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# Colorectal Cancer in Montgomery County, Ohio: A Descriptive Analysis

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Colorectal Cancer in Montgomery County, Ohio:  
A Descriptive Analysis

by

Ursula Turner

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## **Abstract**

In the United States colorectal cancer (CRC) is one of the most common malignancies, and is the third leading cause of cancer deaths (Sharma & O'Keefe, 2007). Approximately 270,000 cases of colorectal cancer were diagnosed in 2008 with 81,900 cases resulting in death. There were 16,520 cases diagnosed in African Americans and 7,120 resulted in death or significant illness (American Cancer Society, 2008). Mortality as the result of CRC is greater among the African American population with 27% and 38% higher death rates for African American males and females when compared with Caucasian males and females (Agarwal, 2005). CRC is characterized by the abnormal growth of cells and tissues in the large intestine, rectum and anus. The symptoms of CRC are often associated with other diseases or illnesses. Therefore, routine screenings are necessary for disease prevention and early detection.

## **Introduction**

In the United States colorectal cancer (CRC) is one of the most common malignancies, and is the third leading cause of cancer deaths (Sharma & O'Keefe, 2007). Approximately 270,000 cases of colorectal cancer were diagnosed in 2008 with 81,900 cases resulting in death. There were 16,520 cases diagnosed in African Americans and 7,120 resulted in death or significant illness (American Cancer Society, 2008).

When comparing African Americans with other ethnic groups, specifically Caucasians, there is a disproportionate burden of disease in the African American population. The incidence of CRC among African American men is 58.9 per 100,000 as compared with 52.2 per 100,000 Caucasian men in Montgomery County, Ohio (OCISS, 2008). Among African American women the incidence of disease when compared with Caucasian women and women of other ethnic groups is significantly disproportionate, with 52.2 per 100,000 African American women and 46.1 per 100,000 Caucasian women diagnosed with CRC (OCISS, 2008).

Mortality as the result of CRC is greater among the African American population with 27% and 38% higher death rates for African American males and females when compared with Caucasian males and females (Agarwal, 2005). Studies have shown that higher rates of incidence, mortality, and morbidity are partially the result of later diagnosis and rapid disease progression (Marcella & Miller, 2000). Studies have also shown socioeconomic status is a predictive factor for some of the disparities in the stage at which colorectal cancer is diagnosed (Sharma & O'Keefe, 2007). African American race remains an independent predictor for CRC diagnosis and survivability (Agarwal, 2005).

High CRC incidence and burden of disease within the African American population can increase lifetime risk for development of CRC. There are numerous factors that can increase the

risk of disease development in the African American population. Many of the factors that affect risk for disease development are modifiable. However, all risk factors for the development of CRC are not modifiable. Modifiable risk factors for the development of CRC are diet, physical activity, obesity and overweight, and heavy alcohol and tobacco use (OCISS, 2008). Non modifiable risk factors for CRC are age, ethnic decent, medical history, and family history, inherited diseases and other diseases of the colon or rectum such as Crohn's disease or Irritable bowel syndrome (OCISS, 2008).

Much of the current literature published on racial disparities in CRC among African Americans and Caucasians focuses on screening rate differences. However, differences in the rate of screening are not the only contributing factor to disparities in the African American population (Agarwal, 2005). Diet also plays a significant role in the development of CRC (Terry, 2001). Many African Americans have a poor diet consisting of little fruits and vegetables and high intake of fats and red meats, when compared to the Caucasian population. Contributing factors to CRC disparities are standard of care, access to quality care, and socioeconomic status (Marcella & Miller, 2001).

Disparities in CRC have not always existed. The rates for African Americans diagnosed with CRC increased dramatically between 1977 and 1980 before leveling off while rates of CRC among Caucasian men decreased after 1985 and continue to decrease (Gellard & Provenzale, 2010). Disparities in CRC mortality rates across all racial and ethnic groups have decreased. Mortality rates for Caucasians have dramatically decreased since the 1950's for women and the 1980's for men (Gellard & Provenzale, 2010). In the African American community mortality and morbidity as a result of CRC increased into the mid 1980's and 1990's for women and men before leveling off and beginning to decline (Berry, 2009). However, the rate of decline has



been significantly slower for African Americans than Caucasians and individuals of other racial groups.

### **Purpose**

The purpose of this project is to describe the factors that influence disparities between African Americans and Caucasians in Montgomery County, Ohio with regards to CRC. This paper will also describe the factors that can increase the risk of CRC development using available data sets and secondary data sources. In addition, this paper will also identify disparities in the incidence and prevalence of CRC among African Americans and Caucasians. Finally, socioeconomic factors that contribute to the disparities in the mortality and morbidity of African American and Caucasians in Montgomery County, Ohio will be addressed.

### **Literature Review**

#### **Overview of Colorectal Cancer**

CRC is characterized by the abnormal growth of cells and tissues in the large intestine, rectum and anus. CRC begins as a benign adenomatous polyp and over time can develop into malignant tumors. The symptoms of CRC are often associated with other diseases or illnesses. Therefore, routine screenings are necessary for disease prevention and early detection. As CRC grows within the large intestine, the bowel habits can change and the person affected can experience constipation, diarrhea, feeling that the bowel has not completely emptied, blood in the stool, unexplained weight loss, gas pains, cramps, bloating, and nausea or vomiting (Mayo Clinic, 2010).

CRC is often described in five stages. Stage 0 CRC is only found in the innermost lining of the colon and rectum. Stage I CRC has grown into the inner wall of the colon, rectum or anus. However, the tumor has not grown through the wall of the large bowel, rectum or anus. Stage II

CRC the tumors extend into or through the wall of the colon and rectum. The tumor also may have invaded nearby tissues, but the cancer has not spread to the lymph nodes. Stage III the cancer has spread to the nearby lymph nodes but has not become metastatic. Stage IV the cancer has spread to the lymph nodes as well as other parts of the body, such as bone, heart, lungs or the liver (Mayo Clinic, 2010).

### Modifiable Risk Factors

#### Diet

Diet is one of the most important factors that can increase risk for development of CRC (Graham & Mettlin, 1979). Disparities that have developed between African Americans and Caucasians cannot be fully explained. However, it is hypothesized that individual diet plays an important role in disease development. High intake of fruits and vegetables reduce individual risk of developing CRC (Terry, 2001). In addition, intake of adequate amounts of fiber is thought to also reduce the risk (Corman, 1971).

#### *Dietary fiber*

Dietary fiber is found in fruits, vegetables, grains, seeds, nuts and legumes. It is often difficult to define and can be categorized in many different ways. It was first suggested by Denis Parsons Burkitt that dietary fiber could decrease the risk of developing CRC (Corman, 1971). Since the first association of CRC and dietary fiber many studies have investigated the role of increased dietary fiber in reducing CRC risk (Corman, 1971). Studies investigating the relationship between dietary fiber and CRC have been inconsistent and inconclusive. It is postulated that fiber decreases the transit time for food materials through the large bowel and rectum. Fiber can reduce the time carcinogens are in contact with the intestinal epithelium and possibly protect people from developing CRC (Terry, 2001).

### *Fruits and Vegetables*

Studies suggest that consumption of fruits and vegetables decreases the risk of developing CRC by 40-50 percent (Steinmetz and Potter, 1996). The protective effects of fruits and vegetables come from a variety of anticarcinogenic substances (Smith-Warner, 1999). Carotenoids, alpha carotene and beta carotene, lycopene, and flavenoids protect the large bowel and rectum. Orange vegetables, such as carrots, pumpkin and sweet potatoes are rich sources of beta carotene (Steinmetz & Potter, 1996). Beta carotene is an antioxidant and prevents free radicals from damaging the large bowel and the rectum. In addition, beta carotene can be oxidized into vitamin A, which plays a role in differentiation of epithelial cells in the large bowel (Terry, 2001). Other anticarcinogenic substances are not limited to one type of fruit or vegetable but are widespread and their effects vary greatly.

Increased risk of CRC from low intake of fruits and vegetables is less than risks associated with other environmental factors such as cigarette smoking. However, there remains a significant risk for development of the disease among African Americans. The low intake of fruits and vegetables among African Americans can increase the risk of developing CRC by as much as 50 percent (Terry, 2001).

### Effects of Socioeconomic Status

Socioeconomic status influences cancer risk factors such as: nutrition, physical activity, and obesity. Income, education, and health insurance coverage directly impact access to quality healthcare, as well as appropriate screening programs, treatment, and preventive care (Berry, 2009). Social inequalities and the legacy of racial discrimination influence the interaction between patient and physician. In addition, the willingness of patients to participate in screening programs and adhere to medical treatments is also influenced by social and cultural factors.

### *Colorectal Cancer Mortality and Morbidity*

African Americans in Montgomery County as well as the state of Ohio have the highest rate of mortality from colorectal cancer. In 2008 African American males had a 30% mortality rate from CRC as compared with Caucasian males that had a mortality rate of 22.3 percent (OCISS, 2008). When comparing the mortality rates of African American women diagnosed with CRC the mortality rate was 21.7 percent as compared with Caucasian women whose mortality rate was 14.7 percent (Berry, 2009). African Americans have the highest mortality rate of all ethnic and racial groups in the United States.

### *Stage at diagnosis*

Studies have shown that there are positive correlations between race and the stage at which CRC is diagnosed. The relative risk for African Americans is significantly higher for localized and regional stages of CRC compared with distant stages of the disease (Ward, 2004). Among African American males diagnosed with localized colorectal cancer mortality rates are 1.59 times the mortality of Caucasians (Berry, 2009). African Americans are diagnosed later and are often burdened with more severe disease. In Montgomery county 47.6 percent of individuals that are diagnosed with CRC are diagnosed late (OCISS, 2008). Subsequently, this increases the risk of mortality and decreases survivability of the disease.

### *Survivability*

In the past thirty years CRC mortality declined in Caucasians but increased in African Americans. Studies have shown disparities in survival between African Americans and Caucasians (Berry, 2009). However, studies have shown no significant differences between African Americans and Caucasians with the same stage disease. Individuals diagnosed with CRC that survive without recurrence of the disease is lower in African Americans. However, the

racial disparities in mortality are larger (Marcella & Miller, 2001). Studies have shown that the mortality rate among African Americans diagnosed with stage II or III CRC are higher than other races or ethnic groups. However, studies have not shown any racial differences among individuals diagnosed and treated for stage IV colorectal cancer (Berry, 2009). Socioeconomic status accounts for half of the disparities that exist for all stages of CRC (Ward, 2004).

Individuals that lack access to quality health care and treatment are less likely to seek medical attention. As the result of lack of early treatment individuals are diagnosed later, and are at greater risk for mortality and are less likely to survive their disease (Marcella & Miller, 2001).

#### *Primary Disease Prevention and Screening*

Within the African American community there is a greater prevalence of risk factors that contribute to higher incidence of disease. One of the primary factors that contributes to development of CRC within the African American community is the low rate of screening and primary prevention (Sharma & O'Keefe, 2007). Individuals that lack health insurance are less likely to follow a physician's orders to undergo preventive screenings such as a colonoscopy or sigmoidoscopy. Having a sigmoidoscopy or a colonoscopy has been positively associated with education, income and access to public or private insurance (Marcella & Miller, 2001).

Screening for CRC differs between African Americans and Caucasians. Studies have shown that African Americans are less likely than Caucasians to follow screening guidelines and recommendations. Subsequent studies confirmed that there are significant disparities between African Americans and Caucasians with regards to screening rates (Berry, 2009). Studies have also shown that Caucasians are more likely than African Americans to keep current with CRC screening recommendations (Marcella & Miller, 2001). Screening disparities between African

Americans and Caucasians can be reduced through education and programs that eliminate socioeconomic disparities between ethnic groups.

### Physical Activity

Physical inactivity is one of the most consistently identified risk factors for the development of CRC. Studies have shown a strong association between physical activity and decreased risk (Renehan, 2008). Current studies indicate that vigorous physical activity significantly decreases the likelihood that an individual will develop CRC (Chan & Giovannucci, 2010). However, in many studies the association between physical activity and risk for CRC are not statistically significant. The amount and type of physical activity that correlates with the greatest decreases in risk are still unknown.

#### *Occupational Physical Activity*

Occupational physical activity has been shown to decrease the risk for CRC (Slattery, 1996). Studies have shown that women are more likely to experience decreases in risk than men from work related activities (Renehan, 2008). It is possible that occupational activities are a greater discriminator of activity in women than in men.

#### *Physical Activity in African Americans*

Researchers have hypothesized that African Americans are less likely to engage in physical activity than other racial or ethnic groups (Renehan, 2008). Studies suggest that the high incidence and prevalence of CRC among African American men and women is caused by low physical activity (Sharma & O'Keefe, 2007). Low rates of physical activity increase the risk for development of CRC without regard for socioeconomic status (Chan & Giovannucci, 2010). Lack of physical activity among African Americans could be identified as a positive correlate for increased disease prevalence and incidence.

## Obesity

The past 30 years have been characterized by increases in the proportion of individuals with excess body mass. Excess body mass is associated with increased risk for development of a number of diseases, including CRC (Chan & Giovannucci, 2010). The mechanism by which high body mass increases risk for development of CRC is not fully known. However, it is thought that increased body mass alters the metabolism and changes cells that line the colon and rectum.

### *Body Mass Index*

Body Mass Index is a statistical measure of an individual's weight. However BMI does not distinguish between lean body mass and adipose tissue. Obesity is defined by a BMI greater than 30 kg/m<sup>2</sup> (Murphy, 2000). Individuals with BMI's greater than 30 are at increased risk for development of CRC. Studies have shown a positive correlation between high BMI and increased risk (Chan & Giovannucci, 2010). In a recent study, BMI and CRC risk were assessed and it was found that individuals with a BMI of greater than 23 had a 14 percent increase in risk for development of CRC (Renehan, 2008). It was also found a BMI of 25-27.4 increases risk by 19 percent, a BMI of 27.5-29.9 increases risk by 24 percent and BMI greater than or equal to 30 increases risk by 41 percent (Renehan, 2008). In a recent study by Larga et al., it was found that 75.3 percent of individuals diagnosed with CRC were either overweight or obese.

### *Fat Distribution and Colorectal Cancer Risk*

The distribution of adipose tissues is a key indicator for development of colorectal cancer. Studies suggest that individuals with a central distribution of fat are at increased risk for the disease development (Chan & Giovannucci, 2010). It is hypothesized that a central distribution of fat activates endocrine pathways that are implicated in carcinogenesis. One of the key pathways that is implicated in the development of CRC is the insulin and insulin like growth

factor axis (Chan & Giovannucci, 2010). The tendency in males toward abdominal distribution of fat and higher insulin level may account for the stronger association between BMI and in men than women (Donohoe, 2010). In contrast the distribution of fat in women is more variable and therefore the association between BMI and CRC is weaker.

### Alcohol

There has been inconsistent evidence as to whether alcohol increases the risk for developing CRC. Studies have shown that high intake of alcohol increases the risk for development of rectal cancer but does not increase the risk of developing colon cancer. Alcohol consumption has been implicated as a risk factor for the development of colorectal cancer. Studies have shown that moderate to heavy alcohol consumption has been identified as an independent risk factor for the development of CRC (Chan & Giovannucci, 2010).

#### *Beer*

Consumption of more than 8 servings of beer per week increased the risk of developing CRC more than 2 fold when compared with individuals that consumed less than 8 servings of beer per week (Wu, 1987).

#### *Wine*

Studies investigating the role of wine in CRC have been inconsistent. One study showed that there is increased risk of CRC with increased consumption of wine. In contrast other studies have shown that increased consumption of wine decreases the risk of developing colorectal cancer. Individuals that consume 30% of their alcohol as wine were shown to have a decreased risk of developing CRC when compared with individuals that drank less than 30 percent of the alcohol as wine (Chao, 2010).



### Tobacco Use

Cigarette smoking is associated consistently with the development of colorectal cancer. Studies have shown that the amount of cigarettes smoked is an important factor in the development of risk for colorectal cancer. Also important is the length of time that an individual has smoked. Studies have shown only a small increase in risk for individuals that smoked between 15 and 35 years. There is a stronger association with risk for development of colorectal cancer in men than women that smoke. In addition, studies have shown that there is an increase in risk for men that smoke when compared with women (Chan & Giovannucci, 2010).

### Non-Modifiable Risk Factors

#### Family History

A family history of CRC is an important risk factor for development of the disease. A history of CRC within a family is also a strong indicator for more frequent screening (Church & McGannon, 2000). However the association between development of CRC and family history are not clear. Studies have shown a consistent increase in the risk of CRC among individuals with a family history of the disease (Fuchs, 1994). There was a 1.7 fold increase in risk among individuals with a family history of CRC. Individuals with two or more relatives with CRC had a significant increase in risk for development of the disease (Church & McGannon, 2000).

#### Age

One of the most recognized risk factors for the development of CRC is age. Development of CRC in individuals under the age of 40 is rare. The rate of 60. Most CRC is diagnosed in individuals over the age of 60 years. In African Americans CRC is often diagnosed at an earlier age (Winamer, 2007).

## Race

Studies have shown that African American race is an independent predictor of risk for CRC (Winamer, 2007). However, data is inconclusive and contradictory as to the relationship between biology and race. African Americans have the highest rate of CRC when compared with individuals of other racial groups (Church & McGannon, 2000).

## Methods

A descriptive analysis of CRC disparities among African Americans and Caucasians in Montgomery County, Ohio was conducted using acquired data sets and secondary sources of data. In addition, a descriptive analysis of African American men and women with CRC in Montgomery County, Ohio was conducted. The prevalence of risk factors, incidence of CRC, and mortality rates were calculated from data sets or retrieved from existing data sources. When possible, data from Montgomery County was compared to counties of similar regional demographics as defined by the Ohio Department of Health, as well as comparisons to Ohio and the United States. Montgomery County is classified as a mixed county with both urban and suburban areas, and in addition to the regional demographics, counties used for comparison were limited to those with an equal distribution of male and females in total the population. In addition, comparison counties were limited to those with  $\leq 20\%$  African Americans in the total population. The counties used for the comparison were included Summit, Lucas, and Stark.

## Primary Factors

The primary factors in CRC disparities that were explored were race, diet, socioeconomic status, access to health care, preventive screenings, physical activity, social factors, and treatment. Secondary data sources for the primary factors in CRC disparities are listed below.

- United States Census

- Ohio county cancer profiles, Ohio Cancer Incidence Surveillance System, Ohio Department of Health
- 2008 Healthy Ohio Community Profiles
- 2006 Behavioral Risk Factor Surveillance System
- Ohio Department of Health cancer profiles , Ohio cancer incidence surveillance system, Ohio Department of Health
- Ohio public information warehouse, Ohio Department of Health
- Cancer incidence and mortality among Ohio residences, 2001 -2005. Ohio Cancer Incidence Surveillance System, Ohio Department of Health, March 2008

### Descriptive Analysis

Factors for CRC that were assessed for Montgomery County included: incidence rates for CRC among African Americans and Caucasians per 100,000 individuals of each race, overall and by stage of diagnosis; incidence and mortality rate per 100,000; invasive CRC cases per 100,000 African American men and women as well as Caucasian men and women; average annual number and percent of CRC cases among African Americans as compare to Caucasian in Montgomery County, Ohio and the United States by stages at diagnosis; CRC mortality per 100,00 African American men and women as well as Caucasian men and women, and the percent of men and women receiving CRC screenings every two year.

The data acquired from the Ohio Cancer Incidence and Surveillance System (OCISS) for CRC in Montgomery County, Ohio was used to create a descriptive analysis of both African Americans and Caucasians affected by colorectal cancer.

## Mapping

In order to identify where CRC cases were occurring within Montgomery County, a map was generated. Incidence of CRC in Montgomery County, Ohio 1996-2005 by census tract. This map was obtained from county cancer profiles, Ohio Cancer Incidence Surveillance System.

## Results

Table 1. Average Annual Population Estimates for Montgomery County by Age Group and Race 2001-2005

Age Group	Gender		Race		Total Population
	Male	Female	African American	Caucasian	
<20	75,845	72,921	40,184	105,705	148,766
20+	188,873	212,925	75,164	318,956	401,798
40+	116,033	138,416	44,181	206,261	254,449
50+	75,598	95,575	28,208	140,578	171,173
All Ages	264,718	285,846	115,349	424,661	550,564

2006, Postcensal Estimates for July 2000, U.S. Census Bureau, 2007

Above is the average population estimate for Montgomery County, Ohio for the years 2001-2005 (Table 1). The population for Montgomery County was 550,564 in 2001-2005 census estimates. The number of African Americans that reside in Montgomery County is 115,349 approximately 21 percent of the total population. The number of Caucasians that reside in Montgomery County is 424,661 approximately 77 percent of the total population. For gender women represent 52 percent of the population and men represent 48 percent of the population.

Table 2. Socioeconomic Profile of Montgomery County, Ohio and the U.S.

Socioeconomic Measures	Montgomery County	Ohio	U.S.
Median Household Income	40,156	40,956	41,994
% Families below poverty	8.3	7.8	9.2
% Female headed house holds	8.4	7.3	7.2
% No highschool Education	16.5	17	19.6
% Uninsured	12.6	12.5	17.3

Census 2000 Demographic Profiles. U.S. Census Bureau, Summary Profile

Table 2 shows the percentage of individuals that are uninsured as well as other socioeconomic indicators. In addition, the socioeconomic profile illustrates the percentage of households that live below federal poverty level, which is 8.3 percent. The percentage of individuals in Montgomery County that are uninsured is 12.6 percent which is equal to the state of Ohio with 12.5 percent of individuals uninsured. The percentage of individuals in the United States that are uninsured is higher than the state of Ohio and Montgomery County with 17.3 percent of individuals uninsured.

Table 3. Physicians, Registered Hospitals and Beds, 2006 and Percentage Uninsured 2004

Health Care	Montgomery County	Lucas County	Summit County	Stark County	Ohio
Physicians per 10,000 Population	29.3	30.8	29.8	22.5	25.4
Registered Hospital	13	8	9	8	207
Number of Beds per 10,000 population	54.3	68.5	48.3	40	40
Percent Uninsured	12.6	13	12.7	12.5	12.5

Healthy Ohio Community Profile, Montgomery County 2008

The percentage of physicians, registered hospitals, and hospital beds represents access to care (Table 3). In Montgomery County there are 13 registered hospitals compared with 8 registered hospitals in Lucas and Stark counties, and 9 registered hospitals in Summit County. Table 3 also illustrates that there are 54.3 hospital beds per 10,000 individuals in the population.

Compared with Summit and Stark County the percentage of hospital beds in Montgomery County is higher with 48.3 and 40.0 hospital beds per 10,000 individuals within the population. Compared with Lucas County there are less hospital beds in Montgomery County with 68.5 hospital beds per 10,000 individuals in the population. The number of hospital beds can directly affect patient care. The higher number of hospital beds can be indicative of greater access to care for individuals with CRC.

Table 4. Colorectal Cancer and Cancer Related Health Behaviors/Risk Factors

Chronic Disease Risk Factors	Heavy Drinking	Cigarette Smoking	<5 Fruits and Vegetables per Day	Lack of Physical Activity	Obesity
Summit County	5.7%	22.0%	77.5%	22.1%	25.5%
Montgomery County	5.1%	22.0%	78.1%	26.4%	27.3%
Lucas County	4.3%	23.9%	82.7%	23.2%	26.4%
Stark County	4.1%	25.1%	77.1%	23.8%	28.3%
Ohio	5.3%	23.4%	78.3%	24.4%	26.5%

2004-2007 Ohio Behavioral Risk Factor Surveillance System; System Chronic Disease and Behavioral Epidemiology, Bureau of Health Surveillance-Prevention, Ohio Department of Health April 2008.

Obesity, diet, and lack of physical activity are key indicators for CRC (Table 4). The percentage of individuals that have risk factors or take part in risk behaviors can be indicative of a population’s susceptibility to CRC. In Montgomery County 27.3 percent of the population are obese. Only Stark County has a higher percentage of obesity at 28.3 percent respectively. The percentage of individuals that consume less than 5 servings of fruits and vegetables per day is also illustrated in table 4. In Montgomery County 78.1 percent of individuals consume less than 5 servings of fruits and vegetables per day. In comparison, Lucas County has the highest percentage (82.7 percent) of individuals with a lower than recommended consumption of fruits and vegetables. Summit and Stark counties have a lower percentage of individuals that consume less than 5 servings of fruits and vegetables per day at 77.5 and 77.1 percent.

In addition to the percentage of individuals that consume less than the recommended servings of fruits and vegetables per day, obesity and physical activity also are important indicators of health and risk for development of CRC. In Montgomery County 26.4 percent of the population is physically inactive. Stark, Summit, and Lucas counties, all have lower percentages of physically inactive individuals within their populations 23.8, 22.1, and 23.2 percent respectively.

Table 5. Colorectal Cancer and Cancer Related Health Behaviors/Risk Factors

Chronic Disease Risk Factors	African American Male	Caucasian Male	African American Female	Caucasian Female
Heavy Drinking	4.8%	6.5%	5.1%	3.8%
Cigarette Smoking	22.1%	19.9%	22.8%	22.4%
<5 fruits and vegetables per day	67.3%	85.1%	78.9%	73.1%
Lack of physical activity	22.5%	25.6%	22.5%	26.4%
Obesity	40.4%	25.7%	47.9%	25.0%

2004-2007 Ohio Behavioral Risk Factor Surveillance System; System Chronic Disease and Behavioral Epidemiology, Bureau of Health Surveillance-Prevention, Ohio Department of Health April 2008.

Behavioral risk factors can indicate a populations' susceptibility for development of CRC (Table 5). In Montgomery County, 40.4 percent of African American males are obese compared to 25.7 percent of Caucasian males. The prevalence of African American females that are obese is 47.9 percent compared to 25.9 percent of Caucasian females. In addition, 78.9 percent of African American females consume less than 5 servings of fruits and vegetables per day compared to 73.1 percent of Caucasian females. Being obese and consumption of less than 5 servings of fruits and vegetables per day is associated with increased risk for CRC. Therefore African Americans are at increased risk for development of CRC because of obesity and consumption of less than 5 serving of fruits and vegetables per day.

Table 6. Colorectal Cancer Screening behaviors a comparison of African Americans and Caucasians in Montgomery County, Ohio

Cancer Screening Behavior	Caucasian Male	African American Male	All	Caucasian female	African American Female	All
Colonoscopy/sigmoidoscopy in past 5 years (age 50+)	53.10%	59.10%	54.50%	59.30%	61.70%	58.90%

2004-2007 Ohio Behavioral Risk Factor Surveillance System; System Chronic Disease and Behavioral Epidemiology, Bureau of Health Surveillance-Prevention, Ohio Department of Health April 2008.

CRC screenings offer means of primary prevention as well as reduction in mortality and morbidity. (Table 6) shows the percentage of African American males that were screened for CRC (59.1 percent) compared to 53.1 percent of Caucasian males. The prevalence of CRC screening behaviors among African Americans is higher than Caucasians. However, increased prevalence of screening among African Americans is not indicative of better incidence and mortality rates for African Americans diagnosed with CRC. Although, African Americans are screened at higher rates for CRC, data shows that African American males die at a rate of 30 per 100,000 compared to 22.3 per 100,000 Caucasian males (Table 11). The incidence rates for African American males was 58.9 per 100,000 compared to 52.2 per 100,000 Caucasian males (Table 11).



Table 7. Comparison of Colorectal Cancer Stage, Vital Status and Age at Diagnosis by Race

Category	Total		African American		Caucasian		Other	
	N	%	N	%	n	%	n	%
Total	3693	100	604	100	2829	100	260	100
<b>Age at diagnosis</b>								
<20	4	0.11	1	0.1	3	0.1	0	0
20-39	80	2.16	21	3.48	54	1.9	5	1.92
40-59	773	20.9	124	20.5	43	1.51	72	27.7
60-79	1942	52.6	340	25.3	1470	52	132	50.8
80+	934	25.3	118	19.5	765	27	51	19.6
<b>Marital Status</b>								
Single	307	8.3	101	16.7	193	6.8	13	5.0
Married	1714	46.4	215	35.6	1395	49.3	104	40
Divorced	352	9.6	89	14.7	250	8.8	13	5.0
Widowed	963	26.1	156	25.8	777	27.5	30	11.5
Unknown	357	9.6	43	7.1	214	7.56	100	38.5
<b>Primary Payer</b>								
Uninsured	63	1.7	13	2.2	40	1.4	9	3.5
Ins NOS	293	7.3	52	8.6	216	7.6	25	9.6
Private	607	16.4	99	16.4	463	16.4	45	17.3
Medicaid	77	2.0	23	3.81	50	1.77	4	1.5
Medicare	2065	55.9	316	52.3	1639	57.9	97	37
Military	15	0.40	5	0.82	10	0.35	0	0
Indian PHS	7	0.18	1	0.17	5	0.18	0	0
Ins Unknown	566	15.3	95	15.7	316	11.17	64	24.6
<b>Early Stage</b>								
In-Situ	213	5.77	35	5.79	153	5.4	25	9.61
Local	1266	34.3	176	29.1	984	34.8	106	41.0
<b>Late Stage</b>								
Regional	1246	33.7	201	33.3	995	35.2	50	19.2
Distant	533	14.4	114	18.9	393	13.89	26	0.1

Ohio Cancer Incidence Surveillance System Data 1996-2006, Chronic Disease and Behavioral Epidemiology section and vital statistics Program, Ohio Department of Health

The descriptive analysis of individuals diagnosed with CRC is contained in table 7. The age at which the greatest percentage of individuals were diagnosed with CRC was 60-79, regardless of race. The percentage of African Americans diagnosed with CRC prior to the age of 60 was 24.1 percent, compared to Caucasians at 20.9 percent. African Americans are also

diagnosed with CRC prior to age 40 in higher percentages than Caucasians, 3.6 percent and 2.0 percent respectively.

Data in table 7 also illustrates that marital status is an important factor in colorectal cancer diagnosis. Among individuals within the population diagnosed with CRC 46.4 percent were married and 8.3 percent were single. The percentage of African Americans that were diagnosed with CRC that were single was 16.7 percent, compared with Caucasians at 6.8 percent. Among married individuals Caucasians had the highest percentage of CRC diagnosed at 49.3 percent.

Table 8. Descriptive Analysis of Colorectal Cancer in Montgomery County, Ohio

Category	African American				Caucasian				Other			
	Male		Female		Male		Female		Male		Female	
	N	%	N	%	N	%	N	%	N	%	N	%
Total	267	100	337	100	1347	100	1482	100	122	100	138	100
Stage of Cancer												
Local	76	28.5	100	2.96	489	36.3	495	33.4	54	44.3	52	37.7
Regional	90	34	111	32.9	453	33.6	543	36.6	24	19.7	26	18.8
Distant	54	20.2	60	17.8	206	15.3	187	12.6	10	8.2	16	11.6
Vital Status												
Alive	130	48.7	143	42.4	796	59.1	914	61.7	96	78.7	99	71.7
Dead	137	51.3	194	57.6	551	40.9	568	38.3	26	21.3	39	28.3
Age at Diagnosis												
<20	1	0.4	0	0	1	0.1	2	0.1	0	0	0	0
20-39	11	4.1	10	2.9	33	2.4	21	1.4	2	1.6	3	2.2
40-59	57	21.3	67	19.9	295	21.9	242	16.3	35	28.7	32	23.2
60-79	159	59.6	181	53.7	739	54.9	731	49.3	62	50.8	68	49.3
80+	39	14.6	79	23.4	279	20.7	486	32.8	18	14.8	33	23.9

Ohio Cancer Incidence Surveillance System Data 1996-2006, Chronic Disease and Behavioral Epidemiology section and vital statistics Program, Ohio Department of Health

Table 8 shows a comparison of age, race, gender, vital status and stage of disease in individuals diagnosed with CRC. Individuals that are under the age of 40 have a low prevalence of disease regardless of race and gender. However, the prevalence of CRC among African

American men is highest under the age of 40 with 4.5 percent of African American men diagnosed compared to 2.5 percent of Caucasian men. The prevalence of CRC among African American women is 2.9 percent compared to 1.5 percent of Caucasian women. African American and Caucasian men between the ages of 40-59 have a similar disease prevalence 21.3 and 21.9 percent respectively. African American and Caucasian men between the ages of 60-79 also have a similar prevalence of disease at 59.6 percent and 54.9 percent.

Table 9. Colorectal Cancer stage of Medicaid Patients

Category	Total		African American		Caucasian		Other	
	N	%	N	%	n	%	N	%
Total	3963	100	604	100	2829	100	260	100
Primary Payer								
Medicaid	130	3.5	43	14	81	2.86	5	1.9
Stage of Cancer								
In Situ	5	0.14	2	0.33	4	0.14	2	0.77
Local	45	1.2	13	2.15	31	1.2	0	0
Regional	33	0.89	11	1.82	21	3.5	1	0.4
Distant	37	1	13	2.2	20	0.71	1	0.4
Vital Status								
Alive	81	2.2	25	4.1	51	1.8	6	2.3
Dead	48	1.3	14	2.3	30	1.1	0	0

Ohio Cancer Incidence Surveillance System Data 1996-2006, Chronic Disease and Behavioral Epidemiology section and vital statistics Program, Ohio Department of Health

Individuals that are diagnosed with CRC are in many instances are beyond the age of 50 and take part in Medicare and Medicaid (Table 9). Medicaid was used as a measure of socioeconomic status in Table 9. The percentage of African Americans that utilized the Medicaid system when diagnosed was 7.12 percent compared to 2.86 percent of Caucasians. Among individuals diagnosed with CRC, 4.9 percent of Caucasians and 4.7 percent of African Americans were diagnosed with in-situ staged disease. The percentage of African Americans diagnosed with local staged disease was 30.2 percent compared with 38.2 percent of Caucasians. African Americans were diagnosed with regional staged CRC at a similar rate to Caucasians at

25.6 and 25.9 percent respectively. However, the percentage of African American diagnosed with distant staged CRC was higher at 30.2 percent when compared with Caucasians at 24.9 percent, respectively.

Table 10. Incidence and Mortality Rate for all Cancer Sites and Types for Montgomery, Lucas, Stark, Summit Counties as well as the Ohio and the United States.

Place	Incidence		Mortality	
	Cases	Rate per 100,000	Cases	Rate per 100,000
Montgomery	2,796	462.2	1,228	200.6
Lucas	2,216	479.1	1,000	213.7
Stark	2,047	460.4	851	185.9
Summit	2,799	464.4	1,244	203.3
Ohio	56,415	465.1	24,845	203.3
United States		467.4		189.8

Ohio Cancer Incidence Surveillance System Data 1996-2006, Chronic Disease and Behavioral Epidemiology section and vital statistics Program, Ohio Department of Health

Table 10 illustrates the incidence and mortality rates of CRC in Montgomery County. The incidence of CRC is lower 462.2 per 100,000 in Montgomery County when compared Lucas, and Summit Counties, 479.1 and 464.4 per 100,000, respectively. The Incidence rate is lower for Stark County, Ohio, and the United States at 460.4, 465.1, and 467.4 per 100,000, respectively. In addition, Stark County has a lower CRC mortality rate, 185.9 per 100,000, than any of the other counties listed in the table. The mortality rate of CRC in Montgomery County is 200.6 per 100,000 which is lower than Lucas and Summit counties as well as the state of Ohio, however the mortality rate is lower 189.8 per 100,000 for the United States.

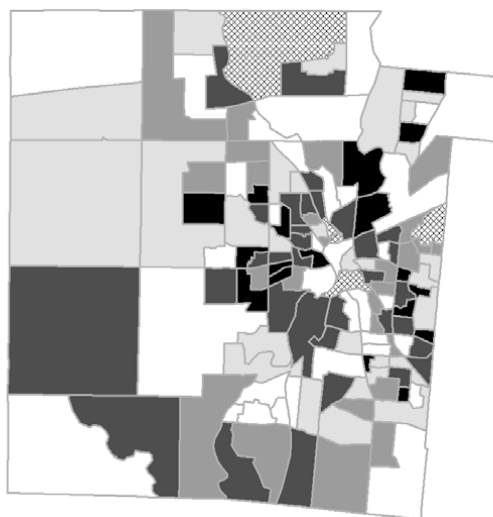
Table 11. Average Annual Number and Age Adjusted Rates of Invasive Colorectal Cancer and Deaths in Montgomery County with Racial and Gender Comparisons 2001-2005

	Incidence				Mortality			
	African American Male	Caucasian Male	African American Female	Caucasian Female	African American Male	Caucasian Male	African American Female	Caucasian Female
Case	24	111	25	119	11	46	12	45
Rate per 100,000	58.9	52.2	42.7	39.8	30	22.3	21.7	14.5

Ohio Cancer Incidence Surveillance System Data 1996-2006, Chronic Disease and Behavioral Epidemiology section and vital statistics Program, Ohio Department of Health

Incidence and mortality rates for race and gender among individuals with CRC in Montgomery County are illustrated in (Table 11). The highest incidence and mortality rate 58.9 per 100,000 and 30 per 100,000 are in African American men diagnosed with CRC. Among Caucasian men the incidence and mortality rate of CRC is 52.2 and 22.3 per 100,000 respectively. The incidence and mortality of CRC among African American women is 42.7 per 100,000 and 21.7 per 100,000. In comparison the incidence and mortality rate for Caucasian women was lower 39.8 per 100,000 and 14.5 per 100,000 respectively.

Figure 1. Average Annual Age-adjusted Incidence Rates of Invasive Colon and Rectum Cancer, by Census Tract, in Montgomery County, 1996-2005



Ohio Cancer Incidence Surveillance System, Ohio department of health, 2008

Figure 1 shows the incidence rates of CRC for Montgomery County Ohio, however, no patterns or conclusions can be drawn from the map.

### **Discussion**

CRC is a serious health issue within the African American community. African Americans have the highest incidence of CRC, of any racial group. Compared with Caucasians, African Americans have a younger mean age at diagnosis. In addition, African Americans are diagnosed at later stages of CRC when compared with Caucasians. Among African Americans mortality and survivability are significantly lower than Caucasians. Currently racial disparities between African Americans and Caucasians diagnosed with CRC cannot be explained by a difference in biology or any other single factor.

One of the key factors in the development of disparities is socioeconomic status. Studies show that individuals that are of lower socioeconomic status are diagnosed later and have more severe disease (Berry, 2009). In Montgomery County, Ohio individuals of African American descent were at greater risk for development of CRC regardless of socioeconomic status. This indicates that there are factors within the African American community that are increasing the risk for disease regardless of income.

Socioeconomic status can directly influence access to health care as well as compliance with medical treatments. Individuals within the African American community that are of low socioeconomic status are less likely to participate in CRC screening programs. Socioeconomic status also influences the point at which individuals are diagnosed with CRC resulting in later diagnosis and more severe disease among African Americans. Census data from the year 2000 shows that only 8 percent of Caucasians live below the federal poverty level compared with 24 percent of African Americans.

Individuals diagnosed with CRC that took part in the Medicaid program had a higher prevalence of more severe disease when compared with individuals that took part in other insurance programs. African Americans that participated in the Medicaid program were diagnosed with more significant disease when compared with Caucasians that participated in the Medicaid program.

African Americans males are screened for CRC at a higher rate of 59.1 percent than Caucasians males at 53.1 percent, however there are significant disparities in incidence and mortality. Diet, socioeconomic status, and obesity, as well as other non modifiable risk factors make African Americas more susceptible to the development of CRC. Some studies have shown that diet is a key factor in the development of CRC (Smith-Wagner, 2002). The diet of African Americans is low in fruits, vegetables and fiber. Studies have indicated that a diet high in fruits and vegetables as well as fiber decrease CRC risk regardless of race or gender (Smith-Wagner, 2002).

Fruit, vegetable and fiber consumption are key in the prevention of CRC. Data indicates that the percentage of African Americans who consume more the 5 servings of fruits and vegetables per day is significantly low when compared with Caucasians. One of the important factors in inadequate consumption of fruits and vegetables is cost as well as access. Individuals that live in urban communities of lower socioeconomic status must travel a significant distance to reach a store the sells fruits and vegetables. It is postulated that fiber from fruits and vegetables decrease the amount of time that toxins remain in the colon and rectum. Thus, decreasing the amount of times that toxins are in contact with the intestinal epithelium.

Inadequate consumption of fruits and vegetables is a risk factor for obesity. Obesity in the African American community is an important factor in the development of CRC. Data

indicates that 47.9 percent of African American women are obese and that 40.1 percent of African American men are obese. The rate of obesity in African Americans is double that of Caucasians at 25.7 and 25.0 percent, respectively. In addition to the increased prevalence of Obesity among African Americans there is also a significantly lower percentage of physical activity. Low physical activity, inadequate fruits, and fiber, and high percentages of obesity within the African American community indicate possible reasons for disparities.

### **Conclusion**

Large disparities exist between African Americans and Caucasians. One to the key factors that affect CRC diagnosis in Montgomery County is socioeconomic status. It is a widely known fact that individuals with low socioeconomic status are more susceptible to mortality and morbidity from CRC. More analysis of data is needed to find the relationship between CRC, race and socioeconomic status. There are preventive programs and measures that can be implemented to decrease and eliminated disparities in CRC. In addition improving screening practices, early detection programs and procedures for individuals that are high risk for CRC will mitigate risk in the African American community.



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## Appendix A: Public Health Competencies

1. Identify key sources of data for epidemiological purposes.
2. Describe a public health problem in terms of magnitude, person, time and place.
3. Comprehend basic ethical and legal principles pertaining to the collection, maintenance, use and dissemination of epidemiologic data.
4. Apply the basic terminology and definitions of epidemiology.
5. Calculate basic epidemiology measures.
6. Communicate epidemiologic information to lay and professional audiences.
7. Draw appropriate inferences from epidemiologic data.
8. Apply descriptive techniques commonly used to summarize public health data.
9. Apply common statistical methods for inference.
10. Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.