EXAMINING THE RELATIONSHIPS AND PATTERNS OF ADULT PATIENT DEVIATION IN POPULATIONS OF DISPARITY FOR COLORECTAL CANCER SCREENING IN SOUTHEAST GEORGIA

by

DIVINE OFFOEGBU MCCASLIN
(Under the Direction of Gerald R. Ledlow, PhD, MHA, FACHE)

ABSTRACT

Background: The findings from previous studies on the socio-demographic and socio-economic factors associated with non-adherence to Colorectal Cancer Screening (CRCS) in populations of health disparities are inconsistent, and few studies have utilized an integrative approach to deliver a CRCS intervention to at-risk adults. ***Methods:*** A cross-sectional study was conducted using data from the 2009-2010 Southeast Georgia Cancer Alliance Integrative project survey to describe the rates of negative patient deviation (non-adherence) to CRCS. ***Results:*** Almost 70% of at-risk adult participants were non-adherent to CRCS. Participants under 45 years of age were 1.8 times as likely to report a negative deviation compared to participants 45 years of age and older. Males were 1.7 times as likely to be non-adherent to CRCS compared to females. Obese participants were 7.8 times as likely to be non-adherent to CRCS compared to underweight, normal weight and overweight participants. A strong correlation existed between county of residence and negative deviation to CRCS. The results of the study support that age, gender, BMI and county of residence were significant factors that showed strong associations to non-adherence to CRCS. ***Conclusion:*** The findings suggest, understanding the relationships that exist between non-adherence to CRCS and factors that determine health outcomes are essential to reducing the mortality and morbidity of CRC.

INDEX WORDS: Colorectal Cancer Screening, Colorectal Cancer, Non-adherence, Negative Patient Deviation, Southeast Georgia Cancer Alliance Integrative project, Populations/groups of health disparity, Colorectal Cancer prevention, Colonoscopy, FOBT

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by

DIVINE OFFOEGBU MCCASLIN

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M.P.H., Morehouse School of Medicine, 2008

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DIVINE OFFOEGBU MCCASLIN

Major Professor:	Gerald Ledlow
Committee:	Gulzar Shah
	Hani Samawi

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DEDICATION

I would like to dedicate this dissertation to anyone who has lost a loved one to Colorectal Cancer and anyone suffering from this disease. May this information guide, inform and bring awareness of the many barriers individuals experience.

I would also like to dedicate this dissertation to my husband, parents, grandparents, siblings, family and friends. All of you have been my support system throughout life and most especially throughout this amazing journey. Your love, prayers, motivation and encouraging words have inspired me to be the focused, determined, disciplined and hard working individual that I am today. Thank you for being the anchor in my life and always steering me down the right path. I hope when you read this you are overwhelmed with knowledge, awareness and you use this information as a guide to assist you in living healthier lifestyles.

-The most important thing that a patient can do is ask a question. The most important thing for a physician to do is to listen. We have the capacity to create, to overcome, to endure, to transform, to love and to be greater than our suffering.

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Chapter 1
BACKGROUND AND SIGNIFICANCE

Introduction

Colorectal cancer (CRC) is the second leading cause of cancer related deaths in the United States (ACS, 2011). Tragically CRC is also the third leading cause of cancer in the United States common in both men and women (ACS, 2011). Approximately 145,000 new cases and 55,000 deaths from CRC occur annually (ACS, 2011). Propitiously, current studies suggest early detection through screening methods and procedures such as, a fecal occult blood test (FOBT) and colonoscopy are effective in reducing mortality and the incidence of CRC. As a result of these statistics, the US Preventive Services Task Force strongly recommends that all average risk individuals aged 50 years and older receive colorectal cancer screenings (CRCS). However, only about 50% of adults in that age group are adhering to screening recommendations (ACS, 2011). Although progress has been made in reducing incidence and mortality rates, and improving survival, recent reports propose that there are significant challenges in promoting CRCS among at-risk, elderly and minority populations (ACS, 2011).

According to the National Cancer Institute, despite national campaigns and evidence-based CRC screening guidelines aimed at increasing public awareness, prevention and access, CRC screening remains underutilized. Studies propose that only a small number of at risk patients are being screened (Walsh, 2002; CDC, 2011; Hsia et al., 2000) compared to the large number of at risk patients that are highly recommended to be screened. Researchers have identified a number of clinical and nonclinical factors of interest that are associated with low screening rates they include: low education level, poor access to healthcare, race/ethnicity, age and/or having a family history of colon cancer (Hsia et al., 2000; CDC, 2013; Walsh, 2002; ACS, 2011).

Furthermore, the early stage of colorectal cancer is usually asymptomatic resulting in a major health concern because polyps are prone to develop on the colon and rectum. When polyps develop and go undetected they eventually become a cancer, contributing to the existing high CRC mortality rates. Studies show if appropriate screenings are performed early it can reduce the incidence and mortality of colorectal cancer (CDC, 2013). Therefore, screening is typically necessary and recommended to detect CRC in its early stages in order to improve health outcomes. Although the rates of colorectal cancer have been slowly decreasing over the past 20 years, this decrease is not making a sufficient impact on health because only about half of the US population over the age of 50 have not been screened (Naylor, 2012). According to the Office of Minority Health, in the United States minorities are less likely to follow the recommended CRC screening guidelines. In addition, minorities make up about half of the unscreened population over the age of 50 years old. Further, in the Southeast region of Georgia the screening rates are lower than the national average rates. Colorectal cancer is a preventable disease. If more education, health promotion and screening efforts are provided among the population in this region the alarming rates of colorectal cancer incidence and mortality could be reduced.

Statement of the Problem

Colorectal cancer is a major health threat for both men and women ages 50 and older. A prevention tactic against this health threat is the utilization of CRC screening. Studies on colorectal cancer indicate that about 28 million people are not up-to-date on their CRC screening, resulting in 51,000 preventable deaths each year (CDC, 2011). Lieberman suggest that despite compelling evidence of the effectiveness of screening, only 30% to 40% of people in the United States who are older than 50 years receive any of the recommended screenings. In

addition, recent studies indicate there are many factors linked as barriers to CRC screening they include the patient's age, BMI, gender, geographic location, income, family history of cancer, fear, ethnicity, physicians recommendation, education level, concerns about discomfort, embarrassment, screening preparation requirements and having poor healthcare access (Wallace et al., 2013; Subramanian et al., 2004; CDC, 2011). Among this extensive list of barriers, several determining factors of non-adherence to CRCS that are perceived as critical were further explored. These key influencing factors include age, gender, BMI, education, income, marital status, county of residence and household size. Given these findings and the low CRCS statistics, increasing CRC screening adherence is of critical importance to the field of public health and public health practitioners.

The state of Georgia suffers from an astounding rate of colorectal cancer incidence and mortality each year (CDC, 2011, ACS, 2009). At least 35,600 new cancer cases will be diagnosed, which is about 97 cases per day, resulting in about 14,400 deaths yearly (Georgia Department of Public Health, 2008). In 2009 Georgia's CRC incidence rate was 461.4 per 100,000 compared to the US rate which was 459.0 per 100,000 (CDC, 2009). Similarly in 2009 according to the CDC, *State Cancer Facts* the death rate for CRC in Georgia was 173 per 100,000 and the U.S. death rate was the same, approximately 173 per 100,000. Research has revealed that for most counties in the Southeast Georgia Cancer Alliance region; the CRC incidence rates are higher than the State of Georgia and national rates (Ledlow, 2010). In the last two decades, despite an increase in CRC campaigns and in the uptake of CRCS, screening rates in at-risk adults remains low. The shocking statistics raises the questions of why people do not adhere to recommended CRCS if they are at an increased risk and what factors actually influence non-adherence to CRC screening. In addition, it also brings the needed attention to identifying

appropriate CRCS methods for at risk adults in this specific region. For this reason, it is important for the researcher conducting this study to examine the factors and relationships of the variables that may influence non-adherence to CRCS in at risk adults 45 years of age and older that reside in Southeast Georgia.

Understanding the relationships between non-adherence and factors that determine health outcomes is essential to reducing the mortality and morbidity of CRC. Studies further indicate the reasons for low adherence to colorectal cancer screenings are the lack of education about colon cancer, lack of awareness of the need for screening and not being able to access a physician's clinic or hospital in proximity to the patient's residence. Knowledge is power; therefore, if more people are educated about colorectal cancer and the availability of safe and effective screening options then, as a result, more people might be screened and thousands of lives could be saved every year (ACS, 2009). In the United States, the survival rate from CRC is inversely related to the stage of cancer and consequently up to 90% of CRC deaths are preventable with early detection (Subramanian et al., 2004). Therefore, obtaining regular screening exams can significantly reduce related CRC morbidity and mortality (Subramanian et al., 2004).

Furthermore, compared to other ethnic groups African Americans have the highest age-adjusted incidence rates and death rates from CRC followed by Hispanics and then Whites (Cancer Statistics, 2011; ACS, 2011). Although, colorectal cancer can be prevented through screening it is underutilized in this group in the United States. In addition, African Americans are typically diagnosed at later stages when CRC is most advanced compared with other ethnicities (Francois, 2008; Subramanian et al., 2004; Wallace et al., 2013; CDC, 2011). As a result, African Americans and Hispanics have the lowest CRC screening rates compared to Caucasians

(Valhov et al., 2005). The literature supports supplementary factors that contribute to the barriers of CRC are multi-factorial and includes an individual's socioeconomic status, knowledge and the beliefs about health and diseases (Francois, 2008). Consequently, Liberman proposes effective CRC screening target appropriate populations, result in early detection of important pathology at a curable stage, be accepted by patients and be performed with high quality. If all of these suggestions can be performed more lives can be saved each year as it relates to CRC.

There are many factors or variables that need to be considered before a patient deviates from adhering to recommended preventive health services. The purpose of this study is to examine the relationships and patterns associated with CRC that contribute to non-adherence (negative deviation) to colorectal cancer screening.

Purpose Statement

The statement of the problem: Screening is effective in reducing the incidence and mortality of colorectal cancer (ACS, 2011; CDC, 2011). However, the effectiveness and efficacy of CRC screening might be reduced by non-adherence to screening, leading to poor health outcomes (Wilkins et al., 2008). The purpose of this study is to examine the relationships and patterns of non-adherence (negative deviation) to recommended CRCS, in at risk adult patients that participated in the Southeast Georgia Cancer Alliance Integrative project. There are consistent gaps and mixed research findings on the socio-demographic and socioeconomic factors associated with non-adherence to CRCS in at risk adults. The significance of this study is to increase colorectal cancer awareness and to educate at risk adults, public health practitioners and policy makers of the urgent need and importance of promoting effective innovated targeted initiatives and policies to reduce CRC. In addition, this study is important because it could assist

in expanding the existing literature on CRCS, and it could assist in closing the gaps in CRC screening and reducing the rates of non-adherence to CRCS.

Research Questions

Based on the gaps in the current literature the following research question was examined in the proposed study:

Main Question

1. Among at risk adult's do age, gender, BMI, education, income, marital status, county of residence and household size have an association with non-adherence to receiving colorectal cancer screening?

Sub-Question:

2. What socio-demographic variables and/or socio-economic variables showed the strongest associations?

Delimitations

The proposed study is a secondary analysis that utilized data from the Southeast Georgia Cancer Alliance (SEGCA) Integrative Project collected from September 2009- June 2010. The integrative intervention included three projects; Chatham County Safety Net Planning Council's: Assess-Connect-Teach (ACT) program, Liberty County Health Department: Bottom's-Up Coalition program and Memorial University Medical Center: Curtis & Elizabeth Anderson Cancer Institute. The study sample included African Americans, Caucasians (not Hispanic), Hispanic's and Asians. The majority of the participants in this study resided in Chatham, Liberty, Bryan and Effingham counties. Non-adherence (negative deviation) was defined as participants in the study who wanted fewer health services than the study protocol recommended. Adherence (positive patient deviation) was defined as study participants who wanted more health services as recommended and/or outlined in the study protocol.

Significance of the Study

This study will contribute to the colorectal cancer literature on identifying significant factors associated with receiving colon cancer education, a Harvard Risk Assessment, fecal occult blood tests, colonoscopies and increasing CRCS in adult patients in Southeast Georgia. The study of colorectal cancer is essential to discuss because so many lives are lost to this preventable disease (CDC, 2011). Colorectal cancer screening is the only way to detect colorectal cancer while in its early stage when mortality and morbidity are low (ACS, 2011). Moreover, in the state of Georgia the CRC rates are quite disturbing. At least 35,600 new cancer cases will be diagnosed, which is about 97 cases per day, resulting in about 14,400 deaths (Georgia Department of Public Health, 2008). Further, it is reported, the colorectal cancer

incidence and mortality rates for most counties in the Southeast Georgia Cancer Alliance region are higher than the state of Georgia and the national average (Ledlow, 2010).

Therefore, the study of non-adherence to colorectal cancer screenings is an important concept to address when relating it to risk and protective factors associated with screening and saving lives. The majority of CRC cases and deaths could be prevented each year by applying existing knowledge about CRC prevention, asking appropriate health questions to physicians about screening, changing dietary habits and following recommend screening advice (ACS, 2011). According to the literature, if the recommended routine screening occurs in people 50 years of age and older, screening exams can find this cancer early when treatment works best and can improve health outcomes (Inadomi et al., 2012).

A critical review of the factors associated to screening in this study may reveal that participants, especially minority participants in the Southeast Georgia are not aware and/or do not have access to all of the benefits to CRC screenings opportunities that can reduce disparities in this population. Moreover, analyzing and understanding the diverse barriers not found or described in the existing literature affecting this population might be discovered, explained and better understood in order to disseminate clear and concise findings to the community. This study can contribute to the existing literature by proposing effective solutions and initiatives to increase CRC screening rates in specific populations in Southeast Georgia. To the researcher's knowledge and after extensive review of the literature, examining the factors and relationships of variables in at risk adults that contribute to non-adherence to CRC screening, through the collaboration between projects and inter-project referrals in Southeast Georgia has not yet been reported in the literature.

In addition, this study can benefit community health workers, community members, policymakers, public health professionals and health care professionals in developing, designing, implementing and evaluating innovative strategies to deliver colorectal cancer screening initiatives, particularly in communities in Southeast Georgia; especially minority communities who are disproportionately affected by colorectal cancer. The primary aim of this study is to examine and identify the factors associated with colorectal cancer screening non-adherence (negative deviation) according to recommended CRC screenings. Essentially, the secondary aim of this study is to identify and develop a list of recommend innovative CRC screening initiatives.

Definitions of Terms

Key Terms	Definition
Southeast Georgia Cancer Alliance (SEGCA) region	Includes the following counties: Chatham, Liberty, Bryan, Effingham, Long, Bulloch, McIntosh, Montgomery, Screven, Toombs and Wayne (Ledlow, 2010).
Fecal Occult Blood Test (FOBT)	A test to check for blood in the stool. Small samples of stool are placed on special cards and sent to a doctor or laboratory for testing. Blood in the stool may be a sign of colorectal cancer. Also called FOBT (National Cancer Institute, 2011).
Colonoscopy	Examination of the inside of the colon using a colonoscope, inserted into the rectum. A colonoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue to be checked under a microscope for signs of disease (National Cancer Institute, 2011).
Rectal cancer	Cancer that forms in the tissues of the rectum (the last several inches of the large intestine closest to the anus) (National Cancer Institute, 2011).
Patient Deviations	Non-adherence vs. adherence and over-adherence vs. adherence (Ledlow, 2010).
Negative Deviation (non-adherence)	The client wants fewer health services than recommended in study protocols (Ledlow, 2010).

Positive Deviation (adherence)	The client wants health services or wants more health services as recommended or outlined in study protocol (Ledlow, 2010).
Harvard Risk Assessment	Interactive tool that estimates the risk of cancer and provides personalized tips for prevention (Harvard School of Public Health, 2008).
Socio-demographic Variables	Gender, age, income level, education level, BMI, county of residence, employment status and marital status (Ledlow, 2010).
Body Mass Index (BMI)	Is a number calculated from a person's weight and height and is a moderately reliable indicator of body fatness for most people (CDC, 2011).
Region (Urban & Rural)	An urban county (metropolitan statistical areas- MSAs) contains a core urban area of 50,000 or more population (OMB, U.S. Census, 2010). A rural county (micropolitan statistical areas) contains an urban core of at least 10,000 (but less than 50,000) population (OMB, U.S. Census, 2010).

Chapter 2

LITERATURE REVIEW

Colorectal Cancer

According to the *Centers for Disease Control and Prevention* (CDC), colorectal cancer (CRC) is a cancer that occurs in the colon and/or rectum. It is sometimes referred to as colon cancer (CDC, 2009). The colon is the main part of the large intestine, which is the long, muscular tube that food passes through during digestion and the rectum is the passageway that connects the colon to the anus (CDC, 2009). CRC occurs when cells in the colon metastasize (ACS, 2011). A group of abnormal cells together can form a growth in the colon called a polyp (CDC, 2011). If the polyps are not removed, cells in the polyps can continue to grow, turn into cancer, and spread. The average lifetime risk of developing colorectal cancer is about one in twenty people (5%) for both men and women; however this varies according to individual risk factors (Cancer Alliance, 2011). About 72% of cases develop in the colon and about 28% occur in the rectum (Cancer Alliance, 2011). Cancer is a major public health problem in the United States because so many people are dying from this preventable disease (CDC, 2011). Twenty-eight million Americans are not up to date on screening which poses a threat to an already exhausted healthcare system (CDC, 2011). It is predicted that in 2013, about 143,000 people in the United States will be diagnosed with CRC and that 51,000 will die from this disease (NCI, 2011). However, if everyone aged 50 years or older had regular screenings at least 60% of deaths from this cancer could be avoided (CDC, 2011).

Colorectal cancer has been a subject under intense debate in recent years, with issues circulating about deficiencies in patient care and quality, low screening rates, poor physician-patient communication, frequent medical errors and the high cost of health care due to late diagnosis and high emergency room visits (OMH, 2011). Conversely, over the past decade, CRC

incidence rates and associated morbidity and mortality have also considerably declined. The success of this decline can be attributed to early detection of pre-cancerous polyps and CRC through increased education and screening efforts. Nonetheless, the incidence and mortality rates for CRC among minorities have remained drastically higher than in Whites (Wallace et al., 2013). Unsurprisingly, these statistics are important concerns in minority groups, because minorities have the highest incidence and mortalities as it relates to chronic diseases such as CRC (OMH, 2011).

Colorectal Cancer in Georgia

In the state of Georgia CRC is a significant health problem. At least 35,600 new cancer cases will be diagnosed, which is about 97 cases per day, resulting in about 14,400 deaths each year (Georgia Department of Public Health, 2008). Also, in 2009 the CRC incidence rates in Georgia was 461.4 per 100,000 compared to the US the rate which was 459.0 per 100,000 (CDC, 2009). According to the CDC, *State Cancer Facts* the death rates for the state of Georgia in 2009 was 173 per 100,000 and the US rate was approximately 173 per 100,000. CRC is a disease that for the most part affects adults of all races, cultures and educational backgrounds (CDC, 2009). In Georgia colorectal cancer mortality rates are higher among African American males than Caucasian males (CDC, 2009). In addition, CRC mortality rates are also higher among African American females than Caucasian females. These statistics are the astounding evidence that disparities are associated with worse health outcomes for African Americans in Georgia.

Further, CRC affects people that are of different socioeconomic backgrounds and geographic locations. As adults age the risk of developing CRC increases and becomes even more prevalent. Research has revealed that for most counties in the Southeast Georgia Cancer Alliance region, the rates are higher than the State of Georgia and the national rates (Ledlow,

2010). Georgia is also one of the top states that incurs significant CRC cost. According to the Centers for Disease Control and Prevention, *National Center for Health Statistics*, an estimated $1 billion is spent annually in CRC medical care cost, $300 million annually for indirect morbidity costs and $1.6 million annually for indirect mortality costs (CDC, 2011). In addition, over 5% of residents in Georgia are uninsured and this percentage is higher for African Americans and Hispanics than Whites (CDC, 2011).

Southeast Georgia Cancer Alliance Region

The Georgia Cancer Coalition has selected the Southeast Georgia Cancer Alliance, Inc., as a regional program of excellence. The Alliance consists of academic institutions, community organizations and community health care providers such as hospitals, physicians, nurses, allied and other health professionals in public health district's 9-1, 9-2, and 9-3 (SEGCA, 2012). The partnership of the three colorectal cancer projects within the Southeast Georgia Cancer Alliance region developed into the model to deliver this intervention. The three projects that formed are: Chatham County Safety Net Planning Council: Assess-Connect-Teach (ACT) program; Liberty County Health Department: Bottoms-Up Coalition program and Memorial University Medical Center: Curtis & Elizabeth Anderson Cancer Institute.

The counties of interest include Chatham, Liberty, Effingham and Bryan which are all part of district 9-1. The goal of the Southeast Georgia Cancer Alliance is to ensure that all persons in southeast Georgia in need of cancer care are treated and served (SEGCA, 2012). According to the Alliance this goal will be achieved by bringing together, and thereby enhancing the resources of the southeast region, the medical community and interested citizens. Consequently improving accessibility to cancer education, prevention, screening, clinical care, and research (SEGCA, 2012).

Risk and Protective Factors associated with Colorectal Cancer

The *American Cancer society* defines a risk factor as anything that affects a person's chances of getting a disease such as, colorectal cancer. Researchers have found several risk factors that may increase a person's chances of developing colorectal polyps or colorectal cancer. According to the CDC if these risk factors are ignored they can lead to death. Examples of these risk factors include age; a person over the age of 50 is at increased risk of CRC. About 9 out of 10 people diagnosed with CRC are at least 50 years old (ACS, 2012). Additional risk factors associated with increased CRC risk include a person's family history; for example if an individual or family member has had polyps or CRC before this increases the chances for developing CRC. In addition, studies have found that having a history of inflammatory bowel disease or inherited syndromes, racial background, having type 2 diabetes and lifestyle-related factors such as, diet, weight, lack of exercise, obesity, low intake of fruits and vegetables, high intake of red or processed meats, heavy alcohol consumption and low levels of folic acid in the body (ACS, 2012) are all risk factors associated with CRC (ACS, 2012, CDC, 2011).

Similarly, several studies have posited that protective factors that influence CRCS include having the education, knowledge and understanding of CRC, healthy dietary habits and the desire to undergo screening. Also, having health insurance, the knowledge of having a family history of CRC, recommendation for CRC screening from a physician and communicating with a physician on the different CRCS options available, all contribute to preventing CRC (ACS, 2012; CDC, 2011; OMH, 2011; Wallace et al., 2013). Hence, additional factors that decrease the likelihood of CRC include: maintaining diet and weight, exercising, high intake of fruits and vegetables, low intake of red or processed meats and low alcohol consumption.

Age

CRC does not discriminate and can occur in both women and men at any age, especially in adults 50 years and older. According to the American Cancer Society, *Colorectal Cancer Facts & Figures*, age is a strong risk factor of CRC because the incidence and death rates for CRC increases with age. The *Centers for Disease Control and Prevention* reports that the risk of getting colorectal cancer increases with age and is greater in men than in women. However, younger adults can develop CRC though their chances increase strikingly after age 50 (ACS, 2013). The American Cancer Society (ACS) also reports, women and men should start screening for colorectal cancer at age 50 and continue until age 75. About 90% of new cases and 94% of deaths occur in individuals 50 and older (ACS, 2011). In addition, the incidence rate of CRC is 15 times higher in adults 50 years and older than in those 20 to 49 years of age (ACS, 2011). Further, in regards to adherence Subramanian et al. reports that age was a significant factor that impacted adherence, with older individuals being more complaint than younger individuals. The study further reports that adherence was lower among individuals less than 65 years and those older than 85 years, with the highest adherence at age 75 (Subramanian et al., 2004).

In general previous study supports age being a significant factor that impacted adherence, with older individuals being more complaint than younger individuals (Thrasher et al., 2002) to CRCS. Additionally, in a study by James et al. despite the increasing risk of CRC incidence with older age, older age decreased the likelihood of receiving a physician's recommendation for CRC screening. Seeff et al. reports that approximately 4–7% of respondents who were recommended by a physician to undergo CRCS did not receive CRCS and participants between ages 50–64 years were more likely to report that a physician recommended them to undergo CRCS, however, were more likely to postpone their screening, compared with participants age 65 years.

Moreover, a study by Messiner et al. reports that CRCS rates among men and women ages 65 years and older are significantly higher than for those ages 50 to 64 years. The literature reports mixed finding on the age range of when older adults seek either a colonoscopy or FOBT. Seeff et al. documents in the article entitled: *Patterns and Predictors of Colorectal Cancer Test Use in the Adult U.S. Population*, the overall age-adjusted percentages of respondents who reported ever having undergone CRCS for any reason were 36.7% for FOBT, 38.1% for colonoscopy and 54.2% just one of screenings or both screenings. The study further accounts that with regards to the types of screening, the FOBT screening rates increased with increasing age until ages 70–79 years and then decreased (Seeff et al., 2004) and that participants age 65 years were more likely to report having undergone an FOBT compared with participants ages 50–64 years (Seeff et al., 2004)**.**

Previous studies report advancing age and marital status were positively associated with screening compliance (Weinberg et al., 2005). Also in regards to age and social behavior, fear about CRC screening and the pain related to screening was the strongest hindrance to screening, while positive attitudes about the value of CRCS were strongly related to compliance (Weinberg et al., 2005). In order to increase the rates of CRCS in the aging population education, awareness and physician counseling and recommendation addressing fears and emphasizing positive messages about screening are imperative.

Gender

Colorectal cancer incidence and mortality rates are about 35% to 40% higher in men than in women (ACS, 2011). Although the reason for this is not completely understood research studies report that it could reflect complex interactions between gender-related differences in exposure to hormones and other risk factors (ACS, 2011). Gender differences in risk patterns

may also help explain why the proportion of colorectal tumors occurring in the rectum is higher in men 31% than in women 24% (ACS, 2011). In the article entitled, *Factors associated with colon cancer screening: The role of patient factors and physician counseling*, women were more likely than men to adhere to physician counseling about receiving CRCS such as a FOBT. In this study adherence also varied by ethnicity, race, sex and education level (Wee et al., 2005). In regards to gender and CRCS, Meissner et al. study found that CRCS increased for both men and women although the prevalence of screening remains higher in men. This study also found that in men with a usual source of health care, colonoscopies were the preferred screening method oppose to the FOBT.

Ethnicity

African American women and men have a higher risk of developing colorectal cancer and a lower survival rate compared to Caucasians, Asians, Hispanics and Native Americans (CDC, 2011). The disparities in CRC screening and adherence rates reflect many of the disparities seen in CRC incidences and mortalities (James et al., 2006), this is because of the disproportionate rates of CRC screening among these groups. In a study by James et al. both Hispanics and African Americans had significantly lower odds of CRC screening adherence compared with Caucasian. Additionally, the incidence rates of CRC are 20% higher and mortality rates are about 45% higher in African American than those in Caucasians (ACS, 2011). It is also imperative to be aware that the burden of CRC varies within racial and ethnic groups. In the study by Meisser et al. the use of CRCS was higher among white men and women if they had higher educational attainment, were former smokers, had health insurance or an usual source of care, or if they talked to a general doctor.

According to C.J. Bradley author of the "*Cancer survival rates by race*"; when compared with whites, African American men and women have poorer survival once cancer is diagnosed. Five-year relative survival is lower in African Americans than in whites within every stratum of stage of diagnosis for nearly every cancer site (Bradley, 2009). It is reported these disparities may result from inequalities in access and delivery of quality health care from differences in co-morbidities (Bradley, 2009). Similarly, African Americans are less likely than whites to be diagnosed with cancer at a localized stage, when the disease may be more easily and successfully treated (Bradley, 2009). The extent to which factors other than stage at diagnosis contribute to the overall differential survival was unclear in this study. However, some studies suggest that African Americans who receive cancer treatment and medical care similar to that of whites experience similar outcomes (Bradley, 2009).

Body Mass Index (BMI)

According to the Centers for Disease Control and Prevention, Body Mass Index (BMI) is a number calculated from a person's weight and height (CDC, 2011). BMI assesses an individual's weight categories that may lead to health problems (CDC, 2011). Research has shown that BMI is an economical and simple way to perform methods of screening for weight categories that may lead to serious illnesses. Since BMI is not a diagnostic tool it is important to have a healthcare provider to perform further assessments to determine health risks (ACS, 2011). BMI is used for population assessment of being overweight and obese and allows people to compare their own weight status to that of the general population (CDC, 2011).

The Centers for Disease Control and Prevention has standard weight status categories associated with BMI these ranges for adults are as follows: adults with a BMI below 18.5 their

weight status is underweight, adults with a BMI 18.5-24.9 there weight status is normal, adults with a BMI 25.0-29.9 there weight status is overweight, and adults with a BMI of 30.0 and above their weight status is considered obese (CDC, 2011). Early studies suggest that being obese or overweight is significantly associated with having a higher mortality and higher risk of CRC, with stronger associations more consistently observed in men than in women (Larsson and Wolk, 2007). Further, previous studies have reported the incidence of colorectal cancer in women has been positively associated with BMI (Field et al., 2001).

In addition, several studies have reported mixed finding on BMI and CRCS suggesting that BMI status can be both a negative and positive predictor for CRCS. According to Kendall et al. study on *Obesity Status and Colorectal Cancer Screening in the US* obesity status was not found to be a hindering factor, but rather an assisting factor, for CRC screening among Medicare beneficiaries. However, the literature presents conflicting results on obesity being reported as a negative or positive predictor for CRC screening (Kendall et al., 2013). Opposing studies report that obese adults were less likely to be screened for colorectal cancer when compared to non-obese patients (Heo et al., 2004).

Education

Education is an important factor to consider when it comes to non-adherence to being screened for colorectal cancer. Studies have shown a person that is more educated is more likely to be knowledgeable about the benefits and risks of CRC screening and is more likely to get screened when compared to a person with a lower level of education (NIH, 2010). In addition, a person with a higher level of education is more likely to have a higher income, have health insurance and have a usual source of care than a person with high school or less level of

education (Wallace et al., 2013). Further, according to the literature each socio-demographic or socioeconomic factor has an independent effect on CRC screening rates (NIH, 2010). Subramanian et al., study supports the research that individuals with higher levels of education are, in fact, more knowledgeable about the importance of CRC screening and have a better understanding of the different CRC tests used for screening. Mandelson et al. study on *Colorectal Cancer Screening Participation by Older Women* found no significant association between demographic characteristics such as race and education and screening adherence in women over the age of 50. Lemon et al. reported that the variables education and adherence were insignificant together, but the interaction between education and sex was significant together and also highly significant when combined with males that had higher education, because they were more likely to adhere to CRC screening. In addition, a study by Subramanian et al. suggests that higher education correlated with undergoing recommended CRC screening tests. On the other hand, James et al. study on *Disparities in Colorectal Cancer Screening: A Guideline-based Analysis of Adherence,* found that non-adherent individuals with less education and African-American race/ethnicity received fewer physician recommendations for CRC screening (James et al., 2006). The research also suggests that education; patient awareness, knowledge and physicians recommendations are significant predictors of whether older patients are screened for CRC (Chen et al., 2008).

Income

Consistent with other studies, income for the most part facilitates if patients can afford to undergo CRC screening or not. Several studies have confirmed the effectiveness and cost effectiveness of CRC screening at reducing colorectal cancer mortality (Walsh & Terdiman, 2003). The literature accounts that individuals who are unemployed are more likely to have no

insurance and are likely to face financial barriers to screening. To assist with this barrier the literature reports state agencies approved legislation that supports individuals who have an annual income of $15,000 or less and meet federal poverty guidelines to be eligible for screening at no cost, and this should assist with adherence (CDC, 2011).

In a study by Subramanian et al. income did not emerge to have a consistent significant impact on adherence although several studies reported that higher income leads to higher rates of adherence (Subramanian et al., 2004). In addition, the literature also suggests in regards to income and mandates and/or policy changes, between the low and middle income participants, mandates seemed to have benefited higher educated participants more than lower educated participants (Cokkinides et al., 2011).

Health Insurance Coverage

According to the CDC, because of the implementation of new laws such as the Affordable Care Act, Medicare and many insurance plans now assist patients to pay for colorectal cancer screenings. Having medical insurance coverage was reported in several studies as a reliable predictor of screening adherence (Zapka et al., 2002). Studies have also shown that CRC screening is typically lower among patients without health insurance than patients with health insurance coverage. The inadequate coverage or the lack of health insurance is considered a health care system barrier for patients trying to undergo CRCS (Wallace et al., 2013). Furthermore, the decisions by Medicare and other health insurance companies to pay and reimburse for colorectal cancer screening in recent years have considerably reduced the financial obstacles to obtaining CRC screening. Despite these developments, studies have found that screening for colorectal cancer remains low nationally (Walsh & Terdiman, 2003).

The literature reports that patient cost sharing has been shown to reduce the utilization of preventive services and may influence preferences of CRCS (Varghese et al., 2005 and Wharam et al., 2008). One study survey found that of health plans purchased from 1999-2000, 97% of the insurance companies covered FOBTs for average risk patients which drastically increased the uptake of this screening method. For the more invasive procedures such as a colonoscopy, health insurance plans only covered about 9% of the cost, decreasing the rate of uptake for this method of screening. Furthermore, Cokkindes et al. study reports that the involvement of state policy makers and effective CRCS legislation that passed in legislation may increase the utilization of both FOBTs and colonoscopies among uninsured individuals.

Marital Status

According to several studies, marital status has a significant association with patients receiving CRC screening (Wang et al., 2011). The literature supports that there is an important relationship between health and marital status. Previous research has established that marriage has a powerful and positive effect on human survival because it is a significant part of the adult life (Kaplan et al., 2006). Several studies document that marriage is a vital type of social support which has been linked to a variety of physiological mechanisms affecting health (Wang et al., 2011). Molloy et al. attest that the spouse is important because he or she plays a significant role in providing emotional support, access to social networks and monitoring and shaping health related behaviors.

The study by Wang et al. found that marriage was associated with better health outcomes of CRC for both men and women, and being single was associated with lower survival rates from CRC (Wang et al., 2011). In addition, this study also found that married couples have

considerably earlier cancer diagnosis and a higher probability of surgery, suggesting that spouses assist in encouraging patients to pursue treatment options (Wang et al., 2011).

Earlier studies suggest that being married or having the support of a spouse has an association with men seeking CRCS (Steinberger, 2006). Also, several studies report that having one or more relatives living in one household increases being up to date with CRCS (Steinberger, 2006). Steinberger et al. author of, *Body Mass Index and Up-to-Date Colorectal Cancer Screening Among Marylanders Aged 50 Years and Older*, suggests that adults who were aged 65 and older, had health insurance and were married were more likely to be up to date on CRC screening than adults who were not married and were aged 65 and older and had health insurance. In addition, in another study Greene et al. found that single black women aged 50 to 64, those who did not have a high school diploma or did not have health insurance, and those who had an annual household income of $15,000 or less were drastically less likely than their counterparts to be adherent with screening guidelines.

Previous research supports, a marriage has a powerful and positive effect on human survival (Kaplan et al., 2006). The literature documents that marriage is a significant type of social support which has been linked to a variety of physiological mechanisms affecting health and health outcomes (Kaplan et al., 2006).

Region (County of residence)

According to the literature disparities in health outcomes due to colorectal cancer has been reported in many demographic groups and geographic locations. The literature report that rural areas account for a higher prevalence of chronic diseases this includes cancer, a finding attributed in part to a population that is poorer, older and less educated (Grosschalk et al., 2003;

Huang et al., 2002; Kinney et al., 2006; Hines et al., 2011). Researchers have documented that in the past the CRC mortality rates for adults over the age of 50 residing in urban cities were consistently higher than the CRC mortality rates for adults over the age of 50 residing in rural areas (Huang et al., 2002). However, the literature trend is shifting and currently suggests that rural residents have higher CRC mortality rates than their urban counterparts (Kinney et al., 2006). There is evidence that suggest that over time the health advantage associated with living in rural areas have diminished (Huang et al., 2002). More recent data suggest that rural residents have higher mortality of CRC and are more likely to be diagnosed at more advanced disease stages (Campbell et al., 2001). The study by Liff et al. assessed the association between the black-white differences in CRC, and found increased occurrences of late-stage CRC tumors in rural residents and also found that the results were limited to black residents. Another study also reported that for rural residence, CRC is associated with a higher risk of late-stage diagnosis and a decreased rate of undergoing CRCS (Fazio et al., 2005). The author Onega et al. affirms that the rural and urban disparity may be mainly significant to black compared to the white population. Further implying that the double exposure of being a minority and residing in a rural location may characterize a particular high risk group (Hines et al., 2011).

Moreover, Rural Healthy People 2020 maintains that with the exception of cancer staging, there appears to be little differences in the incidence and mortality rates of rural and urban populations. However, other studies suggest that health disparities exist between rural and urban populations especially, in the stage of disease at first diagnosis (Grosschalk et al., 2003). Cancer staging is the growth and location of a tumor when a patient is first diagnosed (Grosschalk et al., 2003). When cancer is found and diagnosed early this is considered an indicator of the quality of medical care because it allows for the improvement of health outcomes

in patients for various types of cancers (Grosschalk et al., 2003). On the other hand, delayed or late stage diagnosis results in poorer health outcomes representing poor health indicators (Grosschalk et al., 2003). Interpreting these findings raises the questions regarding utilization and the availability of preventive, screening, and diagnostic services in rural areas suggesting limited availability (Grosschalk et al., 2003).

The *National Cancer Institute* reports that older rural residents typically represent high risk minority populations that have low incomes, less education and have less access to or utilization of early cancer detection programs than their urban counterparts which ultimately results in reduced survival rates. Researcher report after the analysis of the 1999 and 2008 BRFSS, rural residents were also less likely to receive recommended CRCS than their urban counterparts (Cole et al., 2012). In addition, studies suggest rural residence regularly experience inadequate variations in the quality, availability, and accessibility of services when evaluated against their urban counterparts (Cole et al., 2012). The reasons behind this analysis are the limited access to quality medical care facilities, and cancer prevention programs which could negatively affect health outcomes for cancer patients.

In addition, the situation for rural residents is different because these residents are compounded by factors such as, fewer physician visits a year, underutilization of community based health resources, and utilizing the health-care delivery system later and sicker in health than urban residents (Cole et al., 2012). Other barriers that may impact rural resident's stage of diagnosis include poor access to specialists, minimal transportation options for either cancer screening or treatment services, limited geographic access to new effective therapies and technology, limited knowledge of cancer, low participation in health promotion programs, low education levels, unaffordable cost of cancer screening and treatment and inadequate care for

cancer patients (Cole et al., 2012). According to the recent reports despite positive steps in reducing cancer incidence and mortality, there are many challenges posed to individuals residing in rural areas. Suggesting that combating cancer requires a multi-dimensional approach designed to improve the access to health services, which includes the essential need for early cancer screening and detection, and improving patient knowledge regarding risk factors.

Colorectal Cancer Screening (CRCS)

The American Cancer Society defines screening as the testing of individuals for a disease prior to the onset of any symptoms. The goal of CRCS is to reduce disease specific mortality through prevention and early detection (ACS, 2013). CRC screening is most effective when it is applied to a large percentage of eligible people and utilized appropriately (ACS, 2013). A review of recent studies report the death rate (the number of deaths per 100,000 people per year) from CRC has been dropping in both men and women for more than 20 years. The reasons for this drop includes the following: (1) polyps are being detected by screening and removed before they can develop into cancers, (2) screening is also allowing more colorectal cancers to be found earlier when the disease is easier to cure and (3) treatment for colorectal cancer has improved over the last several years (CDC, 2011 and ACS, 2013). As a result, there are now more than 1 million survivors of colorectal cancer in the United States (ACS, 2013).

The study by Wee et al. found that compliance with screening varied widely depending upon the study population and whether interventions were community or practice based. Although the adherence level in this study was between 40% and 50% for FOBT, rates were much higher when the intervention included FOBT supplies and in person provider advice (Wee et al., 2005). Additionally, Wee and colleagues reports that even if only 30% of unscreened

patients undergo screening when recommended to do so, systematic counseling of all eligible patients by physicians would raise the prevalence of colorectal cancer screening to more than half of the at risk population in the United States (Wee et al., 2005). Moreover, systematic counseling may potentially eliminate or minimize disparities by race/ethnicity and education (Wee et al., 2005).

This study further goes on to report that colorectal screening through FOBT, sigmoidoscopy, or colonoscopy remains low in the United States and the Hispanic populations and those with lower education are at higher risk for not being screened (Wee et al., 2005). This low prevalence may be due to lack of patient awareness of the need for screening and inadequate physician counseling rather than poor patient adherence. The study recommends interventions to improve CRCS should focus on raising public awareness and increasing physician efforts to counsel patients about screening (Wee et al., 2005).

According to the American Cancer Society CRC screening, has been shown to reduce CRC mortality through identifying and removing precancerous polyps and detecting and treating the cancer in its early stages. In addition, the standard recommendation for CRC includes either an annual fecal occult blood test (FOBT), flexible sigmoidoscopy every 5 years, an annual FOBT plus flexible sigmoidoscopy every 5 years, a colonoscopy every 10 years, or a double-contrast barium enema (DCBE) every 5 years as recommended by the American Cancer Society. Furthermore, there is a growing body of literature that highlights the importance of physicians taking their patients preference into account when recommending a colorectal cancer-screening test. Matching individuals with their choice of screening test may increase adherence, but no studies have been performed to assess this finding (Ling 2001). The American Cancer Society also suggests that rather than the physician recommending a specific test, patients should be

presented with options for screening methods whenever possible (Smith et al., 2001), including accuracy, cost, potential for cancer prevention, discomfort, and risk. Individuals can then select the test that best reflects their personal preferences and are well informed when making those decisions (Ling, 2001).

Several studies have identified a number of factors that are associated with increasing the utilization of screening the include race, being married, high income, high educational level and having health insurance coverage, recommendation from a physician and a usual source of health care (Wee et al., 2005). In addition, higher levels of education, public awareness and increasing physician efforts to counsel individuals about the importance and advantages of CRCS has proved effective in increases CRCS uptake (Wee et al., 2005).

The literature and several public health organizations advocate that screening for colorectal cancer is the most beneficial and cost-effective way to advance the public's health and reduce the incidence and mortality of CRC (Levin et al., 2008 and Holden et al., 2010). Several additional factors that have shown a significance in CRCS improvement include states mandates and expanding legislation on CRCS. These two variables are important methods adapted to increase the rates of CRCS in uninsured at risk individuals (Cokkinides et al., 2011). CRCS and prevention have been part of the national healthcare reform discussions to improve health outcomes. The Affordable Care Act is an example of legislation that is supposed to improve health and increase access to CRCS, especially in underserved and uninsured individuals (ACA, 2011). According to the U.S. Preventive Services Task Force (USPSTF), this Act requires all new private health plans to cover CRCS and prohibit any out-of-pocket costs to patients.

Harvard Risk Assessment

The Harvard Cancer Risk Index is an interactive tool that provides a simple estimation of the personalized risk for cancer in individuals age 40 and above (Colditz et al., 2000). This relative risk tool can assist in informing both men and women of the major factors contributing to their risk of developing the leading types of cancers based upon Surveillance Epidemiology and End Results (SEER) (Kim et al., 2004). According to the American Cancer Society the most prevalent types of cancers include prostate, breast, lung and colorectal cancer, these contribute to approximately 80% of cancer incidences. In addition, this predictive tool can assist in identifying lifestyle changes that can reduce a patient's risk for developing cancer (Kim et al., 2004). Examples of lifestyle changes include counseling by health care providers to modify health behaviors avoiding smoking cigarettes, changing diet, and increasing physical activity, all of these options are recommended by the U.S. Preventive Services Task Force (Colditz et al., 2000).

According to the literature risk appraisal tools are increasingly being used in the clinical setting to estimate individuals' risks of developing and dying from diseases. These tools have varied both by disease outcome, mortality following hospitalization for acute medical illness, cancer incidence and survival (Kim et al., 2004). In a prospective study entitled, *Validation of the Harvard Cancer Risk Index: A prediction tool for individual cancer risk;* a 10 year follow up study analyzed and calculated participants risk indexes to predict their relative risk for developing CRC and other cancers. Risk indexes are categorized as "low risk", "average risk" or "high risk" for CRC in men and women. This study found the HRA was accurate in predicting an individual's risks of cancers, promoting the acceptance of a risk appraisal tool in predicting various types of cancer (Kim et al., 2004, Colditz et al., 2000).

In addition, a randomized controlled trial conducted within a health center in Boston found the HRA tool was significantly useful in correcting misperceptions about personal colorectal cancer risk and provided accurate estimates of the participant's risk of cancer relative to the general population (Kim et al., 2004). Also, the tool assisted in providing essential health behavior modification suggestions for the primary prevention of colorectal cancer (Kim et al., 2004).

Family History and Genetics

The American Cancer Society reports most CRC cases occur in people without a family history of CRC. Still as many as 1 in 5 people who develop CRC have other family members who have been affected by this disease. People with a family history of CRC, meaning one or more first degree relatives (parents, siblings, or children) are at increased risk (CDC, 2011). Studies show that these individuals are consistently more likely to be compliant with screening recommendations than those at average-risk (ACS, 2013). In a study by Lemon et al. individuals with cancer in their family were twice as likely to be compliant than those without a family history of CRC.

Previous studies also report significant relationship between family history of screening and screening for other cancers further increased adherence to colorectal cancer screening (Hsia et al., 2000). About 5% to 10% of people who develop CRC have inherited gene defects (mutations) that cause the disease (ACS, 2013). Frequently, these defects lead to cancer that occurs at a younger age than is common (ACS, 2013). According to Thrasher, identifying families with these inherited syndromes is important because it lets doctors recommend specific steps, such as screening and other preventive measures when the person is younger (Thrasher et al., 2002) and the disease can be caught earlier.

Fecal Occult Blood Test

The Fecal Occult Blood Test (FOBT) is one test that can be used to screen for CRC. The FOBT can detect very small quantities of blood in stool (ACS, 2011). Usually the FOBT kit is obtained from a health care provider for use at home (ACS, 2011). Bleeding from colorectal cancer may be intermittent or undetectable, so accurate test results require annual testing that consists of collecting 2 to 3 samples (depending on the product) from consecutive bowel movements (ACS, 2011). There are two types of FOBT available guaiac based tests, which detect blood from any source, and immunochemical-based tests, which detect only human blood (ACS, 2013, CDC, 2011). Upon completing either of these tests, patients return the kit to their doctor or to a laboratory for evaluation (ACS, 2011). Patients who have a positive gFOBT are referred for a colonoscopy to rule out the presence of polyps or cancer (ACS, 2011). Studies have shown that the regular use of this screening method reduces the risk of death from colorectal cancer by 15% to 33% (Levin et al., 2008). In addition, FOBT has also been shown to decrease by 20% the incidence of CRC by detecting large polyps, resulting in their subsequent removal by a colonoscopy (Mandel et al., 2000). It is important to note that the effectiveness of FOBT is dependent on repeated screenings over time; a recent study indicated that the majority of patients who choose this testing option failed to adhere to regular testing schedules (ACS, 2011). Physicians recommend an FOBT to be performed annually for patients over the age of 50 and at higher risk for developing CRC (ACS, 2011, Mandel et al., 2000, Levin et al., 2008, CDC, 2011).

Colonoscopy

A colonoscopy is another primarily effective test in detecting CRC. This procedure allows for direct visual examination of the colon and rectum (ACS, 2011). A colonoscopy also

allows for the visualization of the entire colon and removal of polyps. If a polyp is found, it is removed by passing a wire loop through the colonoscope to cut the polyp from the wall of the colon using an electric current (ACS, 2011). Studies show that a colonoscopy is the most sensitive method for the detection of CRC or adenomatous polyps (Rockey et al., 2005). The advantages of CRCS it is highly sensitive and examines the entire colon. A colonoscopy allows for screening, diagnosis, and removal of polyps in a single visit (ACS, 2011). Also, it has been estimated that a colonoscopy screening has the potential to prevent about 65% of colorectal cancer cases (Kahi et al., 2009). Further, a colonoscopy also has the longest re-screening interval of all forms of screening testing, which is every 10 years (ACS, 2011). However, colonoscopy has a higher risk of complications than other forms of testing, including bowel tears or bleeding, especially when a polyp is removed (Levin et al., 2008).

Moreover, previous reviews support the use of a colonoscopy as a primary screening tool. This method has gained momentum due to its superior effectiveness in detecting polyps and reducing colorectal cancer mortality (Lieberman et al., 2000; Nelson et al., 2002). Recent changes in Medicare coverage and insurance plans now provide payment for colonoscopy screening, which has also increased the uptake for this screening method (Rex et al., 2009). In addition, few studies report there is evidence that suggests that once an individual undergoes an invasive screening test, they are more likely to undergo repeat use of this test contributing to the increase in CRCS (Subramanian et al., 2004).

Early Detection: Adherence and Non-adherence

According to the current literature, CRCS is underutilized in the United States. Underutilized is defined as the conditions in which people are not screened or are screened at lower rates than recommended by the CDC, American Cancer Society and the U.S. Preventive

Services Task Force (USPSTF) guidelines. Conversely, recent studies support that there has been an increase in the utilization of CRCS. Key factors associated with patient adherence to CRCS include (1) willingness to undergo tests due to family history, (2) belief that screening tests are effective, and (3) physician recommendation. Studies also report the barriers to CRCS include (1) fear of finding cancer, (2) pain and treatment procedures and (3) the belief that cancer is not curable (Beeker et al., 2000).

Increasing the low adherence of CRCS rates is of critical importance to public health and health care professionals. Although, the CRCS guidelines developed by the Centers for Disease Control and prevention, American Cancer Society and U.S. Preventive Services Task Force are effective, their effectiveness depends on how compliant individuals are with their recommended long-term screening schedules (Subramanian et al., 2004). Further, the importance of patient adherence has also been highlighted in several cost-effectiveness analyses (Vijan et al., 2001). The adherence rate is one of the factors that significantly affects incremental cost-effectiveness and, therefore, the increase in adherence for one type of screening test, and this can make that test more cost-effective than others (Vijan et al., 2001; Crott, 2001; Pignone et al., 2002; Liberman, 1995 and Frazier et al., 2000) while at the same time providing an opportunity to promote being screened for other types of cancers (Coups et al., 2007).

Studies suggest that the prevalence of multiple behavioral risk factors affect colorectal cancer screening adherence and non-adherence for individuals. The data supports that individuals who do not adhere to regular colorectal cancer screening have been found to have higher rates of smoking, lower levels of physical activity, greater alcohol intake, lower folate intake, and lower intake of multivitamins than individuals who adhere to colorectal cancer screening (Seeff et al., 2004). The literature also supports that individuals who do not engage in CRCS may be at

increased risk for colorectal cancer not only due to their lack of screening but also due to their increased levels of other colorectal cancer behavioral risk factors (Coups et al., 2007). Seeff et al. documented individuals who adhere to colorectal cancer screening are less likely than non-adherent individuals to have several behavioral risk factors for colorectal cancer.

This study also found that individuals who adhered to screening were more likely to be older, White, have a higher level of education and income, married, and have a family history of colorectal cancer (Seeff et al., 2004, Coups et al., 2007). Among individuals that adhered to colorectal cancer screening, more risk factors were reported by younger individuals, those with less education, individuals who were not married or partnered, and those reporting poorer overall health (Coups et al., 2007). Additionally, individuals who were not-adherent to colorectal cancer screening were more likely to report having several behavioral risk factors increasing their chances of CRC (Coups et al., 2007). Further, these individuals were more likely to be younger individuals, Blacks, those with less education, individuals who were not married or partnered, those with poorer self-reported health, and individuals with a higher risk of colorectal cancer based on their family history (Coups et al., 2007).

Moreover, treatment for colorectal cancer is most effective when the cancer is found early. With regular screening and testing colorectal cancer can be prevented by finding and removing polyps before they become cancerous (Cancer Alliance, 2012). Earlier detection means a chance to live a longer life. The later the detection the more advanced the cancer can become diminishing the chances of survival. However, there are currently more than one million colorectal cancer survivors in the United States (Cancer Alliance, 2012). In a study by the author Powe, one of the most important determinants of non-adherence in elderly African Americans was fatalism; the belief that death is inevitable when cancer is present. Other studies such as the

one analyzed by Breen et al. found that individuals with a usual source of care are more than three times as likely to be compliant to screenings.

According to the author of the article, "*Barriers and facilitators to colorectal cancer screening: A comparison of reports from primary care physicians and average risk adults*," CRC is the 3rd leading cause of cancer deaths in the US affecting both men and women of all ethnic groups. In addition, African Americans have the highest incidence and mortality rates and have low adherence to recommended screenings and guidelines (Klabubde, 2005). The study goes on to mentions that it is unclear why African Americans have the highest rates of CRC and further studies need to be developed in order to understand this phenomenon. In addition, a study by James et al. supports the literature in reporting that African Americans were less likely to be adherent to CRC screening guidelines when compared to Caucasians, especially if a CRCS was not recommended by a physician.

In 2010, the estimated direct medical cost of colorectal cancer care was about $14 billion (CDC, 2011). However, early detection could substantially reduce the billions of dollars spent on cancer treatment each year (CDC, 2011). However, despite the aggressive national campaigns and evidence-based CRC screening guidelines aimed at increasing public education and awareness CRC screening remains underutilized (Atassi, 2012). It is imperative for patients to understand that early diagnosis and screening can saves lives. If CRC can be identified early treatment can be more effective and less expensive.

Further, the article entitled: "*The Role of Clinical Preventive Services in Disease Prevention and Early Detection"* by Maciosek describes how an integrative team based approach is essential in order to improve the CRC screening rates and reduce the cost, incidence and

mortality of CRC. The article further discusses that many public health preventive measures are effective measures and offers high economic value and may even produce net savings (Maciosek, 2006). Collaborations between clinical and public health community interventions offer high yield and promising health outcomes (CDC, 2011, Maciosek, 2006). The spending crisis will require a comprehensive search for ways to shift spending from services of low economic value to those with high cost-effectiveness or net savings (Maciosek, 2006). Patients want to get good value on the dollar, so it make sense to be proactive and to invest in health prevention with effective services that studies show are vital and offer good economic value. Prevention policies and programs often are cost-effective, reduce health care costs, and improve productivity (Maciosek, 2006).

In a study conducted by the *National Cancer Institute*, suggested key preventive strategies to reduce CRC mortality rates include: early diagnosis and screening, following evidence-based CRC screening guidelines aimed at increasing public awareness, aggressive campaigns and physician referrals (NCI, 2009). An example of a public policy strategy to improve CRC screening or prevention rates can be found in the article entitled: *"Promoting Prevention through the Affordable Care Act."* The author Koh describes how the passing of this legislation will reinvigorate the US health care system and redirect the focus on prevention at every level of society, such as the individual level, worksite level, community level and the national level (Koh, 2010). The significance of this legislation is that it will provide individuals with improved access to clinical preventive services and cover certain screening such as, screening for breast cancer, cervical cancer, and colorectal cancer. According to the literature, this policy change if implemented effectively could assist in improving the CRC disparities in the US. One of the main approaches of the ACA is to remove cost as a barrier to these services,

potentially opening new avenues toward health. For example, the development of new private health plans and insurance policies would cover a range of recommended preventive services with no cost sharing by the beneficiary (Koh, 2010).

Barriers to Colorectal Cancer Screening (CRCS)

The barriers to CRCS must be identified in order to be eliminated. The data from several studies have been reported to understand why the rates of CRC screening are so low. Factors that have emerged impacting patients non-adherence include financial enablers such as income and health insurance coverage, patient demographics, prevention intention, patient co-morbidities, physician recommendation, lack of reminders and tracking systems, healthcare system interactions (usual source of care or annual visits), and colorectal cancer risk (Subramanian et al., 2004). Many of these factors have been identified in previous studies to influence patient adherence to colorectal cancer guidelines. The populations most commonly affected by CRC include African Americans, Hispanics, Asians, new immigrants, individuals born outside the US, and those with limited proficiency with the English language.

A recent trend in the existing literature reports a major influence to the inadequate underutilization of CRCS is the lack of communication by health care providers about the importance of screening (Subramanian et al., 2004). Studies have shown that the absence of a physician's recommendation for screening reduces the likelihood of screening among both insured and uninsured individuals (CDC, 2011). Interestingly enough merely 50% of the general population is routinely screened, and the other half of the population has never been screened (Meissner et al., 2006 and Rim et al., 2011). It is known that screening rates are lower in populations that have limited access to health services, inadequate health insurance, low levels of formal education, and a high proportion of racial/ethnic minorities (Wee et al., 2005). Despite

evidence that regular screening reduces colorectal cancer death rates, data to inform the development of population-based screening programs for medically underserved populations are limited (Degroff et al., 2008 and Cokkinides et al., 2011).

Chapter 3

METHODOLOGY

This chapter will provide details to the research design, population, sample, sampling procedures, instruments, data collection procedures and data analysis process for the proposed study.

Study Design

The study utilized a quantitative approach. The method employed for this secondary data analysis was a cross-sectional study design using a convenience sample. Described as a comprehensive research strategy, the cross-sectional study method looks at a slice of the population at a single point in time, and can estimate prevalence and association (Shi, 2005). The variables were examined to determine the association between risk factors, the response variables and health outcomes. A review of the literature ascertains that similar research studies have also utilized the cross-sectional study design and quantitative approach (Shi, 2005). The quantitative approach was selected for this study in order to gain an understanding and insight on the study sample and to answer the research question and sub-question.

The data for this analysis is from the Southeast Georgia Cancer Alliance Integrative (SEGCA) project collected from September 2009 through June 2010 (Appendix A). This unique dataset presents an overview on the variables that affect adult patient's non-adherence to Colorectal Cancer Screening and ultimately reflects the disparities of Colorectal Cancer Screening for the uninsured and minority groups in Southeast Georgia.

Sample and Population

The sample data used in the study was obtained from the Southeast Georgia Cancer Alliance Integrative Project (SEGCA) survey collected from September 2009 through June 2010 (Ledlow, 2010; Appendix B- Table 1). The study primarily consisted of adult male and females, 45 years of age and under, and 45 years of age and older that were enrolled in the SEGCA integrative project from eleven counties of interest located in Southeast Georgia. These counties included Bryan, Bulloch, Chatham, Effingham, Liberty, Long, McIntosh, Montgomery, Screven, Toombs and Wayne counties. The socio-demographics for this study sample consisted of a majority of uninsured and minority groups.

The population for the study was a specific at-risk group of adults. The participants in this study were from a disparate population which suggests that their rate of CRC could be higher and their risk higher at younger ages, when considering the ACS guidelines for screening. The participants were enrolled in the integration of three colorectal cancer projects within the Southeast Georgia Cancer Alliance region. The three integrative projects included Chatham County Safety Net Planning Council: Assess-Connect-Teach (ACT) Program. ACT provided colorectal cancer health education and risk assessments to 800 uninsured adults and provided colorectal cancer screening to over 300 uninsured adults in Southeast Georgia (Ledlow, 2010; Appendix A). ACT also referred appropriate patients, those with family histories and other signs and symptoms, to Memorial University Medical Center's Anderson Cancer Institute for colorectal cancer genetic counseling and genetic testing (Ledlow, 2010; Appendix B- Table 1). Liberty County Health Department: Bottoms-Up Coalition provided colorectal cancer health education and risk assessments to uninsured adults in Liberty and surrounding counties and provided colorectal cancer screening and colonoscopies to participants that were identified as

low income and uninsured adults in Southeast Georgia (Ledlow, 2010; Appendix B- Table 1). The Bottoms-Up Coalition referred appropriate patients, those with family histories and other signs and symptoms, to Memorial University Medical Center's Anderson Cancer Institute for colorectal cancer genetic counseling and genetic testing. Finally, the Memorial University Medical Center: Curtis & Elizabeth Anderson Cancer Institute provided genetic counseling, genetic testing and colonoscopies to uninsured individuals in Southeast Georgia, who were at increased risk for hereditary colorectal cancer syndromes (Ledlow, 2010; Appendix B- Table 1).

Instrumentation

The data collection instrument was a simple and standardized form, designed exclusively for the Southeast Georgia Cancer Alliance Integrative Project. The data collection instrument was used as a transfer medium, onto which data elements to be analyzed were recorded by each of the three individual projects from September 2009 through June 2010 (Appendix A).

The individual project team leaders, Dr. James Repella, President of the Southeast Georgia Cancer Alliance, and Dr. Gerald Ledlow from Georgia Southern University's Jiann-Ping Hsu College of Public Health, Health Services, Policy and Management met in person in Savannah, Georgia twice in June and August 2009 and collaborated electronically in the months of June through early September 2009 to plan, prepare and develop the data elements, data flow process, research design and patient care flow process for this integrative project (Ledlow, 2010; Appendix B- Table 1).

Data Collection and Procedures

Data Collection:

The proposed study used data elements from the SEGCA Integrative project survey collected from the SEGCA Integrative project from September 2009 through June 2010 to examine the relationship between negative patient deviation and its association to Colorectal Cancer Screening. The original dataset included a sample size of N= 496 adult participants. After cleaning up the survey, missing cases were excluded bringing the sample size to n= 454 adult participants and 42 missing cases. According to Shi (2005), discovering a vital research finding is probable if the researcher utilizes the results of preceding studies to select variables of interest that are prone to having an association or relationship with one another. Therefore, the variables chosen for this study were selected based on the thorough literature review of similar research studies completed within this particular health related focus.

Dependent Variable:

The dependent variable for the study was negative patient deviation to CRCS. Negative deviation was re-coded based on three variables: 1) if the patient received a Fecal Occult Blood Test (Not provided or provided), 2) if a Colonoscopy was performed (Not provided or provided) and 3) the results from the Harvard Risk Assessment (Low Risk, Average Risk, or High Risk). An overall measure of negative deviation was created by summing up the values from the responses to all three of the previous items to yield the variable: negative deviation which was set to equal No Negative Deviation or Negative Deviation to CRCS. The measure negative deviation had a Cronbach alpha value of 0.67, indicating fair reliability. The dependent variable

was measured based on the aspects emphasized in the literature (ACS, 2012; CDC, 2011; OMH, 2011; Subramanian et al., 2004; Wallace et al., 2013).

Independent Variable:

The independent variables analyzed for the study were age, gender, BMI, education, annual family income, employment status, race/ethnicity, health insurance status, marital status, county of residence and household size. Age was categorized as Under 45 years old and 45 years old and older. BMI was categorized as < than 18.5, 18.5-24.9, 25-29.9 and 30-34.9. Gender was categorized as female vs. male. Employment status was categorized as employed full-time, employed part-time and not employed. Health insurance coverage was categorized as no insurance, Medicare, Medicaid, Private Pay Commercial, and Tricare/Federal/VA. Education was categorized as 8^{th} grade or less, 9^{th} grade, 10^{th} grade, 11^{th} grade, High school graduate, Technical College, Bachelors degree, or Graduate degree. Annual family income was categorized as < $10,000, $10, 000-$19,999, $20,000-$29,999 and $30,000-$39,999. County of residence was categorized as Bryan, Bulloch, Chatham, Liberty, Effingham, Long, McIntosh, Montgomery, Screven, Toombs and Wayne. Household Size was categorized as 1 person, 2 people, 3 people, 4 people, 5 people, 6 people and 7 people. Marital Status was categorized as Married, Divorced, Separated, Never married, Living together or Widowed/widower. The controlled variables analyzed in this study included: race/ethnicity, employment status, health insurance coverage, education, marital status and annual family income.

The purpose of the research study was to examine the association of the variables that influence at risk adults, non-adherence (Negative Deviation) to CRC screening. Moreover, this study will further recommend key innovative strategies to promote targeted initiatives to close

the gap in CRC screening and decrease negative patient deviation by advocating for strategies to improve screening rates. The study received IRB approval from Georgia Southern University.

Data Analysis

Univariate (Descriptive) Analysis

SPSS (formerly titled Statistical Package for the Social Sciences, version 18.0) and Microsoft Excel 2010 was used to conduct the statistical computations for the study. The de-identified data were used to calculate the descriptive statistics to summarize and describe the variable distributions and the observations that were made on the study sample. In particular, a descriptive analysis of the data was performed by computing weighted frequencies, percentages, missing values and proportions with standard deviations for the dependent and independent variables, along with the covariates. These figures were then calculated in the total sample and then among at-risk adult patients with a negative deviation (no negative deviation vs. negative deviation) to CRCS. Measures of central tendency were also calculated for each variable using SPSS.

Bivariate Analysis

Bivariate analysis was employed to analyze the strength of association of the variables within the study sample. Crosstab tabulating format in SPSS was used to evaluate the relationship between the dependent and independent variables while adjusting for potential confounder variables. Also, weighted frequencies and proportions with standard deviations for the independent and dependent variables were computed. These figures were calculated in the total sample, and then calculated among a sample of at-risk adults and the various characteristics that influence negative deviation to CRCS.

Bootstrap Analysis

Bootstrapping was utilized for the study in an attempt to understand and identify the shape of the sample distribution. Bootstrapping is a nonparametric procedure for estimating effect size and testing hypotheses (Mooney et al., 1993). This analysis provides greater power with small samples and yields bias-corrected 95% confidence intervals (Preacher et al., 2004). Normality in the data allowed the researcher to infer that the sampling distribution was normal. However, to prevent the researcher from assuming the shape of the sampling distribution, thereby, further ensuring normality in the sample, bootstrapping was performed to estimate the properties of the sampling distribution from the sample data (Field, 2009). Validation of the models was performed on the population by bootstrap re-sampling with replacement using 1000 iterations of the study sample (Driver et al., 2007). The statistics of interest were the estimates of the standard errors and confidence intervals. For nominal variables with one to two categories, the odds ratio value was recorded as the variable of interest. For nominal variables with more than two categories the uncertainty measure of association were recorded. For the ordinal variables gamma was the measure of association that was recorded. Additional statistics of interest were derived and recorded, such as the valve test, degree of freedom (df), mean, median, proportion, and the correlation coefficient (Field, 2009).

Conducting the bivariate correlations between the independent variables and dependent variable assisted in determining which independent variables could be included in the model. Furthermore, this analysis revealed whether a relationship existed between the variables and the strength of the relationship.

Multivariate Analysis

Logistic regression was performed to analyze and explore the relationship between the dichotomous dependent variables, and the categorical and continuous independent variables. Adjusted odds ratio (OR), confidence intervals (CI) and p values are displayed in table 3 and 4. Subsequently, the chi-square test was used to determine which variables were statistically significantly among those at risk adults who were non-adherent to undergoing a CRC screening.

The logistic regression models was constructed to model multivariable associations between the dependent variable Negative Deviation to CRCS and all the independent variable; age (Under 45 years old and 45 years old and older), gender (female vs. male) and BMI (< than 18.5, 18.5-24.9, 25-29.9 and 30-34.9), Education (8^{th} Grade or Less, 9^{th} Grade, 10^{th} Grade, 11^{th} Grade, High School Graduate, Technical College, Bachelors Degree, Graduate Degree, Household Size (1 person, 2 people, 3 people, 4 people, 5 people, 6 people and 7 people), Ethnicity (Hispanic, African American, White and Asian), Employment Status (Employed full time, Employed part time and Not employed), Health Insurance Coverage (No Insurance, Medicare, Medicaid, Private Pay Commercial and Tri-care/Federal/VA), Annual Family Income (< $10,000, $10, 000-$19,999, $20,000-$29,999 and $30,000-$39,999), marital status (Married, Divorced, Separated, Never Married, Living Together and Widowed/Widower) and County of residence (Bryan, Bulloch, Chatham, Liberty, Effingham, Long, McIntosh, Montgomery, Screven, Toombs and Wayne). Two-way interactions between the dependent variable (negative deviation) and each of the independent variables was performed, while considering other confounding variables. All analysis in the study used weighted data to yield a result, with the aim of retaining those reaching significance levels of $p < 0.05$.

Confounders were assessed in the models by identifying which subsets of covariates were within 10% of the assumed "Gold Standard" Model containing all possible confounders and then

subsequently using the most precise subset among eligible subsets of the covariates. The crude and adjusted odds ratios were also considered in the analysis.

Chapter 4

RESULTS

Descriptive Analysis

Overall, a total of 496 adults participated in the Southeast Georgia Cancer Alliance Integrative project. Adult patients who had missing characteristics from the data elements were excluded from the study. A total of n= 454 adult patients were included in the analysis of the study. The demographics of the participants included a total of 398 participants (80.24%) that were 45 years of age and older and 98 of the participants (19.76%) that were under 45 years of age and under (Table 1). The mean age of participants was 50.95 years of age, and 72.01% were female, while 27.99% were male (Table 1). Fifty-four percent of the participants were classified as obese (BMI $\geq$ 30), almost 28% were reported as overweight (25 $\leq$ BMI < 30), 17% of the participants were classified as normal weight and less than 1% was classified as underweight (Table 1).

Of the total number of participants, 97% did not have health insurance and over 2% of the participants had some type of health insurance. 39% of the participants were high school graduates, 19% of the participants had some college, 10% completed the 11^{th} grade, and 7% had technical degrees (Table 1). A significant number of the study sample resided in Chatham County (83.9%). The annual family income for most of the participants was less than $10,000 (56%), and about 54% of the participants were not employed (Table 1). In regards to the participants ethnicity, 59.92% of the participants were African American, 36.61% of the participants were White, 2.04% of the participants were Hispanic and 1.43% of the participants were Asian (Table 1). Most of the participant's household size included 1 person (patient only) 39%, 28% of participants in the study were never married, and 28% of the study participants

were either married or divorced (Table 1). In regards to employment status, 28.04% of the participants were employed full time, 17.11% of the participants were employed part time, and 54.85% of the participants were not employed (Table 1). In addition, the model showed that when analyzing the dependent variable a total of 129 participants had no negative deviation (adherence) to CRCS and 325 participants had a negative deviation (non-adherence) to CRCS.

Table 1. Socio-Economic and Demographic Characteristics of the Study Population, 2010.

Variables	Frequency (n)	Percentage (%)	Missing, n, (%)
Age			
Under 45 years old	98	19.76	
45 years old and older	398	80.24	
BMI			4 (0)
Underweight	4	0.81	
Normal Weight	84	17.07	
Overweight	137	27.85	
Obesity	267	54.27	
Gender			3 (.6)
Male	138	27.99	
Female	355	72.01	
Race/ Ethnicity			7 (1.4)
Hispanic	10	2.04	
African American	293	59.92	
White (not Hispanic)	179	36.61	
Asian	7	1.43	
Education			4 (.8)
8th Grade or less	23	4.67	
9th Grade	22	4.47	
10th Grade	37	7.52	
11th Grade	53	10.77	
High School Graduate	192	39.02	
Some College	96	19.51	
Technical College	37	7.52	
Bachelor's Degree	26	5.28	
Graduate Degree	6	1.22	
Marital Status			12 (2.4)
Married	137	28.31	
Divorced	138	28.51	

Separated	42	8.68	
Never Married	139	28.72	
Living Together	1	0.21	
Widowed/ Widower	27	5.58	
Health Insurance Coverage			4 (.8)
No Insurance	479	97.36	
Medicare	3	0.61	
Medicaid	7	1.42	
Private Pay Commercial	1	0.20	
Tricare/Federal/VA	2	0.41	
Household Size			4 (.8)
1 person (patient only)	194	39.43	
2 people	161	32.72	
3 people	77	15.65	
4 people	37	7.52	
5 people	14	2.85	
6 people	6	1.22	
7 people	3	0.61	
Employment Status			11 (2.2)
Employed Full Time	136	28.04	
Employed Part Time	83	17.11	
Not Employed	266	54.85	
Annual Family Income			5 (1.0)
< $10,000	276	56.21	
$10,000 to $19,999	181	36.86	
$20,000 to $29,999	30	6.11	
$30,000 to $39,999	4	0.81	
County of Residence			
Bryan	12	2.4	
Bulloch	3	.6	
Chatham	416	83.9	
Effingham	11	2.2	
Liberty	44	8.9	
Long	4	.8	
McIntosh	1	.2	
Montgomery	1	.2	
Screven	1	.2	
Toombs	1	.2	
Wayne	2	.4	
Total	**496**	**100.00**	

Source: Southeast Georgia Cancer Alliance, 2010.

Bivariate Analysis

Table 2 displays the factors associated with adult patient negative deviation to colorectal cancer screening. Among this surveyed sample, 68.68% of adult patients 45 years old and older had a negative deviation to recommended colorectal cancer screening (Table 2). Participants under 45 years old had an 83% negative deviation (Table 2). Males (78.03%) were more likely to have a negative deviation when compared to adult female participants. Obese (78.14%) participants were more likely to have a negative deviation compared to overweight and normal weight participants (Table 2). African American (74.64%) adult participants were more likely to have a negative deviation compared to Whites (non-Hispanics), Asians and Hispanics ethnicities (Table 2). Adult participants that only completed the 9^{th} to 11^{th} grade (81.82%) were more inclined to have a negative deviation to CRCS compared to the rest of the educational levels (Table 2). Adult participants that lived with 5 or more people (85%) were more likely to have a negative deviation compared to the other categories (Table 2). In addition, adult participants that were never married (75.97%) were more likely to have a negative deviation to CRCS (Table 2). 72.75% of adult participants that had an annual family income of less than $10,000 to $19,000 were more likely to negatively deviate than participants with an annual family income (56.25%) of $20,000 to $39,000 (Table 2). Adult participants that had other (private pay commercial and Tricare/Federal/VA) as their health insurance (100%) were more likely to have a negative deviation to CRCS, followed by adult patients that did not have health insurance (71.49%) when compared to participants with Medicare, Medicaid or some other type of health insurance (Table 3). Participants that resided in Liberty County (50%) and other Counties (59.38%) were less likely to have a negative deviation than participants from Chatham County (73.71%) that participated in the study (Table 2).

Table 2. Bivariate Association between the Socio-Economic and Demographic Factors and Adult Patients Negative Deviation to CRCS, 2010.

Variables	Negative Deviation (Based on FOBT Screening, Colonoscopy Performed and/or Harvard Assessment)		Total
	No Negative Deviation Frequency (n) Percentage (%)	Negative Deviation Frequency (n) Percentage (%)	
Age (p-value=0.003)*			
Under 45 years old	15 (16.67%)	75 (83.33%)	
45 years old & older	114 (31.32%)	250 (68.68%)	
			454 (100%)
Gender (p-value=0.008)*			
Male	29 (21.97%)	103 (78.03%)	
Female	100 (31.06%)	222 (68.94%)	
			454 (100%)
BMI (p-value=.004)*			
Underweight	2 (66.67%)	1 (33.33%)	
Normal weight	24 (31.58%)	52 (68.42%)	
Overweight	49 (38.28%)	79 (61.72%)	
Obesity	54 (21.86%)	193 (78.14%)	
			454 (100%)
Race/ Ethnicity			
Hispanic	3 (42.86%)	4 (57.14%)	
African American	70 (25.36%)	206 (74.64%)	
White (not Hispanic)	54 (32.53%)	112 (67.47%)	
Asian	2 (40.00%)	3 (60.00%)	
			454 (100%)
Education			
8th Grade or less	8 (36.36%)	14 (63.64%)	
9th Grade to 11th Grade	20 (18.18%)	90 (81.82%)	
High School Graduate	56 (32.75%)	115 (67.25%)	
Some College to Technical College	35 (28.69%)	87 (71.31%)	
Bachelor's Degree	7 (29.17%)	17 (70.83%)	
Graduate Degree	3 (60.00%)	2 (40.00%)	
			454 (100%)
Household Size			
1 person (patient only)	54 (30.17%)	125 (69.83%)	

2 people	44 (29.93%)	103 (70.07%)	
3 people	22 (30.14%)	51 (69.86%)	
4 people	6 (17.14%)	29 (82.86%)	
5 people or more	3 (15.00%)	17 (85.00%)	
			454 (100%)
Marital Status			
Married/ Living Together	36 (27.48%)	95 (72.52%)	
Divorced	43 (32.58%)	89 (67.42%)	
Separated/ Widowed/ Widower	19 (30.65%)	43 (69.35%)	
Never Married	31 (24.03%)	98 (75.97%)	
			454 (100%)
Health Insurance Coverage			
No Insurance	126 (28.51%)	316 (71.49%)	
Medicare/Medicaid	3 (33.33%)	6 (66.67%)	
Other Insurance	0 (0%)	3 (100.00%)	
			454 (100%)
Employment Status			
Employed Full Time	40 (32.00%)	85 (68.00%)	
Employed Part Time	26 (33.33%)	52 (66.67%)	
Not Employed	71 (28.29%)	180 (71.71%)	
			454 (100%)
Annual Family Income			
< $10,000 to $19,999	115 (27.25%)	307 (72.75%)	
$20,000 to $39,999	14 (43.75%)	18 (56.25%)	
			454 (100%)
County of Residence (p-value= .013)*			
Chatham	102 (26.29%)	286 (73.71%)	
Liberty	17 (50.00%)	17 (50.00%)	
Other Counties	13 (40.62%)	19 (59.38%)	
			454 (100%)

Source: Southeast Georgia Cancer Alliance, 2010. *The significance of difference is based on the bootstrap Analysis.

Multivariate Analysis

Table 3 reports the bootstrap resampling estimates based on the socio-demographic characteristics and adult patient negative deviation to CRCS. Table 3 illustrates the value test, degrees of freedom (df), bootstrap inferences (gamma, odds ratio and the uncertainty measures

of association and the confidence intervals) and the p value. Validation of the models was performed on the population by bootstrap resampling with replacement using 1000 iterations of the study sample (Driver et al., 2007). In the bootstrap analysis (Table 3) four characteristics were significantly associated with non-adherence to CRCS. The ordinal variable age had a gamma measure of association of .454, 95% CI= .699-.879 and p = .000 (Table 3). The ordinal variable BMI had a gamma measure of association of .058, 95% CI= .046-.268 and p = .004 (Table 3). Of the nominal variables gender had an odds ratio (OR=.534; 95% CI= .317-.855), and p = .008 and county of residence had an uncertainty measure of association value of .014, CI= .020-.075 and a p value of .013 (Table 3). The rest of the nominal variables showed no significance to non-adherence to CRCS (Table 3). There was a significant association between age and negative deviation to CRCS and the variable BMI and negative deviation to CRCS, gender and negative deviation to CRCS, and county of residence and negative deviation to CRCS (Table 3).

Table 3. Bootstrap Analysis of Association between the Socio-Economic and Demographic Factors of Adult Patients Negative Deviation to CRCS, 2010.

Variables	Valve Test	df	Bootstrap Inference			P value
			Gamma Measure of Association	CI L	U	
Age	.786	1	.454	.699	.879	.000
BMI	.160	1	.058	.046	.268	.004
Education	.788	1	.069	.804	1.068	.335
Household Size	.073	1	.074	.928	1.259	.327
Employment Status	.121	1	.083	.952	1.324	.155
Annual Family Income	2.718	1	.090	.755	1.054	.216

			Odds Ratio (OR) Measure of Association			
Gender	7.097	1	.534	.317	.855	.008
			Uncertainty Measure of Association			
Ethnicity	.011	1	.009	.003	.039	.094
Marital Status	.003	1	.004	.001	.017	.558
Health Insurance Coverage	.013	1	.010	.004	.043	.311
County of Residence	.035	10	.014	.020	.075	.013

Source: Southeast Georgia Cancer Alliance, 2010

Table 4 reports the multivariate logistic regression of the significant factors that showed illustrated an association to adult patient negative deviation. Age, gender, BMI and county of residence were included in the final multivariate model, as there is evidence that these variables demonstrate an association with non-adherence to CRCS. According to the findings the mean age for adult patients to have a negative deviation was 50 years of age. The p-value for age was p=0.003 (Table 4). Participants under 45 years of age were 1.8 times as likely (OR=1.857; 95% CI: 1.002-3.441) to report a negative deviation compared to participants 45 years of age and older. Further, a significant association was found between gender (p = 0.003) and negative patient deviation to CRCS. Males were 1.7 times as likely to be non-adherent to CRCS compared to females (95% CI= .292-.780) (Table 4). BMI was also a significant variable that contributed to negative patient deviation. There was a strong association between BMI and negative deviation to CRCS the p value for this variable was p= 0.018 (Table 4). The results also illustrated a significant correlation between obese participants versus underweight, normal weight,

overweight (Table 4). Obese participants were 7.8 times as likely (OR= 1/0.129= 7.751; 95% CI: 0.238-.606) to be non-adherent to CRCS compared to underweight participants (Table 4). In addition, a significant relationship between normal weight adults (OR=3.496; 95% CI: 0.010-1.01) versus underweight and overweight adult participants (OR=3.344; 95% CI: .339-1.03) resulted in significant associations to negative deviation to CRCS. Adult participants residing in Chatham and Liberty County were 1.6 times as likely to have a negative deviation to CRCS compared to participants that lived in other counties (Table 4). Participants with an annual family income of less than $10,000 to $19,999 were 2 times as likely to having a negative deviation to CRCS compared to adult participants with family incomes of $20,000 to $39,999 (Table 4). The variable Annual family income showed moderate significant associations to patient negative deviation to CRCS in adult patients, although its p value was 0.064 (Table 4). The variables race/ ethnicity, marital status, education household size, employment status and health insurance status all demonstrated decreased odds of having any association to negative deviation to CRCS in this study sample (p-values >0.05). After controlling for confounding variables age, gender, BMI and county of residence all showed strong associations to negative patient deviation to CRCS.

Table 4. Logistic Regression Analysis of Adult Patients Negative Deviation to CRCS, 2010.

Variables	Adjusted Odds Ratio (OR)	95% CI		P value
		L	U	
Age				0.003
45 years old & older vs. Under 45 years old	1.857	.218	.736	
Gender				0.003
Female vs. Males	1.784	0.292	0.780	
BMI				0.018
Underweight vs. Normal weight	3.496	0.010	1.01	
Underweight vs. Overweight	3.344	0.023	1.03	
Underweight vs. Obesity	7.751	0.010	.606	

County of Residence				0.019
Chatham vs. Other Counties	1.680	1.348	2.094	
Liberty vs. Other Counties	1.682	1.139	2.857	
Annual Family Income				0.064
$20,000 to $39,999 vs. < $10,000 to $19,999	2.075	0.985	4.370	
Race/ Ethnicity				0.814
African American vs. Others	0.756	0.211	2.710	
White (not Hispanic) vs. Others	0.860	0.238	3.113	
Marital Status				0.785
Divorced vs. Married Living Together	0.988	0.523	1.865	
Separated/Widowed/ Widower vs. Married Living Together	0.961	0.441	2.095	
Never Married vs. Married Living Together	0.747	0.375	1.488	
Education				0.417
High School Graduate vs. No High School Diploma	1.565	0.888	2.758	
Some College to Technical College vs. No High School Diploma	1.370	0.739	2.542	
College Degree or Higher vs. No High School Diploma	1.738	0.691	4.368	
Household Size				0.560
2 People vs. 1 person (patient only)	0.943	0.574	1.552	
3 People vs. 1 person (patient only)	1.001	0.530	1.891	
4 People vs. 1 person (patient only)	0.515	0.196	1.352	
5 People or more vs. 1 person (patient only)	0.481	0.132	1.748	
Employment Status				0.294
Employed Part Time vs. Employed Full Time	0.907	0.496	1.659	
Not Employed vs. Employed Full Time	1.325	0.826	2.126	
Health Insurance Status				0.747
Insurance vs. No Insurance	0.790	0.189	3.306	

Chapter 5

SUMMARY DISCUSSION AND CONCLUSION

Discussion

The findings from this study support current existing literature in reporting that if patients adhered to CRC screening guidelines and recommendations CRC maybe preventable (CDC, 2012, ACS, 2011). Despite the established efficacy of CRCS more than half of the people recommended for screening are not screened (ACS, 2009). Colorectal Cancer screening is the only way to detect colorectal cancer and this is why disparities in colorectal cancer are a major public health concern. The literature and this study reveal that there are many social determinants of health that contribute to negative patient deviation to CRCS. For this proposed study an integration of three colorectal cancer projects within the Southeast Georgia Cancer Alliance region collaborated to provide colorectal cancer screening services to at-risk adults in Southeast Georgia. To the researchers knowledge this was the first time a partnership between three organizations, collaborated to deliver a colorectal cancer screening integrative project, utilizing the same agreed upon protocol. Upon further review of the general demographics for the population in the Southeast region of Georgia, in particular the counties of interest in this study, this region represents a rural area where the majority of the residents are White, middle to low income, a population with more females than males, and a high age range of people between the ages of 18 to 64 years old (US Census Viewer, 2010).

The results of this study suggest that about 70% of the participants in the study sample had a negative deviation (non-adherence) towards receiving colorectal cancer screening. The study further identified age, gender, BMI and county of residence as key characteristics having a strong association to why the participants in this study sample were non-adherent to CRC

screening. In this study negative deviation was classified in two ways no negative deviation (adherence) and negative deviation (non-adherence). At-risk adult patients who did not adhere to physician recommendations to CRCS were identified as a negative deviation, meaning the patients wanted less of the recommended health services (Ledlow, 2010). However, if patients adhered to physician recommendations this was identified as a positive deviation meaning the patients wanted more of the recommended health services (Ledlow, 2010).

The results of this study showed a majority of male study participants were more likely to be non-adherent than female study participants in receiving CRCS. The study confirms screening for colorectal cancer continues to be low among male adults in Southeast Georgia. The literature suggests the low rates in males could be for various reasons such as the lack of physician referrals, fear, fatalism, lack of time, patient co-morbidities, patient refusal, lack of reminders & tracking systems, lack of education and awareness of CRC, lack of health insurance and the fear that their CRCS exam would be positive for cancer (Steele et al., 2013, Meissner et al., 2006, Etzioni et al., 2004, Brawarsky et al., 2003). The study also highlights that more females participated in the study and this group's adherence rates were somewhat low as well, although higher than the male participants. Although the literature findings are mixed in relationship to gender and CRCS, prior work supports this study in reporting that colorectal cancer screening is increasing for both men and women, even though the prevalence of testing and death rates remains higher in men (Rive et al., 2013, Steele et al., 2013, Meissner et al., 2006, Etzioni et al., 2004, Brawarsky et al., 2003).

Further, the mixed literature supports the results of the current study in documenting that females are more likely to be adherent to CRCS and males are more likely to be non-adherent. In this study the higher adherence rates (no negative deviation) to colorectal cancer screening were

found in the female participants when compared to male participants. This supports the existing literature findings with respect to women going to the hospital more, being screened more, having better patient-physician communication and having lower incidence and mortality rates than males, especially minority racial/ethnic male participants (Steele et al., 2013, Meissner et al., 2006, Etzioni et al., 2004, Brawarsky et al., 2003). On the other hand, Seeff and colleagues study found that males had higher utilization of certain CRCS test modalities than women, further supporting the results of this study on the mixed correlation of CRCS based on gender. Furthermore, men having more colonic adenomas than women coupled with the belief that colorectal cancer is a man's disease may have contributed to the slower uptake of colorectal cancer screening among some of the female participants in the study (Meissner et al., 2006, Burke et al., 2000).

A comprehensive review of the literature suggests a majority of adults over the age of 50 still do not understand the array of colorectal cancer screening modalities that are available to prevent CRC and why they should be screened for CRC. The mean age of the participants in the study sample was 50.95 years old. In this study age was significantly associated with negative patient deviation to CRCS. The study findings suggests that adults under 45 years of age had an 83.33% ($p = .003$) negative deviation from recommended CRCS compared to at-risk adults 45 years of age and older. The findings show that participants under 45 years of age were more likely to have a negative deviation to CRCS, supporting the literature on low expectations in screening rates from younger participants at-risk of CRC. In addition, the finding suggests that minority participants in this region should be screen before the age of 50 because their rate of CRC is higher, and their risk for CRC is higher at younger ages. Of the participants 45 years of age and older 69% had a negative deviation to colorectal cancer screening. The screening

behavior patterns observed in the current study based on age are consistent with the literature with regard to age and CRCS. Seeff et al., found that for CRC screening use is highest among adults in their sixties and then decreases with increasing age. The existing literature supports the study findings, that age is a significant predictor of CRC. This is an interesting phenomenon considering 50 is the age that is recommended to be screened and 90% of new cases occur in people 50 or older (ACS, 2011, CDC, 2012). It is highly important for at-risk adults in this age group to be aware that the incidence and death rates of CRC increases with age (ACS, 2011, CDC, 2012). In the study, 250 participants, 45 years of age and older at some point during the study protocol did not adhere to CRCS. This is a very high number of participants. However, 114 of the participants in this age group adhered to recommended screening. According to the American Cancer Society the incidence rate of CRC is 15 times higher in adults 50 years of age and older than those 20 to 49 years of age.

Prior work examining age differences in CRCS report if everyone 50 years of age and older were screened regularly; it could prevent at least 60% of CRC deaths (ACS, 2011, CDC, 2012, Seeff et al., 2004). In addition, Seeff et al study found the lack of awareness from participants of the need for colorectal cancer screening and the lack of a physician recommendation for the exam were barriers to non-adherence to screening in participants 50 years of age and older, which is consistent with the current study's findings. Moreover, Weinburg et al. study found that a majority of older adults did not understand that "age" could be a risk factor for CRC or could not identify any other risk factors that contributed to CRC. For example, in a study by MeGregor (2008) some of the patients in this study had never heard of a colonoscopy. The literature suggests that age influences screening behavior (Gilbert et al., 2005). A study by Lemon et al., found males age 65-74 were more likely to be adherent than males age

50-68, these results also support the current study findings. This study confirms that screening for colorectal cancer continues to be low in Southeast Georgia.

Furthermore, the study observed a low prevalence of screening among participants under 45 years of age, who chose not to get screened even when test results confirmed they were at an increased risk for CRC. Future research needs to be conducted on this group because regardless of age, this group represents a shadowed population within the study sample that should start screening at the age of 45. According to the American Society for Gastrointestinal Endoscopy, African Americans represent a group at higher risk for CRC because of socio-demographic characteristics such as, family history, life-style related factors, and age. Although, all women and men ages 50 and older should begin routine CRCS at age 50, the current literature reports that African Americans are being diagnosed at a younger age. As a result researchers recommend African Americans to be screened at 45 years of age (ASGE, 2010). Overall differences were presented by age group, nonetheless in order to save the lives of at-risk adults recommended screening should start at age 50 and continue to age 70 in average risk adults (ACS, 2011, CDC, 2012).

The literature examining BMI and CRCS suggests overweight and obese adults are less likely to adhere to CRC screening (Messina et al., 2012). The results from the current study are similar with prior literature, suggesting that BMI within the overweight and obese range has a significant association with non-adherence to CRCS (Cameron et al., 2010). The current study identified at risk adults with higher BMI to have a strong association to non-adherence to CRCS. Obese and overweight participants were more likely to be non-adherent to recommended screening when compared to normal weight or underweight participants. The odds of participants with a BMI classified as obese of having a negative deviation to CRCS were 7.8 times the odds

of a participant that was underweight (Table 3). The American Cancer society reports that being overweight or obese is associated with a higher risk of CRC, with stronger associations observed in men than women. Also, the literature suggests that obesity in the US continues to rise and awareness of overweight and obesity as a CRC risk remains low in the general population (Hawkins et al., 2010) and among those with high BMI (Messina et al., 2012, Hawkins et al., 2010, Cameron et al., 2010). The combination of low perceived risk for CRC in addition to behaviors such as, fear, fatalism or worrying about CRC is associated with the intentions of non-adherence (Messina et al., 2012; Ferrer et al., 2011). Therefore, the findings suggest the potential value of targeting interventions to increase education and awareness of the urgent need for CRC education, screening and for reducing BMI among at risk adults. This health disparity is a major public health concern and will require a comprehensive approach in reducing the incidence and mortality of CRC in the study sample.

The risk factors for CRC identified in this study are consistent with the findings of other multivariate analysis for this sample. The independent variables age, gender and BMI were significantly associated with at risk adult patient's negative deviation to CRCS. Interesting enough, after performing the bootstrap analysis and running the logistic regression the variable county of residence ($p= 0.19$) displayed a significant association to negative patient deviation to CRCS (Table 3). Southeast Georgia is considered to be a rural region of Georgia. Studies propose that rural residents may have less access to instruments, facilities and trained physicians needed to perform CRCS (CDC, 2011, NCI, 2011, Gilbert et al., 2005, Walsh et al., 2003) supporting the study findings that rural residents have higher rates of non-adherence to CRCS. The study results also support the *National Cancer Institute* reports that older rural residents typically represent high risk minority populations that have low incomes, less education and have

less access to or utilization of early cancer detection programs than their urban counterparts which ultimately results in reduced survival rates. In another study, Gilbert and colleague found that participants with a usual source of care, higher annual family incomes, or were residents that resided in urban areas were more likely to have improved access to health care resources and participate in CRC screening than rural residents with the same conditions. Additional covariates that were analyzed in the research study, and exhibited an insignificant association and/or weak relationship to negative patient deviation included household size, employment status, ethnicity, marital status, health insurance coverage, annual family income and employment status (Table 3).

Thus, the gaps in the literature and mixed literature findings suggest a critical need for programs such as the SEGCA integrative project. The SEGCA integrative project and the results from this study proved to be effective in identifying the need for CRCS services in the Southeast region of Georgia. These programs are essential for increasing compliance or adherence in screening recommendations in populations such as the population reflected in this sample. More than half of the uninsured and minority participants in the study had a negative deviation to colorectal cancer screening, and according to the literature and the results of the study it was subsequently due to participant's lack of knowledge about CRC, age, gender and BMI consequently resulting in low screening rates. Overall, the research study was successful in identifying and providing services to a vulnerable population of uninsured and minority participants and was able to educate them on the opportunities for reducing disparities both through a primary intervention through education and secondary prevention through screening.

Although a large number of participants had a negative deviation to CRCS, an unexpected sufficient amount of participants in the study actually adhered to recommended

CRCS (received education, a risk assessment, colonoscopy and FOBT screening) and for those participants these results can be considered as future cost of care avoidance and potential lives saved due to screening. According to the American Cancer Society although African Americans have the highest CRC incidence and mortality rates, prevention measures need to be increased for all racial/ethnic groups. Furthermore, throughout the review of the literature there were quite a few gaps and mixed or inconsistent findings that were presented across several of the studies as it related to non-adherence. A study conducted by Bryant et al., suggested that some key reasons for patient deviation included: the lack of physician referrals, fear, lack of time, patient co-morbidities, patient refusal, lack of reminders and tracking systems, lack of education and awareness of CRC, lack of health insurance and the fear that their CRCS exam would be positive for cancer. To facilitate adherence to CRC screening guidelines, it is important to understand the role of factors such as co-morbidity and access to primary care.

CRC screening programs have different advantages and limitations that physicians should discuss with their patients as part of the process on informed decision making. According to the U.S. Preventive Services Task Force (USPSTF), regular screening for colorectal cancer can reduce deaths by as much as 60% (U.S. Department of Health and Human Services, 2008). In the future if CRC can be prevented it will have to go beyond the concept of individual behavior change. It will have to take a multidimensional approach with the involvement of public health practitioners, health care providers, the patient and policy makers to develop effective strategies, policies and accessible health promotion programs that are innovative and comprehensive enough to educate, train and influence at-risk adults to be screened in order to improve their health outcomes.

Additionally, the review of the literature highlights some of the vital public health implications surrounding the issue of CRC include the urgency to develop effective interventions to reduce disparities in CRC screening participation. Currently, only half of the U.S. population aged 50 and older are screened regularly (ACS, 2010). Among those without health insurance coverage, the screening rates decrease to about 15% (ACS, 2010). The low rates of screening are an indicator that more research and innovative interventions need to be developed in order to encourage patients to get screened. For example, the CDC has started a campaign to aggressively utilize social media and patient reminder systems to inform, educate and empower people about CRC screening. In addition, another effective strategy is the Healthy People 2020 goal to perform CRC screening in up to 70.5% of CRC patients, and if those goals are met close to 1,000 additional CRC deaths will be prevented each year (USPSTF, 2008). An additional public health implication is partnerships between community based organization and clinical settings that need to be developed. Studies show that a team based approach is effective in delivering and enhancing quality and transparent health care to patients with chronic illnesses. In addition, having a well-trained and educated staff to assist in delivering care is essential in delivering quality health care.

The Affordable Care Act (ACA) was developed based on the need for healthcare reform and consistent issues straining the United States healthcare system (KFF, 2013). For example, some of the issues affecting the US healthcare system include the large number of people who lacked health coverage, the high overspending on healthcare, poor health outcomes, health disparities that still exist among various populations and a healthcare system that emphasized treatment instead of prevention (KFF, 2013). The ACA was the multi-level solution to answer and addressing the United States toughest healthcare issues. The goal of the ACA is to expand

and improve access to care (KFF, 2013). Some of the highlights of Colon Cancer screening in the ACA are to ensure access to evidence-based cancer screenings, education, awareness and quality treatment to prevent CRC. In addition, the ACA seeks to eliminate cost barriers to patients in need of CRCS by addressing the low rates in the utilization of recommended preventive services, strategically eliminating out-of-pocket cost for preventive services such as colonoscopies and exempts preventive services under the Medicare program (ACS, 2010). Legislation and mandates similar to the ACA will have to be effectively implemented at the state and local levels in order to make a significant difference in the lives of uninsured and minority patients. Reports suggest that even with the passing of the ACA and in light of the enrollment of over 6 million people to health insurance under the Affordable Care Act (Obama Care), more than 20 million people will still remain underinsured or uninsured (CBO, 2014, KFF, 2014), and programs such as the SEGCA Integrative Project will be essential in reaching those vulnerable populations with significant health disparities exist.

Moreover, the researcher of this study found that negative patient deviation from recommended CRCS can lead to poor health outcomes and increased mortality rates. At-risk adults over the age of 50 in the SEGCA region should try to adhere to recommended screenings by healthcare providers. Overweight and obese adults in the SEGCA region should try to get screened regularly, maintain a healthy weight, consume healthier diets and adopt a physically active life style. Men are at increased risk for developing CRC and this is why it is important for men in the SEGCA region to get screened early. Effective leadership, compassionate physicians, innovative screening strategies and public health policy implications are necessary to increase CRC screenings. Successful policies and mandates that cover CRCS, the support from federal and state funding for CRCS and treatment programs, access to evidence-based prevention and

early detection and treatment services are critical to CRC patients and even more essential to medically underserved at-risk adults (Flowers, 2013).

Conclusion

The significant morbidity and mortality due to colorectal cancer in the United States, underlines the need for an improved and innovative, comprehensive, understanding of the social determinants of health and characteristics that may result in at-risk adults non-adherence to colorectal cancer screening and its drastic consequences. Screening has been shown to result in the early detection of CRC and CRC prevention. The incidence of CRC can be reduced with enhanced efforts directed at mass screening of at-risk adults 50 years and older (ACS, 2010). This study revealed a significant association between age, gender and BMI in adult patient's non-adherence to CRCS within the study sample.

The existing literature correlates to this study in that, in this particular study sample there is an essential need for aggressive and effective initiatives to promote colorectal cancer screening to target adults 45 years of age and older, at-risk adults under 45 years of age, males and people who are obese or overweight. In addition, there is a need for health promotion and awareness programs such as the Southeast Georgia Cancer Alliance Integrative project, to provide free screenings to this service area. Programs and effective polices are imperative to ensure minority and uninsured populations such as the ones represented in this study have access to evidence-based cancer screenings and quality treatment to combat the fight against colorectal cancer.

Limitations

For this proposed study the findings are not generalizable to other populations, only to the population within the study sample. Future studies are needed with a diverse population and

more participants to determine if this model of health promotion and screening prevention can be successfully implemented on a larger scale. In addition, utilization of a convenient sample was also a limitation of the study. Moreover, since the dataset is secondary the researcher had no control over what was included in the survey instrument to be collected in the dataset; thereby, limiting the data analysis. Despite the limitations, evidence for the effect of this efficient and highly focused model is compelling and could be tested in a variety of populations.

Public Health Implications:

The literature reflects the urgency and importance of expanding preventive services such as CRC screening. This is why a multidimensional approach to delivering health care with partnerships between the community, community based organizations and primary care settings is warranted and should continue to be formed. Studies show that a team based approach is effective in delivering and enhancing quality and transparent health care to at-risk patients that suffer from chronic illnesses. In addition, there is a need to develop effective strategies, policies and accessible health promotion programs that are innovative and comprehensive enough to educate, train and influence at-risk adults to be screened in order to improve their health outcomes. For example, the CDC has started a campaign to aggressively utilize social media and patient reminder systems to inform, educate and empower people about CRCS. (CDC Screen for Life: National Colorectal Cancer Action Campaign, 2011). Another effective strategy includes the Healthy People 2020 cancer objectives of promoting evidence-based screening and supporting monitoring trends. If both of these strategies are done correctly this could increase CRCS by 70.5% in the US, and prevent 1,000 CRC deaths each year (CDC, 2011).

Moreover, aligning policies to support opportunities for health and improving health outcomes is very important for all patients. According to researchers, focusing on insurance coverage and funding initiatives to increase CRC screening can improve health services and the continuum of care for patients. An example of an initiative or policy to get more people covered in order to reduce the barriers to screening is the Affordable Care Act (ACA). The ACA decided to address the low rates in the utilization of recommended preventive services and has strategically eliminated out-of-pocket cost for preventive services such as colonoscopies & FOBTs. In addition the ACA exempts preventive services under the Medicare program (ACS, 2010). Furthermore, advancing health equity will assist the United States health care system in reducing and eliminating health disparities in order to improve health outcomes. Access to quality affordable health care is fundamental to improved health outcomes and having well-trained and educated staff members, to assist in delivering care are essential in delivering quality health care. Finally, it is important for all patients to know that CRC can be prevented, treated and defeated.

Recommendations

As public health practitioners and researchers, it is important that as we conduct research studies, we identify and disseminate the key findings to the community and contribute to the existing literature. This process assists patients and communities to obtain access to the information, and to become aware and educated on their health care needs in order to make well informed decisions about their health. For example, the establishment of a national standard for CRCS referral and follow-up system should be developed for all physicians to adhere to and implement while in the examination room with patients. This could drastically increase the uptake of screening in at-risk groups. This study demonstrated the importance of adhering to

early screening to prevent colorectal cancer. Also, this study identified the socio-demographic factors or determinants of health that contributed to adult patient negative deviation in the sample population. Further studies need to be conducted on these factors and additional factors that may influence negative patient deviation to colorectal cancer screening. In addition, training community leaders to mobilize community stakeholders to establish local health policy campaigns is needed. Empowering communities to engage in advocacy efforts to enhance public policies to reduce health disparities related to all race/ethnicities, especially African Americans is also needed and very important to improving health outcomes.

In addition, promoting healthy environments and improved access and the use of healthcare services, increased awareness about health issues and related social and economic problems, mobilizing communities to encourage health insurance enrollment by its members are all essential strategies to promoting healthy lifestyles and improving health outcomes. For example, the development of a campaign for worksite wellness to increase the adoption of workplace health promotion programs could motivate both men and women to become educated on CRC and to get screened for prevention of CRC and better health. Additional evidence-based recommendations include communities having access and partnerships to health promotion programs that are innovative and comprehensive enough to educate, train and influence at-risk adults to be screened. Programs such as the SEGCA integrative project will provide underserved and uninsured people increased access to screening services so that cancer or any other disease can be prevented, detected early and treated if necessary. Finally, essential health technology tools and innovative health care reform should continue to be developed and enhanced to effectively assess the factors that are associated with non-adherence to CRCS.

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Appendix A:

Preliminary Survey

SEGCA INTEGRATIVE PROJECT FY 2010

Client Identification #:_____ Today's Date:_____/_____/_____ Project: **Memorial** ☐ **Liberty** ☐ **Chatham SNet** ☐ **SGHS** ☐

Client Demographic Information *What is the Client's?*

Age (years old):_____

Birth Date: _____
Month Day, Year

Gender: Male ☐ Female ☐

Ethnicity: Hispanic/Latino ☐ African American ☐ White, not Hispanic ☐ Asian ☐ Native American ☐ Pacific Islander ☐ Multiple Ethnicities ☐

Current Health Insurance Coverage:
No Insurance ☐
Medicare ☐
Medicaid ☐
Employer –Based Commercial ☐
Private Pay Commercial ☐
Tricare/Federal/VA ☐
Other ☐

Date Last Medical Examination:
Date: _____
Month Day, Year

Location of Residence:
County: _____
Zip Code:_____

Employment Status:
Employed Full Time ☐
Employed Part Time ☐
Not Employed ☐

Yearly Family Income (All Sources):
Less than $10,000 ☐
$10,000 to $19,999 ☐
$20,000 to $29,999 ☐
$30,000 to $39,999 ☐
$40,000 to $49,999 ☐
$50,000 to $59,999 ☐
$60,000 to $69,999 ☐
$70,000 to $79,999 ☐
$80,000 or more ☐

Education Completed:
8th Grade or less ☐
9th Grade ☐
10th Grade ☐
11th Grade ☐
High School Graduate ☐
Some College ☐
Technical College ☐
Bachelors Degree ☐
Graduate Degree ☐

Household Size:
(Client Only) 1 ☐
(Client +) 2 ☐
3 ☐
4 ☐
5 ☐
6 ☐
7 ☐
8 ☐
9+ ☐

Marital Status:
Married ☐
Divorced ☐
Separated ☐
Never Married ☐
Living Together ☐
Widowed/Widower ☐

Height:_____' _____"
feet inches

Weight:_____ **pounds**

Project Services: Mark all Completed

Colorectal Cancer Education ☐ **Harvard Assessment** ☐
Genetic Counseling ☐ **Genetic Testing Performed** ☐
FOBT Screen Performed ☐ **Colonoscopy Performed** ☐
Referred to: Memorial ☐ **Liberty** ☐ **Chatham SNet** ☐ **SGHS** ☐
Referred to Invasive Surgery ☐
Other (write in):_____

Outcomes/Results:

Harvard Assessment: Low ☐ **Average** ☐ **High** ☐
Genetic Testing: Positive ☐ **Negative** ☐.
FOBT: Positive ☐ **Negative** ☐
Colonoscopy: Polyp(s) Removed ☐ **No Polyps** ☐
Colonoscopy: # Polyps_____
Colonoscopy: Positive ☐ **Stage**_____ **Negative** ☐
Next Colonoscopy (Date): _____

SEGCA INTEGRATIVE PROJECT FY 2010

Client Referral: Genetic Counseling to Memorial

If Client has:

☐ History of colon or endometrial cancer before age 50 years old

☐ History of adenomas before age 40 years old

☐ History of 100 or more adenomas at any age

☐ A Family history of 2 or more 1st or 2nd degree relatives:

- with colon, endometrial, stomach, or ovarian cancer; 1 relative must be diagnosed before age 50 years old or
- with ten (10) or more adenomas.

If any boxes are checked, please refer for genetic counseling:

Fax this form and patient demographics to 912-350-0927.

CLIENT DEVIATION INFORMATION

Client Identification #:_____ Today's Date:_____/_____/_____ Project: **Memorial** ☐ **Liberty** ☐ **Chatham** ☐ **SNet** ☐ **SGHS** ☐

Client Birth Date:_____/_____/_____ **Month Day, Year**

Month Day, Year

If the Client **Deviates** from project recommendations, place an **'X'** in the appropriate box for **positive** (client wants **more services** than recommended) or **negative** (client wants **less services** than recommended) **and place an 'X' on the line / continuum of services where the deviation occurred**. Please finish by **writing in why the client wants to deviate** in their 'words.'

Positive Deviation ☐ **Negative Deviation** ☐

In → **Out**

Welcome **Education** **FOBT** **Colonoscopy** **Invasive Surgery**

Memorial Only **Genetic Counseling** **Genetic Testing**

Reason(s) for Deviation: 1. _____

2. _____

3. _____

Thank you!

Send by mail or email (scan document) or I can pick up in batches; Dr. Ledlow (912-531-9392) at:

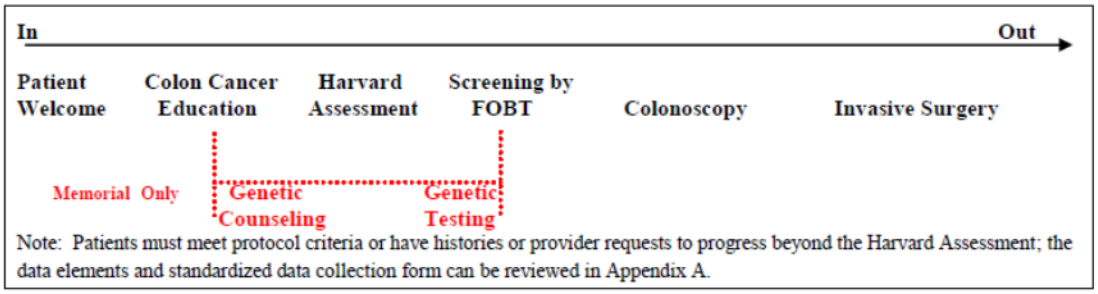
1015 Johnson Drive Statesboro, Georgia 30461

gledlow@georgiasouthern.edu

Appendix B

Preliminary Table

Table 5. Patient Flow process for SEGCA Integrative Project



Note: Patients must meet protocol criteria or have histories or provider requests to progress beyond the Harvard Assessment; the data elements and standardized data collection form can be reviewed in Appendix A.

Appendix C

Figures of Colorectal Cancer

Figure 1. Diagram of Colorectal Cancer

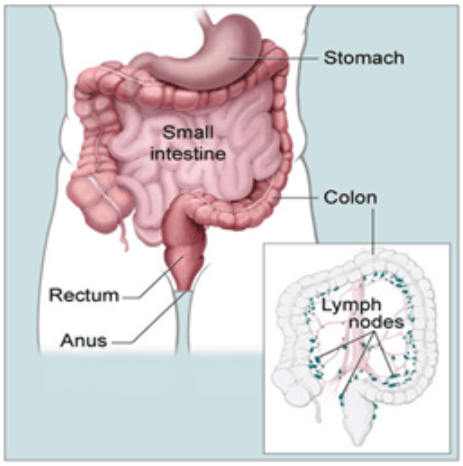
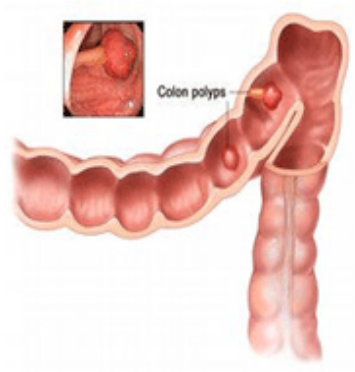


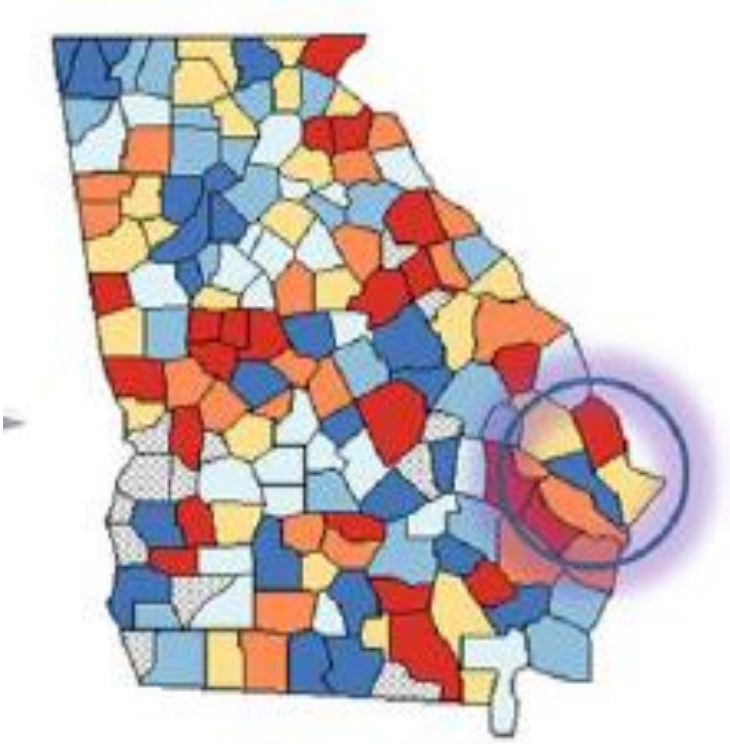
Figure 2. Diagram of Colorectal polyps with abnormal growths inside the colon



Appendix D

State map of Georgia with the counties of interest in the Southeast Georgia Cancer Alliance Integrated Project

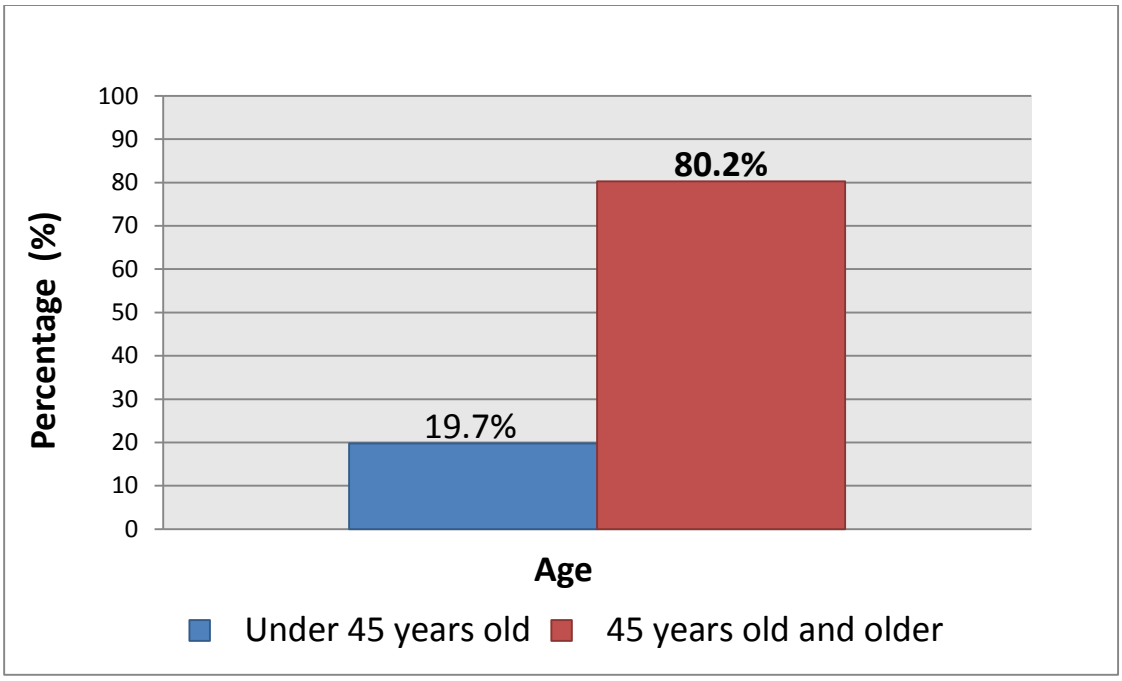
The counties of interest fall within the circle on the map below. They include: Bryan, Bulloch, Chatham, Effingham, Liberty, Long, McIntosh, Montgomery, Screven, Toombs and Wayne.



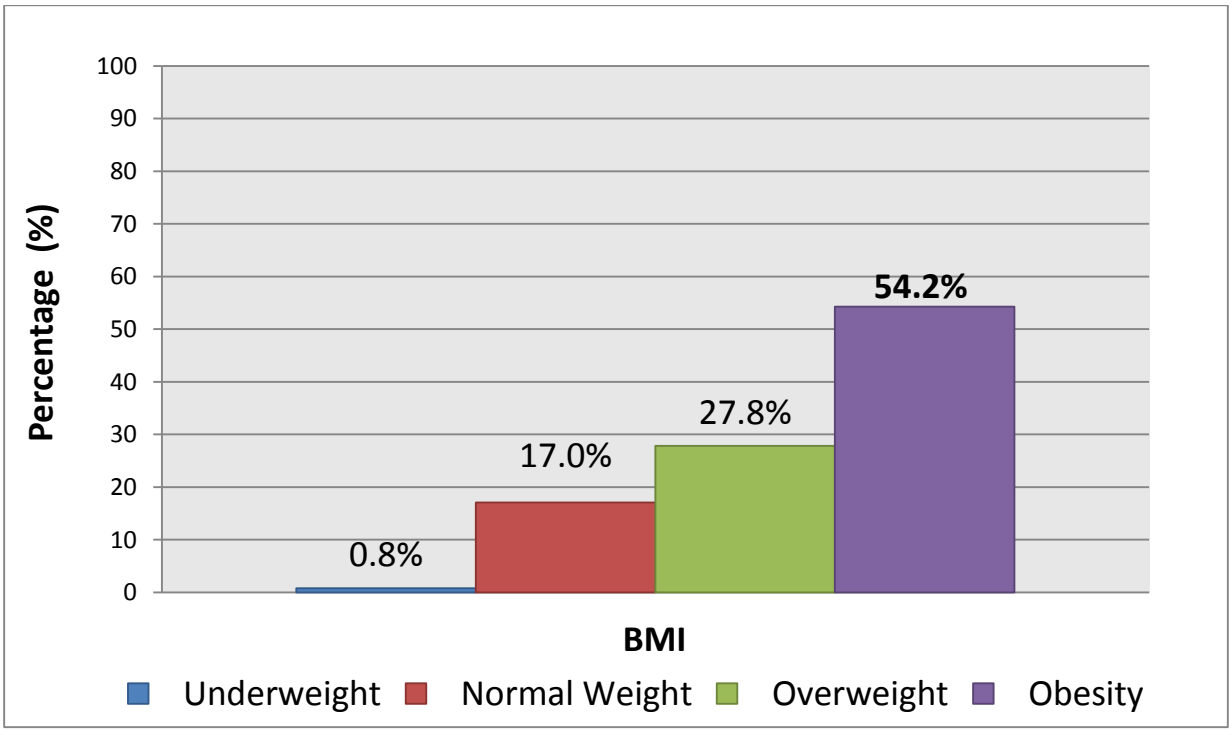
Appendix E

The Socio-Demographics and Socio-Economic Characteristics of the Study Population

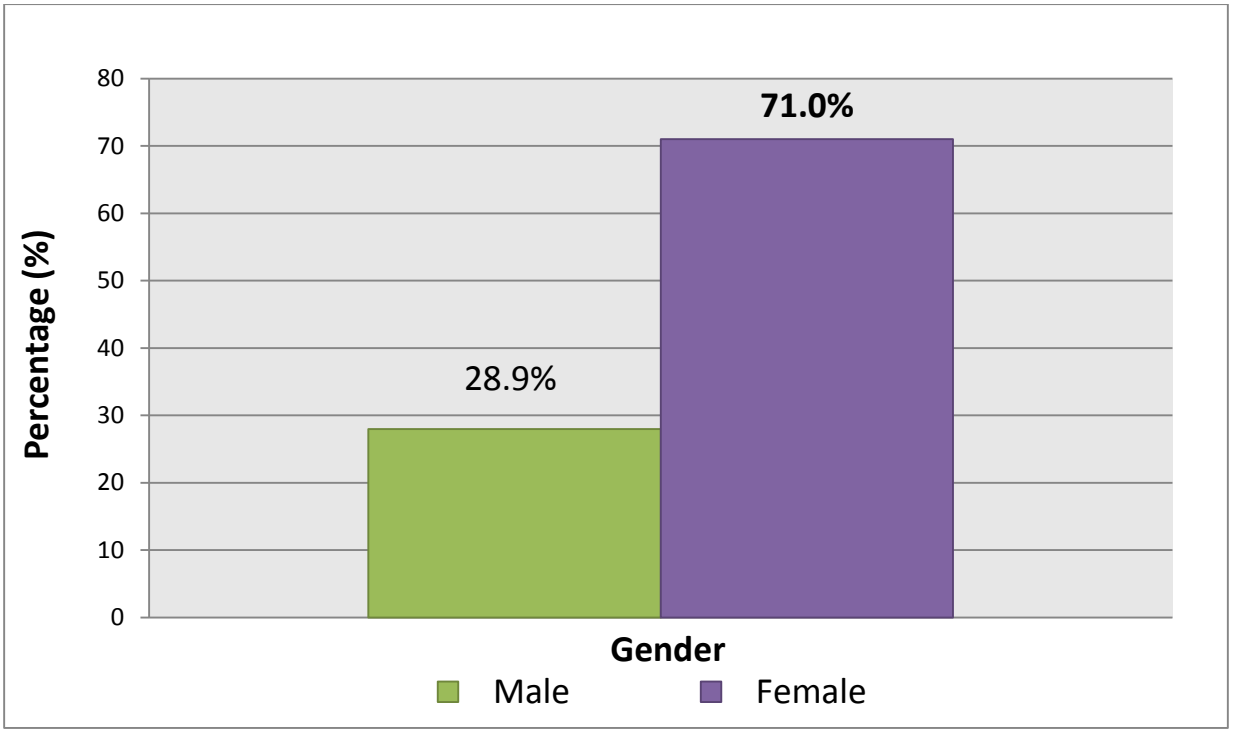
Graph 1: Age Composition of the Study Population, 2010



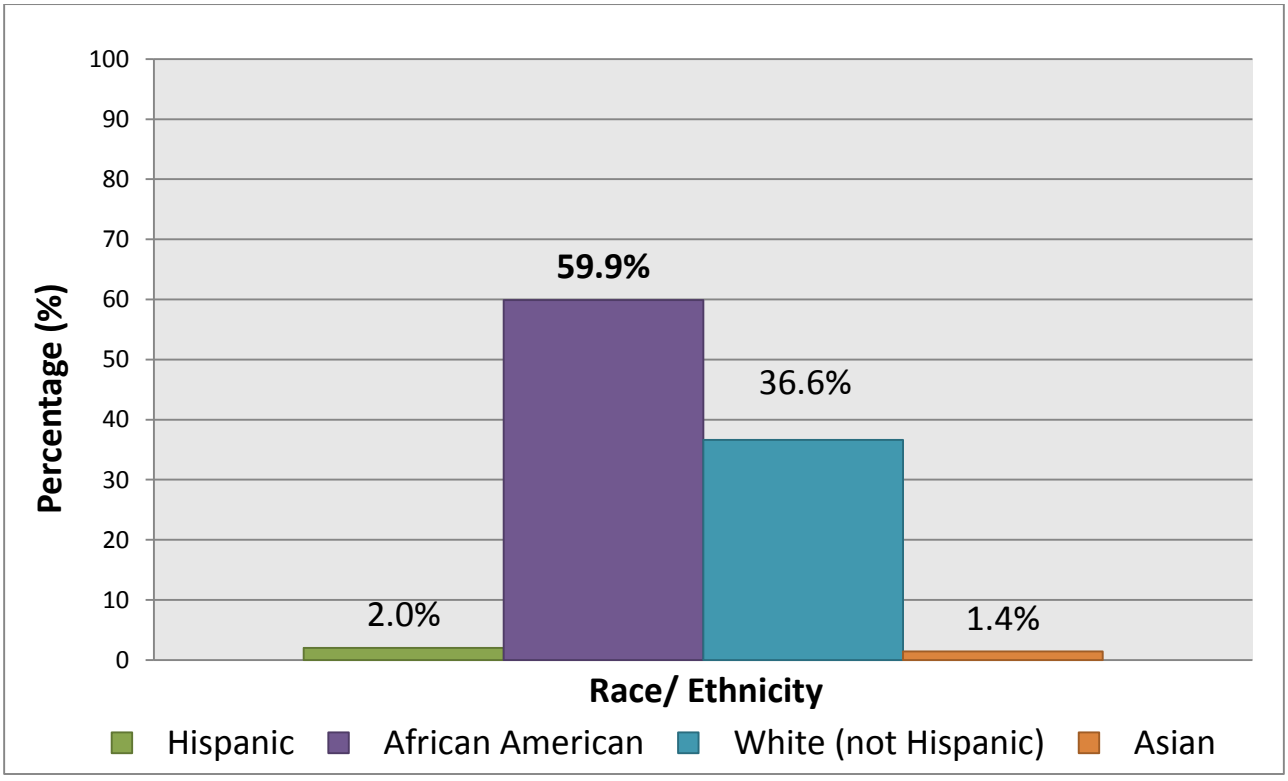
Graph 2: Distribution of the Study Population by BMI, 2010



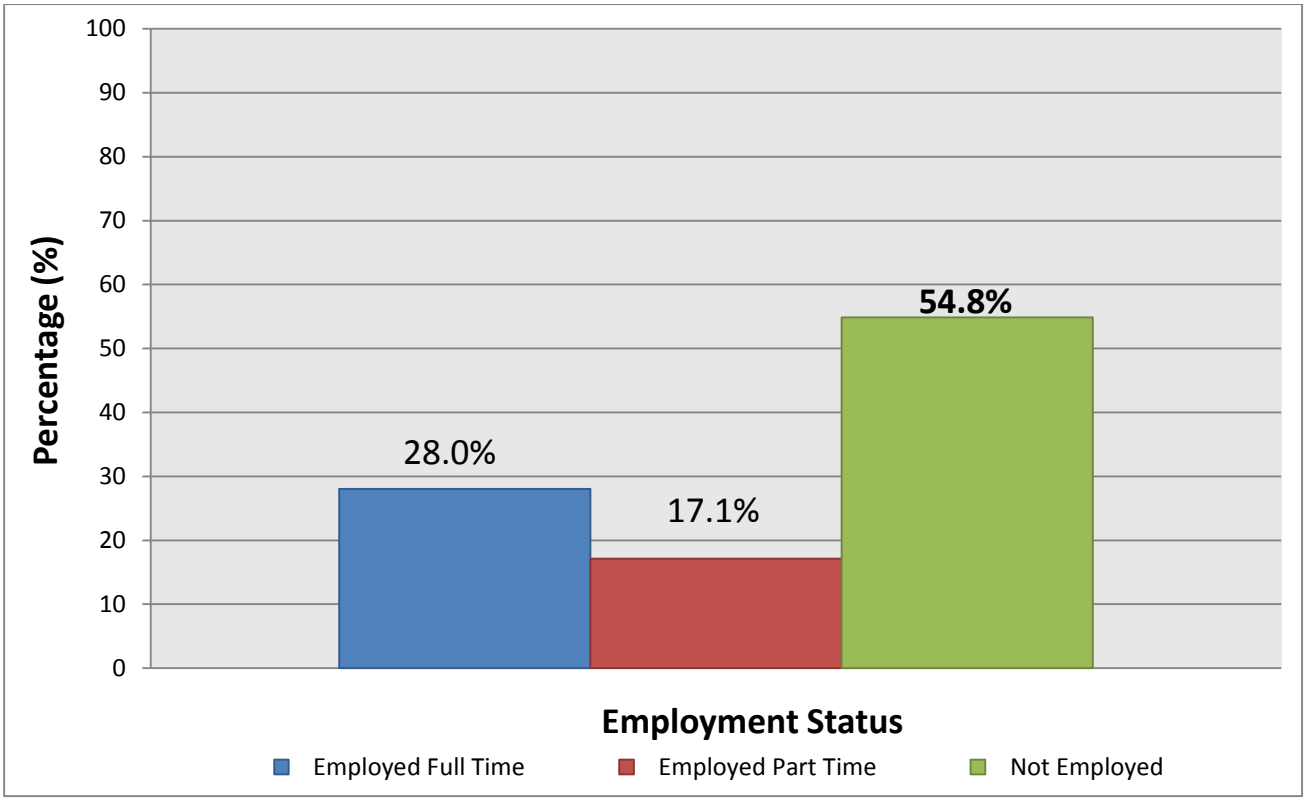
Graph 3: Gender Composition of the Study Population, 2010



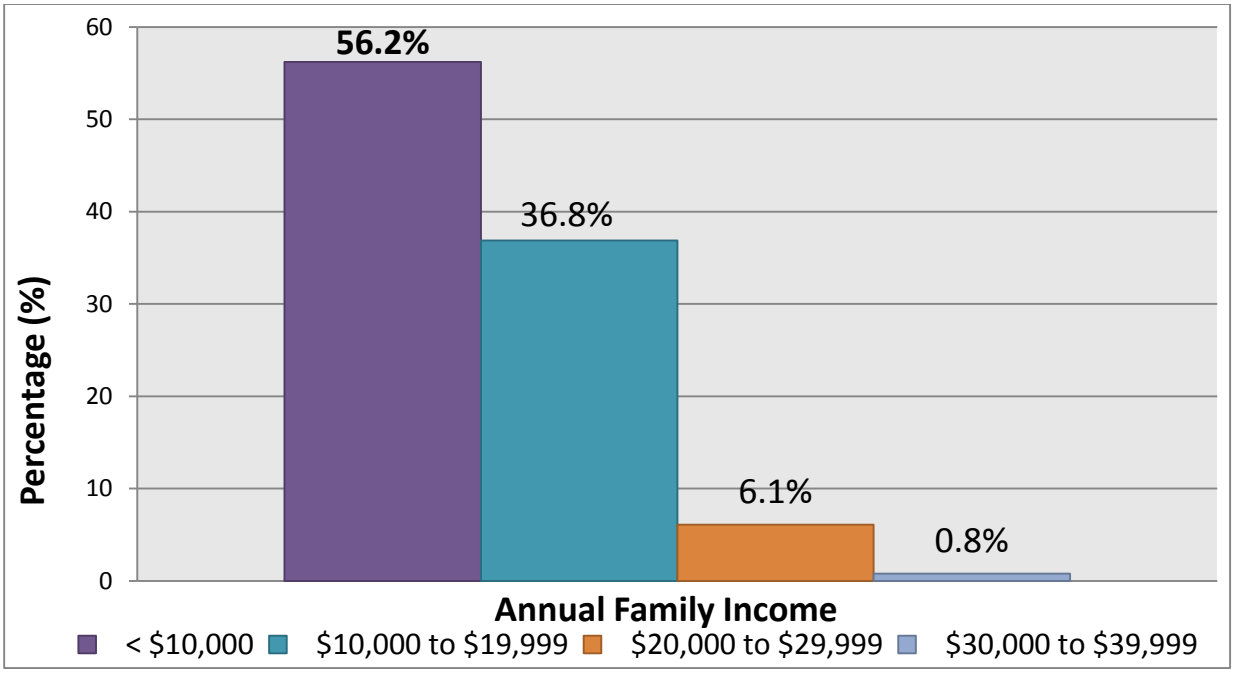
Graph 4: Distribution of the Study Population by Race/Ethnicity, 2010



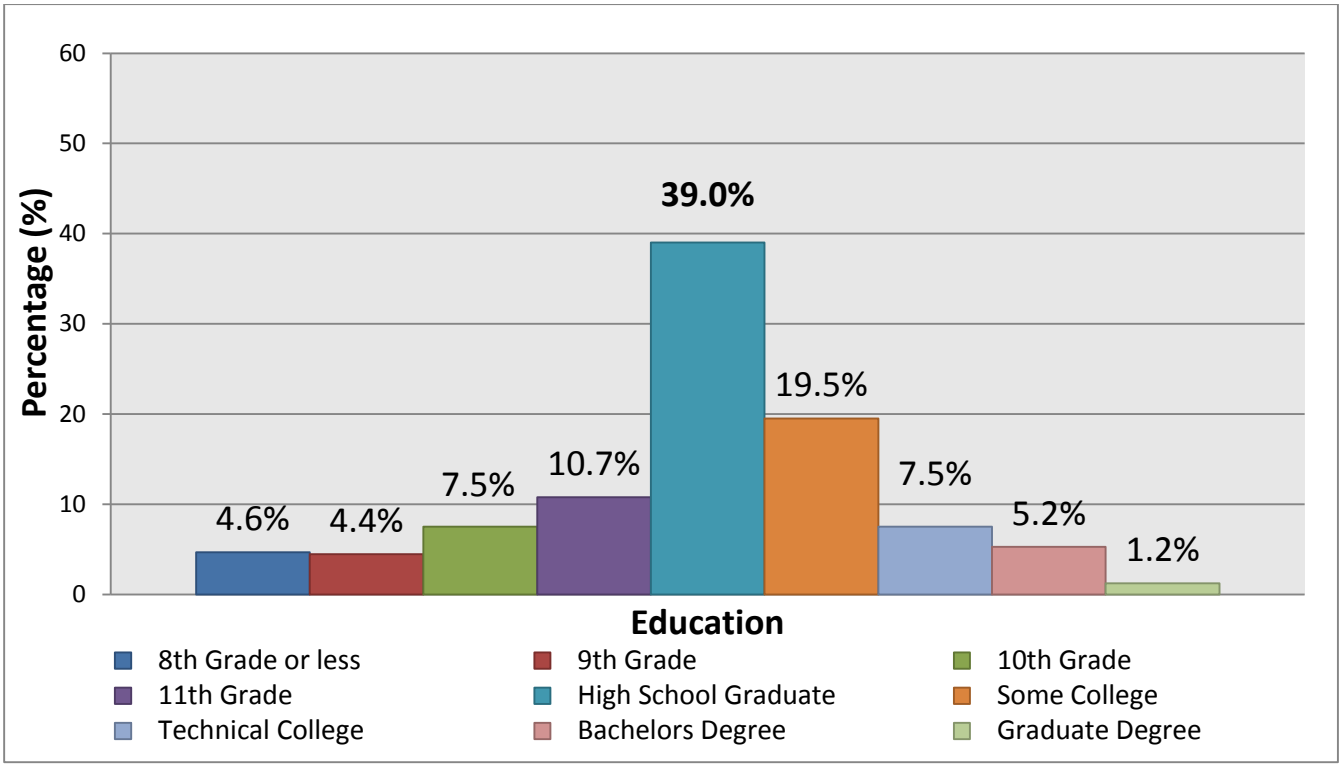
Graph 5: Distribution of the Study Population by Employment Status, 2010



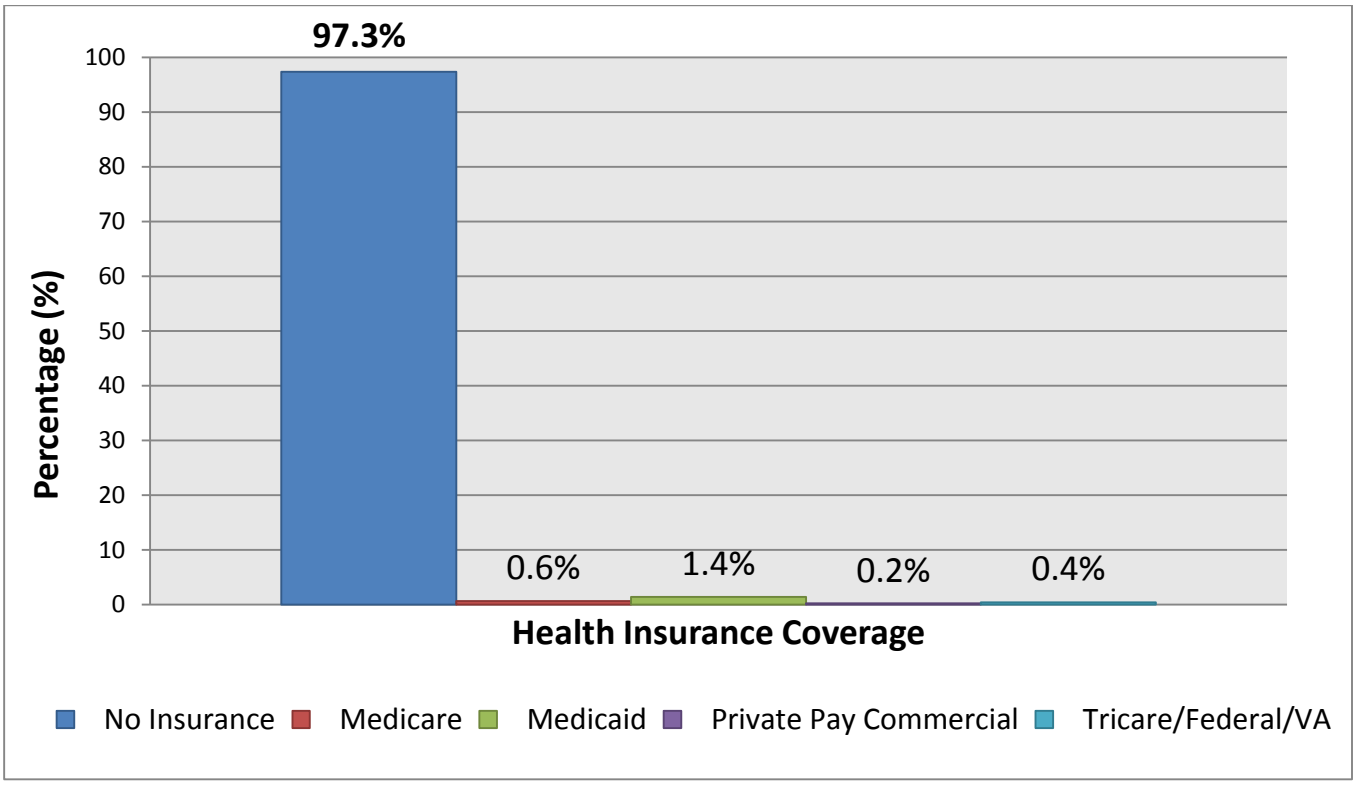
Graph 6: Distribution of the Study Population by Annual Family Income, 2010



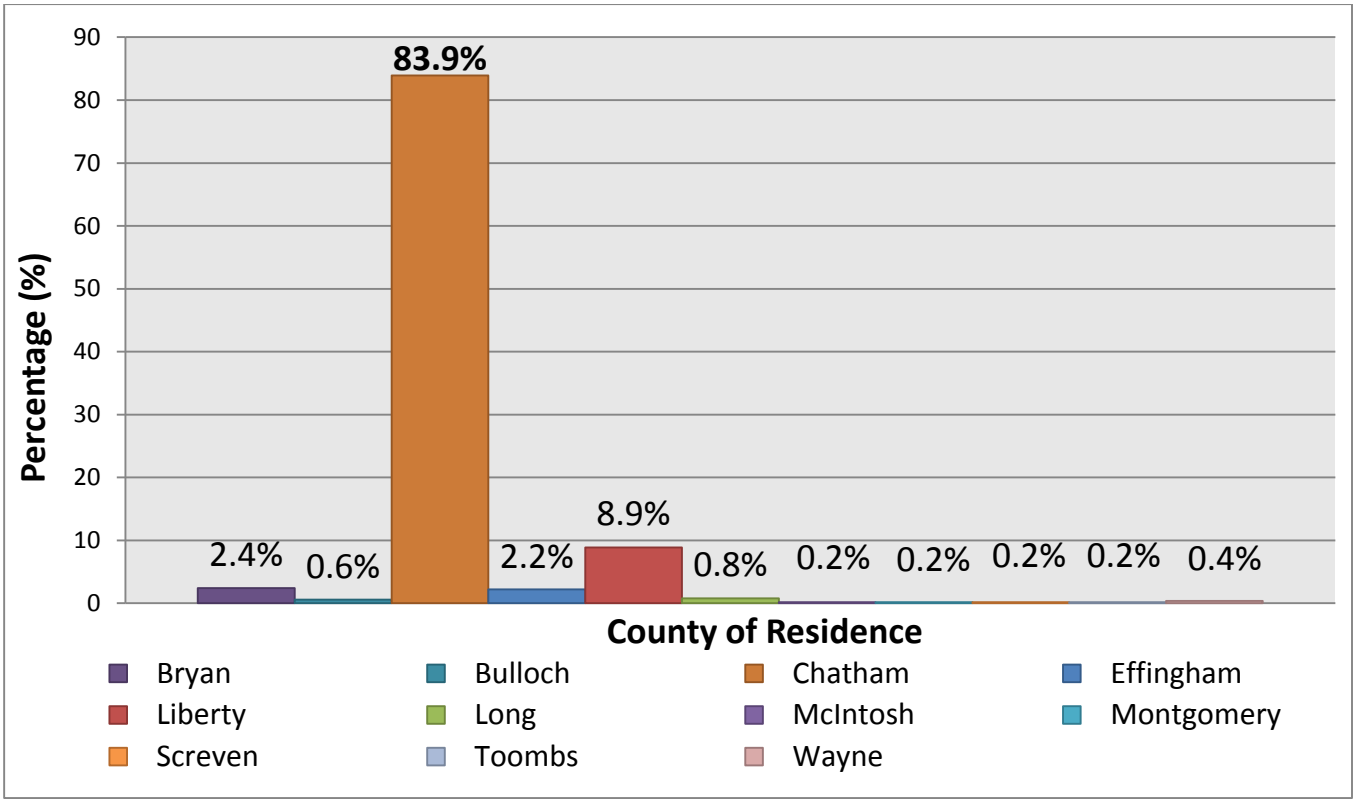
Graph 7: Distribution of the Study Population by Education, 2010



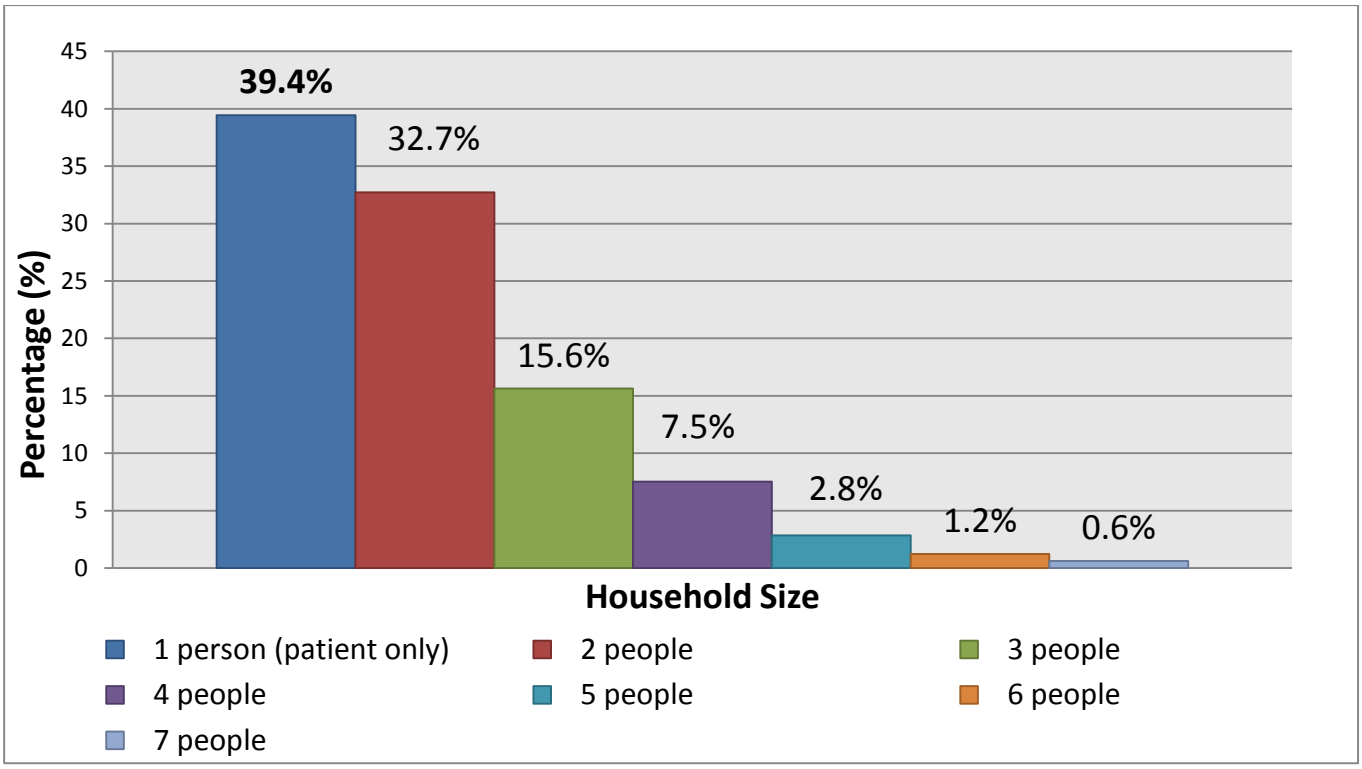
Graph 8: Distribution of the Study Population by Health Insurance Coverage, 2010



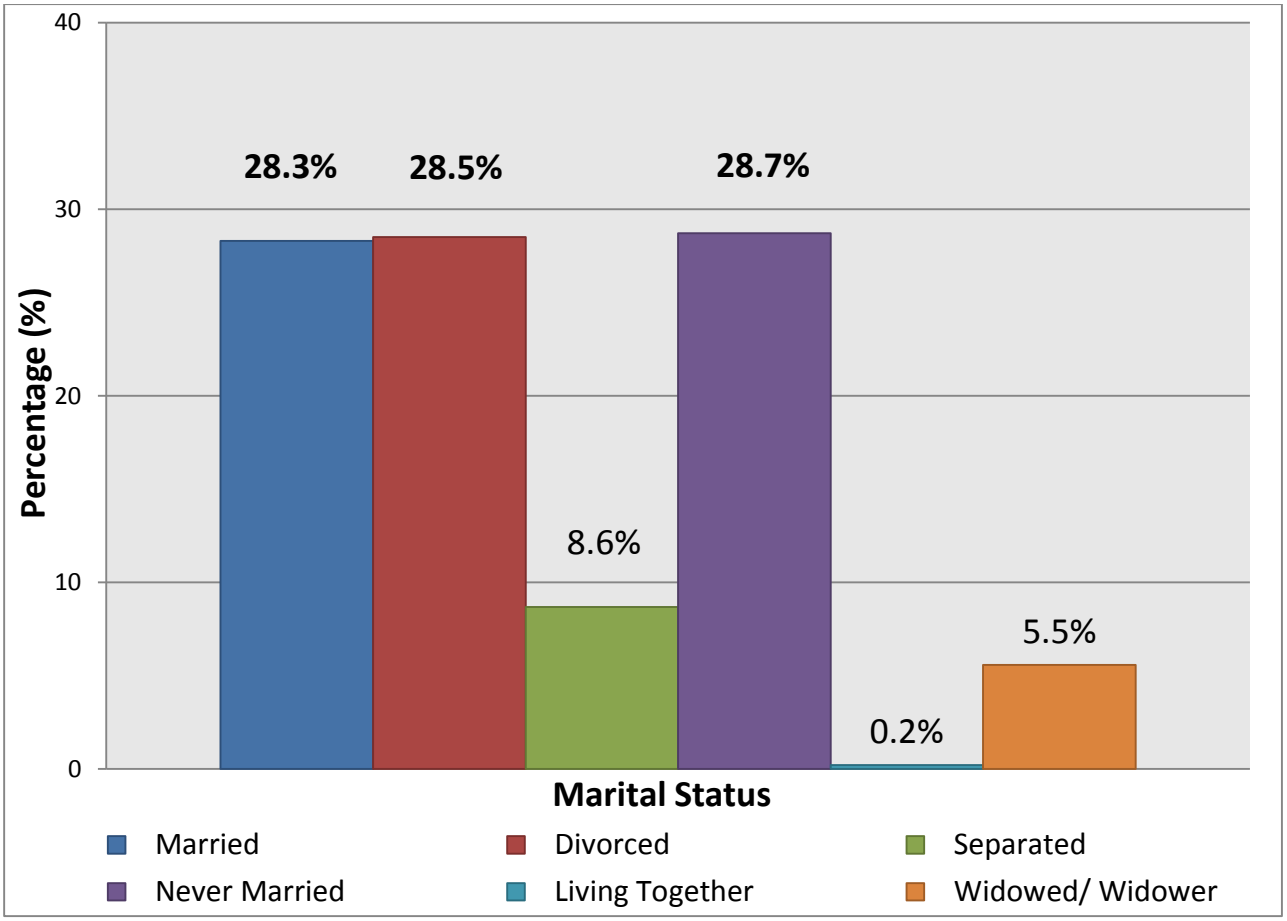
Graph 9: Distribution of the Study Population by County of Residence, 2010



Graph 10: Distribution of the Study Population by Household Size, 2010



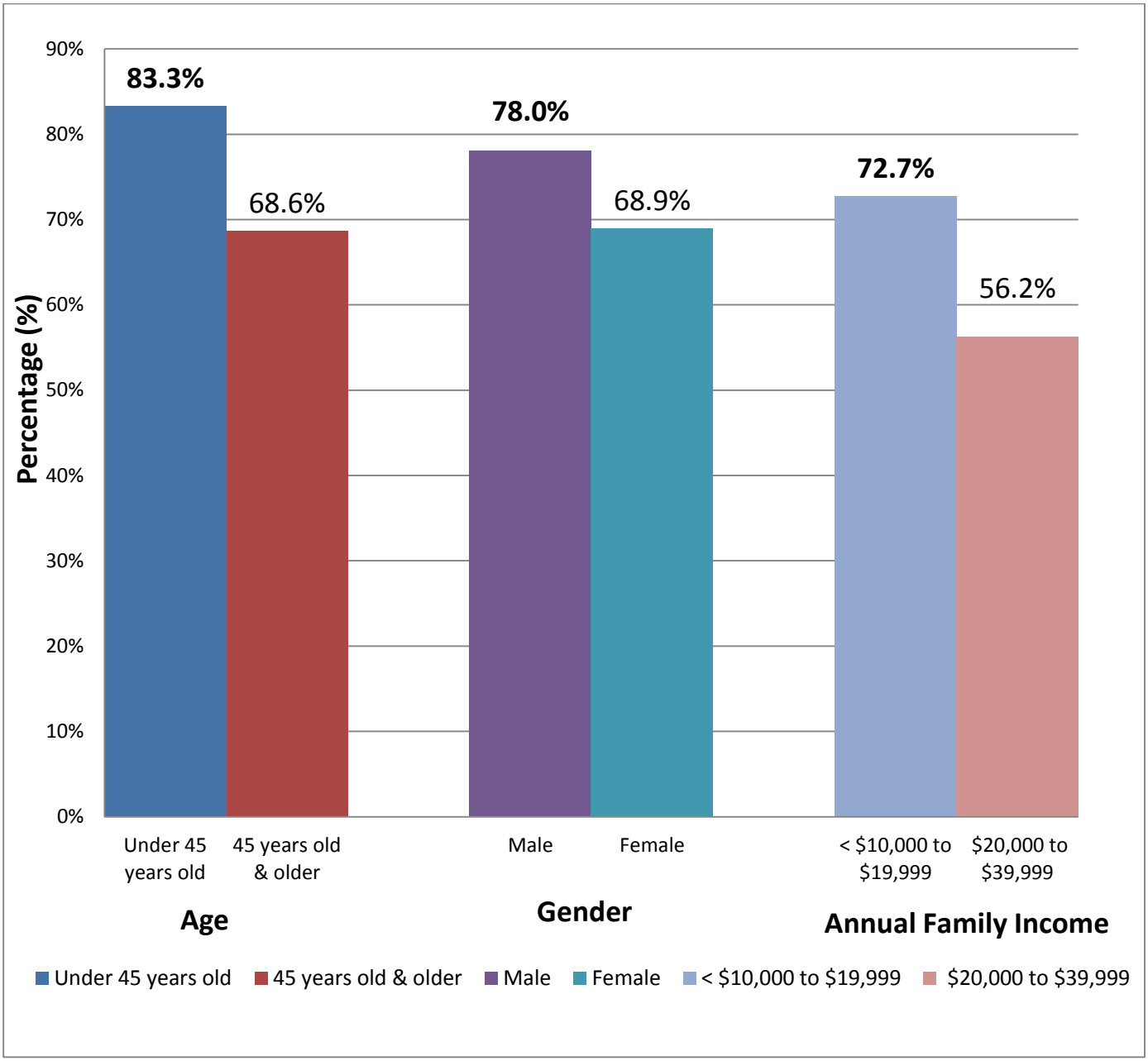
Graph 11: Distribution of the Study Population by Marital Status, 2010



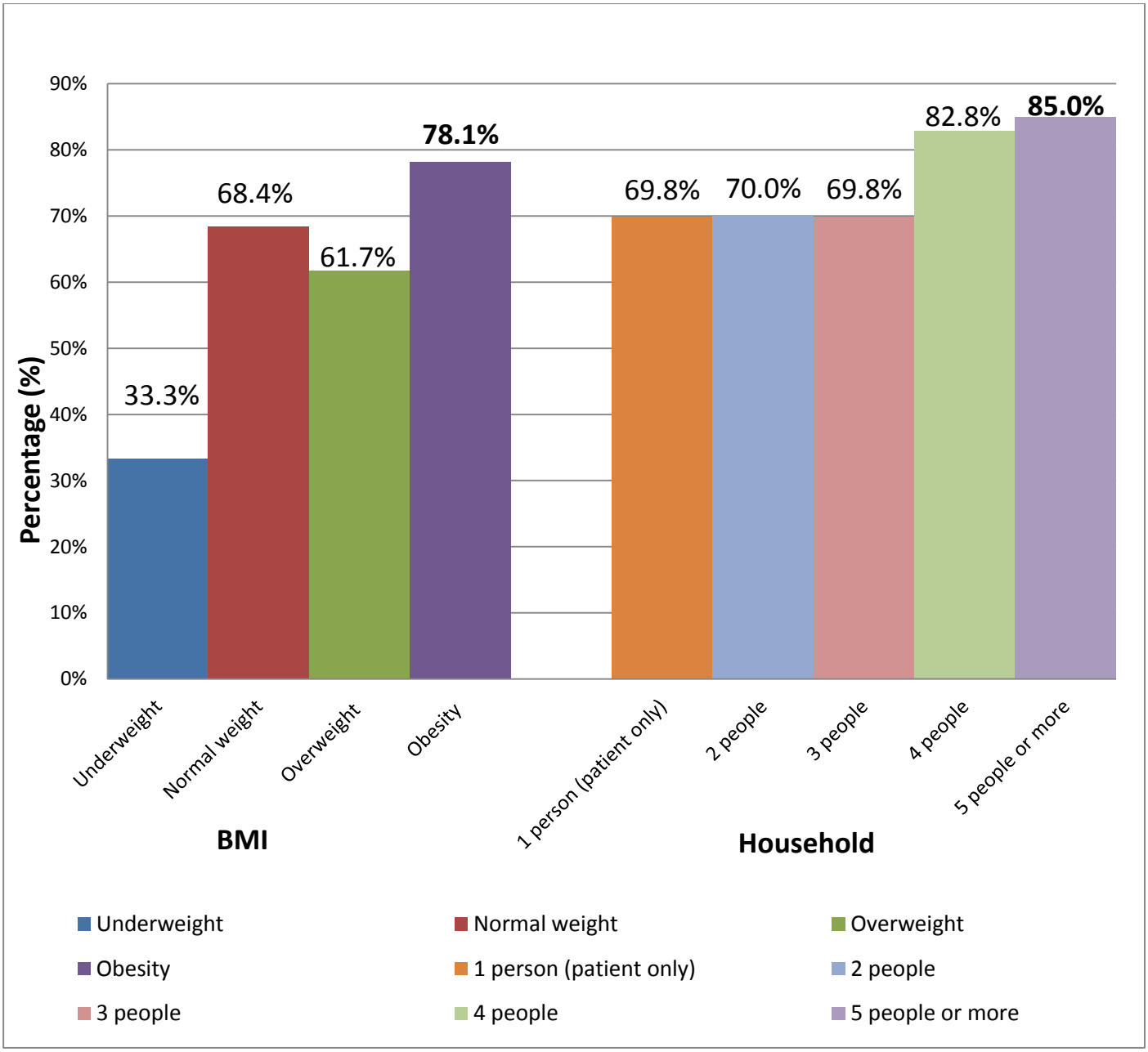
Appendix F

The Bivariate Association between the Socio-Demographics and Socio-Economic Factors and Adult Patients Negative Deviation to CRCS

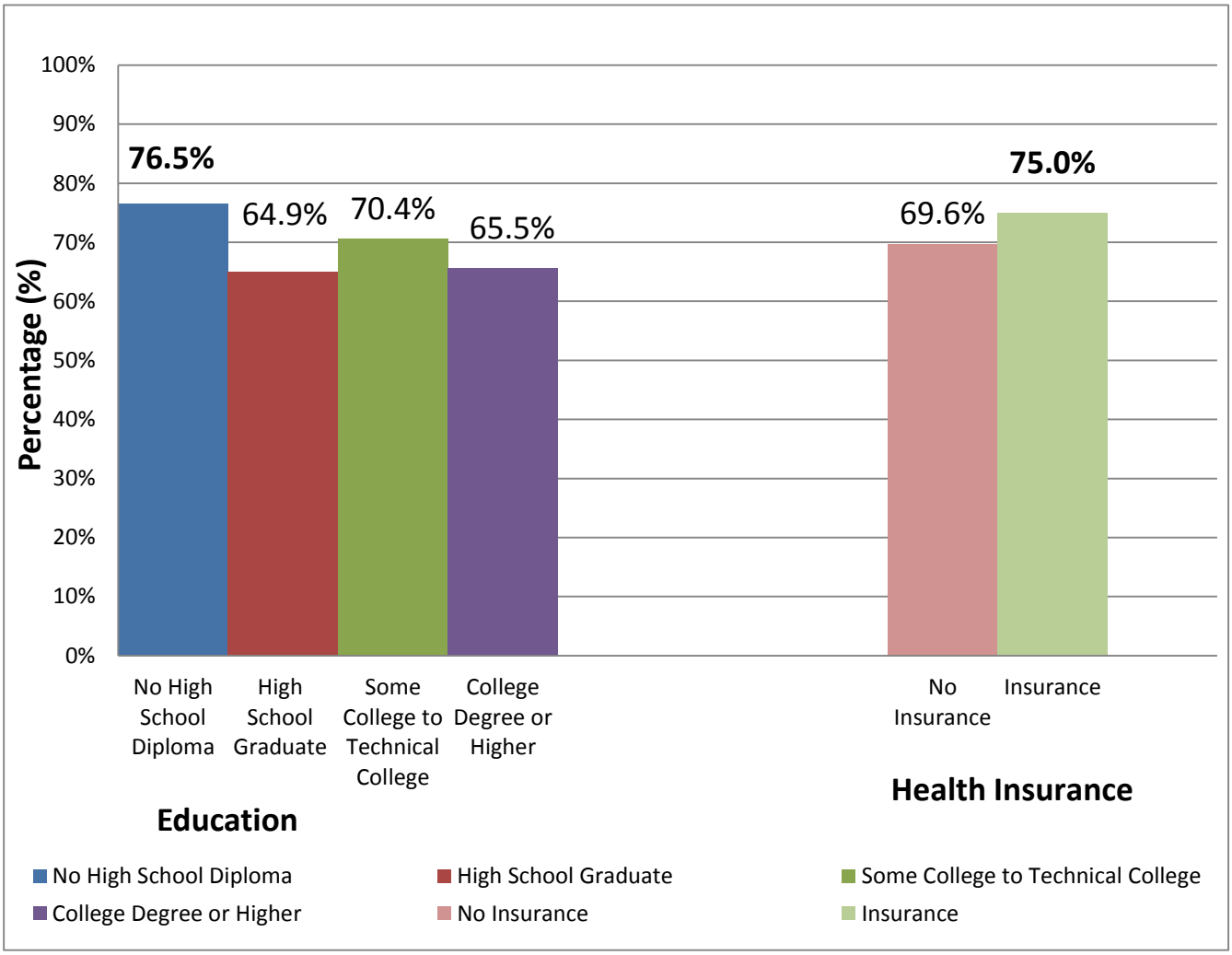
Graph 12: Adult Patients Negative Deviation to CRCS by Age, Gender, and Annual Family Income, 2010



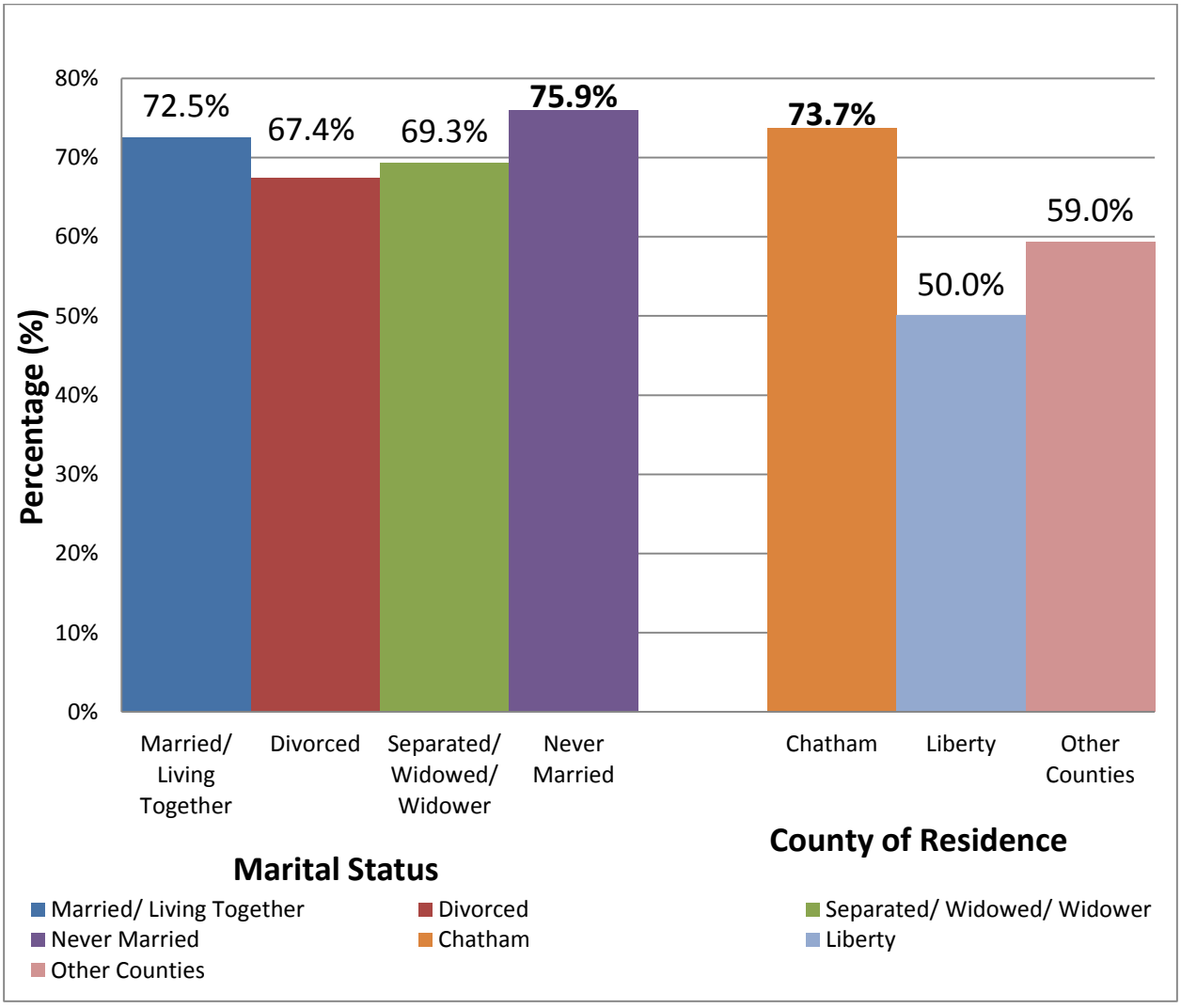
Graph 13: Adult Patients Negative Deviation to CRCS by BMI and Household Size, 2010



Graph 14: Adult Patients Negative Deviation to CRCS by Education and Health Insurance Coverage, 2010



Graph 15: Adult Patients Negative Deviation to CRCS by Martial Status and County of Residence, 2010



Graph 16: Adult Patients Negative Deviation to CRCS by Employment Status and Race/Ethnicity, 2010