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Walden University

College of Health Sciences

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Christine Clinton

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Walden University
2018

Abstract

Socioeconomic Status and Cancer Risks in Employer-Insured Cancer Survivors

by

Christine Clinton

MS, Minnesota State University, Mankato, 2002

BS, Minnesota State University, Mankato, 1998

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Services

Walden University

August 2018

Abstract

Chronic illnesses such as cancer continue to be among the costliest for employers who provide health insurance to their employees. Despite efforts to incorporate health improvement programs in the workplace, there are concerns about the effectiveness of these programs that do not always deliver a positive return on investment. Little is known about the specific socioeconomic status of employees for whom these workplace health improvement programs are designed for. Guided by the social-ecological model, this study sought to understand the relationship between cancer health risks about socioeconomic factors among cancer survivors in the employer-insured population. Data were extracted from the 2013 Behavioral Risk Factor Surveillance System for employer-insured individuals who identified as having been diagnosed with cancer at some point in their life (N = 7,007). A multivariate linear regression analysis was used to assess the effect of household income, level of education, race/ethnicity of respondents on cancer health risks based on the American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention (ACS). The analysis of variance indicated that the overall model was significant ($P < .05$). College graduates had the highest level of compliance with requirement for cancer prevention; participants' adherence to the guidelines varied depending on their household income. This study may contribute to positive social change as it suggests that socioeconomic characteristics of employer-insured individuals, including health history, need to be taken into consideration in the development and implementation of worksite health improvement programs.

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Dedication

I dedicate this project to my Lord and Savior Jesus Christ, who carried me through this journey. To You O Lord, be the glory. I was faced with numerous unexpected challenges as I worked through this project, and I almost gave up on numerous occasions. You, Lord stayed with me and gave me the strength and courage to keep moving forward. Thank You. I also dedicate this work to my parents, Stella Nguessan and Etienne Nguessan, my beautiful daughter, Orianna Clinton, and my husband, Mario Clinton, for supporting me through this journey.

.

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May God Almighty continue to protect and bless every single one of you every day with joy, peace, love, and prosperity.

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Chapter 1: Introduction to the Study

Introduction

Researchers have shown that the United States health care system is the most expensive in the world (Barton, 2010; Kaplan, Spittel, & David, 2015; Shi & Singh 2012). As providers of employee's benefits, a growing number of companies have been burdened by the escalating cost of providing health insurance to their employees. Consequently, employers continuously seek alternatives to help curb their health care expenditures. Chronic conditions which are sometimes preventable or manageable rank amongst the costliest diseases for payers (Machlin & Soni, 2013). Researchers have suggested that workplace or worksite wellness programs may potentially be a beneficial avenue for organizations that are proactive in controlling employee health care cost, increasing employee productivity, and retention (Merill, Hyatt, Aldana, & Kinnersley, 2011). As a result, an increasing number of organizations have made employee health one of their priorities by implementing worksite wellness programs (Kaspin, Gorman, & Miller, 2013). While this may have been a reasonable option, the administration of worksite wellness programs may not always have resulted in the intended outcomes. The variation in the results of the workplace-related health improvement efforts have in part led to growing calls for a better understanding of the factors that may impact these outcomes (Beck, Hirth, Jenkins, Sleeman, & Zhang, 2016). Researchers have suggested that there is a need to consider nonmedical factors, including socioeconomic inequalities as part of the efforts to improve on the efficacy of these programs. In this study I looked

at the relationship between socioeconomic characteristics of cancer surviving populations which received health insurance through their employers and their cancer health risks.

Background

In addition to having the priciest health care system, the United States has the highest mortality rates from noncommunicable diseases amongst developed countries (Kaplan et al., 2015). This issue is of greater concern as there is the conflicting argument that the United States has the most advanced medical care in the world (Kaplan et al., 2015). This paradox is a relevant factor in the health care system as continued efforts to improve and extend quality of life through health in a favorable medical care environment is met with health outcomes that do not always measure up (Berwick, Nolan, & Whittington, 2008). This issue has resulted in increased calls for better understanding of factors that may not have been clearly addressed in the health care system.

Among noncommunicable diseases, cancer is one of the costliest in many aspects. Cancer not only affects the individual, but it also reaches family members and society (Henke et al., 2013; Kendall, 2012). Its effects are also most noticeable for employers who often have the burden of providing health insurance, and for which cancer ranks amongst the highest in healthcare cost, as well as in productivity (Kendall, 2012). To help address the burden that is the result of chronic illnesses, including cancer, employers have been implementing workplace wellness programs for their employees. Employer-sponsored health insurance is the most common source for health promotion services, including workplace wellness programs (Harris, Hannon, Beresford, Linnan, &McLellan,

2014). Studies have showed that workplace wellness programs, also known as worksite health promotion programs can be an effective means for addressing health care costs and employee productivity issues as well as employee retention (Caloyeras, Liu, Exum, Broderick, & Mattke, 2014; Merill, Hyatt, Aldana, & Kinnersley, 2011). Despite numerous positive studies that support the adoption and implementation of worksite wellness programs, there is ample evidence that there are still challenges associated with reaching consistent health outcomes (Goetzel et al., 2014; Watkins & English, 2015). For example, Rongen, Robroek, Lenthe, Burdorf (2013) found in their meta-analysis that workplace wellness programs can lead to the intended outcomes on the condition that population characteristics, as well as characteristics of the intervention are taken into account in the implementation. Furthermore, Kaplan et al. (2015) asserted that health outcomes are not just the result of health care alone; rather, they are the result of a multitude of nonmedical factors, including behavioral, environmental, and social circumstances, many of which may be more significant than the administration of health care in the traditional sense of the term. As these statements continue to be part of the literature, there is a continued need to understand specific relationships between socioeconomic characteristics and health risks within the variety of settings in our society (Braveman et al., 2005). This study was needed to address one of these gaps in our knowledge as it relates to cancer health risks and socioeconomic characteristics in the employer-insured population.

Problem Statement

A growing number of employers have incorporated wellness programs as part of their health insurance benefits and to decrease the cost of providing health care to their employees as well as improve the health and productivity of their workforce. These programs also lead to compliance with the Patient Protection and Affordable Care Act (PPACA) as this new law calls for a higher focus on preventative health measures (Baird, 2013; Claxton et al., 2014; James, 2013). One of the consequences of the implementation of the PPACA has been the implementation of workplace wellness programs that focus on health risks amongst other measures with the primary goal of addressing rising health care cost (Burton, Chen, Li, Schultz, & Edington, 2013). More specifically, interventions that focus on cancer prevention are one of the principal elements of worksite wellness program (Sorensen et al., 2002). While great strides in healthcare have led to decrease in cancer-related deaths, a recent report by the American Cancer Society indicates that cancer is the leading cause of death in 21 states (Siegel, Miller, Jemal, 2015). For employers and health insurers, cancer continues to be among the most expensive illnesses to address (Henke et al., 2013; Kendall, 2012).

The Centers for Disease Control and Prevention (CDC) recognizes workplace wellness program as an adequate resource in the prevention of chronic illness including cancer (Cancer Prevention in the Workplace Writing Group, 2014). The literature supports workplace health promotion programs as effective means to improve health and prevent diseases in employees given the fact that the majority of Americans receive health insurance benefits through their employers (Gould, 2014; Harris, Hannon,

Beresford, Linnan, & McLellan, 2014). For instance, Burton et al. (2013) stated that wellness programs offered as part of the employer-sponsored health benefit can yield positive results when aimed at reducing health risks; Ljungblad, Granström, Dellve, and Åkerlind (2014) found that employees whose employers provided specific health promotion programs positively rated their psychosocial work conditions.

Despite numerous claims on the benefits of workplace wellness programs, there are continued concerns that the programs may not always deliver a positive return on investment and that more studies need to be undertaken to ensure that these insurance-related wellness programs consider other nonmedical elements such as socioeconomic factors in order to be effective. For example, Sorensen et al. (2003) offered a model which considers socioeconomic factors in the prevention of cancer for the working class. They advocated further research that would enable cancer risk reduction intervention based on social inequalities (p. 194). Baird (2013) argues that wellness programs "… are not adequately designed to account for the complexities of health disparities, such as low socioeconomic status" (p. 1498). In their study using the social ecologic framework to address health inequities, Baron et al. (2014) similarly argued that worksite wellness programs ignore how social factors influence health behavior. More recently, Kaplan, et al. (2015) emphasized the critical need to consider behavioral and social contexts as they related to health outcomes.

The problem was that the literature offered little regarding studies that focus on the relationship between some specific non-communicable yet ravaging diseases' health risks such as cancer health risks in relation to socioeconomic factors in employer-insured

populations, including those who have been previously diagnosed with cancer. This information is relevant for employers and insurance that implement wellness program to help ensure that there is a better understanding of the interaction between certain socioeconomic elements and cancer health risks. This knowledge would help in the development and implementation of worksite wellness programs that may ultimately lead to a better return on investment for the employers, the insurer, and most importantly the employees who have access to the resulting workplace wellness programs.

Purpose of the Study

In this study I sought to help decrease the gap within the literature on health promotion and improvement as it pertains to cancer health risks and socioeconomic factors in employer-insured populations. The purpose of this study was to understand the relationship that exists between cancer health risks and specific socioeconomic factors in employer-insured cancer survivors. Further, I looked at cancer health risks in employer-insured cancer survivors in relation to social determinants of health which included household income, level of education, and race/ethnicity as researchers had not typically evaluated this area within the literature.

The study was quantitative in nature and included a comparison of socioeconomic factors and cancer health risks. The independent variables were specific socioeconomic factors, including level of education, household income, and race/ethnicity of employer-insured cancer survivors. The dependent variable was cancer health risks of employer-insured individuals. Gender, age, and smoking status were adjusted for as covariates to

control for their effect on cancer health risk. Insurance status and cancer diagnosis status were the criteria to select the participants of the study and therefore will not be measured.

Research Questions and Hypotheses

The research questions and the corresponding null hypothesis that were addressed in this study are:

Research Question 1: What is the relationship between level of education and cancer health risks for employer-insured cancer survivor?

$H_0$1: Level of education is not related to cancer health risks for employer-insured cancer survivor.

$H_1$1: Level of education is related to cancer health risks for employer-insured cancer survivor.

Research Question 2: What is the relationship between household income and cancer health risks for employer-insured cancer survivor?

$H_0$2: Household income is not related to cancer health risk for employer-insured cancer survivor.

$H_1$2: Household income is related to cancer health risk for employer-insured cancer survivor.

Research Question 3: What is the relationship between race/ethnicity and cancer health risk for employer-insured cancer survivor?

$H_0$3: Race/ethnicity is not related to cancer health risk for employer-insured cancer survivor.

$H_1$3: Race/ethnicity is related to cancer health risk for employer-insured cancer survivor.

Theoretical and/or Conceptual Framework for the Study

The theoretical concept that helped guide the study was the social ecological model (SEM). The SEM was introduced by Stokols, and it advanced that health behaviors were essentially the consequence of interrelations between the individual and several components within the environment; in essence, it proposed that interactions happen at the interpersonal, organizational, community, and policy levels (Cantiello et al., 2015; Colorectal Cancer Control Program, 2013; Stokols, 1992, 1996). Consequently, Stokols (1992) emphasized that health promotion efforts need to link traditionally separate strategies, notably social and behavioral elements, in order to enhance wellbeing.

This model helped provide insight into the interactions between the variables that were studied. This also helped increase our understanding of the relationship between cancer health risks which is associated with the behavioral component of the SEM, and socioeconomic factors such as household income, level of education, and race/ethnicity, which was related to the environmental aspect described in the SEM.

Nature of the Study

The study was quantitative in nature and included a comparison between socioeconomic factors and cancer health risks. The quantitative feature of this study was selected to measure and analyze a causal relationship between the variables in question (Plano Clark & Creswell, 2008). The population for this study were respondents of the 2013 Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor

Surveillance System (BRFSS) that met the criteria for the study. The BRFSS conducts yearly national telephonic behavioral risk surveys (BRFSS, 2014). For this study, data from the 2013 cross-sectional survey was analyzed. The analysis involved exploring the data from the 2013 BRFSS using descriptive analysis (Creswell & Plano Clark, 2010); it included the identification of trends between cancer health risks and the socioeconomic factors of employer-insured individuals that are the focus of the study.

Definitions

The study encompassed an analysis of the relationship between cancer health risks and socioeconomic factors in employer-insured populations. The following are the definition of the dependent and independent variables that were used in the study.

The literature indicated that the socioeconomic status independent variables is often associate with health factors in numerous ways (Braveman et al., 2005). For this study, socioeconomic status was defined as participants' position relative to measurements of level of education, household income, race/ethnicity of the participants (Mackenbach, & Kunst, 1993). Level of education is commonly used as a socioeconomic characteristic and was defined as the highest educational attainment of the participants (Ree et al., 2014). Household income was defined as the sum of financial resources in relation to the household size (marital status and number of children) of the participant (Ali, 2011). Race/ethnicity was defined as the individual's cultural background.

The dependent variable, cancer health risk, was defined by participants' body mass index (BMI), diet, level of physical activity, and alcohol consumption (Thompson et al., 2014). This guideline was also consistent with the American Cancer Society

Guidelines on Nutrition and Physical Activity for Cancer Prevention (American Cancer Society, 2012). Also, McCullough et al. (2011) used these variables in their study to determine the association between adherence to these guidelines and the risk of dying from all causes including cancer and cardiovascular disease. They found that adhering to these recommendations was associated with a lower risk of death from cancer and cardiovascular diseases.

For this study and similarly to McCullough et al. (2011), cancer health risk was measured by scoring the participants as being compliant, or not compliant with the guidelines. Participants who are fully compliant were equated to having the lowest cancer risk, and those who were not compliant were classified as having the greater cancer risk, controlling for age, race, sex, and smoking status. Specific details on how the cancer variables were calculated are described in Chapter 3.

Assumptions

The study presented here was subject to several assumptions. For starters, the data that the BRFSS collect is based on individually reported information. There was the assumption that the data was a true representation of the health status as well as socioeconomic status of the respondents. In addition, the study was only reflective of individuals who participated in the BRFSS survey. I used the SEM as the theoretical framework for the study. The SEM considers interpersonal, organizational, and environmental elements as factors that affect wellbeing. This multifaceted approach assumed that there was a more comprehensive approach to understanding the relationship

between cancer health risks and socioeconomic status in an employer-insured cancer survivor population.

Limitations

The potential limitations for this study included:

- Generalizability of the findings of the study was limited as the study was limited to employees who received health insurance from their employers, and had previously been diagnosed with cancer; consequently, the findings could be potentially generalized to similar populations.
- Participants of the BRFSS reported information related to their health risk and socioeconomic status. As a result, the accuracy of the data was limited to participants' answers.
- The socioeconomic factors that were addressed in this study were limited to only three variables, notably household income, level of education, and race/ethnicity to account for environmental elements as they related to cancer health risks.
- Some the limitations were due to the determination of the cancer health risk that were limited to the American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention.
- The study did not differentiate between the types of cancers that individuals may have been identified with, or for which they may be at risk.

Scope and Delimitations

The basis for this study was employer-sponsored health promotion; consequently, the study focused on individuals who received health insurance from their employers as they were more likely also to be offered workplace-related health promotions programs. The scope of the study focused on those participants who reported being employed as well as receiving health insurance, and who identified as having been diagnosed with cancer at some point. While health risk can be studied for numerous chronic illness, cancer was the target for this study. I selected cancer for the focus of this study as it was one of the costliest for employers.

Significance

While studies have looked at cancer health risk from different perspectives, this was a unique study because it specifically looked at cancer health risk and socioeconomic factors to address challenges related with efforts to improve the health of employer-insured workers. Studies had looked into the development and implementation of workplace wellness programs from different perspectives such as from the workplace leadership perspective, the types of interventions that are being offered, as well as the designs of these types of programs (Malik, Blake, & Suggs, 2014). Despite those types of research, there continues to be calls for further investigation into this topic of workplace health promotion to improve on the appropriate implementation of these programs and more importantly the health outcomes for these programs. Scholars question the effectiveness of the implementation of these programs as studies show a lack of evidence that these programs take into consideration socioeconomic determinants of health (Burton

et al., 2013). While researchers like Cantiello, Fottler, Oetjen, and Zhang, (2015) confirmed through their studies that socioeconomic status was a factor in the selection of private health insurance, there was a need to understand how health risk relate to socioeconomic factors in employer-insured populations. As Ferris, Kline, and Bourdage (2012) pointed out, understanding and preventing health issues may differ based on factors such as gender, race, individual social environment, and lifestyle behaviors. In essence, while socioeconomic status had been shown to be a factor in health risks, it was important to know if that held true within cancer survivor and insured-populations which are more likely to be offered worksite wellness programs. Studies are needed to understand the dynamics between cancer health risks, and socioeconomic factors such as income and level of education in insured cancer survivors. With ongoing development in the field of worksite wellness programs, knowledge and understanding of the relationship that exists between cancer health risks and social determinants of health such as household income, level of education, and race/ethnicity may be instrumental for those involved in designing and implementing wellness programs. In addition, the resulting health promotion programs may lead to more positive outcomes for employees who participate in them as well as for the organizations that provide worksite wellness programs as part of their insurance benefits.

Summary

In this chapter, I discussed how cancer continues to be the costliest disease for employers who provide health insurance to their employees. I introduced the administration of workplace wellness programs as a publicized tool to help address

employee health risks. I also discussed employer-sponsored health insurance as a vehicle for the implementation of workplace wellness programs. I provided the arguments that indicate that health promotion programs can be effective on the condition that socioeconomic factors that lead to health behaviors are thoroughly studied and understood and that this knowledge is taken into account in wellness programs. I also addressed the gap in the literature as it specifically related to cancer health risks in relation to socioeconomic status in an employer-sponsored health insurance population, more specifically cancer survivors, and I made the case for the study. I introduced the SEM as the theoretical framework for the study as well as explained the quantitative nature of the study. Last but not least I provided the assumptions, limitations, scope, and significance of the study.

In Chapter 2, I will provide an overview of the literature search strategy. I will also describe how the theory has been used in other studies as well as the rational for using the SEM. Finally, I will discuss the literature review as it relates to this study.

Chapter 2: Literature Review

Introduction

Socioeconomic factors are important to consider when addressing health risks (Kaplan et al., 2015). The literature offers little regarding the relationship between some socioeconomic factors and cancer health risks within specific settings, as cancer continues to be one the most expensive non-communicable diseases for employers and health insurers (Henke et al., 2013; Kendal, 2012). The purpose of this study is to help bridge the gap within the literature as it pertains to how specific social determinants may be associated with cancer health risks within employer-insured population.

In this chapter, I will begin by describing my search strategy including the sources and types of literature that was part of the review. I will then address the theoretical foundation and conceptual framework in relation to the topic and how they link back to my study. I will follow up with a review of the current literature as it relates to the association between cancer health risks as primarily defined by the American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention (American Cancer Society, 2012) and socioeconomic factors such as household income, level of education, and race/ethnicity.

Literature Search Strategy

My literature research strategy focused on finding source of peer-reviewed health journals that focused on health risks and socioeconomic factors. I primarily accessed Walden University's online Library database as my principal research tool. This online library allowed me to search articles using several databases, including but not limited to

multidisciplinary databases such as Academic Search Complete, ProQuest Central, Science Direct, health science databases including SAGE, Medline, ProQuest Nursing and Allied Health Sources, ProQuest Health and Medical Complete, CINAHL, and PubMed. I also searched several relevant and reputable websites and search sites including those of the American Cancer Society (ACS), the Centers for Disease Control and Prevention (CDC), the National Institute of Health (NIH) and Google Scholar to access related studies. The search terms I used included combinations of relevant keywords including *worksite wellness and socioeconomic factors, workplace wellness and socioeconomic factors, cancer health risk and workplace health prevention, employer-insured health prevention programs, cancer prevention in the workplace, social determinants of cancer, cancer risk and household income for insured, cancer risk and level of education of insured, cancer risk and type of occupation, cancer risk and type of industry, physical activity and cancer risk, nutrition and cancer risk, BMI and cancer risk, alcohol and cancer risk.* I mainly selected peer-reviewed articles that were published within the last five years to ascertain that the information I am relying on is current. While these articles make up the majority of literature I refer to, I included some articles which dated from beyond those five years but help inform this study.

Theoretical Foundation or Conceptual Framework

This study is primarily guided by the social-ecological model. The social ecological model can be traced back to psychologist Urie Bronfenbrenner proposal of the ecology of human development (Golden & Earp, 2012; McLeroy, Bibeau, Steckler, & Glanz, 1988). Bronfendbrenner (1977) proposed that human behavior is the result of the

dynamics between various levels of different systems which include individuals, their families, social ties and cultural influences. According to Stokols (1996), before that time, health behavior theories and models focused primarily on cognitive, affective, and behavioral modification to address unhealthy behaviors; there were also several interventions which emphasized health protection and environmental models that addressed situational factors as relevant in the adoption of healthy practices and well-being. Over time, behavioral health approaches came to be seen as victim-blaming because this theoretical lens often focused on life-style and health behavior, which translated into a focus to change individuals (McLeroy, Bibeau, Steckler, & Glanz, 1988); This process was not seen as conducive to successful and long-term behavioral change. Consequently, the marginal success of interventions that rely solely on either of these independent theories or related models influenced the development of the social-ecological framework (McLeroy et al., 1988; Stokols, 1996).

These advents amongst others suggested the need for health promotion efforts to also consider environmental and social-ecological factors as elements that must be addressed in addition to behavioral changes (Stokols, 1996). For example, in the 70s and 80s, the 1979 Surgeon General's Report on Health Promotion and Disease Prevention strongly suggested the development of preventative health behavior strategies that encompassed physical, emotional and social well-being (Stokols, 1996). In sum, the shift to social ecological model is the result of challenges associated with effectively addressing health promotion which primarily focused on health behavior or environmental challenges related to health.

The social ecological model is a step over behavioral and environmental theories in relation to health promotion because this model offers a framework which integrates and extends the dynamics between these theories (Stokols, 1996). According to Stokols (1996), the social-ecological theory suggests that health is the result of the combined interactions between physical and social environmental situations and "… diversity of intrapersonal factors including genetic heritage, personality dispositions, and health practices" (p. 289). McLeroy et al. (1988) proposed that the social-ecological model offers five levels of influence on health behavior: intrapersonal factors, interpersonal processes and primary groups, institutional factors, community factors, public policy. Appendix A includes the explanation for each of these levels. Similarly, Stokols (1992) states that the model integrates the interactions that may happen at the individual, interpersonal, organizational, community, and policy levels.

It is essential to point out that the limitation of this model is the potential to question the inclusion or exclusion of certain levels in a study. More specifically the literature on this model often mentions the challenges with encompassing all levels within the model. For instance, Green, Richard, and Potvin (1996) stated that given the complexity of dynamics between behavior and environments, it is essential for researchers to decide on the variables most relevant to the health issue and environment at hand. Similarly, Stokols (1996) stated that trying to be overly inclusive by taking into consideration every factor, notably the interpersonal, organizational, community, and policy levels is not a reasonable application of the social ecological model for research. Additionally, McLeroy et al. (1988) summarized several studies which applied the social

ecological model using one or more levels; they emphasize that the application of the model should focus on viewing behavior as being affected by and affecting the social environment. Overall, the consensus for applying the social ecological model to research has been to focus on the specific circumstance related to the health problem and intervention (Golden & Earp, 2012; Stokols, 1996). Applying this method will prevent studies from being overly inclusive, the result of which will provide more practical information for developing interventions (Stokols, 1996).

This study is guided by the social-ecological model in the sense that it investigates the relationship between behavioral cancer health risk patterns, notably the BMI, diet, level of physical activity, alcohol consumption and the social environment or more specifically the socio-economic status as determined by the level of education, household income, race/ethnicity of individuals who receive health insurance coverage through their employers and who have been diagnosed with cancer at some point in their life. The study targets the intrapersonal factors, interpersonal processes and primary groups, the institutional factors, and the community factors, which is consistent with the social-ecological model.

In recent years, the social-ecological model has now become a recommended approach to addressing public health challenges (Golden & Earp, 2012). In addition to organizations such as the World Health Organization, the U.S. Department of Health and Human Services, the Centers for Disease Control, the Institute of Medicine, and the Association of Schools of Public Health encouraging the integration of health behavior

and environmental theories, the health promotion discipline has also experienced increasing research based on the social ecological model (Golden & Earp, 2012).

Studies have used the social-ecological model to better understand how behavior affects and is affected by the social environment. Golden and Earp (2012) conducted a study where they reviewed 157 articles published over a 20 year period and which focused on at least one level of influence of the social-ecological factor as part of an intervention. While they found that the majority of the studies identified the social cognitive theory as the basis for their study, two-thirds of the articles in the study targeted one or two levels of influence as prescribed by the social-ecological model. The majority of studies focused on the intrapersonal or individual followed by the interpersonal social-ecological levels. They also report that 10% of the studies specified the social-ecological approach as the theoretical basis for their study; within those, two-thirds of targeted at least three levels of influence. Golden and Earp (2012) suggest that interventions which only focus on just one level are still consistent with the social-ecological model. They further emphasize a need for more studies that use the social-ecological model to increase the success of multilevel behavior change interventions.

Literature Review Related to Key Variables and/or Concepts

Cancer Health Risks

Recent reports show that cancer incidence rates and death rates have shown improvement over the past decade; still, cancer continues to be the leading cause of death in 21 states (Ryerson et al., 2016; Siegel, Miller, Jemal, 2015). Current reports from the American Cancer Society (ACS) indicate that in general cancer incidence rates have

decreased for men and have remained constant for women between 2003 and 2012 (Ryerson et al., 2016). Additionally, cancer death rates have continued to decrease for most cancers in the same timeframe. However, current data point out that death rates for men and women have increased for cancers of the liver, and of the pancreas (Siegel et al., 2015). In addition, death rates have increased for men for soft tissue cancers (such as the heart), and for uterine cancer for women. In terms of incidence rates by race and ethnicity, while men continued to have a higher cancer incidence rate, black men had the highest incidence rate when compared to every racial and ethnic group between 2003 and 2012 (Ryerson et al., 2016). White women have a higher cancer incidence rate compared to other women. The most common cancers for men included prostate cancer, lung cancer, and colorectal cancer, while the most common among women included breast cancer, lung cancer, and colorectal cancer. While cancer death rates for most cancers have decrease for all races and ethnicities, there are still some cancers such as liver cancer that have increased in various groups (Ryerson et al., 2016). Cancer death rates by race and ethnicity also show men has having the higher death rate of all groups. Black men and women also suffered the highest death rates of all groups. All groups had lung cancer as the highest cancer death rates.

In spite of the progress made with cancer detection and treatment of cancers, there are ongoing needs to better identify and understand the factors that may be responsible for the differences in the occurrences of these diseases, as well as outcomes such as death rates (Ryerson et al., 2016). These recent reports reinforce the fact that cancer continues to be among the most concerning health issues in modern society. Consequently, a study

which aims to further our understanding of cancer health risks in an effort to curb those risks is justifiable.

The ACS estimates that over 572,000 death in the US are related to cancer. Of those, more than one third- have been linked to diet, physical inactivity, and obesity (Kushi et al., 2012). The ACS specifies behaviors such as maintaining a healthy weight, staying physically active, consuming a diet high in plant foods, and limiting alcohol consumption are guidelines to decrease the risk of cancer. Similarly, while researchers often describe cancer as a heterogeneous disease, research has demonstrated that many of the known risk factors such high body mass index, unhealthy diet, physical inactivity, and excessive alcohol consumption can be addressed to help decrease the incidence (Wild, 2012).

Studies have looked at compliance with ACS guidelines from different perspectives. For instance, Lemasters, Madhavan, Sambamoorthi, and Kurian (2014) conducted a study to understand the relationship between history of cancer, cancer type, gender, and cancer health risks according to the ACS recommendations. They used data from the core component of the CDC's 2009 BRFSS to identify survivors for breast, prostate, and colorectal cancers. The final sample included close to 12,000 survivors. The dependent variable for the study were based on the ACS guidelines for health behaviors including diet, smoking habits, alcohol use, BMI, and physical activity. Participants' responses were classified based on the ACS recommendations. The covariates for the study included and were not limited to age, ethnicity, income, insurance, marital status, education, perceived health. They used chi-square tests to assess the differences among

the individuals with $P < .05$ for the significance level. The analysis also included binomial logistic regression to assess engagement in the recommended behavior while controlling for the independent variables. The results of the study indicated that breast cancer survivors were more likely to meet the most the ACS guidelines when compared to other cancer survivors (Lemasters, Madhavan, Sambamoorthi, & Kurian, 2014). The study by Lemasters et al. (2014) is relevant to my study as uses BRFSS to understand cancer risks based on the ACS guidelines. Additionally, his study provides insight into some control variables I may need to consider in my analysis.

These findings are similar to that of Homan, Kayani, and Yun (2016) who also looked at the prevalence of behavioral risk factors in breast cancer survivors using data from the 2010 BRFSS. They used multiple logistic regression to compare breast cancer survivors against women who survived other types of cancer and women with no cancer history. They adjusted for age, race and education, and household income, and controlled for certain conditions. Homan et al. (2016) found that breast cancer survivor were more likely to engage in preventive behavior. This study is relevant as it looks at behavioral cancer risks as a dependent variables in the BRFSS and also provides insight in the analysis which led to the researcher's conclusion.

Reeves, Bacon, and Fredman (2012) also examined the relationship between cancer risk behaviors and caregiving using 2009 BRFSS data of female respondents. The dependent variable, cancer risk behavior was assessed using ACS recommendations. The co-variables included self-reported sociodemographic variables such as race, age, education, employment status, marital status and health variables such as health insurance

status, self-rated general health, and medical visits (Reeves, Bacon, & Fredman, 2012). They used multivariate regression to examine the relationship between caregiving and cancer risks while adjusting for sociodemographic variables. They found that caregivers were most likely to not comply with ACS guidelines as it pertains to cancer prevention. They were also least likely to engage in breast cancer screenings. The study was limited as it only focused on the optional module of the BRFSS; consequently, the data was limited to four states. While the information cannot be generalized to the entire US population, it does provide insight into a segment of the population that may benefit from tailored interventions related to cancer prevention. In addition, this study provided additional information on the analysis of BRFSS with ACS guidelines as dependent variables which may provide some insight into my study.

Socioeconomic status has also been linked to increased cancer risks on many instances throughout the literature. Li, Du, Reitzel, Xu, and Sturgis (2013) studied the recent increase in thyroid cancer incidence because of the competing claims between reports that the increase may be due to the improvement in medical technology advances, and reports that suggest that it may instead be due to people within the high socioeconomic bracket having more access to medical services including screening. Li et al. (2013) linked data from the US Surveillance, Epidemiology, and End Results 9 (SEER 9) and the 2000 US Census database to review data from 49,819 individuals diagnosed with thyroid cancer between 1980 and 2008 in nine regional areas within the United States. Socioeconomic status was determined by categorizing counties into low and high socioeconomic groups. They found that the rate of cancers increased moderately for those

in the high socioeconomic bracket until the 90s and a lot faster afterward (Li et al., 2013). For individuals in the lower bracket, they found that there was a steadier increase throughout the period under study. What was more revealing was that for tumors that were less than 4 cm, the data indicated that those in the high socioeconomic bracket had a higher incidence of thyroid cancer than their counterpart. This trend was even more pronounced when the tumor was less than 2 cm. Based on the findings, the study appeared to be in line with other studies which suggest that socioeconomic status may play a role in thyroid cancer incidence (Li et al., 2013). The authors caution that ecological bias, such as the lack of individual socioeconomic status data, may have affected the findings and more studies are needed to address them. Furthermore, the study also suggests the individuals in the high socioeconomic bracket are more likely to have health insurance and as a result, may be screened more often, a practice which became more widespread in the late 90's with the advent of new cancer screening technology (Li et al., 2013). This study is important for my research as it highlights the fact that socioeconomic factors may be linked to cancer risks; it also supports further studies to clarify the link between the two.

Consuming a healthy diet rich in vegetables, fruits, and fibers is a common public health recommendations to reduce cancer risks (Kushi et al., 2012). Bradbury, Appleby, and Key (2014) reviewed 27 studies that addressed the relationship between fruit, vegetable, and fiber intake and some cancer risks. Each of these studies used data from the European Prospective into Cancer and Nutrition (EPIC), which is a cohort that of 23 centers within 10 European countries. EPIC is an investigative tool used to assess the

relationship between diet, lifestyle, and environment in relation to cancer (Bradbury et al., 2014). Their review of the studies revealed very mixed results; for example they found that there were no significant links between total fruit, vegetable, and fiber intake and some stomach cancer risks; however, there was a strong inverse association between cereal fiber intake and gastrointestinal-related cancers (Bradbury et al., 2014). There was also a significant inverse relationship between fiber intake and colorectal cancer, were cereal fiber was most significant. They also observed the inverse relationship between fruit intake and lung cancer risk in smokers only. The researchers caution that their study was limited because there was no specification in the types of fruits, vegetable and fibers (with the exception of cereal fiber) intake. They assert that more studies are needed to address specific foods in relationship to specific cancers (Bradbury et al., 2014). In spite of the limitations, this recent review is important to my research as it provide evidence of a relationship between nutrition and cancer risk. This supports recommendations from the ACS that the benefits of having a healthy diet outweigh the risk of developing some cancers. In addition, this study relates to my study as it highlights access to and consumption of healthy food which is often tied to socioeconomic status.

Researchers have also isolated specific nutrients such as antioxidants and vitamins in an effort to assess their protective potency against cancer. While some studies have confirmed the benefits of specific nutrients, other studies show that some publicized nutrients may not be as helpful in diminishing cancer risks (Kushi et al., 2012). For example, previous studies have suggested that foods high in calcium may be beneficial in lowering cancer risks (Kushi et al., 2012). Additionally, some studies have showed that

while vitamin D may be beneficial against colorectal cancer, there is no evidence that it may be beneficial in the prevention of other cancers (Kushi et al., 2012). Abbas et al. (2013) reported on the association between the dietary consumption of vitamin D and calcium in the reduction of breast cancer risk. They used dietary survey instruments to gather information on nutrition, medical history, lifestyle factors, alcohol and tobacco consumption, and education levels of 319,985 women in 10 European countries over a mean follow-up time of 8.8 years. Of those, 7,760 women were diagnosed with breast cancer over the follow-up period. Using Cox proportional hazards regression, they analyzed the relationship between the intake of those nutrients and risk of breast cancer. While they found that there was not a substantial association between the consumption of dietary vitamin D and calcium and breast cancer risks, they found that there was a significant inverse relationship between consuming more than 10µg per day of vitamin D and breast cancer risk (Abbas et al., 2013). This study is relevant to my research as it supports the ACS emphasis on the relationship between nutrition and cancer risks.

Maintaining a healthy body weight throughout one's life through diet and physical activity is also an essential element in the prevention of cancer (Kushi et al., 2012). Simons et al. (2013) argue that while studies support the relationship between physical activity and a healthy weight in the reduction of cancer risk, it is necessary also to understand how physical activity may play this role. Simons et al. (2013) analyzed the relationship between work-related physical activity and inactivity as well as previous involvement in sports and colorectal cancer risk. In addition to occupational expenditure and history of sport involvement, the cofounders for their study included participants

BMI, alcohol intake, and processed meat intake amongst others. Covariates included socioeconomic status, nutrition and nutrient intake (Simons et al., 2013). They used Cox regression analysis to analyze cancer risk information for 3,245 men and women colorectal cancer cases and 4,416 male and female sub-cohort members in the Netherlands. Overall, they found that physical activity including long-term physical activity was associated with lower colorectal cancer. Furthermore, there is an inverse relationship between high work-related energy expenditure and colon cancer in men; however, results for rectal cancer were mixed (Simons et al., 2013). This study is important to my research because it highlights the benefits of physical activity as a necessary element in reducing cancer risks. Furthermore, the study included the same variables as my study that are necessary to assess cancer risks. For example, BMI was included in the study because of its relationship to physical activity and because both variable play a significant role cancer risk reduction (Simons et al., 2013).

Alcohol consumption is also a relevant in cancer risks reduction efforts. For example the ACS suggest that men limit their intake to a maximum of 2 drinks per day and that women limit it to 1 drink per day (Kushi et al., 2012). Nelson et al. (2013) conducted a study to estimate the number of deaths, as well as the years of potential life, lost that is due to alcohol consumption in the US. They used mortality data from the 2009 International Classification of Diseases, Tenth Revision codes, alcohol sales data from the 2009 Alcohol Epidemiologic Surveillance System, Alcohol consumption data from the 2009 BRFSS, and data from the 2009-2010 National Alcohol Survey (NAS). Nelson et al. (2013) found that 3.5% of cancer death are attributed to alcohol use. In addition,

they found that alcohol use lead to almost 18 years of potential life lost. This study is relevant to my study because it supports the relationship between alcohol use and cancer risks. Nelson et al. (2013) point out that targeting alcohol consumption as part of reducing cancer risks is not a common public health practice, especially when compared to tobacco cessation programs which seem to get the most attention. Understanding alcohol consumption levels as it relates to cancer risk in an employed and insured population is necessary as part of the efforts to reduce cancer risks.

Socioeconomic and Environmental Disparities in Cancer Health Risks

The literature abounds with studies that identify socioeconomic status as a fundamental factor in health disparities. Also there is strong evidence that socioeconomic status is significantly related to cancer health risks (Mao et al., 2001). Adler and Newman (2002) suggested that socioeconomic status is defined through measures of education, and income and that these elements are a meaningful factor in the prevalence of many chronic illnesses. Furthermore, there is ample information that suggest that individuals who are at a socioeconomic disadvantage are also often at a disadvantage when it comes to noncommunicable disease risk prevalence (Adler & Newman, 2002; Hosseinpoor et al., 2012).

In addition, those who are on the lower spectrum of the socioeconomic status are more likely to be exposed to environments that are not conducive to optimal health. For example, they may live or work in areas with higher levels of pollution (Adler & Newman, 2002). In the same fashion, their social environment may be unfavorable to optimal health (Adler & Newman, 2002). Researchers have consistently demonstrated

that behavioral health risk patterns often relate to socioeconomic status. For example, Sorensen et al. (2003) asserted that social status which can be defined as one's position within the social contexts of economy, access to resources, and exposure to cultural stresses amongst other factors, is inextricably related to health disparities. They specifically point out that the level of vulnerability regarding socioeconomic status is greatly reflected in increased cancer risks. To administer successful health intervention programs to support non-communicable disease prevention, it is important to first effectively identify at-risk individuals (Hosseinpoor et al. 2012).

Guo, Logan, Marks, and Shenkman (2015) hypothesized that people who were on the lower spectrum of the socioeconomic status, as well as smokers, would be more like to have below average survival rates after being diagnosed with oral and pharyngeal cancer. They argued that factors beyond demographics and medical factors contribute to the low survival rate. They proposed that the social environment be a potential factor. As a result, their study focused on smokers as well as the smoking rate within the region the smokers resided in. Using data from the Florida Cancer Data System and data from the 1996-2010 BRFSS, they used multivariable Cox regression to ascertain the association between the predictor variables and oral and pharyngeal survival. They also used a chi-square test the relationship between the variables by socioeconomic status. The control variables included regional smoking as well as demographics such as age, race, and ethnicity. Guo, Logan, Marks, and Shenkman (2015) found that while individual and great regional smoking account for poorer survival rates for people on the lower spectrum of the socioeconomic status, individual smoking was found to be the greater factor.

Although the study is limited in that it only focused on smoking as the principal factor in oral pharyngeal cancer survival, the study is relevant as it emphasizes the importance of ascertain factors beyond socioeconomic status to address cancer risk related challenges.

However, the literature cautions on the conclusion that individuals in the lower socioeconomic spectrum are consistently at a disadvantage in terms of health risks, including cancer risks. For instance, a systematic review of the association between socioeconomic status and colorectal cancer incidence by Aarts, Lemmens, Louwman, Kunst and Coebergh (2010) revealed that while groups in the US and Canada who were categorized as low socioeconomic status tended to have a higher incidence of colorectal cancer, the opposite was true in Europe. This study was relevant as it suggests that other factors may also be relevant when it comes to assessing cancer risks.

Braveman et al. (2010) conducted a study to review trends in socioeconomic disparities in behavioral health indicators. They reviewed data from five nationally recognized sources including the Behavioral Risk Factor Surveillance System (BRFSS), the National Health and Nutrition Examination Survey (NHANES), the National Longitudinal Mortality Study (NLMS), the National Health Interview Survey (NHIS) and the Period Linked Birth/Infant Death Data File (Braveman et al., 2010). Their study supported evidence of inequality in health status in relation to level of income and level of education. They also found that among blacks, the health benefit were not as significant as whites even when both have the same income and education level. While the results of this study support evidence of likely causal relationship between disease and socioeconomic status, the researchers implied that this awareness should not preclude

those who appear to be at a socioeconomic advantage from also being targeted in efforts to improve health status (Braveman et al., 2010).

Sorensen et al. (2003) conducted three studies which demonstrates the influences of social contextual factors on health risk behaviors. The first two included randomized controlled studies aimed at assessing the effectiveness of interventions targeting cancer behaviors. The third study focused on assessing the cost-effectiveness of those interventions over time. They emphasize that social contextual factors encompass a variety of factors including individual, interpersonal, organizational, and community factors (Sorensen et al., 2003). The theoretical foundation for their study combined elements of numerous theories including but not limited to Bandura's social cognitive theory, the theory of reasoned action, the transtheoretical model of behavior change, social epidemiology, and the social-ecological framework. They used the first three models to take into account psychosocial factors that influence behavior change. They used social epidemiology to clarify how socioeconomic status and race-related to health risk behaviors. Finally, they used the social-ecological framework to account for the multiple levels of social influences including interpersonal, individual and organizational, and neighborhood and community factors. They concluded that there is a need to further understand clustered patterns of health risks in relation to socioeconomic factors (Sorensen et al., 2003). This is a relevant study as it supports the need to consider socioeconomic factors at various levels in order to better understand health risks.

Employee Health Risk

As employers seek to invest in their workforce's health to improve their productivity and reduce health care cost, health insurers are increasingly strategizing to help insurers reach those goals (Pai, Hagen, Bender, Shoemaker, Edington, 2009). Health risk assessments (HRA) have increasingly become the common tool for assessing individual health risk and to develop health education strategies for worksite health promotion programs (Pai et al., 2009). While HRAs can be helpful for assessing an employee population's health, researchers caution that it may not be enough to address help improve employee health given the complexity of addressing health issues (Goetzel et al., 2012). Consequently, it may be helpful to understand employee health risk from various angles, including through a social-ecological perspective.

Through the meta-analysis of 18 studies that focus on randomized control trials that address the effectiveness of worksite health promotion programs, Rongen, Robroek, Lenthe, and Burdorf (2013) demonstrated that the efficiency of worksite health programs is dependent on the study population, the type of intervention, as well as the methodologic quality of the study. For example, they state that worksite health promotion programs seemed to be more effective for white-collar workers and for younger employees (<40), and that it was less effective when the intervention aimed to treat. They also found that there was a small effect size of 0.24 for work-related outcomes such as self-perceived health, and productivity- outcomes which are the focus for worksite wellness programs. Through this study, Rongen et al. (2013) show that other elements, including socioeconomic status, may be critical to address within the implementation of

worksite health promotion programs. This also suggests the need to study these factors that may be critical to improving worksite health promotion related health outcomes. This study is relevant to my research as it highlights a gap within the literature which suggests that there is a need to understand better social and ecological factors that may play a role in employee health risks, including chronic health risks. This increased knowledge may be helpful in developing effective worksite health promotion programs.

Lack of physical activity in the workplace is often cited as a significant health risk for employees. Malik, Blake, and Suggs (2014) sought to describe physical activity programs as part of workplace wellness programs as well as the effects of these programs on employees. Their study was motivated by public health policies worldwide that encourage employers to become key player in reducing chronic illness risks in their employee population (Malik et al., 2014). They analyzed 58 studies related to the implementation of physical activity as part of workplace wellness programs. They found that only eight programs incorporated physical activities as part of the wellness programs. The majority of programs provided communication or messages related to physical activity, while others provided some form of counseling. Overall, 32 of the studies showed success in improving physical activity behaviors, while 25 showed no difference over the implementation period of those programs (Malik et al., 2014). One significant limitation was that the majority of the studies relied on self-reports or they did not use validated instruments to determine the improvement in physical activity. Data more specific to the working population under study was not available. In spite of these limitations, this study was relevant to my study as it highlights the efforts to incorporate

chronic disease risk reduction strategies in the workplace. It also supports the need to conduct more thorough studies that take into consideration factors such as socioeconomic status in the development and administration of programs to improve the health of employees.

Burton, Chen, Li, Schultz, and Edington (2013) conducted a study to ascertain health disparities based on ethnicity within a workplace population; they also took a retrospective look at their health risks within two-year period of their participation in their employer-sponsored health plan. The study included over 23,000 employees from various worksites within an organization. A health risk assessment was conducted to assess the health risk status of the population over the period of participation in the employer-sponsored health plan. While they found that significant disparities in health risks existed between the various ethnic groups at the beginning of the study, they found that health risk, though lesser, were still present at the end of the study. Researchers have called for more studies on various socioeconomic factors to understand health disparities in the workplace (Burton et al., 2013). However, this study was limited to the ethnicity of the population. The authors have therefore suggested the need to further research sociodemographic groups to further understand these differences in health risk.

Income and Cancer Health Disparities

Income as a measure of socioeconomic status that influences cancer-related health risks is often the subject of research within the literature. For instance, Lundy et al. (2009) found that there is a significant relationship between income and psychological well-being in survivors of colorectal cancer. Kushi et al. (2012) assert that lower income

makes it more challenging to make healthier choices and as a result, this may impact an individual's cancer risk. While diet and nutrition are a factor in non-communicable disease risks, they are also often associated with what is easily accessible to an individual or a community based on their socioeconomic status. Adler and Newman (2002) stated that higher income allows individuals to access better nutrition and in turn positively impact their health. Grimm, Foltz, Blanck, and Scanlon (2012) examined the inequalities in adult consumption of fruit and nutrition based on the percent poverty income ratio (PIR) based on data from the 2009 Behavioral Risk Factor Surveillance System. The sample size included 353,005 individuals for which they gathered information on fruit and vegetable intake as well as information on their income and their household size. The PIR was used to quantify the household income level of individuals based on their income and the number of individuals in their household. Individuals are then categorized based on their PIR where if the PIR is less than 130%, they are classified as living with greatest poverty. Individuals with a PIR equal to or greater than 400% are considered to be living with the least poverty (Grimm, Foltz, Blanck, & Scanlon, 2012). While their results indicated that consumption of fruits and vegetables was in general low, they determined that individuals living in greatest poverty consume significantly less fruits and vegetables than those living with the least poverty. Even though this result was consistent across the majority of states, they found some exceptions in some states. For example, individuals living with greatest poverty consumed significantly more vegetables thank those living with the least poverty in North Dakota (Grimm, Foltz, Blanck, & Scanlon, 2012). This study is significant for several reasons including the fact that it uses

the percent PIR to quantify socioeconomic status and also because it has a large sample that is representative of the populations under investigation. This study is relevant as it looks at the relationship between diet and income, within a general population; however, it does not take into consideration other socioeconomic factors that may be relevant to the diet such as level of education. Kell, Judd, Pearson, Shikany, and Fernández, (2015) conducted a study where they looked at nutrition in relation to household income and level of education. They found that education was a more significant factor than household income. The variation in results of studies that address socioeconomic factors and health risks provide support for the need to better understand specific relationships between those factors and cancer health risks.

Baron et al. (2014) used the social-ecological model to provide a perspective on how to combine the work-related health and health promotion to reduce health inequities in the low-income working population. They argued that worksite health promotion program often tend to focus on individual lifestyle health behavior changes, such as through the implementation of smoking cessation programs, without any consideration for social and environmental factors that may have an impact on those behaviors. This issue is more significant for low-income worker who are at a lesser advantage on many fronts. For example, Baron et al. (2014) indicated that low-income workers often have higher rates of chronic diseases which is often the result of their being at a social disadvantage. Low-income workers often tend to live in neighborhoods which are not conducive to optimal health including areas with poor walkability factor, food deserts, higher environmental pollution, and hazards. In addition, this population often works in

jobs with higher exposure to health hazards. They conclude that integrating information about work, home, and community environment needs to be a focus in the development of health improvement interventions in the workplace (Baron et al., 2014). This article is important as it demonstrates how the social ecological framework is a tool that can bring into perspective complex factors such as income and environment that may interact when it comes to addressing issues of health improvement in the workplace. This study supports my study as it provides support for studying specific relationship between the social-ecological environment and specific health risks such as cancer health risks for employees.

Income is a significant factor when it comes to purchasing medical insurance coverage (Adler and Newman, 2002). Cantiello, Fottler, Oetjen, and Zhang (2015) examined the factors that may influence the lack of insurance coverage within the young adult population that may not have the opportunity to stay under their parent's health insurance plan as prescribed the Affordable Care Act (ACA). They suggest that the literature seems to point to perceptions of health status, need, and value as well as to socioeconomic status as some of the factors that may influence young adults in not obtaining insurance coverage. For example they state that literature points to people with low income as being most unwilling to purchase health insurance coverage. They used the prospect theory and the social-ecological model as the framework for their study. While the prospect theory helped understand the decision-making process in obtaining insurance, the researchers emphasized that the social-ecological model be essential to understanding how young adults' behavior may also be influenced by a variety of factors

that interact with each other. For example, they postulated that socioeconomic status, more specifically environmental resources such as money and education, may be related to the likelihood of having insurance coverage. Structural equation modeling is a process that allows researchers to conduct concurrent tests of multidimensional and complex hypothesis (Cantiello et al., 2015). Through this process, the researchers determined that socioeconomic status be of greater influence than perception when it came to a young adult getting health insurance coverage. They also stress that the social-ecological model may have been the theoretical construct which predisposed young adults to take or not to take up health insurance coverage. This study is important as it highlights the income variable as a significant factor in health risks. It also supports the evidence that socioeconomic status is a factor in health risks.

Level of Education and Cancer Health Disparities

Mackenback et al. (2015) describe education as "the most stable measure of socioeconomic position because it is normally completed by adulthood" (Mackenback et al., 2015, p. 53). Herndon, Kornblith, Holland, and Paskett (2013) emphasize that level of education is surrogate for socioeconomic status. Level of education is a common measure of socioeconomic status within the literature as it is often associated with increased income; additionally, it is regarded as a tool that affords individuals with the skills to access health resources (Adler & Newman, 2002). In examining the relationship between level of education and breast cancer survival, Herndon et al. (2013) found that having less than a high school degree was a significant risk for death. Sorensen et al. (2003) offers that people with lower levels of education are more likely to take on risky health behavior

and that the opposite is true. Similarly, Cantiello et al. (2015) state that education, which is a socioeconomic factor, is a determinant of health risk.

Hosseinpoor et al. (2012) analyzed data from the 2002 to 2004 World Health Survey to examine the relationship between socioeconomic factors household wealth and level of education and non-communicable disease risks such as unhealthy diet, smoking, physical inactivity, and alcohol consumption. The study focused on social determinants of health because of the increasing calls to further understand socioeconomic inequalities in relation to health outcome inequalities (Hosseinpoor et al., 2012). Overall, they found absolute inequalities in terms of non-communicable risk factors in relation to level of education and household wealth. For example, the lowest fruit and vegetable intake and highest smoking pattern was found in populations with the lowest level of education. However, they also uncovered some mixed inequalities; for instance there was no statistical difference in the level of physical inactivity in spite of the socioeconomic differences in the countries that were included in the study. The researchers explain this last result as a consequence of the lack of effective promotion of physical activity within those countries (Hosseinpoor et al., 2012). This study is a reminder of the importance of taking into consideration level of education and household wealth into account in the development of cancer health risk prevention programs.

The level of socioeconomic status as it relates to level of education is often associated with the individuals' health outcomes in many ways; not only is it associated with disease rate, it is also associated with mortality rate in every part of the world regardless of the countries level of development (Mackenbach et al., 2015). In order to

ascertain the relationship between the inequality in mortality rates and socioeconomic status, Mackenbach et al. (2015) accessed mortality data from populations within 19 European countries and analyzed their data based on individual's level of education and their cause of death. Their study was guided by Link and Phelan's fundamental cause theory which suggests that "a person's socioeconomic status provides him or her with "flexible resources" which can be used "to avoid disease risks or to minimize the consequences of disease once it occurs" regardless of the prevailing circumstances. The association between socioeconomic status and health then "is reproduced" over time via the replacement of intervening mechanisms", and as opportunities for avoiding disease expand so health inequalities continue to exist" (Link & Phelan, 1995; Phelan et al., 2004; Phelan et al., 2010, as cited in Mackenbach et al., 2015, p.52). Mackenbach et al. (2015) hypothesized that if this theory holds true, the relationship between mortality and preventable causes would be a lot more significant than the relationship between mortality and less avoidable causes. They classified causes of death as preventable base on how they are related to behavior change, medical intervention, or injury prevention. They found that in general, there are differences in the mortality rate for each category depending on the level of education of the individuals. For instance they found that individuals with the lowest level of education had higher rates of causes of death related to all three categories. However they found that the mortality rate was higher for individuals with higher levels of education for some causes related to behavior change such as lung cancer and breast cancer. They also found that there were differences in the causes of death depending on the European region under study. The researchers

concluded that the "fundamental cause" theory is not the absolute explanation for the relationship between level of education as a measure of socioeconomic status, and causes of death (Mackenbach et al., 2015). This study is relevant as it underscores the need to look at a multitude of factors such as social and environmental elements when trying to address health inequalities.

Employees, Race/Ethnicity, and Cancer Health Risk

Studies have established a link between employees, race/ethnicity, and cancer health risks on numerous occasions. For instance, working in an environment which involve elevated levels of exposure to diesel engine exhaust such as in mining, railroad, and trucking industries is a significant cancer risk factor (Vermeulen, Silverman, Garnick, Vlaanderen, Portengen, Steenland, 2014). Employment as well as risk/ethnicity risk factors are among the elements that must be addressed to progress in the development of health improvement programs (Baron et al., 2014). Similarly, Adler and Newman (2002) argue that jobs carry varying levels of physical and psychosocial stresses that impact health; consequently it is a factor that cannot be ignored. Baron et al. (2014) point out that low-income workers which make up a third of workers in the United States and which is mostly comprised of "…women, African American, Hispanic, foreign–born and without a high school diploma" (p.540), also have occupations that are often prone to injuries and illnesses. For instance these occupations include cashiers, combined food preparation and service workers such as fast food, home health aides, maids and housekeeping cleaners and child care workers. Working in these environments often exposes workers to unhealthy and hazardous surroundings. Furthermore, working in

these environments affects behaviors related to nutritional and physical activities of low income workers (Baron et al., 2014). They add that low-income occupations are provided by small companies which rarely disclose occupational injuries to the authorities (Baron et al., 2014). Giving these challenges, it is essential to understand insured-employees' cancer risks in terms racial disparities.

Working dynamics have changed with the advent of the internet which allows people to be more available to work (Jackson et al., 2013; Jackson, Kawachi, Redline, Juon, & Hu, 2014). Jackson et al. (2013) collected data on 136,815 individual's race, ethnicity, industry or occupation, employment and socioeconomic status, health behaviors, and medical conditions. They found that blacks had a higher prevalence of short sleep duration than whites in almost all occupations including but not limited to finance, information, real estate, educational services, public administration, healthcare, social work, manufacturing, and construction (Jackson et al., 2013). They also found theat while white laborers had the highest prevalence of short sleep duration among most workers, where black laborers still fared worse. Overall blacks with increasing professional roles tended to have a higher prevalence of short sleep duration. The researchers also noted that the prevalence was comparable for blacks and whites who fit within the lower socioeconomic spectrum (Jackson et al., 2013). Jackson et al. (2013) discussed the potential reasons for the prevalence of short sleep duration for blacks in spite of professional advancements; they suggest that the social environment, including emotional and financial support as well as social stigma or discrimination in the workplace as well as expectations, may be related (Jackson et al., 2013). Consequently,

they recommend further investigation into the possible factors that may impact this work-sleep disparity. This study demonstrates that the race/ethnicity factor is related to health risk; therefore, understanding how race/ethnicity relates to chronic health risks such as cancer risk in employee-insured populations will be important to address.

Similarly, Jackson et al. (2014) conducted study to determine the short sleep duration disparity between employed Asian and employed Whites. They used data from the NHIS to gather information similar to the previous study on 125,610 employed individuals. Jackson et al. (2014) found that overall Asians had a higher prevalence of short sleep duration than whites. The findings were similar to the previous study in that Whites had a lower prevalence of short sleep duration; according to Jackson et al. (2014) however, while Asians tend to be on the higher spectrums of the social, economic status, they suggest that other sociocultural factors may help explain the differences in short sleep duration pattern. For example, Asians, like Blacks, may also experience racial discrimination in the workplace, as well as the pressure to be successful at work (Jackson et al., 2014; Jackson et al., 2013). In addition, acculturation for Asians born outside of the U.S. may also play a role in those differences. These findings continue to be of concern as lack of sleep has also been linked to increased chronic illnesses in this population. Both studies point to race/ethnicity differences in sleep duration. The authors suggest more studies to better understand the sociocultural factors that may be related to these differences. This study reinforces the need to understand how race may impact chronic health risks including cancer health risks specifically among employees who are insured.

Research has indicated a relationship may exist between cancer health risks and certain industries. For example the International Agency for Research on Cancer (IARC) published studies which identified shift work as a possible risk factor in the development of cancer (Grundy et al., 2013, and Menegaux et al., 2013). Studies tend to look at industry as a uniform rate when analyzing health risk rather than looking at specific factors such as occupation and industry sector; this practice prevents effectively assessing and targeting health risks based on specific factors (Smith & Williams, 2014). For example, Hnizdo, Sullivan, Bang, and Wagner (2002) used the National Health and Nutrition Examination Survey (NHANES III) to conduct a study to determine the prevalence of chronic obstructive pulmonary disease (COPD) by specific industry sector and by occupational category. The goal was to provide new information that can be used towards targeted disease prevention programs (Hnizdo, Sullivan, Bang, & Wagner, 2002). Their analysis resulted in 14 industry categories and 12 occupational categories with increased adjusted odds ratios for COPD after adjusting for factors such as education and socioeconomic status (Hnizdo, Sullivan, Bang, & Wagner, 2002). They also found that 19 percent of COPD is related to occupational exposure; the number goes up to 31 percent for non-smokers. This study underscores the evidence that studying workplace-related health risks needs to be specific to the employed population in question.

Menegaux et al. (2013) examined the relationship between night-shift workers and breast cancer in a case-control study in France. They surveyed breast cancer patients as well as individuals who had not been diagnosed with the disease. They classified them

according to their socioeconomic status, medical and family history of cancer, lifestyle habits and occupational history. They also gathered information on their night work schedules. Using unconditional logistic regression models and adjusting for age and known cancer risks, they found that breast cancer risk was associated with characteristics of night work especially for women who worked at night during their first full-term pregnancy. Menegaux et al. (2013) also point out that studies show that nurses who work at night have had results consistent with this finding. This study is relevant to my study as it highlights the role of industries which may require night work as a possible cancer risk factor.

Similarly, Grundy et al. (2013) examined the relationship between breast cancer risk and night shift across several night shift occupations, unlike previous studies which only looked at this relationship among nurses. Using a case-control study, they also demonstrated that there was an increased risk of breast cancer for women who worked night shift for more than 30 years across a multitude of occupations. As in the previous study, this study suggest that a better understanding of cancer risks is needed across employees.

Smith and Williams (2014) conducted a study to address the incidence of injuries in the trucking industry in Washington State. They used data from the Washington State Department of Labor and Industries' State Fund to assess injuries by industry sector such as freight, couriers, and waste, and by occupation such as driver, material handlers and vehicle service. The results were that while industry sectors such as waste and recycling had the lowest injury rate, occupations such as drivers in this sector had the highest injury

rate. This is an important study as it stresses the need to independently look at workplace health risks (Smith & Williams, 2014).

Linan et al. (2008) conducted a study to examine the implementation of worksite wellness programs in accordance with recommendations form the Healthy People 2010. Their study focused on comparing the administration of wellness programs based on the number of employees within the worksite and based on the type of industry according to the US Standard Industrial Classification. They held interviews with 1553 worksites using procedures from the 2004 National Worksite Health Promotion Survey to determine if key elements of these programs such as health education, supportive environment such as healthy behavior support, and integration of the program into the worksite amongst other items were present. The results were that industries such manufacturing and business were most likely to offer comprehensive wellness programs than agriculture and finance industry types. They also found that industries such as transportation, communication, utilities, agriculture, mining, and construction lacked nutrition programs and/or diabetes screening programs (Linan et al., 2008). Furthermore, the researchers state that the worksites often stated that employees often lacked interest in the programs and that they lacked data to develop and administer effective worksite wellness programs; they advocate for more evidence-based worksite wellness programs. This study supports the need to study health risk within different types of industry so as to put in place worksite wellness programs to address those risks. In addition, getting a better understanding of the socioeconomic differences within employees might factor into

developing programs that address the barriers to employees participating in those programs, and as a result, help address chronic disease risks.

Summary and Conclusions

This review of the literature provided significant insight into the variables that are the focus of my study. It also provides the evidence that more research is needed to understand the relationship between socioeconomic status and specific chronic disease risks like cancer risk within the working and insured population. The purpose of the study is to understand the relationship between cancer health risks as defined by the ACS in relation to socioeconomic such as household income, level of education, race/ethnicity. The social, ecological theory is the perspective that guides this study. This study targets the intrapersonal factors, interpersonal processes and primary groups, the institutional factors, and the community factors, which is consistent with the social-ecological model.

Cancer continues to be among the chronic illness that are devastating to employees and their employers. In spite of its effects, studies have showed that there are potential efforts that may help decrease cancer risks. The ACS has provided guidelines for diet, BMI, physical activity, and alcohol consumption that may help cure the risks. Numerous studies have showed however that while these guidelines may be helpful, the results are not always consistent or attainable. Studies have suggested looking at possible factors that may affect the inconsistent results. Socioeconomic status is often suggested as a possible factor to investigate further.

Income and education are among the most significant variables to assess socioeconomic status. Race/ethnicity is a significant factor in the health of individuals.

Studies have consistently demonstrated that behavioral health risk patterns often relate to socioeconomic status. This has often been seen as the main factor in health disparities. Studies point out that the level of vulnerability in terms of race/ethnicity and socioeconomic status is greatly reflected in increased cancer risks. In order to administer effective strategies, it is essential to better understand the specific relationship between cancer risk and socioeconomic status within a specific environment.

Chapter 3: Research Method

Introduction

The purpose of this study was to understand the relationship between cancer health risks and socioeconomic factors including household income, and level of education and race/ethnicity among population-insured cancer survivors. The study was quantitative in nature and was conducted by analyzing secondary data from the 2013 Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS). The CDC BRFSS consists of national data from annual telephonic surveys aimed at gathering information on individual's behavioral health risks, chronic conditions, and prevention (BRFSS, 2014). This is one of the largest national databanks which provides researchers with opportunities to study health trends in the United States. In this study I analyzed information from answers gathered from questions specifically related to socioeconomic factors and cancer health risks. In this chapter I provided details on the methodology including the approach for the study, sampling procedures, participants' inclusion, the procedures for accessing the dataset, permissions to gain access to the data, instrumentation including reliability and validity, variables, and threats to the validity.

Research Design and Rationale

The study aimed to provide answers to the following research questions:

Research Question 1: What is the relationship between level of education and cancer health risks for employer-insured cancer survivor?

Research Question 2: What is the relationship between household income and cancer health risks for employer-insured cancer survivor?

Research Question 3: What is the relationship between race/ethnicity and cancer health risk for employer-insured cancer survivor?

I used a cross-sectional research design for this study. This research method involved collecting information from a random sample of individuals (Frankfort-Nachmias & Nachmias, 2008). The information was then analyzed to describe the pattern of relationships that may exist between variables. I used secondary data from the 2013 CDC BRFSS. The BRFSS is a telephonic investigative tool for collecting uniform data on health risk behaviors (BRFSS, 2014b). Health risk data was collected from adults in households in every state in the United States (US) within a 3-month period, as well as data by cell phone from adults who live in a private home or on a college campus (BRFSS, 2014b). The BRFSS provided information on participants' demographics including household income, level of education, race, and ethnicity, as well as information on their health risks. Cancer health risk could be assessed based on participants' responses to their body mass index (BMI), diet, level of physical activity, and alcohol consumption (Thompson et al., 2014). This guideline is also consistent with the American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention (American Cancer Society, 2012). Consequently, these elements within the 2013 BRFSS were accessed and examined to study the association between socioeconomic status variables as they relate to cancer health risks. A sample of the 2013 BRFSS questionnaire is included in the appendix.

Methodology

Population

This cross-sectional study examined BRFSS data that were collected in 2013, which included information that was gathered by landline from adults in households in every state in the United States, as well as data collected by cell phone from adults living in a private home or on a college campus (BRFSS, 2014b). In 2013, the BRFSS collected 360,079 landline responses and 133,356 cell phone responses, for a total of 493,435 responses (BRFSS, 2014c). Participants who provided information on their demographics and health risks were targeted for the study. Furthermore, the population only included participants in the 2013 BRFSS who positively identified as receiving health insurance from their employer as well as having been diagnosed with cancer at some point in life.

Sampling and Sampling Procedures

Sampling involves the inclusion of a subset of a population rather than the entire population as part of a study; one of the objective of sampling is to accurately estimate values for a larger population through the study of only a segment of that population (Frankfort-Nachmias & Nachmias, 2008). The states that participated in the BRFSS determined their sample after receiving a list of phone numbers from the CDC (BRFSS, 2013b). The states then sampled within geographic areas in accordance with the methodology agreed upon with the CDC. The BRFSS used two samples based on the data collected from the states. The first sample was the landline sampling, also known as the disproportionate stratified sampling (DSS). Here, phone numbers were selected based on the density of known household numbers (BRFSS, 2013b). The second sampling

method was the cellular phone sampling where cell phone numbers were randomly generated, and where each number had equal probability of being selected. Finally, the BRFSS applied a data weighing process to eliminate bias from the sample (BRFSS, 2013b).

The sampling method for this study included using the 2013 BRFSS data of only individuals who positively identified as receiving health insurance from their employer as well as having been diagnosed with cancer. Only employees with insurance that had been diagnosed with cancer at any point in their life were included in this study. The exclusion criteria for this study was based on respondents who identified as never having been diagnosed with cancer at any point in their life. Respondents who met the criteria were included in the study. Consequently, this study used a nonprobability sample design where the convenience sample was based on the data that was available within this inclusion frame. While the BRFSS aimed to annually collect data from at least 4,000 individuals in every state, a power analysis was done to ensure that this number was suitable for the study.

To eliminate bias within the sample, the BRFSS implemented a two-step data weighing process. The first step was the design weighting which took into consideration factors such as the number of phones and number of adults within the household, as well as the number of records within each geographic area (BRFSS, 2013). The second step was the raking weighting or iterative proportional fitting which accounted for the characteristics of the population within the sample and adjusts for characteristic to ensure

that the sample was a representation of the population. Through this weighting processes, the BRFSS ensured that the sample was representative of the population under study.

The data that was analyzed within the BRFSS already contained statements for clustering and sample weights that were used as part of the analysis. I identified and used the clusters and sample weights that were relevant for this study to address the relationship between socioeconomic factors and cancer-related health risks. In order to reduce error in the outcome of the study, I created a complex sample file using the stratum weight (@_STRWT), the primary sampling unit (@_PSU), and the final weight (@_LLCPWT). The complex file was incorporated in the analysis process.

To produce meaningful data that would contribute to the body of knowledge in health science, it was essential to determine the appropriate size of the sample through a power analysis. This meant that it was necessary to determine the probability that the result of the study would occur (i.e., that there is an effect) if the null hypothesis was rejected. The null hypothesis for this study was that there is no relationship between social determinants of health such as household income, level of education, and race/ethnicity, and cancer health risk factors in employees who have been diagnosed with cancer, and who receive health insurance from their employer. To determine the sample size, it was necessary to define the Alpha level (α), the effect size, and the power ($1-\beta$).

The Alpha level (α) is the significance level; it is a Type I Error which indicates the odds of stating that a relationship exists when in reality, there is no relationship. It is standard in social sciences to set the Alpha level (α) at .05; as a result, this level was used for this study. In terms of the effect size for the study, it was helpful to review what

previous similar studies have used; in using this method, I found that the effect size varied from .09 to .50. I selected a statistical power (1-β) of .80 which is the generally accepted statistical power for social sciences. Based on this analysis, the sample size for this study needed to be 199 to ensure 80% power in this study. The 2013 BRFSS participant size exceeded the minimum number needed to have a statistically significant relationship between the variables.

Procedures for Recruitment, Participation, and Data Collection (Archival Data)

The BRFSS used a specific format to recruit participants for the interview. The first part involved the selection of an eligible household which was the principal residence of the occupying members (BRFSS, 2013b). The second part of the recruitment process involved the selection of an adult over the age of 18 residing in the eligible household. The adult was interviewed by phone following the standards established for the BRFSS questionnaire; the process was complete when respondents provide their age, race, and gender (BRFSS, 2013b). Eligible adults who refused to answer the questionnaire, as well as those who were verbally abusive, were not included among the participants. Regarding data collection mechanism, each of the states used a Computer-Assisted Telephone Interview (CATI) system. This system allowed for an automated system for interviewers to efficiently access the scripted questions for the interviews. Once the data was collected, each state provided participants' data in aggregate form to the CDC on a monthly basis. This information is published annually with standard tabulations including the data that was accessed for this study (BRFSS, 2013b).

Procedure for Gaining Access to the Dataset

The CDC annually publishes BRFSS data on their website. This information is available in statistical package formats such as in ASCII and SAS Transport formats on the website. After receiving approval from the university's Institutional Review Board (IRB), I accessed the 2013 BRFSS data in SAS Transport format and converted it to SPSS and Excel for analysis.

Instrumentation and Operationalization of Constructs

The 2013 BRFSS questionnaire for this study was comprised of 3 sections: the core component, the optional BRFSS modules, and the state-added questions (BRFSS, 2014b). The core component and the optional BRFSS modules were the results of a 5-year development process of the BRFSS core instrument. The core components were the standard part of the questionnaires that every state administers; it included questions on health behavior and demographics. The optional BRFSS modules included questions on health topics that states voted to include in the questionnaire. Lastly, the state added questions were added by individual states without input from the CDC.

The relevant data came from questions from the core component of the BRFSS questionnaire. The answers to the data about access to health behavior associated with demographics and cancer health risks were available and selected through responses to the core questions.

The independent variables dataset - level of education, household income, and race/ethnicity were available in the optional BRFSS modules. Level of education was self-reported and was described as the educational attainment of the participants. This

information provided details on the highest grade completed and was measured at the ordinal level. This independent variable was coded where reports of never having less than high school education was coded 1; having a high school degree was coded 2; some college was coded as 3 and being a college graduate was coded 4.

Household income was also self- reported by participants and is coded at the interval level were income between $0 and $14,999 was coded as 1; between $15,000 and $24,999 was coded as 2; between $25,000 and $34,999 was coded as 3; between $35,000 and $49,999 was coded as 4; and $50,000 and above was coded as 5. Race/ethnicity was also self-reported and was classified based on answers and coded at the nominal level where White, Non-Hispanic was coded as 1; Black, Non-Hispanic was coded as 2; Other, Non-Hispanic was coded as 3, and Hispanic was coded as 4. Age, gender, and smoking status were also self-reported and were covariates where age was coded at the interval level, and gender and smoking status were coded at the nominal level.

The dependent variable, cancer health risk, was determined through participants' answers to questions within the core questions. Cancer health risk was assessed based on participants' responses to their body mass index (BMI), diet, level of physical activity, and alcohol consumption (Thompson et al., 2014). This guideline was also consistent with the American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention (American Cancer Society, 2012). Appendix I includes details on the BRFSS questions that were instrumental in gathering the necessary data for the study.

I coded the cancer health risks based on the ACS guidelines for the four dependent variables. Each of the variables was scored equally on a scale of 0 to 2 where 0

was equivalent to not meeting the recommendation, and 2 meant meeting or exceeding the recommendation, where the total maximum score of 8 indicated meeting the guideline and 0 represented not meeting the guidelines. In other terms, the lower the score of the participant, the higher the cancer health risk. Similar to studies by McCullough et al. (2011) and Thomson et al. (2014), the total scores were analyzed to estimate the relative risk of cancer health risks of individuals based on their socioeconomic status. Table 1 describes the dependent variables that were coded and measured to assess cancer health risk.

Table 1

Dependent Variables

Variable	Possible Answers	Coding	Level of Measurement
BMI	18.5< or =25kg/m^2 25<or =30kg/m^2 >30kg/m^2 < 18.5 are excluded	Normal (2) Overweight (1) Obese (0)	Ordinal
Physical Activity	> or =5 hours/week 2.5<5 hours/week < 2.5 hours/week	Preferable (2) Minimum (1) (0)	Ordinal
Nutrition	> or =5 Fruits-vegetables/day 3<5 Fruits-vegetables/week <3 Fruits-vegetables/week	Preferred (2) (1) (0)	Ordinal
Alcohol consumption	(Men) < or = 2 drinks/day (Women) < or = 1 drinks/day (Men) 0 drinks/day (Women) 0 drinks/day (Men) > or =2 drinks/day Women > or =1 drinks/day	2 1 0	Ordinal

Finally, the responses were coded in a manner that will allow for efficient analysis of the data. Once coded, the data were analyzed using SPSS software to determine the association between the variables and to examine the hypotheses of the study:

$H_0$1: Level of education is not related to cancer health risks for employer-insured cancer survivor.

$H_1$1: Level of education is related to cancer health risks for employer-insured cancer survivor.

$H_0$2: Household income is not related to cancer health risk for employer-insured cancer survivor.

$H_1$2: Household income is related to cancer health risk for employer-insured cancer survivor.

$H_0$3: Race/ethnicity is not related to cancer health risk for employer-insured cancer survivor.

$H_1$3: Race/ethnicity is related to cancer health risk for employer-insured cancer survivor.

Regression Modeling Procedure

The data file was initially cleaned to address any issues with missing data that would invalidate the study. In order to analyze the data, I began with a descriptive analysis of the variables in the study and provided information on the frequencies, and standard errors. Performing the descriptive analysis allowed for the initial organization of the data to make the information easier to understand (Frankfort-Nachmias & Nachmias, 2008). This analysis was followed by inferential analysis of the relationship between each

independent variable and the dependent variable using one-way analysis of variance (ANOVA). This helped assess the relationship between level of education and cancer health risk, household income, and cancer health risk, and race/ethnicity and cancer health risk. I conducted the necessary tests to ensure that assumptions for conducting a one-way ANOVA were met (Green & Salkind, 2011).

I also conducted multivariate linear regression analysis to assess the effect of the independent variables (predictors) on the dependent variable (criterion), cancer health risk. This analysis was essential because it helped assess the functional relationship between interval variables as the study aimed to understand the effect of the predictors on the criterion. In addition, this analysis helped clarify how much the criterion can be predicted by the linear regression equation (Green & Salkind, 2011). It also ensured that all assumptions for conducting the multiple regression were met, such as the independent variables being divisible into sets (Green & Salkind, 2011). I also examined the scatterplot of the variables to determine if there were outliers as well as to ascertain a linear relationship between them, either of which would have indicated some problems. The result indicated that there was a linear relationship, that there were no outliers, and that the variables were normally distributed; therefore linear relationship exists between the variables (Green & Salkind, 2011).

Threats to Validity

Addressing the validity of the study helps ensure the quality of the content of the study, the data, and the interpretation of the findings (Creswell & Plano Clark, 2010). The content validity was established by ensuring that the BRFSS captured data related to

cancer health risk variables as wells as socioeconomic variables. The BRFSS is a reliable and valid instrument to collect this behavioral health risk data and comparison to other national instruments also indicated the same (Pierannunzi, Hu, & Balluz, 2013).

Ethical Procedures

The data that was used for this study was secondary in nature. The BRFSS questionnaire was administered on a volunteer basis. In addition, participants were asked for their consent prior to responding to the questionnaire. I had no direct involvement with the participants of the BRFSS. All of the information was de-identified by the states before being sent to the CDC. Although this data is public domain, I sought approval from Walden University's IRB prior to accessing and analyzing it in aggregate form. This helped ensure that the entire study complied with the university's ethical standards and federal regulations.

Summary

Chapter 3 described the details of the methodology that were used for this study. It included an explanation of the rationale behind the selection of the cross-sectional research design for this particular study. The data came from the 2013 BRFSS. The convenience sample design was also suitable for this study as data from the entire population that fit within the inclusion frame was accessed and studied. Although no permission was required to access the BRFSS, I sought permission from the BRFSS to access any data that could have required permission to access in order to assess the relationship between cancer health risks and socioeconomic status. The chapter also included details on the responses within the BRFSS instrument that were used in the

analysis as well as information on the validity and reliability that was relevant for this study.

Chapter 4: Results

Introduction

The purpose of this chapter is to report the results of the analysis of the secondary analysis of the 2013 BRFSS survey data regarding the relationship between socioeconomic status and cancer risks in employer-insured cancer survivors. The goal of the study was to answer the following research questions:

1. What is the relationship between level of education and cancer health risks for employer-insured cancer survivors?
2. What is the relationship between household income and cancer health risks for employer-insured cancer survivors?
3. What is the relationship between race/ethnicity and cancer health risk for employer-insured cancer survivors?

I conducted a descriptive analysis, as well as ANOVA and bivariate linear regression analysis of the data to help answer the questions. In addition, and as part of the process, the following hypothesis were tested:

$H_0$1: Level of education is not related to cancer health risks for employer-insured cancer survivor.

$H_1$1: Level of education is related to cancer health risks for employer-insured cancer survivor.

$H_0$2: Household income is not related to cancer health risk for employer-insured cancer survivor.

$H_1$2: Household income is related to cancer health risk for employer-insured cancer survivor.

$H_0$3: Race/ethnicity is not related to cancer health risk for employer-insured cancer survivor.

$H_1$3: Race/ethnicity is related to cancer health risk for employer-insured cancer survivor.

Data Collection

To best answer these questions, I obtained the publicly available 2013 BRFSS data from the CDC's website in ASCII format. The study participants were randomly selected and interviewed by BRFSS interviewers by phone within 53 states and territories in the United States. The resulting 2013 was made publicly available on the CDC's website in ASCII format and was downloaded to SPSS version 24 and Excel for analysis. A complex sample was created, and the cases were filtered to select the participants whose responses complied with inclusion and exclusion frames. Participants who positively responded to receiving health insurance coverage from their employer as well as having been diagnosed with cancer were included in the sample. In addition, participants had to have provided demographic information such as income, level of education, and race/ethnicity, age, and gender as well as all questions pertaining to their gender, BMI, nutrition, physical activity, and alcohol consumption. Furthermore, cases were eliminated if participants did not provide or if cases were missing any of the variables necessary for the study.

Study Population

The first step of the analysis was to determine the total number of cases that would be available for the study. After cleaning the data and selecting the cases based on the inclusion and exclusion frames, the final sample for the study resulted in a total of 7,007 cases to be analyzed for the study. This study population was found to be appropriate for the study because it is drawn from the 2013 BRFSS which is a reliable instrument to collect information related to health behavior and risks (Pierannunzi, Hu, & Balluz, 2013). In addition, the data that was selected for analysis is compliant with the purpose of the study.

Descriptive Statistics

The demographic characteristic of the sample data consisted of individuals who receive medical coverage through their employer and who have a history of cancer diagnosis. Their level of education was categorized as less than high school, high school, some college, and college graduates. Participants' household income was grouped in the following category: $0 to $14,999; $15,000 to $24,999; $25,000 to $34,999; $35,000 to $49,999; and $50,000 and over. In terms of race, participants were categorized as white, non- Hispanic; black, non-Hispanic; other, non-Hispanic; and Hispanic.

For the covariates, individuals ranged from ages 18 to over 65 and were grouped in the following categories: 18 to 24 years old; 25 to 34 years old; 35 to 44 years old; 45 to 54 years old; 55 to 64 years old; and 65 and older. They were classified as either male or female for the gender category. Finally, in regard to their smoking status, they were classified as either smokers or nonsmokers.

Lastly, participants compliance with the ACS guideline was based on their behavior as it related to their BMI, nutrition, physical activity, and alcohol consumption. Individuals received ACS scores ranging from 0 to 8 where 0 indicated no compliance whatsoever with ACS guidelines for cancer prevention, and 8 indicated full compliance with the recommendation. Scores ranging from 1 to 7 indicated some compliance with the recommendations. Descriptive analysis of the data was performed to provide a general overview of the data.

The average ACS score for the participants was 3.96 with a standard deviation of 1.7. Scores varied between 0 and 8. Table 2 provides the result of the means analysis for the dependent variable.

Table 2

ACS Scores

Mean	N	Std. Deviation	Minimum	Maximum
3.96	7007	1.709	0	8

Review of the descriptive statistics of the data indicated that majority of the population consisted of college graduates with 47.3% (*n* = 4,042) (Table 3). This group is followed by participants with some college which represented 31.2% (*n* = 1,801), and participants with high school degrees at 18.7% (*n* = 1,076). The population with the lowest representation were participants with less than high school level of education with accounted for 2.8% (*n* = 88) of the sample group.

In terms of income, the majority of the population, 80% (*n* = 5,509), had an income of $50,000 or more. Individuals with income between $35,000 and $49,999 were

the next largest group an accounted for 12% (*n* = 828). These were followed by the participants with incomes between $25,000 and $34,999 representing 4.4% (*n* = 391); population with income between $15,000 and $24,999 at 2.9% (*n* = 243); and the smallest group comprised of participants with income at $14,999 and below, and who represented 0.7% (*n* = 36) of the sample.

For the race and ethnicity variable, non-Hispanic whites were the largest with 87.7% (*n* = 6,510). Non-Hispanic blacks were 3.7% (*n* = 187) of the group; similarly, others, non-Hispanic represented 3.7% (*n* = 156) of the sample population. Hispanics were 4.8% (*n* = 154) of the group.

Review of the covariates also provided descriptive statistics of the sample population. For age, the largest segment, 41.2% (*n* = 3,253) were between the ages of 55 and 64 years old; the next group were participants ages 45 to 54 who made up 29.6% (*n* = 1,881) of respondents. 12.1% (*n* = 681) of the respondents were between the ages of 35 to 44 years old. Participants 65 years or older made up 10.3% (*n* = 927). The fifth group of individuals were between the ages of 25 and 34 and represented 5.6% (*n* = 232) of respondents. The smallest group in the sample were between the ages of 18 and 24 and made up 0.8% (*n* = 33) of respondents.

The frequency of smoking status showed that 88.9% (*n*= 6,302) of the sample comprised of nonsmokers, while smokers made up 11.1% (*n* = 705). In addition, 57.4% (*n* = 4,257) of the population were female, while 42.6% (*n* = 2750) were men. Table 3 displays the output of the frequencies and unweighted counts for the independent variables in the study.

Table 3

Frequency of Dependent Variables

Variable	Frequency	Std. error	95% CI		Unweighted count
			Lower	Upper	
Education					
Less than High School	2.8%	0.5%	2.0%	4.0%	88
High School	18.7%	1.1%	16.7%	20.9%	1076
Some College	31.2%	1.1%	29.1%	33.4%	1801
College Graduate	47.3%	1.1%	45.1%	49.4%	4042
Total	100.0%	0.0%	100.0%	100.0%	7007
Household Income					
$0-$14,999	0.7%	0.4%	0.3%	1.9%	36
$15,000-$24,999	2.9%	0.3%	2.3%	3.7%	243
$25,000-$34,999	4.4%	0.4%	3.7%	5.2%	391
$35,000-$49,999	12.0%	0.9%	10.3%	13.9%	828
$50,000 and above	80.0%	1.0%	77.9%	81.9%	5509
Total	100.0%	0.0%	100.0%	100.0%	7007
Race/Ethnicity					
White, Non-Hispanic	87.7%	1.2%	85.2%	89.9%	6510
Black, Non-Hispanic	3.7%	0.5%	2.9%	4.8%	187
Other, Non-Hispanic	3.7%	0.8%	2.4%	5.8%	156
Hispanic	4.8%	0.9%	3.4%	6.8%	154
Total	100.0%	0.0%	100.0%	100.0%	7007
Age					
18-24	0.8%	0.2%	0.5%	1.2%	33
25-34	5.6%	0.8%	4.2%	7.3%	232
35-44	12.1%	0.7%	10.8%	13.6%	681
45-54	29.6%	1.1%	27.6%	31.8%	1881
55-64	41.6%	1.1%	39.4%	43.8%	3253
65 or older	10.3%	0.6%	9.2%	11.5%	927
Total	100.0%	0.0%	100.0%	100.0%	7007
Smoking status					
Non-Smoker	88.9%	0.7%	87.4%	90.3%	6302
Smoker	11.1%	0.7%	9.7%	12.6%	705
Total	100.0%	0.0%	100.0%	100.0%	7007
Sex					
Male	42.6%	1.2%	40.3%	44.9%	2750
Female	57.4%	1.2%	55.1%	59.7%	4257
Total	100.0%	0.0%	100.0%	100.0%	7007

Inferential Analysis

The mean ACS score for each category of each of the independent variables was determined to ascertain the level of compliance with the guidelines within each category. The results of this analysis indicated that for the level of education, college graduates had the highest mean score (4.18) while those with less than high school degrees had the lowers mean scores (3.36). The same was true with household income where the highest income of $50,000 or above had the higher the ACS mean score (4.05), and the lowest the household income of $14,999 or below had the lowest ACS mean score (3.28). Regarding race/ethnicity, whites had the higher mean score (3.98), while blacks had the lowest mean score (3.44). Table 4 includes the details of the mean ACS score for each categorical independent variable.

Table 3

Means of ACS for each categorical variable

	Mean	N	Std. Deviation	Minimum	Maximum
EDUCATION LEVEL					
Less than High School	3.36	88	1.690	0	8
High School	3.54	1076	1.611	0	8
Some College	3.74	1801	1.688	0	8
College Graduate	4.18	4042	1.708	0	8
HOUSEHOLD INCOME					
$0-$14,999	3.28	36	1.406	1	6
$15,000-$24,999	3.74	243	1.700	0	8
$25,000-$34,999	3.55	391	1.701	0	8
$35,000-$49,999	3.66	828	1.660	0	8
$50,000 and above	4.05	5509	1.709	0	8
RACE/ETHNICITY					
White, Non-Hispanic	3.98	6510	1.707	0	8
Black, Non-Hispanic	3.44	187	1.566	0	8
Other, Non-Hispanic	3.78	156	1.751	0	8
Hispanic	3.75	154	1.824	0	8
AGE					
18-24	3.73	33	1.682	0	7
25-34	3.81	232	1.755	0	8
35-44	3.88	681	1.664	0	8
45-54	3.81	1881	1.714	0	8
55-64	3.99	3253	1.698	0	8
65 or older	4.27	927	1.720	0	8
SMOKING STATUS					
Non-Smoker	3.99	6302	1.704	0	8
Smoker	3.65	705	1.725	0	8
SEX					
Male	3.97	2750	1.671	0	8
Female	3.95	4257	1.734	0	8
Total	3.96	7007	1.709	0	8

Analysis of Variance

In addition, a one-way analysis of variance (ANOVA) was performed for the variables to ascertain if the means on the compliance with the ACS guidelines for cancer risk prevention, or the criterion (dependent) variable significantly differed between the independent variables. The result showed that for each of the means where $p < .01$, we have an indication that the null hypothesis can be rejected and that we can accept the alternate hypothesis. As a result, we find that the null hypothesis can be rejected for all of the independent variables with the exception of gender, one of the covariates. There does not appear to be a statistical significance between the mean for gender and compliance with ACS guidelines for cancer risk prevention. We can confirm that there is a significant relationship between each of independent variables level of education, household income, and race/ethnicity, and the level of compliance with the ACS guidelines. Table 5 is the result of the ANOVA.

Table 4

ANOVA between groups

Variables	Sum of Squares	df	Mean Square	F	Sig.
Level of Education	504.737	3	168.246	59.014	.000
Household Income	210.765	4	52.691	18.211	.000
Race/Ethnicity	66.577	3	22.192	7.617	.000
Age	143.872	5	28.774	9.911	.000
Smoking Status	73.461	1	73.461	25.229	.000
Gender	.369	1	.369	.126	.722

Multiple Linear Regression Analysis

Once the previous analysis helped determine that there is a significant relationship between the variables, I conducted multiple linear regression analysis to assess the independent effect of each independent variable (predictor) on the dependent variable (criterion), cancer health risk. In order to do so, I started with regression diagnostic to ensure that all of the assumptions were met. This is an essential step to ensure that the accuracy of the interpretations. I checked for linearity, independence of error, homoscedasticity, multicollinearity, undue influence, and normal distribution of error. In terms of the independence of error, the Durbin-Watson in the model summary had a value of 1.976 which indicates that there is no correlation between the residuals in our multiple linear regression (Table 6). In addition, the coefficient of multiple determination, or the R square, indicates that the model explains 3.8% of the variability of the response data around the mean. The ANOVA of the model indicated that the overall model was significant ($p < .05$) (Table 7). The coefficients output helps determine if there is an issue of multicollinearity. Review of the Variance Inflation Factor (VIF) for each independent variable shows that there is no collinearity as all of the values are far below 10. In other words, there is no evidence that the independent variables have a high level of correlation amongst each other. Similarly, the tolerance values are greater than 0.1 which also indicates that there is no correlation between the independent variables. As a result, we can assume that we have met the assumption. Table 8 provides an overview of the coefficients output and collinearity diagnostics. The Cook's Distance was between the values was < 1 which indicates that there is no undue influence or the presence of outlier

that may affect the model (Table 9). The histogram (Figure 1) shows a normal distribution of errors, and there is no significant deviation from normality. Last but not least, the scatterplot helped determine if the residuals were equal in variance. The scatterplot indicated a linear relationship between the variables, and issues homoscedasticity, (Figure 2). The results of the regression diagnostics indicated that all assumptions were met for the regression analysis.

The multiple regression analysis provided insight into the relationship between the variables. Table 8 provides the result of the outputs for this analysis. It is important to point out that dummy variables for each of the categorical independent variables were created as part of the analysis. In addition, and as part the regression analysis, a reference variable was selected within each category of variables, against which the other variables were compared. Consequently, the sign of the regression coefficient or unstandardized coefficient (B) allows for comparison between each significant variable and the corresponding reference variable. In other terms, if the unstandardized coefficient is negative, it indicated a decrease in the relationship when compared to the reference variable, or a lower ACS score, while a positive unstandardized coefficient indicted a higher ACS score when compared to the reference variable. It is also important to note that the lower the ACS score, the less compliant a participant is with the ACS recommendations for cancer previous, and as a result, the higher the cancer risk for this participant. The following section is an outline of the finding of the regression analysis:

In terms of level of education, the reference variable were participants who were classified as college graduates. The variable for participants who had some college was

found to be a significant variable; compared to college graduates, those with only some college had a lower ACS score and therefore a higher cancer risk (B = -.375, p = .000). The high school variable was also found to be significant, and similarly, employer insured cancer survivors with high school education also had a lower ACS score when compared to the college graduates (B = -.558, p = .000). Lastly, the less than high school variable was also significant, and participants who had less than a high school education also had lower ACS points when compared to the reference variable, college graduates (B = -.656, p = .000) compared to college graduates.

For the independent variable household income, the reference variable was participants who had a household income of $50,000 or more. Variables for participants with household income between $35,000 and $49,999 as well as those between $25,000 and $34,999 were found to be significant. When compared to the reference variable of people with household income of $50,000 or more, participants with household incomes between $35,000 and $49,999 showed less compliance with ACS guidelines (B = -.232, p = .000). Those with household income between $25,000 and $34,999 were also showed increased cancer risk (B = -.309, p = .001). regression analysis showed the significant independent variables.

The reference variable for race was non-Hispanic whites. Only the non-Hispanic blacks variable was found to be significant when compared to the reference variable. This group had a lower ACS score and showed higher cancer risk when compared to the reference group (B = -.491, p = .000).

The regression analysis was also conducted for covariates where for the age reference variable was participants between the ages of 55 and 64. People between the ages of 45 and 54 were found to have a significant effect with ACS scores that were lower that the reference group (B = -.137, p = .000). On the other hand, the population 65 years and older was also found to have a significant effect, but they had a higher ACS score, or lower cancer risk index when compared to the reference group (B = .249, p = .000).

Several of the categorical independent variables were found to be non-significant, and they included: participants with income less than $14,000; income between $15,000 and $24,999; Other non-Hispanic participants; Hispanic participants; participants 44 years and younger; smoking status; and gender. The following table illustrates the findings of the regression analysis:

Table 5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.194	.038	.035	1.679	1.976

Table 6

Regression Diagnostics - ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	770.678	17	45.334	16.084	.000[b]
Residual	19699.320	6989	2.819		
Total	20469.998	7006			

Table 7

Coefficient outputs and collinearity diagnostics

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	4.296	.040		107.239	.000		
Level of Education							
CollegeGraduate	Reference						
LessthanHighSchool	-.656	.185	-.043	-3.537	.000	.944	1.059
HighSchool	-.558	.060	-.118	-9.267	.000	.853	1.173
SomeCollege	-.375	.049	-.096	-7.634	.000	.871	1.148
Household Income							
50000andabove	Reference						
lessthan14999	-.525	.283	-.022	-1.853	.064	.980	1.021
between15000and24999	-.043	.115	-.005	-.375	.708	.912	1.096
between25000and34999	-.309	.090	-.041	-3.420	.001	.937	1.067
between35000and49999	-.232	.064	-.044	-3.592	.000	.928	1.077
Race/Ethnicity							
WhiteNonHispanic	Reference						
BlackNonHispanic	-.491	.125	-.046	-3.929	.000	.992	1.008
OtherNonHispanic	-.155	.136	-.013	-1.139	.255	.992	1.008
Hispanic	-.134	.138	-.012	-.974	.330	.983	1.017
Age							
age55to64	Reference						
age18to24	.018	.298	.001	.062	.951	.967	1.034
age25to34	-.158	.115	-.017	-1.372	.170	.949	1.054
age35to44	-.137	.071	-.024	-1.926	.054	.910	1.099
age45to54	-.194	.049	-.050	-3.975	.000	.858	1.165
age65andolder	.249	.063	.049	3.952	.000	.880	1.137
Smoking Status							
non-Smoker	Reference						
smoker	-.102	.069	-.018	-1.474	.140	.935	1.069
Gender							
Female	Reference						
Male	-.078	.042	-.022	-1.849	.064	.955	1.047

Table 8

Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.68	4.55	3.96	.332	7007
Std. Predicted Value	-3.858	1.768	.000	1.000	7007
Standard Error of Predicted Value	.040	.394	.074	.041	7007
Adjusted Predicted Value	2.67	4.55	3.96	.332	7007
Residual	-4.467	4.679	.000	1.677	7007
Std. Residual	-2.661	2.787	.000	.999	7007
Stud. Residual	-2.663	2.800	.000	1.000	7007
Deleted Residual	-4.473	4.735	.000	1.681	7007
Stud. Deleted Residual	-2.664	2.802	.000	1.000	7007
Mahal. Distance	2.988	385.009	16.998	27.865	7007
Cook's Distance	.000	.012	.000	.000	7007
Centered Leverage Value	.000	.055	.002	.004	7007

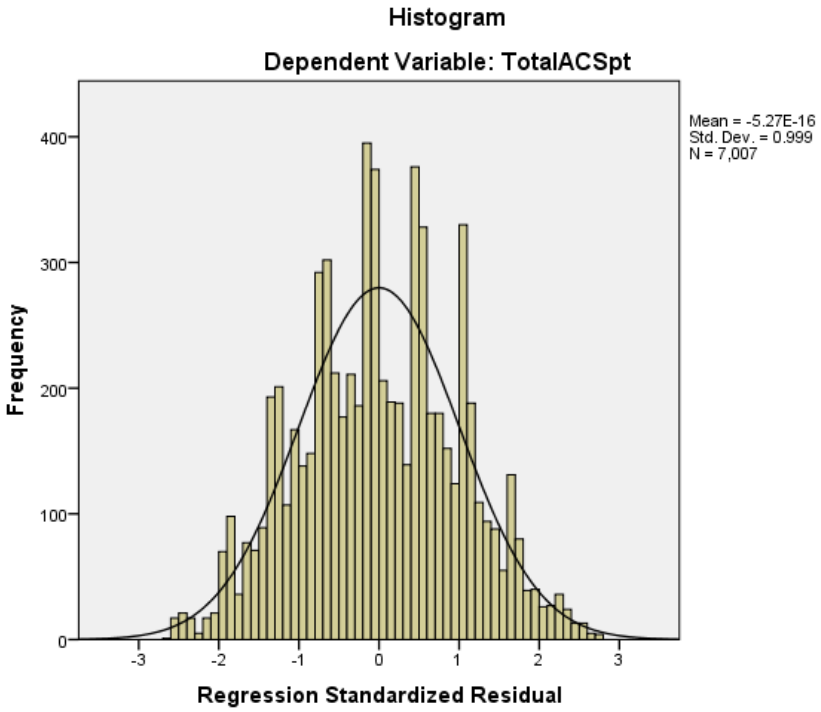

Figure 1. Histogram

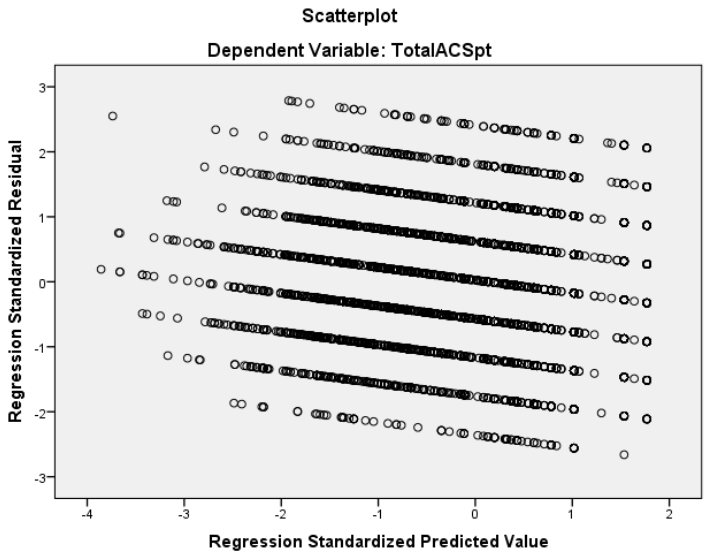

Figure 2. Scatterplot

Summary

The analysis of the 2013 BRFSS data provided a clearer insight into the relationship between socioeconomic status and cancer health risk within the employer insured cancer survivor population. This step was essential to allow for testing of the hypotheses initially outlined. The following section summarizes the result of these tests based on the regression analysis.

In terms of level of education in this study, the goal was to understand the relationship between cancer health risks based on the ACS guidelines and level of education in the employer insured cancer survivor population, controlling for age, smoking status, and gender. The ANOVA indicated that there was a significant relationship between level of education and compliance with ACS guidelines. As a result, the null hypothesis was rejected. The analysis supported the alternate hypothesis, indicating that level of education was a significant predictor of the compliance with ACS

guideline, and therefore of cancer health risk within this population. This finding of the regression analysis was in line with expectations as the literature tends to show that higher levels of education correlate with healthier habits.

The analysis also helped evaluate the relationship between household income and cancer health risk-based ACS guidelines for this population and controlling for age, smoking status and gender. The result of the analysis of variance revealed that there was a significant relationship between the two variables, therefore rejecting the null hypothesis. The alternate hypothesis was supported as there was a significant relationship between the predictor and the criterion. Therefore, household income can help predict cancer health risk within the population. The regression analysis found that the risk varies depending on the bracket for the income. This finding was somewhat unexpected as the belief is that a higher income would correlate with a healthier lifestyle, therefore a lower risk.

The third research question focused on the relationship between race/ethnicity and cancer health risks based on the ACS guidelines and level of education in the employer insured cancer survivor population, controlling for age, smoking status, and gender. The analysis of variance revealed that there was a significant relationship between these two variables. Once more, the null hypothesis was rejected. The alternate hypothesis was favored as the results showed that there was a meaningful relationship between cancer health risk and race/ethnicity of employer-insured cancer survivors. The regression analysis showed that non-Hispanics whites had lower cancer risks than other

race/ethnicities when controlling for age, smoking status, and ethnicity and based on the ACS guidelines.

This chapter included a description of the variables within the study as well as the analysis of the relationship between the variables. The information was instrumental in testing the hypothesis and essential to help understand the relationships in question. In the next chapter, I will be interpreting the findings, I will describe the limitations, and provide recommendations for future research. Finally, will discuss the implications of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Researchers have shown that behavioral factors associated with chronic illnesses including cancer risks are often linked to socioeconomic status (Doubeni et al., 2012; Hastert, Beresford, Sheppard, & White, 2015). Populations that rank lower on the socioeconomic index seem to be at a greater risk when it comes to behavioral factors associated with increased cancer health risk (Doubeni et al., 2012; Uthman, Jadidi, & Moradi, 2013). The purpose of the study was to determine the relationship between socioeconomic factors and cancer health risks in the employer insured cancer survivor population. This study was undertaken to understand the relationship between the independent variables, level of education, household income, and race/ethnicity, and the dependent variable, cancer health risk. The goal was to determine statistically significant information that could potentially be incorporated into the development and implementation of future worksite wellness programs aimed at improved cancer health risk outcomes. The outcome may be a better return on investment for the employers, the insurers, and most importantly the employees who have access to these workplace health improvement programs that focus on cancer prevention.

In this study, I analyzed the association between socioeconomic factors, notably level of education, household income, and race/ethnicity after adjusting for age, smoking status, and gender against compliance with the ACS guidelines for cancer prevention. Based on the review of the literature, one expectation of the study was to observe a

similar pattern in the employer insured cancer survivor population as in other populations where studies found socioeconomic characteristics to be inversely related to cancer risk.

Interpretation of Findings

Findings within the literature indicated that compared to populations with high socioeconomic status, the lower the socioeconomic status of a group, the higher the cancer risk for this group (Doubeni et al., 2012; Li et al., 2013; Uthman et al., 2013). However, studies have also pointed to the fact that this relationship may depend on a variety of factors (Paxton et al., 2012). The social ecological model which guided this study, suggests that health is the result of the interaction between behavior and the social environment. In the current study, and through this lens, we examined cancer risk behavior in accordance with the ACS guidelines, in relation to socioeconomic factors within the employer insured cancer survivor population. We found that the mean score for compliance with ACS guidelines for cancer prevention was 3.96 out of a possible total score of 8 for the study population. The mean score was low; this result reinforced findings within the literature that showed that cancer diagnosis did not necessarily translate into engagement in optimal long-term and sustained cancer prevention behaviors or compliance with recommendations. It also confirmed that a variety of factors needed to be taken into consideration to understand the possible relationships between the variables (Bluethmann et al., 2015; Rock et al., 2012; Paxton et al., 2012).

Level of education

The first research question dealt with understanding the relationship between level of education as a socioeconomic factor and cancer health risk within the employer

insured population. The analysis showed that there was a significant relationship between level of education and cancer health risk in the employer insured cancer survivor population ($p < .05$). As expected, it found that the mean ACS score for each categorical variable for level of education increased as the level of education increased. This finding is in line with studies including that of Doubeni et al. (2012) who found in their study that the risk of colorectal cancer decreased as the level of education increased. This is also similar to Uthman et al., (2013), who found the same inverse relationship between cancer risk and level of education was prevalent within the literature in their metanalysis of studies about cancer risk and socioeconomic status.

The review of the coefficient however in our study showed that compared with college graduate, there was only a very small difference in the effect between each of the levels of education and participants being college graduates in our population of employer-insured cancer survivors. In other words, while level of education is a significant factor, the effect between the levels was not as great as expected. For example, participants with less than a high school degree, the unstandardized coefficient decreased very slightly ($B = - .656$) when compared to high school graduates ($B = -.558$). We can note that while level of education is statistically significant for this population, the size and strength of the regression coefficient were trivial.

Household Income

The following research question sought to address the relationship between household income as a socioeconomic factor, and cancer health risk in the employer insured cancer survivor population. Researchers have most consistently shown an inverse

relationship between income and cancer health risk (Conway et al., 2015; Hastert et al., 2015; Uthman et al., 2013). Our study demonstrated that there was a significant relationship between household income and cancer health risk in the employer insured cancer survivor population for income between $25,000 and $34,999 ($B = -.309$, $p < .05$) and for income between $35,000 and $49,999 ($B = -.232$, $p < .05$).

The analysis showed that the lowest income bracket of 0-$14,999 had the lowest ACS score (3.28), while the highest household income group of $50,000 or more had the highest ACS score (4.05). These two findings are in agreement with the expectation, based on the literature which shows this inverse relationship between household income and cancer risks. However, the analysis showed that for the middle household income categories, while the mean scores remained between the scores abovementioned, their pattern differed from expectations. Participants with household income between $15,000-$24,999 had a higher ACS mean score (3.74) than participants in the $25,000-$34,999 and $35,000-$49,999 mean scores (3.55 and 3.66 respectively). One possible explanation for these differences may be with the types of cancers within each of these categories, as some studies have also shown that the relationship between level of income and cancer health risk might vary depending on the type of cancers within the groups (Conway et al., 2015).

Race/Ethnicity

The last research question sought to determine the relationship between race/ethnicity as a socioeconomic factor, and cancer health risk in the employer insured cancer survivor group. Cancer rates have historically been higher among non-Hispanic,

blacks than any other race and especially when compared to non-Hispanic, Whites (DeSantis et al., 2016; Desantis et al., 2015; Paxton et al., 2012;). Race/ethnicity was a significant variable in the study only for non-Hispanic blacks (B = -.491, p < .05) when compared to non-Hispanic whites. Also, and as expected non-Hispanics, Blacks had the lowest ACS mean score (3.44). The highest ACS compliance was for non-Hispanic, white population (3.98) within the study. This finding was in line with findings within the literature, such as Paxton et al. (2012), who found that African American women who were cancer survivor were less likely to comply with preventive recommendations such as physical activity and BMI.

Age

Our study revealed that age was only significant for participants over the age of 45 when compared to participants between the ages of 55 and 64, the reference category. Participants who were between 45 and 54 years old scored lower than the reference category indicating a higher risk (B = -.194, p < .05). However, those over the age of 65 scored significantly higher than the reference category (B = .249, p < .05), which translates into a lower risk than their counterpart, based on their compliance with ACS guidelines.

Smoking Status

Smoking status is often associated with SES and (Conway et al., 2015; Haster et al., 2015; Uthman et al., 2012). Our study showed that nonsmokers employer insured survivors had a higher mean score (3.99) than smokers (3.65) in terms of compliance with ACS guidelines for cancer prevention within the selected population. However

smoking status was not a significant factor in our study when comparing smokers to nonsmokers within the employer insured cancer survivor group.

Gender

The mean score for our study revealed that men scored higher (3.97) on the mean score than women (3.95). While studies tend to show that incidences of cancers vary between sexual categories, gender was not statistically significant in our study as we focused on compliance with the ACS guidelines as a measure of cancer risk with the employer insured cancer survivor population.

Limitations of the Study

There were several limitations in this study that deserve to be mentioned. Starting with the source of the data, it is important to note that the study population was selected from the 2013 BRFSS data. While the 2013 BRFSS data is supposed to be nationally representative of the United States, the fact that the data was filtered to only include a fragment of the population that fits within the inclusion frame prevents the findings to be generalizable to the entire population. Another limitation of the study was that there were only three main socioeconomic variables used in the study. Socioeconomic status encompasses a very wide array of factors, so the use of more variables may have provided a more comprehensive overview of the relationship in question. Another limitation of the study was that I used the ACS Guidelines on Nutrition and Physical Activity for Cancer Prevention as a tool to ascertain cancer risk. A more standardized tool to measure cancer risk may have provided more conclusive findings. Last but not least, the study was limited because it suggested that all cancers were undifferentiable.

Studies have suggested that different types of cancers may occur at different rates, and depending on socioeconomic status (Conway et al., 2015; Hastert et al., 2015). Studies on cancer risks based on specific types of cancers within the employer insured cancer survivor population may provide valuable information for the development of cancer prevention programs. Another limitation of the study is that the R square only explains 00.38 of the variability of the response around the mean. It is important to find the better predictor that will help determine the cancer risk.

Regarding generalizing the findings, the external validity which address the generalizability can be ensured if the characteristics of the sample population in this study is similar to the general population giving the same setting (Frankfort-Nachmias & Nachmias, 2008). The internal validity was determined in this study when changes within the independent variables, notably the socioeconomic status of participants showed changes in the dependent variable, in this case cancer health risks (Frankfort-Nachmias & Nachmias, 2008).

Recommendations

There are a few recommendations that can be made based on this study. One suggestion would be to develop a more standardized instrument to increase the validity and reliability of the findings as they related to cancer health risk within the employer insured cancer survivor population. Another recommendation would be to conduct a long-term prospective study to include participants who eventually develop cancer based on the compliance with the ACS guidelines. One way to enhance the study would be to ascertain the cancer risks based on specific types of cancers, and to look at more

socioeconomic variables within the employer insured cancer survivor population. For example, Homan, Kayani, and Yun (2016) found that breast cancer survivors were more likely to engage in preventive behaviors such as cancer screenings than other women who survived other types of cancers.

Implications

There are implications for practice, policy, future research, and social change within this study. As cancer continues to be a major public health concern, the study looked at a specific segment of the population that is not much studied within the literature, notably the employer insured cancer survivor population. Populations that engage in recommended behaviors are less likely to develop cancer (Doubeni et al., 2012). However, the literature showed that populations do not necessarily comply with recommended behaviors for illness prevention. One assumption from our study was that differences between people socioeconomic characteristics within the workforce may be factors that affect whether they engaged or not in preventive behaviors.

Implicaton for Practice

In terms of implications for practice, this study provided an insight into how some socioeconomic differences may be significant in terms of cancer risk within a specific group. While cancer survivors within the population may comply with some of the recommendations for cancer prevention, they do not meet all of the guidelines; furthermore, their risk level varied within their socioeconomic status in this study. As suggested in the review of the literature, a significant number of employer and insurance health programs for employees use a uniform approach in the development of worksite

health improvement programs which may not take into consideration significant differences between the participants in the workforce. The information from our study can serve as a reference, or guideline for practice to consider the development of cancer prevention programs, as well as chronic illness prevention programs that are more specifically tailored to the individual within the population for whom these programs are intended to serve. Another implication for management may be emphasizing the need to take into consideration the educational level of employees within the workforce in the development of prevention programs. As described in the study, participants with less than high school were at 2 times a greater risk when compared to participants with incomes that were less than $50,000.

Implicaton for Policy

Organizational compliance with PPACA includes incorporating measures for health prevention (Claxton et al., 2014; Baird, 2013; James, 2013). While this is part of the current effort to ameliorate healthcare, more is needed to integrate socioeconomic status and health status as part of the public debate when it comes to establishing wellness programs for specific populations within specific environments. Based on this study, one implication for policy would be to incorporate within policies some guidance that programs are tailored to individuals' specific socioeconomic status and health status. In addition, health practitioners can influence policymakers to enhance requirements so that such programs strongly consider socioeconomic disparities and health status within specific populations in the development and administration of workplace health improvement programs (Golden, McLeroy, Green, Earp, & Lieberman, 2015).

Implicaton for Future Research

While this study looked at specific socioeconomic determinants to ascertain the relationship between cancer health risks and socioeconomic status within the employer insured cancer survivor group, there are implications for future research. Studies for worksite programs may need to investigate patterns of other chronic illnesses to identify their relationship to socioeconomic status. In addition, while we only focused on education, household income, and race/ethnicity, there may be a need to identify the most relevant socioeconomic factors that may be most relevant for this type of studies.

Implicaton for Social Change

In terms of social change, this study expands or contributes to our body of knowledge because employer-sponsored health services programs are increasingly looking to improve the health and well-being of their employees through proven measures. Employers, as well as employees, are interested in programs that are most effective at producing desirable outcomes for their employees and consequently for the workforce, and through it, society. Given the diversity of the American workforce, programs that effectively take into consideration difference, such as the ones outlined in this study, in the development of health and wellness improvement programs, are more likely to produce positive outcomes for the vested parties, notably, the employees, their families, and the employers. Consequently, more emphasis needs to be placed on tailoring worksite programs to socioeconomic status of participants.

Conclusion

This study investigated the relationship between socioeconomic status and cancer health risk within the employer insured cancer survivor population through the social-ecological model. The results of this study should be interpreted carefully as several factors would need to be taken into consideration to increase the validity and reliability of the findings. As mentioned a better instrument may need to be developed to more accurately ascertain the relationship and make more reliable and valid interpretations. Still, this study is probably the first of its kind to take a closer look at socioeconomic diversity, particularly level of education, household income, and race/ethnicity, as it pertains to cancer health risks within this segment of the population: the employer insured cancer survivor population.

While some studies showed that cancer diagnosis might lead to better compliance with recommendation for cancer prevention, this study showed that this may not always be the case (Bluethmann et al., 2015). As described in the findings of the study, level of education was inversely related to cancer risk for the study population. In terms of level of income, we found that not all household income level were statistically significant in relation to cancer health risk. Race/ethnicity was only significant for non-Hispanic blacks when compared to non-Hispanic whites.

The analysis revealed some unexpected results such as the lack of statistical significance for certain categorical socioeconomic variables in relation to cancer risk. This was a reminder that while there may be some significant differences, some of the differences may not necessarily impact the outcome of cancer risk. However, this finding

hinted at the importance of testing various socioeconomic factors and categorical variables for a more thorough assessment.

More studies are needed to have a better understanding of the relationship between socioeconomic factors and cancer health risks. In addition, more efforts are needed to investigate segments of the population such as the group within this study so that their socioeconomic characteristics are not overlooked in the development of programs. Taking all of these factors into consideration in the development of cancer prevention programs may lead to more effective outcomes within efforts to address chronic illnesses, such as cancer, in the employer insured population.

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Appendix A: Social Ecological Levels

Social Ecological Levels according to McLeroy, Bibeau, Steckler, and Glanz (1988).

Level	**Description**
Intrapersonal factors	Characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, etc. This includes the developmental history of the individual.
Interpersonal processes and primary groups	Formal and informal social network and social support systems, including the family, work group, and friendship networks.
Institutional factors	Social institutions with organizational characteristics, and formal (and informal) rules and regulations for operation
Community factors	Relationship among organizations, institutions, and informal networks within defined boundaries.
Public Policy	Local, state, and national laws and policies.

Appendix B: Variable Descriptions

Type of variable	Variable	Question	BRFSS Possible answers	Level of Measurement
Independent	**Level of education**, (Core questions, Section 8, 8.8)	What is the highest grade or year of school you completed?	1. Never attended school or only attended kindergarten	Ordinal
			2. Grades 1 through 8 (Elementary)	
			3. Grades 9 through 11 (Some high school)	
			4. Grade 12 or GED (High school graduate)	
			5. College 1 year to 3 years (Some college or technical school)	
			6. College 4 years or more (College graduate)	
			7. Refused	
	Household Income: Household income (Core questions, Section 8, 8.10)	Is your Household income from all sources:		Ordinal
		1. Less than $10,000 If "no," code 02	Yes	
			No	
		2. Less than $15,000 If "no," code 03; if "yes," ask 01 ($10,000 to less than $15,000)	Yes	
			No	

		3. Less than $20,000 If "no," code 04; if "yes," ask 02 ($15,000 to less than $20,000)	Yes	
			No	
		4. Less than $25,000 If "no," ask 05; if "yes," ask 03 ($20,000 to less than $25,000)	Yes	
			No	
		5. Less than $35,000 If "no," ask 06 ($25,000 to less than $35,000)	Yes	
			No	
		6. Less than $50,000 If "no," ask 07 ($35,000 to less than $50,000)	Yes	
			No	
		7. Less than $75,000 If "no," code 08 ($50,000 to less than $75,000)	Yes	
			No	
		8. $75,000 or more	Yes	
			No	
		9. Don't know	Don't know	
		10. Refused	Refused	

	Household Income: Marital Status (Core questions, Section 8, 8.5)	Are you?		
		1. Married	Married	Nominal
		2. Divorced	Divorced	
		3. Widowed	Widowed	
		4. Separate	Separate	
		5. Never married	Never married	
		6. A member of an unmarried couple	A member of an unmarried couple	
		7. Refused	Refused	
	Household Income: Number of Children (Core questions, Section 8, 8.7)	How many children less than 18 years of age live in your household?	Number of Children	Ordinal
			None	
			Refused	
	Health insurance status (Optional BRFSS Module, Module 4, 2)	Are you currently covered by any of the following types of health insurance or health coverage plans?		Ordinal
		1. Your employer	Your employer	
		2. Someone else's employer	Someone else's employer	
		3. A plan that you or someone else	A plan that you or someone else	
		4. buys on your own	buys on your own	

		5. Medicaid or Medical Assistance [or substitute state program name]	Medicaid or Medical Assistance [or substitute state program name]	
		6. The military, CHAMPUS, or the VA [or CHAMP-VA]	The military, CHAMPUS, or the VA [or CHAMP-VA]	
		7. The Indian Health Service [or the Alaska Native Health Service]	The Indian Health Service [or the Alaska Native Health Service]	
		8. Some other source	Some other source	
		9. None	None	
		10. Don't know/Not sure	Don't know/Not sure	
		11. Refused	Refused	
	Cancer (Core questions, Section 7, 7.6,7.7)	Has a doctor, nurse, or other health professional EVER told you that you had any of the following-	Yes, No, Don't know, Refused	
		7.6 you had skin cancer	Yes, No, Don't know, Refused	
		7.7 you had any other types of cancer	Yes, No, Don't know, Refused	

Dependent	**Behavior Risk for Cancer:** Alcohol consumption (Core questions, Section 10, 10.1-10.4)	During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor?	1 _ _ Days per week 2 _ _ Days in past 30 days 8 8 8 No drinks in past 30 days 7 7 7 Don't know / Not sure 9 9 9 Refused	
		One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. During the past 30 days, on the days when you drank, about how many drinks did you drink on the average?	_ _ Number of drinks 7 7 Don't know / Not sure 9 9 Refused	
		Considering all types of alcoholic beverages, how many times during the past 30 days did you have **X [CATI X = 5 for men, X = 4 for women]**	_ _ Number of times 8 8 None 7 7 Don't know / Not sure 9 9 Refused	

		or more drinks on an occasion		
		During the past 30 days, what is the largest number of drinks you had on any occasion?	_ _ Number of drinks 7 7 Don't know / Not sure 9 9 Refused	
	Behavior Risk for Cancer: Nutrition (Core questions, Section 11, 11.1-11.6)	During the past month, how many times per day, week or month did you drink 100% PURE fruit juices? Do not include fruit-flavored drinks with added sugar or fruit juice you made at home and added sugar to. Only include 100% juice.	1 _ _ Per day 2 _ _ Per week 3 _ _ Per month 5 5 5 Never 7 7 7 Don't know / Not sure 9 9 9 Refused	
		During the past month, not counting juice, how many times per day, week, or month did you eat fruit? Count fresh, frozen, or canned fruit	1 _ _ Per day 2 _ _ Per week 3 _ _ Per month 5 5 5 Never 7 7 7 Don't know / Not sure 9 9 9 Refused	
		During the past month, how many times per day, week, or	1 _ _ Per day 2 _ _ Per week 3 _ _ Per month 5 5 5 Never	

		month did you eat cooked or canned beans, such as refried, baked, black, garbanzo beans, beans in soup, soybeans, edamame, tofu or lentils. Do NOT include long green beans.	7 7 7 Don't know / Not sure 9 9 9 Refused	
		During the past month, how many times per day, week, or month did you eat dark green vegetables for example broccoli or dark leafy greens including romaine, chard, collard greens or spinach?	1 _ _ Per day 2 _ _ Per week 3 _ _ Per month 5 5 5 Never 7 7 7 Don't know / Not sure 9 9 9 Refused	
		During the past month, how many times per day, week, or month did you eat orange-colored vegetables such as sweet potatoes, pumpkin,	1 _ _ Per day 2 _ _ Per week 3 _ _ Per month 5 5 5 Never 7 7 7 Don't know / Not sure 9 9 9 Refused	

		winter squash, or carrots?		
		Not counting what you just told me about, during the past month, about how many times per day, week, or month did you eat OTHER vegetables? Examples of other vegetables include tomatoes, tomato juice or V-8 juice, corn, eggplant, peas, lettuce, cabbage, and white potatoes that are not fried such as baked or mashed potatoes.	1 _ _ Per day 2 _ _ Per week 3 _ _ Per month 5 5 5 Never 7 7 7 Don't know / Not sure 9 9 9 Refused	
	Behavior Risk for Cancer: Physical Activity (Core questions, Section 12, 12.1-12.8)	During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?	Yes, No, Don't know/not sure, Refused	

		What type of physical activity or exercise did you spend the most time doing during the past month?	_ _ (Specify) 7 7 Don't know / Not Sure 9 9 Refused	
		How many times per week or per month did you take part in this activity during the past month?	1_ _ Times per week 2_ _ Times per month 7 7 7 Don't know / Not sure 9 9 9 Refused	
		And when you took part in this activity, for how many minutes or hours did you usually keep at it?	_:_ _ Hours and minutes 7 7 7 Don't know / Not sure 9 9 9 Refused	
		What other type of physical activity gave you the next most exercise during the past month?	_ _ (Specify) 8 8 No other activity 7 7 Don't know / Not Sure 9 9 Refused	
		How many times per week or per month did you take part in this activity during the past month?	1_ _ Times per week 2_ _ Times per month 7 7 7 Don't know / Not sure 9 9 9 Refused	
		And when you took part in this activity,	_:_ _ Hours and minutes	

		for how many minutes or hours did you usually keep at it?	7 7 7 Don't know / Not sure 9 9 9 Refused	
		During the past month, how many times per week or per month did you do physical activities or exercises to STRENGTHEN your muscles? Do NOT count aerobic activities like walking, running, or bicycling. Count activities using your own body weight like yoga, sit-ups or push-ups and those using weight machines, free weights, or elastic bands.	1_ _ Times per week 2_ _ Times per month 8 8 8 Never 7 7 7 Don't know / Not sure 9 9 9 Refused	
	Behavior Risk for Cancer: Weight (for BMI) (Core questions, Section 8, 8.11)	About how much do you weigh without shoes?	_ _ _ _ Weight *(pounds/kilograms)* 7 7 7 7 Don't know / Not sure 9 9 9 9 Refused	

	Behavior Risk for Cancer: Height (for BMI) (Core questions, Section 8, 8.12)	About how tall are you without shoes?	_ _ / _ _ Height *(f t / inches/meters/centimeters)* 7 7/ 7 7 Don't know / Not sure 9 9/ 9 9 Refused	