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Benefits of a Flexitarian Diet: Educating College Students of Lifestyle Approaches to Reduce the Risk of Developing Breast and Prostate Cancer

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BENEFITS OF A FLEXITARIAN DIET: EDUCATING COLLEGE STUDENTS OF LIFESTYLE APPROACHES TO REDUCE THE RISK OF DEVELOPING BREAST AND PROSTATE CANCER

A Capstone Experience/Thesis Project

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The Degree Bachelor of Sciences with

Honors College Graduate Distinction at Western Kentucky University

By

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ABSTRACT

Practicing the Flexitarian diet, a plant-based diet, in conjunction with physical activity can promote a lifestyle consistent with the American Cancer Society's recommendations for reducing risks of breast and prostate cancer (*American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention*, 2015)

College students were assessed on knowledge of the relationship between diet and cancer risk prior to and after accessing information on the American Institute of Cancer Research site or the WKU Flexitarian Pinterest Page.

Participants were recruited from the National Panhellenic and Interfraternity Council memberships and the International students at Western Kentucky University. Participants completed a three-phase survey to identify current lifestyle and willingness to modify lifestyle behaviors related to nutrition and cancer.

A majority of participants that accessed The WKU Flexitarian Pinterest page or the American Institute of Cancer Research Diet and Cancer Page reported willingness to make a least one lifestyle modification related to diet and cancer risk (91% of participants who accessed the WKU Flexitarian Pinterest Page and 93% of participants that accessed the American Institute of Cancer Research Page).

Keywords: Flexitarian Diet, Breast Cancer, Prostate Cancer, College Students

DEDICATION

I dedicate this to my Grandmother, Pat Ridgeway, who fought breast cancer with grace and persistence.

Also, Hayden Hickey, who sees the best in me.

ACKNOWLEDGEMENTS

This project would never have been possible without the endless encouragement of my family and friends. I would not be the person that I am today without their support.

Thank you to Dr. Cook-Newell for working tirelessly to make this project possible and believing in me when I did not think this was possible. Also, thank you to Dr. Payne-Emerson and Dr. Lartey for their wisdom and time.

Thank you to the Honors College for the hundreds of opportunities that it has given me. I would not have written a thesis or been able to travel the world without their generosity and support.

Thank you to the Faculty Undergraduate Student Engagement Grant for supporting this project and allowing me to travel to present it.

Finally, thank you to the lady on the plane who gave me the idea to study nutrition's role in cancer prevention and treatment. I know that it was God's hand.

VITA

March 13, 1994…….Born Ft. Campbell, TN

May 2012……...….Graduated Hopkinsville High School

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August 2016……..……....University of Kentucky Hospital Dietetic Intern

AREA OF STUDY

Major: Hospitality Management and Dietetics

Concentration: Nutrition and Dietetics

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INTRODUCTION

Cancer is the second leading cause of death in the United States surpassed only by heart disease. [1] In 2015, the American Cancer Society predicted 1,658,370 Americans would be diagnosed with one or more types of cancer; 589,430 Americans will succumb to its complications and effects, resulting in approximately 1,620 American deaths per day from cancer.

Cancer, an unregulated proliferation of abnormal cells characterized by uncontrolled mutations is a multistep process involving mutation of healthy cells, which undergo hyperplasia and dysplasia before becoming cancerous. Hyperplasia is increased organ or tissue cell number with normal appearance. Dysplasia cells look abnormal but are not considered cancer cells. [2]

Tumors, groups of cancer cells, are classified as benign or malignant. A benign tumor appearing as a wart or a skin tag does not have the potential to invade surrounding tissue. A malignant tumor has the ability to invade surrounding tissue and spread throughout the body. Metastasis, the invasion and spread of malignant tissue, increases the chance of mortality if not treated. [3]

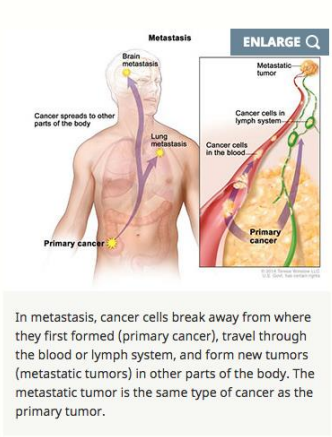


Figure 1… Metastasis

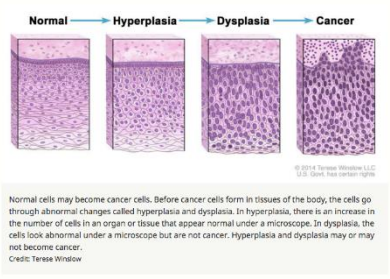


Figure 2… Life cycle of cancerous cell

Five main categories of cancer cells exist: carcinoma, sarcoma, leukemia, lymphoma, and myeloma. Carcinoma, cancer of the epithelial tissue, may present on the skin or in the lining of the organs or body cavities. Carcinomas account for 80 to 85% of all cancers in the United States and the United Kingdom, respectively. [2,4] Sarcoma, cancer of the connective tissue, occurs in bones, cartilage, tendons, and fibrous tissue. Leukemia, an excess of white blood cells in bone marrow, inhibits the white blood cells ability to fight off infection. Lymphoma, cancer of the lymphatic system, includes cancer of tubes and glands, which regulate fluids and fight infection. Myeloma, cancer of plasma cells, white blood cells formed in bone marrow to fight infection, results when cells grow out of control and become cancerous. If the plasma cells are not working properly and grow at an uncontrolled rate, infection cannot be prevented, and again, the cells have the potential to form a tumor. [5]

A wide range of environmental factors, referred to as carcinogens, can cause cancer. Carcinogens include lifestyle factors, exposures to the environment, certain types of medical treatment, workplace and household exposures, and pollution. [6] Carcinogens are related to a variety of or linked to specific cancers. The American Cancer Society

lists nutrition, tobacco use, physical activity, medical treatments, workplace and household exposures, and pollution as the major factors. The effects of carcinogens, (e.g, over exposure to ultraviolent rays can cause skin cancer, frequent tobacco use is likely to cause lung cancer) are diverse.

With over 100 types of known cancers, diagnosis can be a long and complex process that requires series of medical tests and professional evaluation of the patient. A physical examination is necessary to determine if cancer is present or if there is an underlying medical condition creating symptoms similar to cancer. A family medical history identifies genetic predispositions to cancer while lab tests, such blood, urine, or other body fluids, determine prevalence of cancer biomarkers. Diagnosis may require a series of images, such as ultrasound, MRI, or a PET and/or CT scan. A biopsy, performed by needle, endoscope, or surgery, obtains a sample of cancer cells to determine if it is malignant. [7] Upon diagnosis, treatment options ranging from slightly invasive to life-altering, will be determined by the patient and medical team. A combination of the major treatment options, surgery, chemotherapy, and radiation, is often recommended for effective and expeditious results. The major treatments have a wide range of duration, i.e., surgery could be a one-day event or chemotherapy may last for months or years. The patient and the medical team will determine treatment recommendations based on the needs of the patient and the severity of the diagnosis.

CHAPTER 2

BREAST AND PROSTATE CANCER

Breast cancer, the most common cancer among women and second most common cause of death among white, black, Asian/Pacific Islander, and American Indian/Alaska Native women, was diagnosed in 224,147 women and 2,2125 men in the United States in 2012. [9] It ranked first in the top ten most common cancers for all races in the US population as of 2012. [10] The possibility that breast cancer will be the cause of a woman's death is around 3%. However, breast cancer research and preventative procedures have resulted in detection and treatment with 2.8 million breast cancer survivors in the US alone.[11,12]

Breast cancer cells, malignant cells in the breast, are able to invade surrounding tissue, leading to metastasis. Breast cancer can be metastatic at time of diagnosis or following treatment. Metastasis is likely in the breast, because the breast and surrounding tissue contain lymph vessels. The lymphatic system carries lymph to fight infection in other parts of the body. Cancer cells enter into the lymph system and can travel through the bloodstream and spread to other organs and parts of the body. Cancerous cells are most likely to develop in the milk-producing ducts and glands. [13]

Of the many risk factors for breast cancer certain factors can be avoided, while others, such as age or family history cannot be modified. Risk factors include gender, age, genetics, family history, personal history, race, and ethnicity. Breast cancer is 100 times more common in women than men, and risk increases with age; two of three invasive breast cancers are found in women over 55 years of age. White women are more likely to develop breast cancer, while African-American women have a higher mortality rate due to breast cancer. Delayed or lack of childbearing increases risk, as do oral contraceptives, while breastfeeding could lower risks. Mutations in the genes, BRCA1 and BRCA2, are responsible for 5 to 10% of all breast cancers. BRCA1 and BRAC2 are human genes that produce tumor suppressor protein and help to repair damage to DNA. Therefore, these genes are important for stability proper function of the cell's genetic material. If the genes are not working properly, damage to the cell may not be repaired properly.[14]

Lifestyle factors associated with breast cancer include alcohol intake, being overweight or obesity, and a low level of physical activity. [15]

Prostate cancer, the most common cancer site among American men in 2012, was diagnosed in 177,489 men. Statistics indicate 1 in 39 men will die of prostate cancer.[16] Prostate cancer is the most common cancer site in all races and second leading cause of death in men; lung cancer ranks first. [10]

Prostate cancer, found only in men, develops when cells begin to grow uncontrollably in the prostate gland, which is located below the bladder and in front of the rectum. [17] Growth may be slow and symptoms not exhibited early on in the disease state, with the cancer detected after death caused by another disease or condition. [18]

Almost all prostate cancer diagnoses are adenocarcinomas - cells that make and release mucus. Four out of five prostate cancers are local stage or early stage prostate cancer. Advanced prostate cancer is able to metastasize through the blood or lymphatic system. Approximately 80% of advanced prostate cancer spread to the bones or lymph nodes. Patients with distant stage prostate cancer, or cancer that has spread to the bones or lymph nodes, have a five-year survival rate of 28% compared to a 100% survival rate for local or regional stage prostate cancer.[19]

Prostate cancer risk is increased in individuals when an immediate family member is diagnosed with prostate cancer. The risk also greatly increases for men who live in the US compared to other countries. Lifestyle factors, such as smoking, above normal Body Mass Index, high calcium intake, or sedentary lifestyle, increase the risk for aggressive prostate cancer. Non-modifiable risks include: African American race, tall height, or a family history of prostate cancer. There have been many studies that have tested the relationship between increased calcium intake and greater prostate cancer risk. Several of the studies do indicate increased risk of prostate cancer with increased calcium intake. However, the effect of calcium on prostate cancer risk is still not clear.[20-23]

Risk factors are different in aggressive prostate cancers compared to slow-growing cancers. [24]

CHAPTER 3

DIET AND CANCER RISK

According to the World Cancer Research Fund, 20% of all cancers are caused by modifiable factors: diet, physical activity, and tobacco. This organization's analysis of global research indicates about a third of the most common cancers can be prevented through a nutritious, i.e., healthy, diet, maintaining a healthy weight, and engaging in regular physical activity. Specific recommendations of the World Cancer Research Fund include body fat levels; physical activity; food and beverages that promote weight gain; plant and animal foods; alcoholic drinks; food preservation, processing and preparation; dietary supplements; and breastfeeding.

The American Cancer Society (ACS) Guidelines on Nutrition and Physical Activity for Cancer Prevention state specific and detailed recommendations for individual and community action. The recommendations for Individual Choice include achieve and maintain a healthy weight throughout life; adopt a physically active lifestyle; and consume a healthy diet with an emphasis on plant foods. For the Community Action recommendations public, private and community collaborative involvement is advised. These guidelines address the numerous ways to reduce the risk of many cancers with

specific recommendations for servings of food groups, limiting consumption of alcoholic beverages, food additives and contaminants, food processing, and food safety.

In addition, the content includes diet and physical activity factors that affect risks for select cancers, with particular interest in breast and prostate cancer guidelines. [25]

Fruits and Vegetables

Fruits and vegetables are nutrient dense, providing vitamins and minerals with minimal calories and fat. Rich in bioactive substances, such as terpenes, sterols, indoles, and phenols that may help prevent some types of cancer in epidemiological studies. [26,27,28] The ACS recommends at least 2 ½ cups of fruits and vegetables each day. In addition, fruits and vegetables may reduce cancer risk through indirect effects on energy intake and body weight. It is important to eat a variety of fruits and vegetables to obtain the vitamins, minerals and phytonutrients that each has to offer.

Many fruits and vegetables contain antioxidants, which have been studied in their role in reducing the amount of free-radical damage that can contribute to the damage of normal, healthy cells. Examples of antioxidants include lycopene in tomatoes, beta-carotene in yellow and orange vegetables, and vitamin C in citrus fruits. [29] However, many studies have found that supplementation of antioxidants and vitamins do not contribute to reducing the risk of cancers in human subjects and could possibly increase cancer risk. [25] This emphasizes the necessity to obtain nutrients from foods, rather than supplements. Whole foods contain other phytochemicals that are not typically included in supplements, such as lycopene, beta-carotene and vitamin C commonly are. Therefore, the benefit of the food can't be isolated to a supplement.

While the research is unclear about the role of antioxidant supplementation, it is known that cruciferous vegetables in particular have properties that potentially reduce cancer risk. Cruciferous vegetables contain carotenoids, dietary fiber, vitamins, folate,

and minerals. During digestion of cruciferous vegetables, indoles and isothiocynates are produced which have been found to reduce cancer production in animal subjects by protecting DNA from damage and inactivating cancer cells. Cruciferous vegetables include, broccoli, cauliflower, bok choy, and kale. [30]

Whole Grains

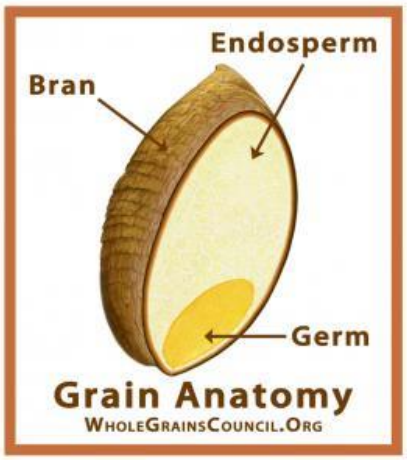


Figure 3…Anatomy of a Whole Grain

Grains such as wheat, rice, barley, and oats, and foods made from them, contribute to the overall healthy diet. Whole-grain foods, made from the entire grain seed, are lower in caloric density than refined grain counterparts and can contribute to maintaining energy balance.[31] Using the entire grain reduces processing and refining, retains dietary fiber adding bulk to the diet and promotes satiety. Diets high in fiber allow the body to increase waste and rid the body of toxins while decreasing transit time reducing risk of cancer.

The influence of fiber on cancer risk has not been substantiated, however, prospective studies indicate fiber intake from foods is associated with a reduced risk of a variety of cancers. Aune et al., found an inverse association between dietary fiber and

breast cancer risk. [32] However, a meta-analysis investigating the relationship between dietary fiber and prostate cancer risk found no association. [33] Based on evolving evidence, consuming high-fiber foods such as beans and whole-grain breads, cereals, rice, and pasta is recommended and preferable to fiber supplements. The evidence implies increased whole grains and dietary fiber contribute to a healthful diet, which leads to a healthy weight, but may not be directly related to reducing cancer risk

Meats

The well-substantiated associations between red meat and processed meat intake with cancer risk led to the ACS guidelines to limit consumption of red and processed meats. For practical purposes, there are three meat categories: 1) white meat – poultry 2) red meat - beef, lamb, veal, or pork and 3) processed meat - bacon, sausage, and deli meats. Factors that may increase the risk of cancer associated with meat are the fat content in meat and the preparation process. In keeping with ACS guidelines consuming meat in smaller portions and as a side dish or flavor enhancer rather than the focus of a meal is one-step in achieving and maintaining a healthy weight. Plant protein may be a healthier option as it is rich in biologically active constituents and nutrients that may protect against cancer.

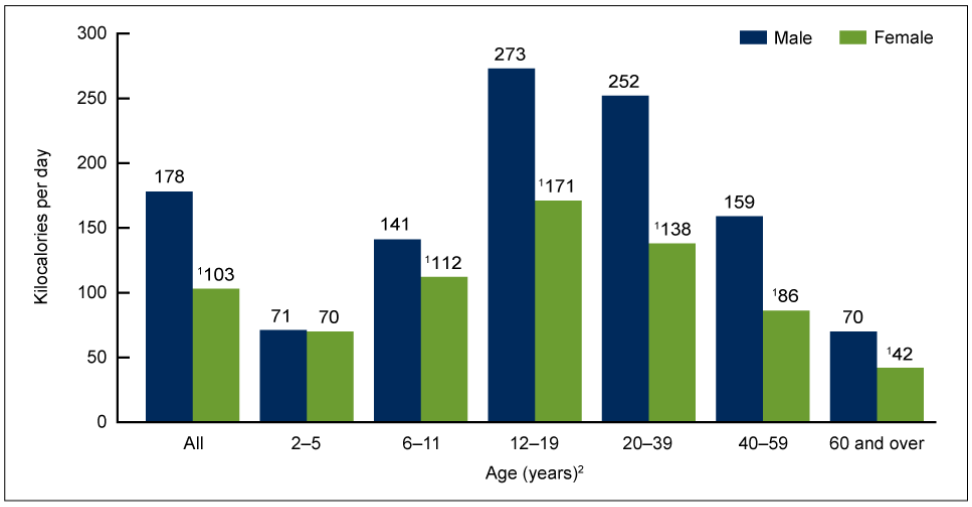
Many epidemiologic studies have reported a small but significant association between high intakes of processed meats and red meats that increase cancer incidence and mortality as well as death from other causes.[34,35] Increased cancer risk is associated with the processing and cooking processes. When meat is cured, nitrates and nitrites are produced. When consumed in large amounts these chemicals increase cancer risk. The

cooking method is important when considering cancer risk as high temperatures form heterocyclic amines and polycyclic aromatic hydrocarbons in the muscle of meat. These compounds can cause DNA mutation contributing to increased damage to a normal, healthy cell. Limiting processed meats and modifying high heat cooking methods, such as chargrilling, frying, and curing is important in reducing cancer risk. [36]

There many studies have tested the relationship between red and processed meat consumption and breast and prostate cancer risk. These studies have found that there is not an independent association between intake of red and processed meat of breast cancer or prostate cancer. However, this association should be tested further for other potential mediators. [37,38]

Sugary Drinks and Alcohol

Figure 1. Mean kilocalories from sugar drinks for ages 2 and over: United States, 2005–2008



1Significantly different from males.
2Significant quadratic trend for both males and females.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2005–2008.

Figure 4… Soda Intake Among Americans CDC

Trends indicate the largest percentage of calories in the American diet comes from foods high in fat, added sugar, and refined grain products. According to the CDC,

sugary drinks contribute an average of 179 kilocalories per day in the diet of American men and an average of 103 kilocalories per day in the diet of American women.[39] Consumption of sugary drinks, such as sodas, can increase the risk for breast and prostate cancer as a result of weight gain. Increased body weight and adult weight gain are associated with an increased risk of breast cancer among postmenopausal but not premenopausal women. [25] In a study of African American and European American women increased energy-dense food and sugary drinks were associated with breast cancer risk.[40] The ACS guidelines recommend limiting the amount of sugary beverages, which add little nutrient value and contribute to excess caloric intake, to avoid potential weight gain as well as reduce the risk for other co-morbidities, such as type 2 diabetes. In addition, consuming a varied diet that emphasizes plant foods may help to displace calorie-dense foods.

Studies in the early 1980s consistently reported associations between alcohol consumption and breast cancer risk. Today, alcohol intake is recognized as one of the behaviors associated with increased breast cancer risk. When alcohol is metabolized it releases acetaldehyde, a toxic compound that has the potential to damage DNA in a normal, healthy cell and reduce the absorption of cancer-reducing nutrients such as vitamins and minerals.[41] Alcohol increases the amount of estrogen in the body, which in turn increases the risk for breast cancer. In fact, one study found for every 10 grams over 45 grams of alcohol consumed per day breast cancer risk increased by 7.1% compared to abstainers.[42] To reduce the risk of breast cancer it is important to reduce the amount of alcohol or eliminate it from the diet. The National Institute on Alcohol Abuse and Alcoholism defines a standard drink as a 12 oz. beer or cooler, 8 oz. of malt liquor, 5 oz.

of wine, or 1.5 oz. of distilled spirits. [43] The Dietary Guidelines for Americans and ACS recommend a moderate intake of alcohol, which is defined as one standard drink for women and two standard drinks for men per day.[44]

Physical Activity

Physical activity affects risk in both breast cancer and aggressive forms of prostate cancer. One study found that physical activity has two mechanisms for reducing breast cancer risk in pre and post-menopausal women: it lowers estrogen levels (a causative factor of breast cancer) and controls body weight.[45] A meta-analysis on physical activity and prostate cancer identified a relationship between physical activity and reduced risk of prostate cancer. One possible mechanism for reducing risk may be related to "alteration in hormone levels, immunity, energy balance, insulin-like growth factors, and antioxidant defense mechanisms." [46]

Exercise is important in achievement and maintenance of a healthy body weight. Many studies have been conducted to understand the effects of physical activity on cancer risk. The ACS recommends 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity each week for adults and one hour each day for children and teens. Moderate physical activity is defined as equal to a brisk walk, while vigorous physical activity is defined as increasing the heart rate and working different muscle groups. This recommendation also includes limiting screen time. [25]

Author	Study	Year	Subject	Breast Cancer	Prostate Cancer	Other Cancers	Increase Risk	Decrease Risk
Norat T, Chan D, Lau R, Vieira R[56]	*The Associations Between Food, Nutrition and Physical Activity and the Risk of Breast Cancer*.	2008	Food and Physical Activity	X			X	X
World Cancer Research Fund International[57]	Diet, nutrition, physical activity and prostate cancer.	2011	Food and Physical Activity		X		X	X
Brennan SF, Cantwell MM, Cardwell CR, Velentzis LS, Woodside JV[58]	Dietary patterns and breast cancer risk: a systematic review and meta-analysis	2009	Low-moderate alcohol intake	X				X
Hiatt RA, Bawol RD[59]	Alcoholic beverage consumption and breast cancer incidence.	1964-1972	High alcohol intake	X			X	
Hunter DJ, Spiegelman D, Adami HO, et al.[60]	Cohort studies of fat intake and the risk of breast cancer-a pooled analysis	1976-1993	Fat intake	X			X	
Wright ME, Chang SC, Schatzkin A, et al.[61]	Prospective study of adiposity and weight change in relation to prostate cancer incidence and mortality.	1995-1996	High BMI and mortality		X		X	
Liu Y, Hu F, Li D, et al.[62]	Does physical activity reduce the risk of prostate cancer? A systematic review and meta-analysis.	2011	Physical Activity		X			X
Kirsh VA, Peters U, Mayne ST, et al.[63]	Prospective Study of Fruit and Vegetable Intake and Risk of Prostate Cancer	1993-2001	Fruit and Vegetable intake		X			X

CHAPTER 4

THE FLEXITARIAN DIET

Upon review of the American Cancer Society recommendations, it is evident a plant-based diet with incorporation of physical activity has the potential to be the best method to reduce the risk of developing breast and prostate cancer. However, a vegetarian or vegan diet may be too restrictive for the general population. The flexitarian diet combines two-word "flexible" and "vegetarian" and meets these criteria. [47] The flexitarian diet recommends moderation of processed meat and red meats while emphasizing the importance of consuming a variety of fruits, vegetables, legumes, whole grains, and dairy. [48]

The flexitarian diet is identified as a subset of vegetarianism in which participants are encouraged to take small steps by gradually eliminating meat in the diet.[49] Sustainability, morality, and health benefits are identified as motives for following a plant-based diet. [50,51]

Many research articles on the flexitarian diet focus on teaching health professionals about the benefits of the plant-based diet. [52-53] Research focused on the health effects and perception of a plant-based diet in the general population is minimal with the current research assessing dietitians or nutrition students. There is a paucity of

information on the education or application of a plant-based diet in the general population despite 36% of Americans reporting interest in such. [54]

Author	Study	Year Published	Sustainability	Morality	Health Benefits	Education
Forestell	To eat or not to eat red meat. A closer look at the relationship between restrained eating and vegetarianism in college females	2012			X	
Ratini[49]	Flexitarian Diet Review: Less Meat and Weight Loss?	2016			X	
Tudoran, Fischer, van Trijp, Grunert, Krystallis, & Esbjerg[50]	Overview of consumer trends in food industry.	2012	X	X	X	
Palmer[51]	Nutrients of Concern for Individuals Following a Plant-Based Diet	2014	X	X	X	
Mangels, Messina & Messina[52]	*The dietitian's guide to vegetarian diets*.	2011				
Shah[53]	*A vegetarian eating pattern curriculum to educate registered dietitians and dietetic interns*	2013				X
Sentenac[54]	Research Suggests 36% of Americans Open to Plant-Based Eating	2015			X	X

CHAPTER 5

METHODOLOGY

Approval from the WKU IRB was obtained to conduct research on college students' perception of diet and cancer risk. This study consisted of two surveys through Qualtrics: a preliminary questionnaire with a pre-assessment followed by a post-assessment a week later. The pre and post-assessments asked participants about their willingness to make lifestyle modifications associated with risk for breast and prostate cancer. After completion of the pre-assessment, participants were separated into two groups. The experimental group was instructed to access information on the WKU Flexitarian Pinterest Page while the control group accessed information on the American Institute of Cancer Research website. After one week and review of their respective sites, participants were asked to complete the post-test. The sample group was recruited from the WKU Greek Community and WKU International Students, aged 18 and older. Student Activities and the Office of International Students provided student contact information upon approval from the WKU IRB. Results were analyzed comparing pre- and post- assessments in the control and experimental groups using appropriate statistical analysis. Intent to make lifestyle change(s) was tabulated from written responses.

CHAPTER 6

RESULTS

Table 3 displays demographic information for the Survey 1, Survey 2-A, and Survey 2-B:

Table 3

Gender	**N**	**Female**	**Male**	**Prefer not to answer**
Survey 1	227	83%	16%	1%
Survey 2A-- WKU Flexitarian Pinterest Page	109	81%	19%	0
Survey 2B-- AICR Diet and Cancer Risk Page	105	80%	19%	1%

Country of Origin	**N**	**US**	**Outside of US**
Survey 1	227	99%	1%
Survey 2A-- WKU Flexitarian Pinterest Page	109	95%	5%
Survey 2B-- AICR Diet and Cancer Risk Page	107	96%	4%

Participants were majority female from the United States in all three surveys.

Table 4

Breast or Prostate Cancer in Immediate Family	**N**	**Yes**	**No**	**Unsure**
Survey 1	228	16%	81%	3%
Survey 2A-- WKU Flexitarian Pinterest Page	109	17%	80%	4%
Survey 2B-- AICR Diet and Cancer Risk Page	107	12%	83%	5%

Breast and Prostate Cancer in Extended Family	**N**	**Yes**	**No**	**Unsure**
Survey 1	228	46%	42%	12%
Survey 2A-- WKU Flexitarian Pinterest Page	109	45%	42%	13%
Survey 2B-- AICR Diet and Cancer Risk Page	107	49%	42%	9%

Table 4 indicates the prevalence of breast and prostate cancer in the families of the participants. Many of the participants have extended family that has been diagnosed with either breast or prostate cancer.

Table 5 indicates willingness to make a lifestyle modification if it could reduce the risk for breast and/or prostate cancer:

Table 5

Willingness to eat Fruit or Vegetable daily if it could lower risk	**N**	**Yes**	**No**	**Maybe**
Survey 1	226	90%	1%	9%
Survey 2A-- WKU Flexitarian Pinterest Page	109	93%	0%	7%
Survey 2B-- AICR Diet and Cancer Risk Page	107	97%	0%	3%

Willingness to reduce sugary beverages if it could reduce risk	**N**	**Yes**	**No**	**Maybe**
Survey 1	226	86%	1%	13%
Survey 2A-- WKU Flexitarian Pinterest Page	109	88%	3%	9%
Survey 2B-- AICR Diet and Cancer Risk Page	106	97%	3%	6%

Willingness to reduce alcohol intake if it could reduce risk	**N**	**Yes**	**No**	**Maybe**
Survey 1	225	76%	7%	17%
Survey 2A-- WKU Flexitarian Pinterest Page	109	72%	8%	19%
Survey 2B-- AICR Diet and Cancer Risk Page	107	70%	7%	22%

Willingness to exercise 3-5 a week if it could reduce risk	**N**	**Yes**	**No**	**Maybe**
Survey 1	225	83%	2%	16%
Survey 2A-- WKU Flexitarian Pinterest Page	108	90%	1%	9%
Survey 2B-- AICR Diet and Cancer Risk Page	107	86%	1%	19%

The majority of participates were willing to reduce their intake of sugary beverages and alcohol while also willing to eat fruit or vegetables daily and exercise 3-5 times a week to decrease their risk of breast and prostate cancer.

Table 5 represents the number of participants that are willing to eat a plant-based meal if it could lower their risk for breast and prostate cancer before and after given materials about diet and cancer risk:

Survey 1= 59% of participants indicated willingness to eat a plant-based meal if it could reduce their risk for breast and prostate cancer (N=113)

Survey 2 A&B= 65% of participants indicated willingness to make at least one lifestyle change. (N=140)

Table 6

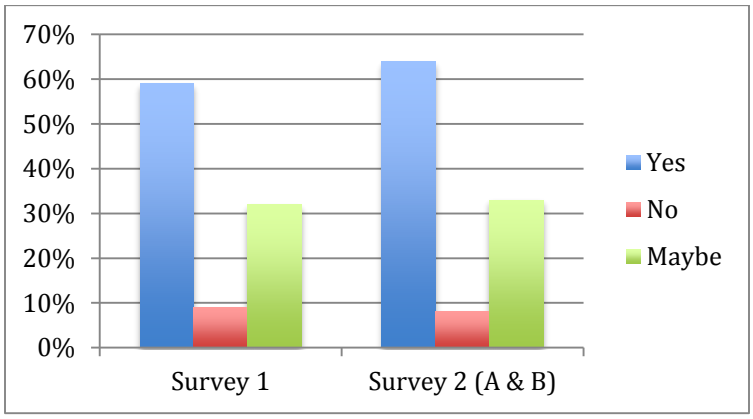
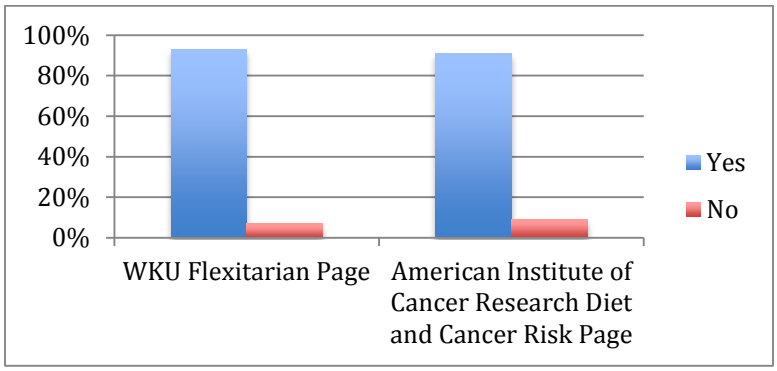


Table 6 identifies participants that are willing to make at least one lifestyle modification to reduce their risk of breast and prostate cancer.

Survey 2-A= 93% of participants indicated willingness to make at least one lifestyle change. (N=101)

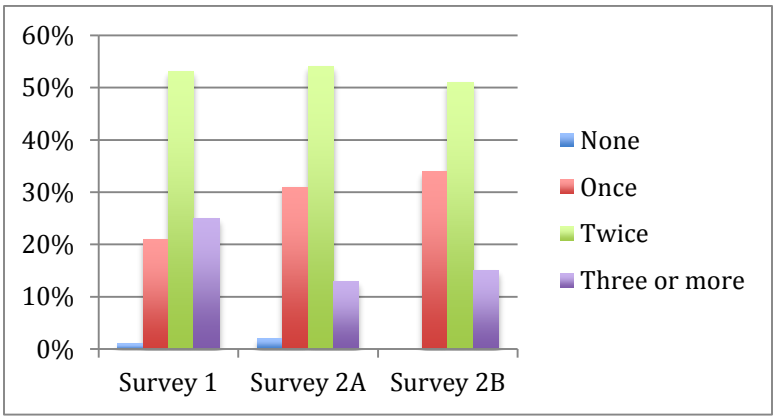
Survey 2-B= 91% of participants indicated willingness to make at least one lifestyle change. (N=97)

Table 7

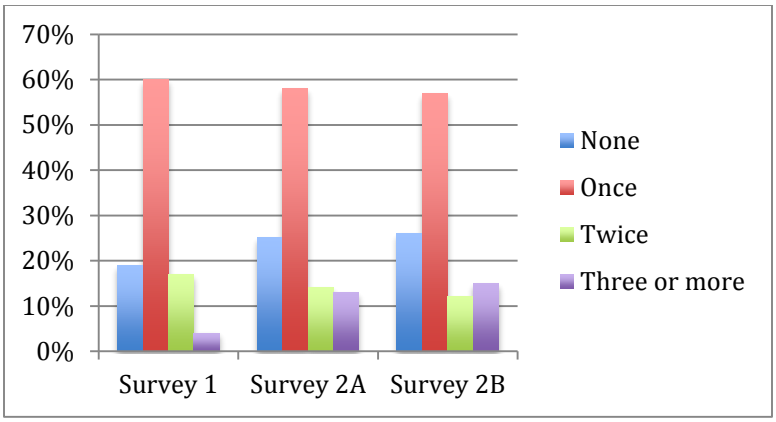


We gathered information that gave us insight on the diet of a college student:

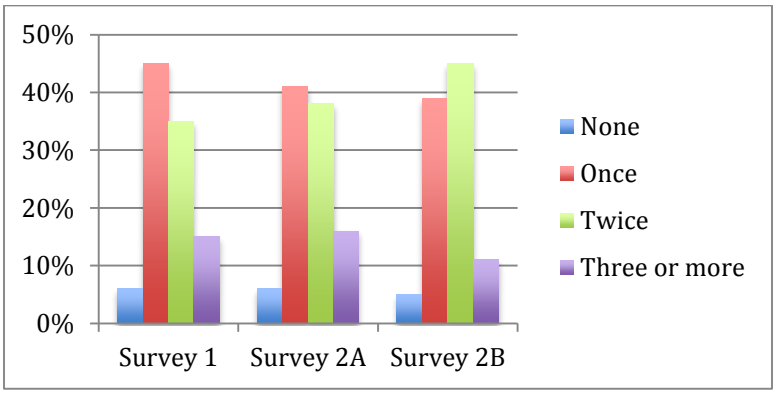
Animal Products—Daily Intake



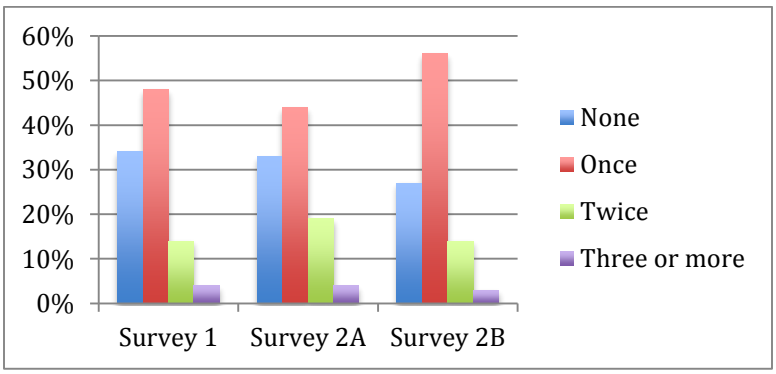
Red or Processed Meats—Daily Intake



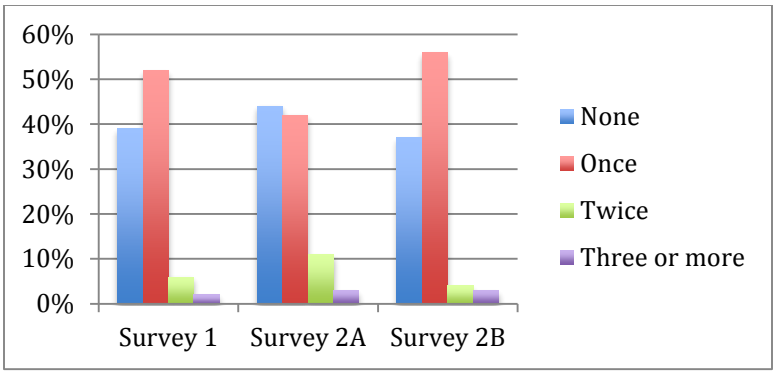
Dairy Products—Daily Intake



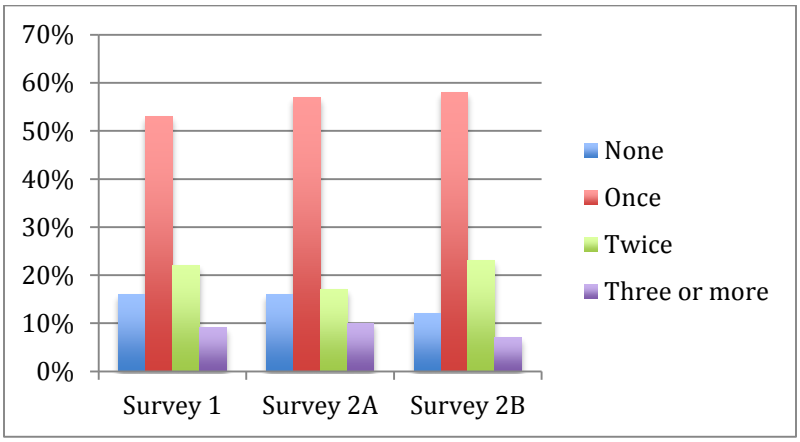
Cruciferous Vegetables—Daily Intake



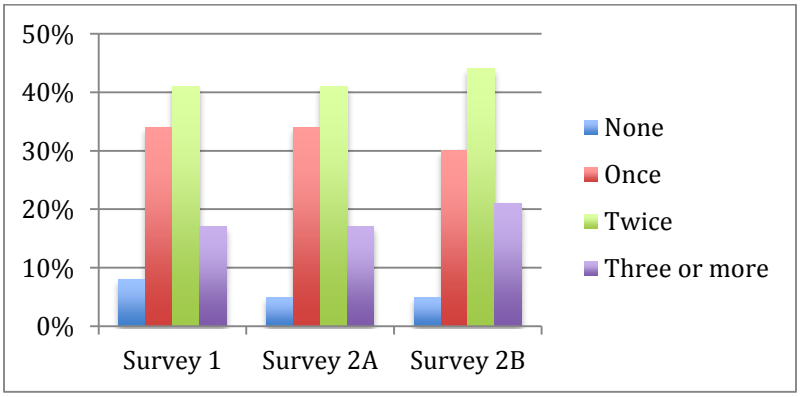
Orange/Yellow Vegetables—Daily Intake



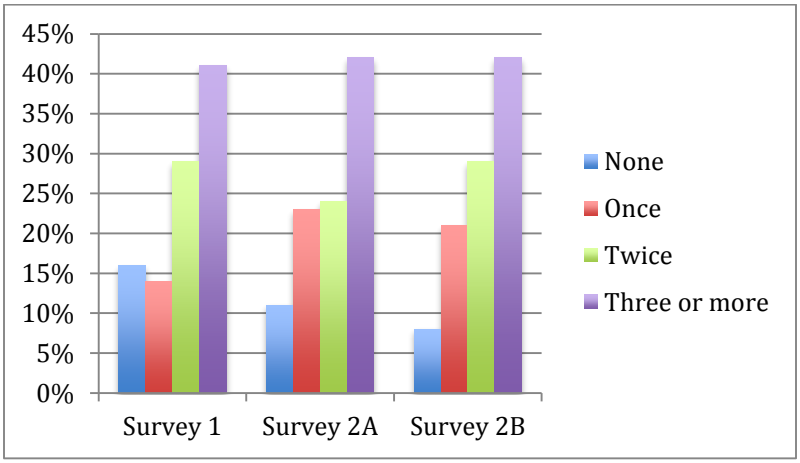
Fruit—Daily Intake



Whole Grains—Daily Intake



Exercise—Weekly Participation



CHAPTER 7

DISCUSSION

The purpose of this study was ~~is~~ to identify the willingness of college students to modify their lifestyle if they knew it could help to protect them from breast and prostate cancer. Outcomes of the research indicate college students are willing to make at least one a lifestyle modification (93% of participants in Survey 2-A and 91% of participants in Survey 2-B). The participants indicated willingness to modify eating habits and exercise if it could lower their risk of breast or prostate cancer. An unexpected result was the number of students who indicated the willingness to increase fruit and vegetable intake and lower soda and alcohol intake if it could reduce their risk of breast and prostate cancer.

Response to the study was robust in the Greek community. Recruitment of participants was enhanced through social networks to encourage participation in the study. However, the international student response was small.

From the results of this study, we can ascertain the daily eating and lifestyle habits of undergraduate students. This information could lead to further studies concerning lifestyle habits. In survey 2A and 2B, the majority of participants indicated an intake of one serving of fruit and one serving of cruciferous vegetables. Participants also reported consuming a total of zero to one serving of orange/yellow vegetables a day.

It would be interesting to see how many students are meeting the recommended intake of 2 ½ cups.

Upon review of the literature, it was evident that there were few studies conducted to educate the general population about the benefits of a plant-based diet and its effect on health. Therefore, this study could be a foundation for other studies designed to assess the perception of the flexitarian diet in relation to diseases other than cancer. This study also identifies that college students do have an interest in their overall health. Below are a few more support comments indicating interest. One student contacted me through a phone call with his personal experience switching to a plant based diet stating, *"I believe my health has done a complete 180. I've lost all of the weight I gained since coming to college and am in the best shape of my life. My skin and hair are both healthier my mind is sharper. I've seen improvements in my serving skills at work. I have tons of energy and hardly ever nap anymore. I don't feel sick or bloated after a meal. And it may not be the plants but my whole demeanor has changed for the better."* –Tanner Bruton, WKU Student.

CHAPTER 8

CONCLUSION

In conclusion, this study demonstrates that college students are interested in practicing a healthful lifestyle starting with simple modifications. It identifies the need for nutrition education on college campuses. The intent of this study was to empower students to make a modification to achieve a healthy weight and reduce the risk of breast and prostate cancer. As identified in the results, 16% of participants reported an immediate family member has been diagnosed with breast or prostate cancer and 46% of participants reported extended family members have been diagnosed with breast or prostate cancer, which means this study could have an impact and encourage conversations about healthful eating.

This study was not without challenges. While the "plant-based" diet has been studied for many years, the flexitarian diet was only recently given a name and received attention from health professionals. Therefore, it was difficult to find research concerning the flexitarian diet. Further issues occurred during survey distribution; initial surveys were not dispersed at the correct time or links to the surveys were not correct, denying participants access to the surveys. The first email to participants was put into the clutter folder, thus, some students never saw the survey or did not see it until the second or third survey.

The flexitarian diet is less restrictive than a vegetarian or vegan diet and has many of the same benefits. College students are willing to make a modification including eating a plant-based meal in order to reduce the risk of breast and prostate cancer. The lack of research on nutritional education on this topic shows that this topic is not being discussed enough among college campuses. Therefore as young health professionals, it is our responsibility to promote education and change to create a healthier population.

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APPENDIX 1

SURVEYS

Survey 1 Flexitarian Diet and Cancer Risk

Please answer the following questions.

What is your age in years?
- 18-24
- ≥25

What is your gender?
- Male
- Female
- Prefer not to answer

What is your country of origin? _____

What is your major at Western Kentucky University?_____

Have you taken a Nutrition Course in college?
- Yes
- No

Does/ has anyone in your immediate family have/had Breast or Prostate Cancer?
- Yes
- No
- Unsure

Does/ has anyone in your extended family have/had Breast or Prostate Cancer?
- Yes
- No
- Unsure

Do you know of the effects of a plant-based diet on the risk for breast and prostate cancer?

Yes
No

Would you be willing to consume a fruit or vegetable daily if it could lower breast or prostate cancer risk?

Yes
No
Maybe

Would you be willing to eat a plant-based meal (a meal with no meat) if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing to reduce intake of sugary beverages if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing in lower your intake of alcohol if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing to exercise 3-5 times a week if it could lower breast and prostate cancer risk?

Yes
No
Maybe

How often do you consume animal products, such as meat, fish, poultry, eggs, per day?

None
Once
Twice
Three or more times

How often do you consume red meat or processed meats such as deli meats, bacon, sausages, etc., per day?

None
Once

Twice
Three or more times

How often do you consume dairy, such as, milk, cheese, yogurt, etc., per day?
None
Once
Twice
Three or more times

How often do you consume cruciferous vegetables, such as, broccoli, cauliflower, cabbage, per day?
None
Once
Twice
Three or more times

How often do you consume orange/yellow vegetables, such as, carrots, winter squash, sweet potatoes, etc., per day?
None
Once
Twice
Three or more times

How often do you consume fruit per day?
None
Once
Twice
Three or more times

How often do you consume whole grains, i.e., breads, cereals, pasta, etc., per day?
None
Once
Twice
Three or more times

How often do you exercise each week?
None
Once
Twice
Three or more times

If you use tobacco, how often?
Daily
Weekly
Occasionally
Not Applicable

Survey 2 A **Flexitarian Diet and Cancer Risk**

Instructions:
Please access https://www.pinterest.com/wkuflexitarian/

After review of the content in the assigned link:
Please answer the following questions.

What is your age in years?
- 18-24
- ≥25

What is your gender?
- Male
- Female
- Prefer not to answer

What is your country of origin? _____

What is your major at Western Kentucky University? _____

Have you taken a Nutrition Course in college?
- Yes
- No

Does/ has anyone in your immediate family have/had Breast or Prostate Cancer?
- Yes
- No
- Unsure

Does/ has anyone in your extended family have/had Breast or Prostate Cancer?
- Yes
- No
- Unsure

Do you know of the effects of a plant-based diet on the risk for breast and prostate cancer?
- Yes
- No

Would you be willing to consume a fruit or vegetable daily if it could lower breast or prostate cancer risk?
- Yes
- No
- Maybe

Would you be willing to eat a plant-based meal (a meal with no meat) if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing to reduce intake of sugary beverages if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing in lower your intake of alcohol if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing to exercise 3-5 times a week if it could lower breast and prostate cancer risk?

Yes
No
Maye

How often do you consume animal products, such as meat, fish, poultry, eggs, per day?

None
Once
Twice
Three or more times

How often do you consume red meat or processed meats such as deli meats, bacon, sausages, etc., per day?

None
Once
Twice
Three or more times

How often do you consume dairy, i.e., milk, cheese, yogurt, etc., per day?

None
Once
Twice
Three or more times

How often do you consume cruciferous vegetables, such as, broccoli, cauliflower, cabbage, per day?

None
Once
Twice
Three or more times

How often do you consume orange/yellow vegetables, such as, carrots, winter squash, sweet potatoes, etc., per day?

None
Once
Twice
Three or more times

How often do you consume fruit per day?

None
Once
Twice
Three or more times

How often do you consume whole grains, i.e., breads, cereals, pasta, etc., per day?

None
Once
Twice
Three or more times

How often do you exercise each week?

None
Once
Twice
Three or more times

If you use tobacco, how often?

Daily
Weekly
Occasionally
Not Applicable

After reviewing the relevant information that you were instructed to review, were you more interested in modifying your lifestyle if it would help to lower risk for breast or prostate cancer?

Yes
No

How much time was spent reviewing the information in the assigned link?

5-15 min
15-30 min
30-45 min
45+ min

How likely are you to continue to use this information to modify your lifestyle choices?

Not likely
Somewhat Likely
Likely
Very Likely
Definitely

If yes, please explain briefly.

Survey 2 B **Flexitarian Diet and Cancer Risk**

Instructions:
Please access http://www.aicr.org/reduce-your-cancer-risk/diet/ .

After review of the content in the assigned link:
Please answer the following questions.

What is your age in years?
- 18-24
- ≥25

What is your gender?
- Male
- Female
- Prefer not to answer

What is your country of origin? _____

What is your major at Western Kentucky University? _____

Have you taken a Nutrition Course in college?
- Yes
- No

Does/ has anyone in your immediate family have/had Breast or Prostate Cancer?
- Yes
- No
- Unsure

Does/ has anyone in your extended family have/had Breast or Prostate Cancer?
- Yes
- No
- Unsure

Do you know of the effects of a plant-based diet on the risk for breast and prostate cancer?
- Yes
- No

Would you be willing to consume a fruit or vegetable daily if it could lower breast or prostate cancer risk?
- Yes
- No
- Maybe

Would you be willing to eat a plant-based meal (a meal with no meat) if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing to reduce intake of sugary beverages if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing in lower your intake of alcohol if it could lower breast and prostate cancer risk?

Yes
No
Maybe

Would you be willing to exercise 3-5 times a week if it could lower breast and prostate cancer risk?

Yes
No
Maye

How often do you consume animal products, such as meat, fish, poultry, eggs, per day?

None
Once
Twice
Three or more times

How often do you consume red meat or processed meats such as deli meats, bacon, sausages, etc., per day?

None
Once
Twice
Three or more times

How often do you consume dairy, i.e., milk, cheese, yogurt, etc., per day?

None
Once
Twice
Three or more times

How often do you consume cruciferous vegetables, such as, broccoli, cauliflower, cabbage, per day?

None
Once
Twice
Three or more times

How often do you consume orange/yellow vegetables, such as, carrots, winter squash, sweet potatoes, etc., per day?

None
Once
Twice
Three or more times

How often do you consume fruit per day?

None
Once
Twice
Three or more times

How often do you consume whole grains, i.e., breads, cereals, pasta, etc., per day?

None
Once
Twice
Three or more times

How often do you exercise each week?

None
Once
Twice
Three or more times

If you use tobacco, how often?

Daily
Weekly
Occasionally
Not Applicable

After reviewing the relevant information that you were instructed to review, were you more interested in modifying your lifestyle if it would help to lower risk for breast or prostate cancer?

Yes
No

How much time was spent reviewing the information in the assigned link?

5-15 min
15-30 min
30-45 min
45+ min

How likely are you to continue to use this information to modify your lifestyle choices?

Not likely
Somewhat Likely
Likely
Very Likely
Definitely

If yes, please explain briefly.

Survey 3 Incentive Notification

Would you like to be entered into a drawing for one of two mini iPads?

Yes
No

What is your WKU email address? This will only be used for award notification and is not linked to Surveys 1 & 2.