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WIC Participant Fruit and Vegetable Intake in California

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Walden University
2018

Abstract

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MPH, Walden University, 2015

BS, California Baptist University, 2012

Dissertation Submitted in Partial Fulfillment

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Abstract

Low-income populations in the United States consume less healthful diets than higher-income populations, specifically relating to fruit and vegetable consumption. The supplemental nutrition program Women, Infants, and Children (WIC) is intended to bridge this gap by providing nutrition education and vouchers for nutritious foods. The purpose of this study was to determine if the 2009 WIC food package revisions impacted fruit and green vegetable consumption in 18 to 24-year-old females in California. Using the social ecological model as a guide, a population of WIC (N = 115) and non-WIC (N = 276) participants from the California Behavioral Risk Factor Surveillance System survey were analyzed for trends on daily fruit and green vegetable consumption over the period of years 2009, 2011, 2013, and 2015. ANCOVA analysis showed that WIC and non-WIC populations did not consume significantly different amounts of green vegetables, but did consume significantly different amounts of fruits, p = .120 and p = .028 respectively. Additionally, WIC participant fruit consumption did not significantly increase over the years, p = .376. However, a decrease of .031 (95%CI [.019,.584], p = .037) was identified in green vegetable consumption between 2009 and 2015. Due to mean differences between samples and years it is evident that there are influencing factors driving fruit and vegetable consumption outside of income barriers, such as possible social or environmental factors. This study adds to the literature regarding the WIC food package revisions and may promote positive social change by encouraging future researchers to identify barriers to healthful diets in WIC populations and determine if additional food package revisions may be needed to increase healthful diets in low-income populations.

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Dedication

To my dad, Daniel L. Winsor III, I love you, and I miss you.

Acknowledgments

I greatly appreciate the time and effort my committee, Dr. McDoniel and Dr. Risica, have put into my doctoral study. Their support and patience throughout this process have taught me so much, and I will be forever grateful for their guidance and expertise.

To my husband, Jonathan, thank you for putting up with me and encouraging me when I was stressed out or thought I could not accomplish my dream. To my children, Daniel and Olivia, for being my number one motivation, to be the best example I can be for you both.

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Chapter 1: Introduction to the Study

Introduction

Fruit and vegetable consumption is an important indicator of health risks, as fruit and vegetable intake adds essential nutrients to diets and is linked to the reduction in many of the chronic diseases that are plaguing the United States, such as heart diseases, stroke, obesity, and some cancers (Moore & Thompson, 2015). Fruit and vegetable consumption varies greatly by state; however, national fruit and vegetable consumption is alarmingly low, with 76% and 87% of the United States population failing to meet fruit and vegetable recommendations, respectively, between the years 2007 and 2010 (Moore & Thompson, 2015). Low-income populations consume inadequate quantities of fruits and vegetables, despite the availability of nutritional assistance programs, such as the Women, Infants, and Children (WIC) program, which provides cash-value vouchers to purchase produce (Darmon & Drewnowski, 2008; Haynes-Maslow, Parsons, Wheeler, & Leone, 2013).

Supplemental nutrition programs such as the WIC program, a subsidy of the United States Department of Agriculture (USDA), are intended to provide low-income families improved access to healthy foods. Improved food access is provided through federal grants for services and goods, including supplemental foods, health care referrals, and nutrition education for low-income pregnant and postpartum women, infants, and children up to age 5 years (USDA, 2015). The food packages provided by the WIC program are intended to provide supplemental foods that are needed to meet the unique nutritional needs of low-income pregnant, breastfeeding postpartum, non-breastfeeding

postpartum women, infants, and children up to 5 years of age (USDA, 2016). The WIC program revised their food packages in 2009, for the first time since the program was created in 1972, to address nutritional inequalities in low-income populations and to align their food packages with the Institute of Medicine (IOM)'s recommendations (Schultz, Byker Shanks, & Houghtaling, 2015; USDA, 2005). There are several variables that are accounted for when providing a food package to an individual, such as special dietary concerns, breastfeeding status, and personal preference. Additionally, there are several potential factors that may ultimately influence food purchasing behaviors; however, as program participants are required to purchase food items approved by the USDA and IOM, their purchasing behaviors are largely influenced by the food packages provided by the WIC program. The 2014 WIC program food package final modifications included that yogurt could be requested as a partial substitute for milk, and there were more fish and whole grain options for women and children, as well as additional fruits and vegetables for children (USDA, 2016). Additional changes included the allowance of states and local WIC agencies more flexibility to meet the nutritional and cultural needs of WIC participants and to allow parents of older infants to choose between fresh fruits and vegetables or jarred baby foods (USDA, 2014).

The mission of WIC is to protect and improve the health of low-income women, infants, and children up to the age of 5 years who are at a nutritional risk by providing nutritious foods to supplement diets, information regarding healthy eating, and referrals to health care services (USDA, 2015a, para. 1). WIC strives to meet the needs of the participants on a nutritional and cultural level to ensure that every child is provided the

opportunity to grow healthy and strong regardless of income or culture (USDA, 2014). The USDA regulates WIC participants' purchases through providing food vouchers specific to the individual's nutritional needs, offering educational classes, and requiring periodic counseling sessions to address any nutritional concerns. Individual states are permitted the option to provide additional fruit and vegetable vouchers to be redeemed at farmer's markets, which California has opted to participate in. The current gap in the literature that I have addressed is that though there have been studies looking at the 2009 food package revisions, they were either in different regions of the United States, such as New England and the Mid-West, or they analyzed the short-term impact of the revisions, such was the case in the California research (Andreyeva & Luedicke, 2015; Andreyeva, Luedicke, Henderson, & Schwartz, 2014; Andreyeva, Luedicke, Tripp, & Henderson, 2013; Andreyeva & Tripp, 2016; Andreyeva et al., 2012; Gleason & Pooler, 2011; Kong et al., 2013; Ritchie, Whaley, & Crocker, 2014; Schultz et al., 2015; Whaley, Ritchie, Spector, & Gomez, 2012). In this study, I examined the California population over a period of 6 years, from 2009 to 2015, to understand how the WIC food package revisions impacted the WIC population and how the WIC population compares to non-WIC populations in the same region (California).

In this study, I used quantitative methods to perform a longitudinal analysis to determine how the intervention of food package revisions impacted the WIC population over a period of years from 2009 to 2015. This analysis was based on secondary data obtained from the California Behavioral Risk Factor Surveillance System (BRFSS) conducted by Sacramento State University (CSUS) on behalf of the Centers for Disease

Control and Prevention (CSUS, n.d.). I investigated the possible inequality between WIC participants' fruit and vegetable intake and non-WIC participants, and how fruit and vegetable intake changed over the years following the food package revisions. Understanding the impact that the WIC program food package revisions have had on the WIC population is significant for ensuring that low-income populations are receiving adequate nutritional assistance to close the gap in health inequalities between low-income populations and the general population. The importance of this study is that it may allow researchers to understand the impact of WIC food package revisions on the WIC population as well as to compare the WIC population to the non-WIC population to determine if additional revisions may be necessary to increase the healthful diets of low-income populations.

Problem Statement

The WIC program ensures that participants receive vouchers to help them meet nutritional standards such as iron and vitamin C intake as well as other necessary vitamins and minerals (USDA, 2013). Prior to 2009, there had been no food package revisions implemented to meet the IOM's nutrition requirements, such as the requirement of the consumption of at least 2.5 cups of fruits and vegetables per day (Shultz et al., 2015; USDA, 2005). The 2009 food package revisions were published in 2007 and required to be implemented by October 1, 2009 (Shultz et al., 2015).

As part of the national WIC program revisions in 2009, the WIC program has ensured that WIC-authorized vendors ensure that the healthy food options provided in the food packages, such as fresh fruits and vegetables, are available and accessible to the

WIC program participants (Tester, Yen, Pallis, & Laraia, 2011). Several research studies have been conducted regarding voucher redemption patterns relating to the 2009 food package revisions to determine participant willingness to purchase new types and varieties of foods as well as revision impact on healthful diets (Andreyeva & Luedicke, 2014; Andreyeva et al., 2014; Andreyeva et al., 2013; Andreyeva & Tripp, 2016; Andreyeva et al., 2012; Kong et al., 2013; Gleason & Pooler, 2011; Whaley et al., 2012; Ritchie et al., 2014; Schultz et al., 2015; Whaley et al., 2012). Previous research has been conducted in California, specifically, regarding how the revisions impact healthful diets and food package revision consumer satisfaction (Ritchie et al., 2014; Whaley et al., 2012). However, the previous research in California conducted telephone surveys 1 month prior to the food package revisions and 5 months after the food package revisions and did not represent a trend analysis (Ritchie et al., 2014; Whaley et al., 2012). Dietary patterns are critical to understanding the needs of the community, as poor dietary choices may be an indicator of factors such as food insecurity, learned behavior, access to foods, and personal preference (Committee on Examination of the Adequacy of Food Resources and SNAP Allotments, 2013). When populations have limited access to healthy foods, they are more likely to purchase processed and energy-dense foods to satisfy hunger because the healthier options are limited and more expensive, which then contributes to an increase in weight status (Food Research and Action Center, n.d.; Nguyen, Shuval, Bertmann, & Yaroch , 2015).

Purpose

The purpose of this quantitative study was to evaluate how the USDA's WIC program food package revisions in 2009 may have influenced fruit and vegetable intake in WIC program participating female adults ages 18 to 24 years. An increase in fruit and vegetable increase consumption following the WIC food package revisions supports the anticipated changes expected from the policy revisions, providing evidence that the policy change is effective. In this study, I aimed to identify possible environmental factors influencing fruit and vegetable consumption such as access and availability of fruits and vegetables as well as ability to purchase based on available funds. There are several potential factors that may ultimately influence food purchasing and consumption behaviors, such as access, cost barriers, culture, and preferred taste. However, as program participants are recommended to purchase food items approved by the USDA and IOM, their purchasing behaviors are largely influenced by the food packages provided by the WIC program. Thus, as the major revisions included the increase in fruit and vegetable cash-value vouchers, the purpose of this research was to determine possible differences in fruit and vegetable (FV) consumption among female adults aged 18 to 24 years in households receiving WIC benefits with female adults in the same age range in households who do not receive WIC benefits to determine if FV intake was significantly impacted by the 2009 food package revisions.

Research Questions

The research questions of this study were designed to address the gap in the literature regarding the topic of study and to contribute to the existing literature regarding

FV consumption in WIC populations. The research questions were designed to add to the discussion surrounding the WIC program effectiveness and future directions for ensuring the health of low-income populations through nutrition. The following research questions are based on responses from the California BRFSS surveys from 2009, 2011, 2013, and 2015. The questions regarding FV intake were as follows:

Fruit:

All included survey years: "During the past month, not counting juice, how many times per day, week, or month did you eat fruit? Count fresh, frozen, and canned fruit."

Vegetables:

2009: "How often do you eat lettuce or a green leafy salad, with or without other vegetables? Count mixed-green and spinach salads." (Such as leaf lettuce, romaine, spinach, and cabbage including green, red, bok choy and Napa or Chinese cabbage.)

2011 and beyond: "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?"

The California BRFSS changed the FV consumption survey questions between the years 2009 and 2011. The survey questions introduced in the 2011 survey were piloted in the 2009 survey using slightly different wording, as seen above, but analyzed the same variable of green vegetables.

Research Question (RQ)1: Is there a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?

$H_0$1: There is not a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

H_a1: There is a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

RQ2: Is there a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?

$H_0$2: There is not a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

H_a2: There is a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

RQ3: Is there a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions?

$H_0$3: There is not a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

H_a3: There is a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

RQ4: Is there a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions?

$H_0 4$: There is not a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

$H_a 4$: There is a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

Framework

Grounding research in theory is essential, as theory is an organized and systematic set of concepts that gives purpose to the understanding of the research problem (Creswell, 2009). In quantitative research, theory is a scientific prediction or explanation of the research hypothesis (Creswell, 2009). Thus, the theory chosen for this research was intended to evaluate how the changes in the WIC program's food packages may have influenced the diet quality of the participants.

The theory that applied to this research was the social ecological model; it was first introduced as a conceptual model by Bronfenbrenner in the 1970s and was formalized as a theory in the 1980s (Bronfenbrenner, 1994). The social ecological model

suggests that an individual's attitudes and behaviors are influenced by his or her social environment (Bronfenbrenner, 1994). Though this theory is generally applied toward behavior change interventions, it was pertinent to this research in that it helped explain how and why one variable affects the other. In this study, that included how the ecological environment, such as cost barriers, food accessibility, and food availability affected diet trends in a population. Social ecological strategies are useful for both explaining unhealthy lifestyles and promoting healthy lifestyles (Breslow, 1996). For instance, the social ecological model states that the social ecological environment includes the microsystem (roles, activities, and relationships), exosystem (external factors that affect the individual), and macrosystem (culture, beliefs, and ideologies), which are then further subdivided into the levels of influence (Bronfenbrenner, 1994). The levels of influence include the intrapersonal (i.e., personal dietary preferences, perceptions, age, and knowledge), interpersonal (i.e., food availability, culture, social support), community (i.e., built environment and socioeconomic status), organization (i.e., WIC nutrition education), and policy (i.e., WIC authorized foods, cash-value voucher limits, and stocking requirements). Understanding how these systems influence unhealthy behaviors helps to identify how to address the unhealthy behaviors (Ford & Dzewaltowski, 2010). This theory applied to the research because the food package revisions address various levels of influence by increasing knowledge of healthful diets through nutrition education (intrapersonal and organizational levels), increasing food availability (interpersonal and community levels), and improving access and affordability of FV (policy level).

Nature of the Study

The nature of this study was quantitative to compare dietary intake between and within populations. The study design was a causal-comparative, longitudinal study in that the intent was to examine how WIC might influence FV consumption and to determine if the 2009 food package revisions influenced FV consumption. The research served to provide useful data to understand the impact of the WIC program food packages on diet quality, which allows researchers to better understand how to tailor food packages to the population.

Operational Definitions

The following terms are defined for clarity as they are common terms used throughout this study. Many of the terms are defined by the WIC program; others are defined based off how they are used in the survey instrument and research study.

Benefits: Benefits are defined as any education, voucher, or service provided by the WIC program that is intended to increase healthful diet.

Food packages: There are 7 food packages available to WIC participants and they are prescribed according to the nutritional needs of the participant. (USDA, 2017, §246.10).

Food Package V—Pregnant and partially (mostly) breastfeeding women: This package is 1 of 7 food packages available. This is designed for women who are pregnant with one child only or to women who are breastfeeding, up to 1 year postpartum. (USDA, 2017, §246.10).

Food Package VI—Postpartum women: This is 1 of 7 food packages available. This package is designed for women who are not breastfeeding their infant under 6 months postpartum. (USDA, 2017, §246.10).

Food Package VII—Fully breastfeeding: This is 1 of 7 packages available. This is designed for women who are exclusively breastfeeding their infant, up to 1 year. This package is also available to pregnant women with two or more fetuses. (USDA, 2017, §246.10).

Fruit: Fruits are defined for this study as self-reported fruit intake such as fresh fruits, not including fruit juices (BRFSS, 2017).

Non-WIC: Any survey respondent who did not report themselves or any other adult in the household receiving WIC benefits in the 12 months prior to answering the BRFSS questionnaire.

Vegetable: Vegetables are defined as self-reported vegetable intake of lettuce or a green leafy salad, with or without other vegetables, including mixed-green and spinach salads, and specific items such as leaf lettuce, romaine, spinach, and cabbage including green, red, bok choy and Napa or Chinese cabbage (BRFSS, 2017).

Voucher: A document provided by WIC to the participant that is used by the participant to obtain supplemental foods; also known as a *food instrument* (USDA, 2017, §246.2).

Women, Infants, and Children (WIC): A federally funded health and nutrition program available to women, infants, and children who qualify, authorized by section 17 of the Child Nutrition Act of 1966, 42 U.S.C. 1786. (USDA, 2017, §246.2).

WIC nutrition education: Any individual or group sessions or the provision of materials intended to improve the health status of the participant through either diet or exercise. (USDA, 2017, §246.2).

Scope and Delimitations

The scope of this research addresses the research questions and covers the self-identified 18 to 24-year-old females, both participating in WIC and those not participating in WIC, who participated in the BRFSS from the years 2009 through 2015 (i.e., 2009, 2011, 2013, and 2015). The reason for the time-period was due to survey questions. Prior to 2009, the survey did not ask about WIC participation; thus, an analysis that includes FV intake in the years prior to the revisions could not be shown. The study approach allowed for a time series analysis showing the trends of FV consumption among the WIC participating population in the region alongside the non-WIC participating population. The aspects included in this study allowed for an understanding as to how WIC participation impacts FV consumption to see if the impact is significant or if additional revisions need to be made to continue to improve WIC participant diets in relation to non-WIC participants.

Limitations

Study limitations included that the study participants may not have been enrolled in WIC for the same length of time, and some may have had more WIC counseling and education than others due to length of enrollment. It could not be verified that survey participants were truthful in their claim to be receiving WIC benefits. Additionally, the survey did not ask about food accessibility, and therefore it could not be verified that all

survey respondents (WIC or non-WIC) have equal access to FV. Demographic differences between sample groups (WIC and non-WIC) may have confounded the observations between these groups. Data could not be analyzed prior to 2009 as the BRFSS survey did not include the necessary data in previous years. The number of children participants have was not accounted for, which impacted the total household dollar amount received for FV. Religious nutritional exclusions were not accounted for. Data weighting practices changed between survey years 2009 and 2011 due to the addition of cell phones being included in the random dial procedures.

Significance

The WIC program is a USDA funded supplemental nutrition program intended to bring about positive nutritional habits for low-income populations. The WIC program provides supplemental nutrition assistance, nutrition education, and health referrals for low-income, nutritionally at-risk pregnant, breastfeeding, and postpartum women as well as infants and children up to the age of 5 years (USDA, 2015). Several studies have been conducted relating to the 2009 food package revisions, largely in New England and largely relating to the general WIC population (Andreyeva & Luedicke, 2014; Andreyeva et al., 2014; Andreyeva et al., 2013; Andreyeva & Tripp, 2016; Andreyeva et al., 2012; Schultz et al., 2015). Research has been conducted in California regarding how the revisions impact healthful diets and food package revision satisfaction (Ritchie et al., 2014; Whaley et al., 2012). Additional research has been conducted to determine what may influence FV consumption (Ford & Dzewaltowski, 2010; Yaktine & Murphy, 2013). It is well understood that several psychosocial factors as well as environmental factors

contribute to FV consumption (Grigsby, Zenk, Odoms-Young, Ruggiero, & Moise, 2010; Kropf, Holben, Holcomb, & Anderson, 2007; Wheeler & Chapman-Novakofski, 2014). Additional research as to the longer-term impact of the revisions is necessary to see how the revisions are continuing to impact diet, specifically in ensuring FV intake in WIC populations is comparable to the general population. The research may provide insight as to how to best tailor packages to the WIC program population to bring about positive nutritional supplementation from the WIC program vouchers. The research facilitates positive social change by encouraging future researchers to focus on how food packages provided to low-income populations specifically impact the overall health of the population via dietary patterns. The research adds to the literature regarding the impact of the WIC program food package revisions in California.

Summary

The mission of WIC is to protect and improve the health of low-income women, infants, and children up to the age of 5 who are at a nutritional risk by providing nutritious foods to supplement diets, information regarding healthy eating, and referrals to health care services (USDA, 2015a, para. 1). The USDA regulates WIC participants' purchases through providing food instruments specific to the individual's nutritional needs, offering educational classes, and requiring period counseling sessions to address any nutritional concerns. WIC offers foods that are intended to promote a healthy diet; however, a large portion of low-income individuals do not consume adequate FVs. Therefore, the purpose of this quantitative study was to identify if, and how, the increase in the value of the FV cash value voucher in WIC food packages in 2009 influences FV

intake. The research facilitates positive social change by encouraging future researchers to focus on how food packages provided to low-income populations specifically impact the overall health of the population. Additionally, the research adds to the literature regarding the impact of the WIC program food package revisions in California.

Chapter 2: Review of the Literature

Introduction

This chapter is a review of the literature surrounding the USDA's special supplemental nutrition program WIC and its impact on a healthful diet, specifically relating to FV consumption. In the review, I highlight how FV consumption may be influenced by both internal and external factors relating to the individual. I examine the WIC program's attempt to bring about additional nutritional benefits via food package revisions in 2009 and examine the impact these revisions have had on healthful diets in the WIC population.

In this review, I focused on the USDA's special supplemental nutrition program WIC, which is a federally funded supplemental nutrition program requiring recipients to participate in nutritional education, nutritional counseling, and body composition tracking to receive vouchers for healthful foods. The program provides services to women, infants, and children who fall into one or more of several categories relating to nutritional deficiencies relevant to low-income populations. I examine the WIC program food package revisions of 2009 and their impact on healthful diets in the general WIC population as well as specific diet-related issues to the WIC population. I also examine FV consumption in the WIC population and its relation to the USDA recommendations for healthful diets.

Additionally, I observe how FV consumption relates to the overall health of populations, specifically low-income populations. I examine the social ecological model and its impact on dietary behaviors. Moreover, I assess barriers and facilitators to

healthful diets regarding FV consumption. Finally, I examine how the WIC program and adequate FV intake can promote health.

Literature Search Strategy

An extensive literature search was conducted for the years 2009 to 2017 regarding low-income populations, the WIC program, the social ecological model, and FV consumption, which included research published in 2009 and later regarding the WIC program food package revisions and their influence on WIC populations. The literature was searched to understand the impact that the social ecological model and WIC has on FV consumption. Literature was stored and organized via Zotero software and an excel spreadsheet literature matrix. Table 1 outlines the literature search strategy:

Table 1
Literature Search Strategy

Item	Result
Name and host of the database	Walden University Library
Time period searched:	2009-2017
Population	Current WIC participants
Intervention	Recipient of USDA WIC benefits
Outcome	Fruit and vegetable consumption
Databases searched	Academic Search Complete MEDLINE with Full Text CINAHL Plus with Full Text CINAHL and MEDLINE Simultaneous Search PubMed ScienceDirect
Keywords	WIC, BRFSS, nutritional behaviors, fruit consumption, vegetable consumption, fruit and vegetable, WIC participants, USDA, California
Relevant articles	WIC Revisions - 19 articles California WIC - 3 articles

Background

FV consumption is an important indicator of health risks, as FV intake adds essential nutrients to diets that are linked to the reduction of many of the chronic diseases that are plaguing the United States, such as heart diseases, stroke, obesity, and some cancers (Moore & Thompson, 2015). FV consumption varies greatly by state; however, national FV consumption is alarmingly low, with 76% and 87% of the United States population failing to meet FV recommendations, respectively, between the years 2007 and 2010 (Moore & Thompson, 2015).

FV intake surveillance is conducted via the BRFSS, which is collected by the states on behalf of the Centers for Disease Control and Prevention (CDC) to create a single dataset for the nation. BRFSS data are collected via a random-digit-dialed telephone survey of civilian adults over the age of 18 years who reside in the United States and its territories every other year starting in 1984 with the most recent data for 2015 (BRFSS, 2017). BRFSS collects data on health behaviors that may be indicators of health risks such as chronic diseases and conditions, access to healthcare, and the use of preventative health services (BRFSS, 2017). BRFSS asks respondents about FV consumption using a series of questions relating to how many times per day, week, or month they have consumed whole fruit, dried beans, 100% fruit juice, dark green vegetables, orange vegetables, and other vegetables (Moore & Thompson, 2015).

Social Ecological Model

The social ecological model as described by Bronfenbrenner (1994) suggests that an individual's development and behavioral patterns are best understood and explained

when all the aspects of one's influencing environment are explained. Bronfenbrenner (1979) stated,

> The ecology of human development involves the scientific study of the progressive, mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings, and by the larger contexts in which the strings are embedded. (p. 21)

This definition of human development proposed by Bronfenbrenner explains an individual's environment as one that influences the person on a reciprocal, mutually accommodating interaction containing various systems collectively understood as the ecological system.

The ecological system, including the microsystem, exosystem, and macrosystem, are further subdivided into levels of influence, including the intrapersonal, interpersonal, community, organization, and policy, which can each play a critical role in how an individual develops and interacts with the world. The most effective way to examine an individual's behavior is to approach the influencing factors as a cohesive unit internal and external forces working together to impact behavior. Bronfenbrenner's (1994) theory explains a process of ongoing influence and accommodation in which an individual and his/her environment is constantly interacting to affect how an individual behaves and reacts to stimuli, allowing for the opportunity to grow. The most basic principle of Bronfenbrenner's theory is that development occurs because of the interaction between the individual and the environment.

The various systems within the theory help to explain human development as they relate to the various roles and relationships a person may encounter. The microsystem includes a pattern of activities, roles, and interpersonal relations experienced by a developing person. The mesosystem includes the interrelations between multiple settings that the developing person actively participates. An exosystem is one or more settings that do not involve the developing person as an active participant. However, the developing person may still be affected by the events occur in the system. Finally, the macrosystem refers to the form and content of lower-order systems that either exist or may exist at the level of subculture or culture, along with any belief systems or ideology underlying such consistencies. The multiple levels of influence experienced by an individual then has an impact on overall development.

Behaviors such as dietary choices are affected by the multiple levels of influence outlined in Bronfenbrenner's (1994) social ecological model. This model allows for an explanation as to how these various levels may impact an individual's dietary preferences and knowledge, which shifts dietary patterns from an individual responsibility to that of a societal or systemic responsibility. This social ecological approach to dietary patterns, such as consuming adequate FVs, explains how face-to-face experiences of the microsystem, interrelations among settings in the mesosystem, and larger events and decisions in the exosystem intertwine to create the macrosystem in which a person ultimately experiences cultures and subcultures that tell them how and what to eat.

McLeroy et al. (1988) built upon Bronfenbrenner's social ecological model to address the rising concern that health promotion is often focused on victim-blaming

rather than addressing the influencing factors to chronic disease and poor health choices. McLeroy et al. addressed how individual and social influences affect how an individual makes health decisions, suggesting that behavior is determined by a combination of intrapersonal, interpersonal, institutional, community, and public policy factors. With such an explanation for health behaviors, FV consumption in vulnerable populations, such as those who participate in the WIC program, can be linked not only to individual responsibility but also to community (food availability) and public policy (WIC food voucher allotment). Thus, FV intake in such populations is directly linked to the policy guiding their health choices.

Healthful Diets and the Social Ecological Model

The social ecological model is an effective model for explaining healthful diets as implementing changes at multiple levels of the social ecological model have been shown to be effective at improving eating behaviors (USDA, 2015). The factors that influence dietary patterns are social and cultural norms, sectors, settings, and individual factors (USDA, 2015). Dietary guidelines are posted to suggest which foods should be consumed to ensure adequate nutrient intake for optimal health, however, without considering the social ecological influences to following such guidelines, the guidelines are ineffective. It is essential to consider the individual factors that influence diet, such as socioeconomic status, age, disability, knowledge, skills, beliefs, etc. Although people may be counseled on how to eat properly, individuals ultimately make diet decisions based on personal preferences through learned behaviors from cultural and societal influences. The setting and policy aspects are also crucial aspects to consider. If an individual lives where there

is poor access to fresh fruits and vegetables, this will impact their ability to consume proper nutrients. Individual factors, such as lack of knowledge and low socioeconomic status may also be barriers to a healthful diet. Such barriers would lead to poor dietary choices. Such influencing factors are why WIC policy is crucial, as it not only determines a monetary amount to provide for healthful foods but also determines the type of education participants receive.

History of WIC

The WIC program was formed in 1972 as a pilot supplemental nutrition program directed at improving the health of at-risk pregnant mothers, infants, and children [National Women, Infants, and Children Association, (NWICA), n.d.]. The WIC program is the third largest food and nutrition assistance program in the United States (USDA, 2017). The WIC Program serves to safeguard the health of low-income women, infants, and children who are younger than five years of age who have a nutritional risk by offering a variety of services such as nutrition education, providing supplemental foods, and health care referrals (USDA, 2015). The WIC program is federally administered by the United States Department of Agriculture (USDA) and is locally administered by 90 state WIC agencies spanning all covering all 50 States, the District of Columbia, 34 Indian Tribal Organizations, American Samoa, Guam, Commonwealth Islands of the Northern Marianas, Puerto Rico, and the U.S. Virgin Islands (USDA, 2017).

Participants of the WIC program must have a family income that is below 185% of the United States poverty level or participate in one of the following welfare programs: Supplemental Nutrition Assistance Program (SNAP), Medicaid, or Temporary Assistance

for Needy Families (TANF) program (USDA, 2017). The WIC program is not an entitlement program; funds are not set aside by Congress to allow for all eligible applicants to participate (USDA, 2017). The WIC program is funded via a federal grant program in which Congress authorizes a specific funding amount per fiscal year (USDA, 2017).

2009 Food Package Revisions

The WIC program food package revisions of 2009 were intended to align the WIC program food packages with the IOM's dietary guidelines (National Research Council, 2005). The 2009 food package revisions were the first revisions since 1980 (Shultz et al., 2015). The revisions were intended to increase fruit, vegetable, whole-grain, and low-fat dairy consumption among program participants (National Research Council, 2005). Included in the revisions, were regulations to ensure that WIC-authorized grocers ensure adequate stock, availability, and access to the WIC authorized foods (National Research Council, 2005). Additional inclusions of the revision were religious freedoms to choose foods and increased food package option for breastfeeding mothers (National Research Council, 2005). The changes requested were warranted by the changes in the WIC program population. The WIC program has grown dramatically from serving 88,000 when it began as a permanent program in 1974 to serving over 7.4 million women, infants, and children per month in 2017 (USDA, 2017). Additionally, the demographics of the program have become more racially, ethnically, and religiously diverse over the years (National Research Council, 2005). Aside from population-related changes, there have been societal changes in things such as dietary patterns and food

supply, women in the workforce, and income-related health risks (National Research Council, 2005). As science advances with new research findings, dietary guidelines have changed, yet the WIC program food vouchers did not account for such changes, leaving the population served with dietary allowances that did not meet current dietary regulations.

The process of revising the WIC program food package required the alignment of the provisions with several criteria ranging from foodborne illness contamination threat to overall healthfulness of the foods (National Research Council, 2005). There are seven food package categories and the revisions were specific to each category and nutritional need. The specific changes to the foods and resources provide reduced juice, milk and eggs, but higher FV through vouchers, and a new provision of whole grains (National Research Council, 2005). The fruits and vegetables cash value voucher for all three adult recipient food packages increased from $4.00 to $11.00, which is a 175% increase in monetary value. Foods included before and after the 2009 changes in packages V, VI, and VII, which are specific to pregnant and post-partum mothers, are listed in Table 2, Table 3, and Table 4, respectively. Voucher revisions relating to pregnant and post-partum women are included below as they are the female adult WIC voucher receiving population, the remainder of the food packages relate to infants and children, which is not pertinent to this study, there are no packages available to adult men.

Table 2

Food Package V: Pregnant and Partially (Mostly) Breastfeeding (Up to 1 Year Postpartum)

Food	Pre 2009	Post 2009
Juice, single strength	288 fl oz	144 fl oz
Milk	28 qt	22 qt
Breakfast cereal	36 oz	36 oz
Cheese	N/A	N/A
Eggs	2 ½ dozen	1 dozen
Fruits and vegetables	$4.00 in cash value vouchers	$11.00 in cash value vouchers
Whole wheat bread	N/A	1 lb
Fish (canned)	N/A	N/A
Legumes, dry or canned and/or peanut butter	1 lb (64 ounce canned) Or18oz	1 lb (64 ounce canned) And 18oz

Note. Adapted from "Snapshot of the WIC Food Packages", by the United States Department of Agriculture Food and Nutrition Services, 2015, Retrieved from https://www.fns.usda.gov/sites/default/files/wic/SNAPSHOT-of-WIC-Child-Women-Food-Pkgs.pdf

Table 3
Food Package VI: post-Partum (up to 6 months' post-partum)

Food	Pre 2009	Post 2009
Juice, single strength	192 fl oz	96 fl oz
Milk	24 qt	16 qt
Breakfast cereal	36 oz	36 oz
Cheese	N/A	N/A
Eggs	2 ½ dozen	1 dozen
Fruits and vegetables	$4.00 in cash value vouchers	$11.00 in cash value vouchers
Whole wheat bread	N/A	N/A
Fish (canned)	N/A	N/A
Legumes, dry or canned and/or peanut butter	1 lb (64 ounce canned) Or 18oz	1 lb (64 ounce canned) And 18oz

Note. Adapted from "Snapshot of the WIC Food Packages", by the United States Department of Agriculture Food and Nutrition Services, 2015, Retrieved from https://www.fns.usda.gov/sites/default/files/wic/SNAPSHOT-of-WIC-Child-Women-Food-Pkgs.pdf

Table 4
Food Package VII: Fully Breastfeeding (up to 1-year post-partum)

Food	Pre 2009	Post 2009
Juice, single strength	336 fl oz	144 fl oz
Milk	28 qt	24 qt
Breakfast cereal	36 oz	36 oz
Cheese	N/A	1 lb
Eggs	2 ½ dozen	2 dozen
Fruits and vegetables	$4.00 in cash value vouchers	$11.00 in cash value vouchers
Whole wheat bread	N/A	1 lb
Fish (canned)		30 oz
Legumes, dry or canned and/or peanut butter	1 lb (64 ounce canned) Or 18oz	1 lb (64 ounce canned) And 18oz

Note. Adapted from "Snapshot of the WIC Food Packages", by the United States Department of Agriculture Food and Nutrition Services, 2015, Retrieved from https://www.fns.usda.gov/sites/default/files/wic/SNAPSHOT-of-WIC-Child-Women-Food-Pkgs.pdf

The changes to the food packages have been a source of much research, as these were the first major changes to occur since the program began. Several researchers have examined the impact the food packages have had on various aspects of diet, economy, and supermarket trends. Notable research has been conducted in New England as well as in California to see the impact of the revisions.

Changes in purchasing behaviors between the years of 2011 and 2016 were assessed in New England based on scanner data from a local supermarket chain to determine the potential influence of the WIC food package revisions (Andreyeva,

Luedicke, Middleton, Long, & Schwartz, 2011; Andreyeva et al., 2012; Andreyeva et al., 2013; Andreyeva et al., 2014; Andreyeva & Luedicke, 2015; Andreyeva & Tripp, 2016). Major changes to the WIC food packages for dairy products included a reduction on the overall allotment of milk and cheese and a disallowance of whole-milk for participants over the age of 23 months (Andreyeva et al., 2014). Due to the WIC food package changes, WIC purchasing of whole-milk declined from 60% to 25% (Andreyeva et al., 2014). Total milk purchases dropped by 14.2% and WIC-eligible cheese purchases declined by 37.2% (Andreyeva et al., 2014). The changes in the food purchasing behaviors are significant because it shows that the food packages impact purchasing behaviors significantly, as few purchases in dairy were supplemented via outside funds (i.e., cash, debit/credit, or food stamps) (Andreyeva et al., 2014). The health impact is considerable as well, as a decrease in milk fat or other animal products results in saturated fat, which is a type of fat considered to be dangerous to health when consumed in larger amounts than 7-10% of daily fat intake. Therefore, a decrease in dairy consumption potentially means an increase in the health of WIC participants Andreyeva et al., 2014.

Food package revisions required that WIC-authorized vendors stock adequate quantities of WIC-approved foods to ensure that WIC participants can access the foods that they are receiving vouchers for (Andreyeva et al., 2012). This requirement led to an increase in the affordability and availability of healthful foods such as whole-grains, FV, and low-fat dairy products in various locations throughout the nation including New Orleans, Louisiana, Baltimore, Maryland, and New England (Andreyeva et al., 2012;

Cobb, et al., 2015; Rose, O'Malley, Dunaway, & Bodor, 2014; Zenk, et al., 2012; Zenk, et al., 2014). Small grocers, both WIC-authorized and non-WIC-authorized, were more likely to stock additional healthful foods such as whole-grains, FV, following the food package revisions (Rose et al., 2014). Overall, the revision led to a noticeable increase in the availability of healthful foods following the WIC food package revisions, which is an important first step to reducing health inequalities in low-income and minority neighborhoods (Cobb, et al., 2015).

A comparison of grocers in low-income urban neighborhoods in Philadelphia, Pennsylvania, with the majority population consisting of minorities of Hispanic and African American ethnicities utilized the Nutrition Environment Measure Survey for Stores (NEMS-S) to evaluate the impact the food package revisions had on access to healthful products (Hillier, et al., 2012). The survey allowed for availability, price, and quality of fruit, vegetables, milk, cereal, beans, canned fish, meat, whole grains and juice to be evaluated, using *t*-tests and regression, before and after the 2009 WIC food package revisions (Hillier, et al., 2012). The availability of healthful foods was shown to increase significantly in both WIC-authorized and non-WIC-authorized grocers with more substantial increases in WIC-authorized grocers (Hillier, et al., 2012). The results of this study are consistent with the research conducting in studies by Andreyeva and colleagues, showing that the food package revisions increased the availability of healthful foods for both low-income populations and the general population.

The revised stocking requirement for WIC-authorized vendors can help to improve the food environment for both WIC participants as well as non-participants as

there is a greater availability of healthful foods, with the most drastic increase being in whole-grain availability (Andreyeva et al., 2012; Rose et al., 2014; Zenk, et al., 2012). The 2009 WIC food package changes were found to be beneficial to a variety of income levels, not simply low-income. The revisions also encourage healthful diets, as previously inaccessible foods are now more easily accessible. Although a direct link has not been found between increased access to, and subsequent purchase of healthful foods with individual outcomes, it is hypothesized that an increase in the purchase of healthful foods leads to an increase in a healthful diet, and thus an increase in overall individual and population health.

The California WIC program had several changes in 2009 that supplemented the voucher revisions. April 2009 saw the launch of a six-month statewide nutrition education curriculum, *Healthy Habits Every Day*, which was delivered in three two-month blocks focusing on the topics of FV intake, lower-fat milk, and whole-grains (Ritchie et al., 2010). These educational programs were intended to prepare the California WIC population for the coming changes and educate them on the importance of a healthful diet. The module specific to FVs, "Get Healthy Now," took place in April and May of 2009, in which all local WIC agency program in California were required to participate. However, participants who enrolled after May 2009 did not receive such education, as the nutrition education changes bi-monthly (Ritchie et al., 2010).

In California, preliminary research into the impact of the voucher revisions is promising but limited. Random sampling of over 9,000 pregnant or post-partum WIC participants was conducted, with approximately 3,000 surveys being collected from the

sample (Whaley et al., 2012). The participants were surveyed by an independent public opinion research organization (Whaley et al., 2012). Overall, the revisions are shown to improve diet quality in WIC families, showing that between September 2009 and March 2010, whole-grain consumption increased 17.3%, whole-fat dairy consumption decreased over 60% while accompanied by an increase in lower fat milk products, and FV consumption increased (Whaley et al., 2012). The reported changes in FV intake showed no significant change in fruit consumption, but a 7.2% increase of vegetables and no explanation as to why vegetable consumption increased but fruit consumption did not (Whaley et al., 2012).

FV intake was only slightly impacted by the voucher revisions in California, despite the extensive statewide coordinated nutrition education program that occurred between April and October 2009 (Ritchie et al., 2010). However, the research only looked at a 6-month change in diet pattern, which is not sufficient to determine the long-term impact of the voucher changes. Additionally, post-partum mothers surveyed reported preferring an additional cash-value voucher for baby foods in lieu of jarred baby foods, which would increase the overall cash availability for FVs for the household (Kim, et al., 2013). With such an overwhelming preference for fresh FVs over jarred, it would be expected to see more of an increase in FV consumption overall in the population (Kim, et al., 2013).

Despite previous research findings that the food package revisions led to a significant increase in healthful diets for low-income populations, additional research has found that the revisions did not improve access to a variety of healthful foods. Federal

stocking requirements for WIC authorized vendors is minimal, requiring only that there are two varieties of fruits, two varieties of vegetables, and one variety of whole-grain-rich cereal (Pelletier, Schrieber, & Laska, 2017). In addition to the federal guidelines, states are permitted to make additional requirements, which leads to disparities across the United States in the availability and accessibility of healthful foods for WIC participants. State and local requirements impact the overall availability of fresh FVs, in that only small improvements have been seen post-revisions in small vendors. This may be due to the overall income level of the neighborhood, as in some location only WIC- authorized vendors increased in the availability of FVs (Havens et al., 2012; Zenk, et al., 2012). The increase in healthful foods was most prominent in large grocers and urban regions, whereas rural regions and low-income regions continue to have low accessibility and availability of healthful foods (Havens et al., 2012; Lu, et al., 2016). Therefore, the food package revisions, though increasing the dollar amount permitted to the WIC participants, does little to address the access to a variety of healthful foods in poverty-stricken neighborhoods or those with only small grocers.

Summary and Transition

The 2009 revisions to the WIC program were intended to increase the healthful diets of WIC participants through providing updated nutritional education and food purchase vouchers that are in line with the dietary guidelines. These revisions, according to the social ecological model, should impact individual behavior and healthful diets as the vouchers are a policy level change that then affects the community and individual levels of the individual's ecological system. This chapter examined how the voucher

revisions relate to the social ecological model and the impact that the revisions have had on healthful diets in the WIC population.

This chapter provided insight into the need for the research and its potential social change impacts. The literature presented shows that the food package revisions are preliminarily having a positive impact on overall diet quality. However, the research fails to examine the long-term impact that the revisions are having on FV consumption, which is a major indicator for overall health, as FV consumption is directly linked to risk of chronic disease. The research examined shows that the WIC voucher revisions have the potential to have a long-term impact on the overall health and well-being of the WIC population, for generations to come if the vouchers are targeted for optimal health and nutrition. The voucher revisions also have an impact on overall food availability, which then impacts non-WIC populations. The social change impact is tremendous, as if the FV intake of WIC populations is not significantly increasing over the years following the revisions a need for further revisions, or targeted education may be necessary to further promote healthful diets.

Chapter 3 will examine the methodological aspects of this research study. Chapter 3 will examine the sample size, population, and secondary data source. Chapter 3 will provide insight into the validity and reliability of the proposed research study.

Chapter 3: Research Method

Introduction

The purpose of this study was to determine if participation in the WIC program had a causal effect on the consumption of FVs. When purchasing foods, the consumer's shopping, and ultimately consumption, is influenced by several factors, including but not limited to cost, food availability, budget, personal preference, food insecurity, and cultural influence. However, due to the WIC program limiting the products that WIC participants may purchase, participants of the WIC program face fewer outside influences, as they can purchase foods limited to the approved food shopping list. Participants are provided a cash-value voucher for FV that they can purchase any fresh, frozen, or canned fruits and vegetables within the allotted dollar amount. Anything over that allotment must be paid for by the purchaser by either personal funds or an additional supplemental nutrition program, such as SNAP.

Participants are allotted freedom of purchase of FV using the voucher systems if they abide by the allotted dollar amount. The dollar amount is dependent upon food package due to nutritional need. However, the dollar amount may be insufficient to allow for the participant to consume the daily recommended amounts of FVs. However, it is important to consider that the allotted dollar amount is not intended to provide all the FVs an individual or family may need, rather it is intended to supplement their existing purchases and encourage the consumption of FVs.

In this study, I examined if the FV consumption of participants of the WIC program increased following the 2009 food package revisions and if FV consumption in

the WIC population is comparable to the general population. This research was necessary to understand how the WIC program aids participants in meeting the nutritional guidelines set forth by the USDA. The research questions for this study were intended to contribute to the literature to better understand how the WIC program aids in ensuring low-income populations meet dietary guidelines.

The theoretical framework of this study was based on Bronfenbrenner's (1994) social ecological model. In this research, I assessed how the independent variable of participation in the WIC program impacted the dependent variable of FV consumption in California. The social ecological model suggests that behavioral changes are more likely to occur when more than one level of social ecological influences (i.e., intrapersonal, interpersonal, organizational, community, or public policy) is addressed with a given intervention. The WIC program uses a multidimensional approach to encourage healthy behaviors and healthful diets, specifically paralleling the individual, organizational, and policy levels outlined in Bronfenbrenner's social ecological theory.

The WIC program uses several aspects of the social ecological theory to bring about positive health behaviors in participants, such as relying on the intrapersonal level by requiring nutrition education group classes and individual counseling to increase knowledge and beliefs surrounding dietary choices. The food package revisions rely on the interpersonal level to increase food availability and be culturally sensitive. The community level is addressed by reducing the socioeconomic barriers to accessing healthful foods. The program also uses the policy level by restricting food purchases and requiring health documentations such as height, weight, and special dietary proofs, when

applicable. A covariate of the study is concurrent (or familial) enrollment in an additional nutritional supplementation program, such as SNAP, which may also impact the ability to purchase fruits and vegetables. Individuals who benefit from more than one supplemental program may have more fruit and vegetable consumption than those individuals who only receive WIC benefits.

In this chapter, I describe the study design and methods that I used to complete the research study. I describe the quantitative approach used for this study to provide a causal-comparative experimental design to determine how FV consumption was impacted by participation in supplemental nutrition programs. The comparison was made by comparing FV consumption of WIC participants to non-WIC participants. The comparison documents any statistical significance between WIC and FV consumption. I also describe the methodology relating to population, sample size, sampling methods, and survey instrumentation. Threats to validity are addressed, as are ethical considerations. The chapter concludes with a summary of the research methods and a transition to data analysis.

Research Design

In this study, I used a quantitative causal-comparative design to guide the research process. A causal-comparative research design was effective for this study as it could provide information regarding relationships that may exist between the variables when the event or intervention has already occurred (Brewer & Kuhn, 2010). Causal-comparative experimental designs are effective for identifying differences between groups as they relate to the treatment (Brewer & Kuhn, 2010). The study was also

longitudinal, which allowed for assessment of dietary patterns over a time period, in this case 2009 to 2015.

The purpose of this study was to compare FV consumption between groups and between years to determine how WIC participation impacts FV consumption. It was important to compare FV consumption between groups to determine the effectiveness of the WIC program at increasing FV consumption. The purpose of comparing FV consumption over time was to determine if FV consumption of WIC participants increased in the years following the increase of the cash-value dollar amount of the FV cash-value voucher due to the 2009 food package revisions. This was a necessary comparison to determine if the voucher program influences dietary behaviors, or if external factors may be impacting diet quality. External factors such as the possibility of an increase in the cost and access to FVs may be an influencing factor in FV consumption trends and would warrant additional research to confirm.

The causal-independent variable is WIC participation, which is a logical causality because WIC participation ensures that the individual benefits from not only a cash-value voucher to purchase FVs but also nutritional education and counseling encouraging positive nutritional behaviors. WIC participation also insinuates that the individual meets the WIC program guidelines for categorical, residential, income, and nutritional risk criteria.

The data used in this study were secondary data obtained from the California Behavioral Risk Factor Surveillance Survey (Ca BRFSS), which is an extension of the CDC BRFSS. Data were obtained by submitting a Data Request Form to the Public

Health Survey Research Department at Sacramento State University. The data analyzed were from the years 2009 (pre-WIC food package revisions) to the most current year available for download, 2015, in order to view trend data. Categorizing participants into the categories based on WIC participation is self-reported from the BRFSS questionnaire asking if the individual has benefitted from WIC vouchers in the past 12 months.

WIC Eligibility Requirements

WIC eligibility requirements fall into four categories: categorical, residential, income, and nutritional risk.

Categorical: As the WIC program is intended to serve WIC, individuals must fall into one of these categories. For women, they must be pregnant, postpartum (6 months or less from the termination of pregnancy) or breastfeeding (up to 1 year from termination of pregnancy; USDA, 2017). Infants are defined as a baby up until its first birthday (USDA, 2017). Children qualify up until their fifth birthday (USDA, 2017). If the individual does not fit into one of these three categories, then they do not qualify for WIC benefits.

Residential: Applicants are required to live in the state in which they apply to receive benefits (USDA, 2017). State and local agencies may make additional residency requirements, such as the applicant must live in the county in which they apply (USDA, 2017).

Income: State agencies may set their income-level guidelines; however, the income standard is that the applicant must be between 100 and 185% of the Federal Poverty Income guidelines (USDA, 2017). An applicant may qualify as automatically

income eligible if they receive benefits from SNAP, Temporary Assistance for Needy Families, or Medicaid (USDA, 2017).

Nutritional risk: Nutritional risk means that the applicant has a medical-based or dietary-based condition, such as anemia or diet lacking adequate nutrients as determined by the WIC program or a referring physician (USDA, 2017).

Operational Definition of Non-WIC Participant

A non-WIC participant is an individual who did not receive WIC benefits in the last 12 months or whom did not report WIC benefits when completing the BRFSS.

Setting and Population

The population analyzed for this study were participants of the BRFSS who reside in California. Sampling bias may have been an issue, as low-income populations may not have telephone services, home or mobile, which may limit their chances of being included in the survey (Mokdad, Stroup, & Giles, 2003). The survey is conducted in English and Spanish, which then excludes other linguistic minorities.

Sampling Method

The sampling method for this study is cluster sampling in which participants of the BRFSS were categorized into groups based on supplemental nutrition program participation and age at the time the BRFSS survey was conducted. Cluster sampling was appropriate for the research as it allowed for small samples of a larger population to be analyzed as representative of the population. Cluster sampling also ensured mutual exclusivity, in that no individual can classify as both populations, for example, an individual is either part of the WIC population or not but cannot be in both populations.

This is the most accurate method of sampling to ensure a sample that meets the criteria set forth in the research questions including, participation in supplemental nutrition programs and geographic residence (Saint-Germain, n.d.). While cluster sampling is not ideal for all research projects due to the similarities of groups, it was necessary for this research as the intent is to look at a unique population with an existing dataset (Carlin & Hocking, 1999).

Sample Size

The sample size for this study was dependent on respondent data for each year for the CA BRFSS. The available sample size varies by survey year. Table 5 shows the total number of 18 to 24-year-old female respondents. As the population of interest for this study is the 18 to 24-year-old female population living in California, and the study utilized secondary data, power calculations were necessary to ensure adequate sample size provided for the analysis. A power calculation was conducted using G*Power 3.1 to determine sample size. With a power of .80 and alpha set at .05 the required sample size for RQ1 and RQ2 was 128 and the necessary sample size for RQ3 and RQ4 was 82. Type I error (α) would reject a true null hypothesis. Type II error (β) would be the failure to reject an untrue null hypothesis (Banerjee et al., 2009). Alpha and beta is avoided by ensuring proper sample size by calculating effect size (Banerjee et al., 2009). The achieved sample sizes are 391 and 115, for RQs 1 and 2 and RQs 3 and 4, respectively.

Table 5
CA BRFSS Cross Tabulation Respondent Data

		Interview Year				
		2009	2011	2013	2015	Total
WIC	Yes	42	24	35	14	115
	No	117	39	70	50	276
Total		159	63	105	64	391

Instrumentation and Materials

The data utilized for this research study was secondary data obtained from the California BRFSS which is a subsidiary of the nationwide BRFSS conducted by the CDC and carried out in California by CSUS Public Health Survey Research Program (PHSRP). The California BRFSS utilizes a random digit dial of California landlines and cell-phones (CSUS, n.d.). Interviews are conducted over the phone in English and Spanish (CSUS, n.d.). Data is then weighted to the California population, which allows researchers to estimate the prevalence of health behaviors and conditions for the statewide population (CSUS, n.d.). Weighting is important because it adjusts for nonresponse bias and makes the sample more representative of the population (CSUS, n.d.). Variables that are used to weight the data are age, sex, categories of ethnicity, geographic regions within states, marital status, education level, home ownership and type of phone ownership are currently used to weight BRFSS data (CDC, 2015). Weighting protocols ensure that data is representative of the population and accounts for underrepresented populations (CDC, 2015). Weighted data allows for a more accurate representation of low-income populations, as they are often harder to reach in large surveys such as the BRFSS (CDC,

2015). However, data utilized in this study is the raw, respondent data, and thus is not weighted.

Reliability and Validity of the BRFSS

The BRFSS is considered to be valid and reliable. The reliability and validity of the BRFSS has been tested several times in order to examine issues related to national and state estimates as well as comparison estimates (CDC, 2017). Several researchers have found the data quality, reliability, and validity of the survey to mirror larger surveys such as NHANES and NHIS showing similar results in terms of health risks (CDC, 2017). For a complete list of research testing the BRFSS quality, reliability, and validity visit the CDC webpage for methods, validity, and reliability related to the BRFSS **here**. The 1989 to 2009 fruit and vegetable consumption modules are considered to have moderate validity and reliability based on reasonable correlation with other dietary assessment tools (CDC, n.d.). The BRFSS fruit and vegetable module has been compared to several 24-hour recalls, food frequency questionnaires, and diet records (CDC, n.d.). For the fruit and vegetable specific variables, there is no published research to verify the reliability and validity of the fruit and vegetable consumption modules after 2011 (CDC, n.d.). However, the questions are similar to other national surveys, such as the NHANES and the 1989-2009 modules provide some insight into the validity and reliability (CDC, n.d.). Review studies have relied on repeat interviews up to three months later showing moderate reliability (CDC, n.d.).

Study Variables

Independent

The independent variables of this study include WIC participation status and survey years 2009, 2011, 2013, and 2015. WIC participation status determines FV consumption, as it affects the available funds for an individual to purchase fruits and vegetables to consume. The survey year is important as the analysis is to determine if FV consumption changed over the years following the WIC food package revisions, which were implemented in October 2009.

Dependent

The dependent variables for this study are fruit consumption and green vegetable consumption, as self-reported to the BRFSS. FV consumption may be linked to WIC participation because if the individual does not have adequate funds to purchase FV, then consumption may be low. FV consumption may also be dependent on the year, as WIC FV cash-value vouchers increased in 2009. Thus, FV consumption was be compared between WIC and non-WIC populations each year (2009, 2011, 2013, and 2015) to determine if WIC participation may influence FV consumption. The following survey questions from the BRFSS identify this variable:

Fruit:

All included survey years: “During the past month, not counting juice, how many times per day, week, or month did you eat fruit? Count fresh, frozen, and canned fruit”

Vegetables:

2009: “How often do you eat lettuce or a green leafy salad, with or without other vegetables? Count mixed-green and spinach salads.” (Such as leaf lettuce, romaine, spinach, and cabbage including green, red, bok choy and Napa or Chinese cabbage.)

2011 and beyond: “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?”

The California BRFSS changed the FV consumption survey questions between the years 2009 and 2011. The survey questions introduced in the 2011 survey were piloted in the 2009 survey using slightly different wording, as seen above, but analyzed the same variable of green vegetables.

Additional Variables

Demographic information between the two groups, WIC and non-WIC, were analyzed to determine differences that may exist between the two groups. Factors were included as potential covariates, as determined by existing literature. Demographics analyzed include highest level of education, marital status, race/ethnicity, Latino origin, number of children in the household under the age of 18 years, and employment status.

Data Analysis

Data was obtained from Sacramento State University (CSUS) Public Health Survey Research Program (PHSRP) after a data user agreement was submitted, which can be viewed in Appendix B. Data was entered into SPSS 24.0 for analysis. Descriptive statistics were gathered to describe the sample based on information gathered in the

demographics section of the survey. Statistical analysis included ANCOVA for possible confounders, which were identified, thus covariate analyses were employed. Table 6 shows the research questions, applicable variables, and applicable statistical analysis.

Table 6
Research Questions

Research Question (RQ)	Independent Variable (IV)	Dependent Variable (DV)	Level of Measure	Statistical Test
RQ1: Is there a difference in green vegetable consumption between 18-24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.	Survey Year (2009, 2011, 2013, 2015) WIC Participation	Fruit Consumption	IV - Interval IV- Ordinal DV- Ordinal	Two-way ANCOVA
RQ2: Is there a difference in fruit consumption between 18-24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?	Survey Year (2009, 2011, 2013, 2015) WIC Participation	Green Vegetable Consumption	IV - Interval IV- Ordinal DV- Ordinal	Two-way ANCOVA
RQ3: Is there a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18-24-year old WIC participants from California after implementation of the 2009 WIC food package revisions?	Survey Year (2009, 2011, 2013, 2015)	Green Vegetable Consumption	IV - Interval DV- Ordinal	One-way ANCOVA
RQ4: Is there a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18-24-year old WIC participants from California after implementation of the 2009 WIC food package revisions?	Survey Year (2009, 2011, 2013, 2015)	Fruit Consumption	IV - Interval DV- Ordinal	One-way ANCOVA

The data for this sample needed to be analyzed for the potential of covariates. As fruit and vegetable intake is largely related to socioeconomic status, the covariates in this study could include any of the demographic variables analyzed including employment status, education level, income, marital status, and food stamp participation. In order to ensure that the proper covariates are included, not only is looking to the literature important, but also conducting preliminary analysis to ensure normality, homogeneity of regression, homoscedasticity, linearity, and homogeneity of variance. Variables were analyzed to ensure they do not covariate each other, such as with income and food stamps status. In order to ensure the analysis is done properly, all potential covariates were tested for collinearity any variables that are significant at the $p = .05$ level were excluded as covariates. Additionally, the interaction between the independent variable(s) and the potential covariates was analyzed to ensure homogeneity of regression.

Research Questions and Hypotheses

The research questions of this study were designed to address the gap in the literature regarding the topic of study and to contribute to the existing literature regarding FV consumption in WIC populations. The research questions were designed to add to the discussion surrounding the WIC program effectiveness and future directions for ensuring the health of low-income populations through nutrition. The following research questions are based on responses from the CA BRFSS surveys from 2009, 2011, 2013, and 2015. The questions regarding FV intake are as follows:

Fruit:

All included survey years: “During the past month, not counting juice, how many times per day, week, or month did you eat fruit? Count fresh, frozen, and canned fruit.”

Vegetables:

2009: “How often do you eat lettuce or a green leafy salad, with or without other vegetables? Count mixed-green and spinach salads.” (Such as leaf lettuce, romaine, spinach, and cabbage including green, red, bok choy and Napa or Chinese cabbage.)

2011 and beyond: “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?”

The California BRFSS changed the FV consumption survey questions between the years 2009 and 2011. The survey questions introduced in the 2011 survey were piloted in the 2009 survey using slightly different wording, as seen above, but analyzed the same variable of green vegetables.

Research Questions

Research Question (RQ)1: Is there a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?

$H_0$1: There is not a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

H_a1: There is a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

RQ2: Is there a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?

$H_0 2$: There is not a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

$H_a 2$: There is a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

RQ3: Is there a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions?

$H_0 3$: There is not a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

$H_a 3$: There is a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

RQ4: Is there a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions?

$H_0$4: There is not a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

H_a4: There is a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions.

Ethical Protection of Participants

This research was conducted to examine the impact that WIC participation has on FV intake. No contact was made with participants for this research study. Data was downloaded via secondary data set. Original data was collected via CSUS PHSRP on behalf of the CDC. CDC has their own International Review Board (IRB) in place to ensure the safety and security of participants. Although no personal identifiers are included in the data, the data is aggregate to maintain confidentiality. Data was obtained via secure, password protected email from the director of PHSRP, Dr. Tomasilli, on March 29, 2018, after obtaining Walden University IRB approval (03-29-18-0406385). Data will be stored on a personal password-protected laptop which is used solely by the researcher and will be kept for a minimum of 5 years, and then be destroyed. Data will also be stored on a password protected USB drive as a backup. Missing and incomplete data will be excluded from data analysis to ensure the validity of the analysis.

Summary and Transition

Chapter 3 provided a plan and rationale for conducting the research. The research design was intended to allow for a comparison between years as well as between groups, to accurately describe the FV intake inequalities, if any, between the WIC population and the non-WIC population and to show how the WIC food package revisions impacted FV consumption. This chapter described the research methodology, target population, instrumentation, data analysis plan, and ethical considerations. Chapter 4 describes data analysis and results of the study questions. Chapter 5 provides an interpretation of the results, discussion, and implications for social change.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to evaluate how the USDA's WIC program food package revisions in 2009 may have influenced FV intake in WIC program participating female adults ages 18 to 24 years. An increase in FV intake following the WIC food package revisions supports the anticipated changes expected from the policy revisions, providing evidence that the policy change is effective. This study also served to identify if there were significant differences between WIC participants and non-WIC participants' FV intake to determine if there is a dietary gap between populations. I also intended to identify possible environmental factors influencing FV consumption such as access and availability of FVs as well as ability to purchase based on available funds. There are several potential factors that may ultimately influence food purchasing and consumption behaviors, such as access, cost barriers, culture, and preferred taste. However, as program participants are recommended to purchase food items approved by the USDA and IOM, their purchasing behaviors are largely influenced by the food packages provided by the WIC program. Thus, as the major revisions included the increase in FV cash-value vouchers, the purpose of this research was to determine possible differences in FV consumption among female adults ages 18 to 24 in households receiving WIC benefits with female adults the same age range in households who do not receive WIC benefits to determine if FV intake was significantly impacted by the 2009 food package revisions.

Data Preparation

Walden University IRB approval was granted prior to data collection and analysis. Following IRB approval, data sets were downloaded via secure, password protected, email from CSUS PHSRP and immediately saved to a password protected USB drive and password protected personal laptop, used solely by myself, the researcher.

The data were downloaded as four separate data sets for the years 2009, 2011, 2013, and 2015. Necessary variables were extracted from each data set and compiled into a single dataset. Study inclusion criteria were then run to include only participants who were female, between the ages of 18 and 24 years, answered *yes* or *no* to WIC participation, and had at least one child in the household or were pregnant at the time of survey collection. Data were matched with the BRFSS codebooks available for download in the CSUS PHSRP webpage to ensure codes were the same. It was noted that the "main race" variable was coded differently for 2015 than the previous years, and data codes were transformed to match. However, it was also noted that for 2015 respondents who met the inclusion criteria, none had answered the race question; all responses were blank, though Hispanic origin was reported. *Figure 1* and Tables 7 and 8 explain show the data preparation for the records used.

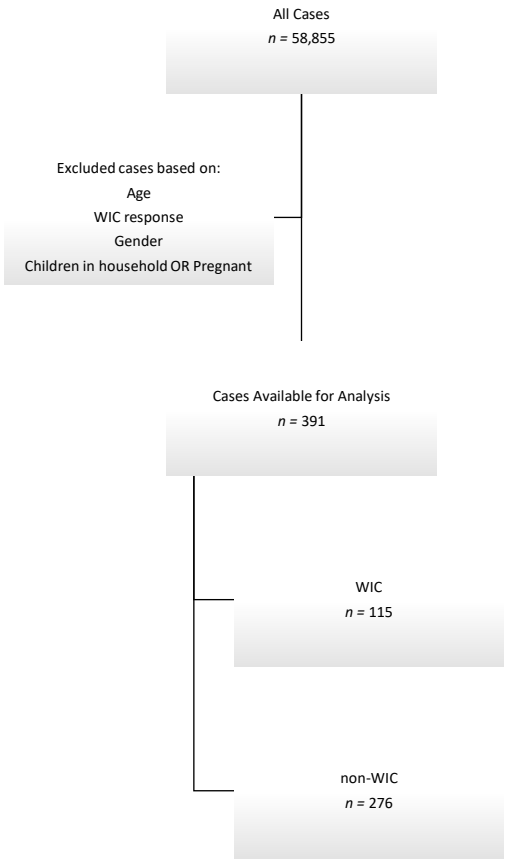

Figure 1. Eligible records available for analysis after including exclusion criteria.

Table 7
Available Records for Analysis
Count

	Interview Year				
	2009	2011	2013	2015	Total
Total Records	17,539	17,501	11,214	12,601	58,855
Eligible Records	159	63	105	64	391

Table 7
Eligible Records for Analysis WIC Status
Count

		Interview Year					
		2009	2011	2013	2015	Total	%
WIC	Yes	42	24	35	14	115	29%
	No	117	39	70	50	276	71%
Total		159	63	105	64	391	100%

Responses for fruit and green vegetable intake were reported as either day, week, month, or year. To create a common unit of measure, all the responses were transformed into a daily value unit (weekly value/7, monthly value/30, yearly value/365). Missing values were not excluded from the data set though they were excluded from variable analysis (i.e., if the fruit response was missing, the case was excluded from fruit analysis, but not green vegetable analysis).

Data Description

The data analyzed in this research study came from the California BRFSS that is collected and stored on behalf of the CDC by CSUS PHSRP. The survey has been conducted on a yearly basis since 1984. The years of data analyzed in this study are from 2009, 2011, 2013, and 2015.

An inclusion criterion for the data analysis included survey respondents who were female, between the ages of 18 and 24 years, and had at least one child in the household or was pregnant. Additional inclusions were that the respondent answered either *yes* or *no* to WIC participation. The final sample size for the study once the inclusion criteria were applied included 115 WIC participants and 276 non-WIC participants, which satisfied sample size requirements detailed in Chapter 3.

In this study, I assessed demographic variables as well as research question pertinent variables. Demographic variables analyzed included marital status, education level, number of children under the age of 18 in the household, employment status, food stamp receipt status, and income level. Research question pertinent variables included WIC participation status, green vegetable consumption, fruit consumption, and study year.

Data Analysis

The SPSS software program, Version 24, was used for data analysis. Dependent variables, green vegetable and fruit consumption, were explored for distribution and normality. The study analyzed only green vegetable consumption due to BRFSS question wording, but it is referred to as just vegetable consumption when in conjunction with fruit consumption, therefore it is FV unless discussing vegetable consumption separately, then it is green vegetable. The exploratory distribution can be seen in Figure 2 and Figure 3. Descriptive statistics were performed to explain demographic data, shown in Table 10. Two-way ANCOVA was performed for Research Questions 1 and 2 to examine the mean differences of how WIC status impacted vegetable and fruit consumption, respectively, per survey year, with covariate inclusion. One-way ANCOVA was performed for Research Questions 3 and 4 to examine the mean differences between FV consumption, respectively, per survey year, with covariate inclusion. Potential covariates included employment status, education level, marital status, pregnancy status, number of children in household, food stamp receipt, and income. The covariates were identified from previous research as potentially important and covariates meeting homogeneity of

regression per each RQ were included accordingly. The findings of these analyses are detailed in the following sections.

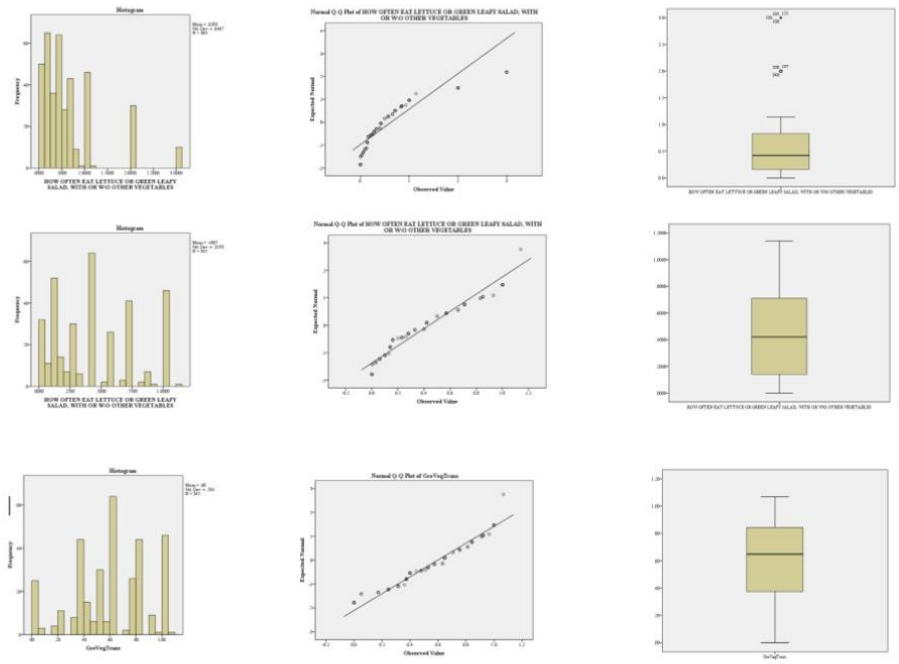

Figure 2. Green vegetable exploratory distribution (normal, outliers removed, data transformed).

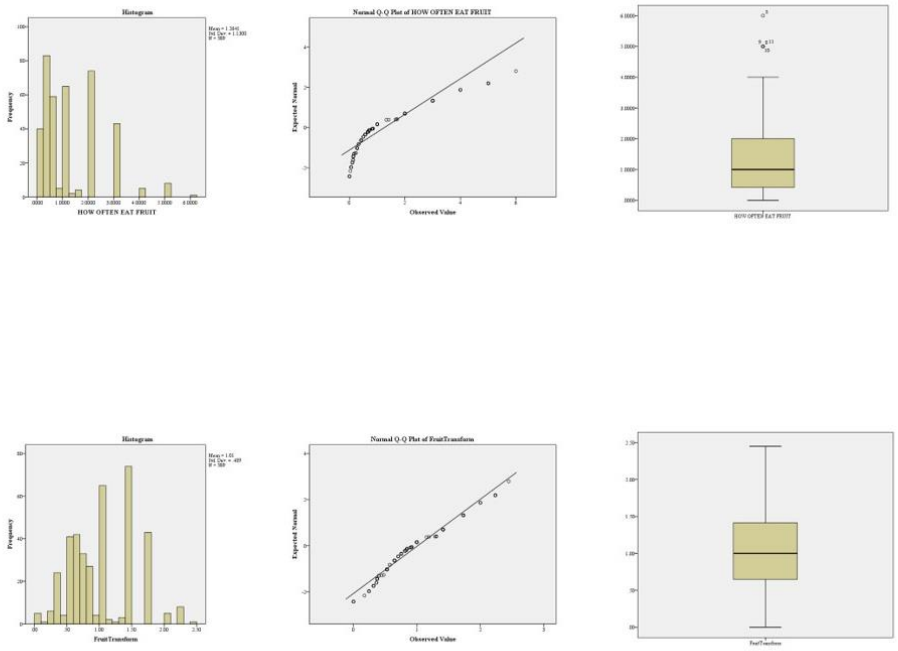

Figure 3. Fruit exploratory distribution (normal and data transformed.)

Table 8
Characteristics of Potential Covariates for WIC and Non-WIC Combined ANOVA

		SS	*df*	*MS*	*F*	*p*
Age	Between Groups	4.703	3	1.568	.377	.770
	Within Groups	1611.404	387	4.164		
	Total	1616.107	390			
Number of Children in Household	Between Groups	.813	3	.271	1.115	.343
	Within Groups	94.066	387	.243		
	Total	94.880	390			
Marital Status	Between Groups	1.398	3	.466	.751	.523
	Within Groups	240.336	387	.621		
	Total	241.734	390			
Income	Between Groups	20.497	3	6.832	6.789	.000
	Within Groups	384.438	382	1.006		
	Total	404.935	385			
Employment	Between Groups	13.800	3	4.600	2.844	.038
	Within Groups	625.960	387	1.617		
	Total	639.760	390			
Education Level	Between Groups	1.314	3	.438	.600	.616
	Within Groups	282.645	387	.730		
	Total	283.959	390			
Pregnancy status	Between Groups	.147	3	.049	1.006	.390
	Within Groups	18.830	387	.049		
	Total	18.977	390			
Food Stamps	Between Groups	4.726	3	1.575	9.605	.000
	Within Groups	63.468	387	.164		
	Total	68.194	390			

Table 9
Characteristics of Potential Covariates for WIC Only
ANOVA

		SS	*df*	*MS*	*F*	*p*
Age	Between Groups	26.895	3	8.965	2.581	.057
	Within Groups	385.505	111	3.473		
	Total	412.400	114			
Number of Children in Household	Between Groups	.526	3	.175	.709	.549
	Within Groups	27.439	111	.247		
	Total	27.965	114			
Marital Status	Between Groups	4.942	3	1.647	2.272	.084
	Within Groups	80.501	111	.725		
	Total	85.443	114			
Income	Between Groups	11.932	3	3.977	6.863	.000
	Within Groups	64.329	111	.580		
	Total	76.261	114			
Employment	Between Groups	12.757	3	4.252	3.579	.016
	Within Groups	131.887	111	1.188		
	Total	144.643	114			
Education Level	Between Groups	.414	3	.138	.187	.905
	Within Groups	81.882	111	.738		
	Total	82.296	114			
Pregnancy status	Between Groups	.604	3	.201	2.202	.092
	Within Groups	10.144	111	.091		
	Total	10.748	114			
Food Stamps	Between Groups	2.094	3	.698	2.907	.038
	Within Groups	26.654	111	.240		
	Total	28.748	114			

Demographic Data

The demographic data of the population per year were analyzed using descriptive statistics. The results are shown in the following Tables 11, 12, and 13.

Table 11
Demographic Characteristics

		Interview Year					
		2009	2011	2013	2015		
		n%	*n%*	*n%*	*n%*	*SD*	*p-value*
Reported Age in Years	(*M*)	21	21	21	21	2.036	.096
WIC	Yes	26.4	38.1	33.3	21.9	.456	.138
	No	73.6	61.9	66.7	78.1		
Pregnancy Status	Yes	3.8	4.8	4.8	9.4	.221	.388
	No	96.2	95.2	95.2	90.6		
Children Under 18 In Household	0-1	62.3	50.8	55.2	62.5	.493	.340
	2 or more	37.7	49.2	44.8	37.5		
Marital Status	Married or Previously Married	17.0	27.0	17.1	15.6	.787	.486
	A member of an unmarried couple	15.1	7.9	12.4	10.9		
	Never Married	67.9	65.1	70.5	73.4		
Household Income	Less than $25,000	39.6	47.6	57.4	25.4	1.025	<.000
	$25,000 to less than $50,000	30.2	20.6	18.8	23.8		
	$50,000 or more	26.4	19.0	13.9	28.6		
	Don't Know/Not Sure	3.8	12.7	9.9	22.2		
Anyone in Household Receive Food Stamps Past 12 Months	Yes	9.4	34.9	31.4	28.1	.418	<.000
	No	90.6	65.1	68.6	71.9		
Employment Status	Employed	26.4	30.2	25.7	46.9	1.280	.023
	Out of work	22.6	15.9	12.4	14.1		
	Homemaker	18.9	17.5	17.1	7.8		
	Student	32.1	34.9	41.0	28.1		
	Retired/ Unable to Work	0.0	1.6	3.8	3.1		
Education Level	Less than Grade 12	20.8	17.5	13.3	12.5	.853	.177
	Grade 12 or GED	26.4	41.3	41.0	31.3		
	Some college/Technical School	43.4	36.5	38.1	51.6		
	College graduate	9.4	4.8	7.6	4.7		

Table 12
Race Characteristics

		Interview Year			
		2009	2011	2013	2015
Race	White	129	45	69	*
	Black or African American	9	7	11	*
	Asian	12	4	13	*
	Native Hawaiian or Other Pacific Islander	0	1	0	*
	American Indian or Alaska Native	9	5	9	*

Note. *2015 was a low response year for Race, no data available for inclusion criteria population

Table 13
Latino Origin Characteristics

		Interview Year			
		2009	2011	2013	2015
		Count	Count	Count	Count
Hispanic Origin	Yes	52	38	63	34
	No	54	25	41	30
	Don't Know/Not Sure	0	0	1	0

Results

The sample for this research study included female 18-24-year old respondents of the California Behavioral Risk Factor Surveillance System Survey for the years 2009, 2011, 2013, and 2015. The participants of this study were included based on whether or not they responded to various questions of the BRFSS including WIC participation status, the number of children in the household, pregnancy status, age, gender, fruit, and green vegetable consumption. The participant's average age for each of the survey years was 21

years old. 29%, (*N* = 115) of the total respondents for the four years surveyed were WIC participants, the remaining 71% (N = 276) were not WIC participants. 5.1% (*N* = 20) of the respondents were pregnant at the time of the survey. The majority, 69.1% (*N = 270*) of respondents had never been married, 18.4% (*N* = 49) were either married, widowed, or divorced, and the remaining 12.5% (*N* = 49) were in an unmarried partnership at the time of the survey. The majority of respondents, 89% (*N* = 348), reported and income of less than $50,000 per year. 22.8% (*N* = 88) of the respondents received food stamp benefits. The majority of the population studied were either students or employed, 30% (*N* = 118) and 34.3%(*N* = 134), respectively. The remainder were either out of work, homemakers, or unable to work, 17.4% (*N* = 64), 16.4% (*N* = 64), and 1.8% (*N* = 7), respectively. The majority of the participants were either high school graduates or attending college, 33.5% (*N* = 131) and 42.2% (*N* = 165), respectively. A small portion, 7.4% (*N* = 29), were high school graduates, which is expected to be a small portion as the highest age included in this study was 24 years. The remainder, 16.9% (*N* = 66), had less than a high school education. The years 2011 and 2013 had the highest rates of both WIC participation and food stamp participation. All other demographic characteristics were fairly similar between the years. The demographics of this sample describe the most common characteristics of 18-24-year old females in California.

Research Question 1

RQ1 for this study was as follows: Is there a difference in green vegetable consumption between 18-24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015? The null hypothesis

stated that there is no difference in green vegetable consumption between 18-24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

A two-way ANCOVA was conducted to assess mean differences between WIC participants and non-WIC participants green vegetable consumption over the BRFSS survey years 2009, 2011, 2013, and 2015. The independent variables were WIC participation (*yes* or *no*) and survey year (2009, 2011, 2013, and 2015). The dependent variable was daily green vegetable consumption.

Preliminary checks, as detailed in chapter 3, were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances (p = .502), homogeneity of regression slopes, and reliable measurement of covariates. After adjusting for the covariate of food stamp participation, there was a significant interaction effect, F (3,336) = 3.224, p = .023, η2 = .028, between WIC participation and year. However, green vegetable consumption did not significantly differ by either WIC participation nor year of assessment [WIC participation: F (1,336) = 2.431, p = .120, η2 = .007; year: F (3,336) = 1.701, p = .167, η2 = .015]. The covariate of food stamp participation was not statistically significant, p = .123, $\eta 2$ = .007. These results are shown in Table 13 and *Figure 4*. The results suggest that neither WIC participation nor year individually affects green vegetable consumption, but when combined the effect is significant.

Green Vegetable consumption was assessed by WIC status for each year of assessment. Mean green vegetable consumption for the years is as follows, 2009 (n =

132), 2011 (*n* = 58), 2013 (*n* = 92), and 2015 (*n* = 63) were .458 (*SD* = .327), .417 (*SD* = .323), .409 (*SD* = .314), and .458 (*SD* = .308), respectively. Green vegetable consumption for the years 2009 and 2011 (.103, 95%CI [.003,.204], *p* = .043) differed significantly.

Table 14
Interaction Between WIC Participation and Year on Green Vegetable Consumption

Dependent Variable: Green Vegetable

Source	*SS*	*df*	*MS*	*F*	*p*	*η2*
Food Stamps	.190	1	.190	2.394	.123	.007
Year	.405	3	.135	1.701	.167	.015
WIC	.193	1	.193	2.431	.120	.007
Year * WIC	.767	3	.256	3.224	.023	.028
Error	26.651	336	.079			

a. R Squared = .038 (Adjusted R Squared = .015)

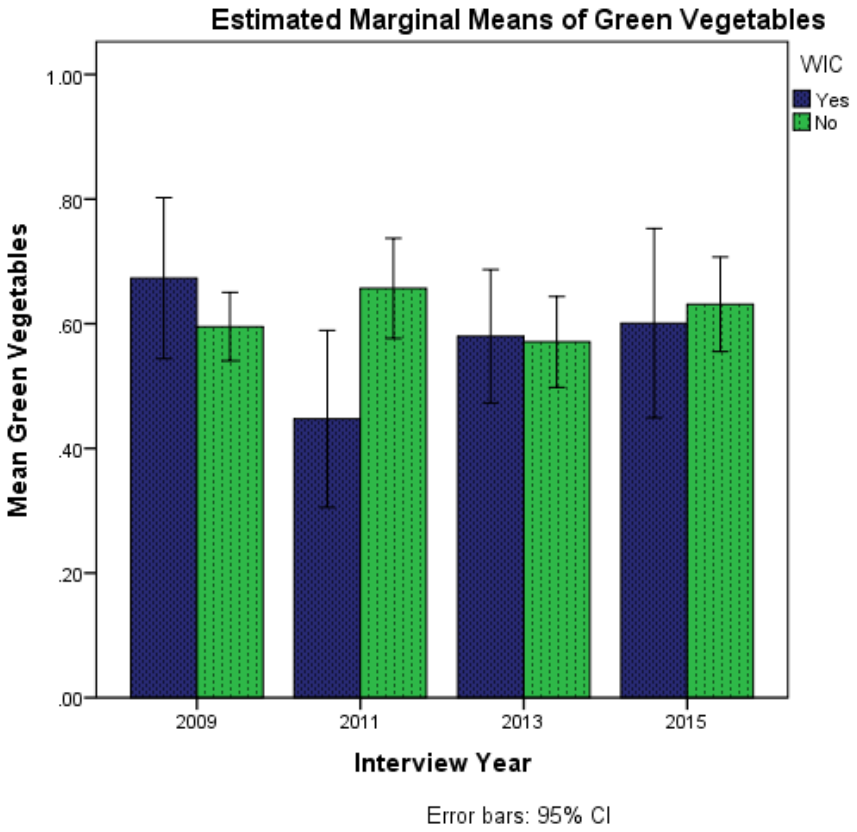

Figure 4: Mean green vegetable consumption in WIC and non-WIC participants

Research Question 2

RQ2 for this study was as follows: Is there a difference in fruit consumption between 18-24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015? The null hypothesis stated that there is no difference in fruit consumption between 18-24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015.

A two-way ANCOVA was conducted to assess mean differences between WIC participants and non-WIC participants fruit consumption over the BRFSS survey years 2009, 2011, 2013, and 2015. The independent variables were WIC participation (*yes* or *no*) and survey year (2009, 2011, 2013, and 2015). The dependent variable was daily fruit consumption.

Preliminary checks, as detailed in chapter 3, were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances ($p = .273$), homogeneity of regression slopes, and reliable measurement of covariates. After adjusting for the covariate of food stamp participation, there was no significant interaction effect, F (3,380) = .252, $p = .860$, $\eta 2 = .010$. Main effects for WIC participation was statistically significant, F (1,380) = 11.141, $p = .028$, $\eta 2 = .028$. Main effects for year was not statistically significant: F (3,380) = 1.324, $p = .266$, $\eta 2 = .010$. These results are in Table 14 and *Figure 5*. The results suggest that WIC participants and non-WIC participants consume different amounts of fruits, regardless of year surveyed.

Fruit consumption was assessed by WIC status for each year of assessment. Mean fruit consumption for the years is as follows, 2009 (*n* = 159), 2011 (*n* = 63), 2013 (*n* = 103), and 2015 (*n* = 64) were .984 (*SD* = .495), 1.122 (*SD* = .492), .1.040 (*SD* = .506), and .930 (*SD* = .427), respectively. There was no statistically significant difference between years for fruit consumption. There was a statistically significant different between WIC participation and fruit consumption, .211, 95%CI [.087,.335], *p* = .001, suggesting that WIC participants consume more fruits daily than non-WIC participants.

Table 15
Interaction Between WIC Participation and Year on Fruit Consumption

Dependent Variable: Fruit

Source	*SS*	*df*	*MS*	*F*	*p*	*η2*
Food Stamps	.046	1	.046	.196	.658	.001
Year	.926	3	.309	1.324	.266	.010
WIC	2.598	1	2.598	11.141	.001	.028
Year * WIC	.176	3	.059	.252	.860	.002
Error	88.608	380	.233			

Note. a. *R* Squared = .046 (Adjusted *R* Squared = .025).

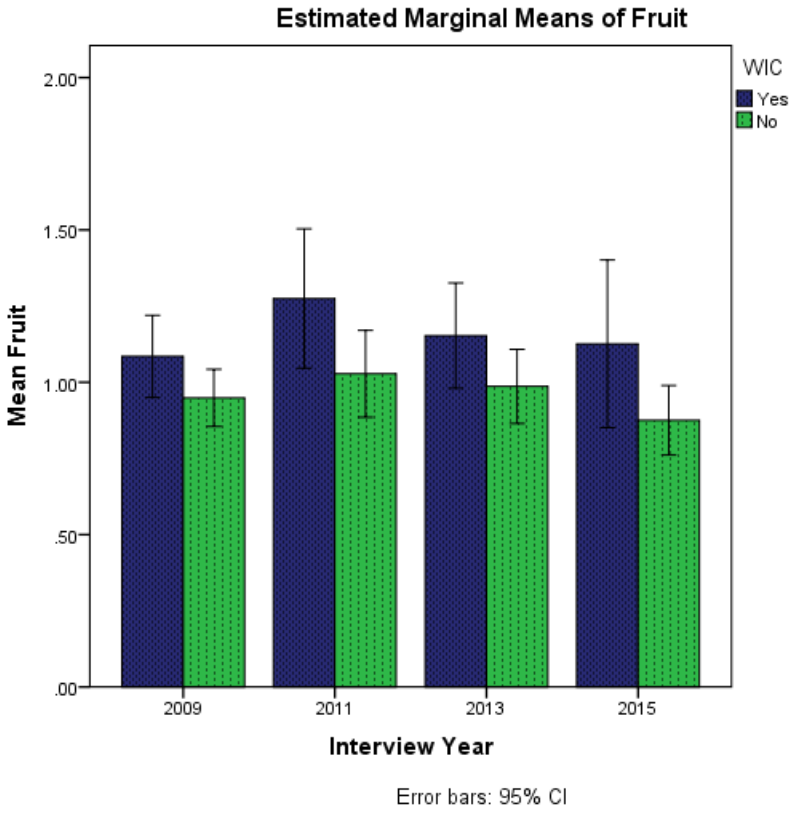

Figure 5: Mean fruit consumption in WIC and non-WIC participants

Research Question 3

RQ3 for this study was as follows: Is there a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18-24-year old WIC participants from California after implementation of the 2009 WIC food package revisions? The null hypothesis stated that there is no difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18-24-year old WIC participants from California after implementation of the 2009 WIC food package revisions?

A one-way ANCOVA was conducted to determine if Green Vegetable consumption in the WIC population was different over the assessed years. Years analyzed were 2009 (n = 42), 2011 (n = 24), 2013 (n = 35) and 2015 (n = 14). Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances (p = .414), homogeneity of regression slopes, and reliable measurement of covariates. One covariate was included, food stamp participation, as it did not violate the assumption of homogeneity of regression. Green vegetable consumption was as follows, 2009 (M = .960, SD = 0.475), 2011 (M = .594, SD = .496), 2013 (M = .750, SD = .462), 2015 (M = .656, SD = .324). The differences between years was statistically significant, F (3, 110) = 3.842, p = .012, $\eta 2$ = .095. There were statistically significant decreases in green vegetable consumption from 2009 to 2011 of .377, 95%CI [.137,.616], p = .002, 2009 to 2013 of .221, 95%CI [.006,.437], p = .044, and 2009 to 2015 of .301, 95%CI [.019,.584], p = .037. The results are shown in Table 15, Table 16, and *Figure 6*. The results suggest that green vegetable consumption in the WIC population was higher in 2009, before the food package revisions, than it was in the following years.

Table 16

Mean Green Vegetable consumption of WIC participants per year

Dependent Variable: Green Vegetable

Interview Year	Mean	Std. Deviation	N
2009	.9604	.47521	42
2011	.5946	.49625	24
2013	.7502	.46248	35
2015	.6589	.32475	14
Total	.7834	.47750	115

Table 17

The effect of Interview Year on Fruit consumption of WIC participants

Dependent Variable: Green Vegetable

	SS	*df*	*MS*	*F*	*p*	*η2*
Contrast	2.464	3	.821	3.842	.012	.095
Error	23.522	110	.214			

Note. The F tests the effect of Interview Year. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

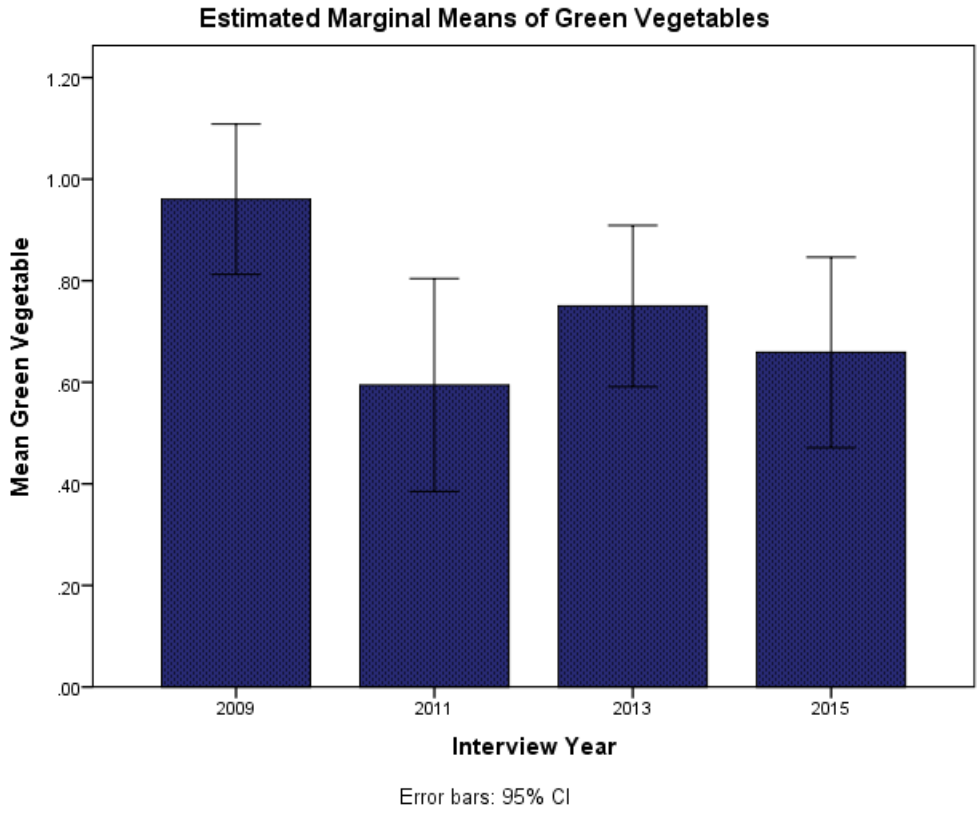

Figure 6. Mean green vegetable consumption of WIC participants

Research Question 4

RQ4 for this study was as follows: Is there a difference in consumption fruit between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18-24-year old WIC participants from California after implementation of the 2009 WIC food package revisions? The null hypothesis stated that there is no difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18-24-year old WIC participants from California after implementation of the 2009 WIC food package revisions?

A one-way ANCOVA was conducted to determine if Fruit consumption in WIC participants was different over the assessed years. Years analyzed were 2009 (n = 42), 2011 (n = 24), 2013 (n = 33) and 2015 (n = 14). Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, homogeneity of variances (p = .525), homogeneity of regression slopes, and reliable measurement of covariate. One covariate was included, food stamp participation, as it did not violate the assumption of homogeneity of regression. After adjusting for the covariate of food stamp participation, which was not significant (p = .269*, $\eta 2$* = .011), there was no significant difference between years, F (3,108) = 1.044, p = .376, $\eta 2$ = .028. Fruit consumption was as follows, 2009 (M = 1.085, SD = 0.432), 2011 (M = 1.275, SD = .541), 2013 (M = 1.153, SD = .488), 2015 (M = 1.126, SD = .476). Results are shown in Table 17, Table 18, and *Figure 7*.

Table 18

Mean Fruit consumption of WIC participants per year

Dependent Variable: Fruit

Interview Year	*M*	*SD*	*η2*
2009	1.0851	.43242	42
2011	1.2750	.54144	24
2013	1.1531	.48803	33
2015	1.1262	.47670	14
Total	1.1504	.47758	113

Table 19

The Effect of Interview Year on Fruit consumption of WIC participants

Dependent Variable: Fruit

	SS	*df*	*MS*	*F*	*p*	*η2*
Contrast	.716	3	.239	1.044	.376	.028
Error	24.702	108	.229			

Note. The F tests the effect of Interview Year. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

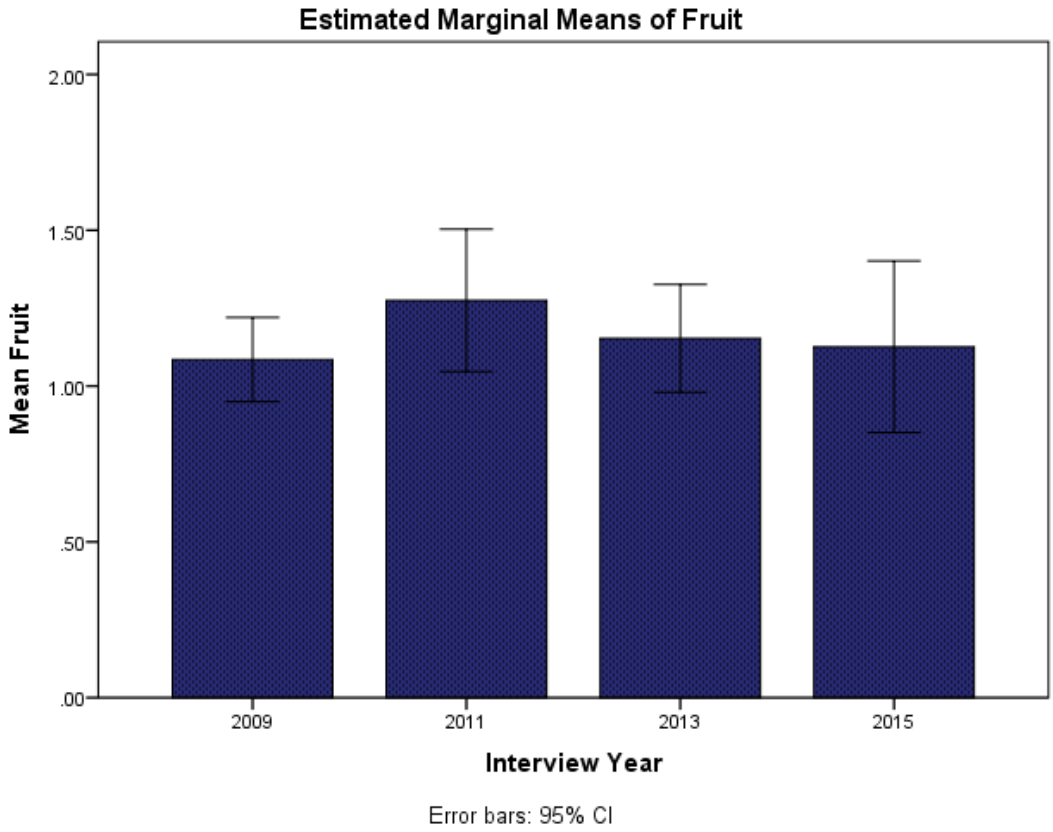

Figure 7. Mean fruit consumption of WIC participants

Summary

This chapter provided an explanation of data analysis and results from the secondary data analysis of data from the California Behavioral Risk Factor Surveillance System (CA BRFSS) survey. Preparation of the data for analysis resulted in several modifications, which included revisions for study inclusion criteria, key study variables, and the combining of four datasets into one. All covariates were assessed at each research question and for collinearity.

Results from two-way ANCOVA address research questions 1 and 2. Results from one-way ANCOVA address research questions 3 and 4. Results from the two-way ANCOVA for RQ1 indicated that there was a significant interaction effect between WIC

participation and survey year, suggesting that WIC participants and non-WIC participants consume different amounts of green vegetables. Additionally, the mean difference in green vegetable consumption for the years 2009 and 2013 was significantly different. Results from the two-way ANCOVA for RQ2 show that main effects for WIC participation were statistically different, but main effects for year was not, thus suggesting that WIC participants and non-WIC participants consume significantly different amounts of fruits, in which WIC participants consume more fruit than non-WIC participants. Results from the one-way ANCOVA for RQ3 indicate that there was a statistically significant difference in green vegetable consumption between years for WIC participants. Results from the one-way ANCOVA for RQ4 indicate that there was no statistically significant difference in fruit consumption between years for WIC participants.

In chapter 5, an interpretation of results and comparison of results with previous literature will be provided. Strengths, limitations, and recommendations for future research will be addressed. Additionally, a discussion of results as they relate to positive social change will be provided. A brief overview of the study and its findings will conclude the chapter.

Chapter 5: Discussion, Conclusions, and Recommendations

In this quantitative study, I examined the effectiveness of the 2009 WIC food package revisions on FV consumption for 18 to 24-year-old WIC participating females in California. Mean differences of FV consumption between 18 to 24-year-old female WIC and non-WIC populations was also compared. The populations analyzed in this study were respondents of the Ca BRFSS survey for the years 2009, 2011, 2013 and 2015. Of the initial 58,855 survey respondents, 391 were included in this study as they met the age, WIC response, gender, and pregnancy/household children criteria. Of the study population, 115 were WIC participants, and 276 were not WIC participants though sample size per research question varied due to variable response.

The purpose of this study was to evaluate how the USDA's WIC program food package revisions in 2009 may have influenced FV intake in WIC program participating female adults ages 18 to 24 years. An increase in FV consumption following the WIC food package revisions would support the anticipated changes expected from the policy revisions, providing evidence that the policy change is effective. This study also served to identify if there were significant differences between WIC participants and non-WIC participants FV intake to determine if there is a dietary gap between populations. The study was intended to identify possible environmental factors influencing FV consumption such as access and availability of fruits and vegetables as well as ability to purchase based on available funds. The following research questions guided this study:

RQ1: Is there a difference in green vegetable consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?

RQ2: Is there a difference in fruit consumption between 18 to 24-year-old WIC participants and non-WIC participants of the same age in California over the years 2009, 2011, 2013, and 2015?

RQ3: Is there a difference in green vegetable consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions?

RQ4: Is there a difference in fruit consumption between the years 2009 to 2015 (2009, 2011, 2013, and 2015) in 18 to 24-year-old WIC participants from California after implementation of the 2009 WIC food package revisions?

As detailed in the previous chapter, preparation of the data for analysis resulted in several modifications, which included revisions for study inclusion criteria, key study variables, and combining four datasets into one. All covariates were assessed at each research question and for collinearity and to ensure homogeneity of regression.

Results from two-way ANCOVA addressed RQ1 and RQ2. Results from the two-way ANCOVA for RQ1 indicated that there was a significant interaction effect between WIC participation and survey year, suggesting that WIC participants and non-WIC participants consume different amounts of green vegetables in certain years but not due to WIC participation. Additionally, the mean difference in green vegetable consumption for the years 2009 and 2011 (.103, 95% CI [.003,.204], $p = .043$) differed significantly.

Thus, the null hypothesis was accepted, as there was no significant difference between WIC and non-WIC populations. Results from the two-way ANCOVA for RQ2 show that main effects for WIC participation, F (1,380) = 11.141, p = .001, $\eta 2$ = .028, were statistically different, but main effects for year was not, F (3,380) = 1.324, p = .266, $\eta 2$ = .010., thus suggesting that WIC participants and non-WIC participants consume statistically significant amounts of fruits, with WIC participants consuming higher quantities of fruits than non-WIC participants. Thus, the null hypothesis is rejected.

Results from one-way ANCOVA addressed RQ3 and RQ4. Results from the one-way ANCOVA for RQ3 indicated that there was a statistically significant difference in green vegetable consumption between years for WIC participants. The differences between years was statistically significant, F (3, 110) = 3.842, p = .012, $\eta 2$ = .095. There were statistically significant decreases in green vegetable consumption 2009 to 2011 of .377, 95% CI [.137,.616], p = .002, 2009 to 2013 of .221, 95% CI [.006,.437], p = .044, and 2009 to 2015 of .301, 95% CI [.019,.584], p = .037. Therefore, the null hypothesis is rejected. Results from the one-way ANCOVA for RQ4 indicate that there was no statistically significant difference in fruit consumption between years for WIC participants. There was no significant difference between years, F (3,108) = 1.044, p = .376, $\eta 2$ = .028. Therefore, the null hypothesis is accepted.

Interpretation of the Findings

The results of this study conflict with previous studies relating to WIC FV consumption following the food package revisions. Although none of the previous research studies compared WIC and non-WIC populations in terms of healthful diet, or

fruit and vegetable consumption, the results were surprising. Previous studies in various locations throughout the United States noted a significant increase of FV access following the food package revisions. In New England, local grocery scanner data noted that there was a significant increase in FV consumption following the food package revisions (Andreyeva et al., 2012). This increase was presumably due to the requirement that WIC approved vendors stock adequate quantities of WIC approved foods (Andreyeva et al., 2012). Research in New Orleans, Louisiana, Baltimore, Maryland, and Philadelphia showed the same results of an overall increase in FV availability following the food package revisions (see Cobb et al., 2015; Rose et al., 2014; Zenk, et al., 2012).

Research Question 1

For RQ1, I accepted the null hypothesis that there is no statistically significant difference in green vegetable consumption between WIC participants and non-WIC participants. The results showed that green vegetable consumption significantly decreased from 2009 to the following years, wherein 2009 had the largest green vegetable consumption. WIC participants and non-WIC participants on average consume different amounts of green vegetables, .557 and .618, respectively, though the difference is not significant, .061, 95% CI [-.139,.016], $p = .120$.

Research Question 2

For RQ2, I rejected the null hypothesis, as there is a statistically significant difference in fruit consumption between WIC participants and non-WIC participants. The results showed that there was no statistically significant difference in fruit consumption between years. WIC participants and non-WIC participants on average consume different

amounts of fruit, 1.168 and .957, respectively, and the difference is significant, .211, 95% CI [.087,.335], $p = .001$.

Research Question 3

For RQ3, I rejected the null hypothesis that there is no statistically significant difference in green vegetable consumption between the years 2009, 2011, 2013, and 2015. However, rather than being a positive change in green vegetable consumption, a negative change was reported. In other words, green vegetable consumption in 18 to 24-year-old female WIC participants was higher before the food package revisions.

Research Question 4

I accepted the null hypothesis for RQ4, as there is no statistically significant difference in fruit consumption between the years 2009, 2011, 2013, and 2015 for 18 to 24-year-old female WIC participants.

Discussion

Although the results were different between RQ3 and RQ4, both indicate that the food package revisions were not healthfully beneficial to the WIC population. These results contradict the studies examined in Chapter 2 that showed that the food package revisions had positive impacts on healthful diets in WIC populations, though the previous researchers did not look specifically at FV consumption, but rather diet as a whole, including whole-grains and dairy through purchasing behaviors and store stocking requirements (Andreyeva et al., 2012; Cobb et al., 2015; Rose et al., 2014; Zenk et al., 2012; Zenk et al., 2014). A 7.2% increase in vegetable consumption had been previously found in California, but there was no increase in fruit consumption 6 months following

the food package revisions in 2010 (Whaley et al., 2012). However, the sample for Whaley et al.'s (2012) study was not limited to females ages 18 to 24 but was open to any qualifying WIC participant who responded to the survey. Additionally, the survey was not the BRFSS, but rather a survey created specifically to test WIC food package revision impact. The results of this current study showed that vegetable consumption decreased, and fruit consumption remained the same. These differences may be due to sample size differences as well as survey differences, as the BRFSS survey was not designed with WIC food package revisions in mind, whereas the previous study conducted was designed with WIC food package revisions in mind.

Theory Integration

Differences between this research and previous research may be, in part, due to social ecological differences. The social ecological model states that there are several factors that may influence health decisions, such as diet quality, including intrapersonal, interpersonal, organization, community, and policy (Bronfenbrenner, 1994). The WIC program utilizes several aspects of the social ecological theory to bring about positive health behaviors in participants such as relying on the intrapersonal level by requiring nutrition education group classes and individual counseling to increase knowledge and beliefs surrounding dietary choices. The food package revisions rely on the interpersonal level to increase food availability and be culturally sensitive. The community level is addressed by reducing the socioeconomic barriers in accessing healthful foods. The program also utilizes the policy level by restricting food purchases and requiring health documentations such as height, weight, and special dietary proof, when applicable. The

results of this study show that various levels of the social ecological model are interacting, for example, the results of RQ2 showing a significant difference between WIC and non-WIC populations fruit consumption, wherein the WIC population consumes more fruits, may be interpreted as a successful nutritional campaign at the intrapersonal level, though it cannot be known for sure what other factors influence fruit consumption. Conversely, a lack of significant increase of fruit and green vegetable consumption between the years 2009, 2011, 2013, and 2015 show that the policy level of the social ecological model had a negative effect on the healthful diets of WIC participants in California. Though the literature, as noted previously, found only positive changes following the food package revisions. These differences may be due to the location of the research because geographic location impacts cost and overall availability of fruits and vegetables.

Limitations

Study limitations include that the study participants may not have been enrolled in WIC for the same length of time, some may have had more WIC counseling and education than others due to thelength of enrollment. It cannot be verified that survey participants are truthful in their claim to be a receiving WIC benefits. Additionally, the survey did not ask about food accessibility and therefore it cannot be verified that all survey respondents (WIC or non-WIC) had equal access to FV, as low-income populations often live in food swamps or food deserts where fresh produce is not readily available or costs too much (Wu, Saitone, & Sexton, 2017). Data could not be analyzed prior to 2009 as the BRFSS survey did not include the necessary data in previous years.

The number of children participants have is not accounted for, which impacts the total household dollar amount received for fruits and vegetables, only number of children in the household is addressed, which may or may not be children receiving WIC benefits, and may not be the children of the survey respondent. Religious nutritional exclusions are not accounted for. Personal preferences for dietary choices are not addressed by the BRFSS survey. Additionally, the BRFSS survey asks nutrition questions based on a recall method, meaning that there is no guarantee the respondent is accurately estimating the amounts of fruits and vegetables being consumed (CDC, n.d.; CSUS, n.d.). The sample size for this study is smaller than studies identified in the literature considerably, which may account for the variance in the results of this study versus previous studies.

Recommendations for Future Research

Through this research, I provided results that contradict previous studies, thus a need for further research is needed to determine what factors may have led to the variance in results. Previous research in California that examined fruit and vegetable intake after the WIC food package revisions analyzed fruits and vegetables as one variable and examined the change six-months after the food package revisions were implemented (Whaley et al., 2012). In this study, I looked at fruit and green vegetables separately and over a period of 6 years, which allowed for a more detailed examination. However, the sample sizes differed significantly, wherein the previous research has a sample of over 9,000 and this study had a sample of less than 400. These differences may explain the variance in the results for California. It would be beneficial to conduct a qualitative or mixed-methods study of WIC and non-WIC participants to determine the

factors contribute to fruit and vegetable consumption. Future research should identify cost barriers to fruit and vegetable consumption that are related to policy and environment specifically, as the cost of food, not just availability, may be an issue, as it has been identified by the CDC as a limitation to fruit and vegetable consumption (Lee-Kwan, Moore, Blanck, Harris, Galuska, 2017).

Implications for Social Change

The research I have completed facilitates positive social change by encouraging future researchers to focus on how food packages provided to low-income populations specifically impact the overall health of the population via dietary patterns. This research study adds to the literature regarding the impact of the WIC program food package revisions in California. The results of this research indicate that further nutritional education is necessary to impact dietary patterns in low-income populations. Motivation and social support may also need to be addressed to lead to a lasting impact on healthful diets. Both WIC and non-WIC populations in this study did not consume adequate fruits or green vegetables, though orange or other colored vegetables were not studied in this research study, it is still evident that Californians are not consuming adequate fruits and vegetables, which is consistent with previous research and statistics stating that only 24% and 13% of the population consume the recommended daily amounts of fruits and vegetables, respectively (Moore & Thompson, 2015). Thus, it is evident that education into the importance or fruit and vegetable consumption is key, and possibly environmental factors such as cost and availability of produce need to be addressed, regardless of socioeconomic status. The literature has provided insight into the

availability of fruits and vegetables, stating that the 2009 food package revisions increased stocking for fresh produce, however, it is still unclear from the literature how price of produce was affected (Andreyeva et al., 2012; Cobb, et al., 2015; Rose et al., 2014; Zenk, et al., 2012; Zenk, et al., 2014). This research can provide useful insight for the Women, Infants, and Children program as to dietary practices in populations and proves the need for additional services. This study may aid in obtaining grants for additional education programs or training of WIC staff to properly educate on the importance of fruit and vegetable consumption. This study shows that, in California, fruits and vegetable consumption did not significantly increase after the 2009 WIC food packages were implemented, thus there may be other social-ecological factors influencing fruit and vegetable consumption, and research is needed to identify and address those factors.

Conclusion

The purpose of this study was to identify differences between WIC and non-WIC populations fruit and green vegetable consumption, and to determine the impact of the 2009 WIC food package revision on fruit and green vegetable consumption. The study was a quantitative design in which survey data from the BRFSS 2009, 2011, 2013, and 2015 were analyzed. The results of this study show that there was not a significant increase in fruit and green vegetable consumption in WIC populations between the years 2009, 2011, 2013, and 2015, as would be expected from a 275% increase in cash-value vouchers allotted for fruit and vegetable purchases. The results also show no significant difference in fruit consumption between WIC and non-WIC populations. The study

provides useful insight as to the effect that the 2009 WIC food package revisions have had on fruit and green vegetable consumption in the identified population. There are still several factors that could explain these results that were not accounted for in this study such as nutrition policy, economic factors, and issues relating to food availability in general. There are several issues relating to poor nutrition and unequal access to healthful foods that go well beyond a single program's, such as WIC's, control. Diet, as noted by the social ecological model, is a complex human behavior and thus requires more than a single policy change to create a lasting impact. The WIC food package revisions are a step in the right direction towards creating more access to healthful foods for low-income populations, but the revisions themselves do not create more food, closer grocers, or more affordable prices. Such factors need to be addressed if a lasting and meaningful impact on diet is to be seen.

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Appendix A: BRFSS Data User Agreement

SACRAMENTO STATE

California State University, Sacramento
Public Health Survey Research Program
6000 J Street • Folsom Hall 2048 • Sacramento, CA 95819-6128
T (916) 278-2080 • F (916) 278-2200 • www.csus.edu/research/phsrp

California Behavioral Risk Factor Surveillance System Data User Agreement
California State University, Sacramento
Public Health Survey Research Program

It is of utmost importance to protect the identities of California Behavioral Risk Factor Surveillance System (BRFSS) respondents. Every effort has been made to exclude identifying information on individual respondents from the computer files. Certain demographic information—such as sex, race, etc.—has been included for research purposes. All research results must be presented or published in a manner which ensures that no individual can be identified. In addition, there must be no attempt either to identify individuals from any computer file or to link with a computer file containing respondent identifiers.

The undersigned agrees to all of the following regarding use of California Behavioral Risk Factor Surveillance System (BRFSS) data sets:

1. BRFSS data will be used for academic, research, or professional purposes only. BRFSS data will not be used to identify people.

2. If the investigator unexpectedly learns the identity of one or more living individuals, then the research activity is considered to involve human subjects under the HHS regulations and must go through IRB review at the investigator's home institution.

3. BRFSS data is for the exclusive use of the individual requesting the data. The user will not alter, share, release or redistribute original BRFSS data.

4. Original BRFSS data is released "as is." Neither the Public Health Survey Research Program of California State University, Sacramento nor the California Department of Public Health, or any of their respective divisions or subdivisions, make any representations, express or implied, about data completeness or accuracy, or fitness of the data for a particular purpose.

5. User will acknowledge the "California Behavioral Risk Factor Survey Workgroup" in all publications or presentations pursuant to the guidelines set forth in the most current version of the *California Behavioral Risk Factor Survey SAS Documentation and Technical Report* (this document will be included in an email with the dataset requested).

6. User will notify Public Health Survey Research Program of all writings and/ or presentations, including but not limited to published articles, accepted abstracts, academic papers, and conference presentations or papers, that include or are based on BRFSS data.

7. User agrees to send via email one (1) reprint of all publications using BRFSS data to the following entity:

   Public Health Survey Research Program
   California State University, Sacramento
   ATTN: Compliance Officer
   Phone: 916-278-2080
   Fax: 916-278-2200
   Email: PHSRP@csus.edu

8. This agreement supersedes all previous BRFSS data user agreements.

9. Upon receipt and approval of the appropriate forms, the Research Technician will send an email with instruction on how to download the data. The user will have 48 hours to download the data with the token sent upon approval. After the user has used the data according to the above agreement, they are responsible for properly destroying and deleting the data, including all electronic and hard copy versions.

Complete the form below to request BRFSS data. You must print the form to sign and date before scanning and emailing to Compliance Officer at PHSRP@csus.edu.

Requestor Information	
Name of Requestor:	Lindsay Estrada
Position Title:	Ph.D. Public Health Candidate
Organization:	Walden University
Address:	[redacted]
Phone:	
Email:	

Data Use	
Year(s) of data requested:	2009, 2011, 2013, 2015
Research Question/ Area of Interest:	Did the 2009 food package revisions impact fruit and vegetable consumption in the adult WIC program population in California? Is there a difference in fruit and vegetable consumption between adult WIC participants and adult non-WIC participants in California?
What statistical software will be used to analyze the data?	SPSS

Agreement Signature; I agree to follow the guidelines stated above	
Requestor Signature:	X [redacted]
Date:	March 28, 2018

Appendix B: BRFSS Letter of Cooperation

SACRAMENTO STATE

California State University, Sacramento
Public Health Survey Research Program
6000 J Street • Folsom Hall 2048 • Sacramento, CA 95819-6128
T (916) 278-2080 • F (916) 278-2200 • www.csus.edu/research/phsrp

March 27, 2018

To Walden University Institutional Review Board:

As the Director of the Public Health Survey Research Program (PHSRP) at California State University, Sacramento, I am the Compliance Officer for the distribution of the California Behavioral Risk Factor Surveillance System (BRFSS) data. PHSRP conducts BRFSS data collection for the CA Department of Public Health, and therefore houses and disseminates the data on their behalf. CA CRFSS data is publically available upon request using our Data User Agreement (DUA), available on the PHSRP website (http://www.csus.edu/research/phsrp/datarequest.html).

Upon receipt of a DUA, I will grant Lindsay Estrada (PhD(c)) approval to access 2009, 2011, 2013, and 2015 BRFSS data, and send her the data via email.

Please feel free to contact me if you have any further questions about BRFSS data access.

Sincerely,

Julia C. Tomassilli, Ph.D.
Director
Public Health Survey Research Program (PHSRP)
California State University, Sacramento
6000 J Street
Sacramento, CA 95819-6128
[redacted]