and Buncombe County, and total female population in North Carolina and Buncombe County, separated by black (includes Hispanic) and white non-Hispanic race demographics. Following the charts for all cancer sites, individual cancer sites will be listed by the rate of mortality from highest to lowest: lung/bronchus, colon/rectum, breast, pancreatic, prostate, and cervical. For percent differences between the incidence and mortality rates, please refer to tables one and two.

## All Cancer Sites (Figures 1-6)<sup>1</sup>

Figure 1 shows the average yearly incidence and mortality rate for all individuals diagnosed with cancer between 2010 and 2014 in North Carolina.

Figure 1: All Cancer Sites in North Carolina 2010-2014



<sup>1</sup> Source: *National Cancer Institute*

Figure 2 shows the average yearly incidence and mortality rate for all individuals diagnosed with cancer between 2010 and 2014 in Buncombe County.

Figure 2: All Cancer Sites in Buncombe County 2010-2014

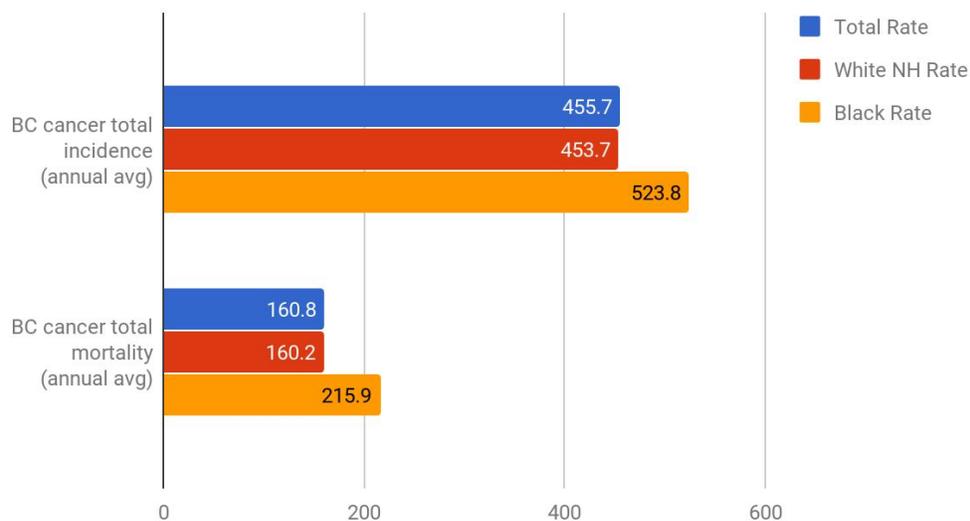


Figure 3 shows the average yearly incidence and mortality rate for all male individuals diagnosed with cancer between 2010 and 2014 in North Carolina.

Figure 3: All Cancer Sites for Males in North Carolina 2010-2014

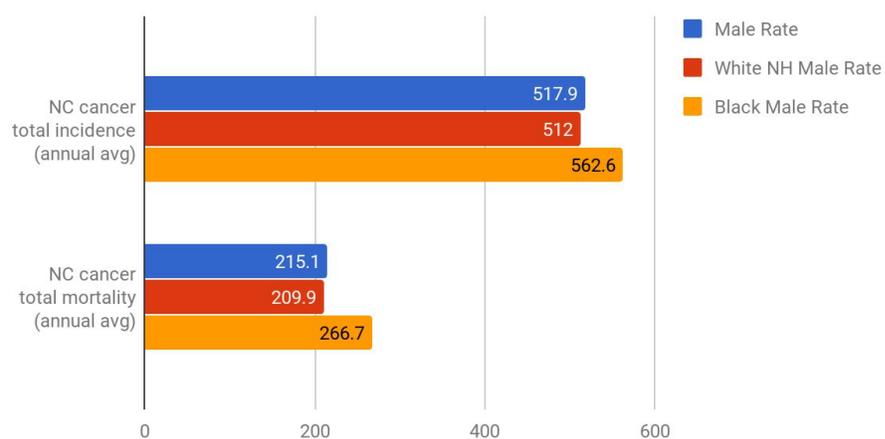


Figure 4 shows the average yearly incidence and mortality rate for all male individuals diagnosed with cancer between 2010 and 2014 in Buncombe County.

Figure 4: All Cancer Sites for Males in Buncombe County 2010-2014

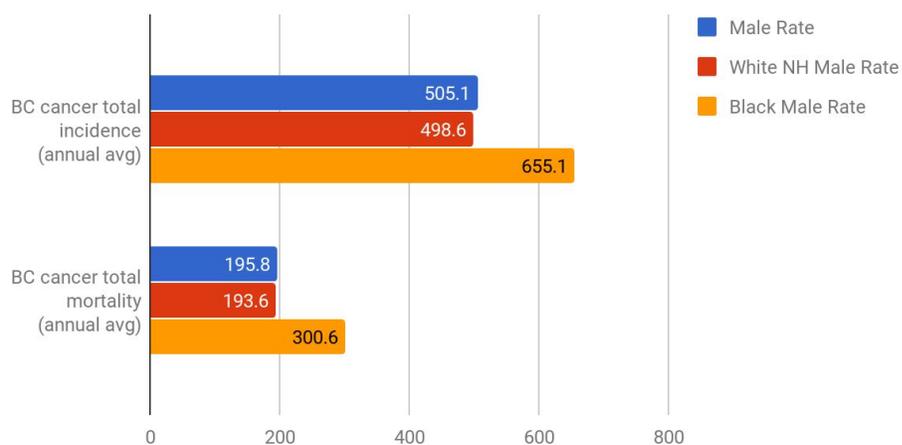


Figure 5 shows the average yearly incidence and mortality rate for all female individuals diagnosed with cancer between 2010 and 2014 in North Carolina.

Figure 5: All Cancer Sites for Females in North Carolina 2010-2014

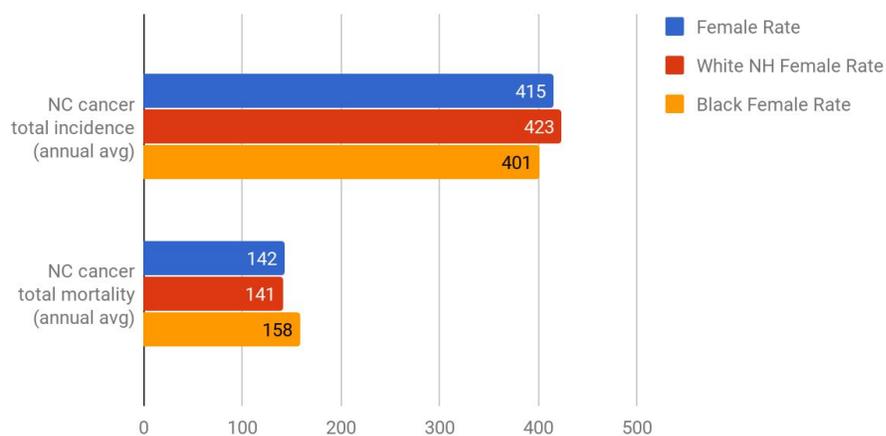
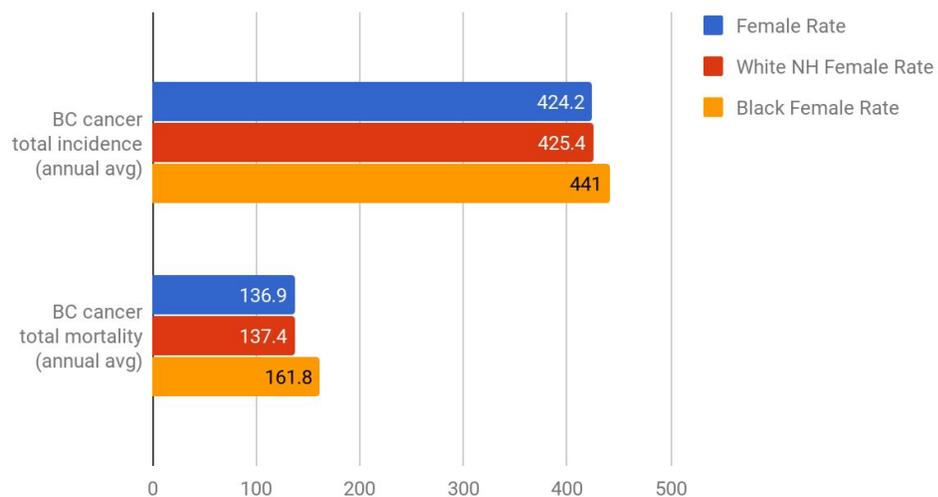


Figure 6 shows the average yearly incidence and mortality rate for all female individuals diagnosed with cancer between 2010 and 2014 in Buncombe County.

Figure 6: All Cancer Sites for Females in Buncombe County



## Lung and Bronchus Cancer (Figures 7-12)<sup>2</sup>

Figure 7 shows the average yearly incidence and mortality rate for all individuals diagnosed with lung and bronchus cancer between 2010 and 2014 in North Carolina.

Figure 7: Lung/Bronchus Cancer in North Carolina 2010-2014

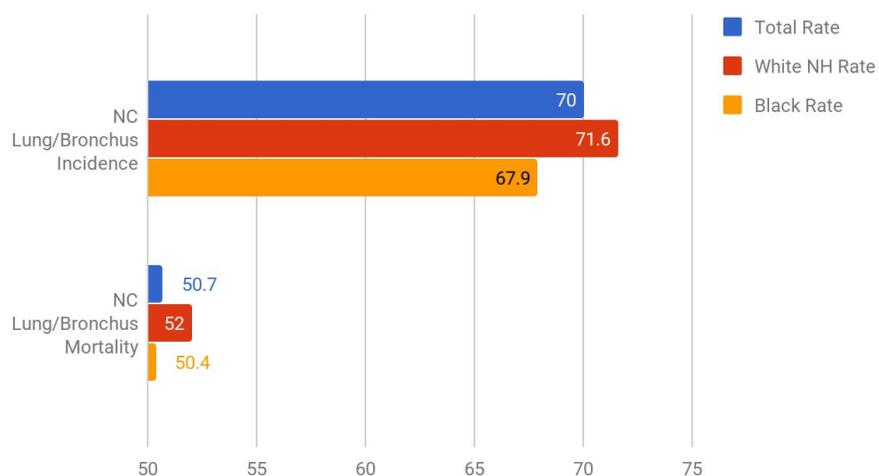


Figure 8 shows the average yearly incidence and mortality rate for all individuals diagnosed with lung and bronchus cancer between 2010 and 2014 in Buncombe County.

<sup>2</sup> Source: *National Cancer Institute*

Figure 8: Lung/Bronchus Cancer in Buncombe County 2010-2014

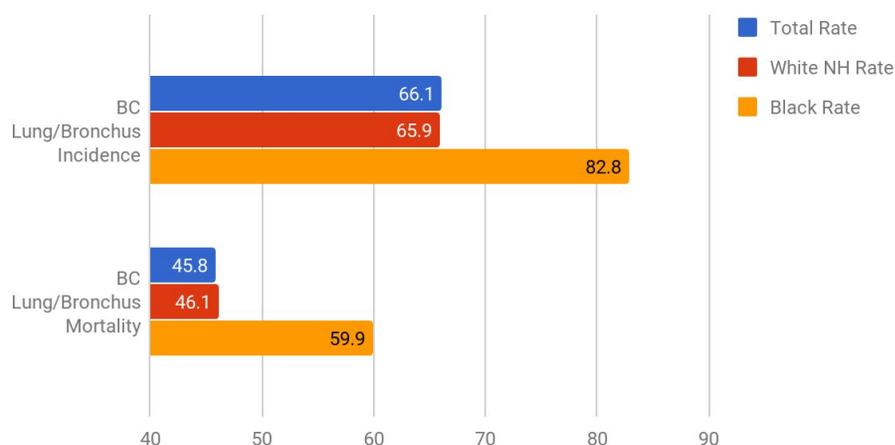


Figure 9 shows the average yearly incidence and mortality rate for all male individuals diagnosed with lung and bronchus cancer between 2010 and 2014 in North Carolina.

Figure 9: Male Lung/Bronchus Cancer Rates in North Carolina 2010-2014

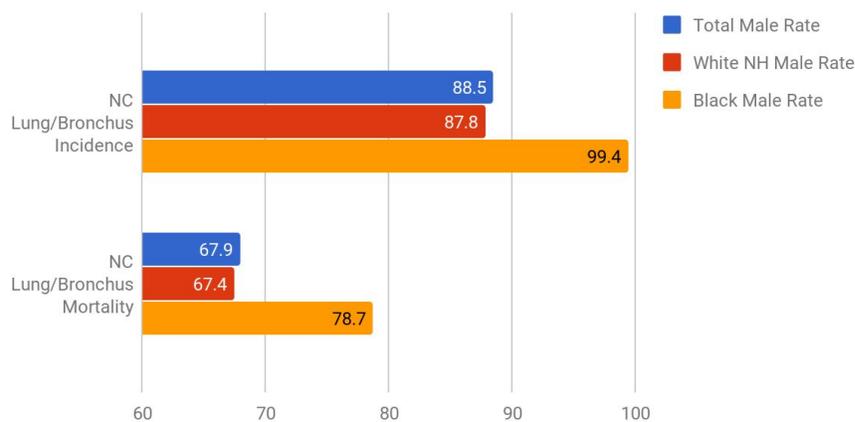


Figure 10 shows the average yearly incidence and mortality rate for all male individuals diagnosed with lung and bronchus cancer between 2010 and 2014 in Buncombe County.

Figure 10: Male Lung/Bronchus Cancer Rates in Buncombe County 2010-2014

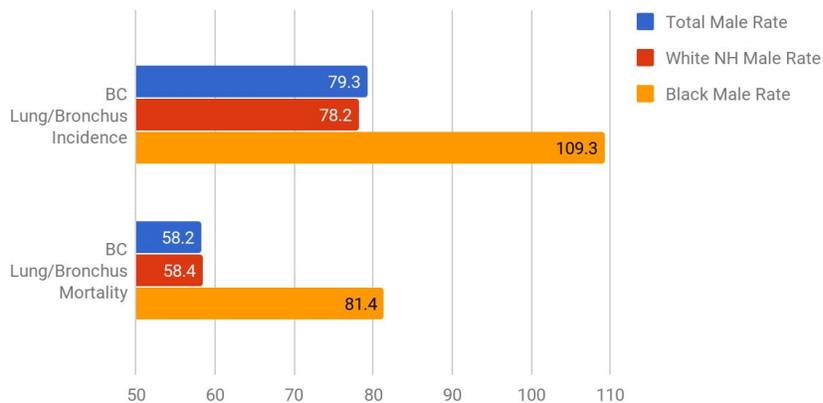


Figure 11 shows the average yearly incidence and mortality rate for all females individuals diagnosed with lung and bronchus cancer between 2010 and 2014 in North Carolina.

Figure 11: Female Lung/Bronchus Cancer Rates in North Carolina 2010-2014

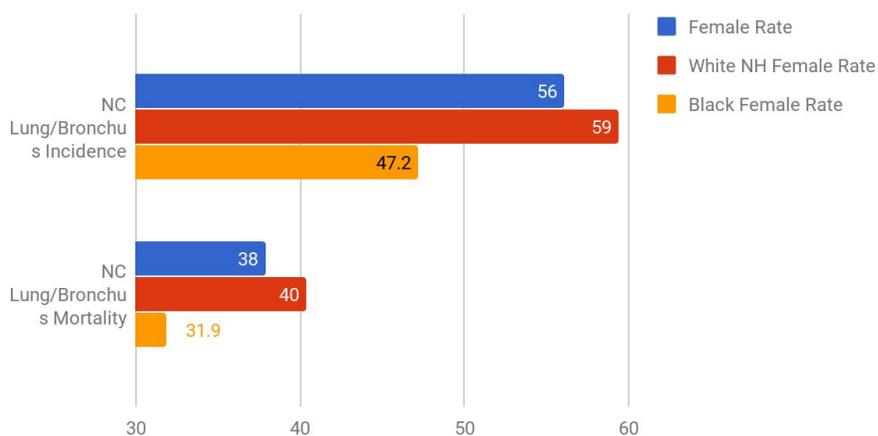
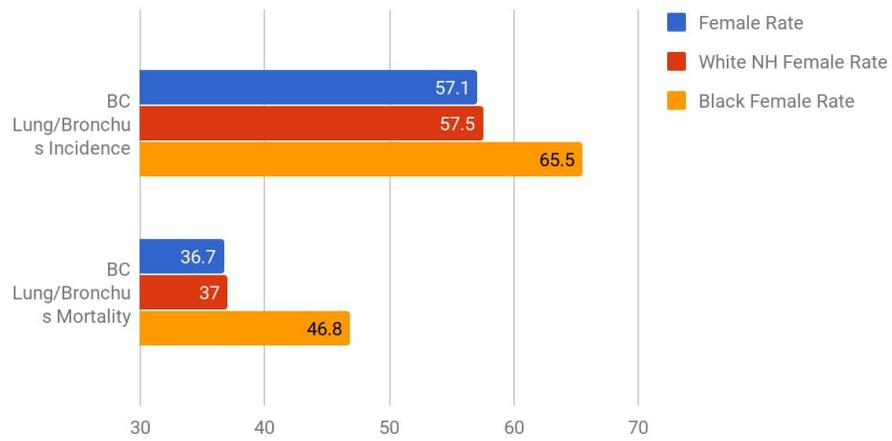


Figure 12 shows the average yearly incidence and mortality rate for all females diagnosed with lung and bronchus cancer between 2010 and 2014 in Buncombe County.

Figure 12: Lung/Bronchus Cancer Rates in Buncombe County  
2010-2014



### Colon and Rectum Cancer (Figures 13-18)<sup>3</sup>

Figure 13 shows the average yearly incidence and mortality rate for all individuals diagnosed with colon/rectum cancer between 2010 and 2014 in North Carolina.

Figure 13: Colon/Rectum Cancer in North Carolina 2010-2014

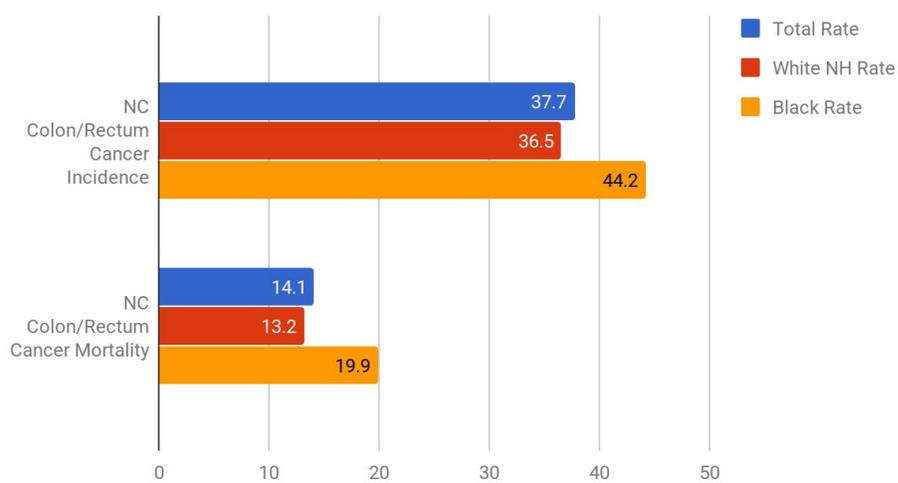


Figure 14 shows the average yearly incidence and mortality rate for all individuals diagnosed with colon/rectum cancer between 2010 and 2014 in Buncombe County.

<sup>3</sup> Source: *National Cancer Institute*

Figure 14: Colon/Rectum Cancer in Buncombe County 2010-2014

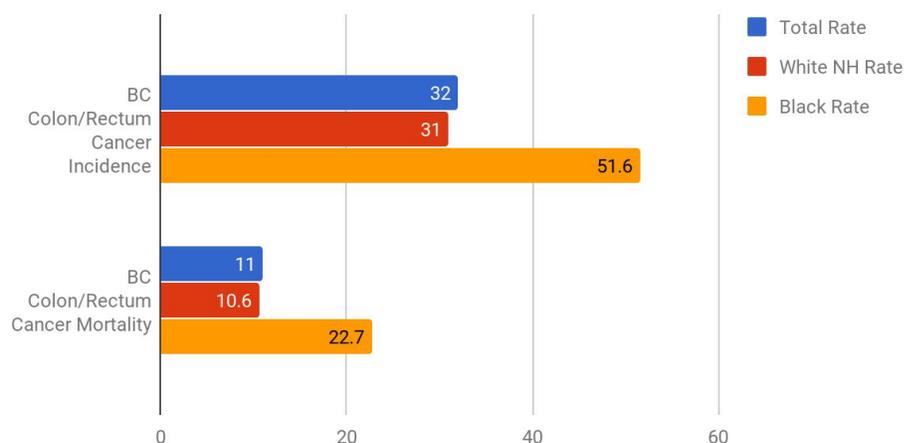


Figure 15 shows the average yearly incidence and mortality rate for all males diagnosed with colon/rectum cancer between 2010 and 2014 in North Carolina.

Figure 15: Male Colon/Rectum Cancer Rates in North Carolina 2010-2014

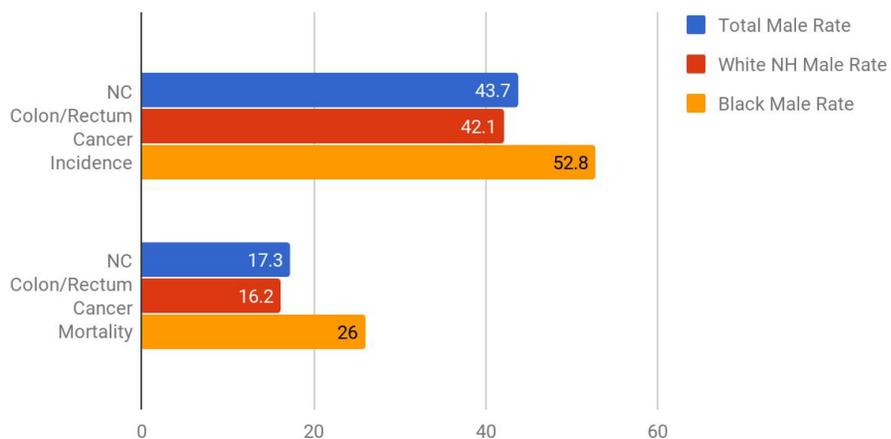


Figure 16 shows the average yearly incidence and mortality rate for all males diagnosed with Colon/Rectum cancer between 2010 and 2014 in Buncombe County. There are no data available for black male colon/rectum cancer mortality.

Figure 16: Male Colon/Rectum Cancer Rates for Buncombe County 2010-2014

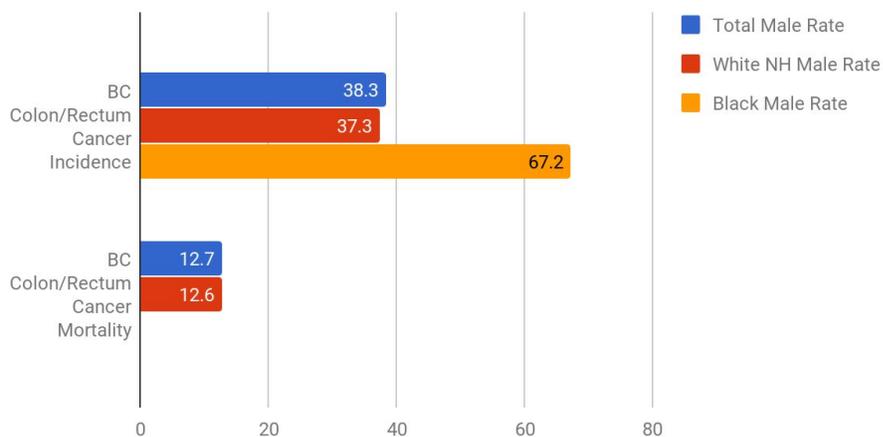


Figure 17 shows the average yearly incidence and mortality rate for all females diagnosed with colon/rectum cancer between 2010 and 2014 in North Carolina.

Figure 17: Female Colon/Rectum Cancer Rates in North Carolina 2010-2014

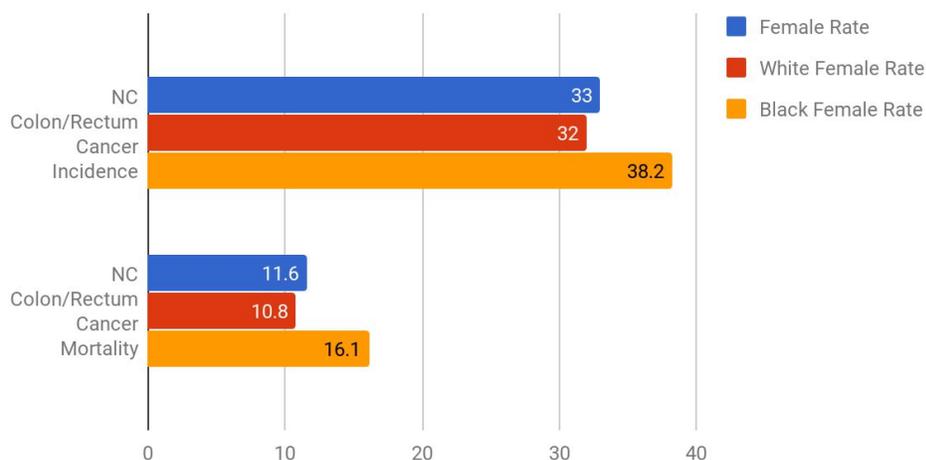
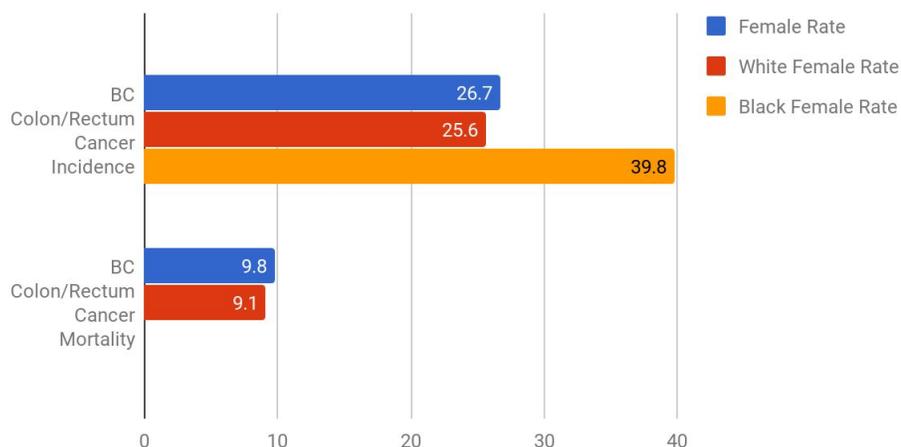


Figure 18 shows the average yearly incidence and mortality rate for all females diagnosed with colon/rectum cancer between 2010 and 2014 in Buncombe County. There are no data available for the Buncombe County black female colon/rectum cancer mortality rate.

Figure 18: Female Colon/Rectum Cancer Rates for Buncombe County 2010-2014



### Breast Cancer (Figures 19-20)<sup>4</sup>

Figure 19 shows the average yearly incidence and mortality rate for all females diagnosed with breast cancer between 2010 and 2014 in North Carolina.

Figure 19: Breast Cancer in North Carolina 2010-2014

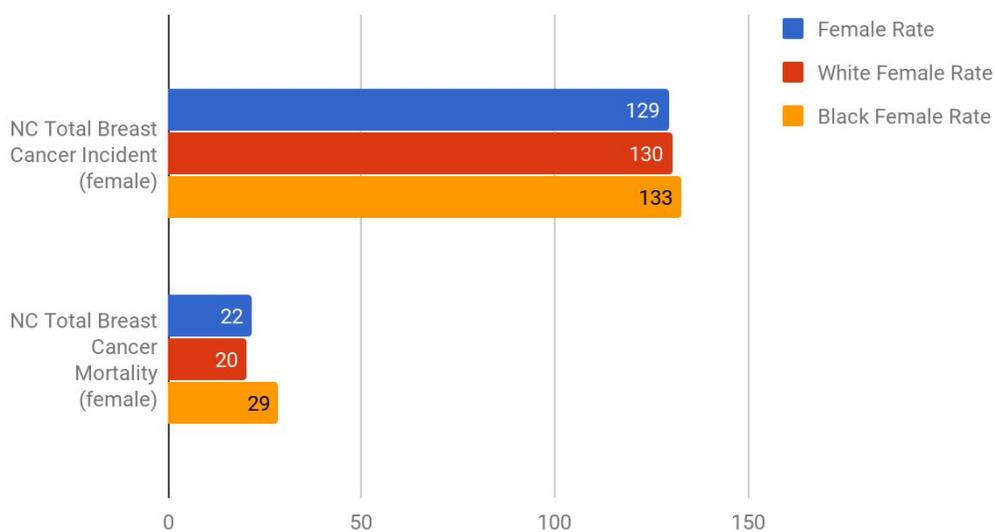
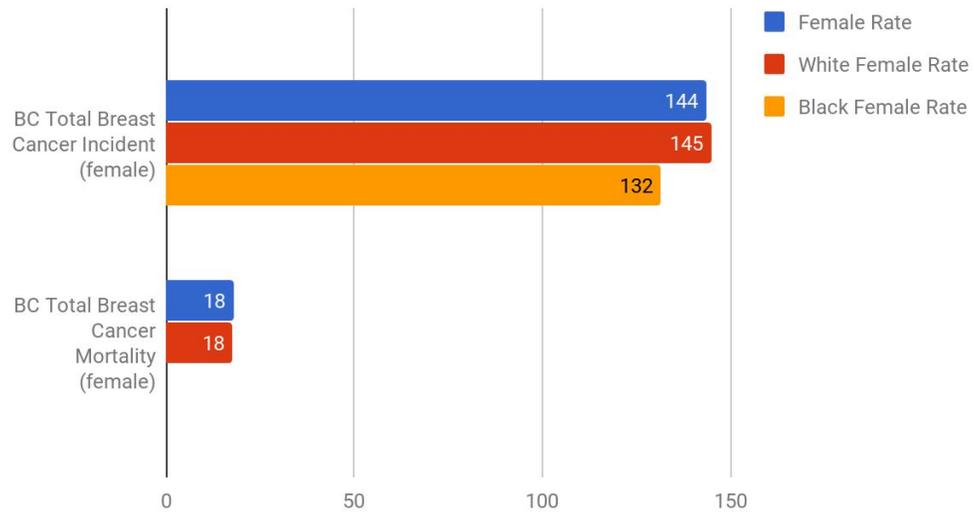


Figure 20 shows the average yearly incidence and mortality rate for females diagnosed with breast cancer between 2010 and 2014 in Buncombe County, North Carolina. There are no data available for the black female breast cancer mortality rate.

<sup>4</sup> Source: *National Cancer Institute*

Figure 20: Breast Cancer in Buncombe County 2010-2014



### Pancreatic Cancer (Figures 21-26)<sup>5</sup>

Figure 21 shows the average yearly incidence and mortality rate for all individuals diagnosed with pancreatic cancer between 2010 and 2014 in North Carolina.

Figure 21: Pancreatic Cancer in North Carolina 2010-2014

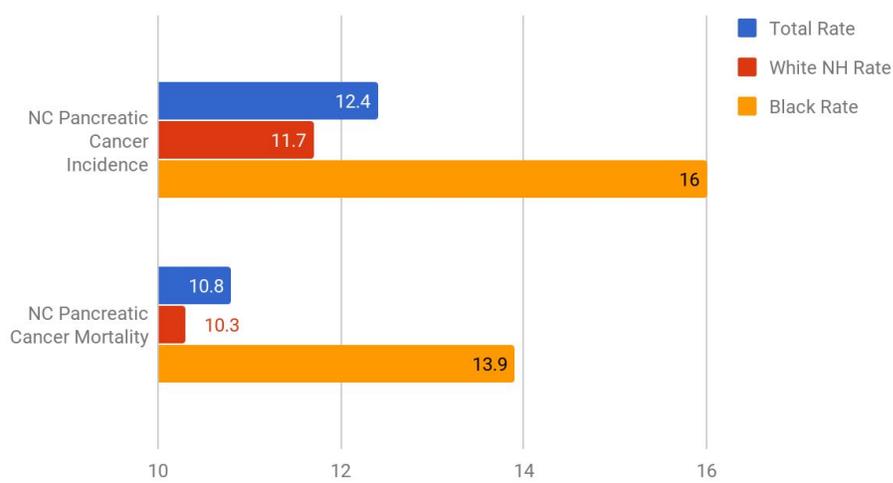


Figure 22 shows the average yearly incidence and mortality rate for all individuals diagnosed with pancreatic cancer between 2010 and 2014 in Buncombe County. There are no data available for incidence and mortality rates of the Buncombe County black population.

<sup>5</sup> Source: *National Cancer Institute*

Figure 22: Pancreatic Cancer in Buncombe County 2010-2014

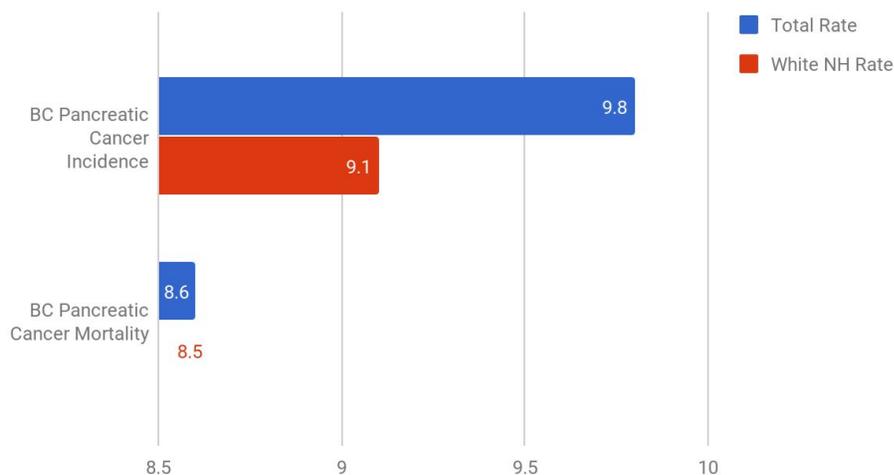


Figure 23 shows the average yearly incidence and mortality rate for all males diagnosed with pancreatic cancer between 2010 and 2014 in Buncombe County.

Figure 23: Male Pancreatic Cancer Rates for North Carolina 2010-2014

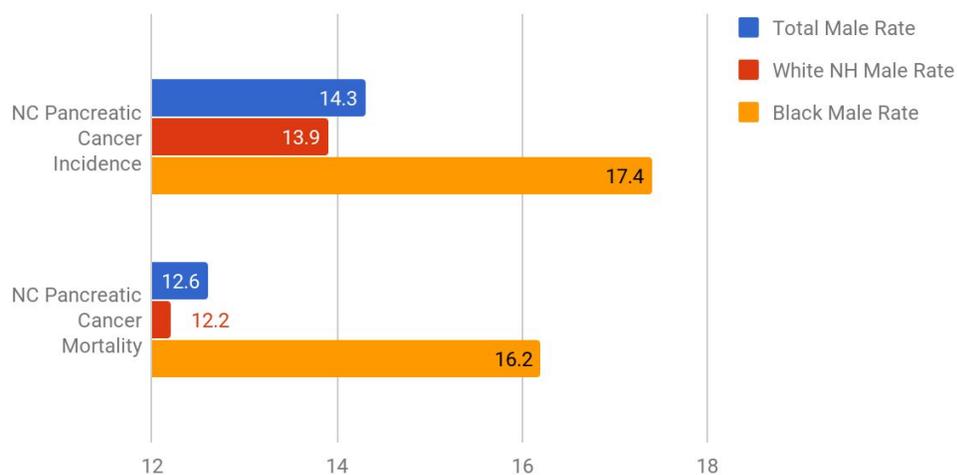


Figure 24 shows the average yearly incidence and mortality rate for all male individuals diagnosed with cancer between 2010 and 2014 in Buncombe County. There

are no data available for the black male pancreatic cancer incidence and mortality rates in Buncombe County.

Figure 24: Male Pancreatic Cancer rates in Buncombe County 2010-2014

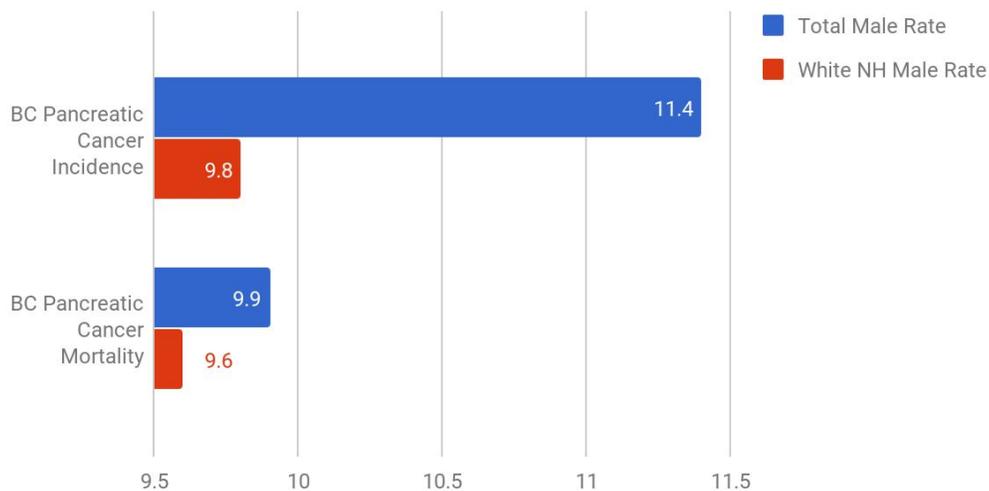


Figure 25 shows the average yearly incidence and mortality rate for females diagnosed with pancreatic cancer between 2010 and 2014 in North Carolina.

Figure 25: Female Pancreatic Cancer Rates for North Carolina 2010-2014

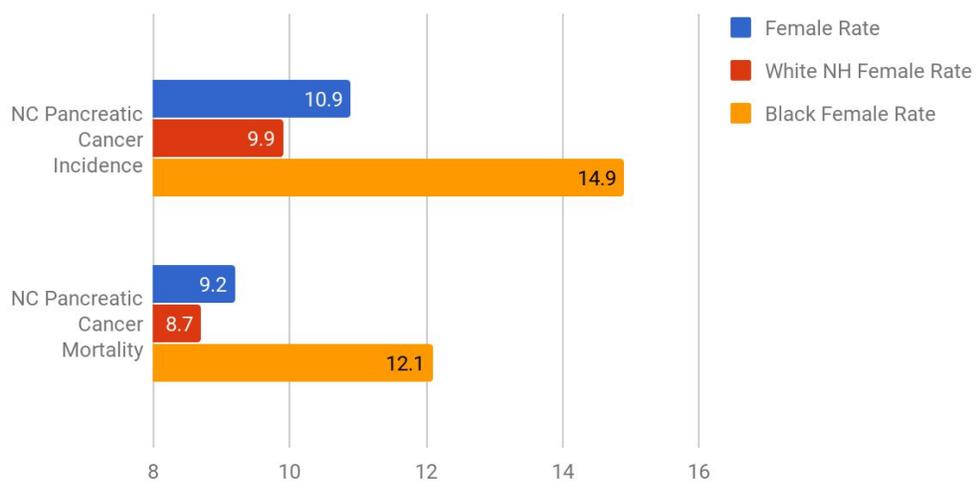
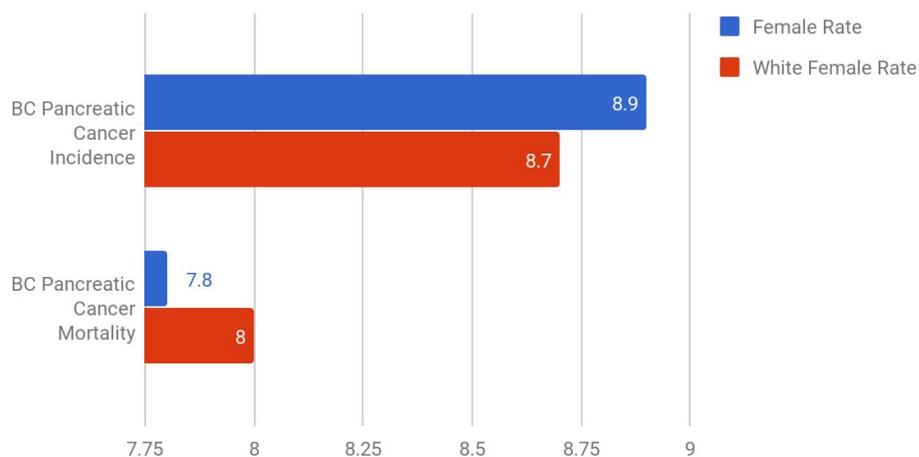


Figure 26 shows the average yearly incidence and mortality rates for females diagnosed with pancreatic cancer between 2010 and 2014 in Buncombe County, North Carolina. There are no data available for the black female pancreatic cancer incidence and mortality rates in Buncombe County.

Figure 26: Female Pancreatic Cancer Rates in Buncombe County 2010-2014



## Prostate Cancer (Figures 27-28)<sup>6</sup>

Figure 27 shows the average yearly incidence and mortality rate for all males diagnosed with prostate cancer between 2010 and 2014 in North Carolina.

Figure 27: Prostate Cancer in North Carolina 2010-2014

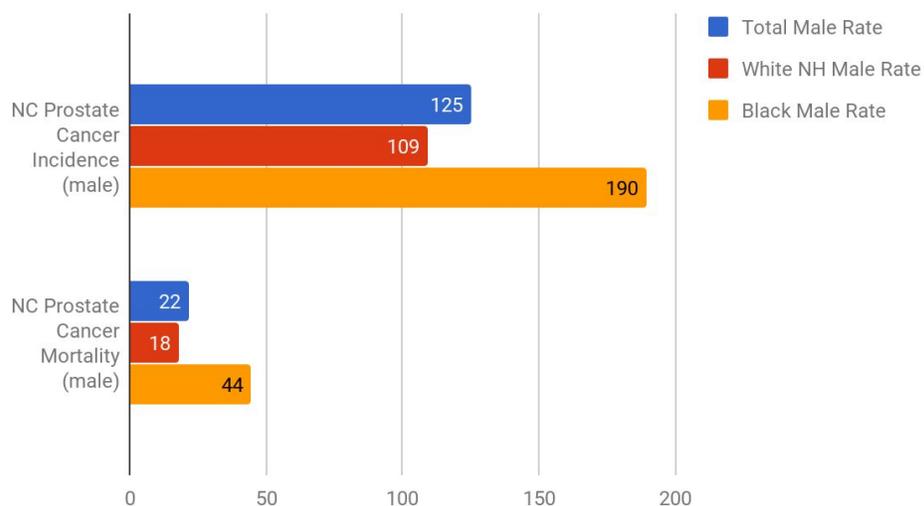
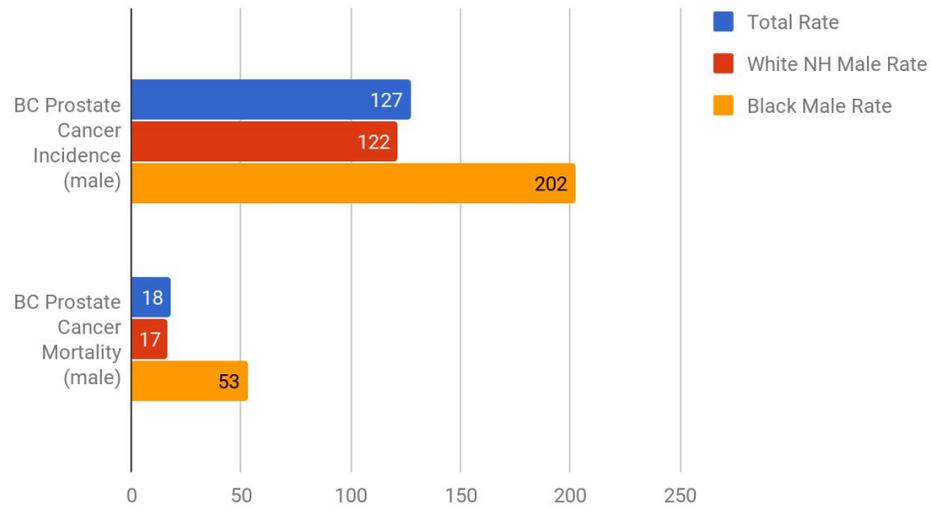


Figure 28 shows the average yearly incidence and mortality rate for all males diagnosed with prostate cancer between 2010 and 2014 in Buncombe County.

<sup>6</sup> Source: *National Cancer Institute*

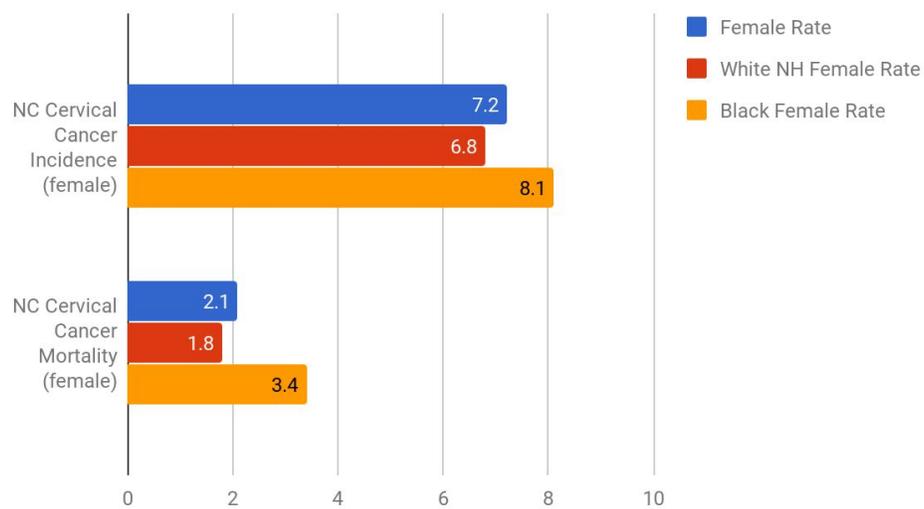
Figure 28: Prostate Cancer in Buncombe County 2010-2014



### Cervical Cancer (Figures 29-30)<sup>7</sup>

Figure 29 shows the average yearly incidence and mortality rate for females diagnosed with cervical cancer between 2010 and 2014 in North Carolina.

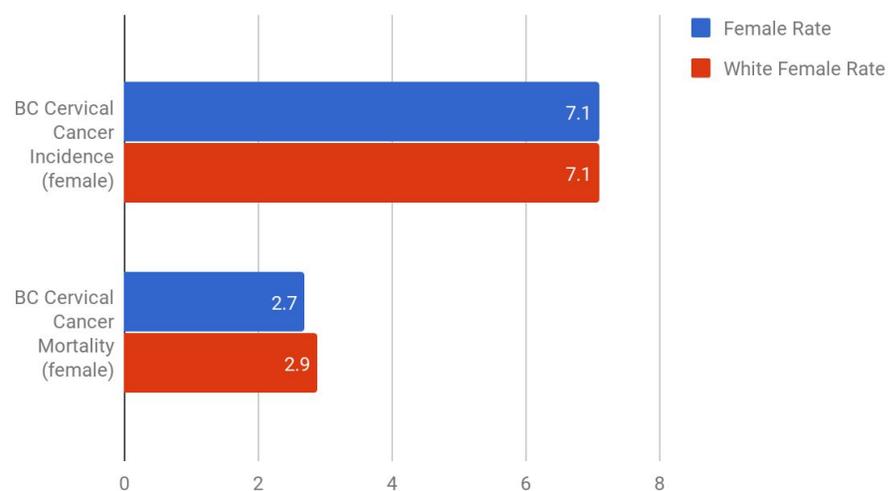
Figure 29: Cervical Cancer in North Carolina 2010-2014



<sup>7</sup> Source: *National Cancer Institute*

Figure 30 shows the average yearly incidence and mortality rate for all females diagnosed with cervical cancer between 2010 and 2014 in Buncombe County, North Carolina. There are no data available for the black female cervical cancer incidence and mortality rates in Buncombe County.

Figure 30: Cervical Cancer in Buncombe County 2010-2014



## Annotated Reference Appendix

Asheville Buncombe Institute of Parity Achievement. Asheville, NC: Wix.  
[abipaasheville.wixsite.com/abipa](http://abipaasheville.wixsite.com/abipa).

Local initiative to provide health education and support to African-Americans in Buncombe County and Asheville City. One of their programs called PACE (Parity Achievement through Community Empowerment) provides services through collaboration with community organizations, groups, and individuals in an effort to address and improve health conditions for African Americans, with a particular emphasis on breast and prostate cancer.

BCCCP & Wise Woman. *Buncombe County, NC: Public Health - Breast and Cervical Cancer Control and Wise Woman Programs*. Buncombe County, NC: Buncombe County. [www.buncombecounty.org/governing/depts/health/bcccp.aspx](http://www.buncombecounty.org/governing/depts/health/bcccp.aspx).

The Buncombe County Health Department provides free breast and cervical exams, Pap smears, mammograms and other health screenings for women age 21-64 without health insurance. Furthermore, they assist in hosting a Ladies Night Out program on the first Thursday of every month, offered by Mission Health, ABIPA, Asheville Radiology Breast Center and other partners. Free physicals, mammograms and health education for qualifying uninsured or underinsured women. Free child care and transportation, refreshment, blood pressure checks, cholesterol screening and Pap smears are provided.

Buncombe County. (2015). *County Profile: Buncombe County, North Carolina*. Buncombe County, NC: HealthData.org.  
[www.healthdata.org/sites/default/files/files/county\\_profiles/US/2015/County\\_Report\\_Buncombe\\_County\\_North\\_Carolina.pdf](http://www.healthdata.org/sites/default/files/files/county_profiles/US/2015/County_Report_Buncombe_County_North_Carolina.pdf).

This document is a County Profile of Buncombe County's life expectancy and mortality rates separated by sex, but not race. The institute for Health Metrics and Evaluation at the University of Washington analyzed the performance of all 3,142 US counties or county-equivalents in terms of life expectancy at birth, mortality rates for select causes, alcohol use, smoking prevalence, and obesity prevalence by using novel small area estimation techniques and the most up-to-date county-level information circa 2015.

Director, SCHS. (2018). *State Center for Health Statistics. N.C.*. Raleigh, NC: State Center for Health Statistics. [www.schs.state.nc.us/](http://www.schs.state.nc.us/).

The N.C. State Center for Health Statistics is responsible for the North Carolina Central Cancer Registry and provides the most up-to-date statistics on cancer in each North Carolina County including Buncombe County. The data on cancer incidence, mortality, and survival has not been updated since 2014 and they currently only have estimates on these populations for 2017 based on the 2010-2014 census.

Mission Health. (2015). 2015 Buncombe County Community Health Assessment. Buncombe County, NC: Mission Health. [www.mission-health.org/mydocuments/download.php?f=buncombe\\_county\\_cha\\_2015\\_2018.pdf](http://www.mission-health.org/mydocuments/download.php?f=buncombe_county_cha_2015_2018.pdf).

In the 2015 Buncombe County Community Health Assessment, in Chapter three, there is a table that shows the data for cancer mortality in buncombe county- separated by race. Based on the data used in the article from 2005 to 2011, the leading cause of death in Buncombe County was cancer.

Mission Health. *Cancer Care*. Buncombe County, NC: Mission Health. [www.mission-health.org/cancer-care.php](http://www.mission-health.org/cancer-care.php).

Based in Asheville, Mission Health is a not-for-profit, independent community hospital system governed and managed exclusively in western North Carolina. Mission's Cancer Care provides cancer prevention, diagnosis, treatment, supportive care and survivorship with an emphasis on convenience for our patients and their families with a team approach to cancer care.

Mountain Area Health Education Center. Asheville, NC: 828:Design. [mahec.net/](http://mahec.net/).

The Mountain Area Health Education Center's (MAHEC) mission is to train the next generation of healthcare professionals for Western North Carolina through quality healthcare, innovative education, and best practice models that can be replicated nationally. MAHEC works to provide quality healthcare in rural areas of western north carolina through their residency program. Additionally,

MAHEC plans to assist with The State of Black Asheville in researching local health disparities in cancer incidence and mortality.

National Cancer Institute. *Cancer Health Disparities Research*. Rockville, MD: National Cancer Institute. [www.cancer.gov/research/areas/disparities](http://www.cancer.gov/research/areas/disparities).

The National Cancer Institute has a page dedicated to cancer health disparities research, explaining why it is critical to the progress against the disease. In addition to explaining why this research is important, they discuss opportunities to research cancer disparities, the challenges in research to reduce cancer disparities, and NCI's role in cancer disparity research.

National Cancer Institute. *State Cancer Profiles*. Rockville, MD: National Cancer Institute.

[statecancerprofiles.cancer.gov/incidencerates/index.php?stateFIPS=37&cancer=047&race=00&sex=0&age=001&type=incd](http://statecancerprofiles.cancer.gov/incidencerates/index.php?stateFIPS=37&cancer=047&race=00&sex=0&age=001&type=incd).

The National Cancer Institute has State Cancer Profiles, where one is able to manually select the demographic, cancer type, and region they are interested in knowing about. The most recent data available through the National Cancer Institute on Buncombe County is between the years of 2010 and 2014.

Satcher, David. (2011). *Multicultural Medicine and Health Disparities*. New York, New York: McGraw Hill Professional.

Chapter 9, written by Otis W. Brawley, MD, and Susan G. Moore, MD, MPH covers the topic of oncology and discusses the incidence and mortality rates of all cancers in the United States separated by race and sex and what disparities can be drawn from the data. The data used in this chapter is from the SEER Program and National Center for Health Statistics collected over the course of 1997 to 2001.

## Bibliography

Ahmed, Atif A., and Malak Abedalthagafi. (6 Sept. 2016). *Cancer diagnostics: The journey from histomorphology to molecular profiling*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine.

[www.ncbi.nlm.nih.gov/pmc/articles/PMC5295463/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5295463/).

Alcaraz, Kassandra, et al. (2018). *Cancer Facts & Figures for African Americans 2016-2018*. Atlanta, GA: American Cancer Society.

[www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-facts-and-figures-for-african-americans/cancer-facts-and-figures-for-african-americans-2016-2018.pdf](http://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-facts-and-figures-for-african-americans/cancer-facts-and-figures-for-african-americans-2016-2018.pdf).

Allicock, Marlyn, et al. (May 2013). *African American Women's Perspectives on Breast Cancer: Implications for Communicating Risk of Basal-like Breast Cancer*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine.

[www.ncbi.nlm.nih.gov/pmc/articles/PMC3955723/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3955723/).

American Cancer Society. (2018). *Diet and Physical Activity: What's the Cancer Connection?*. Atlanta, GA: American Cancer Society.

[www.cancer.org/cancer/cancer-causes/diet-physical-activity/diet-and-physical-activity.html](http://www.cancer.org/cancer/cancer-causes/diet-physical-activity/diet-and-physical-activity.html).

American Cancer Society. (2018). *Minority Cancer Awareness*. Atlanta, GA: American Cancer Society.

[www.cancer.org/latest-news/special-coverage/minority-cancer-awareness.html](http://www.cancer.org/latest-news/special-coverage/minority-cancer-awareness.html).

Anderson, Bulatao, Cohen, editors. (2004). *Race/Ethnicity, Socioeconomic Status, and Health*. Critical Perspectives on Racial and Ethnic Differences in Health in Late Life.

Washington (DC): National Academies Press (US).

<https://www.ncbi.nlm.nih.gov/books/NBK25526/>

Asheville Buncombe Institute of Parity Achievement. Asheville, NC: Wix.  
[abipaasheville.wixsite.com/abipa](http://abipaasheville.wixsite.com/abipa).

BCCCP & Wise Woman. *Buncombe County, NC: Public Health - Breast and Cervical Cancer Control and Wise Woman Programs*. Buncombe County, NC: Buncombe County. [www.buncombecounty.org/governing/depts/health/bcccp.aspx](http://www.buncombecounty.org/governing/depts/health/bcccp.aspx).

Buncombe County. (2013). *State of the County Health Report*. Buncombe County, NC: Buncombe County. [www.buncombecounty.org/common/health/SOTCH-2013.pdf](http://www.buncombecounty.org/common/health/SOTCH-2013.pdf).

Buncombe County. (2015). *2015 Buncombe County Health Assessment*. Buncombe County, NC: Buncombe County. [www.buncombecounty.org/common/health/CHA/2016-community-health-assessment.pdf](http://www.buncombecounty.org/common/health/CHA/2016-community-health-assessment.pdf).

Burgard, Sarah A., and Lin, Katherine Y. (Aug. 2013). *Bad Jobs, Bad Health? How Work and Working Conditions Contribute to Health Disparities*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC3813007/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3813007/).

Carter, Ashley JR, and Nguyen, Cecine N. (2012). *A comparison of cancer burden and research spending reveals discrepancies in the distribution of research funding*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC3411479/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3411479/)

Center for Disease Control and Prevention. (2017, May 31). *Lung Cancer*. [https://www.cdc.gov/cancer/lung/basic\\_info/risk\\_factors.htm](https://www.cdc.gov/cancer/lung/basic_info/risk_factors.htm).

Center for Disease Control and Prevention. (2017, July 03). Vital Signs. Retrieved from <https://www.cdc.gov/vitalsigns/aahealth/index.html>

Chavez, Karen. (18 Oct. 2016). *Race Plays Role in Breast Cancer Risk, Deaths*. Asheville, NC: The Citizen-Times. [www.citizen-times.com/story/news/local/2016/10/18/race-plays-role-breast-cancer-risk-deaths/91566534/](http://www.citizen-times.com/story/news/local/2016/10/18/race-plays-role-breast-cancer-risk-deaths/91566534/)

Devesa SS, Diamond EL. (1980) *Association of breast cancer and cervical cancer incidence with income and education among whites and blacks*. Rockville, MD: National Cancer Institute. vol. 65 3 (pg. 515-528).

Director, SCHS. (2018). *State Center for Health Statistics. N.C.*. Raleigh, NC: State Center for Health Statistics. [www.schs.state.nc.us/](http://www.schs.state.nc.us/).

Dorak, M. Tefvik, and Karpuzoglu, Ebru. (2012). *Gender Differences in Cancer Susceptibility: An Inadequately Addressed Issue*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC3508426/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3508426/).

Department of Health and Human Services. (21 May, 2018). *Environmental Health Disparities and Environmental Justice*. National Institute of Environmental Health Sciences. Washington (DC): U.S. Department of Health and Human Services, [www.niehs.nih.gov/research/supported/translational/justice/index.cfm](http://www.niehs.nih.gov/research/supported/translational/justice/index.cfm).

Fine, M. J., Ibrahim, S. A., & Thomas, S. B. (2005). *The role of race and genetics in health disparities research*.

Greiner AC, Knebel E. (2003). *Health Professions Education: A Bridge to Quality. Washington (DC): National Academies Press (US)*. Chapter 3, The Core Competencies Needed for Health Care Professionals. Rockville, MD: National Institutes of Health. <https://www.ncbi.nlm.nih.gov/books/NBK221519/>

Hafeez, Hudaisa. (20 Apr. 2017). *Health Care Disparities Among Lesbian, Gay, Bisexual, and Transgender Youth: A Literature Review*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC5478215/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5478215/).

Harper S, Lynch J, Meersman SC. (2009). *Trends in area-socioeconomic and race-ethnic disparities in breast cancer incidence, stage at diagnosis, screening, mortality, and survival among women ages 50 years and over (1987–2005)*. Cancer Epidemiol Biomarkers Prev. vol. 181 (pg. 121-131).

Institute of Medicine (US) Committee on Assuring the Health of the Public in the 21st Century. (May 2002). *The Future of the Public's Health in the 21st Century*. Washington (DC): National Academies Press (US). The Health Care Delivery System. <https://www.ncbi.nlm.nih.gov/books/NBK221227/>

Liu L, Deapen D, Bernstein L. (1998). *Socioeconomic status and cancers of the female breast and reproductive organs: a comparison across racial/ethnic populations in Los Angeles County, California (United States)*. *Cancer Causes Control*. vol. 94 (pg. 369-380)

Mackillop WJ, Zhang-Salomons J, Boyd CJ. (2000). *Associations between community income and cancer incidence in Canada and the United States*. *Cancer*. vol. 89 4(pg. 901-912)

Mission Health. (2015). 2015 Buncombe County Community Health Assessment. Buncombe County, NC: Mission Health.  
[www.mission-health.org/mydocuments/download.php?f=buncombe\\_county\\_cha\\_2015\\_2018.pdf](http://www.mission-health.org/mydocuments/download.php?f=buncombe_county_cha_2015_2018.pdf).

Mission Health. *Cancer Care*. Buncombe County, NC: Mission Health.  
[www.mission-health.org/cancer-care.php](http://www.mission-health.org/cancer-care.php).

Mountain Area Health Education Center. Asheville, NC: 828:Design. [mahec.net/](http://mahec.net/).

Mukherjee, Siddhartha. (1 Apr. 2011). *Beyond the 'War,' The Future Of Cancer Treatment*. Washington (DC): NPR.  
[www.npr.org/2011/04/01/135042052/beyond-the-war-the-future-of-cancer-treatment](http://www.npr.org/2011/04/01/135042052/beyond-the-war-the-future-of-cancer-treatment).

Natale-Pereira, Ana; Enard, Kimberly R.; Nevarez, Lucinda; Jones, Lovell A.. (2011). *The Role of Patient Navigators in Eliminating Health Disparities*. Hoboken, NJ: Wiley Online Library. [onlinelibrary.wiley.com/doi/pdf/10.1002/cncr.26264](http://onlinelibrary.wiley.com/doi/pdf/10.1002/cncr.26264).

National Cancer Institute. *About the SEER Program*. Surveillance, Epidemiology, and End Results Program. Rockville, MD: National Cancer Institute. [seer.cancer.gov/about/](http://seer.cancer.gov/about/).

National Cancer Institute. *Cancer Health Disparities Research*. Rockville, MD: National Cancer Institute. [www.cancer.gov/research/areas/disparities](http://www.cancer.gov/research/areas/disparities).

National Cancer institute. *Risk Factors*. Rockville, MD: National Cancer Institute, [www.cancer.gov/about-cancer/causes-prevention/risk](http://www.cancer.gov/about-cancer/causes-prevention/risk).

National Cancer Institute. *State Cancer Profiles*. Rockville, MD: National Cancer Institute.

statecancerprofiles.cancer.gov/incidencerates/index.php?stateFIPS=37&cancer=047&race=00&sex=0&age=001&type=incd.

National Institutes of Health. (8 Aug. 2001). *NOT-OD-01-053: NIH Policy on Reporting Race and Ethnicity Data: Subjects in Clinical Research*. Bethesda, MD: U.S. Department of Health and Human Services. [grants.nih.gov/grants/guide/notice-files/NOT-OD-01-053.html](https://grants.nih.gov/grants/guide/notice-files/NOT-OD-01-053.html).

National Institutes of Health. (2002). *Strategic Research Plan and Budget to Reduce and Ultimately Eliminate Health Disparities Volume I Fiscal Years 2002-2006*. Bethesda, MD: National Institutes of Health. <https://www.nimhd.nih.gov/>.

Norris, Louise. (21 Apr. 2018). *North Carolina and the ACA's Medicaid Expansion: Eligibility, Enrollment and Benefits*. Healthinsurance.org. [www.healthinsurance.org/north-carolina-medicaid/](http://www.healthinsurance.org/north-carolina-medicaid/).

North Carolina State Center for Health Statistics. (Nov. 2000). *Racial and Ethnic Differences in Health in North Carolina*. Raleigh, NC: North Carolina State Center for Health Statistics. [www.schs.state.nc.us/schs/pdf/MinorityReport.pdf](http://www.schs.state.nc.us/schs/pdf/MinorityReport.pdf).

Olshansky, S. J., Antonucci, T., Berkman, L., Binstock, R. H., Boersch-Supan, A., Cacioppo, J. T., ... & Jackson, J. (2012). *Differences in life expectancy due to race and educational differences are widening, and many may not catch up*. *Health Affairs*, 31(8), 1803-1813.

Palmer, et al. (19 Nov. 2012). *Individual and Neighborhood Socioeconomic Status in Relation to Breast Cancer Incidence in African-American Women | American Journal of Epidemiology | Oxford Academic*. OUP Academic. Oxford, England: Oxford University Press. [academic.oup.com/aje/article/176/12/1141/205046](http://academic.oup.com/aje/article/176/12/1141/205046).

Pew Research Center. (2015, June 11). Chapter 1: Race and Multiracial Americans in the U.S. Census. <http://www.pewsocialtrends.org/2015/06/11/chapter-1-race-and-multiracial-americans-in-the-u-s-census/>

Polite, N., et al. (24 July 2017). *Charting the Future of Cancer Health Disparities Research: A Position Statement from the American Association for Cancer Research, the American Cancer Society, the American Society of Clinical Oncology, and the*

*National Cancer Institute*. Freshwater Biology. Hoboken, NJ: Wiley/Blackwell (10.1111).  
onlinelibrary.wiley.com/doi/full/10.3322/caac.21404.

Potrony, Miriam, et al. (Sept. 2015). *Update in Genetic Susceptibility in Melanoma*.  
Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine.  
[www.ncbi.nlm.nih.gov/pmc/articles/PMC4583600/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4583600/).

R. Torres-Zeno. (1995). *Health Policy Guidelines for Health Administrators*. Ypsilanti,  
MI: Eastern Mich Univ. Madgraph.

Regitz-Zagrosek, Vera. (July 2012). *Sex and Gender Differences in Health Science &  
Society Series on Sex and Science*. Advances in Pediatrics. Bethesda, MD: U.S.  
National Library of Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC3388783/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3388783/).

Reynolds P, Hurley SE, Quach AT, et al. (2005). *Regional variations in breast cancer  
incidence among California women, 1988–1997*. Cancer Causes Control. vol. 162 (pg.  
139-150).

Satcher, David. (2011). *Multicultural Medicine and Health Disparities*. New York, New  
York: McGraw Hill Professional.

Satia, Jessie A. (Apr. 2009). *Diet-Related Disparities: Understanding the Problem and  
Accelerating Solutions*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of  
Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC2729116/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2729116/).

Siegel, Rebecca L., et al. (2018). *Cancer Statistics, 2018*. Hoboken, NJ: Wiley Online  
Library. onlinelibrary.wiley.com/doi/pdf/10.3322/caac.21442.

Sohn, Heeju. (Apr. 2017). *Racial and Ethnic Disparities in Health Insurance Coverage:  
Dynamics of Gaining and Losing Coverage over the Life-Course*. Advances in  
Pediatrics. Bethesda, MD: U.S. National Library of Medicine.  
[www.ncbi.nlm.nih.gov/pmc/articles/PMC5370590/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5370590/).

Susan G. Komen®. *Comparing Breast Cancer Screening Rates Among Different  
Groups*. Dallas, TX: Susan G. Komen®,  
[ww5.komen.org/BreastCancer/DisparitiesInBreastCancerScreening.html](http://ww5.komen.org/BreastCancer/DisparitiesInBreastCancerScreening.html).

Syed, Samina T., et al. (Oct. 2013). *Traveling Towards Disease: Transportation Barriers to Health Care Access*. Advances in Pediatrics. Bethesda, MD: U.S. National Library of Medicine. [www.ncbi.nlm.nih.gov/pmc/articles/PMC4265215/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4265215/).

Tavernise, S. (19 Jan. 2018). *Black Americans See Gains in Life Expectancy*. New York, New York: The New York Times. [www.nytimes.com/2016/05/09/health/blacks-see-gains-in-life-expectancy.html](http://www.nytimes.com/2016/05/09/health/blacks-see-gains-in-life-expectancy.html).

U.S. Department of Health and Human Services. (2017). *Familial Breast Cancer*. Genetic and Rare Diseases Information Center. District of Columbia: U.S. Department of Health and Human Services. [rarediseases.info.nih.gov/diseases/10415/familial-breast-cancer](http://rarediseases.info.nih.gov/diseases/10415/familial-breast-cancer).

Wilson-Stronks, Amy; Lee, Karen K.; Cordero, Christina L.; Kopp, April L.; Erica Galvez. *One Size Does Not Fit All: Meeting the HealthCare Needs of Diverse Populations, Hospitals, Language, and Culture: A Snapshot of the Nation*. Oakbrook Terrace, IL: The Joint Commission. [www.jointcommission.org/assets/1/6/HLCOneSizeFinal.pdf](http://www.jointcommission.org/assets/1/6/HLCOneSizeFinal.pdf).

Yost K, Perkins C, Cohen R, et al. (2001). *Socioeconomic status and breast cancer incidence in California for different race/ethnic groups*. Cancer Causes Control. vol. 128 (pg. 703-711)