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This doctoral project, directed and approved by the candidate's committee, has been accepted by the College of Graduate and Professional Studies of Abilene Christian University in partial fulfillment of the requirements for the degree

Doctor of Nursing Practice

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Date: August 19, 2023

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Abilene Christian University
Doctorate in Nursing Practice

Is Conventional Colonoscopy More Effective Than Computed Tomography Colonography in the
Screening of Colorectal Cancer Among Young African American Adults?

A scholarly paper submitted in partial satisfaction
of the requirements for the degree of
Doctor of Nursing Practice

by

Abena Abrafi Nimako

October 2023

Dedication

I dedicate this dissertation work to Almighty God, who continues to give me strength, guidance, good health, security, and wisdom while living the beautiful life He has given me. To my father Isaac Gyasi Nimako and my mother Gladys Genevieve Darko-Danquah for always believing in me and being a constant voice of encouragement. A special feeling of gratitude to Dr. Raymond Nomel, whose words of encouragement and push have brought me this far. My sister Ama Nimako and daughter Nana Akua Amaning supported me with cheers and strengthened me when I felt like giving up. I offer all these to God, to whom I am most grateful.

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To God be the glory. Great things He has done. “I (you) can do all things through Christ who strengthens me (you)”: Philippians 4:13.

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Abstract

Healthcare journalist Brenda Goodman's article on *CNN Health* on October 10, 2022, about a new study examining the effectiveness of colonoscopies, essentially concluded that the efficacy of conventional colonoscopy is in question. This research sought to establish whether conventional colonoscopy is more effective than computed tomography (CT) colonography in screening colorectal cancer among young African American adults. The researcher employed a literature review and a case-control research design to gather data on the subject. Data were collected from literature, the SEER database, the CDC, and the American Cancer Society websites. The study sample consisted of African Americans between the ages of 35 and 50 with colorectal cancer screening by CT colonography and conventional colonoscopy. Analysis using a case-control design found an odds ratio of 4.9, which indicated that African Americans were 4.9 times more likely to be diagnosed with colorectal cancer when their doctors used conventional colonoscopy than when they used CT colonography. The findings suggest that traditional colonoscopy is more effective than CT colonography in the screening of colorectal cancer.

Keywords: colorectal cancer, CT colonography, virtual colonoscopy, optical colonoscopy, conventional colonoscopy, African American young adults.

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Chapter 1: Introduction

Chadwick Boseman, the actor best known for his portrayal of Black Panther, passed away suddenly and shockingly at 43, much to the surprise and disbelief of his fans and colleagues. For someone in such excellent health, dying of colorectal cancer is nearly incomprehensible at a young age. Aside from the fact that colorectal cancer (CRC) has become more prevalent among those under the age of 50 than it is among those over 50, many people mistakenly think it is rare (Carethers, 2018). According to Siegel et al. (2023), the year 2023 will record a CRC diagnosis among 153,020 individuals with 52,550 deaths including 19,550 cases with 3,750 younger individual (below 50 years) deaths. That the incidence of CRC has dropped among the elderly but has increased among younger individuals is even more alarming. On October 10, 2022, healthcare journalist Brenda Goodman wrote an article on *CNN Health* about a new study examining the effectiveness of colonoscopies. She was reporting on a landmark study published in the *New England Journal of Medicine* that suggested that the benefits of colonoscopies for cancer screening might be overestimated. The 10-year study indicated that colonoscopies only reduced the incidence of colon cancer by around 5%, far less than anticipated in many earlier studies. Further, this European study suggested that the procedure, often carried out with a long flexible tube pushed up the rectum, did not significantly lower the risk of dying from colon cancer (Goodman, 2022). Once this study was published, U.S. doctors were very apprehensive and cautious. They affirmed that traditional colonoscopy screening detects colorectal cancer and saves many lives. Dr. Otis Brawley, an oncologist at Johns Hopkins University and the former chief medical officer of the American Cancer Society, mentioned his fear that this would cause many people to question whether they should get colon cancer screening. Dr. Richard Wender, chair of the Department of Family Medicine and Community

Health in the Perelman School of Medicine at the University of Pennsylvania, said the study had severe shortcomings and limitations. He added this would cause a flaw in the cancer screening test's randomized trials. They would inevitably become trials of invitations to screen, not the test itself (Smith, 2022).

Problem Statement

As the second leading cause of cancer-related death, CRC is the third most common cancer disease worldwide, making up approximately 10% of cancer-related deaths in Europe and North American countries (Amlani et al., 2020). CRC rates are highest in the more developed countries for reasons believed to be due to the Western lifestyle (diet, exercise, medication). Although there is a long way to go, continuous public education on colonoscopy as the gold-standard method for detecting CRC has helped decrease the incidence of CRC over 10 years in the United States compared to an increase in European countries, such as Spain, the U.K., and Italy, in those same 10 years. Europe has poor colonoscopy attendance, but the compliance rate for colonoscopy referrals is between 64% and 92% (Amlani et al., 2020).

Research demonstrates higher CRC rates among adults under 50 years old. According to a study by the American Cancer Society, CRC case rates and mortality in the United States are rising among young adults (35–50 years). Since 2000, U.S. CRC cases have risen from 5.9% to 7.2% new cases per 100,000 people, a 22% increase. Nonetheless, overall new deaths from CRC have been decreasing (Saey, 2017).

Background

As asserted by Rex et al. (2017), the prevalence of CRC, according to research and studies, is firmly age-related, causing its rise with increasing age. As a credit to the widespread screening of CRC in the United States, the occurrence of CRC has been reduced by 3% to 4%

every year in individuals under 50. Nonetheless, CRC remains a significant public health concern among U.S. young adult residents under age 50, with unclear reasons for this rise. More discussion is occurring on prophylactic therapies to reduce the burden of diagnosed colon malignancy. The primary course of preventive action is screening to help determine treatment options, reduce CRC morbidity and mortality, and improve life quality. Attention must be paid to colorectal symptoms, such as irritable bowel disease (Crohn's disease), iron deficiency anemia, change in bowel habits, hematochezia, abdominal pain, presence of polyps, and melena with a negative upper endoscopy. Recommendations for chemoprophylaxis, screening, and immunization exist and are encouraged to prevent the risk of severe adverse events (Rex et al., 2017).

People of color are more likely than any other racial or ethnic group in the United States to be affected by CRC, with African Americans having the highest disease prevalence. CRC is 20% more frequent among African Americans than the general population, and they are 40% more likely to die from it than the general population. Although various factors contribute to health inequalities, the most prevalent are differences in risk factors and access to health treatment, inversely proportional to the individual's socioeconomic level. African Americans bear a disproportionately large percentage of the burden of cancer compared to the rest of the world's population. Furthermore, systemic racial disparities that complicate things and go beyond the apparent relationship to cancer may occasionally impair their capacity to prevent, diagnose, treat, and survive cancer (Patel & Ahnen, 2018).

According to multiple studies, African Americans have the lowest colon cancer survival rates of any racial or ethnic group (Patel & Ahnen, 2018). According to the National Cancer Institute's (NCI) Surveillance, Epidemiology, and End Results (SEER) program database,

African Americans had a 5-year relative survival rate for CRC of 57.3% between 2003 and 2009, compared to 67% for Whites during the same period (Lapumnuaypol et al., 2018). Black males with colon cancer had the lowest overall survival rate of any ethnic group, confirmed at all stages of the illness. According to research, between 2003 and 2009, 24% of African Americans were diagnosed with distant metastases, whereas only 20% of Whites were diagnosed with the disease (Ashktorab et al., 2016). Advanced tumors are more likely to be discovered among African Americans because of lower screening rates, cancer diagnosis at an earlier stage, and limited access to healthcare services in this population.

CRC incidence has reduced overall, while right-sided tumors have grown in all ethnic and racial groupings, independent of the prevalence of CRC in the general population. As part of this discussion, it is critical to emphasize this tendency's negative effect on the African American community and its members. In a 2007 analysis of 254,469 people from the SEER database, researchers discovered tumors among anatomical subsites in different ethnic groups (Lapumnuaypol et al., 2018).

Colonoscopy is more prevalent among African Americans as a preventive health strategy compared to other screening tests. According to research published in 2008, African Americans are more likely than other ethnic groups to support colonoscopies as a form of CRC screening (Ashktorab et al., 2014). One research indicated that 70.1% of African American patients chose colonoscopy over stool DNA or occult blood, with race and education associated with patient preferences. In a San Francisco Community Health Network study, Whites were likelier than non-Whites to get a colonoscopy. However, earlier evidence demonstrates that colonoscopy is preferred over fecal tests (Ashktorab et al., 2014).

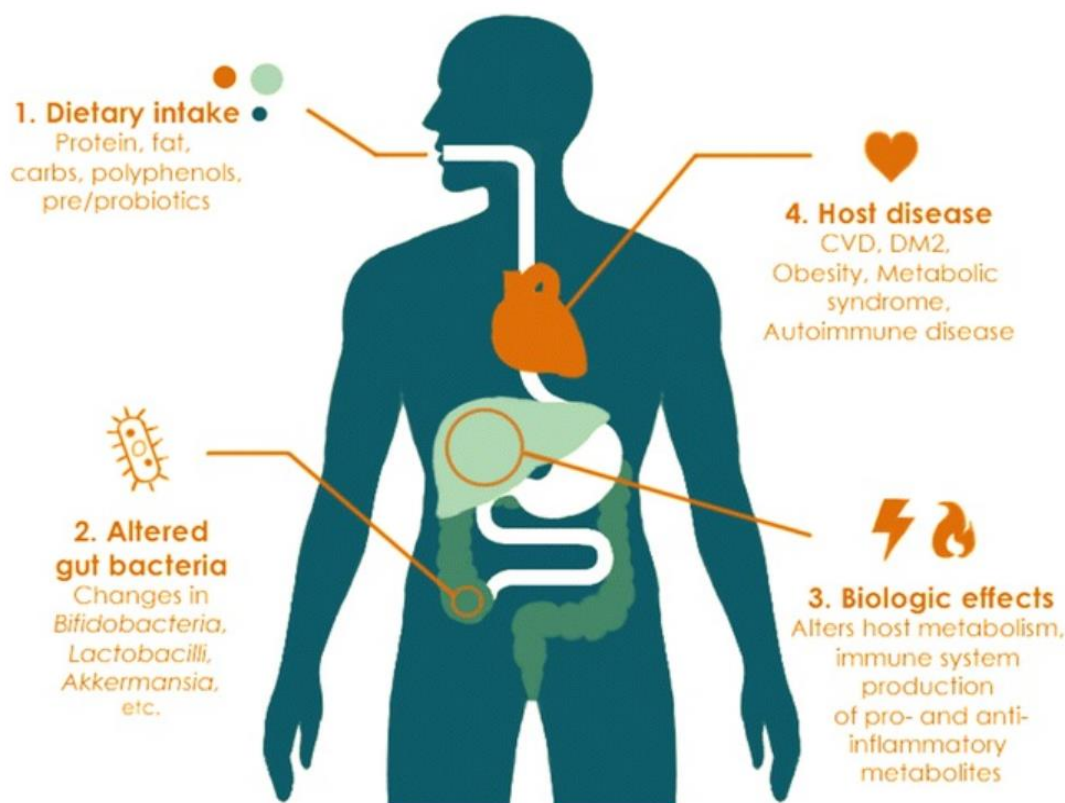
The American College of Gastroenterology and American Society for Gastrointestinal Endoscopy do not recommend CRC screening for patients at an average risk younger than 50. The American Cancer Society (ACS) has amended its screening standards and advises that everyone aged 45 years or older begin screening for cancer in 2018. The recommendations of the American College of Cardiology were considered by the United States Preventive Services Task Force in October 2020, according to the organization (Carethers, 2018).

Following these revised recommendations, it is anticipated that the incidence of early-onset colon cancer will decrease. It is concerning that continuing gaps exist between African Americans and Whites regarding access to and participation in CRC screening. Recently there has been a rise in the incidence of early-onset CRC among people aged 20 to 45. As a result, the new recommendations will no longer be relevant to this age range. Given the increasing focus devoted to early-onset CRC and the long-standing issue of racial inequalities in CRC incidence and outcomes, substantial progress is predicted to be made in tackling these converging public health concerns in the coming years (Carethers, 2018).

Purpose

Adults between 50 to 75 years are monitored by Healthy People 2020 based on who has received a CRC screening. The baseline for CRC screening in 2008 was 52.1% of adults aged 50–75 years, with a target of 70.5% in 2020; the report stated that 65.2% of adults aged 50–75 years have received a CRC screening. This indicates improvement based on the Healthy People 2020 objective guidelines. Disparities exist among racial and ethnic groups, education groups, groups with private health insurance, and education groups, all among persons aged 50–75 years in 2018. CRC screening was highest among persons with an advanced academic degree: 74.8% (Healthy People 2020, 2020).

With rates of new diagnoses still rising among young adults, CRC is a leading cause of cancer death among people between ages 35 and 50 in the United States. This led to scientists from all walks of life (government, academia, patient advocacy, industry) meeting virtually in September 2020 to discuss CRC among this age group. The NCI and the National Institute of Environmental Health Sciences organized this gathering to discuss the early onset of CRC, focusing on assessment, diagnosis, prevention, treatment, and management. Discussions centered around risk factors and the cause of CRC. The NCI reiterated the statement by Rebecca Siegel of the American Cancer Society, that in 2020 about 18,000 people under 50 would be diagnosed with CRC in the United States. However, the disease is still relatively uncommon, with a less than 1% prevalence rate among younger adults. People of all races can develop CRC at a young age, with high spiking numbers in racial groups such as American Indians, Alaska Natives, and Whites. Nonetheless, young African American adults still lead in the likelihood of getting CRC. Indulging in an unhealthy Western diet triggers the gut bacteria's mechanism of action, causing an increased rate of CRC in young adults. The body reacts by accelerating the growth of intestinal tumors, which causes irritation and inflammation from gut disturbances, which in turn is caused by the consumption of high fat, less fiber, and high sugar diets, as shown in one study of mice (NCI Staff, 2020).

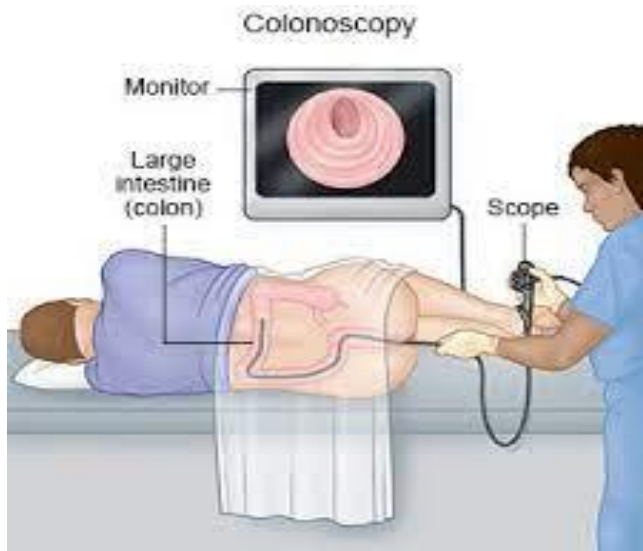
Figure 1*Changes in the Gut Microbes*

Note. Singh et al. (2017). Influence of diet on the gut microbiome and implications for human health. *Journal of Translational Medicine*, 15(73). <https://doi.org/10.1186/s12967-017-1175-y>.
CC by 4.0.

Colonoscopy is a necessary life-saving tool procedure in the healthcare industry today. It is a resourceful and all-around screening procedure to detect gastrointestinal (GI) diseases such as irritable bowel diseases, GI bleeding, and colon impaction. It is imperative to detect CRC early. Screening colonoscopy helps direct steps in oncologic treatment with planning for surgical interventions. The human colon is the most significant part of the intestine, comprising the anus, rectum, and colon (Stauffer & Pfeifer, 2021).

There are two types of colonoscopies: virtual or computed tomography (CT) colonography, and optical (or traditional or conventional) colonoscopy. A colonoscopy examines the large intestine and the distal portion of the small intestine. Parts of the colonoscope include a tip with a high-definition camera and accessory channels through which equipment such as clips for polyp excision and fluids are passed to cleanse the colon mucosa and the colonoscope lens. In real time, the colonoscope connected to a screen portrays abnormalities such as polyps, which are overgrowth of the colon wall (Stauffer & Pfeifer, 2021).

Conventional (optical) colonoscopy uses a colonoscope with a camera and controls at the tip, sending pictures to a TV monitor. The colonoscope, a thin, flexible, hollow tube with a camera and light at the end, is gently inserted into the colon, air is then pumped into the tube to keep it inflated for easy inspection. Also, the colonoscope is equipped for water irrigation, polypectomy, and collection of colon biopsies (Guinigundo, 2018). Optical colonoscopy's versatility and immersing utility have helped make CRC an early detected and easily preventable disease in the last few decades (Stauffer & Pfeifer, 2021).

Figure 2*What to Expect During Optical Colonoscopy*

Note. Tresca, A. J. (2023, August 09). *Colonoscopy: Overview.* Verywell Health.

<https://www.verywellhealth.com/colonoscopy-4014117>

Virtual colonoscopy or CT colonography is a CRC test used to visualize the intra-abdominal and pelvic organs in individuals 45 years or older. Sometimes extracolonic lesions may be identified even though they are of no clinical importance, but it can detect polyps early and, subsequently to, direct intervention. CT colonography is an efficient and quick way of screening the entire colon to detect adenomatous polyps using virtual-reality three-dimensional (3D) techniques (Bortz, 2021).

Figure 3*What to Expect During CT Colonography*

What to Expect During a Virtual Colonoscopy

- 1.**
24 hours before test:
Clear out bowels with
laxatives, enema,
all-liquid diet
- 2.**
Night before test:
Drink contrast
medium so colon will
be visible in x-ray
- 3.**
Day of test: Tube
inserted 2 inches into
rectum to inflate
colon for imaging
- 4.**
CT scans taken for
10-15 minutes

- 1**
Lay on back
inside CT
machine

CT machine

Colon (Large intestine)
Small intestine
Rectum

- 2**
Air is gently released into bowels

Inside colon

Polyp

Polyps and health issues can be hidden or hard to see

Rubber tube

Air

Air gently expands colon to allow for clear images

Note. Tresca, A. J. (2023, August 09). *Colonoscopy: Overview*. Verywell Health.

<https://www.verywellhealth.com/colonoscopy-4014117>

Significance

According to Saey (2017), the CDC and the American Cancer Society have shown an increasing rate of CRC cases and mortality among young adults (35–50 years) in the United States. Nonetheless, colorectal deaths and tumors have decreased in individuals 50 and older (Saey, 2017). There are many reasons for performing a colonoscopy, which can be grouped into diagnostic and therapeutic indications. A diagnostic indication can either be for screening or elective purposes. Whether high or average, screening colonoscopies are performed to investigate CRCs based on a patient's risk. Patients receive a colonoscopy at 10-year intervals when chances are moderate, meaning unremarkable results and no identified pathology with the first colonoscopy screening. The 10-year gap is for continuous surveillance screening of premalignant lesions and CRC. The screening procedure in high-risk patients occurs before age 50, with surveillance screening the following year, and again at 3 and 5 years depending on the initial findings and primary risk.

Indications for high-risk CRC patients include a family history of CRC, a family history of polyps, and a history of inflammatory bowel diseases. In the case of an elective colonoscopy, there might be the need to evaluate GI bleeding, occult blood in the stool sample, iron deficiency anemia, unexplained weight loss, persistent abdominal pain, suspected inflammatory colon, or unexplained change in bowel habits and patterns. Colonoscopy is performed for therapeutic purposes to treat bleeding lesions, remove foreign bodies, dilate any stricture or stenosed part of the GI tract, remove and ablate lesions, and the palliative management of found neoplasms (Stauffer & Pfeifer, 2021).

The use of sedation is highly recommended worldwide during a routine endoscopic procedure. Various anesthetic agents are used during colonoscopy to control the individual's

behavior for the successful completion of the procedure. In the United States, data from surgery indicate that more than 98% of colonoscopies are performed with anesthetics. However, not all patients tolerate colonoscopy with sedation due to religious preferences or a previous bad experience, such as cardiorespiratory complications during the sedation. The preferred sedative agent is the well-accepted short-acting propofol, which has a fast onset with a short half-life and rapid recovery time (Zhang et al., 2018).

A health organization called the United States Preventive Services Task Force (USPSTF) provides recommendations for medical therapies and procedures, including those for CRC. The USPSTF recommendation is for patients 50 to 75 years old to undergo a colonoscopy every decade. This is a Grade A recommendation according to the USPSTF guidelines. The reason for the 10-year interval between surveillance colonoscopy procedures for average-risk individuals is because a polyp takes 10 years to develop into cancer. Research has proven that screening colonoscopy significantly reduces CRC mortality through early detection and intervention. Gastrointestinal clinicians and providers must familiarize themselves with CRC screening guidelines and start colonoscopy screening at age 50 if the patient is at average risk, or 10 years before the age their relative was first diagnosed with CRC to educate and encourage patients (Stauffer & Pfeifer, 2021).

A population-based retrospective cohort study utilizing the SEER registry discovered that patients under 50 who had CRC were more likely to be African American than other ethnicities. Concerning CRC investigations with African Americans under 50, relatively few have yet been explored involving this group. Screening for CRC may be accomplished using several methods. Physicians owe it to their patients to inform them of all treatment alternatives that are currently accessible to them. According to the organization, the American College of Gastroenterology

continues to advocate colonoscopy as the primary CRC preventive screening procedure for the time being (Ashktorab et al., 2016). During a colonoscopy, you will be able to see the whole colon and collect samples of any abnormal mucosa, as well as remove any adenomatous polyps, all of which are beneficial.

Nature of Project

The nature of this project was to gather evidence-based research that supports the benefits of convincing patients to consider optical (conventional) colonoscopy screening over virtual colonoscopy for quality outcomes. I will discuss in full the gold standard tool for CRC screening, optical colonoscopy, by comparing both optical and virtual colonoscopies. Although CRC can affect every population, my focus in this project is on its impact on young African American adults under 50 years old and continuous colonoscopy screening to help track CRC.

Practice-Guided Questions

1. Regarding CRC screening, how accurate are both colonoscopy types?
2. Why is the African American population the most impacted by CRC?
3. What risk factors contribute to CRC development in young people?
4. Virtual colonoscopy versus conventional colonoscopy?

PICO Question

The PICOT question was the following: Is conventional colonoscopy more effective than CT colonography in the screening of CRC among young African Americans?

Definitions of Key Terms

Colon adenomas polyp. This is small clump of cells forming on the colon lining that can be precancerous or cancerous (Dash et al., 2020).

Optical colonoscopy. (This is also referred to as conventional or traditional colonoscopy.) This is a type of colonoscopy that uses a colonoscope with a camera and controls at the tip, sending pictures (of abnormalities such as polyps) to a TV monitor (Stauffer & Pfeifer, 2021).

CRC prevention. Implementation strategies to stop or prevent CRC (Centers for Disease Control, 2020).

CRC screening. This is a procedure to detect abnormalities that can lead to CRC (Centers for Disease Control, 2020).

Virtual colonoscopy. (This is also referred to as CT colonography.) A CRC diagnostic procedure used to visualize the intra-abdominal and pelvic organs (Bortz, 2021).

Scope and Limitations

This study aims to determine the most effective colonoscopy type—CRC screening using optical colonoscopy compared to virtual colonoscopy—among African Americans between the ages of 35 and 50. Other objectives include determining why African Americans are the ethnic group in America most impacted by CRC and investigating why the illness is becoming more common among young people. I started by considering all participants from the available database within the research timeframe and then I narrowed this list down to African American persons, male or female, between the ages of 35 and 50.

Chapter Summary

Compared to other ethnic groups, African Americans are more likely than other ethnic groups to have CRC that begins in the right colon rather than the left colon or the rectum, which would be rectal cancer (Patel & Ahnen, 2018). According to preliminary remarks, colon tumors on the right side of the body are more difficult to identify and have a poorer prognosis than those

on the left side (Carethers, 2018). Patients must maintain periodic follow-up appointments during CRC treatments and management depending on the type and staging of cancer. Regular follow-ups include x-rays, lab tests, screening procedures, and proactive measures to maintain a positive perspective of living with and managing the disease. The best way to examine and diagnose the problem for patients with chronic gastrointestinal symptoms is by viewing the colon and rectum (mainly through colonoscopy).

Chapter 2: Literature Review

The techniques employed to assess and monitor CRC are analyzed in this study to identify the most effective choices. I considered and compared the practical efficiency of various approaches and primary colonoscopy techniques. The search engine I utilized specializes in peer-reviewed scientific and biological literature. The PubMed platform is employed to retrieve and access scientific papers of interest. The number of citations is considered to gauge the most resonant and applied scientific concepts relevant to cancer screening. Choosing the findings from scientific sources mainly informed me about the screening methods for CRC. I especially looked at the findings in choosing sources that investigated the effectiveness and practicality of various methods, the cost of administering the service at scale, and technical aspects in running them.

The employed search terms represent the concepts and findings of interest from scientific platforms chosen for the literature review. I combined the search terms *colonoscopy* and *CRC* to retrieve scientific research that study practical usage and technical aspects. I also combined the terms *African American*, *screening*, and *CRC* to provide additional screening approaches for the subject disease. A total of six findings were retrieved and utilized for this literature review because of the specific nature and quality of information they detailed. From the chosen sources, two articles inform on current colonoscopy techniques and their effectiveness for screening CRC. Three articles elucidate alternative screening methods for CRC and how they are implemented in a medical setting. One paper assesses the interplay between the current status of screening methods and prospects that might provide more effectiveness in the field.

Theoretical Framework

The health belief model (HBM) or theory (HBT) is a relevant merit-based theory that has been used to effectively promote health changes in patients to help reduce the CRC disease

process. The health belief theory explores individuals' willingness and motivation to change their health conditions, prevent sickness, and adopt specific measures to maintain their health goals (Coviello, 2020). According to Lau et al. (2020), the health belief theory sheds light on the intrapersonal (resilience, unhealthy health behaviors, lack of participation in care) and interpersonal social determinants of health (education, income, health literacy, social support) and their influence on an individual's health behaviors. Scientists are putting in great efforts to help themselves, health professionals, and the public better understand the barriers to CRC screening based on the HBM's "six socio-behavioral constructs: perceived benefits, barriers, susceptibility, severity, the presence of cues to action, and self-efficacy" (Lau et al., 2020). See Appendix A for the CRC HBM conceptual framework. Hatami et al. (2018) reiterate that an estimated 30%–40% of CRC cases are connected to nutrition and other lifestyle factors; the increased risk of CRC is blamed globally on Western diets that are low fiber and high in red meat, calories, and fat.

Literature Review

Improving Colonoscopy Quality

Schoenfeld (2020) discussed three approaches to improving colonoscopy quality for screening CRC. The screening approach has been improved using three methods that aim to provide more accurate insights about the components of interest from specimens. The research outlines the shortcomings of the typical colonoscopy method concerning the physiology of a subject and the need to introduce additional processes to enhance its effectiveness. The primary method proposed by the study is the frequency of colonoscopy screening schedules using interval-based techniques. The second recommendation is the frequency of pointing out adenomas in average-risk individuals during the first screening. The third recommendation to

improve colonoscopy quality is establishing consistencies for repeating screening tests to enhance accuracy by assessing physiological and external conditions (Schoenfeld, 2020).

Assessing the quality attributes of colonoscopy to determine how effective the method is at identifying CRC incidences is a sustainable approach to improving the technique. Shine et al. (2020) provided a historical development of the method and the foundational concepts behind various screening techniques. The study suggests six quality indicators to ensure a standardized implementation of colonoscopy for consistent results across different medical settings. The rate of adequate bowel preparation, withdrawal time, caecal intubation rate, complication rates, surveillance intervals, and adenoma detection rate are reproducible components. These factors are relevant in determining the method's effectiveness in screening compared to other approaches. The provided scope of quality indicators reveals the technical features accounted for during the screening process (Shine et al., 2020).

Current CRC Screening Status

The overall strategies for reducing the mortality associated with CRC mainly outline changing lifestyle choices such as diet. Ladabaum et al. (2020) presented novel ideas for new developments in screening methods that overcome some legacy challenges in colonoscopy in their study. The researchers offer more effective and insightful indicators as screening factors. Advancements in genetics present new methods of assessing various indicators that can point to a positive diagnosis of CRC. The effectiveness of colonoscopy is compared to its limitations to prompt and highlight the relevance of new methods, such as fecal immunochemical tests and sigmoidoscopy. The strategies of detecting chemical compounds with specific CRC markers are more efficient and overcome limitations of effectiveness that rely on adenoma traces.

The screening interventions for CRC require standardization to guarantee consistent outcomes and quality of service. The operator and system dependence exhibited in screening tests depicts the challenge of quality of service as determined by various external factors. Kaminski et al. (2020) proposed a standard approach to enhancing the quality of screening for colonoscopy across regions in their study. Offering definitive guidance for quality assurance in screening programs enables medical interventions to adhere to consistent methodologies across regions and realize consistent outcomes. Their study focuses on three system implementation levels: the individual screening-eligible subject, the provider who is the operator, and the system that encompasses the entire workflow of resources. The suggested guidance enables the scaling of operations with consistent results.

Alternative Screening Methods

As asserted by Roy et al. (2021), the US Preventive Service Task Force recommends the start age for CRC screening at 50, continuing to age 75, although the start age has been moved 5 years earlier in recent studies. Available CRC screening methods include a high-sensitivity stool blood test and a direct visualization test. Examples of high-sensitive stool tests are guaiac-based fecal occult blood test (gFOBT), fecal immunochemical test (FIT,) or multitarget stool FIT-DNA test). Colonoscopy, flexible sigmoidoscopy, or CT colonography are examples of direct visualization tests. Colonoscopy is the best screening tool as it can detect early colonic and rectal abnormalities and precancerous polyps to reduce mortality. The repeat of colonoscopy in 2 to 10 years is based on the remarkable or unremarkable impression from the screening (Roy et al., 2021).

The Roy et al. (2021) review study was especially interested in studies that involved a large sample of African Americans. The inclusion criteria for this systemic review study were

randomized controlled trials or quasi-experimental studies, peer-reviewed studies, and screening completion outcomes. Exclusion criteria for this review included studies that did not include a comparison group, studies that duplicated the findings from another previously published study to report, findings on a subset of participants from the original study, and studies that did not measure a CRC screening outcome, such as studies that only measured changes in knowledge or screening intentions. In addition, the Roy et al. (2021) review did not involve studies that did not include greater than 50% of African Americans in the participant sample and studies conducted outside of the United States.

He et al. (2020) revealed that cancer surveillance in China is weakened by the nonavailability of standardized guidelines for postcurative CRC surgery, hence the high incidence and mortality rates leading to patients seeking answers, many of them joining a postsurgical survival program. These researchers collected, compared, and analyzed CT colonography, optical colonoscopy, and enhanced colonoscopy/histopathology data among patients ($n = 345$) involved with curative CRC surgery one year after surgery and 6-month intervals for the next 2 years. The study participants started at 367 patients who underwent corrective surgery for CRC; 352 patients were available at the research centers 1 year after surgery during follow-up. Among them, 345 patients met the inclusion criteria of undergoing CT colonography and standard colonoscopy 1 year after surgery and at 6-month intervals for the next 2 years during the follow-up. Both colonoscopy methods found 298 suspicious polyps. Comparing the detection of polyp sensitivity, virtual colonoscopy and conventional colonoscopy revealed 0.952 and 0.906 sensitivities detected, respectively, and among those 0.783 and 0.641 were accurate, respectively. CT colonography and standard optical colonoscopy both detected 298 polyps as suspicious. Concerning enhanced colonoscopy/histopathology, sensitivities for

detecting any polyps for CT colonography and routine optical colonoscopy were 0.952 and 0.906, while accuracies were 0.783 and 0.641, respectively. CT colonography may be a sensitive and accurate surveillance tool for CRC patients. The weakness of the study was clinical practice-based in aspects, such as cost and patient preferences, as well as a small study size, which affected the validity of the research (He et al., 2020).

The Gold-Standard Colonoscopy

Atkin et al. (2018) also affirm that optical colonoscopy is the gold-standard test for examining symptoms that can indicate CRC; however, a less invasive alternative is CT colonography. Nevertheless, according to Atkin et al. (2018), further examination is required after CT colonography to confirm any suspected colonic lesions. This is a crucial element in determining whether virtual colonoscopy is a viable alternative to optical colonoscopy. The study compared the frequency of further colonic examinations performed on symptomatic individuals following CT colonography or optical colonoscopy to look for significant (> 10 mm) polyps or CRC. In this study, the pragmatic multicenter randomized trial enrolled patients from 21 U.K. hospitals with CRC symptoms. Patients had to be 45 years or older and be deemed fit for a colonoscopy by the referring practitioner. Blocks of six patients were randomly selected (2:1) for colonoscopy or CT colonography using computer-generated random numbers. with the study center and sex-stratified. Although the study looked into the intention to treat, it also examined the primary outcome—the frequency of further intestinal examination (Atkin et al., 2018).

In a study conducted by Neri et al. (2019), 1,610 participants were randomized to get a virtual ($n = 538$) or optical ($n = 1,072$) colonoscopy. Thirty patients withdrew their consent, leaving 1,047 patients for optical colonoscopy and 533 patients for CT colonography allocated

for investigation. Compared to 86 (8%) patients in the optical colonoscopy group, 160 (30%) patients in the virtual colonoscopy group underwent extra-intestinal exploration. With a limited predictive value for large polyps or cancer, almost half of the referrals post-CT colonography were for tiny (10 mm or less) polyps or clinical uncertainty. In the trial group, big polyps or CRC detection rates were 11%. The findings indicated that 29 colorectal malignancies were missed by CT colonography, but none were missed by colonoscopy (out of 55). Neri et al. (2019) concluded that guidelines are needed to reduce the referral rate after CT colonography.

Both Atkin et al. (2018) and Neri et al. (2019) agree that the gold-standard colonoscopy provides a sensitive luminal examination that enables biopsy samples to be collected for an accurate diagnosis. However, compared to younger individuals with no comorbidities, older patients and those with comorbidities are more likely to have an incomplete or challenging colonoscopy and are at a higher risk of adverse outcomes. Therefore, in some cases, employing a different first-line inquiry for individuals with CRC-related symptoms would be advisable. Virtual colonoscopy is a relatively recent radiological method for examining the big gut. Optical colonoscopy is more intrusive than CT colonography, which may make it safer and more tolerable for patients. Most colonoscopy patients require sedation, which is not essential for CT colonography. However, an optical colonoscopy is typically needed if lesions that require biopsy or removal are found during a virtual colonoscopy. Additionally, extracolonic lesions are found by CT colonography, which may help explain symptoms but may also trigger further research with little real clinical value. Both studies show that no randomized experiment has previously compared CT colonography and optical colonoscopy in symptomatic patients (Neri et al., 2019).

Economic Feasibility

Sonneberg et al. (2019) discussed the relentless efforts to push CT colonography to replace optical colonoscopy as the primary screening method for CRC. CT colonography combines CT or MR imaging information to produce two- and three-dimensional colon scans. Computer models based on a Markov process were used to analyze the cost-effectiveness of two screening methods: CT colonography and traditional colonoscopy among 100,000 participants aged 45 years and above at a 10-year interval. Notably, the study found that conventional colonoscopy investigated doubtful results from CT colonography. Both colonoscopies were performed 3 years after the polypectomy until no adenomatous polyps were detected. Compared to optical colonoscopy screening, which costs \$20,930 for every life-year saved, CT colonography screening costs \$24,586. Compared to CT colonography, optical colonoscopy is more cost-effective than CT colonography, with incremental cost-effectiveness ratios of \$10,408 and \$11,484, respectively. Even if CT colonography's sensitivity and specificity reach 100%, traditional colonoscopy screening is still more economical. The initial compliance rate of CT colonography needs to be 15%–20% higher, or the procedural expenses need to be 54% lower than optical colonoscopy for the two screening procedures to become similarly cost-effective. For CT colonography to be cost-effective and competitive with optical colonoscopy in the screening for CRC, it would need to be made available at a very cheap cost or produce compliance rates that are far higher than those of the latter (Sonneberg et al., 2019).

Hsu and Chiu's (2022) study explored the cost-effectiveness of colonoscopy and other related procedures in the screening of CRC. The incidence and death of CRC can be decreased by population screening programs, which have been implemented in many nations with moderate-to-high disease occurrences. Optical colonoscopy is crucial in CRC screening as the

primary screening method, the diagnostic examination following a positive noninvasive test, the therapeutic technique for resecting identified neoplasms, and the monitoring examination following the excision of neoplastic lesions. Although optical colonoscopy is more effective than other noninvasive tests at finding colorectal neoplasms, it is more expensive, labor-intensive, and invasive. The best or most economical screening technique may change due to the variability of healthcare systems in terms of the size of health revenue, population demographics, and payment systems in each nation.

Hsu and Chiu (2022) deem economic analysis of various disease management techniques crucial, particularly in organized health screening programs where resources and clinical capacity are limited and each stage of the screening flow needs to be carefully monitored. The therapeutic techniques used to treat screening-detected lesions and subsequent surveillance techniques also add significantly to the cost of care. The ideal solution is heavily influenced by the willingness to pay, which is affected by several variables, including demographics, income, education, and health consciousness. The study presented an objective assessment from the standpoint of cost-effective population health (colonoscopy) screening programs from the initiation of screening through associated treatment procedures and surveillance (Hsu & Chiu, 2022). Comparing 10-year colonoscopies to other techniques with higher willingness-to-pay thresholds or lower colonoscopy costs, Hsu and Chiu (2022) pointed out that optical colonoscopy screening is the most successful. However, there are differences in the findings between studies from other nations, which may be related to the various cost parameters and model assumptions.

Risk Factors

In colon cancer's growth, hereditary and environmental factors play a substantial role. Roughly three-quarters of individuals with colon cancer lack a family history of the illness to

depend on for support. In most developed nations like the United States, the average individual has a 3% and 5% lifespan risk of colon cancer. Moreover, the risk of this infection is high in those individuals previously diagnosed at 50 years and above. The existence of more than one family member affected by colon cancer increases the chances of being diagnosed with the disease. The increased risk of a family member suffering from the condition may result from low-penetrance hereditary variables for rare colon cancer. Moreover, the disease is associated with a family history in less than 20% of the population (Jackson et al., 2016).

People with genetic colon cancer disease represent between 5% and 10% of all the affected individuals, signifying a substantial amount of the total patient population. Among the infections incorporated in the study, Lynch disease is the most common. A change in a single mismatch-repair gene is accountable for the growth of this disease. Due to insufficient mismatch repair, particularly during gene replication, the accumulation of gene mutations, especially in the microsatellite gene, is prompted. Moreover, it is easy to distinguish microsatellite instability (MSI) screening by applying the polymerase chain reaction (PCR) procedure, which tests normal and malignant genes from a single patient. This approach can identify microsatellite instability. Previously, medical pathology measures like the Amsterdam and Bethesda approaches were applied to screen Lynch syndrome individuals. MSI is currently used in medical practice to test growth samples from individuals diagnosed before reaching 70 years of age (Petrick et al., 2021).

Among the hereditary colon cancer disease, Lynch syndrome is increasingly becoming more common, followed by familial adenomatous polyposis. The DNA responsible for controlling the triggering of the Wnt signaling pathway is considered to be responsible for the development of the illness that causes a mutation in the body. Additionally, adenomatous

polyposis coli (APC) is one of the known tumors that interferes with the colon's lining. In individuals suffering from hereditary adenomatous polyposis, polyposis is detected early. More studies have focused on polyposis connected with mutations in the mutY gene glycosylase, recognized as a possible gene type of colon cancer disease. Increased occurrence of colon cancer has been demonstrated to be linked with inflammatory bowel disease (IBD). For instance, the more an individual has had IBD, the more likely they will acquire the infection again, even though numerous types of research have indicated a decrease in the occurrence of colon cancer in those individuals affected with IBD because of efficient anti-inflammatory medications and increased monitoring (McLeod et al., 2022).

Environmental and lifestyle factors can increase an individual's likelihood of suffering from colon cancer, most of which can be modified. Increased body mass index, cigarette smoking, and alcohol abuse are some of the contributing aspects of gastrointestinal diseases. An increase in weight is linked with a roughly 3% increase in the risk of acquiring the condition based on an individual's body mass index. Moreover, those who have type-2 diabetes are highly likely to suffer from colon cancer compared to those who have not acquired the disease, thereby making them more susceptible to the condition. Consuming more alcohol daily has been associated with a 20% rise in the risk. Consuming more alcohol (roughly 50% of daily fat) has been associated with a 50% increase in susceptibility. Excessive cigarette smoking for an extended time comes with the same effect like that of excessive drinking. The chances of an individual being exposed to colon cancer become high, approximately 1.16-fold per 100 grams of certain meals like red meat. Moreover, the intake of meals with increased quantities of vegetables and fruits is likely to prevent the possibility of developing the disease (Melson et al., 2020).

Racial Disparities

According to Augustus and Ellis (2018), of all ethnic groups in the United States, African Americans have the highest CRC incidence and mortality rates. Yet, discrepancies persist even though some of these disparities can be attributed to variations in access to care and; cancer screening; and other socioeconomic factors (Augustus & Ellis, 2018). To assess progress in eliminating the disparities, Augustus and Ellis (2018) pointed out that it is crucial to look at recent developments in the understanding of ethnicity-specific factors, including genetic and environmental factors related to CRC risk, the biology of CRC progression, and the changes in screening and mortality. The number and size of research conducted to identify the etiological basis of CRC incidence and mortality in African Americans represents a major constraint in this area. Despite this restriction, numerous investigations have shown significant etiological variations. Validating these variations is necessary, and further research is required to determine how they affect inequities (Augustus & Ellis, 2018).

Augustus and Ellis (2018) emphasized that the slightest difference in CRC incidence between African Americans and Whites since the late 1980s can be attributable to CRC screening improvements, perhaps the most encouraging development. Yet, there is still a persisting disparity in cancer mortality. In the United States, CRC is the second most prevalent cause of cancer-related death and the third most common cancer in both men and women. A disproportionate amount of the cost falls on African Americans, who have a mortality disparity that is considerably greater and a CRC incidence that is more than 20% higher than that of Whites. African Americans, in particular, have a higher percentage of CRCs in the proximal colon and are more frequently diagnosed with CRC at a younger age and with a more advanced form of the illness. Even with screening, access to care and other socioeconomic factors account

for some of these differences; a sizable amount of the variance persists, although these factors are highly considered (Augustus & Ellis, 2018).

Synthesis of Findings

The depiction of the CRC screening population is mainly discussed through high-risk factors due to the resource intensiveness of the process for African Americans. Identifying high-risk subjects using specific risk factors is a consistently proposed and promoted approach across the studies. Still, the low socioeconomic status of African Americans is an undermining factor. A proposed 10-year timeline for optical colonoscopy screening relative to more frequent fecal immunochemical tests is a future recommendation for optimizing CRC screening processes. Categorizing patients using hereditary syndrome factors is a practical approach for colonoscopies and fecal immunochemical tests. Developing a more effective target faction to focus on creates a more economically viable methodology for delivering the screening services at scale. Providing more affordable services to patients by optimizing the screening services is a prospective implementation in the medical setting (Maida et al., 2017).

Interventions enacted for CRC must enhance their accuracy for African Americans due to variations in perception and socioeconomic status to create high-quality processes. Delivering efficient operations using quality indicators that can be reproduced in any medical setting to actualize consistent outcomes is commendable across multiple studies. Having quality interventions of screening services using standardization approaches effectively addresses CRC among populations. Utilizing the quality indicators enables providers and operators of systems to adhere to specific aspects of significance during the administration of service to realize a better outcome. Creating reproducible approaches to colonoscopy screening and fecal immune chemical tests is a sustainable quality assurance technique. They are developing standard

interventions across different medical settings independent of operator or system conditions because of consistent quality indicators effectively as a screening approach for colonoscopy and future tests.

In conclusion, CRC screening data in 2018 revealed that only 65.2% of adults completed screening despite the Healthy People 2020 objectives target for adults between 50 and 75 years to receive CRC screening at 70.5%. This systematic review aimed to provide enough evidence for future strategies to promote CRC screening, starting with increasing the use of gFOBT among African Americans. Findings from this review aligned with the Healthy People 2020 objective, which seeks to increase CRC screening based on current guidelines from leading medical and community health organizations, such as the United States Preventative Task Force, the American Cancer Society, the American Academy of Family Physicians, and Task Force on Community Preventive Services, to detect CRC early and reduce its mortality rates (Roy et al., 2021).

The outcome of patients using the colonoscopy screening technique relies on adenoma traces in fecal samples. The technique's effectiveness is limited due to system and operator independence that can present variations in outcome in the analysis of samples. Quality indicators provide a standard workflow, adequate bowel preparation, and assessment of surveillance intervals. Aligning the procedures of conducting colonoscopy with the quality indicators enhances the quality of the outcome for the screening tests administered. Creating a guided system for screening and more accurate indicators for eligible subjects, such as hereditary syndromes, combine relevant information to optimize the screening process. The patient's outcome is enhanced by combining standard procedures and information from the additional test as indicators of the target subjects.

Although good screening tools CT colonography and optical colonoscopy detecting premalignancy and malignancy in individuals presenting with postcurative CRC surgery the latter is recommended for right-sided colon cancer and the former for left-sided colon cancer. CT colonography is a noninvasive, sensitive, and accurate surveillance tool for CRC patients but in those with no severe symptoms requiring no physical examinations with clinical parameters (He et al. 2020).

Critique of Findings

The established process of conducting screening tests according to high-risk populations is a strength of the current colonoscopy approach that reduces the impact of CRC through early diagnosis. The directed manner of identifying subjects susceptible to CRC due to specific genetic sequences is a strength and commendable approach to conducting the screening. The effectiveness of colonoscopy screening methods to accurately actualize proper positive diagnosis for African American subjects attests to the method's precision. Incorporating insight from additional information sources, such as hereditary syndromes, enhances the accuracy and outline the strength of current screening options. The consistent understanding communicated across the studies concerning the practical effectiveness of colonoscopy as a screening methodology is a strength.

The technical know-how required to undertake colonoscopy makes it an easy-to-adopt resource for screening patients. The colonoscopy application can be scaled and expanded with minimal training for operators. Correcting errors in the screening workflow can be conducted conveniently due to its complexity in realizing accurate outcomes. Improvements to the screening process can be additionally enacted through its analysis because of the easily graspable concepts. In contrast, the fecal analysis in the screening process is complex, presenting variations

in populations and operators' capabilities. The inconsistencies in the outcome due to the design of the process and reliance on the aptness of the operator and system create a challenge that leads to a negative effect. The slow-paced adoption by the medical society of contemporary methods undermines the effectiveness of innovation in healthcare. The limited analysis and sources denoting the current screening techniques, such as sigmoidoscopy, create a challenge of leveraging the resources presented through discovery and innovation.

The assessment of economic factors for screening processes using colonoscopy and fecal immunochemical tests fail to establish standardized cost models to deliver fair and quality services across different regions. Formulating a cost assessment method for the screening process, regardless of external factors that create dynamic variations, is a sustainable approach to making the service more accessible (Sekiguchi et al., 2020). Reducing the unethical business practice of overcharging the screening process, especially with colonoscopy, enables eligible subjects to access the services more fairly. The lack of guidelines to inform patients on cost challenges variation in its usage across the different regions depending on external aspects. The limitations in offered procedures create a challenge that reduces the overall effectiveness, because it encourages various interpretations that lead to variations in cost.

The gap in research concerning CRC and colonoscopy screening is found in the lack of incentives to adopt data analysis techniques to revolutionize the workflow. The impact of data science on the medical domain has introduced resources and methods of analyzing a vast volume of complex data to derive desirable insights. Reducing the overall input of operators in the screening process by employing data science is a gap in research that could enhance the application of screening for CRC. Incorporating better workflow steps that leverage computing to make meaning of complex biological data is a gap in research that could revolutionize the

screening of CRC. Additionally, computing resources could enhance the scaling ability to expand to other regions with minimal technical requirements. In the study by He et al., (2020) comparing virtual colonoscopy and conventional colonoscopy usage in suspected colonic diseases, CT colonography was complementary to optical colonoscopy and not a sole definitive test. Likewise, a virtual colonoscopy is not an efficient screening tool for patients with anemia, rectal bleeding, and diarrhea, leading to less colon polyp sensitivity (He et al., 2020).

Practice Comparison

The economic challenges associated with the resources required to administer colonoscopy screening are a barrier that undermines its practicality in the medical domain. The technical demands related to performing and delivering assessments also create a challenge that reduces the overall usage and availability of the screening intervention. As a medical intervention, affordability is a factor that directly correlates to the adoption and use by target factions. A barrier of an economic element due to the required skills of operators and cost limits the usage or recommendation for patients who are eligible for screening. The cost factor determines the inclusion of a screening method as an intervention option; colonoscopy falls short in this regard and limits its access. Consequently, there is a recommendation of a 10-year interval to create a practical usage that delivers accurate insights even with the resource requirements (Sekiguchi et al., 2020).

Additional screening methods, such as fecal immunochemical tests, create economically viable options and can be administered frequently to diagnose CRC earlier. The feasibility of solutions by adding contemporary solutions that are cost-effective and rapid makes screening exercises scalier. Affordability and requirements of conducting screening tests determine the feasibility of interventions. Combining affordable methods with low accuracy and less

affordability with high accuracy administered at longer intervals creates effective medical interventions. The introduction of additional screening tests that offer more information regarding the patient's condition can be combined to yield better accuracy. Enhancing the reach and usage of screening interventions by introducing overhead tests, such as DNA tests to determine genetic markers, allocates screening resources more fairly.

Experiential knowledge that new screening methods demand can be aligned with colonoscopy because of the similarity in fecal compound analysis. The practical usage of the fecal immunochemical test is enhanced because of the parallel nature of skills applied for colonoscopy. The accuracy and error rate associated with operator incompetence is limited due to the design of the process. There is assured consistency and a more convenient introduction of new screening methods to complement colonoscopy. The alignment of required operational skills between colonoscopy and fecal immune-chemical tests create a more conducive transition of operations and introduction to enable more screening services. Reducing the overall cost of screening services ensures better reach through affordability. The alignment in processes also permits the adoption of quality indicators for new screening methods.

Accurate segmental localization and tumor resection are crucial for the patient's prognosis, given surgical intervention once CRC has been established. CT colonography is usually only used for diagnostic purposes. However, the doctor will need to perform a traditional colonoscopy to remove any clinically significant polyps discovered. The ability of CT colonography to distinguish between feces, artifacts, and tiny polyps could be inferior to that of optical colonoscopy. In addition, due to the increased risk of colon perforation, optical colonoscopy is not advised for patients with active diverticulitis, IBD, Crohn's disease, or ulcerative colitis. Patients who have had a bowel perforation in the past or who have extreme

pain or cramping on the exam day should not undergo a traditional colonoscopy (Neri et al., 2019).

Chapter Summary

The affordability of colonoscopy for African Americans as a primary screening intervention for CRC is not convenient due to the socioeconomic status of the subject population. Introducing complementary screening methods with limited accuracy but better affordability attributes more access to such medical interventions. The long-term interval for the colonoscopy screening method provides accuracy and compromises its high-cost factor. Patient outcome using standardized methods promotes consistency in service quality across different settings. There need to be more research incentives to automate CRC screening using data analysis techniques. Leveraging data science methods to reduce the input of operators would prospectively make the screening process more effective.

Chapter 3: Methodology

This chapter outlines the plan for collecting and analyzing data. More specifically, I used a case control research design. The study sample consisted of African Americans between the ages of 35 and 50 screened for CRC using CT colonography and conventional colonoscopy.

Project Design

Lin et al. (2021) considered several modalities to prevent CRC. Their conclusion and findings illustrated the need and efficacy of early screening in the fight against CRC. The analysis examined the sensitivity and specificity of 21 tests, including urine, serum, stool, and direct visualization. The result supported the U.S. Preventive Services Task Force in producing a suggestion for screening for CRC (Lin et al., 2021). In recent years, artificial intelligence (AI) has entered the world of screening and diagnosis, assisting providers in cues, determining disease location, and determining if the disease is benign or malignant. Though its use is not widely available and widespread, the results are otherwise promising (Liang et al., 2022).

Contrary to Lin et al.'s (2021) research method, the current project used a case-control design to arrive at its conclusion. A case-control study (or case-referent research) compared two groups based on recognized causative factors and the outcomes. To identify possible risk factors for CRC, individuals with the condition and screened using the traditional colonoscopy method were compared to CT colonography screening. The target group was individuals with CRC; however, the differentiation was the modality used for screening and its effectiveness.

Interprofessional Collaboration

This project continuously relied on interprofessional collaboration among Abilene Christian University (ACU) stakeholders interested in my research study. My project chair was primarily involved in directing and guiding the incorporation of evidence-based content within a

proper writing format. Other professionals of interest from ACU were the DNP project director and the dissertation and project manager, who helped approve the project's miniproposal. Collaboration with the ACU IRB committee was ensured as needed throughout the project development process.

Practice Setting

This case-referent research compared two interventions—CT colonography and optical colonoscopy—among a target population of young African Americans 35 to 50 years old. I did not conduct the project at an organizational site; data was sorted from the SEER program database through the eRA Commons account (National Institute of Health [NIH]). To identify possible risk factors for CRC, the comparison was between young African American individuals with the condition who underwent screening using the traditional colonoscopy method compared to virtual colonoscopy screening.

Target Population

The research participants were African Americans, focusing on young adults between the ages of 35 and 50 at the time of the investigation. CRC is a common concern among African Americans in this age bracket, particularly those with risk factors. Because of this, it was critical to gather a sample of participants that represented the study well.

Data Collection Method

African Americans aged 35 to 50 screened for CRC using traditional colonoscopy were compared to the same population screened via CT colonography to discover whether there is a relationship between screening outcomes using the two types of colonoscopies. Data was collected from the NIH SEER database on patients who had undergone the two screenings. Inclusion criteria were African Americans between 35 and 50 years with a history of CRC.

Exclusion criteria were non-African American adults (35 to 50 years) with or without CRC history. Additionally, I assessed the benefits and risks of colonoscopy screening outcomes. There were no survey tools/instruments used for this project. See Appendix E.

Analysis Plan

The plan involved using the SEER program database for all incident cases of colorectal adenocarcinoma in men and women aged 35–50 years of African American descent who had been diagnosed with their first malignant tumor at the time of the search. Other inclusion criteria included screening with optical colonoscopy compared to virtual colonoscopy. The lower limitations of this study were the age of 35, and it identified all colonoscopies performed among participants over 2 years, from 2020 to 2022.

The reference date was the date of the CRC diagnosis. CRC tests and other study criteria were identified using the International Classification of Diseases, ninth revision, Current Procedural Terminology, Healthcare Common Procedure Coding System codes, and other classification systems, such as gender, birth year, race (Black), and SEER registration location. Patients that fell within the target population with CRC or inflammatory bowel disease (IBD) were included in the study.

Risk/Benefits/Protection of Human Subjects

The acquisition of data and the analysis were closely connected. After obtaining data, I analyzed it with further data collection and review in response to the findings. To guarantee the data collected, I performed statistical analyses to adequately support the conclusions. Another important consideration in deciding study methodology was fighting against confirmation bias in the data collected. Sato (2019) described data collection and analysis as intertwined, allowing the researcher to see patterns that emerge from the data. This form of presentation severely

prevented reinforcing preexisting beliefs regarding the population of interest—young African American adults.

Case-control research designs are influenced primarily by factors such as costs and the rarity of the disease. As a lone researcher, I undertook this study with data from the SEER database through the eRA account for cost-effectiveness. The case-control research design is often used to study rare illnesses or as a preliminary evaluation where there is no prior knowledge of the relationship between a risk factor and an exciting disease. Prospective cohort studies are more expensive and take longer to complete, while these are less expensive and quicker. Case-control studies offer more statistical power in many situations than cohort studies, which must often wait for a sufficient number of disease episodes to be collected before beginning (Sato, 2019).

IRB Approval & Process

The ACU's IRB reviews and approves all research involving human subjects to ensure that it complies with all federal, institutional, and ethical guidelines to protect the health, well-being, and rights of individuals involved in medical research. A research study must be conducted with the full approval of the IRB. This study was not conducted with an institution; hence no other organizations' IRB consent other than ACU's was required (see Appendix F). Once approved by the DNP project chair and a committee member, an application process of the proposed research project for IRB approval at ACU was initiated. To demonstrate the seriousness and value of performing research, two IRB-completed courses—Responsible Conduct of Research and Social Behavioral Education—were required. (See Appendices B and C for respective training certificates.)

Feasibility

There was no cost to using the NIH's SEER database. Most educational institutions have eRA Commons accounts, of which ACU is part. I reached out to the NIH eRA Commons account administration, who directed me to their ACU representative, after which I got an account created for me. Although I did not have a letter of support from an organization, I have a letter stating I do not need one. (See Appendix D) The study was completed with data collected over 2 years and documented with an audit trail completed to enable other researchers to replicate the research in a comparable setting (Sato, 2019).

Ethical Considerations

Since this project used data from the NIH SEER database, there was no risk of harm or breach of confidentiality. The repository only keeps personal information of interest to me as the researcher, i.e., demographic information and others that, through meta-analysis, benefit the project. The project considered several inclusive criteria for finalizing and manipulating the obtained data. I had no access to personal health information (PHI) and personal identifiable information (PII), hence preventing the violation of HIPAA (Health Insurance Portability and Accountability Act) rules.

Chapter Summary

The purpose of this chapter was to outline the methodology employed to collect and analyze data. Generally, case control was selected as the appropriate research design that aided the research in understanding optical colonoscopy compared to virtual colonoscopy, in which I asked the following research question: "Is conventional colonoscopy more effective than CT colonography in the screening of CRC among young African Americans?" I estimated that the

data collection, analysis, and thesis writing would take approximately 5 months, as illustrated in Table 1.

Table 1

Project Timeline Chart

Project item	Aug 2022	Sept 2022	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023
Identifying study population	X								
Applying for ACU IRB		X							
Awaiting ACU IRB Approval			X	X					
ACU IRB Approved					X				
Selecting the Sample						X	X		
Analyzing the data							X	X	
Thesis Writing							X	X	X

Chapter 4: Results

This section of the study provides results collated from the various databases on African Americans between the ages of 35 and 50 with CRC that were screened using conventional colonoscopy and those that were screened using CT colonography. The findings and analysis section comprehensively assesses the intended study purpose, population, main study topic, and methodology used to collect and analyze data. A concise summary of the findings and analysis section is also incorporated at the end of the chapter. Moreover, this section provides the research outcome associated with identifying the precision of colonoscopy in CRC among Blacks between 35 and 50 years old. The analysis of the results is meant to provide an extensive view concerning the accuracy of colonoscopy.

Purpose of the Project

The study's main objective was to establish the level of precision of colonoscopy concerning screening CRC among young adult African Americans. Moreover, some of the available choices for CRC screening include CT colonography, flexible sigmoidoscopy (FS), optical colonoscopy, fecal immunochemical test (FIT), and the guaiac fecal occult blood test (gFOBT).

CT Colonography and Optical Colonoscopy

When utilizing CT colonography, also known as virtual colonoscopy, the associated risks are reduced, and it calls for the abandonment of anesthesia. Moreover, it provides an opportunity for a more comprehensive assessment of the colon in the entire process. McLeod et al. (2022) established through meta-analysis that CT colonography came with a pooled (collective) sensitivity and precision (accuracy) of 66.8%. Moreover, optical colonoscopy had a joint (collective) sensitivity and accuracy of 80.38% in documenting growth in asymptomatic

screening individuals. In both studies, polyp growths bigger than 8 mm in length were comparably sensitive. Nonetheless, growths smaller than 8 mm in length had reduced the sensitivity of CT colonography in both tests.

Even though optical colonoscopy and CT colonography successfully identified CRCs, they had the same level of accuracy (91%). The main problem of CT colonography is that it needs a similar level of preparation and distress as a colonoscopy (Obaro et al., 2018). Some contentious CT colonography challenges include allergic reactions, emission, and the necessity for an optical colonoscopy, particularly in a positive test. Conversely, traditional colonoscopy shows a negligible risk of damage. Moreover, there is no proof that CT colonography is associated with an individual's increased possibility of suffering from CRC or death.

Using the SEER database, the research revealed that colonoscopies were being conducted. Earlier studies have indicated that the precision of clinical assertions for colonoscopy processes has been verified. Apart from age, race, and femininity, I incorporated data from the SEER registry about region depending on residence at a particular date, financial situation determined by average salary, and rural or municipal residence. To evaluate the variables, I applied a multivariate logistic regression method. Moreover, ICD-9 analytical codes obtained from healthcare institutions, outpatient, and carrier information within 1 year before my study's reference date did not indicate any multimorbidity revealed in the sample population. Hereditary colon cancer in an individual's close family was another probable complicating aspect (Chini et al., 2022).

FS and Traditional Colonoscopy

Based on sensitivity and precision, colonoscopy is superior in clinical diagnosis. In this context, if additional screening checks disclose neoplasia or precancerous injuries in the

digestive organs, this is the last phase in the diagnostic process. Based on the latest research, polypectomy, instead of the process itself, is linked with a one in a thousand occurrence of damage (Wiseman et al., 2020). Even though optical colonoscopies are extensively accessible, they are not always considered cheap or readily available to the public, making it complex to conduct mass screening. Additionally, most of the case control and probable longitudinal studies have indicated that colonoscopy is effective, because it has a death rate reduction of more than 68% but does not have much impact on the deaths associated with proximal colon cancer. According to Wiseman et al. (2020), total cancer deaths have decreased by 29%, distal cancer deaths decreased by 47%, and deaths associated with proximal cancer have not recorded any change.

Even though optical colonoscopy is linked with decreased CRC deaths, the impact does not go beyond other sections of the large intestines. Inadequate duodenal preparation, inadequate colonoscopy, problems with the elimination of proximal colonic growth, or dissimilarities in the pharmacologic physiognomies of proximal CRCs could cause inconsistency. In this case, extensive randomized control trials are needed to effectively address these problems (Wiseman et al., 2020). Individuals who have been found with colon cancer can participate in confirmatory clinical trials that can compare yearly colonoscopies with one-time colonoscopies to assess the occurrence and death rates of CRC in the coming years. The same studies are being conducted to compare colonoscopies and FITs to establish that one is superior to the other. Unlike FS, colonoscopy necessitates additional colon preparation.

Deaths associated with CRC can be controlled using FS screening. Moreover, a traditional colonoscopy must be conducted if precancerous growths are discovered after the screening. Unlike those not screened, individuals with a single and sporadic FS recorded a

reduced risk of CRC mortality of more than 26% (Shaukat et al., 2021). However, when proctosigmoidoscopy is utilized to diagnose, treat and reduce colon cancer, the mortality rate decreases by 45%. Different programs are presently using optical colonoscopies to prevent colon cancer.

Fecal Immunochemical Test

Fecal immunochemical test (FIT) developed from the previous gFOBT test. Based on the producer, this nonhuman haematoxin antibody has failed to react with meat (Dash et al., 2020). Therefore, meats that have peroxidase should be consumed in large quantities. Proteolytic enzymes easily damage intestinal blood in the gastrointestinal tract. Thus, this explains why it is considered a suitable substrate for the FIT approach used in screening. Compared to gFOBT research, the FIT method requires collecting small amounts of stools as samples. While screening high-level CRCs and nonmalignant tumors, conventional and complex gFOBT methods have proved effective. As revealed, FIT is 95% precise in diagnosing colon cancer, with sensitivity and precision recorded at 79 % and 94% (Dash et al., 2020). Many diagnostic programs have indicated that the plan has previously prevented illness.

Moreover, periodic single FIT diagnosis initiatives in different countries have decreased the occurrence of colon cancer by 22% after 11 years of monitoring. The failure of FIT to recognize colon growths is a substantial setback to the technique. Specific experiments are more precise than others, while others are less accurate when different sample sizes are used.

Guaiac Fecal Occult Blood Test

Heme-containing enzymes, integrated into a screening method of the Guaiac fecal occult blood test (gFOBT), can be utilized to identify fecal blood. Apart from being a cheap and straightforward method, it is also an extensively accessible examination. According to White and

Itzkowitz (2020), CRC diagnosis conducted on 4,551 individuals aged between 50 and 80 years indicated that yearly marginal blood tests incorporated with rehydration showed a decrease in cumulative CRC deaths by roughly 33% within 13 years. The research conducted by Luque et al. (2021) differentiated the outcomes of fecal occult blood (FOB) diagnosis within 10 years from that of unscreened tests. Moreover, using FOB diagnosis after every 2 years to identify the illness led to an 18% reduction in CRC deaths within 10 years. In this case, the results were accurate for individuals between 45 and 75 years old.

An investigation conducted for more than 30 years demonstrated that individuals subjected to annual gFOBT as an alternative to conventional treatment recorded a decrease of 32% in CRC deaths. It is interesting that men's mortality was lower than women's (Gao et al., 2019). This approach has been more successful in reducing CRC mortalities than avoiding diagnosis. Nonetheless, it is questionable because heme is needed for the color change. Even though many studies have indicated that the sensitivity of one cancer diagnosis is reduced, it is approximately 50% (Dadkhah et al., 2019). There is a likelihood that nutritional antioxidants or peroxidase affected the outcome. Due to the unspecified nature of gFOBT, its estimated payback percentage (PPV) fluctuated between 3% and 10%. As a result, a more precise test was essential almost immediately.

Demographic Analysis

African Americans in the United States between 35 and 50 years old, who had been found to be suffering from their first colon cancer, were considered in this study after assessing colon cancer cases from the SEER database between 2020 and 2022. The search found 58,978 incidences that matched the necessities to be incorporated. In this assessment, all colonoscopies (virtual and optical) took more than 5 years to complete before the CRC screening guidelines

were applied in part because of the age bracket of 35 to 50 years which was outside of the recognized range for conducting colonoscopies. Moreover, I excluded individuals suffering from colon cancer and registered in Medicare Part A (inpatient) or Part B (outpatient) for more than 5 years before the beginning of the study. An individual suffering from cancer was matched with another participant registered in Medicare Part A/B before diagnosis.

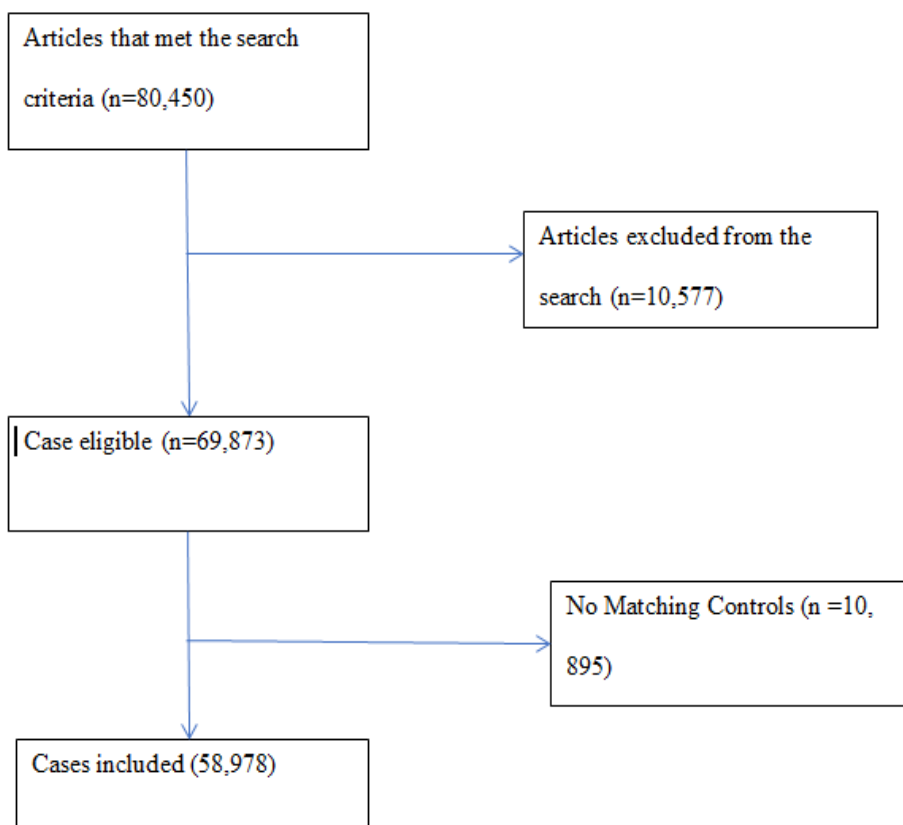
To start the arithmetic, the screening acted as the central reference point. I also applied the ICD-19 identification system and other considered methods to classify CRC tests and other study criteria. Participants diagnosed with CRC and had undergone surgery or had clinical assertions that showed cancer were included in the study. Moreover, any individual who obtained either process outside the study's anticipated potentially inappropriate drug prescription (PIDP) timeframe were excluded from the study. The classification of cases (optical colonoscopy) and controls (virtual colonoscopy) depended on age, gender, ethnicity (African Americans), and SEER registration locality. Due to individual comparison, it was easy to spend roughly a similar amount of time evaluating the colonoscopy history for the affected individuals screened with both colonoscopies.

Data Analysis

The research assumed an invasive occult phase (IOP) that lasted 1–2 years. Additionally, PIDP, including all accessible lookback periods before the projected start of the IOP in conditions where the IOP was anticipated to take less than 1 year, were incorporated. Therefore, with the restriction, it was easy to establish whether the duration of the IOP and reference date impacted the study findings. The sensitivity assessment incorporated PIDP timelines of 5 years or the entire duration before IOP and shorter waits of 1–2 years. More than one colonoscopy performed during the projected PIDP timeline was required to establish vulnerability status of

the patient. When the possibility of being diagnosed with CRC was matched with the occurrence of both colonoscopies, a probability ratio and related 95% assurance level for CRC were estimated using a logistic regression approach.

I considered features such as an individual's location and financial status for comparisons. I also incorporated the score of Charlson's co-occurring conditions and the region's average salary in dollars. Additionally, the reference group for the included models consisted of people who had recorded a reduced endoscopy within the applicable timeline, eliminating those with colonoscopies but without sigmoid. The research incorporated 80,450 participants from various studies, with more than 10,577 studies (articles) excluded due to unmet criteria. Therefore, 58,978 were left as the overall number of active cases. During the predicted PIPD, 18% of patients and 34% of controls provided Medicare claims for colonoscopy. Moreover, the critical trial's occurrence of colon cancer was reduced by 60%. (See Figure 4.)

Figure 4*Population Selection, Inclusion, and Exclusion Cases*

While the ratio of intervention and controls reduced somewhat, the relative decrease in occurrence remained the same (95% CI). Therefore, there was no difference concerning the duration that IOP and PIDP were anticipated to last, because the impacts were similar irrespective of the time. Since the study timeframe was shorter, a small percentage of the population was vulnerable. However, the relative occurrence reduction remained constant.

Questions Guiding the Inquiry

1. Regarding CRC screening, how accurate are both colonoscopy types?
2. Why is the African American population the most impacted by CRC?
3. What risk factors contribute to CRC development in young people?

4. Virtual colonoscopy versus conventional colonoscopy?

Reliability/Validity

To ensure the reliability and cogency of the research, I compared every with many controls arbitrarily chosen from the population. Additionally, an important feature to consider when assessing internal cogency is whether or not observed changes can be linked with intervention. According to Wiseman et al. (2020), when the same control groups are not satisfactorily matched with the susceptible (intervention) group, the internal cogency of the study can be negotiated.

Strengths and Limitations

This study aimed to determine the most effective colonoscopy type optical colonoscopy compared to virtual colonoscopy—for CRC screening among African Americans between the ages of 35 and 50. Other objectives included determining why African Americans are the ethnic group in America most impacted by CRC and investigating why the illness has become more common in young adults. I started the study started with all participants from the available database within the research time frame and then narrowed it down to African American ethnicity regardless of gender. The study excluded African American individuals not between the ages of 35 and 50.

The fundamental limitation of this study was finding exact data on African Americans between the ages of 35 to 50. Most of the population who underwent CRC screening were 50 years and above. Most persons under 40 may also be unable to afford CT colonography because they are perhaps financially unstable, which might discourage them from being screened.

The research had several limitations: focusing on a single ethnic group, African Americans, making it difficult to match the incidences of colon cancer without including other

ethnic groups like Whites in the study. The other limitation is linked to the research method: case-control. For instance, there is constantly a recollection prejudice when people are requested to provide stories concerning their experience with the disease or situations causing the infection. Even though the exhibiting outcomes offer a lasting framework for assessing the advantages and problems from a screening platform, experimental test sensitivity and accuracy data depend on a single screening. The effects of repeated tests have indicated some correlated results. Even though the models presumed independence of the screening test results, including associated outcomes across reiterated screening tests, this would only have an uncertain impact on the projected results of the models. The models used failed to simulate colon cancer trials due to insufficient proof concerning the occurrence of colon cancer based on age, their malignant perspective, and the ability to screen trials to identify them.

Interpretation and Inferences of the Findings

Irrespective of the time of the IOP and PIDP, individuals with a colonoscopy were more than 50% less likely to be infected with colon cancer compared to those individuals who did not have a colonoscopy. Some scholars found similar outcomes in previous research on CRC occurrence in which colonoscopy signs were supplied. Checking on the previously published articles on case control performed in four incorporated healthcare systems in the United States, researchers noted that the odds proportion for having a screening colonoscopy within a duration of between 3 months and 10 years before the reference date garnered a 95% confidence interval (Dash et al., 2020). Moreover, another study identified a 40% decrease in the occurrence of colon cancer in the research cohorts based on the results of screening colonoscopies. Even though the provided odds-ratio approximations may not be as accurate as those from earlier experimental studies, it is inspiring that the technique that does not necessitate a time-consuming

exam sign assessment generates approximations of colonoscopy-linked CRC occurrence reduction that are matched with those from previous experimental studies (White & Itzkowitz, 2020).

When conducting case-control studies on the effectiveness of cancer diagnosis for tests that might inhibit cancer occurrence and deaths, evaluating cancer occurrence instead of mortality comes with many methodological benefits. The chances of substantial prejudices in cancer occurrence research, like the dissimilarity in testing intensities between cases and controls within a given period or depending on an individual's age or mischaracterization of test indication, is reduced in cancer occurrence studies (Luque et al., 2021). An accurate classification of the relevant timespan, like combined PIDP and IOP, is essential, because an undervaluation of the time of this duration will lead to differential categorization, with screened controls likely to be categorized as unscreened than screened cases. Since diagnostic tests are characteristically focused on the screening time in a mortality study, it is essential to suggest the relevant timespan accurately.

Since many individuals with colon cancer receive a screening colonoscopy as part of their treatment, the suitability and accuracy of the test is necessary. Dadkhah et al. (2019) stated that there must be a prerequisite for the resource-intensive clinical record to verify exposure status and perform occurrence studies. Managerial claims are essential sources of research information, because recording the receipt of a colonoscopy is substantially less time-consuming than validating the procedure's justification. Additionally, a colonoscopy performed for any purpose may be used to evaluate the impact of utilizing cancer as the outcome of overall cancer occurrence.

When unexplained gastrointestinal signs like constipation are observed, it is essential to attribute the occurrence of malignant adenomas or sessile serrated adenoma growths to diagnostic colonoscopies conducted concerning these symptoms. The level of connection between screening and diagnostic colonoscopies is dissimilar (Petrick et al., 2021). Moreover, if precancerous growths are highly likely to be discovered during diagnostic colonoscopies, they will probably influence colon cancer prevention in the coming years. Colonoscopies may find additional advanced, extensive, bleed-prone growths that can cause disease.

Case-control studies exploring screening efficiency in reducing cancer occurrences are few and far between, irrespective of the many benefits of early detection. For instance, compounding errors might have occurred in the current review if the timespan used in the calculations of the PIDP and IOP were wrongly stated in the measures. Because every person's PIDP and IOP are unique, generalizing from one person to another is complex. The timespan for PIDP and IOP is usually not recognized (Jackson et al., 2016). This might lead to unfairness in case-control studies evaluating the importance of cancer screening in preventing or decreasing cancer occurrences and deaths. Based on the odds proportion attained in this situation, the PIDP and IOP were concerned with the right of the colon, which is encouraging to understand. More deliberations must be considered when evaluating the joint importance of screening and diagnostic processes, like other aspects that might impact the risk of colonoscopy and colon cancer.

Patients suffering from inflammatory bowel infection and a family record of the illness were eliminated from the research due to the increased risk of colon cancer and the increased occurrence of colonoscopies that such patients normally have compared with the general population. Due to the total amount of information accessible, the SEER-Medicare data has

intrinsic confines. Suppose there had been enough access to management codes that incorporated data on the family history of CRC. In that case, it could have been essential to conclude that the data were incorrect because of the increased occurrence of CRC in patients screened with CT colonography (Jackson et al., 2016).

Conversely, the occurrence studies have few issues because the study accessed equivalent odds ratio approximations irrespective of how the PIDP and IOP estimates were elevated. Based on Medicare coverage guidelines, the study could only incorporate colonoscopies performed on individuals aged 35 years and above in the study population. On the other hand, the SEER-Medicare database failed to include any data on colonoscopies conducted on adolescents, which might have had a significant effect on the later occurrence of colon cancer (McLeod et al., 2022). Colonoscopies for individuals suffering from colorectal growths should be conducted more than once within 5 years, and individuals who have never had colon polyps should have one performed once every 10 years.

Chapter Summary

The main emphasis of this chapter was to establish the precision of optical colonoscopy when diagnosing colon cancer. Moreover, the study established that even though people have started using additional diagnostic methods, colonoscopy is still considered the high-quality standard for colon cancer discovery. Irrespective of how it is conducted, an optical colonoscopy has a 95% precision rate or more.

Chapter 5: Discussion, Recommendations, Conclusion

In this chapter, I discuss and interpret the results from the previous chapter. Apart from assessing the results, the chapter contains subtopics that report the study's inadequacies and implications. The methods for CRC available. It can be described as a gold standard screening option in contemporary medicine and a potential means of preventing CRC because of its prevalence and effectiveness, increasing the screening rate among populations. This screening method can identify other significant disorders and malignant polyps. Among other things, and compared to CT colonography, an optical colonoscopy has many advantages in addition to being quick and painless. If no precancerous changes are found, an optical colonoscopy must only be performed once every 10 years for people at average risk. Some literature compared the segmental localization of tumor accuracy between CT colonography and optical colonoscopy. Some literature indicated that optical colonoscopy is the gold standard procedure currently in use. They noted that accurate segmental localization and tumor resection are crucial for the patient's prognosis, given surgical intervention once CRC has been established (Schoenfeld, 2020).

On the other hand, several critical medical organizations have recognized CT colonography as a minimally invasive imaging test of the colorectum for detecting and screening CRC. Most research on CT colonography published has employed optical colonoscopy as the gold standard test as their primary method of finding colorectal polyps. Yet, test sensitivity for invasive cancer cannot be well assessed in single studies due to the low prevalence of invasive cancer, particularly in a screening environment, and the small numbers of malignancies found in the screening group. Furthermore, the two most recent systematic studies of the diagnostic

accuracy of CT colonography focused exclusively on polyps rather than cancer (Chini et al., 2022).

Study Findings

Increased Sensitivity

Conventional colonoscopy has increased sensitivity, a critical factor enhancing its effectiveness. Whether working with symptomatic patients or asymptomatic for screening, high sensitivity for CRC is essential. Various studies, according to Sonnenberg et al. (2019), have indicated that some malignancies within the rectum were among the majority of cancers missed by CT colonography; only 38% (six of 16) of cancers were found close to the splenic flexure. For instance, sometimes miss malignancies that appear on the right side of the colon; this complements the ability of CT colonography to detect right-sided cancers. Right-sided examination during CT colonography seemed very straightforward, whereas it is more difficult during optical colonoscopy because of the greater distance the scope has to travel into the colon. The proportionate rise in rectosigmoid tumors overlooked by CT colonography may be related to difficulties with luminal distention and may also be partially attributable to cancer's standard anatomic distribution. In one of the works of literature, CT colonography was less effective than optical colonoscopy for identifying patients with polyps less than 6 mm in a group of CRC surveillance patients 1 year after resection (Sonnenberg et al., 2019)

Gold-Standard Test

In retrospect, optical colonoscopy is a gold-standard test for examining symptoms that can indicate CRC; however, CT colonography is a less invasive alternative to conventional colonoscopy. With its use, further examination is required to confirm any suspected colonic lesions, and this is a crucial element in determining whether or not CT colonography is an

effective alternative to traditional colonoscopy. An optical colonoscopy provides a sensitive luminal examination that enables biopsy samples to be collected for an accurate diagnosis. Yet, older patients and those with comorbidities are more likely to have an incomplete or challenging colonoscopy than younger patients without comorbidities. They are also more likely to experience adverse outcomes. This is a situation in which CT colonography may be preferable (He et al., 2020).

Consequently, in some cases, employing a different first-line inquiry for individuals with CRC-related symptoms would be advisable. One of the main challenges with colonoscopies is that most colonoscopy patients require sedation, which is not essential for CT colonography. On the other hand, and as a challenge in CT colonography, an optical colonoscopy is typically needed if lesions that require biopsy or removal are found during a CT colonography, implying that conventional colonoscopy is the better option (Bortz, 2021).

More importantly, about 30% of individuals in Goa et al.'s (2019) study underwent extra-intestinal inquiry after CT colonography compared to only 8% after a traditional colonoscopy, implying the effectiveness of the latter. In fact, with a limited predictive value for CRC or significant polyps, almost half of the referrals following CT colonography were for polyps smaller than 10 mm or due to clinical uncertainty. In referrals for colonoscopy, there were also significant variables such as sex-based or racial differences in relative referral rates. Women, for instance, were more likely than males to have a second examination after a colonoscopy, mainly because their colonoscopy was incomplete. In contrast, men were more likely to have a second examination after a CT colonography, typically because a malignancy or polyp was discovered. This supports findings from earlier studies that indicate women had fewer polyps and had a worse colonoscopy (optical/conventional) experience than men. However, overall, conventional

colonoscopies were more effective than CT colonography when all variables were considered (Gao et al., 2019).

Lowering Risk of CRC by Screening

The study by Joseph and DeGroff (2019) found that prior research has demonstrated that traditional colonoscopies lower the risk of CRC by 40% to 69% and the risk of death from the disease by 29% to 88%. Men in the United States are affected by the disease at a rate of 1 in 23 or 1 in 25 for women. The key to preventing colon cancer and detecting it early is routine by colonoscopy screening. According to estimates, African Americans have a 40% greater risk of passing away from the illness than White Americans. According to the CDC, almost two-thirds of American adults between 50 and 75 have had colon cancer screening recently (Joseph & DeGroff, 2019).

High-quality screening is critical for detecting cancer. For many middle-aged adults, colonoscopies are a dreaded milestone in life. The promise has been that beyond age 45, you have the highest chance of developing and possibly preventing CRC if you put up with the uncomfortable and intrusive procedure of having a camera travel the length of your large intestine once every decade. It ranks as the second most frequent cancer-related fatality in the country. In the United States some 15 million optical colonoscopies are performed annually.

Right and Left Colon/Rectum

Only a few observational studies have looked at the effectiveness of both colonoscopy in the right and left colon/rectum independently, and the findings are inconsistent. Early research revealed little to no efficacy in the right colon, suggesting that clinically significant lesions may be biologically distinct or less easily identifiable by optical colonoscopy. Nevertheless, because these observational studies relied on administrative data, it was impossible to distinguish

between colonoscopies done for screening and those done because of persisting symptoms. With broad confidence intervals and design restrictions, such as the use of self-reported screening exposure and the use of cancer stage as an endpoint rather than death, more recent studies have found some indication of benefit in the right colon when using conventional colonoscopy compared with other tests such as CT colonography. One of the studies discovered that screening using a traditional colonoscopy was linked to a 67% reduced mortality risk from CRC overall (Doubeni et al., 2018) In addition, these researchers also found a 65% lower risk of right-colon cancer and a 75% lower risk of left-colon/rectum cancer associated with optical colonoscopy screening.

Prevalence

Traditional colonoscopy has been the preferred method for CRC screening and prevention in the United States for more than 10 years. Early reports by Melson et al. (2020) stated that colonoscopy screenings reduce the risk of CRC by 90%. Patients may benefit from colonoscopies in two different ways. It can, first and foremost, identify and assist in the excision of precancerous polyps. Several studies have demonstrated that polypectomy during optical colonoscopy reduces the risk of CRC. Moreover, according to some research, a negative colonoscopy can strongly indicate CRC development for up to 20 years. Secondly, using an optical colonoscopy is also very critical in detecting CRC at an early stage. This will increase the chances for treatment and cure, unlike discovering it at an advanced stage (Melson et al., 2020).

Moreover, colorectal malignancies in persons without inflammatory bowel disease are likely to develop from precancerous polyps. Most of these polyps develop over 10 years or more due to a well-documented series of mutations. Neri et al. (2019) mentioned that studies have observed that by the time people reach the age of 50, 25% of men and 15% of women will have

adenomatous polyps. Recent academic and community practice studies show that the actual rate might be higher. Even early malignancies and the vast majority of these polyps are asymptomatic. It would seem then that optical colonoscopy is the best screening method, because it enables identifying and removing these polyps before they develop into cancer (Neri et al., 2019).

Further, some evidence from the studies suggested that those with an optical colonoscopy with polypectomy have a lower risk of developing CRC. The National Polyp Study 1993 was the first study to point out this benefit. Colonoscopic polypectomy could prevent between 76% and 90% of colorectal malignancies. A comparable survey conducted in Italy by Citarda and associates revealed a 66% decrease in colon cancer incidence (Winawer et al., 2021).

In one of the studies cited by He et al. (2020), before surgery, 65 patients with CRC who had been diagnosed using optical colonoscopy underwent CT colonography (mean age 64; 45 females, 19 males) due to some reasons. Patients were sent to CT colonography after an incomplete optical colonoscopy in 45 of 65 cases (69%). Patient intolerance to optical colonoscopy leading to incompleteness was due to stenosing malignancy causing persistent difficulty in navigating the portion of the colon affected by the lesion. Because pneumocolon (presence of air in the colon) could not be acquired in individuals with the obstructive lesion of the sigmoid colon, CT colonography enabled a thorough colonic evaluation in 63 of 65 cases. However, the sensitivity of CT colonography was not 100% per patient and lesion. A statistically significant difference from a traditional colonoscopy was seen ($p = .05$). Regarding segmental localization of masses, CT colonography accurately found every lesion, whereas colonoscopy missed 16 of 67 (24%) of the lesions, except for six (9%), which were missed due to incomplete colonoscopy. The mismatch occurred in the cecum ($n = 3$), rectum ($n = 2$), sigmoid ($n = 2$),

descending colon ($n = 1$), and transverse colon ($n = 2$), and 10 of 67 (15%) lesions were found by optical colonoscopy but wrongly placed. The studies established significant fairness in CT colonography and optical colonoscopy agreement ($k = 0.62$). Some of the considerable values include sensitivity (100%), specificity (96%), positive predictive value (85%), and negative predictive value (100%) of CT colonography in identifying the exact site of colonic masses. CT colonography performs better than other methods to locate tumors segmentally and identify colonic masses (diameter > 3 cm). However, overall, studies indicate that conventional colonoscopy is superior to other tests (He et al., 2020).

NCI staff (2020) reported that 59% of people 45 years of age or older had received a CRC screening, ranging from 50% of Asian individuals to 61% of White and Black people. Additional factors that contribute to low screening prevalence include living in the United States for less than 10 years (29%), not having health insurance (21%), and just having completed high school (48%). In 2020, screening prevalence varied greatly by state, from 53% in California to 70% in the District of Columbia and Massachusetts. While CRC mortality is declining, the future looks less promising due to the rapidly evolving disease environment. Cohorts born in the latter part of the 20th century have heightened risk, with age shifting the burden of CRC to younger people. Notably, one in five new cases also affects people in their early 50s or younger.

Furthermore, people are currently being diagnosed with more advanced diseases than in the mid-1990s, before widespread screening, when there was a general shift to later-stage disease. Despite more success in preventing left-sided cancers by screening, there has been a shift from right- to left-sided malignancies (NCI Staff, 2020). This change is likely due to changes in the risk of an underlying disease with an unknown origin, a reason why conventional colonoscopy would be more effective than CT colonography.

Even though screening can prevent a sizable number of CRC deaths in the United States, only about four in 10 individuals 45 years and above get a screening. Most people are ignorant or not current regarding screening, including almost half of those in various states, such as Mississippi. Another hindrance is the lack of medical insurance. Only a few young people and those without health insurance get screened. Promoting healthier lifestyles and maintaining equitable access to high-quality healthcare for all people, including those living in rural and other underresourced places, could help reduce CRC inequalities and advance progress. Saey (2017) established persistent and glaring racial and geographic inequities, with Alaskan Native death rates nearly four times greater than non-Hispanics and Whites.

The Black community is also disproportionately affected by CRC, with the highest rates of any racial/ethnic group in the United States. Compared to most other populations, McLeod et al. (2022) stated that African Americans have a 20% higher risk of developing CRC and a 40% higher risk of dying from it. The causes of the variations are complicated, but they mostly correspond to variations in risk factors and access to healthcare, both of which are influenced by socioeconomic class. In actuality, the prevalence of cancer among African Americans is disproportionately high. They frequently face more prominent barriers to cancer prevention, identification, treatment, and survival, such as pervasive and complicated systemic racial inequities beyond the evident link to cancer.

These challenges may include lower-paying jobs, a lack of health insurance or less comprehensive coverage, a lack of access to wholesome and reasonably priced foods, poor housing and education standards, and hazardous residential locations. According to Durado Brooks, MD, vice president of prevention and early detection at the American Cancer Society, CRC is the second-deadliest malignancy in the nation (Nayani et al., 2017). It is more crucial

than ever that everyone has access to and is getting the necessary screenings because this disease is wreaking havoc on the Black community. The basic screening tests are still accessible to prevent or detect the disease at an early, more treatable stage, even during and after the COVID-19 pandemic. Certain CRCs can be found and even contained with screening.

Implications for Healthcare Leaders

The study is essential in acknowledging why incidences of colon cancer are high among Blacks in the United States. The study should assist healthcare specialists and investors in developing suitable plans to fight colon cancer among the increasing number of young people. The study's results support previous research that showed the accuracy and benefits of optical colonoscopy when screening for colon cancer.

Evidence-Based Practice Findings

In the second quarter of 2020, CRC screening rates fell by almost 80% compared to 2019. Nevertheless, a recent study using Behavioral Risk Factor Surveillance System (BRFSS) data discovered that, in contrast to reductions in breast and cervical cancer screening from 2018 to 2020, CRC screening remained stable, because a 16% decline in colonoscopy was offset by a 7% increase in stool testing (Fedewa et al., 2022). The rise in stool testing draws attention to the potential for these noninvasive options to both boost screening prevalence, particularly among underprivileged areas that favor home-based choice, and prevent screening declines during upcoming disruptions in health care. The EBP discussed above portrays DNP essential III – analytical methods for evidence-based practice.

The DNP Essential VII, Clinical Prevention and Population Health for Improving the Nation's Health, resonates with the Healthy People campaign created by the U.S. Department of Health and Human Services (HHS), which is an initiative started in 1979 to set national health

objectives for the next 4 decades. The Healthy People initiative has been accepted nationwide to advance the shared vision of enhancing all Americans' health in a disintegrating healthcare delivery system (Manderscheid & Wukitsch, 2018). Leading health indicators (LHI) is a smaller portion of the Healthy People 2020 objectives that convey prioritized health issues and direct their measures while assessing the nation's health, enhancing health alliances among organizations, and influencing the use of health measures at the community, state, and national levels to improve the health of the U.S. population (Healthy People 2020, 2020). Clinical preventive services are health care guidelines (routine disease screening and scheduled immunizations) recommended by the U.S. Preventive Services Task Force to help reduce death and disability and improve U.S. populations' health (Ngo-Metzger et al., 2018). The recommendation for CRC detection and treatment is to screen at 50 or 45 (with a family history of CRC); it is an effective way of reducing the risk of contracting the disease. It is highly recommended to practice evidence-based CRC preventive services, because they are cost-effective and provide high-quality care by eliminating unnecessary tests and procedures. Improvement and progress is ongoing in CRC screening. As of 2020, in the United States, only 25% of adults aged 50 to 64 and less than 40% of adults aged 65 and above were up to date on CRC screening; hence, the essence of upholding screening guidelines and passing on its importance by healthcare professionals (Healthy People 2020, 2020). Nurses must familiarize themselves with CRC disease screening guidelines to confidently educate patients on CRC services, as most U.S. adults have limited knowledge about clinical preventive services. In addition, nurses must vigorously educate populations with low education, low-income levels, Hispanics, and African Americans about the benefits of clinical preventive services to help reduce deaths, disease processes, and healthcare costs of the American people.

Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care, the fourth DNP Essential's usage, was observed in my literature searches. Healthcare professionals use technology to communicate before, during, and after CRC screening for continued care and data collection and sharing. When not removed, growths in the colon or rectum linings called polyps will likely lead to CRC. Detection and removal of polyps done through the technological application of the colonoscope are vital to preventing CRC (Centers for Disease Control, 2020). Secondary prevention screening procedures, such as colonoscopy, capsule endoscopy, and CT colonography scanning, are used to detect the colorectal disease process early. Colonoscopy is the primary diagnostic screening measure for CRC due to its high accuracy in detecting tumors in the colon. Another advantage of colonoscopy techniques is finding polyps, removing them, and taking biopsy samples for testing.

Most importantly, colonoscopy gives access to diagnostic and therapeutic insights into the disease process. Proper detection of colon adenoma and cancer depends on the colonoscopy quality. Cure and maintenance therapies for CRC include surgery, radiation, and chemotherapy. New treatments for CRC include radiotherapy, laparoscopic surgery when the disease is in its primary stage resection of a metastatic tumor when the colon and other organs (liver and lungs) are affected, and neoadjuvant and palliative chemotherapy for some forms of colorectal metastatic cancer (Kuipers et al., 2015). According to Chen et al. (2018), preventing the development of malignant tumors focuses on the early detection of stage cancers and adenomas using screening colonoscopy. Colonoscopy screening is anticipatory guidance, a safe and patient-tolerated examination aiming to find colorectal tumors. Although colonoscopy is an invasive technique due to methods used, such as bowel preparations (laxatives) and anesthetic agents, it is a beneficial one-step procedure. The one-step advantage of colonoscopy is its

fulfillment of screening tests, diagnosis, and polypectomy simultaneously. Further treatment can be ordered by finding abnormalities and progressive tumor changes during a colonoscopy screening.

Colonoscopy is the only colon screening tool used to monitor patients after polypectomy and CRC surgery. Enhanced technical performance must be encouraged with CRC screening procedures, test results must be easily accessible among clinicians and providers, and patients must be enabled to undergo appropriate follow-up after testing. Primary care physicians and clinicians are counted on to provide high-quality assessments to decide on proper CRC screenings (Rex et al., 2017). In all these measures and approaches to CRC screening, the absence of technology interferes with electronic documentation, test performance, and information gathering to educate patients, train the care team, and track disease prognosis.

According to estimates, thousands of CRC cases and fatalities may be avoided if CRC screening prevalence nationwide reaches 80%. The multitarget stool DNA test outperforms fecal immunochemical testing (FIT) and high-sensitivity guaiac-based fecal occult blood testing in terms of life years gained in real-world settings. Moreover, multitarget stool DNA testing is more accurate in detecting serrated polyps—precursors to 15%–30% of all CRCs, including many interval cancers—than fecal immunochemical testing or colonoscopy alone. The 3-year screening schedule of multitarget stool DNA testing could be less demanding than annual testing, but it still has a far higher price tag than other stool tests (Melson et al., 2020). The target of CRC screening prevalence in reaching an 80% success rate nationwide would help prevent CRC and improve the nation's health.

Recommendations for Future Research and Clinical Practice

In retrospect, no one can deny that optical colonoscopy is a powerful test for detecting and preventing CRC. It is and has remained the most common CRC screening method in the United States. Traditional colonoscopy dramatically lowers the incidence and death of left-sided CRC, as shown by this study. However, some researchers and doctors are concerned about the relative inability of optical colonoscopy to detect CRC in the right colon, which is probably a combination of factors. Therefore, further efforts are required to standardize training for all colonoscopists and identify and implement suitable quality assurance measures that are not specialty-specific, given the numerous studies demonstrating that the type of endoscopists performing the examination significantly affects the right-sided benefit (Baran et al., 2018)

Moreover, whether the various specializations can agree on specific minimal training standards that incorporate competency-based assessments rather than numerical ones remains to be seen. One thing is certain: optical colonoscopy performance must be improved if we want to fully benefit from CRC screening, especially in the right colon. In terms of society, more must be done to inform people about the value of CRC screening. In addition, to reduce obstacles to CRC screening, doctors and public health professionals must collaborate with a focus on the particular culture and requirements of the target community.

The standard colonoscope has undergone numerous date changes to enhance CRC performance and outcomes. They have so far shown to be of only marginal value. Except for the Third Eye Retroscope (TER), ancillary devices haven't performed any better. Despite its demonstrated improvement in adenoma yield, the TER has not been evaluated in a nonacademic setting, and it is not yet clear what the cost-benefit analysis would be for utilizing this device for

all individuals undergoing optical colonoscopy (Waye, 2020). Developing one's technique rather than buying new tools would benefit colonoscopists more.

Chapter Summary

Several factors that will ultimately determine the direction of colorectal screening in the United States cost-effectiveness, acceptance, and insurance coverage are part of the many options explored in this chapter. Suppose costs are reduced to an acceptable level for conventional colonoscopy and CT colonography; it is possible that a particular test combination, such as an optical colonoscopy with interval fecal DNA testing, could offer the best risk/benefit ratio. Today, and even in the foreseeable future, traditional colonoscopy will be the cornerstone of CRC screening regardless of what the future brings. The key to maximizing the effectiveness of conventional colonoscopy is to perform it with high standards and track recognized performance improvement indicators.

Conclusion

It is essential to establish the accuracy of colonoscopy in screening colon cancer patients, particularly considering that there are many disease screening options. Even though there are many options for screening colon cancer, this study established that performing an optical colonoscopy is essential compared to other techniques used to evaluate colon cancer because its level of precision is high. Apart from assessing the precision level of colonoscopy processes, the study established why the disease is becoming more common among African Americans and teenagers. Based on the research's other objectives, it was confirmed that African Americans are developing this disease at an increased rate compared to those from the White community and other ethnic groups mainly because of their lower socioeconomic status. Teenagers are

experiencing the spread of this disease at an increased rate compared to the elderly, an aspect that can be linked to dietary concerns.

Moreover, CT colonography is currently responsible for CRC screening drives and replacing what research has shown to be the best technique: optical colonoscopy, except in cases when there is an incomplete optical colonoscopy. The probable responsibility is the suggestion of optical colonoscopy as the immediate CRC screening method with many benefits, such as its accuracy and safety. Because this assessment was meant to inform the readers, accurate devotion to screening plans was presumed to estimate attainable advantages for individuals who follow the recommendations.

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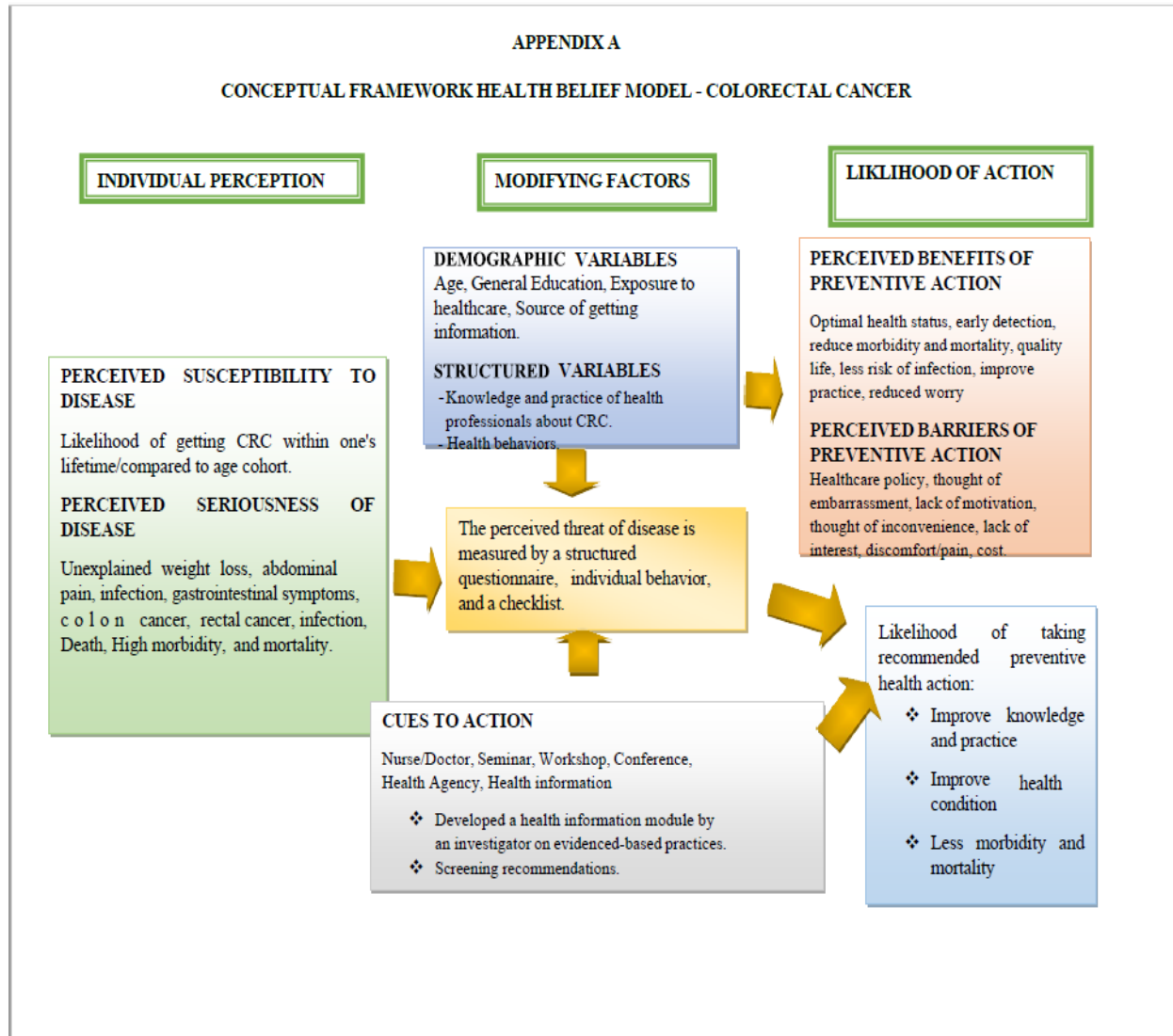
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Appendix A: Conceptual Framework Health Belief Model - Colorectal Cancer



Note: Conceptual frame work of health belief model, by M Parashar, 2019, Slide share

<https://pt.slideshare.net/mannparashar/conceptual-frame-work-of-health-belief-model>

Appendix B: Responsible Conduct of Research Training Certificate

Completion Date 10-Jan-2022

Expiration Date 09-Jan-2026

Record ID 46542264

This is to certify that:

ABENA NIMAKO

Has completed the following CITI Program course:

Not valid for renewal of certification
through CME.**All Researchers (RCR)**

(Curriculum Group)

All Researchers (RCR)

(Course Learner Group)

1 - RCR

(Stage)

Under requirements set by:

Abilene Christian University**CITI**
Collaborative Institutional Training InitiativeVerify at www.citiprogram.org/verify/?w519f1163-4b75-4340-bd05-58dc2b86b28e-46542264

Appendix C: Social Behavioral Education Training Certificate



Completion Date 08-Jan-2022
Expiration Date 07-Jan-2026
Record ID 46542279

This is to certify that:

ABENA NIMAKO

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social & Behavioral Research - Basic/Refresher
(Curriculum Group)
Social/Behavioral/Education
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Abilene Christian University



Verify at www.citiprogram.org/verify/?wff0aa30c-c328-4f91-a431-14d340c7cbd6-46542279

Appendix D: Memorandum for Nonutilization of Support Letter

I hereby state that I am not using an organization for my project based on my research type (case-control or case-referent research), in which conventional colonoscopy will be compared to computed tomography (CT) colonoscopy in the screening of colorectal cancer among young (35 to 50 years) African Americans. Data will be sorted from the Surveillance, Epidemiology, and End Results (SEER) Program database through eRA commons account (National Institute of Health).

ABENA NIMAKO

Abena A. Nimako July 18th, 2022
DNP Student (Abilene Christian University)

Appendix E: Memorandum for Nonutilization of Survey Tools

I hereby state that I am not using a survey tool or instrument. Data will be sorted from the Surveillance, Epidemiology, and End Results (*SEER*) Program database using my eRA commons account (National Institute of Health) created for me by ACU.

ABENA NIMAKO

05 August 2022

Abena A. Nimako

ACU DNP Student

Appendix F: IRB Approval

Date: 1-18-2023

IRB #: IRB-2022-122

Title: Is Conventional Colonoscopy More Effective Than Computed Tomography (CT) Colonography in the Screening of CRC Among Young (35 to 50 years) African American Adults?

Creation Date: 11-17-2022

End Date:

Status: Approved

Principal Investigator: Abena Nimako

Review Board: ACU IRB

Sponsor:

Study History

Submission Type	Initial	Review Type	Exempt	Decision	Exempt
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Key Study Contacts

Member	Abena Nimako	Role	Principal Investigator	Contact	xxxxxx@acu.edu
Member	Abena Nimako	Role	Primary Contact	Contact	xxxxxx@acu.edu
Member	Donna Atobajeun	Role	Co-Principal Investigator	Contact	xxxxxx@acu.edu