2018

Factors Affecting Colorectal Cancer Screening Among African-Born Immigrants in the United States

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2018

Abstract

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MSc, University of Ibadan Nigeria, 2005

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Dissertation Submitted in Partial Fulfillment

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Doctor of Philosophy

Public Health

Walden University

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Abstract

Despite the evidence that colorectal cancer screening is effective in reducing the incidence of and mortality from colorectal cancer, racial and ethnic disparities in colorectal cancer screening persist in the United States. African-born immigrants in the United States have lower colorectal cancer screening rates than native-born Americans. The purpose of this quantitative, retrospective, cross-sectional study was to examine how family income, health insurance status, language of interview, length of stay in the United States, perceived health status, level of education, and having a usual place for medical care affect colorectal cancer screening among African-born immigrants in the United States. The immigrant health services utilization model provided the framework for the study. Secondary data collected in 2010, 2013, and 2015 through the National Health Interview Survey from 349 African-born immigrants age 40 years and above were analyzed using logistic regression and a chi-square test of independence. A stratified multistage sampling procedure was used to select the sample for the study. Results showed a significant association between colorectal cancer screening and health insurance status, length of stay in the United States, perceived health status, and having a usual place for medical care. However, no association was found between colorectal cancer screening and family income, education level, and interview language. Findings may be used to impact positive social change and guide policy decisions on colorectal cancer preventive interventions targeting African-born immigrants living in the United States.

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Dedication

This work is dedicated to God almighty that preserved my life until this moment. To my father, Ephraim Chibundu, of blessed memory who encouraged me and provided so much sacrifice to ensure that I advanced in my academic pursuits. To my beloved wife who encouraged and helped me overcome several difficulties that I encountered on my academic journey. To men and women who did not advance their education because of their poor financial background.

Acknowledgments

The guidance and insight that Dr. Frazier Beatty, my committee chair, provided me during the dissertation process were invaluable. Thank you so much for your excellent input, and for steering this dissertation in the right direction. I appreciate Dr. Xianbin Li for the critique of the work to ensure its sound quality. Thanks for all you did. I give many thanks to Dr. Kai Stewart, the university research reviewer, for a careful review of my work. I have confidence in the quality of my study because of the great job you did. I forever remain grateful to my parents for the discipline they inculcated in me while I was growing. Their advice and parental guidance helped point me in the right direction as a young man. Their sacrifice helped see me through my first degree, which formed a foundation for my pursuit of this doctoral degree.

My wife, Peace Chibundu, has been exceptional in giving me the needed support and encouragement throughout this academic journey. She willingly sacrificed several family times on the altar of the pursuit of this doctoral degree to ensure I concentrated on my studies. Indeed, all of the strength came from her, but the weaknesses are mine. I deeply appreciate her. I want to thank my children, Chisom, Prevailer, and Kelechi, for bearing with my absence at family times, sports events, and picnics. Thank you for your understanding. I hope to make up the time stolen from you because of my studies. I also want to thank other family members, friends, and colleagues, especially Emenike Akwafuo, Yemi Adejinmi, Ugochukwu Azubike, and others who contributed in one way or another to the successful completion of this work.

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Chapter 1: Introduction to the Study

Colorectal cancer is the third most common cancer worldwide, and it ranks fourth among causes of cancer-related deaths, with an expected increase of 2.2 million new cases and 1.1 million deaths from colorectal cancer by 2030 (Arnold et al., 2017). In both men and women living in the United States, colorectal cancer is the third most commonly diagnosed cancer, and the second leading cause of cancer-related deaths (American Cancer Society [ACS], n.d.). In the United States, about 135,430 people will be diagnosed with colorectal cancer in 2017, and approximately 50,260 people will die from the disease in the same year (ACS, n.d.). Several studies have shown that screening for early detection and removal of precancerous polyps is effective in decreasing both incidence of and mortality from colorectal cancer (ACS, n.d.; Nemeth, Jenkins, Nietert, & Ornstein, 2011). Concerted public health effort has led to increases in colorectal cancer screening rates, yet racial disparities in colorectal cancer screening persist in the United States (Shavers, Jackson, & Sheppard, 2010; Wallace & Suzuki, 2012). Racial minorities have lower colorectal cancer screening rates than non-Hispanic Whites in the United States (ACS, n.d.; Klabunde et al., 2011). Also, immigrant populations living in the United States have lower screening rates than native-born Americans (Goel et al., 2003; Reyes & Miranda, 2015; Shahidi, Homayoo, & Cheung, 2013; Shih, Elting, & Levin, 2008) and may be at a disadvantage in terms of early detection and removal of precancerous polyps. African-born immigrants living in the United States emigrate from the African continent where colorectal cancer is considered a rarity, and routine colorectal cancer screening is not a common practice (Laiyemo et al., 2016). As African-

born immigrants become acculturated, the adoption of a Western lifestyle and dietary patterns associated with increased colorectal cancer risks creates the need for increased colorectal cancer screening. The objective of this study was to examine factors that influence colorectal cancer screening among African-born immigrants living in the United States. The study was significant because its findings may be useful in the design of interventions that may help increase colorectal cancer screening among African-born immigrants, which may help decrease colorectal cancer incidence and mortality among the immigrant population and U.S. population. Chapter 1 includes the background, problem statement, purpose of the study, research questions and hypotheses, theoretical basis for the study, significance of the study, nature of the study, definitions of terms, assumptions, scope and delimitation, limitations, and a summary.

Background

Colorectal cancer disease results when abnormal cells in the colon and rectum multiply and invade surrounding cells and tissues with devastating health effects (ACS, n.d.; National Cancer Institute [NCI], n.d.-a). Colorectal cancer contributes to morbidity and mortality in the United States and other parts of the World (Gellad & Provenzale, 2010). In the United States, there are racial and ethnic disparities in colorectal cancer incidence and mortality, with African Americans and Alaska Natives recording the highest incidence rates and Asian/Pacific Islanders recording the lowest rates (ACS, n.d.). Also, racial minorities and immigrant populations are more likely to be diagnosed with late-stage colorectal cancer with a lower chance of survival (Choe, Koepsell, Heagerty, & Taylor, 2005; Marcella & Miller, 2001; Papageorge, Carchman, & Kennedy, 2016;

Siegel, Naishadham, & Jemal, 2012). Studies have shown that colorectal cancer screening is effective in reducing colorectal cancer incidence and mortality (D. Davis et al., 2011), and early detection and removal of precancerous polyps has been shown to prevent development to invasive cancer and decrease the mortality outcome (Toll et al., 2011). According to Edward et al. (2010) and Vogeelar et al. (2006), modeling studies suggested that more impact in reducing colorectal cancer deaths can be achieved through increased screening than by reduction of colorectal cancer risks.

Average-risk individuals begin colorectal screening at age 50 while those who are at increased risk can start screening at an earlier age (ACS, n.d.). The options recommended by the United States Preventive Services Task Force (USPSTF) for colorectal cancer screening include (a) flexible sigmoidoscopy that is done every 5 years, (b) colonoscopy that is conducted every 10 years, (c) double-contrast barium enema that is performed every 5 years, and (d) computed tomographic colonography that is done once in 5 years; the fecal occult blood test and stool DNA test carried out yearly and used primarily for cancer detection can also be used to detect some precancerous polyps (ACS, n.d.). However, in the United States, colonoscopy remains the most commonly used screening test for colorectal cancer (ACS, n.d.).

Despite the benefits of increased colorectal cancer screening, racial disparities in colorectal cancer screening persist in the United States (ACS, n.d.; Klabunde et al., 2011; Shahidi et al., 2013). Studies have shown that foreign-born populations have lower colorectal cancer screening rates than native-born Americans (ACS, n.d.; Goel et al., 2003; Reyes & Mirinda, 2015; Shahidi et al., 2013; Shih et al., 2008). Further, studies

have revealed that foreign-born status is a barrier to colorectal cancer screening in the United States (Goel et al., 2003; Reyes & Mirinda, 2015). The implication is that immigrant populations are not taking advantage of screening services available in the United States where they are resident, so they may suffer from colorectal cancer and its associated poor health outcomes and mortality. Some studies have addressed factors that affect colorectal cancer screening among specific immigrant populations in the United States (Kim, Chapman, & Vallina, 2012; Ladabaum et al., 2014; Lee & Lee, 2013; Talaat, 2015), but no known study has focused on African-born immigrants living in the United States. The current study's outcome will add to literature, and also has the potential of generating knowledge that may be essential for the design of colorectal cancer preventive interventions that can be tailored to African-born immigrants living in the United States whose population is continually increasing.

Problem Statement

Roughly 136,000 cases of colorectal cancer are diagnosed annually, and the disease claims nearly 51,000 lives yearly in the United States (ACS, n.d.; Centers for Disease Prevention and Control [CDC], n.d.-a). One out of 22 men and 1 out of 24 women in the United States will be diagnosed with colorectal cancer in their lifetime (ACS, n.d.). Colorectal cancer care costs in the United States are between $4.5 billion to $9.6 billion in annually and could increase to $14 billion by 2020 if the current trend in the disease burden continues (Yabroff, Lund, Kepka, & Mariotto, 2011; Yabroff et al., 2009). Although colorectal cancer screening has been shown to be effective in reducing the incidence of and mortality from colorectal cancer, racial and ethnic disparity in

colorectal cancer screening persists in the United States (CDC, n.d.-b; Shavers et al., 2010; Wallace & Suzuki, 2012). In the United States, non-Hispanic Whites have higher colorectal cancer screening rates than non-Hispanic Blacks, Hispanics, and other racial minorities (ACS, n.d; CDC, n.d.-b; Klabunde et al., 2011). Immigrant populations in the United States have lower screening rates for colorectal cancer and other cancers compared to Americans born in the United States (ACS, n.d.; Goel et al., 2003; Maxwell, Crespi, Antonio, & Lu, 2010; Reyes & Miranda, 2015; Shih et al., 2008). According to the ACS (n.d.), not only are U.S. immigrant populations most likely to have low screening rates, they are least likely to be aware of the need for colorectal cancer screening. The low rate of colorectal cancer screening implies that opportunity for colorectal cancer prevention is often missed among U.S. immigrant populations.

Factors that affect colorectal cancer screening among U.S. immigrant populations have been the subject of studies that focused on Hispanics, Asian-Americans, Pacific Islanders, and other minorities (Gorin & Heck, 2005; Kim et al., 2012; Lee & Lee, 2013), but no study has focused on immigrants from African countries. African-born immigrants living in the United States are part of the African American population known to have lower screening rates and higher incidence of and mortality from colorectal cancer relative to Whites (ACS, n.d.; Lansdorp-Vogelaar et al., 2012), as African-born Blacks living in the United States are usually categorized along with American-born Blacks as African Americans in public health studies. In addition to the finding that foreign birthplace is a barrier to colorectal cancer screening (ACS, n.d.; Goel et al., 2003; Shih et al., 2008), African-born immigrants living in the United States may represent a segment

of the U.S. population with low rates of colorectal cancer screening. According to the U.S. Census Bureau (2014), the population of African born immigrants living in the United States has grown to over 1.7 million between 2008 and 2012, with the number doubling each decade since 1970. Given the high growth rate of the population of African-born immigrants in the United States, understanding colorectal cancer screening barriers and facilitators among them is warranted and critical for the development of interventions and colorectal cancer prevention strategies specific to the rapidly growing population.

Purpose of Study

The purpose of this quantitative study was to examine the factors that affect colorectal cancer screening among African-born immigrants living in the United States. I assessed the relationship between colorectal cancer screening and factors including education level, health insurance status, having a usual place for medical care, perceived health status, family income, length of stay in the United States, and interview language. The dependent variable was ever had colonoscopy. The independent variables were education level, health insurance status, length of stay in the United States, language of interview, family income, perceived health status, and having a usual place for medical care. The population was African-born immigrants living in the United States who were 40 years old and above at the time of the study.

Research Questions and Hypotheses

I designed the research questions and hypotheses to examine how socioeconomic status measured by education level and family income, acculturation measured by interview language and length of stay in the United States, access to health care measured by having a usual place for medical care and health insurance status, and perceived health status influenced colorectal cancer screening among African born immigrants living in the United States.

Research Question 1: Is socioeconomic status measured by education level and family income associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 1: There is no association between socioeconomic status measured by the level of education and family income and colorectal cancer screening among African-born immigrants living in the United States.

H_a 1: There is an association between socioeconomic status measured by the level of education and family income and colorectal cancer screening among African-born immigrants living in the United States.

Research Question 2: Is acculturation measured by the length of stay in the United States and interview language associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 2: There is no association between acculturation measured by the length of stay in the United States and interview language and colorectal cancer screening among African-born immigrants living in the United States.

H_a 2: There is an association between acculturation measured by the length of stay in the United States and language of interview and colorectal cancer screening among African-born immigrants living in the United States.

Research Question 3: Is perceived health status associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 3: There is no association between perceived health status and colorectal cancer screening among African-born immigrants living in the United States.

H_a 3: There is an association between perceived health status and colorectal cancer screening among African born immigrants living in the United States.

Research Question 4: Is access to health care measured by having a usual place for medical care and health insurance status associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 4: There is no association between access to health care measured by having a usual place for medical care and health insurance status and colorectal cancer screening among African-born immigrants living in the United States.

Ha 4: There is an association between access to health care measured by having a usual place for medical care and health insurance status and colorectal cancer screening among African-born immigrants living in the United States.

Theoretical Framework

The theoretical framework for the study was the immigrant health services utilization model (see Yang & Hwang, 2016). This theory builds on Andersen's widely used health behavior model to explain the pattern of immigrants' health services

utilization (see Andersen, 1995). The immigrant health services utilization model discusses the need for care, resources, predisposing factors, and macrostructural/contextual factors specific to immigrants to offer an understanding of the utilization of health care services by immigrants. According to Yang and Hwang (2016), the need for care includes an individual's perception of the need to utilize health services and is measured by health status, which could be professionally or self-rated. Whereas resources consist of the means by which an individual is empowered to receive or access health services, predisposing factors are conditions that indicate an individual's inclination to use health services; macrostructural and contextual factors are conditions at the community level beyond an individual's control (Yang & Hwang, 2016). Yang and Hwang explain how the above factors influence the use of health services by immigrant populations in specific ways. Colorectal cancer screening is a preventive public health intervention measure geared toward reduction of colorectal cancer incidence and mortality, and its utilization among immigrant populations can be affected by several factors discussed under the different domains presented in the model (see Yang & Hwang, 2016). Therefore, the immigrant health services utilization model can be applied in studying the possible factors that affect colorectal cancer screening among African born immigrants living in the United States. The theoretical framework is described in greater detail in Chapter 2.

Nature of the Study

I conducted this quantitative cross-sectional study in which I extracted and analyzed secondary data collected by the NHIS in 2010, 2013, and 2015 to determine whether there were significant associations between the outcome variable and independent variables. Getting screened for colorectal cancer was the dependent variable, while education level, health insurance status, length of stay in the United States, interview language, family income, perceived health status, and having a usual place for medical care were the independent variables. The target population was men and women age 40 years and above, who are African-born immigrants living in the United States. The cross-sectional design enabled me to estimate the prevalence of the independent variables in the population and describe how they related to the dependent variable during the period the data were collected. The demographics of the participants and information on the variables were represented numerically in the secondary data.

Definition of Terms

Access to healthcare: Timely use of health care services to achieve the best possible health outcomes (Healthy People 2020, n.d.).

Acculturation: A process in which an individual or a group of people from a culture assimilate and adopt a different lifestyle after a continuous first-hand contact with another culture (Johnson, Carroll, Fulda, Cardarelli, & Cardarelli, 2010).

African immigrant: A person who was born in one of the countries of Africa who left Africa to live in another country such as the United States.

Educational level: The number of years an individual put into school attendance for formal learning.

Immigrant: A person who left the country of birth to live in another country like the United States.

Laparotomy: A surgical procedure that involves a large incision through the abdominal wall that enables access to the abdominal cavity.

Melanocytes: Specialized skin cells that produce melanin.

Perceived health status: A measure of how people view their state of health as excellent, very good, good, fair, or poor (National Center for Health Statistics, n.d.).

Socioeconomic status: The social class or standing of an individual or a group which can be measured by a combination of income, education, and occupation (American Psychological Association, n.d.).

Assumptions

Because the NHIS questionnaire for collection of data on colorectal cancer was validated, I assumed that the self-reported data collected from the participants on variables of interest in this study were accurate and reliable. Also, I assumed that there was no interviewer bias, that the coding of data was done to give a precise reflection of data collected from the respondents, and that any missing data were random. Further, I assumed that the African-born immigrants living in the United States are a homogenous group even though they emigrated from different countries in Africa and live in various geographical regions of the United States.

Limitations

The study was based on secondary data from NHIS, and there were no changes made to the collected data. Recall bias was a possibility in this study because the study respondents may not have given accurate answers to the questions that were asked because of possible difficulty in remembering previous events. Also, the African-born immigrant population living in the United States was treated as one homogenous group, even though the African continent is made up of 57 countries with differences among the people, which could have resulted in variations in the association between the dependent and independent variables of interest based on the country of origin. There was no exploration of the differences among the population of African-born immigrants from different African countries in this study.

Scope and Delimitations

The study was limited to African-born immigrants age 40 years and above who were living in the United States and participated in the interview conducted by the NHIS in 2010, 2013, and 2015. The survey was conducted on only African-born immigrants who were resident in the United States and were non-institutionalized at the time. African descendants born in the United States were excluded from the study. Findings may be useful in understanding factors affecting colorectal cancer screening among African-born immigrants living in the United States.

Significance of the Study

The study was significant because the findings added to the literature on colorectal cancer screening by providing information on factors that affect colorectal

cancer screening among African-born immigrants living in the United States. Study findings may improve the understanding of specific barriers to and facilitators of colorectal cancer screening among African-born immigrants living in the United States, which is critical to the development of interventions that may lead to increased rate of colorectal cancer screening among African-born immigrants in the United States. Colorectal cancer is preventable and treatable when diagnosed at the early stage (CDC, n.d.-b; Toll et al., 2011). Increased colorectal cancer screening resulting from appropriate public health interventions among African-born immigrants in the United States may lead to increased chance of diagnosing colorectal cancer at early stages. Early diagnosis of colorectal cancer may lead to an overall decreased cost of treating the disease, which is approximately $29,196 per Medicare patient in the United States, with the cost increasing as the stage of diagnosis advances (Luo, Bradley, Dahman, & Gardiner, 2009).

Colonoscopic polypectomy results in about 53% reduction in mortality from colorectal cancer (Zauber et al., 2012). Implementing appropriate interventions shaped by the findings from this study may result in reduced morbidity and mortality from colorectal cancer. Findings may ensure that African-born immigrants who are part of the Black population in the United States with the highest colorectal cancer incidence and mortality rates (ACS, n.d.), do not endure the consequences of the disease. Improved health among African-born immigrants living in the United States may lead to improved health of the U.S. population because the health of a country is influenced by the choices individuals and groups make (Healthy People 2020, n.d.).

Summary

In the United States, colorectal cancer is the third most common cancer diagnosed in both men and women (ACS, n.d.; Nemeth et al., 2011), and it contributes significantly to morbidity and mortality in the United States and other parts of the world (ACS, n.d.). Studies have shown that colorectal cancer screening is effective in reducing colorectal cancer incidence and mortality (D. Davis et al., 2011), and early detection and removal of precancerous polyps has been shown to prevent its development to invasive cancer and decrease the mortality outcome (CDC, n.d.-b; Toll et al., 2011). Although colorectal cancer screening plays a crucial role in reducing colorectal cancer-related morbidity and mortality, racial and ethnic disparities in colorectal cancer screening persist in the United States (Shavers et al., 2010; Wallace & Suzuki, 2012). U.S. immigrant populations have lower colorectal cancer screening rates than native-born Americans (ACS, n.d.; Goel et al., 2003; Maxwell et al., 2010; Reyes & Miranda, 2015; Shih et al., 2008), and foreign-born status has been shown to be a barrier to colorectal cancer screening (Goel et al., 2003). Understanding factors that influence colorectal cancer screening among specific immigrant populations is a critical step toward taking policy decisions that may help narrow the colorectal cancer screening disparities that exist among U.S. immigrant populations and native-born Americans.

The purpose of the study was to examine the association between colorectal cancer screening and acculturation, socioeconomic status, perceived health status, and access to health care among African-born immigrants living in the United States. The theoretical basis for the study was the immigrant health services utilization model, which

discusses the need for care, resources, predisposing factors and macrostructural/contextual factors specific to immigrants to offer an understanding of the utilization of health care services by immigrants. In Chapter 2, I review the existing literature on colorectal cancer and colorectal cancer screening to affirm the relevance of the study. I also provide a detailed description of the immigrant health services utilization model and concepts related to the research topic.

Chapter 2: Literature Review

The purpose of this study was to examine factors that influence colorectal cancer screening among African-born immigrants living in the United States. A review of prior research was imperative for a proper understanding of the factors that affect colorectal cancer screening among African-born immigrants living in the United States. Studies have shown that U.S. immigrant populations have lower colorectal screening rates than native-born Americans, and they are also among those who are least likely to be aware of the need for colorectal cancer screening (ACS, n.d.). Low screening rates among the U.S. immigrant population means that opportunities for early diagnosis and treatment are often missed. African-born immigrants are part of the African American population in the United States that has low screening rates and a high incidence of and mortality from colorectal cancer (ACS, n.d.; Lansdorp-Vogelaar et al., 2012). African-born immigrants come from a continent where colorectal cancer is considered a rarity, and there is a low level of awareness of the disease among the populace (Busolo & Woodgate, 2015). Cancer prevention efforts by various national governments are deficient as there is no organized population-based colorectal cancer screening program in any country in Africa (Laiyemo et al., 2016). These circumstances may negatively impact African-born immigrants' perception of the need to get screened for colorectal cancer while living in the United States. Studies that can be applied to increase colorectal cancer screening among the immigrant population are needed.

In this literature review, I describe the theoretical framework for the study, colorectal cancer disease and the risk factors, epidemiology of colorectal cancer in the United States and Africa, colorectal cancer screening and related concepts, and disparities in colorectal cancer screening in the United States and underlying factors. I also describe disparities in colorectal cancer screening among foreign-born populations and native-born Americans, and colorectal cancer screening in Africa. The synthesis of the underlying theories and facts related to colorectal cancer and colorectal cancer screening helped to confirm the need for the study.

To locate relevant journal articles needed for the review of the literature, I used search engines such as Google Scholar, MEDLINE simultaneous search, Science Direct, CINAHL, and MEDLINE. The key words and compound phrases used in the search include *racial disparities in colorectal cancer screening*, *colorectal cancer screening among immigrants, factors affecting colon cancer screening, health disparities, colorectal cancer screening among African immigrants in the United States, colorectal cancer, and screening among Africans*. Most of the materials used for the literature review were articles from peer-reviewed journals published not more than 5 years from the time of the study.

Theoretical Framework

The theoretical basis for this study was the immigrant health services utilization model (see Yang & Hwang, 2016). The model builds on Andersen's (1995) health behavioral Model to explain disparities in health services utilization among immigrant populations by taking into account factors that are pertinent to immigrants (see Andersen,

1995). According to Yang and Hwang (2016), Andersen's health behavioral model was first proposed in 1968 and had undergone several phases of revisions that gave rise to Andersen's 1995 model. Andersen used three clusters of factors to explain people's health services utilization: (a) predisposition to use health service, which is shaped by demographics, social structure, and health beliefs; (b) enabling factors, which include personal or family resources (income, regular source of care, and health insurance) and community resources (health personnel and facilities); and (c) need for care, which includes perceived needs and professionally evaluated needs. The Andersen's health behavioral model holds that in addition to the predisposition to use health services, enabling factors, community resources, the health care system, and environmental factors also predict health services utilization. The model has been found to be effective in predicting health services utilization (Yang & Hwang, 2016) and has been used to study health services utilization among populations such as homeless people (Stein, Andersen, & Gelberg, 2007), African American women (Copeland & Butler, 2007), immigrants (Bustamante et al., 2012) and rural dwellers (Slifkin, 2002). According to Yang and Hwang, although Andersen's health behavioral model has been used to study immigrants, the studies were done by adding a few predictors that are germane to immigrants without proposing a theoretical framework that accounted for immigrants' health services utilization. To guide analysis of immigrant health services utilization and to help gain a better understanding of immigrant health services utilization, Yang and Hwang proposed immigrant health services utilization model as a theoretical framework to explain immigrant health services utilization.

The immigrant health services utilization model retains the ideas of Andersen's (1995) health behavioral model but also takes into account factors that are pertinent to immigrants (see Yang and Hwang, 2016). The model holds that need for care, enabling factors, and predisposing factors proposed by Andersen as factors that predict health services utilization are cogent but need to be specified for immigrants. Yang and Hwang also noted that macrostructural or contextual factors should be singled out and emphasized and that the elucidation of the direct and indirect effects of need for care, predisposing factors, enabling factors, and macrostructural or contextual factors on health services utilization is needed. However, Yang and Hwang stated that unlike Andersen's model that covers health behavior in general and personal health practices, the outcome variable in the immigrant health services utilization model is limited to use of health services provided by health professionals and does not include personal health practices as an outcome variable. Yang and Hwang explained factors that predict immigrant health services utilization at general and immigrant specific levels as below.

Need for care is one of the factors that determine health services utilization, and there are general and specific need factors for immigrants (Yang & Hwang, 2016). Need for care is one of the factors associated with health care seeking activities, medication use, and health services utilization (Andersen, 1995; Mellner & Lundberg, 2003) and it has been found to be a strong predictor of health services utilization (Giltay, Vollaard, & Kromhout, 2012). According to Andersen (1995), the need for care is measured by health status which can either be self-rated or professionally evaluated. According to Yang and Hwang, immigrants with better health status are less likely to use health services

compared to those with worse health status because of less need for health services. This position is consistent with the finding that there is an inverse relationship between the use of health services and good health status (Blackwell, Martinez, Gentleman, Sanmartin, & Berthelot, 2009; Dhingra, Zack, Strine, Pearson, & Balluz, 2010).

There are need factors that are specific to immigrants (Yang & Hwang, 2016). Immigrants are healthier than natives at the time of migration because of the practice of selecting healthy individuals for immigration, a phenomenon known as healthy migrant effect (Antecol & Bedard, 2006; McDonald & Kennedy, 2004). However, Yang and Hwang argued that immigrants have special needs for healthcare because of certain types of health problems related to the health environment of their native countries and diseases that are prevalent there. For example, Asian immigrants living in the United States have more susceptibility to diseases like hepatitis, liver and lung cancers, and parasitoses compared to U.S.- born citizens because of the prevalence of these diseases in their countries of origin (Dhooper, 2003).

Enabling factors in the context of health services utilization include financial resources, social resources, and access to health (Yang & Hwang, 2016). Financial resources are monetary means used to obtain health services; social resources are relationships through friendships, kin, and communities that help the individual gain access to health care; and access to health services is the availability of health professionals and facilities that provide health services (Yang & Hwang, 2016). The ability to purchase health insurance and income is used to measure financial resources, and both health insurance and income predict health services utilization (Yang & Hwang,

2016). Lower household income is associated with reduced access to care as people with lower household income are less likely to have a regular source of health care (Ye, Mack, Fry-Johnson, & Parker, 2012).

Social resources are an enabling factor that influences immigrant health services utilization (Yang & Hwang, 2016). Nandi et al. (2008) stated that health information can be diffused through family members and other relatives, friends, and peers, and it can help shape immigrants' health-seeking behaviors; social networks can help connect immigrants to the appropriate health services personnel and facilities that can help increase their access to health care services. Evidence showed that availability of medical personnel and facilities is an essential factor that influences health services utilization (Yang & Hwang, 2016). Soneji, Armstrong, and Asch (2012) and Benarroch-Gampel et al. (2012) found that increased availability of medical personnel results in increased utilization of healthcare services. However, Yang and Hwang (2016) recognized that the availability of medical personnel may not necessarily result in increased health care utilization among immigrants given that there are factors pertinent to immigrants that can prevent them from having access to available medical personnel.

There are enabling factors that are specific to immigrants that affect their health services utilization (Yang & Hwang, 2016). Because new immigrants tend to get unskilled and low-paying jobs (Aguilera & Massey, 2003; Kwainoe, n.d.), there is a more significant effect of financial resources on health services utilization among immigrants than natives (Yang & Hwang, 2016). However, some wealthy immigrants bring in money to their host countries, which empowers them financially (Yan, 2014) and increases their

chance of health services utilization in the host countries (Yang & Hwang, 2016). Also, some immigrants use their social connections to get free or cheaper medicine from the homeland (Bergmark, Barr, & Garcia, 2010), which may result in the reduction of health services utilization in the host country (Yang & Hwang, 2016).

Predisposing factors in the context of health services utilization include the conditions that show a proclivity for health services utilization, and they include demographic factors, health beliefs, socioeconomic factors, and genetic factors (Yang & Hwang, 2016). Anderson (1995) stated that gender, age, race or ethnicity, and marital status have been found to influence health services utilization. Dhingra et al. (2010) found that women have more likelihood of health services use than men. Also, racial and ethnic differences in health services utilization can be ascribed partly to genetic predisposition and cultural differences (Dhingra et al., 2010). Yang and Hwang argued that the influence of demographic factors on health care utilization in the general population of the host country may not be any different among immigrants.

Socioeconomic status, which has education level and income as indicators, can also influence health services utilization (Yang & Hwang, 2016). Hernandez-Quevedo and Jimenez-Rubio (2009) showed that people with higher education levels have a higher tendency to seek health services than those with lower education levels. Similarly, there is evidence of a positive correlation between socioeconomic status and health services utilization (Szwarcwald, Souzar-Junior, & Damacena, 2010). Health beliefs, which include knowledge about, attitude toward, and values concerning health and health care services, may influence perception of the need for health care and health care utilization

(Anderson, 1995). Yang and Hwang argued that higher perceived susceptibility to disease, higher perceived disease severity, and increased perceived benefits of taking action may result in higher likelihood of health services utilization, whereas increased perceived barriers to taking action will decrease the likelihood of health services utilization.

Yang and Hwang (2016) asserted that there are predisposing factors that are specific to immigrants including immigration status, assimilation, and immigrant ethnic culture that impact health services utilization among immigrants. Yang and Hwang argued that immigration status, which is associated with rights, benefits, resources, and psychological condition, is probably the most crucial factor that influences immigrant health services utilization. Chavez (2012) agreed that undocumented immigrants underutilize medical services in comparison to legal immigrants and citizens, thereby making undocumented immigrant status a barrier to health care services utilization. Similarly, Bustamante et al. (2012) and Raymond-Flesch, Siemons, Pourat, Jacobs, and Brindis (2014) found that because of fear of deportation, language barriers, shame, and high medical bills, undocumented immigrants are less likely than legal immigrants to seek medical care. Lai and Surood (2010) and Lebrun (2012) found that newer immigrants experience hardships and barriers such as lack of financial resources, unfamiliarity with the health care system of the host country, experience of disrespect or discrimination, limited English proficiency, and distrust in Western medical care, which decrease their likelihood of seeking medical care.

Assimilation or acculturation in the context of immigrant health services utilization entails adaptation to the culture and society of the host country, and it is an essential immigrant-specific predisposing factor (Yang & Hwang, 2016). Yang and Hwang argued that the ability of immigrants to adapt to the culture, social system, and health care system of the host country can impact health services utilization: a higher degree of assimilation leads to higher health services utilization among immigrants, and different levels of adaptation may result in variations in health services use among immigrants. Immigrant ethnic culture is an immigrant-specific predisposing factor that refers to the cultural patterns such as norms, beliefs, traditions, behaviors, and values brought by immigrants to the host society (Yang & Hwang, 2016). Yang and Hwang argued that immigrant ethnic culture influences utilization of health services among immigrants. Latino immigrants view illness as will of God or divine punishment resulting from sinful acts, and as a result consult folk healers for treatment instead of seeking professional health services (Padilla & Villalabos, 2007; Ransford, Carrillo, & Rivera, 2010).

According to Yang and Hwang (2016), macrostructural and contextual factors include conditions at community or societal level that individuals do not have control over. They include the health care system, government policy, and other social, economic and political conditions. Yang and Hwang argued that some government policies that are not designed by intent to affect health behaviors might bear on health services utilization. The Personal Responsibility and Work Opportunity Act enacted in 1996 in the United States, makes most legal immigrants ineligible to receive publicly funded services such

as Medicaid until after 5 years of residence. It also makes immigrants ineligible for Supplemental Security Income and Food Stamps until citizenship status is attained. According to Yang and Hwang, the Personal Responsibility and Work Opportunity Act restricted immigrants' access to health care thereby impacting their health services utilization. Also, the health care system could have a significant effect on immigrants' health services utilization (Yang & Hwang, 2016). The Affordable Care Act made legal immigrants eligible to buy health insurance through the health insurance exchanges and to receive premium and cost-sharing subsidies, which could boost the health services utilization of immigrants (Yang & Hwang, 2016).

According to Yang and Hwang (2016), contextual factors specific to immigrants that predict health services utilization include the condition under which immigrants exit their country of origin, experiences of health services utilization in the homeland before emigration, and context of reception by the host country. Sanz et al. (2011) found that immigrants from countries that have a universal health care system are more inclined to get health insurance and use health care services than immigrants from countries without universal health care system. Yang and Hwang argued that context of reception by host country that include government policies toward new immigrants, attitudes of the host society toward new immigrants, and immigrants' ethnic community in the host country may combine to affect immigrants' adaptation to the host country's systems as well as influence immigrant health services utilization.

According to Yang and Hwang (2016), in addition to directly influencing health services utilization, some of the determinants of immigrant health services utilization

have intervening or mediating effect by having indirect effects on immigrant health services use through other variables. The mediating effects of determinants of health services utilization are shown in Figure 1.

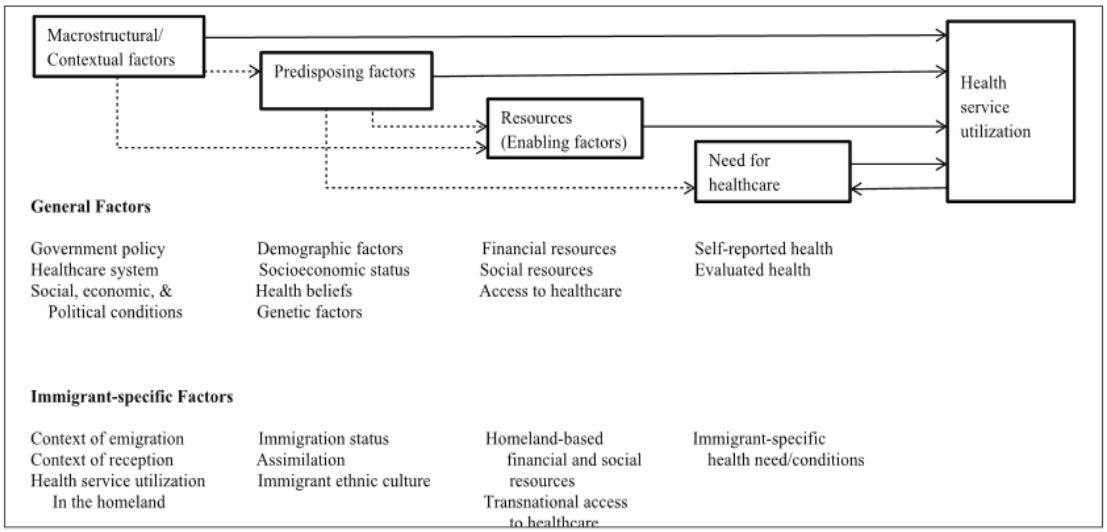

Figure 1. An analytical framework for immigrant health services utilization. Note: A solid line denotes a direct effect and a broken line indicates that some of the factors within the category have an indirect effect on health service utilization via one or more mediating variables, but the mediating relationships do not necessarily occur in a total fashion. Adapted from " Explaining Immigrant Health Service Utilization: A Theoritical Framework" by Philip Q. Yang and Shann Hwa Hwang. Sage Open, p. 4. Copyright 2016 by.authors

Yang and Hwang (2016) asserted that socioeconomic factor, which is one of the predisposing factors could influence health services utilization through the enabling factors because people with a higher socioeconomic status tend to have more resources at their disposal to utilize health services than people with lower socioeconomic status. Immigration status, which is an immigrant-specific predisposing factor, can affect health services utilization through enabling factors given that immigration status could affect immigrants' access to resources for health care. Age, which is one of the predisposing

factors, affects health services utilization through the need factors because as an individual's age increases, the need for care increases and so is the health services utilization.

The immigrant health utilization model provides a basis for this study as it showed the possible factors that could directly or indirectly influence health services utilization among immigrants. It also revealed the different domains under which to assess the potential factors that could influence colorectal cancer screening among immigrants. The model, therefore, serves as a valuable tool with which to identify relevant variables that could affect the use of health care services such as colorectal cancer screening among African-born immigrants living in the United States.

Methodologies Used in Previous Studies

I reviewed several studies that were similar to this study. A good number of the studies I reviewed were quantitative in nature (Bustamante et al., 2012; Kim et al., 2012; Lee, Ju, Vang, & Lundquist, 2010; Maxwell et al., 2010; Talaat, 2015), while some others were done using qualitative design (Gany, Herrera, Avallone, & Changrani, 2006; Harcourt et al., 2014; Lee & Lee, 2013; Ndukwe, Williams, & Sheppard, 2013). Researchers recruited study participants using different sampling techniques such as purposeful sampling (Lee & Lee, 2013), convenience sampling (Harcourt et al., 2014; Kim et al., 2012; Ndukwe, Williams & Sheppard, 2013), random sampling (Maxwell et al., 2010), and snowball sampling (Tung, Nguyen, & Tran, 2008). Tung et al. (2008) and Kim et al. (2012) who used snowball sampling and convenience sampling method respectively stated that study participants were recruited from one site and that the

relatively small sample used in their studies limited the generalization of the results to the entire target population.

The review showed that researchers collected data using self-administered questionnaire (Kim et al., 2011; Talaat, 2015; Tung et al., 2008), focus group discussions (Gany et al., 2006, Ndukwe, Williams & Sheppard, 2013), and face-to-face interview (Harcourt et al., 2014; Lee & Lee, 2013). Researchers got large samples of immigrants by extracting secondary data from state and national databases. Lee and Vang (2010) merged the 2001, 2002, and 2005 data from California Health Interview Survey that enabled the use of large sample size for a study on Asian-American women subgroups. Bustamante et al. (2012) conducted a population-based study with large sample size by combining data from two linked databases. Maxwell et al. (2010) merged the 2001, 2003, and 2005 data from California Health Interview Survey to get a large sample for a study on disparities in colorectal cancer screening among five Asian ethnic groups. Tung, Nguyen, and Tran (2008) pilot-tested the questionnaire used in their research to ensure study participants understood the questions uniformly to enable appropriate responses to the questions. Tung et al. stated that there was a possibility that the ethnic women that made up the study sample over-reported screening test receipt to provide answers that are socially desirable but did not know the level of overestimation in their study. In some of the studies reviewed, the authors used logistic regression for data analysis (Kim et al., 2012; Maxwell et al., 2010). However, in some other studies, the authors used analytical techniques such as one-way Analysis of Variance, Chi-Square test, and T-test were (Kim et al., 2012; Talaat, 2015; Tung, Nguyen, & Tran, 2008).

Health insurance status, language barrier, lack of English proficiency, lack of recommendation for screening by primary care physicians, and other factors have been found to influence colorectal cancer screening in some minority and immigrant populations in the United States. Shahidi et al. (2013) analyzed data on 30,434 colorectal cancer average-risk adults age 50 years and above extracted from the 2007 California Health Interview Survey, and found that lack of health insurance and lack of English proficiency decreased the odds of getting colorectal cancer screening among immigrants in the United States. Talaat (2015) carried out a cross-sectional study on adherence and barriers to colorectal cancer screening among Arab-Americans, and results showed that not considering colorectal cancer screening as necessary, low knowledge level of the need to undergo screening, lack of recommendation by primary care physicians, and language barrier impacted negatively on colorectal cancer screening among the population. Similarly, Wang, Moehring, Stuhr, and Krug (2013) did an integrated review of eight studies that focused on barriers to colorectal cancer screening among Hispanics in the United States, and findings showed that lack of awareness of colorectal cancer screening, fear, and screening costs were some of the barriers to colorectal cancer screening among Hispanics. Other barriers to colorectal cancer screening revealed in the study include low educational levels, lack of provider recommendations, and limited English language proficiency.

Cancer Overview

Cancer is a complex, heterogeneous disease in which abnormal cells divide uncontrollably and invade other surrounding tissues (CDC, n.d.-b). According to NCI

(n.d.-b), for cancer cells to form, the normal process of cell division, growth, and specialization in function are altered leading to the formation of abnormal cells that divide without control and may or may not form tumors. Cancer cells can overcome the biological mechanisms that control cell division as well as the mechanisms that program cell deaths, which the body uses to get rid of cells that are not needed (NCI, n.d.-b). Cancerous cells may be malignant, a form in which they invade nearby tissues or influence surrounding healthy cells, or may be benign when they are localized undifferentiated mass that is not able to invade surrounding tissues and rarely threatens life (NCI, n.d.-b)

According to NCI (n.d.-b), cancer types are named in line with the organs or tissues where the cancers form or described by the cell type from where they originate irrespective of whether the tumor is malignant or benign. However, cancer can develop from a mix of tissues or cells thereby making classification more complex (NCI, n.d.-b). *Carcinomas* are the most common kind of tumor, and they are formed by epithelial cells that cover the inside and outer surfaces of the body; when viewed under a microscope, *carcinomas* have a column-like shape (NCI, n.d.-b). *Adenocarcinoma* is a type of carcinoma that originates from epithelial cells that produce fluids or mucus, which are often found in glandular tissues such as breast, colon, and prostate (NCI, n.d.-b). *Basal cell carcinoma* originates from the basal layer of the epidermis, while *squamous cell carcinoma* forms in the squamous cells, which are found on the outer surface of the skin and organs such as stomach, intestines, kidneys, bladder, and lungs (NCI, n.d.-b). The *transitional cell carcinoma* forms in epithelial tissues that are found in the linings of

bladder, ureters, and parts of the kidneys (NCI, n.d.-b). *Sarcomas* are cancer types that originate from bone, fibrous tissues such as tendons and ligaments, and soft tissues that include muscle, fat, lymph vessels, and blood vessels (NCI, n.d.-b). *Lymphoma* is a cancer type that originates from lymphocytes, *multiple myeloma* starts in the plasma cells, and *melanoma* starts from melanocytes, which are specialized cells that form melanin (NCI, n.d.-b).

Colorectal Cancer

Description

According to Li and Lai (2009), the colon and rectum are parts of the large intestine whose functions are to absorb water and nutrient, as well as store feces until defecation through the anus. For description purpose, the colorectal region is divided into three different parts including (a) the right part that is proximal to the splenic flexure, which is made of cecum, ascending colon, and transverse colon; (b) the left part that is distal to the splenic flexure, which is made of descending colon and sigmoid colon; (c) rectum (Ellis, 2010; Li & Lai, 2009). The diagram showing the three segments of the colorectum is shown in Figure 2.

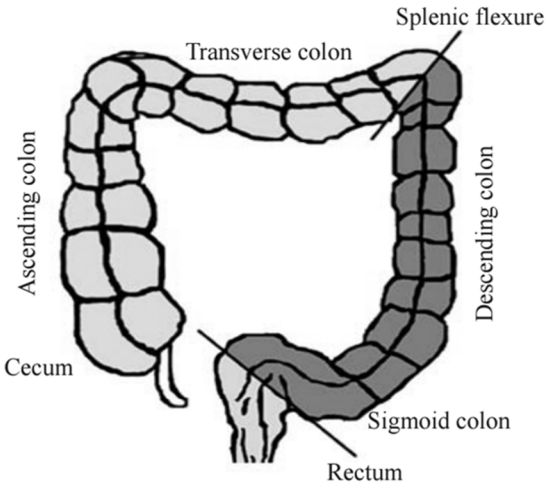

Figure 2. A diagram showing the three segments of the colorectum: right-sided tumors are classified as originating proximal to the splenic flexure (cecum, ascending colon, and transverse colon); left sided tumors arise distally to this site (descending colon, sigmoid colon) and rectum. Adapted from "Colorectal cancer, one entity or three" by Li Feng-ying and Mao-de Lai. Journal of Zhejiang University Science, 10 (3), p.221. Copyright (2009) by authors.

There are structural and physiological differences in the various segments of the large bowel that include (a) the colon has a thinner wall compared to the rectum; (b) the ascending colon has multi-layered capillary networks, whereas the capillary networks of the distal colon is single layered; (c) both mucosal capillary density and average width of the mucosal capillary bed gradually reduced toward the distal colon (Li & Lai, 2009; Skinner & O'Brien, 1996). The structural and physiological differences in the different parts of the large bowels are connected to the reason why nutrient and water absorption take place at highest rates in the cecum and progressively decreases towards the rectum (Li & Lai, 2009). There are histological differences between the distal and proximal colon including (a) the proportion of goblet cells that secrete mucin believed to be a defense for the mucosal surface against physical and chemical stimuli, is higher in the

sigmoid colon and rectum; (b) compared to other segments of the large bowels, the rectum has higher concentration of endocrine cells, which may be related to the high incidence of carcinoma of the rectum; (c) short-chain fatty acids and ethanol are in largest amount in the proximal colon, while neutral mucopolysaccharides are predominant in the descending colon, and these differences may influence aspects of colon function (Li & Lai, 2009).

Types of Colorectal Cancer

There are different kinds of colorectal cancer. About 95% of all colorectal cancer cases are *adenocarcinomas,* and they start as a growth of cell called polyp in the cells of the lining of the colon and rectum and then spread to other layers (NCI, n.d.-b). The tumor is called *mucinous adenocarcinoma* when it appears to be in a pool of mucus under the light microscope, and makes up about 10 to 15 percent of all colon and rectal *adenocarcinomas*. However, it is called *signet ring cell adenocarcinoma* when the tumor cells have a signet shape under a light microscope, and makes up about less than 1 percent of *adenocarcinomas* (NCI, n.d.-b; Jass, 2007). Other less prominent cancers of the colon and rectum include (a) *primary colorectal lymphomas,* which is a non-Hodgkin lymphoma that develops in the lymphocytes of the lymphatic system, and account for about 0.5 percent of all colorectal cancer cases; (b) *gastrointestinal stromal tumor* that forms in *interstitial cell of Cajal* found in the lining of the gastrointestinal tract, and develop mostly in the stomach and most others form in the small intestine and rectum; (c) *leiomyosarcomas*, which occurs in the three layers of the smooth muscles found in the colon and rectum that guide waste products through the digestive tract, and constitutes

about 0.1 percent of colorectal cancer cases; and (e) *melanomas* that are commonly associated with skin cancer but occur anywhere else including the colon and rectum (NCI, n.d.-b; McRee & Goldberg, 2011).

Tumoregenesis

The formation of *adenomatous polyps* known as the precursors of *adenocarcinoma* in the epithelial cells lining the intestinal mucosa marks the beginning of colorectal cancer (Toll et al., 2010). The adenomatous polyps have a grape-like appearance in the inner walls of the intestinal lumen where they usually develop as people get older (Gibbons, Sinha, Phillips, & Clark, 2011). At the advanced stage, the adenoma is associated with the highest risk of colorectal cancer, and is characterized by adenomatous polyps larger than 1cm in diameter and presence of high-grade dysplasia (Wong et al., 2010). However, despite the estimation that over 70 percent of colonic carcinomas arise from pre-existing *adenomatous polyps*, less than 10 percent of colorectal adenomas progress to *adenocarcinomas* (Wong et al., 2010).

According to Tariq and Ghias (2016), colorectal cancer carcinogenesis can arise from one or a combination of pathways that include the *chromosomal instability* (CIN), CpG *island methylator phenotype* (CIMP) and *microsatellite instability*. The CIN pathway starts with mutations in the *adenomatous polyposis coli*, followed by mutational activation of oncogene called KRAS gene and inactivation of tumor suppressor gene called tumor protein p53; the tumors arising from CIN pathways comprise 85 percent of sporadic tumors, and constitute a part of familial adenomatous polyposis cases (Tariq & Ghias, 2016). The CIMP mechanism is characterized by promoter hypermethylation of

tumor suppressor genes such as o-6-Methylguanine-DNA Methyltransferase and MutL Homolog 1, a process often associated with protein B-Raf mutation and microsatellite instability that leads to cellular transformation (Sameer, Nissar, & Fatima, 2014; Tariq & Ghias, 2016). In the MSI pathway, there is inactivation of genetic alterations in short repeated sequences; the MSI tumors have poor differentiation but better prognosis and are often associated with proximal colon (Sameer, Nissar, & Fatima, 2014; Tariq & Ghias, 2016).

Risk Factors

There are several factors implicated in the literature that predispose, contribute to or modify the risk for colorectal cancer. While some are modifiable and are related to behavior or lifestyle such as smoking, alcohol intake, physical inactivity, diet, overweight, and obesity, others are non-modifiable factors including age, heredity and family history, and medical history among others (ACS, n.d.). With regards to modifiable factors, several studies have linked smoking and alcohol consumption to increased risk of colorectal cancer. In a study, Pelucchi, Tramacere, Bofetta, Negri, & Vecchia (2011) found that heavy alcohol consumption (four or more drinks per day) increased the risk of colorectal cancer by 50 percent, while light alcohol consumption (one drink per day) did not have association with risk of colorectal cancer. In a case-control study, Zhao et al. (2012) used 702 cases and 717 controls to carry out a research that showed that people that drink alcohol had a higher risk of colorectal cancer [odds ratio(OR), 2.2; 95% Confidence Interval(CI), 1.2-4.0] compared to non-alcohol drinkers used as reference category. The risk increased with the number of years of alcohol drinking and number of

daily alcohol intake. Similarly, Bagnardi et al. (2015) conducted a meta-analysis of 572 studies using a total of 486,538 cases, and found that the risk of colorectal cancer in heavy alcohol drinkers (greater than 50 grams of alcohol per day or greater than three drinks per day) was 44 percent higher than the risk in non-drinkers. The result also showed that moderate drinkers (less or equal to 50 grams per day or two to three drinks per day) were 22 percent more at risk of colorectal cancer than non-drinkers used as a reference group. For tobacco smoking, Wei et al. (2009) did not identify tobacco smoking as a risk factor for colorectal cancer. However, in November 2009, the International Agency for Research on Cancer (IARC) stated that there is enough evidence to conclude that tobacco smoking causes colorectal cancer (ACS, n.d.). Consistent with the position of IARC, Botteri et al. (2008) conducted a meta-analysis with 126 observational studies with 39,779 cases, and the results revealed that tobacco smoking has a strong association with both colorectal cancer incidence and mortality. The analysis of data used for the study provided a pooled relative risk of 1.18 (95% CI {1.11, 1.25}) for smokers compared to non-smokers used as a reference category, and there was a dose-response relationship with increasing number of years of smoking and packs per day. In the same study, meta-analysis of 10 cohort studies showed an absolute risk increase of 6 deaths per 100,000 person-years among smokers compared to non-smokers. However, the risk estimates among smokers were higher for rectal cancer than for colon cancer. In the same vein, Hannan, Jacobs, and Thun (2009) carried out a prospective study in which 184, 187 adults in the United States were followed up from 1992 to 2005, and analysis of data using Cox proportional hazard models showed that colorectal cancer incidence was

higher in current smokers [Hazard ratio (HR) = 1.27; 95% CI (1.06, 1.52)] as well as in former smokers (HR, 1.23; 95% CI {1.11, 1.36}) compared to life-long non-smokers. The result of the analysis also showed that risk of colorectal cancer was highest among participants with up to 50 years of smoking history (HR = 1.38; 95% CI {1.04, 1.84}). Further analysis showed that former smokers had risk of colorectal cancer decreased with greater time since smoking cessation (*P* trend= 0.0003) and with earlier age at cessation (*P* trend = 0.0003).

Concerning physical inactivity or sedentary lifestyle as a risk factor of colorectal cancer, various studies have shown a strong association between physical activity and decreased risk of colon cancer, but not with cancer of the rectum (ACS, n.d.). Schmid and Leitzmann (2014) carried out a meta-analysis using data from 43 studies that included a total of 68,936 cancer cases, and results revealed that people who are the most sedentary are about 54% more at risk of colon cancer than those with the lowest level of sedentary time. However, the study did not show any relationship between sedentary behavior and cancer of the rectum. In another study, Campbell, Patel, Newton, Jacobs, and Gapstur (2013) in a cohort study with 2,293 participants without a diagnosis of colorectal cancer at baseline and followed up for 16.1 years, showed that there was an association between decreased risk of mortality and increased recreational physical activity before and after colorectal cancer diagnosis.

Diet is one of the factors that have been found to influence the risk of colorectal cancer. According to ACS (n.d.), though the evidence of the influence of diet on

colorectal cancer occurrence is still accumulating, the role of specific dietary elements in influencing colorectal cancer risk has been evaluated, and some dietary elements were found to protect against occurrence of colorectal cancer. However, some other dietary elements have been found to increase the risk of colorectal cancer. Several studies have linked consumption of large quantities of red and processed meat to increased risk of colorectal cancer (Bouvard et al., 2015; Kim, Coelho, & Blachier, 2013). A meta-analysis by Chan et al. (2011) using 24 prospective studies revealed that people that consumed the largest quantities of red and processed meat were 22% more at risk of colorectal cancer compared to people that ate the least amount of red and processed meat. The study further revealed that the risk of colorectal cancer increased approximately linearly with increased intake of processed and red meat up to about 140 grams per day where there was no further increase in colorectal cancer risk. On the contrary, adequate intake of calcium has been linked to lower risk of colorectal cancer (Aune et al., 2012; Song, Garrett, & Chan, 2015). The results of studies on the association of intake of fruits, vegetables, fiber, and vitamin D and the risk of colorectal cancer were inconsistent (Lee & Chan, 2011; Song et al., 2015). In spite of the above, the World Cancer Research Fund and the American Cancer Society advocate for intake of a diet high in fruits, vegetables, and whole grains for cancer prevention (Kushi et al., 2012).

Concerning overweight and obesity, mounting evidence shows that being overweight or obese increases the risk of colorectal cancer (ACS, n.d.). Ma et al. (2013) conducted a meta-analysis with 54 studies involving 9,000,000 participants from several countries, and the pooled relative risk showed that participants who are obese were 33%

more at risk of colorectal cancer than participants with normal weight. The result also showed that for central obesity that was based on waist circumference, participants in the category of highest waist conference were 45% more at risk of colorectal cancer than participants in the lowest waist conference category. In separate studies, Bisschop et al. (2014) and Renehan et al. (2012) found that weight gain has more influence on the risk of colorectal cancer at early adulthood than later in life.

In addition to the modifiable risk factors discussed above, the long-term intake of non-steroidal anti-inflammatory drugs (NSAIDs) has been linked to lower risk of colorectal cancer (ACS, n.d.). Chan et al. (2005) carried out a prospective cohort study using 82,911 women who were followed up for 20 years within which their use of aspirin and other NSAIDs were assessed. The result revealed that participants that regularly used aspirin were 23 percent less at risk of colorectal cancer than participants who were non-regular users, with maximum risk reduction benefit at 14 tablets of Aspirin per week. However, the reduction in risk of colorectal cancer was not significant until after 10 years of Aspirin use. Similarly, Rothwell et al. (2010) carried out a study that involved four randomized trials of Aspirin versus control in the primary and secondary prevention of vascular events, and found that taking aspirin at a daily dose of at least 75mg reduced the 20-year risk of colon cancer but not that of rectal cancer. Also, sub-site data in the study showed that the use of aspirin decreased the risk of cancer of the proximal colon but not that of the distal colon. In addition to the protective effect of aspirin against the risk of colorectal cancer, it has been found that regular use of aspirin after diagnosis of colorectal cancer improved colorectal cancer survival (Bains et al., 2016). Despite the

benefits of aspirin use, the American Cancer Society does not yet recommend the use of aspirin for cancer prevention in the general population because of untoward effects such as gastrointestinal bleeding and increased risk of heart attack associated with the use of aspirin and other NSAIDs (ACS, n.d.).

With regards to non-modifiable factors, age is one of the factors that influence the risk of colorectal cancer. According to ACS (n.d.), the risk of colorectal cancer increases after age 40 with a median age of 68 in men and 72 years in women. Strikingly, the median age at diagnosis in sub-Saharan Africa is between 41 and 59, and the proportion of patients younger than 40 years old is 19 to 38%, which is higher than 1.9 percent in the United States (Katsidzira, Gangaidzo, Mapingure, & Matenga, 2015). However, in the United States, there is an increasing incidence of colorectal cancer among adults younger than age 50 (NCI, n.d.-a), even though it makes a minimal contribution to the overall burden of colorectal cancer in the United States (Katsidzira et al., 2015). Heredity or family history has been implicated as one of the factors that influence the risk of colorectal cancer; about 30% of people diagnosed with colorectal cancer have a family history of the disease (ACS, n.d.). Individuals whose first-degree relatives were diagnosed with colorectal cancer were 2 to 4 times more at risk of developing colorectal cancer, with the risk highest among those that have multiple first-degree relatives diagnosed with colorectal cancer (Butterworth, Higgins, & Pharaoh, 2006). Also, there are mounting pieces of evidence indicating that familial risk of colorectal cancer goes beyond first degree relatives (Samadder et al., 2014). The increased risk of colorectal cancer among people whose first-degree relatives had colorectal cancer was observed

among Chinese women who are regarded as a low-risk population in comparison to the western population (Murphy et al., 2009).

Further, individuals with a personal history of *adenomatous polyps*, chronic inflammatory bowel disease, and diabetes have increased risk of colorectal cancer (Lutgens et al., 2013; Ren, Kirkness, Kim, Asche, & Puli, 2016; Vu et al., 2014). In a population-based cohort study in Sweden in which Larsson, Giovannuci, and Wolk (2005) followed up 45,550 men until there was diagnosis of colorectal cancer, death, or 7 years of follow up, the result of Cox proportional hazards models revealed that there was a 49 percent increased risk of colorectal cancer among men that have diabetes after taking into account potential confounders. The result of the study is consistent with the result of a systematic review and meta-analysis of 30 cohort studies on the relationship between diabetes mellitus and colorectal cancer in which it was found that participants with diabetes were 27% more at risk of developing colorectal cancer than non-diabetic study participants (Jiang et al., 2011). However, the underlying mechanism for the relationship between diabetes mellitus and colorectal cancer has not been clearly elucidated. Shikata, Ninomiya, and Kiyohara (2012) suggest that slower bowel transit times in diabetic patients which could lead to more exposure of the mucosa of the colon to potential carcinogens may be contributory to the observed relationship between diabetes mellitus and colorectal cancer.

Epidemiology of Colorectal Cancer

Colorectal cancer ranks third among the most commonly diagnosed cancer in both men and women worldwide and ranks second among causes of cancer-related deaths.

(ACS, n.d.; CDC, n.d.-a). In 2008, 1.24 million new cases of colorectal cancer were diagnosed worldwide, which makes up about 9% of all new cases of cancer. In the same year, approximately 600,000 deaths resulting from colorectal cancer were recorded worldwide, with about 70% occurring in low and middle-income countries (McRee & Goldberg, 2011; World Health Organization [WHO], 2012). The number of new cases of colorectal cancer recorded globally increased to about 1.36 million in 2012 with 55% of the cases occurring in more developed regions of the world, and 694,000 deaths from the disease were recorded the same year (IARC, 2012). There are variations in incidence rates across the geographical regions of the world, yet geographic patterns are relatively similar in men and women (IARC, 2012). Taiwan and other parts of China record colorectal cancer as the most common type of cancer; Europe and Oceania as a region record the highest number of new cases of colorectal cancer, while Africa and Asia have the lowest incident cases (IARC, 2012; Zhao et al., 2012). However, in terms of mortality, while there is less variability across different regions of the world, more deaths are recorded in the less developed countries of the world with central and eastern Europe recording the highest rates (20.3 per 100,000 for men and 11.7 per 100,000 for women), and western Africa recording the lowest rates (3.5 per 100,000 for men and 3.0 per 100,000 for women), which reflects poorer survival in more impoverished regions (IARC, 2012).

In the United States, colorectal cancer is the third most common cancer diagnosed in both men and women (ACS, n.d.; Nemeth et al., 2011). About 145,000 new cases of and 55,000 deaths from colorectal cancer occur yearly in the United States (ACS, n.d.).

According to ACS (n.d.), 1 out of 22 men (4.6%) and 1 out of 24 women (4.2%) will be diagnosed with colorectal cancer in their lifetime, and estimates show that about 135,430 people will be diagnosed with colorectal cancer in 2017 and about 50,260 persons (27,150 men and 23,110 women) will die from the disease in the same year. The incidence of colorectal cancer increased from 1975 through to mid-1980s after which it has been on the decline; the accelerated reduction in incidence since the mid-2000s has been ascribed to the detection and removal of precancerous polyps resulting from increased colorectal cancer screening (ACS, n.d.). Though colorectal cancer incidence has been on decline in the United States generally, the incidence in adults younger than 50 years of age is on the upward trend, and the underlying factors are unknown even though it has been suggested that it could be a reflection of increased sedentary lifestyle, higher prevalence of obesity, and unhealthy dietary patterns in children and young adults (ACS, n.d.; Siegel, Jemal, & Ward, 2009). Among all the major racial and ethnic groups in the United States, the incidence rates have been on the downward trend in the last ten years except American Indian and Alaska native men among whom the incidence rates have been relatively stable (ACS, n.d.).

In the African continent, the data collection systems are weak in most of the countries, and so available statistics are not adequate for accurate estimation of the burden of colorectal cancer disease in the continent (Graham, Adeloye, Grant, Theodoratou, & Campbell, 2012). However, the scant statistics available indicate that colorectal cancer is the fifth most common cancer in Africa with incidence of colorectal cancer for men about 4.38 per 100,000 of population while that of women is 3.69 per

100, 000 of population; southern African countries have the highest incidence rate (Graham et al., 2012). In the year 2000, there were about 23000 new cases of colorectal cancer with approximately 59% occurring in men (Graham et al., 2012). Evidence showed that incidence of colorectal cancer is much lower in Africa than in Western countries, but there were similarities in trend for colorectal cancer by age and sex in both African and Western nations (Jemal et al., 2011). In sub-Saharan Africa, the males bear a slightly higher burden of colorectal cancer disease more than the females as the male to female ratio of the disease ranges from 1.3:1 to 1.6:1, and the median age at diagnosis is 41 to59 years, which indicates that young people bear a disproportionate burden of the disease in the region (Katsidzira et al., 2015). The reason for the early onset of the disease in sub-Saharan Africa is not yet known. However, given that many early onsets of colorectal cancer are also seen among African Americans in the United States (Siegel, Jemal, & Ward, 2009), it is suspected that constitutional factors common to people of African descent may be contributory to the trend (Katsidzira et al., 2015). Further, racial disparity in colorectal cancer burden is recorded in African countries with different ethnic populations. For example, in South Africa, the highest incident rate is recorded among people of European origin, followed by Indians, Asians, and people of mixed ancestry and lowest among indigenous blacks (Laiyemo et al., 2016). The trend is in contrast with that of the United States where African Americans bear a disproportionate burden of colorectal cancer disease in the United States. About 74 to 88% of the colorectal cancers diagnosed in Africa are *adenocarcinomas*, with *mucinous adenocarcinomas* making up about 11 to 16% of the cases, and *signet-ring cell adenocarcinomas*, which are rare

globally, accounting for about 3-5% of colorectal cancer cases in Africa (Katsidzira et al., 2015). The high frequency of *signet-ring cell carcinomas* compared to the rest of the world underscores the high rate of early onset of colorectal cancer observed in Africa (Katsidzira et al., 2015).

Colorectal Cancer Screening

The slow course of growth from precancerous polyp to invasive cancer creates an opportunity for prevention and early detection of colorectal cancer (ACS, n.d.). Early detection of premalignant polyps through screening and removal of precancerous polyps is considered an important strategy aimed at reducing the incidence and prevalence of and mortality from invasive colorectal cancer (ACS, n.d.; Nemeth et al., 2011). When detected at early stage, the treatment of colorectal cancer is more favorable (CDC, n.d.-b). Modeling studies have suggested that increasing colorectal cancer screening will create more impact in reducing colorectal cancer mortality compared with the reduction of risk factors or increased treatment use (Edwards et al., 2010; Vogeelar et al., 2006). The United States Preventive Services Task Force (USPSTF) recommends colorectal cancer screening for men and women age 50 to 75 years, while the decision for individuals age 76 to 85 years to get screened for colorectal cancer should be individualized with patient's overall health and prior screening history taken into account (USPSTF, 2016). However, individuals who are at increased risk of colorectal cancer because of their family history and certain medical conditions such as chronic inflammatory bowel disease are recommended to begin colorectal cancer screening earlier than at age 50 years (ACS, n.d.).

The tests that can detect *adenomatous polyps* as well as cancer include (a) flexible sigmoidoscopy that is done every 5 years, (b) colonoscopy that is conducted every 10 years, (c) double-contrast barium enema that is performed every 5 years, and (d) computed tomographic colonography (CTC) that is done once in 5 years. In addition to the above, there are high sensitivity stool tests such as fecal occult blood test (FOBT) and stool DNA test used primarily for cancer detection even though they are also capable of detecting some precancerous polyp. However, because the high sensitivity stool tests are done annually, adherence to the tests in the community settings is a challenge (ACS, n.d.).

Despite the availability of colorectal cancer screening tests and evidence showing the effectiveness of colorectal cancer screening in preventing invasive colorectal cancer, only 59% of the U.S. population is current for the recommended testing; about 9% reported screening with FOBT and 56% reported testing with colonoscopy or sigmoidoscopy within the recommended time interval (ACS, n.d.). Among the general population of adults 50 years and older in the United States with average risk of colorectal cancer, those who are younger than 65 years, non-Whites, recent immigrants, people that have fewer than 13 years of education, and people who lack health insurance have lower screening prevalence; men are slightly more likely to get screened for colorectal cancer than women (ACS, n.d.).

Flexible Sigmoidoscopy

According to ACS (n.d.), the sigmoidoscope used to carry out the flexible sigmoidoscopy test enables the visual examination of the rectum and lower one-third of

the colon, and if there is the presence of a polyp or tumor, the patient gets a referral for colonoscopy to have the entire colon examined. The test is carried out without sedation and is done once in 5 years. According to Schoen et al. (2012), there is a 21% reduction in colorectal cancer incidence and a 26% reduction in colorectal cancer mortality associated with sigmoidoscopy as a screening tool. In the same vein, Atkin et al. (2010) carried out a randomized clinical trial in the United Kingdom using 170,432 eligible men and women between 55 and 64 years of age, and found a 33% reduction in colorectal cancer incidence and 43% reduction in mortality from colorectal cancer among participants that completed a single sigmoidoscopy test.

Colonoscopy

This is a procedure for colorectal cancer screening carried out using a colonoscope, which enables the visual examination of the entire colon with the aid of a light and small video camera on the end of the instrument; it provides an opportunity for removal of a polyp found during the procedure (ACS, n.d.). Colonoscopy has some advantages over other tests for colorectal cancer. For example, it is the most sensitive test for detection of *adenomatous polyp* and colorectal cancer, and has the longest rescreening interval among all other tests for colorectal cancer (ACS, n.d.; Rockey et al., 2005). The use of colonoscopy as the sole screening tool has been advocated for by several scientific societies in North America (Dighe et al., 2010). It has been found that when used alone, colonoscopy is very effective in reducing both incidence of and mortality from colorectal cancer (Dighe et al., 2010; de Wijkerslooth et al., 2010). Zauba et al. (2012) conducted a study in which data from 2,602 participants that were prospectively referred for

colonoscopy and had adenomas removed during colonoscopy were analyzed, and the result showed that there is a 53% reduction in risk of death from colorectal cancer among the participants compared to the general population. Similarly, Citarda, Tomaselli, Capocaccia, Barcherini, & Crespi (2001) in a study conducted in Italy showed that incident rate for colorectal cancer decreased by 80% in patients whose colon were cleared of greater or equal to 5mm of adenomatous polyps compared to the reference population. However, there are limitations associated with the use of colonoscopy. First, despite its high sensitivity, the procedure misses about 20% of all *adenomatous polyp* and 10% of advanced adenomas (Heresbach et al., 2008). Second, according to Dighe et al. (2010), the test is technically demanding, and its successful completion is dependent on the skill of the colonoscopist. Third, colonoscopy requires pre-procedure bowel preparation and post-procedure care as a result of the use of sedation during the procedure (Dighe et al., 2010). Also, the risk of complications including bowel tears and bleeding is higher in colonoscopy especially when a polyp is removed during the procedure in comparison to other tests (ACS, n.d.).

Double Contrast Barium Enema

The test involves taking an x-ray of the colon following the introduction of Barium sulfate into a cleaned colon through the rectum which helps to fill and open the colon partially; the patient is referred for colonoscopy for full visualization of the colon if an abnormality is observed (ACS, n.d.). The sensitivity of the test in detecting small polyps and cancer is lesser than that of colonoscopy, and its use has become unpopular as a result of more availability of colonoscopy, patient and physician preferences of other

tests, scarcity of well-trained radiologists to carry out the procedure as well as comparatively lower insurance reimbursement (ACS, n.d.).

Computed Tomographic Colonography(CTC)

The test also called virtual colonoscopy produces a detailed 2- or 3-dimensional view of the full colon by use of a type of x-ray machine usually linked to a computer that creates images of the interior colon, and patients with polyps or any other abnormality are referred for colonoscopy (ACS, n.d.). The less invasiveness of CTC compared to other structural tests, short duration of the procedure, and absence of need for recovery time confer some advantages on CTC over other tests. Also, the sensitivity of CTC in detecting invasive cancer and polyps of 1cm or larger is similar to that of colonoscopy (Johnson et al., 2008). However, the use of CTC may be undermined by the risk of cumulative exposure to radiation, the inability of the CTC to detect small polyps and lack of coverage by many insurance plans (ACS, n.d.; Dighe et al., 2010).

Disparities in Colorectal Cancer Screening in the United States

According to CDC (n.d.-a), the racial and ethnic disparity in colorectal cancer screening persists in the United States despite the national increases in colorectal cancer screening rates. The colorectal cancer screening rates for racial minorities remains lower than that of the Whites (Klabunde et al., 2011; Wilder & Wilson, 2016). The screening rate among Whites has been found to be consistently higher than those of the African Americans, Hispanics, Asian/Pacific Islanders, Native American and Alaska Natives, and other minority populations in the United States. After controlling for covariates, Williams, Dabney, and Holmes (2013) found that in the United States, compared to

Whites, African Americans, Hispanics, and Asians were 28%, 33%, and 37% less likely to undergo colorectal cancer screening respectively. In another study, Liss and Baker (2014) after analyzing a national data found that Whites self-reported the highest rate of colorectal cancer screening (62.0%) while the self-reported rates among other racial groups were 59.0% for African Americans, 54.6% for Native Hawaiian/Pacific Islander, 52.5% for Hispanic-English, 49.5% for American Indian/Alaska Native, 47.2% for Asians, and 52.5% for Hispanic–Spanish. As a distinct immigrant population, the colorectal cancer screening rate among African-born immigrants in the United States is not known, and is not expected to be different from the trend of lower colorectal cancer screening rates recorded among racial minorities in the United States. Also, considering that the experience of health care utilization in the country of origin before emigration is capable of influencing immigrants' utilization of health care services in foreign lands (Yang & Hwang, 2016), it is reasonable to expect that lack of population-based colorectal cancer screening services in African countries may negatively impact the likelihood of undergoing colorectal cancer screening among African-born immigrants living in the United States.

Numerous studies have been done in an attempt to explain racial and ethnic disparities in colorectal cancer screening in the United States. Some of the factors that have been found to influence racial and ethnic disparities in colorectal cancer screening include socioeconomic status, socio-cultural factors, and access to care (ACS, n.d.; Duobeni et al., 2010; Liss & Baker, 2014; White, Vernon, Franzini, & Du, 2011). Because these factors have not been able to fully explain disparities in colorectal cancer

screening (Stimpson, Pagan, & Chen, 2012), some other studies have been done to see how macro-level factors influence screening and shape disparities in colorectal cancer screening, and the results are mixed. Stimpson, Pagan, and Chen (2012) analyzed the 2000 and 2005 data from NHIS in which the study populations consisted of Whites, African Americans, Hispanic/Latinos, Asian Americans, and American Indians/Alaska natives. The result revealed that policy modifiable and contextual factors such as the supply of gastroenterologists and local health insurance market influenced individuals' likelihood of undergoing colorectal cancer screening but did not adequately account for the racial and ethnic disparities in colorectal cancer screening. Bennaroch-Gampel et al. (2012) analyzed 2003 to 2007 data from 974, 879 beneficiaries of Texas Medicare and found that though increased availability of colonoscopists and primary care physicians led to increased use of colonoscopy generally, the use of colonoscopy among Blacks and Hispanics did not increase like it did among Whites, and so led to wider disparities in colonoscopy use between Whites and Blacks and Whites and Hispanics. In contrast to the above finding, Soneji, Armstrong, and Asch (2012) found that increased physician supply explained the colorectal cancer screening disparity between Whites and Hispanics but did not affect the disparity between Whites and Blacks. The study was conducted with data from 1997 to 2008 collected by Behavioral Risk Factor Surveillance System.

The disparity in physician recommendation for colorectal cancer screening is another factor that has been found to contribute to racial and ethnic disparities in colorectal cancer screening (ACS, n.d.; Lopez-Class et al., 2012). In a cross-sectional quantitative study in which a 2002, 2004, 2006 and 2008 sets of secondary data that were

analyzed consisted of 11,368 Whites and 2,495 Blacks age 50 years and above and all participants were Maryland residents, Rich, Kuyateh, Dwyer, Groves, and Steinberger (2011) who employed logistic regression analytical technique in data analysis found that Whites significantly reported more physician recommendation for colonoscopy and sigmoidoscopy than did Blacks (75% Vs. 65%). Further, the analysis showed that the proportion of respondents who reported physician recommendation for colonoscopy and sigmoidoscopy increased from 2002 to 2008 in both races, but the difference in physician recommendation for colorectal cancer screening between Blacks and Whites did not change with time. Similarly, Ahmed, Pelletier, Winter, and Albatineh (2013) analyzed data on 5900 adults from 2000 edition of NHIS and found that compared to Whites, Blacks and Hispanics were respectively 26% and 34% less likely to receive a recommendation for colorectal cancer screening. The result of the above study is consistent with the findings of the study by Shokar, Carlson, and Weller (2005) in which 560 participants age 50 to 80 years from different racial groups were recruited from a University-based family medicine clinic in Southeast Texas in 2004 and 2005. Upon analysis of study data, the result showed that racial minority groups were significantly less likely than Whites to receive a doctor's recommendation for colorectal cancer screening, a factor which in turn was found to influence racial and ethnic differences in colorectal cancer screening. The reason for the resultant effect of racial disparities in physician recommendation for colorectal cancer screening on racial and ethnic disparities in colorectal cancer screening may not be far-fetched as it has been found that physician recommendation for colorectal cancer improves the odds of getting screened for

colorectal cancer (Gilbert & Kanarek, 2005). Racial minority populations including immigrants who are at a disadvantage in receiving physician recommendation for colorectal cancer screening may likely record low colorectal cancer screening rates. It is needful to address the findings from these studies in order to increase colorectal cancer screening among racial minorities. It may help make achievable the goal of having 80% of adults age 50 and above in the United States screened for colorectal cancer by 2018, an initiative led by the American Cancer Society, the Center for Disease Control and Prevention and the National Colorectal Cancer Roundtable (ACS, n.d.).

Disparities in Colorectal Cancer Screening Among Native-Born and Foreign-Born Populations in the United States

The existence of disparity in colorectal cancer screening between foreign-born and U.S-born citizens of the United States is established (CDC, n.d.-a). According to ACS (n.d.), foreign-born individuals living in the United States are among the subgroups of U.S. populations that are most likely to have low colorectal screening rates. Several studies have shown that foreign-born populations living in the United States have lower colorectal cancer screening rates than the native-born U.S. population. Shih et al. (2008) analyzed data from the 2000 NHIS Cancer Control Module that were collected from 38,633 households and found that rate of colorectal cancer screening for foreign-born individuals was significantly lower than that of U.S-born individuals with the same socioeconomic and insurance status. Also, Shahidi et al. (2013) analyzed data from 2007 California Health Interview Survey collected from 30,434 screening-eligible adults and found that compared with U.S-born citizens, foreign-born U.S. citizens have lower odds

of colorectal cancer screening (OR = .88; 95% CI {.74, 1.06}). In the same vein, Reyes and Miranda (2015) used the NHIS 2000 to 2010 data in a study in which they found that while native-born U.S. citizens have 56% colorectal cancer screening rates, the rate for foreign-born U.S. citizens was 52%. The implication of lower screening rates among immigrant populations in the United States is that more opportunities for early diagnosis are missed among foreign-born populations in the United States. The findings from these studies highlight the need to investigate how the factors identified in literature affect colorectal cancer screening practices of specific immigrant populations such as African-born immigrants.

The factors that drive the disparity in colorectal cancer screening between U.S-born and foreign-born U.S. citizens have been examined in several studies and factors such as nativity, access to health insurance, limited English language proficiency, and cultural factors have been implicated (ACS, n.d.). Goel et al. (2003) in a study in which they used 1998 data from NHIS collected from 98,785 respondents, found that demographic and socioeconomic barriers such as low income, less education, and lack of health insurance were more prevalent among the foreign-born population than among the U.S-born citizens. Goel et al. suggested that these factors might explain some of the disparity in colorectal cancer screening between native-born and foreign-born U.S. citizens. In another study, Shahidi et al. (2013) did a stratified analysis of the 2007 California Health Interview Survey data and found that there is a relationship between foreign birthplace and decreased odds of colorectal cancer screening, and that the relationship is more pronounced among foreign-born populations that lacked health

insurance as well as among those with limited English proficiency. Further, Johnson (2010) used 2005 California Health Interview Survey data collected from 1496 foreign-born Mexican American men and women who were 50 years old and above, to carry out a study. It was found that more acculturated Mexican Americans were 3 to 4 times more likely to get screened for colorectal cancer, while less acculturated Mexican Americans were 2 times as likely not to get screened for colorectal cancer. The implication is that cultural differences between foreign-born populations living in the United States and U.S-born populations could explain some of the disparities between foreign-born and native-born populations living in the United States given that cultural preferences are known to influence health-seeking behavior (Dhingra et al., 2010). The findings from these studies highlight the need to investigate how some of the factors identified in literature affect colorectal cancer screening practices of immigrant populations in the United States. Since the immigrants live in the communities along with native-born Americans, the health status of the foreign-born populations affect that of the entire country, and so interventions designed to increase colorectal cancer screening should include those targeting immigrant populations and other disadvantaged minority groups.

Colorectal Cancer Screening in Africa and Its Implication for the Study

Colorectal cancer is regarded as a rare disease in Africa. Even though the prevalence of the disease in the African continent is on the increase, available data suggest that there is still a low burden of the disease in Africa compared to the Western countries (Katsidzira et al., 2015). Even among clinicians in Africa, the perception that colorectal cancer is a rare disease subsists (Katsidzira et al., 2015). Also, there is a low

level of awareness of the disease among the populace (Busolo & Woodgate, 2015). Cancer prevention efforts by various governments are deficient as there is no organized population-based colorectal cancer screening program in any country in Africa (Laiyemo et al., 2016). These may not be unrelated to the experience of inadequate access to colonoscopy and modern cross-sectional imaging techniques in African continent (Katsidzira et al., 2015) and a consequent delay in presentation and diagnosis of colorectal cancer in Africa (Gondos, Brenner, Wabinga, & Pakin, 2005). Even in hospital and clinic settings, though colonoscopy is employed in the diagnosis of colorectal cancer in Africa, yet in many others, it is done without colonoscopy because of lack of access to the technique. In a retrospective study by Chalya et al. (2013) in which they examined clinicopathological patterns and challenges of management of colorectal cancer in a resource-limited setting using Tanzania as a case study, it was revealed that out of 332 colorectal cancer patients, none received colonoscopy and more than 30% of the patients were diagnosed at laparotomy.

Several studies on colorectal cancer in Africa have linked the low incidence of the disease in Africa to African lifestyle practices and dietary pattern that are thought to be protective against the risk of colorectal cancer (Katsidzira et al., 2015). It is, therefore, reasonable to expect that prevalence of risk factors for colorectal cancer among immigrants from Africa be lower than it is among native-born Americans. However, previous studies on immigrants have shown that adoption of Western lifestyle and dietary patterns as a result of acculturation have a significant effect on the prevalence of risk factors and incidence of colorectal cancer among immigrant populations (Ladabaum et

al., 2014; Maskarinec & Noh, 2004). Because it cannot be ruled out that the African-born immigrants living in the United States can acquire Western lifestyle and dietary pattern that can lead to increased colorectal cancer risk among the immigrants as they become acculturated over the years, there is a need for increased screening rates among these immigrants from Africa. Therefore, studies that can yield information on factors that influence colorectal cancer screening among African born immigrants in the United States are imperative.

Summary

In chapter 2, I presented detailed information found in the literature on cancer, colorectal cancer, colorectal cancer screening, and disparities in colorectal cancer screening in the United States. The review of the literature revealed that disparities in colorectal cancer screening persist in the United States despite decreased incidence of and mortality from colorectal cancer associated with increased colorectal cancer screening (ACS, n.d.). The racial minorities and immigrant populations in the United States record lower screening rates than non-Hispanic Whites (ACS, n.d.; Klabunde et al., 2011; Shahidi et al., 2013; Wilder & Wilson, 2016). I reviewed some studies that focused on factors that influence colorectal cancer screening among some immigrant populations in the United States, and some of the factors revealed in the studies include health insurance status, immigration status, acculturation, English proficiency, recommendation for colorectal cancer screening by primary care physician, and level of knowledge of colorectal cancer screening among others. Though African born immigrants living in the United States are an integral part of the U.S. population, yet literature on colorectal

cancer screening practices and factors that affect colorectal cancer screening among African-born immigrants is almost non-existent. This study was designed to fill the identified gap and yield knowledge that may be useful in designing interventions geared toward increasing colorectal cancer screening among African-born immigrants living in the United States. In chapter 3, I discussed the study design and methodology, study variables, statistical methods, research setting and sampling technique, inclusion and exclusion criteria, and ethical considerations.

Chapter 3: Research Method

This study was designed to examine factors that influence colorectal cancer screening among African-born immigrants living in the United States. This chapter focuses on the research design and method used to carry out the study. The major sections include study design, study population, sampling method, data collection and instrumentation, statistical analytical methods, ethical considerations, and validity and reliability of NHIS data. The NHIS has monitored the health of the U.S. population since 1957 through personal household interviews on a broad range of health topics, and the U.S. Census Bureau has been the data collection agent (CDC, n.d.-c). I accessed the data for this study through the Integrated Public Use Microdata Series (IPUMS), which is a repository of public data from NHIS managed at the University of Minnesota by Minnesota Population Center (NHIS, n.d.). The IPUMS collects, preserves, and harmonizes U.S. census data, and makes them available for easy access and enhanced documentation.

Type of Study and Design

The dependent variable in this study was ever had colonoscopy. The independent variables included education level, health insurance status, length of stay in the United States, interview language, family income, perceived health status and having a usual place for medical care. The data for the study were collected in 2010, 2013, and 2015 through a cross-sectional interview survey, and a quantitative cross-sectional design was used to examine the relationship between the independent variables and the dependent variable. According to Suresh, Suresh, and Thomas (2012), a cross-sectional survey enables researchers to take a snapshot of a population at a specific time to describe the pattern of distribution of a variable or variables of interest in the population. Cross-sectional studies are associated with the use of survey questionnaires in the conduct of research (Frankfort-Nachmias & Nachmias, 2008). The cross-sectional design was considered appropriate for this study because I measured the prevalence of the independent variables in the population and examined how they relate to the dependent variable in the period the data were collected.

The quantitative approach was appropriate because the demographics of the participants and data on the variables collected from the participants were numeric. According to Singleton and Straits (2005), a quantitative approach enables researchers to apply findings to the entire population from which a representative sample is drawn. This study could have been done using other research methods, but the cross-sectional quantitative approach was preferred because of the advantages it offered with regard to time and financial considerations. Several studies that addressed specific populations

have been done using cross-sectional quantitative methods to examine relationships between variables of interest. For example, Kim et al. (2012) used cross-sectional design to examine colorectal cancer screening among Korean Americans living in the United States. Similarly, Harcourt et al. (2014) used secondary data from a cross-sectional survey to study factors associated with breast and cervical cancer screening among African immigrant women in Minnesota.

Setting and Sampling Technique

The target population was African-born immigrants age 40 years and above who identify Africa as region of birth and are living in the United States. According to the U.S. Census bureau (2014), about 1.6 million African immigrants were living in the United States in 2010, and nearly 34.5% of the population in that year were age 45 years and above which translates to approximately 554,415 people. In this study, the participants were limited to age 40 years and above based on the guideline that a person with an average risk of colorectal cancer should begin screening at age 50 years, while individuals with a high risk of colorectal cancer should start screening before age 50 years (ACS, n.d.). The study participants were selected based on the sampling design used by the NHIS in the original survey. The sample design was based on stratified multistage sampling which is used to make estimates for the country from subsamples in each of the four census regions of the United States (CDC, n.d.-c). The first stage involves dividing the United States into about 1700 geographically defined areas known as primary sampling units (PSUs) made up of a metropolitan area, a large county, or a cluster of adjacent counties. The PSUs are then stratified in line with social and

demographic characteristics of the area. Then in every stratum, one or more PSUs are sampled depending on the year, and the probability of each PSU being selected is proportional to its population size within the strata. In the second stage of sampling, geographical area segments within each PSU are sampled, and the segments are divided into clusters that are made of about 4 to 9 housing units. The selected households are then assigned a quarter of the year, which is further distributed across 13 weeks within the quarter for the interview. The NHIS sampling design from 2006 to 2015 included an all-area sample frame based on area sampling for housing units in place at the U.S. census 2000 (CDC, n. d.-c).

Profile of African Immigrants in the United States

According to the U.S. Census Bureau (2014), there were approximately 1.6 million African-born immigrants living in the United States in 2012. The American Immigration Council [AIC] (2015) recorded that the number of African-born immigrants living in the United States in 2013 was about 1.8 million and that the population of African-born immigrants in the United States has been doubling each decade since 1970. The African-born immigrants represent about 4% of the total foreign-born population in the United States; most of these immigrants came from Nigeria, Egypt, Ethiopia, Ghana, and Kenya, which together made up nearly 50% of the African immigrant population in 2013 (AIC, 2015). Although many of the African immigrants came into the United States through the diversity visa program passed in 1990 to encourage immigration from underrepresented countries, others from countries like Democratic Republic of Congo, Eritrea, Sudan, and Ethiopia arrived through refugee resettlement programs in the United

States. The educational attainment of immigrants from Africa is higher than that of the overall foreign-born population in the United States; about 41% of African immigrants have a bachelor's degree or higher compared to 28% overall (U.S. Census Bureau, 2014). Approximately 54.9% of African-born immigrants are in the age bracket of 18 to 44 years, and although 21.8% of the population spoke only English at home, 49% spoke English and other languages at home (U.S. Census Bureau, 2014). There is high labor participation among African immigrants in the United States; however, there is 20.7% poverty rate among the population (U.S. Census Bureau, 2014).

Sample Size Determination

There are several methods used to calculate sample size, which is dependent on the type of data or study design (Kadam & Bhalerao, 2010), so one blanket formula cannot be used for different study designs. This study was a quantitative cross-sectional study in which logistic regression was applied in the data analysis. According to Tabachnick and Fidell (2001), the formula for computing sample size for logistic regression is $N \geq (8/f^2) + (m-1)$ where $f^2 = R^2/ (1- R^2)$, m= number of independent variables, and R^2 = effect size. According to Hallahan and Rosenthal (1996), the effect size expected from a study can be obtained from previous research, pilot study, or Cohen's advice. Because there had not been a previous study on colorectal cancer screening among African-born immigrants in the United States, I followed Cohen (1988) who suggested the following effect sizes for regression studies: small = R^2 less than 0.13, medium = R^2 between 0.13 and 0.26, large = R^2 greater than 0.26. The R^2 represents the strength of the relationship between two variables. To detect a small effect size of 0.05 in

this study with seven independent variables, the sample size needed was $S \geq (8/0.0526) + (7-1)$, where $f^2 = 0.0526$, $S \geq 158$. Out of about 1.8 million African-born immigrants living in the United States, a minimum of 158 participants was needed for the study.

Instrumentation and Data Collection Method

The NHIS collected the data through in-house personal face-to-face interviews with a representative sample of the population who were noninstitutionalized. Trained personnel of the National Center for Health Statistics conduct the interviews by visiting about 35,000 to 40,000 households across the United States every year, out of which a total of 75,000 to 100,000 eligible adult family members in the selected household units are invited for interview (CDC, n.d.-d). The interviewers reach as many homes as possible among the chosen ones to ensure result accuracy, and the participants are not replaced with anyone else once selected (CDC, n.d.-d). The interview lasts about one hour, and the questionnaire consists of two main parts; one part is made up of core questions that remain the same including questions on demographic information, health status, limitations, injuries, access to health care and utilization, health insurance status, and income and assets, and the second part consists of questions that address current issues of national interest (CDC, n.d.-d). In this study, the questions in the second part of the questionnaire covered areas such as colorectal cancer screening, education level, having a usual place for medical care, number of years lived in the United States, and perceived health status.

The NHIS uses the computer assisted personal interviewing (CAPI) to administer the questionnaire, which guides the interviewers through the data collection process by

allowing for routing and branching to appropriate questions based on the responses as the interviewer enters the answers directly into the computer. The CAPI has the advantage of determining if a response is consistent with previous responses and if they are within an allowable range; the ability to check possible error range to responses, improved data storage, and cost reduction due to elimination of printing and mailing costs are some of the advantages of CAPI (Kissinger et al., 2010).

To gain access to the data, I created a user account following the instructions given on the NHIS website. While creating the account, I disclosed that I am a PhD student at Walden University and that the data would be used for research for my dissertation. I was given access to the data through my account, and I followed instructions on the website to extract the data. I also wrote a letter to the IPUMS team who confirmed that creating a user account is all that was needed to have access to data on their website, and that no formal permission was needed to have access to the data, which was in the public domain.

Reliability and Validity of Instrument

A measuring instrument is said to be reliable when it is consistent in measuring what it is intended to measure, and it is valid when it correctly measures what it is designed to measure (Center for Applied Linguistics, n.d). The NHIS questionnaire that was used to collect the data had been pretested and standardized to ensure its reliability and validity, and the study benefited from the advantage of using data collected with the aid of an instrument that had been standardized and used for studies over several years at the national level in the United States. In addition, specific quality control procedures

were carried out to ensure high quality of the data collected by NHIS (CDC, n.d.-c). Some of the quality control procedures included (a) observation of NHIS interviewers in a group of households by interviewer supervisor who made observations and reported about the performance of the interviewer; (b) field edits to check for completeness, consistency, and legibility of entries; (c) interview processes monitored by the Census Bureau's PANDA system that provides checks on response rates, completion rates, item response times, item non response, and other data quality indicators; (d) a re-interview of about 5% of all interviews done as a measure to check interview performance and ensure reliability and accuracy of NHIS data; and (e) computer edits carried out to check for inconsistencies and invalid responses (CDC, n.d.-d).

Inclusion and Exclusion Criteria

To qualify as a participant in this study, the individual had to be a noninstitutionalized man or woman age 40 years and above who migrated from any country in Africa and identified Africa as the region of birth. Potential study participants had to be living in the United States at the time of the interview. The participant had to be proficient in English or any preferred language for the interview, and had to provide informed consent to participate in the study. Individuals who identified as a second or third generation immigrants of African origin were excluded from the study.

Study Variables

Dependent Variable

In this study, the outcome variable was colorectal cancer screening. The USPSTF (n.d) recommended that colorectal cancer screening for average-risk individuals start at

age 50 years and continue until age 75 years, while those who are at increased risk because of certain medical conditions and family history should begin at an earlier age. The outcome variable was categorical and had a dichotomous outcome of no or yes. The outcome variable was assessed by the question, "Have you ever had a colonoscopy?" The options for the answer in the questionnaire were yes, no, refused, or don't know. For this study, only the outcome of yes or no was used in the analysis. Although other tests are used for colorectal cancer screening, colonoscopy remains the most common screening test for colorectal cancer in the United States (ACS, n.d.; Collazo, Jandorf, Thelemaque, Lee, & Itzkowitz, 2015). The use of colonoscopy as the sole screening tool in North America has been advocated by several scientific societies (Dighe et al., 2010). Colonoscopy is carried out every 10 years which is the longest screening interval among all the recommended tests, and it has the advantage of offering an opportunity for both screening and diagnostic follow-up of positive results in the same examination.

Independent Variables

The study's independent variables were assessed based on the predisposing, enabling, and needs domain as detailed in the immigrant health services utilization model (Yang & Hwang, 2016). The level of education and family income, which are indicators of socioeconomic status were assessed under the predisposing domain. Having a usual place of medical care and health insurance status, which are indicators of access to health care were assessed under enabling domain, and perceived health status was assessed under needs domain. The length of stay in the United States and interview language, which are indicators of acculturation were assessed under the predisposing domain. The

level of education was assessed in the questionnaire by the question “what is the highest level of school completed or the highest degree?” Total family income was assessed by the question “what is your best estimate of the total income of all family members from all sources before taxes?” For this study, the answer on the level of education was assigned into three categories including (a) high school education or less, (b) more than high school and some college education, and (c) 4 years of college degree and higher. Total family income was regrouped into three categories including (a) less than $35000 per annum, (b) $35000 to $75000 per annum, (c) more than $ 75000 per annum. Perceived health status was assessed by the question “would you say your health is excellent, very good, good, fair or poor”? For this study, responses were regrouped into two categories including (a) excellent, very good, and good health status were regrouped into good health, and (b) fair and poor health status were regrouped into poor health. Health insurance status was assessed using a question that asked whether participant had health insurance or not. For the purpose of this study, the responses were regrouped into two categories including (a) yes, and (b) no. Having a usual place for medical care was assessed by the question “is there a place that you usually go to when you are sick or need advice about your health?” In this study, the responses were regrouped into two categories including (a) yes, and (b) no. Length of stay in the United States was assessed by the question “about how long have you been in the United States?” For this study, the responses to the question were regrouped into two categories including (a) less than 5 years, and (b) 5 years or more. In this study, the participants who have stayed less than 5 years were referred to as recent immigrants, and those who have stayed 5 years or more

were referred to as established immigrants. No question was used to assess the language of the interview in the questionnaire but the language by which the interviews were conducted was indicated and grouped into two categories including (a) English, and (b) others.

Data Analysis Plan

The data analysis was done using IBM SPSS version 21, and the data were limited to the participants who satisfied the inclusion and exclusion criteria and completed the interview in 2010, 2013, and 2015. All statistical tests were conducted using an alpha level, which tells how extreme the result of the significance test must be to reject the null hypothesis (Taylor, 2017). In this study, the alpha (α) level is 0.05. The null hypothesis was retained and the alternative hypothesis rejected if the p-value was greater than the alpha level. On the other hand, the null hypothesis was rejected and the alternate hypothesis retained if the p-value was less than or equal to the alpha level.

Statistical Test for Research Hypothesis

The type of statistical test used for analysis of data in this study was predicated on the research questions and hypothesis. The details of the research questions and hypothesis are presented as below.

Research Question 1: Is socioeconomic status measured by education level and family income associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 1: There is no association between socioeconomic status measured by education level and family income and colorectal cancer screening among African-born immigrants living in the United States.

Ha 1: There is an association between socioeconomic status measured by education level and family income and colorectal cancer screening among African born immigrants living in the United States.

In the Research Question 1 above, ever had colonoscopy, which was the outcome variable, was categorical. The education level and family income, which were the predictor variables, were categorical. Therefore chi-square test of independence was used to test the association between ever had colonoscopy and socioeconomic factors. The significance of the Pearson chi-square statistic was determined by alpha level, which determined whether the null hypothesis was rejected or accepted. Because the outcome variable was dichotomous, simple logistic regression was used to assess the relationship between ever had colonoscopy and each of the socioeconomic factors. The odds ratio, which indicated the change in odds resulting from a unit change in the predictor variable and its 95% confidence interval (CI) were presented in Chapter 4. Also, I used multiple logistic regression analysis to see the effect of each variable of interest in this study on the probability of getting a colonoscopy when all the variables are in the model. The odds ratio, which indicated the change in odds resulting from a unit change in the predictor variable and its 95% CI were presented in Chapter 4

Research Question 2: Is acculturation measured by length of stay in the United States and language of interview associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 2: There is no association between acculturation measured by length of stay in the United States and language of interview and colorectal cancer screening among African-born immigrants living in the United States.

Ha 2: There is an association between acculturation measured by the length of stay in the United States and language of interview and colorectal cancer screening among African born immigrants living in the United States.

In the Research Question 2, ever had colonoscopy, which was the outcome variable was categorical. The length of stay in the United States and language of interview, which were the predictor variables were categorical. Therefore, chi-square test of independence was used to test for the association between ever had colonoscopy and each of the predictor variables. The significance of the Pearson chi-square statistic was determined by the alpha level, which determined whether the null hypothesis was rejected or accepted. Because the outcome variable was categorical and dichotomous, simple logistic regression was used to assess the relationship between ever had colonoscopy and each of the predictor variables. The odds ratio which indicated the change in odds resulting from a unit change in the predictor variable and its 95% confidence interval were presented in Chapter 4.

Research Question 3: Is perceived health status associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 3: There is no association between perceived health status and colorectal cancer screening among African-born immigrants living in the United States.

H_a 3: There is an association between perceived health status and colorectal cancer screening among African born immigrants living in the United States.

In the Research Question 3, ever had colonoscopy, which was the outcome variable, was categorical. Perceived health status, which was the predictor variable, was categorical. Therefore chi-square test of independence was used to test for the association between ever had colonoscopy and perceived health status. The significance of the Pearson chi-square statistic was determined by alpha level, which determined whether the null hypothesis was rejected or accepted. Simple logistic regression was also used to assess the relationship between ever had colonoscopy and perceived health status. The odds ratio which indicated the change in odds resulting from a unit change in the predictor variable and its 95% CI were presented in Chapter 4.

Research Question 4: Is access to healthcare measured by having a usual place for medical care and health insurance coverage status associated with colorectal cancer screening among African born immigrants living in the United States?

H_0 4: There is no association between access to health care measured by having a usual place for medical care and health insurance status and colorectal cancer screening among African-born immigrants living in the United States.

H_a 4: There is an association between access to health care measured by having a usual place for medical care and health insurance status and colorectal cancer screening among African-born immigrants living in the United States.

In the Research Question 4, ever had colonoscopy, which was the outcome variable, was categorical. Having a usual place for medical care and health insurance status, which were the predictor were categorical. Therefore chi-square test of independence was used to test for the association between ever had colonoscopy and the predictor variables. The significance of the Pearson chi-square statistic was determined by alpha level which determined whether the null hypothesis was rejected or not. Simple logistic regression was also used to assess the relationship between ever had colonoscopy and each of the predictor variables. The odds ratio which indicated the change in odds resulting from a unit change in the predictor variable and its 95% confidence interval were presented in Chapter 4.

Descriptive statistics were used to show a summary of the demographics of the sample which was representative of the study population, and it included quantitative representation and description of the characteristics of the study population. Descriptive statistics was also used to show the relationships between variables and links between the outcome and predictor variables. In this study, the descriptive statistics included the mean and standard deviation calculated for continuous variables, while counts and proportions were calculated for categorical variables. Inferential statistics were used to make inferences and predictions from the data. In this study, inferential statistics presented include Pearson chi-square statistics and p-value from chi-square test of independence, and 95% CI, odds ratio, p-value, and Wald statistics from logistic regression.

Chi-square test of independence is a statistical test that is used to examine if there is a relationship between two nominal or categorical variables; a relationship between the

variables is confirmed if the null hypothesis is rejected and alternative hypothesis accepted, whereas no relationship is established between two variables if the null hypothesis is accepted (Statistics Solutions, n.d.). In this study, ever had colonoscopy, which was the outcome variable was categorical and so also were the predictor variables that included the language of interview, length of stay in the United States, health insurance status, have a usual place for medical care, family income, education level, and perceived health status. Hence, chi-square test of independence was appropriate for assessing the relationship between the outcome and predictor variables.

Logistic regression is a statistical test that can be used to predict categorical outcomes from categorical or continuous predictors (Field, 2013). The logistic model can be used to assess whether or not a variable made a significant contribution to the occurrence of an outcome. According to Field (2013), the b-values and the Wald statistics are very crucial in interpreting the outcome of logistic regression. Whereas the b-values represent the change in the odds of the outcome variable occurring resulting from a unit change in the predictor variable, the Wald statistics signifies whether the b-coefficient for a predictor variable is significantly different from zero or not (Field, 2013). The result of the test of significance of the Wald statistics indicates whether the predictor variable makes a significant contribution to the outcome occurring or not. The odds ratio represents the change in odds of the outcome occurring; a value of odds ratio greater than 1 indicates that the odds of the outcome occurring increases as the predictor variable increases or changes from one category to another, whereas a value less than 1 signifies that the odds of outcome occurring decreases as the predictor increases or changes from

one category to another (Field, 2013). In this study, ever had colonoscopy, which is the outcome variable was categorical and so also were the predictor variables that included the language of interview, length of stay in the United States, health insurance status, have a usual place for medical care, family income, education level, and perceived health status. Hence the logistic regression analysis was appropriate for the assessing the relationship between the outcome and predictor variables and for assessing whether or not the predictor variables contributed significantly to the occurrence of the outcome variable. Logistic regression has been used in studies that examined factors that affect colorectal, breast, and cervical cancer screening in several specific populations (Harcourt et al., 2014; Kim, Chapman, & Vallina, 2013).

Threat to Validity

In general terms, anything that initiates a shift from a valid study is a threat to its validity. Whereas external validity is the extent to which the result of a study can be generalized to the general population, internal validity refers to the degree to which study outcome is explained by the effects of a predictor variable on the outcome variable and not by alternate explanation (McLeod, 2013). The secondary data used for this study was generated from a cross-sectional survey in which participants responded to questions on past activities. Participants may not accurately recall specific events that occurred in the past. This may introduce recall bias into the study and pose a threat to the internal validity. Also, there is a possibility that participants were tempted to give a socially acceptable response to questions. Studies have shown that participants may provide socially satisfactory answers, or may not accurately report a cancer screening test

(Blackwell et al., 2008; Bowman, Sanson-Fisher, & Redman, 1997), which can pose a threat to the internal validity of the study.

Ethical Considerations

The secondary data from the NHIS used for this study is in the public domain, and NHIS ensures that the confidentiality of the data is maintained by not retaining personal identifiers like names, telephone numbers, and birth dates of the study participants. Before starting the interview the interviewer got a verbal consent for participation in the interview from the study participants (CDC, n.d.-d). The response the participants gave during the interview was on a voluntary basis, and participants had the right to withdraw from the interview at any point in time. The interviewers informed the participants about the purpose of the interview and the details of how the data collected from them would be used; the participants were assured that the law protects the information they would provide (CDC, n.d.-d). The original data were not altered or modified in this study, and so the data's integrity was maintained throughout the time of this study.

Summary

In Chapter 3 above, the method used to carry out the research was described by providing details of the study design, sampling frame, sampling methods, data collection instrument, and the method of data analysis. Also clearly described were the inclusion and exclusion criteria, study variables, limitations and delimitation, and ethical considerations. In the Chapter 4, I present the actual data analysis and the results.

Chapter 4: Results

The purpose of this quantitative cross-sectional study was to examine factors that affect colorectal cancer screening among African-born immigrants living in the United States. I merged and analyzed 2010, 2013, and 2015 secondary data from the NHIS. In line with the research questions, I assessed the association between colorectal cancer screening and predictor variables such as family income, education level, health insurance status, having a usual place for medical care, number of years lived in the United States, language of interview, and perceived health status. The data were analyzed with SPSS Version 21 using a Chi-square test of independence and simple and multiple logistic regression techniques. In this chapter, I present a summary of the data analysis including the descriptive statistics of the participants, the results of the Chi-square test of independence, and logistic regression analysis. The data analysis revealed the relationship between each of the independent variables and the dependent variable, and also provided answers to the research questions. In this chapter, Table 1 shows the summary of the distribution of the demographics of the study participants in line with the individual variables examined and Table 2 shows the summary of the chi-square test of independence. Table 3 shows the result of the simple logistic regression, while Table 4 summarizes the outcome of the multiple logistic regression analysis.

Research Questions and Hypotheses

Research Question 1: Is socioeconomic status measured by education level and family income associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 1: There is no association between socioeconomic status measured by education level and family income and colorectal cancer screening among African-born immigrants living in the United States.

H_a 1: There is an association between socioeconomic status measured by education level and family income and colorectal cancer screening among African-born immigrants living in the United States.

Research Question 2: Is acculturation measured by the length of stay in the United States and language of interview associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 2: There is no association between acculturation measured by the length of stay in the United States and language of interview and colorectal cancer screening among African-born immigrants living in the United States.

H_a 2: There is an association between acculturation measured by the length of stay in the United States and language of interview and colorectal cancer screening among African-born immigrants living in the United States.

Research Question 3: Is perception of health status associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 3: There is no association between perceived health status and colorectal cancer screening among African-born immigrants living in the United States.

H_a 3: There is an association between perceived health status and colorectal cancer screening among African-born immigrants living in the United States.

Research Question 4: Is access to health care measured by having a usual place for medical care and health insurance coverage status associated with colorectal cancer screening among African-born immigrants living in the United States?

H_0 4: There is no association between access to health care measured by having a usual place for medical care and health insurance status and colorectal cancer screening among African-born immigrants living in the United States.

H_a 4: There is an association between access to health care measured by having a usual place for medical care and health insurance status and colorectal cancer screening among African-born immigrants living in the United States.

Demographic and Descriptive Characteristics of the Study Population

The total sample size for the study was 349 African-born immigrants age 40 years and above living in the United States at the time data for the study were collected. Descriptive statistics showed that the youngest age of participants was 40 years while the oldest was 85 years. The mean age of participants was 51.98 years with a standard deviation of 9.17. I grouped age of participants into four categories: 40-49 years, 50-59 years, 60-69 years, and 70 years and above. The highest number of participants (n=158) was in the age group 40-49 years, which represented 45.3% of the participants. The number of participants in the age group 50-59 years was 123, which represented 35.2% of

the participants. There were 50 participants in age group 60-69, which represented 14.3% of the participants. Age group 70 years and above had 18 participants who represented 5.2% of the participants. Out of the 349 participants, 90 stated that they had had a colonoscopy in the past, which represented 25% of the participants, while 259 said they have not ever had colonoscopy, which represents 74.2% of the total number of participants. Out of 158 participants in the age group 40-49 years, 9(5.6%) had a colonoscopy in the past, while 41(33.3%) of the 123 participants in the age group 50-59 years had a colonoscopy. In the age group 60-69 years, 33(66%) of 50 participants had a colonoscopy, whereas in the age group 70 years and above 7(38.8%) of 18 participants had a colonoscopy.

Analysis of the educational level of the participants showed that 162(46.4%) had at least four years of college, 99(28.4%) had high school education or less, and 88(25.2%) had some college education. Of the 349 participants, 265(75.9%) had health insurance coverage while 84(24.1%) did not have health insurance coverage. Most of the participants (*n*=288, 82.5%) had a usual place for medical care, while 61(17.5%) participants did not. Also, although a high percentage of the participants (*n*=307, 88%) reported themselves to be in good health, 42(12%) perceived they had poor health status. The descriptive statistics further revealed that out of the 349 participants, 321(92%) had stayed 5 years or more in the United States and they were labeled established immigrants in this study; 28(8%) participants have lived less than 5 years in the United States and they are referred to as recent immigrants in the study. The interview was conducted in a language the participant is fluent in, and analysis showed that 340 participants (97.4%)

had their interview done in English, while nine (2.6%) interviewed in other languages. The total family income was regrouped into three categories including (a) $0-$34,999 referred to as low income, (b) $35,000-$74,999 referred to as middle income, and $75,000 and above known as the high income group. Analysis revealed that 87(24.9%) of the participants were in the high-income group, 97(27.8%) were in the middle-income group, and 165(47.2%) were in the low-income group. In Table 1 below, I present the demographic data according to the variables examined.

Table 1

Distribution of Demographics and Individual Factors

Characteristics	Frequency	Percentages
Age		
40-49	158	45.3%
50-59	123	35.2%
60-69	50	14.3%
70-85	18	5.2%
Education		
High school education or less	99	28.4%
Some college education	88	25.2%
4 years of education or more	162	46.4%
Health Insurance Status		
Have health insurance	265	75.9%
Does not have health insurance	84	24.1%
Total Family Income		
$0-$34,999	165	47.3%
$35,000-$74,999	97	27.8%
$75,000 and above	87	24.9%
Perception of Health Status		
Good	307	88.0%
Poor	42	12.0%
Having a Usual Place for Medical Care		
Yes	288	82.5%
No	61	17.5%
Number of Years Stayed in United States		
5 years or more (established immigrants)	321	92.0%
Less than 5 years (recent immigrants)	28	8.0%
Language of Interview		
English Language	340	97.4%
Other language	9	2.6%

Results of Analysis

I conducted a chi-square test of independence and a simple and multiple logistic regression to examine the relationship between colorectal cancer screening and the independent variables including level of education, family income, health insurance status, having a usual place for medical care, length of stay in the United States, language of interview, and perceived health status. The results of the analyses are shown in Table 2, Table 3, and Table 4 respectively.

Table 2

Chi-Square Test of Independence of the Dependent and Independent Variables

Number of participants *N*=349	Ever had colonoscopy		*P*-value
	Yes	No	
Number of participants	90	259	
Level of education			
High school education or less	23(25.6%)	76(29.3%)	.704
Some college education	22(24.4%)	66(25.5%)	
4 years of college degree or higher	45(50.0%)	117(45.2%)	
Total family income			
$0-$34,999	34(37.8%)	131(50.6%)	.163
$35,000-$74,999	27(30.0%)	70(27.0%)	
$75,000 and more	29(32.2%)	58(22.4%)	
Insurance status			
Have health insurance coverage	83(92.2%)	182(70.3%)	.000
No health insurance coverage	7(7.8%)	77(29.7%)	
Having a usual place of medical care			
Yes	89(98.9%)	199(76.8%)	.000
No	1(1.1%)	60(23.2%)	
Language of interview			
English language	88(97.8%)	252(97.3%)	1.00
Other language	2(2.2%)	7(2.7%)	
Years stayed in United States			
Less than 5 years	1(1.1%)	27(10.4%)	.005
5 years and over	89(98.9%)	232(89.6%)	
Perceived health status			
Good	72(80.0%)	235(90.7%)	.007
Poor	18(20.0%)	24(9.3%)	

Table 3

Results of Simple Logistic Regression Analysis of Independent Variables and Colorectal Cancer Testing

Variable	B	S.E	Wald	df	Sig.	ExpB	95%C.I. for ExpB	
							Lower	Upper
Usual care place	-3.29	1.01	10.47	1	.001	.03	.005	.27
Insurance status	1.61	.41	15.00	1	.000	5.01	2.21	11.34
Stay in U.S	2.33	1.02	5.19	1	.023	10.35	1.38	77.36
Interview lang.	.20	.81	.06	1	.80	1.22	.24	5.99
Health status	-.89	.34	6.94	1	.008	.40	.21	.79
Edu. level			.70	2	.705			
Edu. level(1)	-.24	.29	.66	1	.417	.79	.44	1.40
Edu. level(2)	-1.43	.30	.22	1	.636	.87	.49	1.56
Income total			5.04	2	.080			
Income total(1)	-.66	.29	4.84	1	.028	.52	.29	.93
Income total(2)	-.26	.32	.65	1	.419	.77	.41	1.45

Note. variable(s) entered on step 1: Usual place for care, Insurance status, Stay in US, Interview Lang, Health status, Education level, Income total.
Ref. categories: have a place for usual medical care, have no insurance, recent immigrants, interview in English language, good health status, 4 years of college degree and above, high income group.

Socioeconomic Status and Colorectal Cancer Screening

To answer Research Question 1, I used a chi-square test of independence to examine whether socioeconomic status measured by the level of education and total family income was associated with colorectal cancer screening. I assigned the level of education into three categories: high school education or less, some college education, and four years of college or higher. The results showed that when there was no association between education level and colorectal cancer screening, 25 participants were expected to get a colonoscopy but 23 participants got a colonoscopy, and 73 participants were expected not to get a colonoscopy but 76 participants did not get a colonoscopy for the high school education or less category. For some college education category, 22 participants were expected to get a colonoscopy and the same number of participants expected got a colonoscopy, and 65 participants were expected not to get a colonoscopy but 66 participants did not get a colonoscopy. For the 4 years of college and above category, 41 participants were expected to get a colonoscopy but 45 participants got a colonoscopy, and while 120 participants were expected not to get a colonoscopy, 117 participants did not get a colonoscopy. Based on the result of the Pearson chi-square test of independence $\{\chi^2 = .702, df = 2, p = .704 (p > .05)\}$, there is no statistically significant association between level of education and colorectal cancer screening. Simple logistic regression was carried out to assess the association between colorectal cancer screening and socioeconomic status. The result of the simple logistic regression between colorectal cancer screening and education level in Table 3 above showed that education level did not significantly predict whether a participant would get a colonoscopy or not (Wald

statistics = .70, df = 2, p = .705 {p > .05}). Therefore, there is no statistically significant association between education level and colorectal cancer screening. Based on the result of chi-square test of independence and simple logistic regression, the null hypothesis is retained, and the conclusion was that there was no statistically significant association between colorectal cancer screening and education level. Further, using the participants who had 4 years of college or more as reference group, the B coefficient, which represented the logit of the outcome variable (natural logarithm of the odds of outcome occurring) associated with a one-unit change in the predictor variable, and the Exp(B), which represented the odds ratio indicated that though there was no statistically significant association between colorectal cancer screening and education level, participants in high school education or less category had lower odds of getting colorectal cancer screening than the participants with 4 years of college education or more {B = -.24, Exp (B) = .79, 95% CI (0.441, 1.405)}. In the same vein, compared to the participants with 4 years of college education and above, thr participants with some college degree had lower odds of getting colonoscopy {B= -.14, Exp (B) = .867, 95% CI (.479, 1.567)}.

To test for association between colorectal cancer screening and total family income, I assigned total family income into three categories: $0-34,999 (low income), $35,000-$74,999 (middle income), and $ 75,000 or more (high income). The results showed that when there was no association between colorectal cancer screening and total family income, among the participants in the low income category, 42 participants were expected to get a colonoscopy but 34 participants got a colonoscopy, and while 122

participants were expected not to get a colonoscopy, 131 participants did not get a colonoscopy. For participants in middle-income category, 25 participants were expected to get a colonoscopy but 27 participants got a colonoscopy, and while 72 participants were not expected to get a colonoscopy, 70 participants did not get a colonoscopy. For participants in high-income category, 22 participants were expected to get a colonoscopy but 29 participants got a colonoscopy, and while 64 participants were not expected to get a colonoscopy, 58 participants did not get a colonoscopy. Based on the result of the Pearson chi-square test of independence ($\chi^2 = 5.116$, df = 2, p = .077 {p > .05}), there is no statistically significant association between colorectal cancer screening and total family income. Simple logistic regression was carried out to assess the association between colorectal cancer screening and total family income. The result of the simple logistic regression as shown in Table 3 above indicated that total family income did not significantly predict whether a participant would get a colonoscopy or not (Wald statistics = 5.04, df = 2, p = 0.080 {p > .05}). Therefore, there is no statistically significant association between total family income and colorectal cancer screening. Based on the result of chi-square test of independence and simple logistic regression, the null hypothesis was retained, and the conclusion was that there was no association between colorectal cancer screening and total family income. Further, using the participants in the high-income category as a reference group, though there was no statistically significant association between total family income and colorectal cancer screening, the B coefficient, which represented the logit of the outcome variable (natural logarithm of the odds of outcome occurring) associated with a one-unit change in the predictor variable,

and the Exp (B), which represented the odds ratio indicated that the participants in low-income group had lower odds of getting colorectal cancer screening than the participants in high-income group {B = -.66, Exp (B) = .52, 95% CI (.29, 0.93)}. Similarly, the participants in middle-income group had lower odds of getting colorectal cancer screening than the participants in the high-income group {B = -.69, Exp (B) = .77, 95% CI (41, 1.45)}.

Acculturation and Colorectal Cancer Screening

To answer Research Question 2, I conducted a chi-square test of independence to assess the association between acculturation measured by the number of years lived in the United States and language of interview and colorectal cancer screening. To determine the association between colorectal cancer screening and number of years lived in the United States, I categorized the participants into two groups: recent immigrants (lived less than 5 years in the United States) and established immigrants (lived in the United States for 5 years or more). The result of the chi-square test of independence showed that when there was no association between colorectal cancer screening and number of years lived in the United States, among established immigrants, 82 participants were expected to have a colonoscopy but 89 participants did get a colonoscopy, and while 238 participants were expected not to get a colonoscopy, 232 participants got a colonoscopy. Among participants who are recent immigrants, 7 participants were expected to get a colonoscopy but one participant had a colonoscopy, and while 20 participants were expected not to have had a colonoscopy, 27 participants got a colonoscopy. Based on the result of the chi-square test of independence ($\chi^2 = 7.851$, df = 1, p = .005 {p < .05}), there

is a statistically significant association between colorectal cancer screening and number of years stayed in the United States. Simple logistic regression was carried out to assess the association between colorectal cancer screening and acculturation measured by the number of years lived in the United States and language of interview. The result of the simple logistic regression between colorectal cancer screening and number of years lived in the United States indicated that the number of years lived in the United States significantly predicted whether a participant would get a colonoscopy or not (Wald statistics = 5.19, df = 1, p = .023 {p < .05}). Therefore based on the chi-square test of independence and simple logistic regression, the null hypothesis was rejected and the alternate hypothesis was retained. The conclusion was that the number of years lived in the United States had a statistically significant association with colorectal cancer screening. Further, using the recent immigrants as a reference group, the B coefficient, which represented the logit of the outcome variable (natural logarithm of the odds of outcome occurring) associated with a one-unit change in the predictor variable, and the Exp (B), which represented the odds ratio indicated that compared to the recent immigrants, the established immigrants were more likely to get colonoscopy {B = 2.34, Exp (B) = 10.36, 95% CI (1.39, 77.37)}.

To assess the association between language of interview and colorectal cancer screening, I categorized the participants into two groups: participants who interviewed in English and participants who interviewed in other languages. The chi-square test of independence showed that when there was no relationship between colorectal cancer screening and language of interview, among the participants that were interviewed in

English, 87 participants were expected to have a colonoscopy but 88 had a colonoscopy, and while 252 participants were expected not to have a colonoscopy, the same number of participants expected had a colonoscopy. Among the participants that interviewed in other languages, two participants were expected to have a colonoscopy, the same number of participants expected had a colonoscopy, and six participants were expected not to have a colonoscopy, 7 participants did not get colonoscopy. Based on the result of the chi-square test of independence ($\chi^2 = .061$, df = 1, p = .804 {p > .05}), there is no statistically significant association between colorectal cancer screening and language of interview. Also, I carried out simple logistic regression to assess the association between colorectal cancer screening and language of interview. The result of the simple logistic regression between colorectal cancer screening and the language of interview as shown in Table 3 above indicated that language of interview did not significantly predict whether a participant would get a colonoscopy or not (Wald statistics = .06, p = 0.805 {p > .05}). Therefore, the null hypothesis is retained and the conclusion was that there was no statistically significant association between language of interview and colorectal cancer screening. Further, using the participants who interviewed in other languages as a reference group, though there was no significant association between colorectal cancer screening and interview language, the B coefficient, which represented the logit of the outcome occurring associated with a one-unit change in the predictor variable, and the Exp (B), which represented the odds ratio indicated that compared to the participants who interviewed in other languages, the participants who interviewed in English had higher odds of getting colonoscopy {B = .20, Exp (B) = 1.22, 95% CI (.249, 5.994)}.

Perception of Health Status and Colorectal Cancer Screening

To answer Research Question 3, I conducted a chi-square test of independence to assess the association between colorectal cancer screening and perceived health status. I categorized the participants into two groups: good health status and poor health status. The chi-square test of independence showed that among the participants that have good health status, 79 participants were expected to get a colonoscopy but 72 participants got a colonoscopy, and while 227 participants were expected not to have had a colonoscopy, 235 participants did not get a colonoscopy. Among the participants that have poor health status, 10 participants were expected to get a colonoscopy, 18 participants got a colonoscopy, and 31 participants were expected not to get a colonoscopy, 24 participants did not get a colonoscopy. Based on the result of the chi-square test of independence (χ^2 = 7.269, df = 1, p = .007 {p < .05}), there is a statistically significant association between colorectal cancer screening and perceived health status. I also carried out a simple logistic regression to assess the association between colorectal cancer screening and perceived health status. The result of the simple logistic regression between colorectal cancer screening and perceived health status as shown in Table 3 above indicated that perceived health status significantly predicted whether a participant would get a colonoscopy or not (Wald statistic = 6.95, df=1, p = .008 {p < .05}). Therefore, based on the chi-square test of independence and simple logistic regression, the null hypothesis was rejected and the alternate hypothesis was retained. The conclusion was that there was a statistically significant association between colorectal cancer screening and perceived health status. Further, using the participants in poor health status as a reference group, the B

coefficient, which represented the logit of the outcome variable (natural logarithm of the odds of outcome occurring) associated with a one-unit change in the predictor variable, and the Exp (B), which represented the odds ratio indicated that compared to the participants who have poor health status, the participants who have good health status were less likely to get colonoscopy (B= -.89, Exp(B) = .41, 95% CI {.210, .795}).

Access to Health Care and Colorectal Cancer Screening

To answer Research Question 4, I conducted a chi-square test of independence to assess the association between access to health care measured by insurance status and having a usual place for medical care and colorectal cancer screening. I categorized the participants into two groups: participants who have health insurance and participants who do not have health insurance. The result showed that when there was no association between health insurance status and colorectal cancer screening, 68 participants who have health insurance coverage were expected to get a colonoscopy, 83 participants got a colonoscopy, and 196 participants were expected not to get colonoscopy, 182 participants did not get a colonoscopy. In the category that did not have health insurance coverage, 21 participants were expected to get a colonoscopy, seven participants got a colonoscopy, and 62 participants were not expected to get a colonoscopy, 77 participants did not get a colonoscopy. Based on the result of the chi-square test of independence ($\chi^2 = 17.61$, df = 1, p = .000 {p < .05}), there is a statistically significant association between health insurance status and colorectal cancer screening. Further, I carried out simple logistic regression to assess the association between colorectal cancer screening and access to health care measured by having a usual place for medical care and health insurance

status. The result of the simple logistic regression as shown in Table 3 above indicated that health insurance status significantly predicted whether a participant would get a colonoscopy or not (Wald statistics = 15.00, df = 1, p = .000 {p < .05}). Therefore, there is a statistically significant association between health insurance status and colorectal cancer screening. Based on the result of the chi-square test of independence and simple logistic regression, the null hypothesis was rejected and the alternate hypothesis was retained. The conclusion was that there was a statistically significant association between colorectal cancer screening and health insurance status. Also, using the group of participants who do not have a health insurance coverage as a reference group, the B coefficient, which represented the logit of the outcome variable (natural logarithm of the odds of outcome occurring) associated with a one-unit change in the predictor variable, and the Exp (B), which represented the odds ratio indicated that compared to the participants who do not have a health insurance coverage, the participants who have health insurance coverage were more likely to get colonoscopy {B = 1.63, Exp(B) = 5.02, 95% CI (2.22, 11.35)}.

To test the association between having a usual place for medical care and colorectal cancer screening using chi-square test of independence, I categorized study participants into two groups: participants who have a usual place for medical care and participants who do not have a usual place for medical care. The result of the chi-square test showed that when there was no association between colonoscopy screening and having a usual place for medical care, among participants who have a usual place for medical care, 74 participants were expected to get a colonoscopy, 89 participants got a

colonoscopy, and 213 participants were not expected to get a colonoscopy, 199 did not get a colonoscopy. Among the participants who do not have a usual place for medical care, 15 participants were expected to get a colonoscopy, one participant got a colonoscopy, and 45 participants were expected not to get a colonoscopy, 60 participants did not get a colonoscopy. Based on the result of the chi-square test of independence (χ^2 = 22.52, df = 1, p = .000 {p < .05}), there is a statistically significant association between having a usual place of medical care and colorectal cancer screening. Further, I carried out a simple logistic regression analysis to assess the association between colorectal cancer screening and having a usual place for medical care. The result of the simple logistic regression between colorectal cancer screening and having a usual place for medical care as shown in Table 3 above indicated that having a usual place for medical care significantly predicted whether a participant would get a colonoscopy or not (Wald statistics = 10.48, df =1, p = .001{p < .05}). Therefore, there is a statistically significant association between having a usual place for medical care and colorectal cancer screening. Based on the results of the chi-square test and simple logistic regression, the null hypothesis was rejected and the alternate hypothesis was retained. The conclusion was that there was a statistically significant association between colorectal cancer screening and having a usual place for medical care. Using the group of participants who have a usual place for medical care as a reference group, the B coefficient, which represented the logit of the outcome variable (natural logarithm of the odds of outcome occurring) associated with a one-unit change in the predictor variable, and the Exp(B), which represented the odds ratio indicated that compared to the participants who have a

usual place for medical care, the participants who do not have a usual place for medical care were less likely to get a colonoscopy {B= -3.2, Exp(B) = .04, 95% CI (.005, .273)}.

Multinomial Logistic Regression

I conducted a multiple logistic regression analysis to show the odds of predicting colorectal cancer screening when all the predictor variables were in the model. The predictor variables in the model included having a usual place for medical care, health insurance status, total family income, level of education, number of years lived in the United States, language of interview, and perceived health status. The result of the analysis is as shown in Table 4 below.

Table 4

Results of Multiple Logistic Regression Analysis of Independent Variables and Colorectal Cancer Testing

Variable	B	S.E	Wald	df	Sig.	ExpB	95%C.I. for ExpB	
							Lower	Upper
Step 1[a] Usual care place	-2.84	1.03	7.61	1	.006	.06	.01	.44
Insurance status	1.11	.45	6.06	1	.014	3.04	1.25	7.36
Stay in U.S	2.10	1.06	3.96	1	.046	8.17	1.03	64.67
Interview lang.	.07	.93	.01	1	.940	1.07	.17	6.61
Health status	-1.15	.39	8.48	1	.004	.32	.15	.69
Edu. level			.16	2	.920			
Edu. level(1)	-.06	.37	.02	1	.876	.94	.46	1.94
Edu. level(2)	.10	.35	.07	1	.788	1.10	.55	2.19
Income total			.01	2	.940			
Income total(1)	-.43	.38	1.31	1	.252	.65	.31	1.36
Income total(2)	-.11	.36	.09	1	.764	.89	.44	1.81
Constant	-2.67	1.53	3.06	1	.080	.07		

Note. variable(s) entered on step 1: usual place for care, Insurance status, stay in US, Interview Lang, health status, Education level, Income total. Reference categories are have a place for usual medical care, have no insurance, recent immigrants, interview in English language, poor health status, 4 years of college degree and above, high income group

The result of the multinomial logistic regression between colorectal cancer screening and the predictor variables showed that the model was a good fit (Omnibus tests of model coefficients, $\chi^2 = 57.62$, df = 9, p = .000 {p < .05}). The model correctly predicted 75.1% of the times whether a participant would get colonoscopy or not. It is shown in Table 4 above that four of the predictor variables including having a usual place for medical care {Wald statistics = 7.61, df = 1, p = .006 (p < .05)}, insurance status {Wald statistics = 6.06, df = 1, p = .014 (p < .05)}, length of stay in the United States {Wald statistics = 3.96, df = 1, p = .046 (p < .05)}, and perceived health status {Wald statistics = 8.48, df = 1, p = .004 (p < .05)} significantly predicted whether a participant would get colorectal cancer screening or not. However, three of the predictor variables including interview language {Wald statistics = 0.01, df = 1, p = .940 (p > .05)}, education level {Wald statistics = 0.16, df = 2, p = .920 (p >. 05)}, and total family income {Wald statistics = .01, df = 1, p = .940 (p > .05)} did not significantly predict whether a participant would get colorectal cancer screening or not.

Further, the multiple regression analysis revealed that using the group of participants who have a usual place for medical care as a reference group, the B coefficient, which represented the logit of the outcome occurring associated with a one-unit change in the predictor variable, and the Exp (B), which represented the odds ratio indicated that compared to the participants who have a usual place for medical care, the participants who do not have a usual place for medical care were less likely to get a colonoscopy {B = -2.84, Exp(B) = .06, 95% CI (.01, .44)}. Using the group of participants who do not have health insurance as a reference group, the participants who

have health insurance coverage were more likely to get a colonoscopy compared to the participants who have no health insurance coverage {B = 1.11, Exp(B) = 3.04, 95% CI (1.25, 7.36}. Using the recent immigrants as a reference group, the established immigrants were more likely to get a colonoscopy compared to the recent immigrants {B = 2.10, Exp (B) = 8.17, 95% CI (1.03, 64.67)}. The multiple logistic regression analysis also revealed that using the participants with perceived poor health status as a reference group, the participants with perceived good health status were less likely to get a colonoscopy compared to the participants with perceived poor health status {B = -1.15, Exp(B) = .32, 95% CI (.15,.69}.

Summary

In this chapter, I reported the results of the statistical analysis used to assess the relationship between colorectal cancer screening and number of years stayed in the United States, interview language, educational level, total family income, perceived health status, having a usual place for medical care, and health insurance status. I also reported how each of the independent variables predicted whether a participant would get a colonoscopy or not. The results of the chi-square test of independence and simple logistic regression analysis showed that number of years stayed in the United States, perceived health status, having a usual place for medical care, and health insurance status had a statistically significant association with colorectal cancer screening among African-born immigrants living in the United States. However, other predictor variables such as interview language, total family income, and education level did not have a statistically

significant association with colorectal cancer screening among African-born immigrants living in the United States.

Multiple regression analysis showed that having a usual place for medical care, health insurance status, number of years stayed in the United States, and perceived health status predicted whether a participant would get a colonoscopy or not. However, interview language, total family income, and education level did not predict whether a participant would get a colonoscopy or not. Further, when all the predictor variables were in the model, the participants who do not have a usual place for medical care were less likely to get a colonoscopy compared to participants who have a usual place for medical care. The participants who do not have health insurance were less likely to get a colonoscopy compared to participants who have health insurance. Compared to established immigrants, recent immigrants were less likely to get a colonoscopy. Further, the analysis showed that participants with perceived good health status were less likely to get a colonoscopy compared to participants with perceived poor health status. In Chapter 5, I interpreted and discussed the study findings in the light of existing literature. I also discussed the significance of the study findings, recommendations for future study, and conclusion.

Chapter 5: Discussion, Conclusions, and Recommendations

This quantitative cross-sectional study was designed to examine factors that influence colorectal cancer screening among African-born immigrants living in the United States. I merged and analyzed 2010, 2013, and 2015 data sets from the NHIS that contained information about 349 African immigrants age 40 years and above living in the United States who identified Africa as the region of birth. In this chapter, I reported the relevant findings of the study and discussed how certain predictor variables affected screening for colorectal cancer among the study population. I also explained the social change implications of the study, limitations, and recommendations for future studies.

The immigrant health utilization model, which provided the theoretical base for this study, posits that clusters of factors that affect health care services utilization (a) predisposition to use of health services, which is shaped by demographics, social structure, and health beliefs; (b) enabling factors, which include personal or family resources (income, regular source of care, health insurance) and community resources (health personnel and facilities); (c) need for care, which includes perceived needs and professionally evaluated needs; and (d) contextual and macrostructural factors. The identification of factors that affect health care services utilization, such as colorectal cancer screening services among specific populations and communities, is imperative because the rate at which individuals and groups avail themselves of available health care services affects their health outcomes (Yang & Hwang, 2016).

In this study, I examined the association between colorectal cancer screening (dependent variable) and independent variables such as total family income, education

level, having a usual place for medical care, health insurance status, number of years lived in the United States, language of interview, and perceived health status. The level of education and family income, which are indicators of socioeconomic status, were assessed under the predisposing domain. Having a usual place for medical care and health insurance status, which are indicators of access to health care, were assessed under the enabling domain, and perceived health status was assessed under the needs domain. The length of stay in the United States in years and language of the interview, which are indicators of acculturation, were assessed under the predisposing domain. The analysis of the data using a chi-square test of independence and simple logistic regression showed that having a usual place for medical care, insurance status, number of years lived in the United States, and perceived health status were significantly associated with colorectal cancer screening among African-born immigrants living in the United States. However, education level, total family income, and interview language were not significantly associated with colorectal cancer screening among the immigrant population. Also, multiple logistic regression analysis revealed that having a usual place for medical care, health insurance status, number of years stayed in the United States, and perceived health status predicted whether a participant would get a colonoscopy. However, interview language, total family income, and education level did not predict whether a participant would get a colonoscopy among African-born immigrants living in the United States.

Interpretation of Findings

In the following sections, I summarized the major findings of this study under these subheadings in line with the research questions and corresponding hypotheses. I

also interpreted the results of this study in the context of existing literature and established concepts in the field of colorectal cancer research.

Finding 1: Low Colorectal Cancer Screening Prevalence Among African-Born Immigrants in the United States

In this study, 90 participants stated they had a colonoscopy in the past, which represented 25 % of the participants, while 259 said they never had a colonoscopy, which represented 74.2% of the participants. The low screening prevalence among the participants was consistent with the finding that screening prevalence is low among immigrant populations in the United States (ACS, n.d; Reyes & Miranda, 2015; Shahidi et al., 2013; Shih et al., 2008). According to the ACS (n.d.), immigrants have lower screening rates than native-born Americans. For example, in 2015 in the United States, the colorectal cancer screening prevalence was 65% among native-born Americans, but immigrants who had lived in the United States for less than 10 years had screening prevalence of 34%, and those who had lived 10 years or more in United States had screening prevalence of 52% (ACS, n.d). The implication of low screening prevalence among African-born immigrants is that they are not using colorectal cancer screening services available in the United States. Opportunities for early colorectal cancer screening are often missed, thereby putting the immigrant population at risk of developing invasive colorectal cancer. Although efforts are being made to increase colorectal cancer screening among the populations of the United States, the results of this study suggested that some segments of the U. S. population may be experiencing barriers in getting the test. There is a need to adopt strategies that will increase colorectal cancer screening prevalence in

every segment of population of the United States, which will help improve the chance of achieving the targeted 80% screening prevalence nationwide by 2018, an initiative that is championed by American Cancer Society, the Centers for Diseases Control and Prevention, and the National Colorectal Cancer Roundtable (ACS, n.d.).

Finding 2: Socioeconomic Status Is Not Significantly Associated With Colorectal Cancer Screening Among African-Born Immigrants in the United States

In this study, I measured socioeconomic status by education level and total family income. The results of the statistical analysis showed that education level did not have a significant association with colorectal cancer screening, and education level did not predict whether a participant got a colonoscopy. This result was contrary to available evidence that showed that education level correlates with health services utilization. Szwarcwald et al. (2010) conducted a study in Brazil using 5000 respondents, and the results showed that less educated people used health services less frequently than more educated people. T. Davis et al. (2001) found that people with limited education have low colorectal cancer screening rates. Also Guerra, Dominguez, and Shea (2005) found that education level predicted the utilization of colorectal cancer screening among Latinos in the United States. The inability of education level to predict and influence screening for colorectal cancer among African-born immigrants suggests the need to explore other factors that may affect the decision to screen for colorectal cancer among the study population. For example, Guerra et al. found that physician recommendation for colorectal cancer screening was a strong motivator to get screened for colorectal cancer among Latinos in the United States regardless of education level.

To assess the association between total family income and colorectal cancer screening, I divided total family income of participants into different groups: low income ($0-$34,999), middle income ($35,000-$74,999), and high income ($75,000 and more). The analysis of the demographics of the study participants showed that 87(24.9%) of the participants were in the high-income group, 97(27.8%) were in the middle-income group, and 165(47.2%) were in the low-income group. Having a higher percentage of participants in the low-income group was consistent with the findings of Aguilera and Massey (2003) and Kwainoe (n.d.) who observed that immigrants, especially new immigrants, tend to have unskilled and low-paying jobs, which may have profound effects on their use of health care services.(Yang & Hwang, 2016)

In the current study, statistical analysis showed that family income was not significantly associated with colorectal cancer screening, and did not predict whether a participant would get screened for colorectal cancer. In previous studies, the effect of income on the use of health care services was mixed. Sambamoorthi and McAlpine (2003) found that high income predicted use of preventive health care services among women in the United States. Morris, Sutton, and Gravelle (2004) revealed that the use of secondary health care services was high among high-income individuals compared to people with low income. However, Ross, Bradley, and Busch (2006) found that higher income did not affect the differences in the use of preventive health care services for cancer prevention among insured and uninsured American adults. Results of the current study suggest that while income category may not be significantly associated with colorectal cancer screening as an individual variable, its effect on colorectal cancer

screening should be examined relative to other variables that may have a substantial influence on colorectal cancer screening.

Finding 3: Acculturation Is Significantly Associated With Colorectal Cancer Screening Among African-born Immigrants in the United States

In this study, I measured acculturation by the number of years lived in the United States and interview language. According to Yang and Hwang (2016), acculturation is often measured by length of stay in the host country and proficiency in English, and that a higher level of English proficiency and a longer stay in the host country indicate a higher level of assimilation into the host country's culture. Results of the current study showed that the number of years lived in the United States was significantly associated with colorectal cancer screening, and also predicted whether a participant would get colorectal cancer screening. This result was consistent with findings that acculturation affects health care utilization among immigrants. According to Lebrun (2012), immigrants with a shorter length of stay and limited language proficiency in the United States and Canada had a lower rate of access to health services compared with those with a longer stay. Johnson (2010) used 2005 California Health Interview Survey data collected from 1496 foreign-born Mexican American men and women who were 50 years old and above to carry out a study. The results showed that more acculturated Mexican Americans were 3 to 4 times more likely to get screened for colorectal cancer, while less acculturated Mexican Americans were 2 times more likely not to screen for colorectal cancer. Acculturation may be critical for African-born immigrants in the United States in terms of getting colorectal cancer screening because the study participants migrated from

a continent where colorectal cancer is considered a rarity (see Katsidzira et al., 2015) and there is a low level of awareness of the disease among the populace (see Busolo & Woodgate, 2015) These circumstances may result in African-born immigrants not being used to going for routine screening for colorectal cancer while they lived on the African continent. Analysis of the demographics of the study sample showed that out of 90 participants who had a colonoscopy, 89(98.9%) were established immigrants while 1(1.1%) was a recent immigrant. This result echoed the position of the immigrant health services utilization model that the extent of adaptation to the culture and social systems of the host country, including the health care system, impacts immigrants' health services utilization (Yang & Hwang, 2016). Getting more acculturated in the United States may have contributed to established immigrants' higher inclination to getting screened for colorectal cancer than recent immigrants. A system that is more welcoming to immigrants, and policies that make it easy for immigrants to get incorporated into the culture and social networks of the United States, may help foster increased screening for colorectal cancer among the study population.

Interview language did not have a significant association with colorectal cancer screening, and did not predict whether a participant would get a colonoscopy. In previous studies, language of interview was operationalized as a measure of acculturation (Lee, Nguyen, & Tsui, 2011). Lebrun (2012) found that in Canada, immigrants who have limited English proficiency had lower odds of health services utilization. However, in the current study, analysis of the demographics of the study sample showed that 340 (97.4%) participants interviewed in English, while 9(2.6%) interviewed in other languages. The

reason why language of interview did not have a significant association with colorectal cancer screening and did not predict colorectal cancer screening may be because most of the participants (340) interviewed in English, and so the language of interview did not have a significant effect on whether a participant would get a colonoscopy.

Finding 4: Perception of Health Status Is Significantly Associated With Colorectal Cancer Screening Among African-Born Immigrants in the United States

To assess the association between perception of health status and colorectal cancer screening, I categorized the study participants into two groups: good health status and poor health status. The immigrant health services utilization model posits that the use of health services by individuals is based on need factors that include an individual's health status, which may be self- or professionally rated (Yang & Hwang, 2016). According to the model, immigrants who have good health status are less likely to use health services than those with poor health status because of less need. Several studies supported the position of the immigrant health services utilization model. For example, Cho, Guallar, Hsu, Shin, and Lee (2010) found that people with poor health status had higher cancer screening rates than those who perceived they had good health status. Also, Hernandez-Quevedo and Jimenez-Rubio (2009) found that poor health status increased the tendency to use health care services relative to being in good health. However, Fatone and Jandorf (2009) did not find any significant differences in individuals' pattern of cancer screening based on health status.

In the current study, the statistical analysis showed that perception of health status had a statistically significant association with colorectal cancer screening and also

predicted whether a participant would get screened for colorectal cancer. Logistic regression showed that participants with perceived poor health status were more likely to screen for colorectal cancer than those in good health status. This result was consistent with the position of the immigrant health services utilization model and studies that found health status to be a predictor of health care services utilization. Worthy of note is that out of 307 participants who perceived themselves to be in good health, only 72 participants who represented 23.4% of participants in good health had colorectal cancer screening. It may be rational to state that 235 participants that represented 76.35% of those in good health did not get screened for colorectal cancer probably because they did not believe they are vulnerable to colorectal cancer. The finding in this study that perceived good health status made people less likely to get screened for colorectal cancer may be a salient factor to consider while developing public health intervention programs aimed at improving rate of colorectal cancer screening in the United States. Given that there are no symptoms when polyps develop in the epithelial cells lining intestinal mucosa, which eventually grow into invasive colorectal cancer overtime, public health interventions should target the correlation between perceived health status, knowledge of colorectal cancer, and the need for colorectal cancer screening among African-born immigrants in the United States.

Finding 5: Access to Health Care Is Significantly Associated With Colorectal Cancer Screening Among African-born Immigrants in the United States

In this study, access to health care was measured by health insurance status and having a usual place for medical care. The analysis of data revealed that both having a

usual place for medical care and insurance status had a significant association with colorectal cancer screening, and also predicted whether a participant would get colorectal cancer screening among African-born immigrants in the United States. The association of having a usual place for medical care and health insurance status with colorectal cancer screening, and their ability to predict colorectal cancer screening were consistent with the findings that health insurance status and having a usual place for medical care predict health services utilization (Yang & Hwang, 2016). Several studies have found that having access to medical care increased health services utilization (Lebrun & Dubay, 2010; Ye, Mack, Fry-Johnson, & Packer, 2012). According to the ACS (n.d.), people who have health insurance and usual place for medical care are more likely to get colorectal cancer screening than those who do not have health insurance and usual place for medical care.

The current study revealed that out of the 90 participants who had a colonoscopy, 83(92.2%) had health insurance and 7(7.8%) participants did not have health insurance. Also, while 89(98.9%) participants had a usual place for medical care, 1(1.1%) participants did not have a usual place for medical care. The result of the analysis of the demographics of the participants supported the result of the logistic regression in the current study that participants who do not have a usual place for medical care were less likely to get screened for colorectal cancer than those who have a usual place for medical care. In the same vein, the current study showed that participants who do not have health insurance were less likely to get screened for colorectal cancer than those who have health insurance. These results leave no doubt that having a place for medical care and having health insurance was critical to getting screened for colorectal cancer among the

study population. However, the demographics of the study population showed that out of 349 participants, 265(75.9%) had health insurance and 288(82.5%) had a usual place for medical care, yet colorectal cancer screening prevalence remained low (25%) among the study population. Therefore, the influence of having a usual place for medical care and health insurance status on colorectal cancer screening should be examined relative to other factors that may affect colorectal cancer screening such as level of knowledge of colorectal cancer screening, doctor recommendation for colorectal cancer screening, and sociocultural factors among others.

Limitation of the study

This study is inherent with several limitations. In the NHIS primary data, information was collected only from noninstitutionalized population in the United States. Groups of individuals who are part of the population of the United States that were not included in the primary data include people in nursing homes, juvenile detention, prisons, halfway houses, and personnel in active duty. The non-inclusion of these groups of individuals in this study may have some implication in the interpretation of the study findings.

The information in the primary data collected from the study participants was self-reported. The possibility of discrepancies existing between self-reported receipt of colorectal cancer screening and actual receipt of colorectal cancer screening among the study participants cannot be ruled out as studies have shown that there may be differences in self-reported use of health care services and actual receipt of it among study participants (Rauscher, Johnson, Cho, & Walk, 2008). The possibility of recall bias

among the participants puts a limitation on the study as participants may not accurately recall past events. Also, studies have shown that study participants may provide socially satisfactory responses during interview surveys (Blackwell et al., 2008), and it cannot be ruled out that some participants in this study may have given socially acceptable answers to some of the interview questions. The above, in addition to recall bias, may result in over-estimation or under-estimation of colorectal cancer screening among the study participants.

This study is limited to the primary data collected from the NHIS. Research questions in this study were limited to the information available in the primary data. The limitation this brought to bear on the study resulted in not investigating some other factors that may have influenced colorectal cancer screening among the study population. In the primary data, the identification of participants was from their region of birth and not based on their country of birth. As a result, all participants were grouped as Africans. Regarding the study participants as one homogenous group gave no chance for the exploration of differences among the population of immigrants from African countries. According to Lee, Ju, Vang, and Lundquist (2010), there were differences in breast cancer screening behaviors among subgroups of Asian Americans, which suggested that there could be differences in health behaviors within subgroups of a major ethnic group. This was not considered in this study because of the limit posed by the use of already existing data.

Recommendations

The findings from this study suggest that there is a need for more studies that may help reveal factors that affect colorectal cancer screening among African-born immigrants living in the United States. The level of knowledge about colorectal cancer and colorectal cancer screening among African-born immigrants have not been reported in the literature, and so future studies should be designed to uncover these needed information and how they influence colorectal cancer screening among the study population. Sociocultural factors have been found to affect decision for cancer screening among different populations in the United States (Purnell et al., 2010). Therefore qualitative studies that involve focus group discussions and other methods should be designed to explore and unearth the sociocultural factors that influence colorectal cancer screening among the study population. Such studies may generate relevant information that can enable health care providers to apply culturally appropriate cancer screening strategies among African-born immigrants in the United States, which may help increase rate of colorectal cancer screening among the population.

This study revealed that socioeconomic factors such as education level and total family income did not influence colorectal cancer screening among African-born immigrants in the United States. The result was contrary to the position of Yang and Hwang (2016) in the immigrant health services utilization model that socioeconomic factors impact people's inclination to the use of health services. The finding may suggest that the relationship between socioeconomic factors and colorectal cancer screening among the study population is complicated. Future studies should explore the relationship

between socioeconomic factors and colorectal cancer screening among African-born immigrants in the United States relative to other variables that may have a strong influence on colorectal cancer screening. Finally, future studies should focus on exploring factors that affect cancer screening among African-born immigrants who are not fluent in English or Spanish. Such studies that are carried out in participants' native language may help encourage more participation in public health studies by Africans, and may reveal factors that influence the decision to undergo cancer screening, which participants may not accurately express in English.

Social Change Implication

This study is significant because its findings added to the literature by revealing some of the factors that affect colorectal cancer screening among African-born immigrants in the United States. Being one of the first studies on colorectal cancer screening among African-born immigrants in the United States, this study may help put to an end the era of paucity of information on colorectal cancer screening among African-born immigrants in the United States by bringing about increased interest for research on the study population among researchers. Also, the findings from this study may provide a reference to future studies that may enable a better understanding of colorectal cancer practices and associated factors among African-born immigrants in the United States.

The information generated by this study may enable the understanding of specific factors that influence colorectal cancer screening among African-born immigrants living in the United States, which may be critical to the development of interventions that may be tailored to the population of African-born immigrants in the United States with a view

to increasing rate of colorectal cancer screening among the population. Implementing appropriate interventions shaped by the findings of this study may result in reduced morbidity and mortality from colorectal cancer among African-born immigrants in the United States. The above may not only lead to improved health outcomes of the population of African-born immigrants in the United States but may lead to improved health of the population of the United States as a whole as the health outcomes of a segment of the population of a country has the potential of impacting the overall health status of the entire country and her health care system (Chou, Johnson, & Blewett, 2010).

According to the ACS (n.d.), the 80% by 2018 initiative is a public health effort led by the American Cancer Society, the Centers for Diseases Control and Prevention, and the National Colorectal Cancer Roundtable with an objective of having 80% of adults 50 years and above in the United States screened for colorectal cancer by 2018. The low (25%) colorectal cancer screening prevalence among African-born immigrants revealed in this study is a far cry from the targeted 80% colorectal screening prevalence of the afore-stated initiative. This finding has brought to the fore one of the health care needs of a minority population in the United States. Research findings in this study points African-born immigrants in the United States to public health professionals and policymakers as one of the minority populations in the United States that are vulnerable to poor health outcomes, that should be targeted for public health programs aimed at improving adherence to colorectal cancer screening recommendations and other preventive health care services.

Conclusion

This quantitative cross-sectional study examined factors that affect colorectal cancer screening among African-born immigrants living in the United States. In the study, I analyzed data from a sample of 349 African-born immigrants in the United States age 40 years and above who identified Africa as region of birth and participated in the NHIS interview survey in 2010, 2013, and 2015. I hypothesized that education level, family income, health insurance status, having a usual place for medical care, number of years lived in the United States, interview language, and perception of health status influenced the receipt of colorectal cancer screening among African-born immigrants in United States.

Analysis using chi-square test of independence and logistic regression revealed that insurance status, having a usual place for medical care, number of years lived in the United States, and perception of health status had a significant association with colorectal cancer screening among African-born immigrants in the United States. However, no statistically significant association was found between colorectal cancer and family income, education level, and language of interview among the study population. Multiple regression analysis showed that insurance status, having a usual place for medical care, number of years lived in the United States, and perception of health status significantly predicted the receipt of colorectal cancer screening among African-born immigrants. However, family income, education level, and language of interview did not predict whether people would get screened for colorectal cancer among the study population. Despite the limitations of this study, it has contributed to literature by revealing some of

the factors that influence colorectal cancer screening among African-born immigrants in the United States. More studies are needed that may reveal other factors that may influence colorectal cancer screening and other preventive health care services among African-born immigrants in the United States.

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Appendix A: Walden Institutional Review Board Approval

IRB <irb@mail.waldenu.edu>

Reply all

Tue 12/19/2017, 5:43 PM

Chidoziri Chibundu;

Frazier Benjamin B. Beatty

Dear Mr. Chibundu,

This email is to notify you that the Institutional Review Board (IRB) confirms that your doctoral capstone entitled, "Factors affecting colorectal cancer screening among African born immigrants living in the United States," meets Walden University's ethical standards. Since this project will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. Your IRB approval number is 12-19-17-0324956.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@mail.waldenu.eduas of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to the project staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 10 business days of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden website:http://academicguides.waldenu.edu/researchcenter/orec

You are expected to keep detailed records of your capstone activities for the same period of time you retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Libby Munson
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