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Socio-ecological barriers and motivators to dry pulse consumption among low-income women in Iowa

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Socio-ecological barriers and motivators to dry pulse consumption among low-income women in Iowa

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The student author and the program of study committee are solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

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ABSTRACT

Low-socioeconomic populations have increased risk of chronic diseases such as heart disease, diabetes, and cancer. There are numerous challenges these households may come across such as restraints on time, funds, and resources for food purchasing decisions. Individual nutrition knowledge, household wants, food availability in the community, and nutrition policies affect foods purchased and consumed. Four nutrients currently under-consumed by the US population include potassium, fiber, calcium, and iron which are labeled as nutrients of concern by the 2015-2020 Dietary Guidelines. A nutrient dense food that provides a good amount of fiber, protein, and several micronutrients are pulses, or dry, edible varieties of beans, peas, and lentils. The current pulse intake in the US is ½- 1 cup per week which is well below the recommendations of 2-3 cups/week for men and 1.5-2 cups/week for women.

The goals of this thesis are to 1) determine socioecological barriers and motivators to legume consumption; 2) assess the knowledge regarding health benefits of pulses among low-socioeconomic women in Iowa; and 3) determine current pulse consumption.

Results from the knowledge, attitudes, and perceptions survey and focus group qualitative analyses indicate knowledge gaps in the health benefits of pulses. According to dietary assessment screeners, current pulse consumption is very low among the US population. Acculturation patterns show Hispanic-dominant participants having greater pulse consumption as compared to English-dominant participants. Community factors illustrate great availability of pulses in grocery stores. Interpersonal and individual

barriers include: limited knowledge of preparation methods, specific health benefits of beans, and household influences.

These mixed method results can be used to develop a nutrition education plan including a hands-on demonstration with recipes on how to incorporate pulses into individual's everyday diets. By increasing participant's pulse consumption, the prevalence of chronic disease may decrease and the nutritional quality may rise.

CHAPTER 1. INTRODUCTION

Legumes are defined as the pea or seed of a plant with a pod and have distinct flowers. Leguminous plants have a symbiotic relationship with the soil as they naturally fix nitrogen in the ground contributing to a sustainable system. These include dry beans, chickpeas, lima beans, lentils, fresh peas, soybeans, peanuts, and edamame. A broad category including dry beans, peas, lentils, and chickpeas are pulses. These are defined as crops harvested solely as dry grains, which differentiate them from other vegetable crops harvested while green. Currently the U.S. population does not meet the 2015-2020 Dietary Guideline recommendations of 1.5-2 cups per week for women ages 18-50, and 2-3 cups per week for men ages 18-50.[1] Encouraging legume consumption is a great way to increase protein, fiber, and several micronutrients in the daily diet. Pulses are a good source of carbohydrates for individuals with type 2 diabetes, may aid in decreasing LDL-cholesterol, and some cancers such as colorectal cancer. They also aid in weight management as they increase satiety.[2]

Despite all of these health benefits, leguminous products have been decreasing in consumption in the U.S. population.[3] In order to increase consumption, the first step is to determine individual's current knowledge, perceptions regarding beans, and barriers to consumption.

Thesis Goals

The goals of this thesis are to determine low-socioeconomic women's current knowledge and perceptions regarding the health benefits of beans.

Goal 1: Identify the barriers to bean consumption among low-socioeconomic women.

Goal 2: Determine individual, interpersonal, community, and policy related influences on low-socioeconomic women's grocery shopping habits.

Goal 3: Make recommendations for an effective nutrition education intervention targeting low-socioeconomic women on nutritious food choices.

Thesis Organization

To begin understanding the health benefits of beans and the current low-socioeconomic population in Iowa, a literature review lays out the background and the need for the current research project. After setting the stage, the methodology from the Knowledge, Attitudes, and Perceptions (KAP) survey among low-income non-Hispanic and Hispanic women is described, followed by the research procedures for a second study utilizing a mixed methods approach to understanding barriers and motivators to pulse consumption. The results from the two studies are presented in the two respective manuscripts are included, one from the KAP survey and one from the mixed methods approach. The thesis will close with a summary of the findings and conclusions for a future nutrition education component. Attached are appendices and resources of the survey tools, references, and documents used throughout this project.

CHAPTER 2: REVIEW OF LITERATURE

Introduction

The prevalence of chronic diseases in Iowa remains relatively high in comparison to the United States. In 2016, 9.3% of the Iowa adult population reported having diabetes, 3.9% were told they had angina or coronary heart disease, 36.2% had high cholesterol, 32% obese, and 36.7% overweight.[4] This is about average with the 2015 health statistics for the US, as 36.6% had high cholesterol. In 2016, approximately 29.9% of the US population was obese, 35.3% were overweight, and 4.1% had coronary heart disease.[4] There are many factors that have a role in chronic disease risk including an individual's lifestyle, food availability, education level, socioeconomic status, ethnicity, among several other factors.[5] Higher income is correlated with a more nutritious diet and longer life expectancy. In fact, individuals with an economic hardship have an 8.5 year decrease in life expectancy.[6] The prevalence of chronic disease is higher among lower-socioeconomic households; 14% higher risk of heart disease, 17% higher risk of diabetes.[7] Numerous research studies have documented lower dietary quality among lower-socioeconomic groups.[8] Job insecurity, housing insecurity, stress, poor sleep, food availability, and cognitive burden are a few of these contributors to less optimal nutrition. Poor housing quality, overcrowding, homelessness, and frequent moving are challenges related to housing stressors. Other causes of stress include; financial burdens, work issues, family responsibilities, and health concerns.[9]

To evaluate pulse consumption patterns, perception patterns, and knowledge regarding the health benefits of pulses, the thesis studies were framed around the

socioecological model. This four components at the individual, interpersonal, community, and policy levels describe individual's food purchasing decisions.

Theoretical Model of Food Choice

There are several different theoretical models that describe how individuals make health behavior changes such as food choice. The Health Belief Model shows how health behavior is influenced by perceived threat to health status and expected net gain. This model focuses on risk and includes components of perceived susceptibility, severity, benefits, barriers, cue to action, and self-efficacy.[10] The Theory of Reasoned Action and Planned Behavior assumes that individuals have control over their behaviors. Components of this model include an individual's attitudes toward the behavior and subjective norms, and perceived behavioral control.[11] Social Cognitive Theory in an interpersonal theory that targets the individual and the immediate environment. Three major factors are included: behavior, personal factors, and environmental factors. This model seeks to explain how behaviors are based on cognitive activity, purposeful, and under control by the individual. A fourth model is the Trans- Theoretical Model of Health Behavior. This is an intrapersonal theory where behavior change occurs as a process rather than a discreet step. The model describes the process in which behaviors may occur, precontemplation, contemplation, determination, action, and maintenance.[12]

The Health Belief Model is commonly used in motivating consumers to change a health behavior that places them at risk for a chronic disease condition. The Social Cognitive Theory is commonly used in studies assessing consumer’s food choices because it takes into account the individual’s self-efficacy and environment, but may not include the broader categories of the community and policy levels. The Trans-theoretical

model is used for the individual level by meeting the person where they are and identifying their motivation to change. These behavior models emphasize individual characteristics, skills, and social influences. They do not take into account the broader community, organizational, and policy influences on individual's need for a health behavior change.

Socio-ecological Model

The socio-ecological model (SEM) has been increasing in popularity due to the intricate network of many factors affecting an individual and their behavior change. This model provides a strong framework for assessing food choice at the four levels of policy, community, interpersonal, and individual levels. These are important factors for food choice decisions, in terms of federal assistance received to purchase foods, food availability in the community, and familial influences on food choice. Ecology refers to the relationship between an organism and their environment.

Four main principles of ecological models are proposed:

- Health behaviors are influenced by multiple factors. These can include intrapersonal, interpersonal, organizational, community, and public policy.
- These influences interact across many levels. All of these variables either directly or indirectly influence an individual to make a behavior change.
- Ecological models study behavior change on multiple levels which is most effective at making a long-term change.
- Ecological models are most effective when they are tied to a specific behavior change.

The theory behind this model is that behavior change is not just made by one individual without their environment affecting that decision. As defined by Brofenbrenner, health behavior changes are complex and incorporate the microsystem, mesosystem, exosystem, and macrosystem.[13] The microsystem is the relationship between the individual and their everyday surroundings, school, work, family. The mesosystem is the relationship between the individual and major settings at one growth-point in their life, family, school, church, peers. The exosystem are all of the other formal and informal social structures influencing an individual, the world of work, the neighborhood, and media. Finally, the macrosystem includes all of the indirect influences of an individual, the culture, laws, regulations, and rules.[13] Five levels of influencing health-related behaviors include; individual, interpersonal, organizational, community, and public-policy.[14] Although not all of these influences directly impact an individual on a daily basis, there may be an indirect impact.

A weakness of ecological models is the specificity regarding the hypothesized influences. This places a burden on the health promotion professionals to determine how all of the variables interact each other. Without identifying specific variables, individual's perspectives are left to provide guidance (USDA). Researchers using ecological models require more attention to the population set to determine how each environmental factor influences the desired health behavior change. Strategizing at each level of an individual's life will elicit positive long-term health changes.[13]

Policy Level: Dietary Guidelines for Americans Need for Nutritional Transitions

The Dietary Guidelines for Americans is a resource that "informs the development of Federal food, nutrition, and health policies and programs."[1] The 2015-

2020 Dietary Guideline recommendations encourage an intake of a variety of vegetables, whole fruits, at least half of grains are whole, fat-free, or low-fat dairy, and a variety of protein sources. They also encourage individuals to limit saturated- and trans-fats, added sugars, and sodium. The most under-consumed nutrients of public-health concern are potassium, dietary fiber, choline, magnesium, calcium, and vitamins A, D, E, C. Iron is under-consumed by females ages 19-50 years old. The Dietary Guidelines highlight four nutrients in which to focus on for 2015-2020: calcium, potassium, dietary fiber, and vitamin D.[1]

A low dietary fiber intake is due to a depressed consumption of vegetables, fruits, and whole grains. The dietary fiber recommendations are 14g/1000 calories.[15] In an average 2000 calorie diet, this would be about 28g per day. The average fiber intake is 16 g/ day.[1] This is well below the recommended consumption, which may lead to increase prevalence of chronic diseases. Pulses are a group that can fit both in the protein and vegetable food groups. For ½ cup of navy beans there is 9.6 g fiber, and a ½ cup of pinto beans there is 7.7 g of fiber, and ½ cup of chickpeas have 8.1 g of fiber.[16]

Low potassium intake is due to low consumption of vegetables, fruits, and dairy. The Dietary Guidelines suggest increasing the consumption of white potatoes, beet greens, white beans, plain yogurt, and sweet potato to meet the potassium recommended dietary allowance (RDA) of 4700 mg per day. The current intake is 2640 mg per day of potassium.[1] Some pulses are a good source of potassium; in ½ cup of lima beans there is 478 mg, ½ cup of white beans contains 595 mg of potassium, and a ½ cup of lentils includes 365 mg of potassium.[17]

Other nutrients that are included in beans and highlighted in the Dietary Guidelines are iron, phosphorus, zinc, magnesium, and folate. The RDA of iron for a female ages 19-50 years old is 18 mg per day[15], and the current intake is 14.9 mg per day.[1] The RDA for phosphorus adult males and females is 700 mg per day[15], and the U.S. is meeting this by consuming 1386 mg per day.[1] Americans are currently meting the zinc RDA of 8 mg per day, as the current consumption is 11.5 mg per day.[1] The current consumption of magnesium nearly meets the RDA of 310 mg per day, and current consumption is 290 mg per day.[1] The RDA for folate for adult males and females is 400 mcg per day, and the current intake is 208 mcg per day.[1]

Policy Level: Resources for Low-Socioeconomic Households in Iowa

One of the ways the Dietary Guidelines are used is by every five years shaping the income-based food eligibility to meet the needs of the low-socioeconomic population. In comparison to the 2017 United States population in poverty, 12.7%, the population in poverty in Iowa is slightly lower at 11.8%.[18] There are several USDA Food & Nutrition Service programs available to low-income families: Supplemental Food Assistance Program (SNAP), Commodity Supplemental Food Programs (CSFP), the National School Lunch Program (NSLP), and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).[19-25]

One program available to women with infants through children up to five years is WIC. WIC's mission is "To safeguard the health of low-income women, infants, and children up to age 5 who are at nutrition risk by providing nutritious foods to supplement diets, information on healthy eating, and referrals to health care."[19] The household income must be at or below 185% of the U.S. federal poverty level to be eligible for WIC

benefits. An income of $45,510 is the income eligibility guidelines for a family of four.[20] Federal grants are provided to states for disperse, so mothers receiving funds from Iowa must reside within the state and have a nutritional risk identified by a health professional. The food benefits are transferred onto an electronic benefits card which can be used for products such as; infant cereal, iron-fortified adult cereal, vitamin-C fruit or vegetable juice, eggs, milk, cheese, peanut butter, beans, canned fish, soy-based beverages, tofu, fruits and vegetables, and whole-wheat bread. One highlight for this research study is in 2007, WIC regulations code of federal regulations 7 C.F.R Part 246 published by the Federal Register were amended to include canned beans. In 2010-2011, WIC participation in Iowa was 70,931, which is approximately 2.3% of the total population.[21] This is slightly lower than the national WIC participation in 2016, which 7.7 million individuals received the benefits, 2.4% of the total population.

An entitlement program available to families that meet the income guidelines is SNAP, formerly called the U.S. food stamp program. Household incomes must be at or below 130% of the federal poverty level. The goal of this program is to provide a hunger safety net for families through State agencies, nutrition educators, and neighborhood and faith-based organizations to aid in making informed decisions. Federal funds are provided through the U.S. Department of Agriculture, which provide food benefits, access to a healthy diet, and education on food preparation and nutrition. SNAP benefits can be used to purchase breads, cereals, fruits, vegetables, meats, fish, poultry, and dairy products, as well as seeds and plants which produce food to eat. SNAP benefits cannot be used to purchase alcohol, non-food items, pet foods, soaps, household products, vitamins, medicine, food that can be consumed in the store, or hot foods.[22] Individuals receiving

SNAP benefits spend $38 less per adult in the household per week as compared to higher income non-SNAP households. In total 35.6% of SNAP participants are food insecure.[23] Households receiving SNAP benefits had lower intakes of vegetables, greens, beans, fruit, whole grains, seafood, and plant proteins as compared to low-income and higher income non-SNAP households.[24] As compared to higher income individuals, SNAP participants purchase 23% fewer vegetables, 47% fewer dark green vegetables and beans, 33% less seafood and 10% more refined grains.[24] This may be due to the perception that fruits and vegetables are more costly as compared to processed convenience foods. Individuals may also believe the misperception that fresh fruits and vegetables are more nutritious as compared to frozen or canned goods, and feel they have inadequate resources to purchase and prepare fresh produce.

In 2013, 419,000, approximately 14% of the Iowa population received SNAP benefits. This is about the same as the national average, approximately 15% of the total US population. In Iowa, the majority of the SNAP benefits went to families with children, 72%, and 21% went to families with elderly or disabled members. In 2013, 14% of Iowa's population received SNAP benefits.[25]

The NSLP is a federally assisted meal program available in public and nonprofit private schools and residential childcare institutions. The household income must be below 130% of the federal poverty level to receive free meals, and 130-185% to receive a reduced-price lunch. The program provides a nutritionally balanced, low-cost or free lunch to students every day. In 2016, 30.4 million children nationwide participated in the NSLP. In 2016, approximately 198,885 students received reduced or free school lunches, which is about 41.3% of the total student enrollment.[26]

Participation in these programs is self-selected. SNAP benefits are beneficial in decreasing food security by 16.2%.[23] Despite several programs offered to families with low income, families still have challenges in purchasing nutritious food products and making the funds last the entire month. SNAP participants are more likely to purchase their groceries in one trip once they receive the benefits rather than shopping periodically throughout the month.[24] For a family of four, individuals receive on average $456 per month.[25]

Community Level: Food Availability in Low-Socioeconomic Neighborhoods

Not only does socioeconomic status affect food-purchasing decisions, so does the community's physical environment and food availability. The growth of the fast food industry and convenience stores may be contributing factors to the obesogenic environment. A greater volume of fast food restaurants are found in low-income and Black communities.[27] Lower-income zip codes have fewer chain supermarkets than middle- and high-income zip codes.[28] The main source of calories among low-socioeconomic households are foods purchased from large grocery stores. The second being from convenience and dollar stores.[24] When comparing Midwest food store availability with Northeast United States food stores, there are 0.75 fewer chain supermarkets, 0.53 fewer non-chain supermarkets, 0.68 fewer grocery stores, and 1.04 more convenience stores.[28] Food availability varies by store type, with supermarkets offering the greatest overall food options. Prices also vary by store type, as chain grocery stores have significantly lower food prices as compared to convenience or small grocery stores.[29]

Among low-income neighborhoods, the types of food stores that are present vary, as there are over three times as many supermarkets in the wealthier neighborhoods compared to low-income areas. The racial composition and wealth of neighborhoods have a strong correlation between food store access.[30] Food prices also vary by store location. Areas with higher rates of poverty have been shown to have 2% higher food prices as compared to higher-income neighborhoods.[31] There are three key reasons this may be true 1) lower income households may rely more on smaller grocery stores rather than supermarkets 2) low-income populations typically are not in suburban locations which have the least food prices and 3) low-income neighborhood supermarkets may have higher prices as compared to a supermarket in a higher-income neighborhood.[32] In terms of where low-socioeconomic families are located, convenience stores may be the closest location to purchase food from which may not provide adequate nutritious food availability.

Community Level: Low-Socioeconomic Households and Dietary Intake

Socioeconomic status has a major impact on the foods families purchase. Foods with higher nutritional value are more frequently consumed in higher-SES families.[33] Research has indicated that individuals of low-socioeconomic status are less likely to follow nutritious dietary patterns. Barriers for healthful eating include; time, cost, family's money situation, lazy, taste of foods, and a lack of discipline.[34] Lower-socioeconomic women reported greater consumption of potatoes, peas, and pumpkins as compared to the higher-socioeconomic groups that consumed a more diverse group of vegetables. A greater number of low-socioeconomic women reported consuming takeaway from McDonalds, Red Rooster, and KFC as compared to high-socioeconomic

women.[8] These foods are chosen for their convenience and the minimal preparation time required.[35] A high intake of these foods do not align with the Dietary Guidelines.

In terms of food groups, meat was the most important purchase for consumers, up to 50% of their grocery funds. Vegetables are considered a side to the main meal but did not make a significant portion of household budgets. Individuals note that canned fruits and vegetables are a less-nutritious substitute to fresh produce but they were consumed because they received them at food pantries at no cost.[36] Whole grain consumption was associated among higher-socioeconomic families and refined grains in lower-socioeconomic households. Lean meats, fish, and seafood are associated in higher-socioeconomic status. Canned goods are common items received at food pantries, including canned fish, fruits, and vegetables, and processed or boxed dinners, which take minimal preparation time. Fewer fruits, vegetables, total fiber, micronutrients, and more fat is consumed among the lower-socioeconomic population.[37] By consuming more of these processed foods, nutritional quality decreases, such as dietary fiber intake being very low.[33]

Lower-socioeconomic households spend money differently as compared to wealthier counterparts as less money per pound of food purchased is less. Among the lowest earning 20% of the U.S. population, approximately $1,249 was spent per person as compared with the highest 20% of the U.S. population spending $1,997 per person, Wealthier households also spend more money on foods eaten away from home.[32]

In terms of specific food availability, a Sacramento, CA survey identified 15 stores with common foods available. Plain bagels were available in a total of 13 stores, canned northern beans in 14 stores, cheddar cheese in 12 stores, and ground pork in 14

stores.[38] Fresh fruits, vegetables, eggs, and beans were priced the same across the stores. This indicates that beans are widely available in grocery stores and residents have high access.

Interpersonal Level: Influences on Food Purchasing Decisions

Interpersonal factors identified by Axelson et al. include household income, education, gender, age, ethnicity, and race. The Engel demand curve is when there is an increase in personal income and a decrease in the importance of the money spent on food products as compared to other expenses.[39] The larger the household, the more money spent on foods, and the nutritional value decreases per person. Households with five or more members had significantly lower nutrient density, and households with three or more members had a greater consumption of carbohydrates.[39] The education level of the female in the household influenced the nutritional quality of the foods purchase and prepared. This may be due to an increase in nutritional knowledge which affects the preferences and general lifestyle.[40] When the woman of the household is employed outside the home, the number of hours spent on meal-prep decreased as the consumption of convenience foods increased.[39]

There are differences among genders and food consumption. More women reported consuming citrus fruits, yogurt, coffee, tea, and low-calorie beverages. Men consumed more whole milk, lunch meats, meat, fish, poultry, desserts, and sugar.[39] Women are 50% more likely to report consuming high-fat foods and high-fiber foods, 25% more likely to eat fruit daily, and 6% less likely to add salt to foods.[41]

Another major interpersonal factor that influences food purchasing decisions is their culture and the traditions they were raised in. Culture can fit with the community

and interpersonal levels. As families migrate to the United States health behaviors change, more specifically food consumption patterns develop to adopt the new culture's behaviors. Assessing the differences between Mexican-American and Mexican dietary intake, immigrants ate fewer eggs, more meat, white bread, cereals, soft drinks, and caffeinated beverages. They continued tortillas usage, drank more beer, wine, and Mexicans drank more spirits. African continued purchased more beef, pork, poultry, fish, and seafood, and less cereal, baked goods, sugary products, and dairy.[42] Health behaviors and food consumption patterns change through the acculturation process, modifying behaviors to adapt to a new culture.

Focusing on persons of Hispanic ethnicity and the acculturation process, the consumption of beans is decreased. A survey conducted among Iowans, concluded that 23.1% of Hispanic dominant women consume beans 5 or more times per week, 11.1% of Bicultural, and 4.1% of English dominant women.[43] By increasing beans in the household there are many health benefits which can target the nutrients of concern identified by the 2015-2020 Dietary Guidelines as well as improve the dietary intake of low-socioeconomic individuals.

Individual Level: Perceptions of Pulses

A survey regarding individual's perceptions and knowledge of the health benefits of beans in Arizona concluded that low-income women were under-informed of the health benefits of beans. Survey participants were gleaned from a WIC clinic, a job center, and Expanded Food and Nutrition Education Program (EFNEP). The majority of the participants, 71% identified as Hispanic. Individuals were divided into three categories; English dominant, 40%, Bicultural, 24%, and Hispanic dominant, 36%,

depending on their responses to the Bidimensional Acculturation Scale (BAS). A seven question Likert-type scale was used to determine participant's knowledge of the health benefits of beans; they improve your nutrition, help you feel full, lower bad cholesterol, lower cancer risk, control blood sugar, maintain a healthy gastrointestinal tract, and help you lose weight. The majority of the participants agreed or strongly agreed that beans can improve your nutrition, help you feel full, and over half reported neutral that beans lower bad cholesterol, decrease cancer risk, and control blood sugar. English dominant women had greater knowledge of beans, 3.32, as compared to the Bicultural, 3.17, and 2.95 for the Hispanic dominant groups.[44] This study represents the low-income Arizona population well, but does not represent the entire U.S. low-income population.

Research by Mattei et al., concluded from 76 Puerto Rican participants that the majority of the sample had a positive perception of legume's taste, nutritional value, tradition, health benefits, and availability. Canned legumes were most commonly purchased rather than dehydrated legumes. All of the participants reported rice to accompany the beans and several commented that the legumes were eaten to have something to accompany the rice.[45] This places much importance on the rice in the diets of Puerto Rican participants.

Research on WIC participant's perceptions of dry beans concludes that WIC participants have greater nutrition knowledge and knew how to prepare dry beans. Participants did not consider dry beans as an alternative to meat products. WIC recipients rarely chose low-sodium canned beans. This research suggests incorporating more recipes featuring low-cost ingredients and education promoting canned beans as a protein and vegetable source.[46]

Further research needs to be conducted to determine individual's food purchasing habits, individual's and family's perceptions of beans, knowledge of the health benefits of beans, and the types of programs that would be beneficial to low-income individuals.

Individual Level: Legumes in the Diet

Beans fit in the legume family which include; soybeans, peanuts, dry beans, dry peas, chickpeas, lentils, fresh peas, and fresh beans. Legumes include a seed pod, or other edible part of a leguminous plant which is used as food.

More specifically, beans fit under the term pulses, which is defined by the Food and Agricultural Organization (FAO) as "limited to crops harvested solely for dry grain, thereby excluding crops harvested green for food, which are classified as vegetable crops."[47] Currently there are 11 recognized principal pulses: dry beans, dry broad beans, dry peas, chickpeas, dry cowpeas, pigeon peas, lentils, Bambara beans, vetches, lupins, and minor pulses.

The recommended bean consumption is 2-3 cups per week for males and 1.5-2 cups per week for females. Currently, adult males ages 19-50 years old consume approximately 1 cup per week and females consume a little more than ½ a cup.[1] In the Midwest states, about 13% of the population consumes dry beans. In 2000, the Hispanic population accounted for 11% of the total U.S. population and consumed a greater amount of beans in proportion to their population density as they account for 33% of all cooked dry beans. Non-Hispanic white individuals accounted for 73% of the U.S. population and only accounted for 54% of the dry bean consumption.[48]

Individual Level: Nutritional Composition and Health Benefits of Pulses

Regular bean consumption is part of a nutritious diet as they are low in energy density, high in fiber, low in fat, good source of protein, high carbohydrate content, and good source of potassium, folate, zinc, niacin, and iron, as well as several other micronutrients. Dry beans contain 1.3 calories per g, are 15-32% both insoluble and soluble fiber, 50-65% carbohydrate, and 17-35% protein content.[49] A higher intake of canned beans is correlated with a greater intake of sodium. This may be due to the Mexican dishes which account for 25% of all pulse consumption.

The high fiber and protein content aids in satiety, as the protein signals to the small intestine to release cholecystokinin or peptide YY for satiety hormones. An increase in satiety over 2-4 hours has been noted by McCrory et al.[48] An increased consumption of pulses may also improve lipid profiles, as they lower Low-density Lipoprotein cholesterol (LDL-C) levels, total cholesterol, and increase High-density Lipoprotein cholesterol (HDL-C) levels. A meta-analysis of 11 clinical trials concluded that serum cholesterol was lowered by 7.2%, LDL-C decreased by 6.2%, HDL-C increased by 2.6%, and triglycerides decreased by 16.6%.[50]

Dry beans are an ideal source of carbohydrates for individuals with diabetes as they have a low glycemic index and a high fiber content. Glycemic index is the increase in blood glucose levels after consuming a set amount of available carbohydrates compared to a control of Glucola, a direct glucose beverage, or white bread. Research has indicated that a low-glycemic load and more than 25 g per day of fiber, will aid in normalizing blood glucose, blood insulin, and body weight.[50] The glycemic index of pinto beans is 39 as compared to 55 for white bread. Kidney beans have a glycemic index of 27

as compared to 42 for white bread. Beans are also high in non-starch polysaccharides 18-20%, resistant starch 5%, and oligosaccharides 4%. One clinical study by Thompson et al., compared the glycemic response of three bean and rice meals with a control meal of white rice. At 90,120, and 150 minutes post consumption, the glycemic response was significantly lower when beans were consumed with the rice. Adding beans to dishes with rice may be beneficial for individuals with diabetes and improve adherence for cultural groups.[51]

Dry beans have also been associated with a risk reduction in colorectal cancer and development of polyps in the intestine. Research conducted by Lanza et al., studied participants with colorectal cancer and concluded that a higher bean intake was correlated with a 49% reduction in the recurrence of advanced adenomas compared with a lower bean intake.[52]

Study Aims

By understanding low-socioeconomic women's perceptions on food choice from multiple levels there will a better understanding of how to assist these individuals in purchasing more nutritious foods as well as living a higher quality of life. One of the target food items for this study included individual's perceptions of dry beans because the current US population has not been meeting the 2015-2020 Dietary Guideline intake recommendations. There is just one publication found regarding perceptions of legumes among Puerto Rican adults. Since this study was conducted in Puerto Rico, the results do not necessarily correlate to the US population.

Once bean consumption patterns and knowledge of the health benefits of beans has been determined among the lower-socioeconomic class, a tailored nutrition education

plan can be designed to most effectively educate the audience. Individuals are more likely to learn from a tailored nutrition education plan rather than a general lesson plan, as one study concluded. This study was conducted with women enrolled in a food stamp program with an intervention program to use low-fat foods. The group receiving the tailored nutrition education plan were more likely to use low-fat cooking techniques. Providing a lesson plan that is easy to follow, provides hands-on cooking demonstrations, and is financially appropriate is a positive way to increase the consumption of beans.

When working with this population there are several factors to keep in mind; their time and attention span may be very limited as there are many factors competing for their time and attention. For example if they relied on public transportation to get to the research study, daycare for their children while they were participating, if they are having a conflict with their spouse at home, or even their physical and mental health conditions. Research with this population may be limited as those who may have their own transportation or are interested in health, or are not afraid of talking in groups may be the only ones participating. Data from this current study are representative of the low-socioeconomic population in Central Iowa. Other populations may have different perceptions regarding dry bean consumption based on if they are in more rural or urban areas.

CHAPTER 3: METHODS

Introduction

Included in this thesis are two studies; a knowledge, attitudes, and perceptions (KAP) survey regarding the health benefits of beans, and a mixed methods approach to low-socioeconomic women's perceptions on legume consumption. The methods section for study 1 will describe the KAP survey creation, data collection, and analyses. The methods section for study 2 will describe a mixed methods approach to low-socioeconomic women's perceptions of food choice. The KAP article regarding the health benefits of beans has been published, and the methods are described within the article.

Quantitative Social Research

The goal of quantitative data is to produce generalizable results that are representative of the target population. Numerical values allow statistical analyses to give data indicating the results and statistical differences between groups. Knowledge, attitudes, and practices (KAP) surveys are a popular method in gathering social data for large, statistically representative populations.[53] They are beneficial in collecting sociological variables; income, education, occupation, and social class. KAP surveys also include sections to document behaviors and explain social opinions. There are many benefits to KAP surveys including; they are simple to design, provide quantifiable data, easily interpreted, and the researcher ends with concise results.[53] Survey results from different population sets can be compared to determine differences between cultures and their social opinions.

Community knowledge is measured by the knowledge section regarding public health behaviors in national programming. The attitudes section can be challenging and provide false generalizations of the opinions and attitudes of the population sample. As participants are completing the survey, they tend to provide answers which the general public may believe as correct instead of providing their own opinions.[53]

When developing KAP surveys, it is essential to ensure the wording of the questions is accurately interpreted and will provide reliable results as to what the population sample truly believes of what is being tested.

Qualitative Social Research

Qualitative data uses observation to gather data in a variety of ways; focus group, in-depth personal interviews, case studies, and direct observation. A group interview, also called a focus group, is a way to gather preliminary data for material development, program development, and evaluation.[54] They provide a way to explore the beliefs and need for information and develop quality quantitative instruments. There are eight criteria for developing high-quality qualitative work; choose a worthwhile topic, rich rigor, sincerity, credibility, resonance, significant contribution, ethical, and meaningful coherence.[55] When drawing conclusions from qualitative results, determine if the participants were representative of the sample population, and be cautious about drawing too broad of conclusions. Triangulation, or cross checking the data is essential by multiple researchers to ensure there is no bias. Finally make sure the results are meaningful and they add to a gap in the current literature.[55]

One of the best strengths of qualitative research is the depth of the analysis. Nutrition educators are seeking more qualitative results to better tailor messages to the

target population.[54] Participants have the opportunity to share their honest opinion with researchers and in some instances be in their natural environment. The moderator and recorders are essential to the success of the focus group. Once the demographics have been defined for a focus group, choosing a moderator that best resembles this group allows for more clear communication and the participants to feel more comfortable and the ability to record raw opinions.[56] The dynamic of a focus group can also skew what is talked about in each group. For example, if there is a dominant person in the group, other members may be afraid to share their opinions if they differ from the dominant individual.

Policymakers find qualitative research useful in terms of describing the settings in which policies are implemented. Qualitative results connect the social world with individuals and how they interact with their environment.[57] One of the key differences of qualitative is the continuous, evolving iterative process that can be adapted based on the targeted population and findings.[54] These results lead to a better understanding of educational problems and insights for greater educational resources.[57]

Study 1- Knowledge, attitudes, & perceptions of the health benefits of beans

This is a cross-sectional, descriptive study to determine individual's knowledge of the health benefits of beans. Low-income Hispanic and Non-Hispanic White women in central Iowa to determine the effect of acculturation on bean knowledge and consumption patterns. Women of low-socioeconomic status were chosen because they may have increased difficulty purchasing the foods they want to eat or low access to healthful foods, such as beans. The main goals were to 1) assess the knowledge of the health benefits of bean consumption among women with low incomes, 2) describe demographic

characteristics, health risk factors, and sources of nutrition information, and compare differences by acculturation status, and 3) to determine the relationship of acculturation status on perceived self-efficacy for maintaining a healthy diet.

Participant Recruitment

Participants were recruited from two healthcare clinics in Marshalltown and Ames, one WIC clinic, and five county extension programs in Polk County. These locations were chosen for recruitment because they primarily serve low-socioeconomic families. A couple of the extension programs were chosen as they serve Spanish-speaking Latinas. Extension personnel conducted survey data collection as part of the education plan. Research staff trained extension personnel, three of which were bilingual, before data collection began. Participants were read a verbal consent form and if accepting, surveys were administered. In the healthcare and WIC clinics, research team members distributed flyers advertising the study and received verbal consent from interested participants before beginning the survey. At least one bilingual research member was available while at the health clinics for recruitment. The survey was available in both English and Spanish languages. Males, individuals over the age of 65, and of different ethnicities other than Hispanic or non-Hispanic white were not directly approached. If they did inquire about taking the survey, they could and their data was excluded from the analysis. It would have been socially inappropriate to exclude interested participants to their face. All participants received an insulated grocery bag as an incentive.

Questionnaire Development

Demographic data such as the Hispanic ethnicity, race, household composition, monthly food expenditures, and total household income are items on the Expanded Food

and Nutrition Education Program entry form.[58] Education, marital status, self-reported health status, smoking, height and weight, were questions from the American Heart Association Women's Survey.[59] The physical activity question and the health information seeking questions were based on the Health Information National Trends Survey.[60] The question on the frequency of bean consumption was taken from the Block Food Frequency Screener.[61]

The bean health benefit questions were asked on a 4-point Likert-type scale: (1) strongly disagree, (2) disagree, (3) agree, or (4) strongly agree and a fifth option of 'do not know.' The questions that were included are that eating beans can: improve your nutrition, help you feel full, lower bad cholesterol, lower cancer risk, control blood sugar, obtain a healthy GI tract, and help you lose weight. These questions originated from a similar survey done in Arizona with EFNEP participants.[44] Since the population in Arizona is vastly different from Iowa, including the origin and amount of the immigrant population, the survey results were expected to be different based on the location.

Participants completed a Bidimensional Acculturation Scale (BAS) with questions about the frequency of speaking/ reading/ listening to Spanish or English languages. This scale was developed by Marin and Gamba et al. to account for the fact that acculturation among Mexicans and Central Americans is bi-dimensional and in two cultural domains (Hispanic and non-Hispanic).[62] This scale analyzes cultural change by language use, linguistic proficiency, and use of electronic media. The BAS was chosen because it includes a concise 24-item survey that takes into account bidimensional change, is thorough, and provides valid results placing individuals in three groups (Hispanic dominant, Bicultural, and English dominant). The survey was provided to participants

verbatim form Marin and Gamba et al. Based on responses to the questions, participants were given points; a score of 2.5 or greater indicates high acculturation, a score of 2.5 or less indicates low acculturation, and a score of greater than 2.5 in both categories indicates bicultural.

The survey was pilot tested at a health fair to check for survey flow and gain experience in survey data collection. After pilot testing minor changes were made to the survey including

All of these surveys were used verbatim in their English formats, and when available the Spanish translation was used. For the instruments where Spanish forms were not available, the forms were translated to Spanish by two bilingual acquaintances, and re-checked by another bilingual volunteer.

Data Analysis

Upon completion of the survey participants were assigned a three-digit identification number to maintain confidentiality of the participants. Data were entered into SPSS Statistics version 24.0 (IBM, Armonk, NY). A total of 202 participants completed the survey, 9 of which were excluded from analysis because they were over the age of 65, 9 invalidated due to other ethnicities than Hispanic or Non-Hispanic White, and 26 excluded due to missing data. The reported data includes a sample size of 158 participants. Completed BAS sections were scored, placing participants into the Hispanic dominant, Bicultural, or English dominant groups. Chi-square analysis and ANOVA was used to determine any statistical significances between the three ethnicity groups. Principal component analysis was used to determine the clustering of the bean health benefit Likert-type questions. One underlying construct representing participant's

knowledge of the bean health benefits was determined by the Eigenvalue and scree plots (eigenvalue 3.73; 53.4% of variance). The seven questions regarding bean health benefits were summed to create a scale with an adjusted Cronbach's alpha of 0.85 indicating high reliability. The higher scored indicated greater knowledge from the participants.

Study 2- Mixed methods approach to low-socioeconomic women's perceptions to food choices

Overview

This exploratory study used a mixed methods approach to determine low-socioeconomic women's perceptions on food choices. Participants were asked to complete a focus group and a survey including food frequency questionnaires, food security module, and bean modules. A total of eight focus groups were conducted in the Ames and Des Moines area. Low-socioeconomic groups were chosen as the target audience because beans have many health benefits and by adding legumes to the diet several nutritional benefits can arise. By applying a mixed methods approach, the study allowed researchers to determine participants' opinions on food choices, grocery shopping practices, and perceptions on beans. The purpose of the questionnaire is to apply supporting statistical numbers with the participants, such as their dietary fat and fiber intake, responses to bean perceptions, and demographic data.

Participant Recruitment

Participants were recruited from the Des Moines and Ames surrounding area. Food pantries, libraries, County Extension offices and programs, Section Aid housing, Salvation Army, family outreach centers, WIC clinics, and health clinics were chosen for recruitment due to the audience they serve. Focus groups were held at the Forest Avenue

Library and Ames City Hall because they are public, central locations for most participants. All focus groups occurred in the evening to give working individuals adequate time to get to the location. Flyers included phone and email contact information for interested individuals to contact the research coordinator. Participants include a convenience sample as data is representative of those who reached out and were interested in the study. All potential participants were called and asked qualification questions to ensure they are representative of the target population, such as age, eligibility in income-based food assistance programs, and availability for participation.

Focus Group Development

A semi-structured interview guide was developed based on an in-depth literature review to determine appropriate questions to ask participants. The interview guide remained constant for each focus group and kept the moderator on track. There were five main groups of questions; individual consumption patterns, individual knowledge of beans, social consumption patterns, physical environment, and policies regarding beans. Questions were derived based on a literature review of common misperceptions of beans and formatted according to the socio-ecological model. The first sections focus on regular food purchasing decisions and then the interview guide gets more specific to discussing their perceptions on the common bean. Food models, examples of canned and bagged pulses, and the MyPlate diagram are used during the focus groups as visual examples. Not only do the focus groups discuss dry beans; but also lentils, chickpeas, and split peas are included in the discussion as they have similar health benefits.

The interview guide and questionnaire were tested with EFNEP educators at the Polk County Extension office, and revisions were made according to feedback. Research

members received extensive training on conducting focus groups. Team members were trained through the Krueger method; developing a question guide, moderating a focus group, taking notes during the discussion, and analyzing for themes.[56] A team of three researchers attended each focus group; two team members took field notes of non-verbal communication and one served as the moderator for each group.

As participants arrived they were assigned an identification number which was placed on their survey so their responses could not be identified. They were asked to read and sign an informed consent which they agreed to voice recording the discussion. If participants arrived early they could begin the questionnaire, and were given time afterward to finish any remaining questions. All participants were given $40 for participation of a maximum of two hours.

Questionnaire Development

The questionnaire included five sections; demographic questions, dietary assessment screeners, bean perception questions, self-efficacy, and the short food security module. The demographic questions (Hispanic ethnicity, race, and household composition) were used verbatim from the Expanded Food and Nutrition Education Program (EFNEP) entry form.[58] Education, marital status, health status, smoking status, self-reported height and weight were used verbatim from the American Heart Association Women's Survey.[59] The employment status question was used verbatim from the Behavioral Risk Factor Surveillance Survey (BRFSS).[63] The physical activity question was taken directly from the 2017 Health Information National Trends Survey (HINTS).[60] The National Institute on Alcohol Abuse and Alcoholism (NIAAA) developed three questions to determine alcohol consumption among an identified population. The

question chosen identifies the frequency of alcohol consumed in the past 12 months, and is one of the three questions recommended.[64]

To determine participant's current dietary fat and fiber intake, the fat and fiber dietary assessment screeners were used verbatim. Results from the fat dietary assessment screener can estimate the grams of fat an individual is consuming per day. The fiber dietary assessment screener can estimate the number of fruits and vegetables an individual is consuming per day as well as the number of grams of fiber per day.[61] Validity tests on the dietary assessment screeners indicate a Spearman r value of 0.69 for estimating total fat intake. The Spearman r value for the fiber dietary assessment screener is 0.50 for number of grams per day and 0.71 for estimating number of fruits and vegetables per day.

To quantitatively understand participant's perceptions of legumes, a series of nine questions. These questions are in a five-point-Likert-type scale (strongly disagree, disagree, agree, strongly agree, and do not know). These questions have been tested in two population sets assessing dietary acculturation patterns among immigrants in both Arizona and Iowa.[43,44] Participants responded to the five questions and researchers analyzed overall bean knowledge based on a scale.

Schwarzer et al. developed a set of five questions used to determine an individual's self-efficacy regarding nutrition. The internal consistency (Cronbach's alpha) value is 0.87 from a large sample of 1,722 participants. Participants responded to the five questions, and researchers scored their overall self-efficacy based on the criteria outlined by Schwarzer et al. Each question was based on a four point Likert-type scale; very certain, rather uncertain, rather certain, and very certain.[65]

The final instrument included is the United States Department of Agriculture (USDA) six-item food security module. This was developed at the National Center for Health Statistics. The instrument includes questions about whether their family could afford balanced meals, how long their food lasted, and if they ever feel hungry because there wasn't enough food.[63] Research has been done on the effectiveness of the short form of the food security module; indicating that 97.1% of households were accurately identified in terms of their food security level. Based on the responses to the questions, researchers scored the responses according to the directions outlined by the USDA Economic Research Service. These scores were categorized into three categories; high or marginal food security, low food security, or very low food security.[63]

Data Analysis

Within a day, the moderator recorded detailed field notes describing the participants, seating arrangement, perceptions of the discussion, and any takeaways from the group. All discussions were transcribed verbatim. Transcriptions were uploaded in NVIVO version 11.0 qualitative analysis software. Two team members read each of the transcripts and identified common themes. A codebook was developed with four common themes arising; family or friends' consumption of beans, individual food consumption, nutrition information, and policy. Transcripts were manually coded in NVIVO identifying sub-nodes within the four large categories. Inter-rater reliability tests were 99.59 and a kappa value of 0.83 indicate high reliability between coders and validity of the codebook.

Questionnaire data was entered into SPSS statistical program by a graduate team member. A codebook was developed by Palmer to identify the variables and how to enter

each case. Frequency tests were done to determine the overall demographics, health behaviors, bean perceptions, and dietary intake of the participants as a whole. One participant was excluded, giving a total n=35, because the results were not reliable. BMI's were calculated based on self-reported height and weight and categorized as underweight, normal, overweight or obese. Food security was calculated based on responses given to the six questions and categorized. Self-efficacy scores were calculated and reported on a summary scale.

CHAPTER 4:
KNOWLEDGE GAPS OF THE HEALTH BENEFITS OF BEANS AMONG LOW-INCOME WOMEN

A paper published in the American Journal of Health Behavior

Palmer S, Winham D, Hradek C. Knowledge gaps of the health benefits of beans among low-income women. Am J Health Behav. 2018(12):27-38.

Abstract

Objectives: To determine knowledge of the health benefits of consuming beans, and to assess if awareness varied by acculturation status among Hispanic and non-Hispanic low-income women. **Methods:** Self-administered survey of women aged 18-65 years in Iowa eligible to receive income-based services through 2 health care clinics, a WIC clinic, and Extension Outreach. Chi-square and ANOVA were used to compare bean health benefit knowledge, demographics, health-risk factors, nutrition information seeking, and self-efficacy by acculturation categories. **Results:** Of the 158 women who completed the survey, 58% were Hispanic, with a mean age of 36 years. In terms of acculturation, 24% were Hispanic-dominant, 30% bicultural, and 46% English dominant. Over 50% of all respondents did not know bean consumption lowered cholesterol, aided blood glucose control, or reduced some cancer risks. Responses for 5 of 7 knowledge statements differed significantly by acculturation. Hispanic-dominant and bicultural women reported significantly better health, higher bean consumption, and less cigarette smoking than English-dominant women. Bicultural and English-dominant women were more likely to use the internet for nutrition information. **Conclusions:** There are knowledge gaps about the health benefits of bean consumption among low-income women. Nutrition education

to improve their knowledge may lead to increased bean consumption, reducing health disparities and improving nutrition.

Key words: legumes; Hispanics; acculturation; chronic disease; nutrition education; health disparities; health information

Introduction

Low-income groups have a higher risk of chronic health conditions which are influenced by nutrition and lifestyle, including cardiovascular disease, type 2 diabetes, high blood pressure, some cancers, obesity, and micronutrient deficiencies.[1] Maintaining a healthy diet may be challenging for low-income individuals due to lack of purchasing power, time; availability, accessibility, and affordability of healthy foods; sociocultural pressures and social stigma.[2] However, certain health risk factors can be reduced by dietary changes, such as increasing the consumption of vegetables, legumes, whole grains, fruits, lean meats, and lowering sodium and sugar intakes.[3]

Increasing or maintaining the consumption of dry beans in the diet is one appropriate change that could benefit low-income persons by improved health, chronic disease risk reduction, and optimal nutrition.[4] Low-income groups tend to have poorer nutritional quality of diets as evidenced by higher intakes of fatty meats, and sugars, but with lower intakes of fruits, vegetables, and complex carbohydrates.[5] The scientific evidence for the health benefits of consuming dry beans (*Phaseolus vulgaris* L.) is strong: increased longevity,[6,7] reduction of serum cholesterol,[8,9] lower risk of and improved glycemic control for persons with type 2 diabetes,[10,11] decreased risk of some cancers,[12] and improved weight management.[13]

Since the 2005 Dietary Guidelines for Americans (DGA) were published, dry bean consumption as part of a plant-based diet that promotes sustainable protein sources has been encouraged across federal nutrition assistance programs.[14,15] The 2015 DGA Committee determined the following shortfalls in nutrients for the majority of Americans, including low-income populations: Vitamins A, C, D, E, folate, calcium, magnesium, potassium, and dietary fiber.[3] Of these shortfall nutrients, dry beans such as navy, pinto, black, white, kidney, and other legumes are good to excellent sources of fiber, folate, magnesium, and potassium.[14] Beans and other legumes are considered vegetables in the DGA. Most have equivalent or higher dietary fiber than many whole grain products.[4] Individuals who consume beans regularly have higher blood levels of folate, iron, zinc, magnesium, and potassium. Beans also offer polyphenolic compounds such as tannins, phenolic acids, and flavonoids, which are strong antioxidants.[16]

Although the current DGA recommendation for the consumption of beans, peas, and lentils remains at 1.5-2 cups per week for a 2000-calorie diet,[3] the average intake of legumes is only 0.5 cups per week, which is 58-65% lower than the recommended amounts for different activity levels.[17] Overall, the US legume consumption remains very low with approximately 8% of the population consuming any legume type on a regular basis.[4] At present Hispanics in the US have a higher consumption of dry beans at 25%,[4] but acculturation of immigrants may erode this rate over time.[18]

In 2015, Hispanics comprised 17% of the US population, but were only 6% of Iowa's residents where this study took place.[19] More than 21% of the Latino population in Iowa was living in poverty in 2014 compared to 12% in the State overall.[20] As Latinos move to rural communities, their families are often culturally isolated and have limited

community resources as well as incomes. Valdivia et al concluded that immigrants moving to the Midwest were seeking employment rather than higher wages.[21] As with all low-income groups, economic resource challenges influence purchasing power, time use, food accessibility and dietary quality.[5]

As Latinos acculturate to a Westernized eating pattern, both positive and negative diet and health factors may occur. Positive attributes include retention of the traditional diet's reliance on beans, fresh vegetables, and corn tortillas.[22] However, potential negative changes may include increased consumption of sugar-sweetened beverages, fast food, and higher intakes of saturated fats, with a decline in vegetable intakes. It is not clear how much of a decrease in Hispanic bean consumption is a result of this dietary acculturation process versus nutrition transition changes in dietary patterns from their country of origin.[18,23] Encouraging bean intake among limited resource population groups, including Hispanics, could help maintain or increase their dietary quality by consuming a nutritious food that is familiar and culturally appropriate. In fact, a program policy change in 2007 led to incorporation of more legumes into the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) food package to improve dietary diversity, as well as to offer culturally sensitive options for immigrants and minorities.[24]

Dietary change typically demands knowledge, self-efficacy to make decisions, reliable sources of information, and an environment that supports behavior change.[25,26] Health literacy, information access, and self-efficacy are essential components for producing dietary change or maintaining positive health outcomes. While those of Hispanic origin tend to have healthier diets than others, in general they know less about

nutrients in foods and diet-related diseases than non-Hispanic Whites.[25] A study by Yoo et al concluded that some Hispanics have a low health literacy due to their limited English proficiency and low access to health care.[27] Few studies have examined these relationships among low-income Hispanic or non-Hispanic Iowa women.

The current research fills an information gap on women's knowledge about the specific health benefits of bean consumption and these mediating factors, including dietary acculturation among low-income Latinas in Iowa in comparison to their non-Hispanic peers. The research objectives were: (1) assess the knowledge of the health benefits of bean consumption among women with low incomes, (2) describe demographic characteristics, health risk factors, and sources of nutrition information, and compare differences by acculturation status, and (3) determine the relationship of acculturation status on perceived self-efficacy for maintaining a healthy diet. The interactions of these variables and their baseline levels in the Iowa communities of interest are essential to develop future tailored nutrition education programming.

Methods

Study Design and Procedures

The study design was a cross-sectional convenience sample of low-income women in Iowa aged 18-49 years, with a focus on Hispanic and non-Hispanic Whites. With agency permissions, participants were recruited between June and November 2016 at 2 health care clinics that serve low-income populations, one WIC office, and 5 County Extension office programs that featured nutrition education classes, and served Latino populations in Central Iowa. For most programs, eligibility is defined as 185% of the federal poverty guidelines based on household size and composition.[24]

At the health clinics and WIC office, the researchers distributed flyers in the waiting room areas to introduce the women to the study and its purpose. Potential participants approached the research team directly, or a bilingual researcher approached them to briefly explain the study. After a researcher read the verbal consent form to the respondent, each woman was asked to confirm that she was at least 18 years old before taking the survey in her preferred language, English or Spanish.

In the extension classes, a trained staff member briefly explained the study opportunity at the beginning of the session, and distributed the survey to interested women at the end of the regular instruction. The staff member confirmed age eligibility, read the verbal consent script to all, and confirmed consent from each woman. At least one bilingual staff member was present at all sites with Hispanic clientele to explain the study and the consent form.

Women who identified as other ethnic or racial groups than Hispanic or non-Hispanic White, or who were older than 65, were allowed to complete the survey, their data were excluded from the analysis due to their small numbers. They were few in number and it would have been socially inappropriate to exclude interested persons. The participants received an insulated grocery bag valued at $5 as an incentive. The Institutional Review Board of Iowa State University reviewed and approved the study.

Instruments and Measures

The survey questions regarding Hispanic ethnicity, race, household composition, monthly food expenditures, and total household income were items taken from the standard Expanded Food Nutrition Education Program entry form.[28] Other demographic information, ie, education, marital status, health status, smoking, self-reported height and

weight, were based on questions from the American Heart Association Women's Survey.[29] The Health Information National Trends Survey was the source for the physical activity question, and a 2-part question series on health and medical information seeking (yes/no) and sources of this information.[30] Wording was modified to ask the participants about their general nutrition information seeking behaviors and sources, instead of health and medical information.[29] The participants were also asked how often they eat beans over a 1-month period.[31]

To assess the participants' knowledge of the health benefits of eating beans, they were asked to indicate their level of agreement to 7 evidence-based statements (improve your nutrition, help you feel full, lower "bad" cholesterol, lower cancer risk, control blood sugar, promote a healthy gastrointestinal tract (GI), and help lose weight), using a 4-point, Likert-type scale: (1) strongly disagree, (2) disagree, (3) agree, or (4) strongly agree, modified to include a fifth option of 'do not know'.[32]

The Bidimensional Acculturation Scale was used to assess acculturation status.[33] The 24 items of the instrument were scored to generate these classifications: (a) Hispanic-dominant (less acculturated), (b) bicultural, or (c) English-dominant (more acculturated). Using the scale as designed, the cutoffs for the English- and Hispanic-dominant classifications are values of 2.5. If an individual scored greater than 2.5 for both scales, they were classified in the bicultural group. By providing multiple dimensions of both English and Spanish language preferences, use of media, and social engagement, the Bidimensional Acculturation Scale is a better measure of ethnic affiliation than the US Census Hispanic ethnicity identifier or language use alone. The

instrument has very high internal consistency for the Hispanic domain (Cronbach's alpha=.87) and non-Hispanic domain (Cronbach's alpha=.94).[33]

To estimate self-efficacy for maintaining a healthy diet, the 3-item General Self Efficacy Scale developed by Luszczynska et al. was modified from a line scale anchored by (1) 'definitely not' to (4) 'exactly true' to 4 discrete options of (1) 'very uncertain', (2) 'certain', (3) 'uncertain', and (4) 'very certain'.[34] Two additional questions phrased in the same style were added. One asked about self-efficacy to change habits regarding cooking.[35] The second asked about self-efficacy if eating at a restaurant.[36] A summary score was computed for each participant for use in the analysis. A higher score indicated a higher certainty to maintain a healthy diet. The Cronbach's alpha for the 5-item scale was 0.86 indicating high reliability, and approximated the reliability of the 3-item General Self Efficacy Scale.[33]

The Expanded Food and Nutrition Education Program, Health Information National Trends Survey, Bidimensional Acculturation Scale, and bean health benefits questions were used verbatim from their published Spanish and English versions. The American Heart Association and self-efficacy questions were translated by a native Spanish speaker, and back-translated by a different bilingual researcher. The final Spanish questionnaires for the study were reviewed by 3 external bilingual nutrition researchers. The English and Spanish versions were pilot tested at a local health fair with 24 Hispanic and non-Hispanic white women from the community. Minor changes were made in language wording and structural formatting based on the pilot test feedback before the official data collection began.

Data Analysis

Data entry, transformations, and analyses were performed using SPSS Statistics, Version 24.0 (IBM, Armonk, NY). The variable descriptive statistics including frequencies, means, and standard deviations were examined for normality. The variables were compared for differences by acculturation status using correlations, chi-square analysis, and ANOVA. Principal components analysis was used to evaluate the clustering of Likert-type questions on bean health benefits. Eigenvalue and scree plots indicated one underlying construct representing the participant's knowledge of the bean health benefits (eigenvalue 3.73; 53.4% of variance).[37] These 7 items were summed to create a scale which had an adjusted Cronbach's alpha of 0.85 indicating high reliability. A higher score indicated a greater knowledge of bean health benefits for a participant.

Results

A total of 202 women responded to the survey. Prior to the analysis, data on 20 respondents who did not meet the target population criteria (6 over 65 years, 9 African Americans, 5 Asian Americans), and 24 who had incomplete data were excluded. Of the 158 participants with complete demographic and bean health benefit knowledge questions, 59% (N = 93) self-identified as Hispanic (71 Mexican, 9 Central American, 7 Puerto Rican, 4 South American, and 2 Dominican). By acculturation category, 24% were Hispanic-dominant, 30% were Bicultural, and 46% were English-dominant. Both Hispanic (N = 8) and non-Hispanic White (N = 65) women were included in the English-dominant (more acculturated) grouping. About 35% of the participants were from low-income health clinics, with an additional 35% from Extension community outreach events, and 23% from Extension classes.

Table 1 shows the demographic and household characteristics by Bidimensional Acculturation Scale categories. The mean age for the women was 36 ± 13 years. Almost 60% of the women self-identified as Hispanic by the US Census ethnicity question. Hispanic-dominant and English-dominant women were significantly older than the bicultural women. Less than 6% of the Hispanic-dominant women reported being single or divorced in contrast to 49% of the bicultural and 52% of the English-dominant women. Nearly 85% of the Hispanic-dominant women had 12 or fewer years of education. All of the bicultural women and all but 7% of the English-dominant women had at least the equivalent of a high school education. The Hispanic-dominant women had larger household sizes, and more children than their peers who were bicultural or English-dominant. Since Hispanic-dominant households were larger, they spent significantly more money on food each month as compared to the Bicultural and English-dominant groups. Monthly income data were deemed unreliable. Some women likely reported annual values, 13% did not answer, and 9% reported implausible values for their household size and service eligibility or usage. Since the study sites verify income eligibility to use the programs, it was assumed the women were from low-socioeconomic households. The English-dominant women reported significantly less frequent consumption of beans than the bicultural or Hispanic-dominant women.

Table 2 shows the percentage distributions of the participant responses by acculturation category for the 7 Likert-type questions regarding their statements about the health benefits of beans. Almost 60% of all participants ‘did not know’ that beans lowered cholesterol (one of the most documented health outcomes for bean consumption), and 65% were unaware of cancer risk reduction from bean consumption.

Nearly 59% did not know beans could help control blood sugar levels. Almost 20% did not know if eating beans can improve one's nutrition or help one feel full.

There were significant differences by acculturation level for 5 of the 7 questions. About 20% of Hispanic-dominant women disagreed that beans improved nutrition, and 20% disagreed that beans helped one feel full. Higher percentages of Hispanic-dominant women disagreed that beans were healthful for the gastrointestinal tract (15.4%) or could aid in blood sugar control (25.6%). The bean health benefit knowledge scale was lower for the Hispanic-dominant (1.7±1.1) compared to the bicultural and English-dominant (2.1±1.5) women, but was not significantly different.

Health characteristics and risk factors by acculturation categories are shown in Table 3. Although the Hispanic-dominant and Bicultural women were significantly shorter in height than the English-dominant women, BMI did not differ by acculturation category. More Hispanic-dominant women did not know their height and/or weight, 20%, as compared to only 4% of the bicultural and 12% of the English-dominant women. The majority of the participants self-reported their health status as good (50%), 30% poor-fair, and 20% very good-excellent. While fewer Hispanic-dominant women rated their health as very good to excellent, more than two-thirds felt their health was good. In contrast, over 40% of the English-dominant women indicated their health was poor-fair. Reported physical activity was not significantly different by acculturation category, and only 19% met or exceeded the recommended activity level of 4 or more days per week. Nearly 68% of the total sample had never smoked, but almost 43% of the English-dominant women were current smokers. Over 78% of the respondents stated that they had looked for information about general nutrition topics. English-dominant and bicultural women were

more likely to consult the internet, whereas Hispanic-dominant women turned to books, or other printed materials more often. Less than 11% of the Hispanic-dominant women reported using the internet for nutrition related information.

Table 4 illustrates the women's responses to 5 self-efficacy questions about their ability to maintain a healthy diet by acculturation categories. The Hispanic-dominant women were "more certain" they could maintain a healthy diet if they had to change various daily habits. The Hispanic-dominant and Bicultural groups have higher self-efficacy scores (3.0±0.4) and (3.0±0.6) respectively as compared to the English-dominant group (2.7±0.6). Although the other 4 self-efficacy Likert responses were not significantly different by acculturation categories, the Hispanic-dominant group responded they were certain about maintaining a healthy diet during certain circumstances more than their peers.

Discussion

The first study objective was to assess the knowledge of the health benefits of consuming beans among low-income Hispanic and non-Hispanic White women. The current findings indicate a large gap in these women's knowledge of the health benefits of beans, including their ability to lower cancer risk, promote weight loss, lower LDL cholesterol, control blood glucose, maintain a healthy intestinal tract, and promote satiety. Compared to a previous study of low-income Hispanic and non-Hispanic women in Phoenix, Arizona, a greater percentage of the women in this research agreed that beans improve nutrition, help a person feel full, lower bad cholesterol, aid in maintenance of blood sugar, maintain a healthy GI tract, and help with weight loss.[32] When comparing the "do not know" responses from the Iowa women to the "neutral" responses from the

Arizona women, more Iowans reported they did not know about the potential for beans to lower 'bad' cholesterol, decreasing the risk for certain cancers, controlling blood sugar, maintaining a healthy GI tract, and aiding in weight loss. Although they were not asked about specific health conditions, 100% of the respondents in a survey of 70 Puerto Rican adults perceived legumes to have high nutritional value and positive health effects.[38]

The second objective for describing health risk factors such as bean consumption, BMI, physical activity, smoking status, and nutrition information sources showed that Hispanic-dominant women had several positive behaviors compared to their peers, including higher bean intakes. Over 25% of Hispanic-dominant women reported consuming beans 5 or more times per week. This finding is similar to national survey bean consumption data for Hispanics.[4] Although serving sizes were not recorded in the current study, it is likely these women are meeting the DGA recommendation. There is room for improvement for the other 77% of the Hispanic-dominant women and the 89% and 96% of the bicultural and English-dominant women who do not meet the DGA recommendation. These consumption patterns are similar to those observed in an earlier study of Hispanic and non-Hispanic female participants in the Expanded Food and Nutrition Education Program in Phoenix.[18] This research found that although Hispanic-dominant women did consume more beans than their peers (2.4 servings vs. 1.6 servings per week), they were still well below the DGA recommendation of 5 or more servings per week. In a Texas study, Mexican-born immigrants were shown to have better nutritional profiles than second generation individuals living in the US.[39] They are more likely to eat beans, and other traditional foods.

The Hispanic-dominant (90%) and bicultural women (89%) were much more likely to have never smoked cigarettes than the English-dominant women (43%) in Iowa. These findings are similar to an Arizona study where 88% of the Hispanic-dominant, 81% of the bicultural, and 56% of the English-dominant women had never smoked.[40] Survey data has found smoking to increase during the acculturation process among Hispanic women more so than men.[41] Smoking prevention integration in nutrition education targeted to low-income women may be appropriate especially for vulnerable populations like youth and young adults. Less acculturated Hispanics are less drawn to tobacco use, but may be persuaded to it through advertising that targets independence and physical attractiveness.[41]

The third objective of determining the relationship of acculturation status, on self-efficacy behaviors related to maintaining a healthy diet determined Hispanic-dominant participants had higher self-efficacy. Fewer Hispanic-dominant women in the present study self-reported their health status in the 'very good - excellent' category (11%) compared to the Bicultural (26%) or English-dominant (21%) women. Analysis of NHANES data by ethnicity indicates Hispanics are more likely to self-report lower health quality than Whites.[42] This may stem from differences in conceptualization of personal health across cultures.

There were also differences among groups in where participants looked for nutrition information. More Hispanic-dominant women used books, brochures, and magazines and talked to friends, family, or co-workers. The English-dominant women preferred to get their nutrition information from internet sources. These results agree with those of Yoo et al who reported that Hispanics are more likely to seek information from

traditional media (television, radio, newspapers, or magazines), family and friends, and medical professionals.[26] A recent Pew Research Center survey, found that 83% of Hispanic adults use traditional media, 71% receive information from a medical professional, and 70% use the radio and newspaper. Getting health information from the media plays a large role in Hispanics' lives for those who do not or are unable to use the health care system.[43]

Implications for Practice

Increasing awareness of the health benefits of consuming beans may help reduce chronic disease risk for conditions that disproportionately affect limited resource women, including Latinas, such as diabetes and cardiovascular disease. In 2012, the prevalence of Americans diagnosed with diabetes was 29.1 million, or 9.3% of the population.[44] According to the 2010-2012 National Health Interview Survey, more than 12% of Hispanics were diagnosed with type 2 diabetes.[43] In moderation, beans are a nutritious source of complex carbohydrates for individuals with type 2 diabetes, serve as a culturally appropriate fiber source, and are packed with nutrients for optimal nutrition like other vegetables.[3,9,11]

Increasing dietary fiber consumption, even moderately, can provide economic health care savings. A study by Abdullah et al. calculated the potential savings from reductions in type 2 diabetes and cardiovascular disease by increasing dietary fiber intakes for Canadians. In a best-case scenario with a daily intake of 20 g of dietary cereal fiber, the estimated savings from type 2 diabetes costs would be $136.8 million Canadian dollars (CAD) and for cardiovascular disease $246.7 million CAD.[45] On average, dry grain beans contain about 7 grams of dietary fiber per ½ cup serving in comparison to 3

grams in Weetabix whole grain cereal, or 2 grams in instant oatmeal for the same serving size.[46] Beans are also effective for total and LDL cholesterol reduction, and are a familiar staple to Latinos. They also come in a variety of flavors and textures in comparison to whole grain cereals.[4] National survey data indicated that elevated cholesterol levels remain a problem for 29% of non-Hispanic White women, and 30% of Hispanic women who had elevated cholesterol levels in 2014.[47]

Limitations

There are several limiting factors to keep in mind when conducting research with low-socioeconomic individuals, which may have influenced the data in this study. They may have a lower literacy level which can interfere with their ability to understand or complete printed survey questions accurately. To aid the lower literacy participants in this study, they had the option of having the survey read to them as they filled out the pages (N = 31). Low-socioeconomic individuals may also have been reliant on public transportation, limiting the time they had to complete the entire survey. Since these data were collected by way of a convenience sample, we cannot generalize the results regarding knowledge of the health benefits of consuming beans to other low-income women, Hispanics, or the US population.

Conclusions

These study findings can be used in the promotion of the regular consumption of dry beans in the general population as they are a good source of nutrients, high in fiber, fat-free, satiating, and are culturally appropriate for Latinos. Retention or promotion of traditional cultural practices may make such a recommendation more relevant and attainable for immigrants and minorities. These findings can aid in the development of

culturally tailored messages for the retention of or increase in bean consumption in traditional and mainstream diets for disease prevention.

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Table 1

Distribution of Demographic and Household Characteristics of Low-income Iowa Women by Acculturation Category (mean ± SD, or percentage) (N = 158)

Characteristics	Total	Hispanic dominant 25% (N = 39)	Bicultural 29% (N = 46)	English dominant 46% (N = 73)
Age in years **	36.3 ± 12.6	38.9 ± 11.6	31.6 ± 11.8	37.4 ± 12.8
Hispanic ***				
Yes	58.2	100.0	100	10.8
No	41.8	0.0	0.0	89.2
Marital Status ***				
Single	24.7	2.6	35.6	29.7
Divorced	14.6	2.6	13.3	21.6
Married	48.1	79.5	40.0	36.5
Cohabitating	12.7	15.4	11.1	12.2
Years of Education**				
6th grade or less	7.0	28.2	0	0.0
7-11th grade	14.6	46.2	0	6.8
12th grade or GED	21.5	10.3	26.7	24.3
Some college, AA, AS or tech	36.1	10.3	42.2	45.9
Bachelor's degree or higher	20.9	5.1	31.1	23.0
Number children <18*[a]	1.4 ± 1.3	1.9 ± 1.3	1.3 ± 1.3	1.2 ± 1.3
Number of adults*[a]	2.3 ± 1.0	2.7 ± 1.0	2.3 ± 1.0	2.1 ± 0.9
Total household size*[a]	3.7 ± 1.7	4.7 ± 1.5	3.7 ± 1.8	3.3 ± 1.6
Monthly amount spent on food**[b]	$439 ± 268	$575 ± 277	$448 ± 265	$365 ± 240
Bean Consumption**				
0-1 per month	19.6	0	15.6	32.4
2-3 times per month	27.8	17.9	20.0	37.8

Table 1 continued

Characteristics	Total	Hispanic dominant 25% (N = 39)	Bicultural 29% (N = 46)	English dominant 46% (N = 73)
1-2 times per week	19.0	20.5	20.0	17.6
3-4 times per week	22.8	38.5	33.3	8.1
5+ times per week	10.8	23.1	11.1	4.1

*p < .05; ** p < .01; *** p < .001; [a] N = 156; [b] N = 145.

Table 2

Percentage of Responses Regarding Health Benefits of Bean Consumption Among Low-income Iowa Women by Acculturation Category (%; N = 158)

Eating beans can ….	Strongly Disagree	Disagree	Agree	Strongly Agree	Do Not Know
1. Improve Your Nutrition* **	**3.2**	**6.3**	**50.6**	**19.0**	**19.0**
Hispanic dominant	12.8	7.7	35.9	28.2	10.3
Bicultural	0	0	68.9	17.8	13.3
English dominant	0	9.5	47.3	14.9	27.0
2. Help You Feel Full* **	**4.5**	**3.2**	**50.0**	**21.8**	**17.9**
Hispanic dominant	17.9	2.6	30.8	28.2	12.8
Bicultural	0	0	63.6	18.2	18.2
English dominant	0	5.5	52.1	20.5	20.5
3. Lower Bad Cholesterol	**0.6**	**7.0**	**26.8**	**6.4**	**56.7**
Hispanic dominant	2.6	2.6	25.6	5.1	56.4
Bicultural	0	6.7	28.9	4.4	60.0
English dominant	0	9.6	26.0	8.2	54.8
4. Lower Cancer Risk	**1.3**	**6.4**	**21.0**	**4.5**	**65.0**
Hispanic dominant	5.1	7.7	10.3	2.6	69.2
Bicultural	0	2.2	22.2	4.4	71.1
English dominant	0	8.2	26.0	5.5	58.9
5. Control Blood Sugar**	**1.9**	**9.6**	**21.0**	**6.4**	**58.6**
Hispanic dominant	5.1	20.5	7.7	5.1	53.8
Bicultural	2.2	0	20.0	6.7	71.1
English dominant	0	9.6	28.8	6.8	53.4
6. Healthy GI Tract**	**2.6**	**5.1**	**39.1**	**8.3**	**42.3**
Hispanic dominant	10.3	5.1	28.2	10.3	38.5
Bicultural	0	0	47.7	9.1	43.2

Table 2 continued

Eating beans can ….	Strongly Disagree	Disagree	Agree	Strongly Agree	Do Not Know
English dominant	0	8.2	39.7	6.8	43.8
7. Help Lose Weight*	**1.9**	**10.2**	**27.4**	**5.1**	**52.9**
Hispanic dominant	7.7	10.3	10.3	2.6	61.5
Bicultural	0	6.7	33.3	6.7	53.3
English dominant	0	12.3	32.9	5.5	47.9

Summary scale	**Total**	Hispanic dominant	Bicultural	English dominant
Knowledge of bean health benefits (μ ± SD) (Sum of questions 1-7)	2.0 ± 1.4	1.7 ± 1.1	2.1 ± 1.3	2.1 ± 1.5

* p < .05; **p < .01; ***p < .001

Table 3

Health Characteristics and Risk Factors of Low-income Iowa Women by Acculturation Category (mean ± SD, or percentage) (N = 158)

Characteristics	Total	Hispanic dominant 25% (39)	Bicultural 29% (46)	English dominant 46% (73)
Self-reported weight and height				
Weight (lb; m ± SD)[a]	160.7 ± 40	160.9 ± 35	154.5 ± 42	165.1 ± 42
Height (in; m ± SD)**[b]	63.5 ± 2.9	62.7 ± 3.4	62.6 ± 2.4	64.3 ± 2.6
BMI (kg/m2; m ± SD)	28.0 ± 6.8	28.8 ± 6.2	27.4 ± 6.6	28.1 ± 7.2
BMI Category (%)[c]				
Underweight - Normal	35.8	21.4	40.0	39.1
Overweight	28.5	32.1	31.1	25.0
Obese	35.8	46.4	28.9	35.9
Do not know height and/or weight (%)[d]	11.6	20.0	4.3	12.3
Self-reported Health Status (%)*				
Poor-Fair	30.4	21.1	21.3	41.1
Good	50.0	68.4	53.2	38.4
Very good-Excellent	19.6	10.5	25.5	20.5
Number days per week moderate physical activity (%)				
Almost never	12.7	13.2	17.0	9.6
Twice a month	11.4	10.5	10.6	12.3
Once a week	23.4	31.6	19.1	21.9
2-3 times per week	33.5	26.3	34.0	37.0
4 or more times per week	19.0	18.4	19.1	19.2
Cigarette smoking * **				
Never smoked	67.7	89.5	89.4	42.5
Successfully quit	12.0	7.9	10.6	15.1
Current smoker	20.3	2.6	0	42.5
Looked for information about nutrition from any source?	78.5	76.3	80.9	78.1
If yes, where did you go first? (N=123)*				
Books, brochures, magazines	30.9	50.0	28.9	22.8
Friends, family, coworkers	8.9	14.3	5.3	8.8
Doctor or health care provider	18.7	25.0	18.4	15.8
Internet	41.5	10.7	47.4	52.6

Table 3 continued

*p < .05; ** p < .01; *** p< 0.001

Note.

BMI definitions are: underweight ≤ 18.5, Normal 18.5-24.9, Overweight 25.0-29.9, Class I Obesity ≥ 30.0-34.9, Class II Obesity ≥ 35.00-39.99, Class III Obesity ≥ 40.0 or higher. (Flegal, 2012); [a]N = 141; [b]N = 151; [c]N = 137; [d]N = 155.

Table 4

Percentage of Low-income Iowa Women Reporting Certainty in Maintaining a Healthy Diet by Acculturation Category (%) (N = 158)

How certain are you that you are able to maintain a healthy diet even if . . .	**Very certain**	**Certain**	**Uncertain**	**Very uncertain**
. . .you would have to change various daily habits.**	**22.2**	**54.4**	**20.3**	**3.2**
Hispanic dominant	23.7	73.7	2.6	0
Bicultural	31.9	46.8	19.1	2.1
English dominant	15.1	49.3	30.1	5.5
... you would have to invest additional effort to convince others that you really want to stick to a healthy diet.	**17.1**	**55.7**	**25.3**	**1.9**
Hispanic dominant	21.1	60.5	15.8	2.6
Bicultural	21.3	59.6	19.1	0
English dominant	12.3	50.7	34.2	2.7
... you would have to change your habits regarding grocery shopping.	**20.3**	**58.9**	**18.4**	**2.5**
Hispanic dominant	28.9	57.9	10.5	2.6
Bicultural	21.3	55.3	23.4	0
English dominant	15.1	61.6	19.2	4.1
... you would have to change your habits regarding cooking.	**20.9**	**55.7**	**20.9**	**2.5**
Hispanic dominant	23.7	60.5	13.2	2.6
Bicultural	25.5	55.3	17.0	2.1
English dominant	16.4	53.4	27.4	2.7
… you are eating at a restaurant.	**14.6**	**43.0**	**33.5**	**8.9**
Hispanic dominant	18.4	52.6	23.7	5.3
Bicultural	17.0	46.8	27.7	8.5
English dominant	11.0	35.6	42.5	11.0
	Total	Hispanic dominant	Bicultural	English dominant
Self-efficacy summary score (mean ± SD)*	2.9 ± 0.6	3.0 ± 0.4	3.0 ± 0.6	2.7 ± 0.6

*p < .05; **p < .01; ***p < .001

CHAPTER 5:

SOCIOECOLOGICAL BARRIERS TO DRY PULSE CONSUMPTION AMONG LOW-INCOME WOMEN IN IOWA: A MIXED METHODS APPROACH

A paper for submission to the Journal of Nutrition Education and Behavior

Abstract

Objective: Determine socioecological influences on dry legume consumption among low-socioeconomic populations in Iowa.

Design: A mixed methods approach of qualitative focus groups and a quantitative questionnaire.

Setting: Two focus groups in Ames, Iowa and five focus groups in Des Moines, Iowa.

Participants: Representatives of the low-socioeconomic population in Iowa as eligibility criteria include: female, aged 18-50 years old, and qualify for income-based federal assistance. Participants (n=35) completed the focus group and questionnaire.

Phenomenon of Interest: Better understand low-socioeconomic population's perceptions of legumes at the policy, community, interpersonal, and individual levels.

Analysis: A socioecological framework guided data analysis. Qualitative analysis for themes among transcripts conducted through NVIVO software by two trained researchers.

Results: At the policy level legumes are eligible to be purchased by federal assistance, although federal assistance did not last the whole month. Legumes are widely available at the community level. At the interpersonal level, spouses and children preferred animal-

source proteins. Individual bean consumption, as well as knowledge of preparation methods and health benefits, were low.

Conclusions and Implications: In-depth analysis concluded low-socioeconomic populations are interested in learning how to best utilize federal food assistance. Hands-on demonstrations and recipes were the strategies participants preferred to introduce legumes into their everyday diet.

Introduction

Households living below the federal poverty level have an increased risk for many chronic disease conditions, including heart disease, strokes, cancer, and type 2 diabetes. A couple of influences on an individual's risk for chronic disease include an individual's lifestyle, nutrition, food availability, education level, socioeconomic status, ethnicity/race, and genetic predisposition.[1] In the wake of limited resources, it may be difficult to focus time and energy on all tasks of daily living. Food choice behaviors may be based more on convenience, familiarity, time restrictions, culture, and family taste preferences rather than the nutrient composition of foods purchased and consumed.[2] Not only do an individual's lifestyle and health behaviors influence their risk for chronic disease, so does their socioeconomic status (SES).

This includes three elements: an individual's economic well-being, education level, and employment status. SES can significantly affect an individual's quality of life and life expectancy. For example, individuals with an economic hardship have decreased life expectancy by 8.5 years.[3] While theoretically modifiable, educational status of an individual regulates access to occupations, ability to use resources, household income, and social status. Individuals who are employed may feel more secure about the future.

Holding a full-time position may decrease physical deterioration with age.[4] Yet, economic well-being, attaining higher education, and gainful employment can be difficult to obtain for individuals who are living in poverty. Economic hardships create sustained worry about obtaining basic needs such as food, shelter, clothing, and care. These stresses in turn can cause health issues.[3]

Socioeconomic status extends far beyond personal health behaviors and includes external influences on an individual such as their family and environment. The socio-ecological model assesses the individual, interpersonal, community, and policy levels of influence.[5] This model includes the microsystem, mesosystem, exosystem, and macrosystem. At the microsystem level, the relationship between the individual and their everyday surroundings isassessed: school, work, and family. The mesosystem includes the individual and major settings in their life: family, school, Church, and peers. The exosystem takes into account formal and informal social structures that influence the individual. Finally, the macrosystem encompasses indirect influences, such as culture, laws, and regulations.[5] The socio-ecological model provides a good framework for assessing food consumption in terms of policies, food availability, and familial influences. Included in the protein food group are pulses, where there are gaps in the literature regarding barriers to consumption.

Pulses are part of the broader category of legumes. Dry beans, chickpeas, lentils, fresh beans and peas, soybeans, and peanuts are included in the legume family, defined as the seed of a plant with a pod. Pulses include the subcategory of dry beans, lentils, and chickpeas, as these are crops grown in a pod and harvested as dry grains. If pulse consumption was increased many shortfall nutrients identified by the Dietary Guidelines

could be addressed, such as dietary fiber.[6] There are numerous health benefits of beans including: good source of fiber, protein, aid in satiety, good source of carbohydrates for individuals with diabetes as they may lower post-prandial blood glucose, decrease LDL-cholesterol, and may prevent some cancers.[7-12] Since 2005, the Dietary Guidelines for Americans have recommended increased consumption of dry grain legumes for better health and nutrition. The current recommendations are for women to consume 1.5-2 cups per week, and for men 2-3 cups per week.[6] Current intake averages 0.5-1 cup per week. (Dietary Guidelines) In the U.S. Midwest only 13% of the population consumes legumes, with Hispanics accounting for the majority of the consumption.[13]

There are few published studies regarding barriers and motivators to bean or pulse consumption in general, nor among limited resource women. Radford & Dahl conducted a survey with predominantly White WIC recipients in Dixie County, Florida to evaluate perceptions on dry beans. Participants did not think of legumes as being a replacement for meat products, but rather as an addition.[14] Findings from a survey with low-income women in Arizona indicated positive perceptions about pulses, but limited knowledge on their functional food benefits. Over half of the participants agreed that beans help improve your nutrition and promote satiety. However, over 50% did not know that beans lower LDL cholesterol, cancer risk, and can lower postprandial blood glucose. The majority of the Arizona women were Hispanic. Results were analyzed by acculturation categories of Hispanic dominant, Bicultural, and English dominant. These results illustrate that acculturation level impacts an individual's consumption of pulses, as the Hispanic dominant women had greater consumption.[15,16] The first studies were surveys assessing the influence of acculturation on pulse consumption which indicated a

knowledge gap among low-socioeconomic women. To date there are no qualitative studies assessing why individuals are not consuming pulses, even though the 2015-2020 Dietary Guidelines recommend consumption.[6]

The benefits of a qualitative study are to understand a target population's motivators and barriers for bean consumption as it allows for extensive analysis as a naturalistic approach. Qualitative studies such as focus groups allow for in-depth breadth of observation rather than a large sample size. Qualitative inquiry is a continuous and adaptive process that is flexible to meet the needs of each group.[17,18] By first understanding influences of food purchasing from the target population of low-socioeconomic households, a tailored nutrition education plan can be developed that will be most effective at changing health behaviors because it will resonate with the audience.[19] The objective of the current study is to investigate elements of the socio-ecological model on barriers and motivators to bean consumption within the low-socioeconomic population

Methods

Focus Group Development

An interview guide was developed based on a literature review, and responses to a knowledge, attitudes, and perceptions survey on beans previously administered with a similar low-socioeconomic target population in Iowa and Arizona. Questions on the interview guide were based on each level of the socio-ecological model.[5] Using the socio-ecological model, five themes were discussed: individual consumption patterns, individual knowledge of beans, social consumption patterns, physical environment, and policies. Canned and dehydrated beans in a bag were on display so participants knew

what was being discussed. A visual demonstration of two meals including all five food groups were shown, one with chicken and one with kidney beans for insights into perceptions of protein sources. The interview questions were pilot tested with a group of seven Expanded Food & Nutrition Education Program (EFNEP) educators, and modifications were made for clearer interpretation and flow.

Survey Instruments

Participant's completed questionnaires on demographics, current dietary intakes, bean perceptions, and food security status. Demographic questions including self-report Hispanic ethnicity, race, and household composition were used verbatim from the EFNEP entry form.[20] Education and marital status questions were taken from the American Heart Association Women's Survey.[21] Employment status was measured by a question from the Behavioral Risk Factor Surveillance Survey (BRFSS).[22] Bean health benefit questions were taken verbatim from surveys administered to women of similar demographic backgrounds in Arizona and Iowa.[15,16] These nine questions utilized a Likert-type scale (strongly disagree, disagree, agree, strongly agree, and do not know option). Food security was measured according to the six-item USDA core food security module.[23]

Participant Recruitment

Recruitment flyers were displayed in health care clinics, WIC clinics, food pantries, libraries, extension program sites, and other community resource agencies. Potential participants expressing interest were screened to ensure eligibility for the study. Eligibility criteria included: female between the ages of 18-50 years old, primarily speak English, and receiving income-based food assistance. Participant's contact information

and availability were recorded on a spreadsheet and focus groups were arranged in public locations near the participants. All participants received $40 cash as an incentive at the end of the focus group. Upon arrival at the focus group, women received a printed copy of the informed consent. A researcher read the consent form aloud to the group and asked if there were any questions prior to women signing. A team of three research staff, including the facilitator, attended each focus group with the other two taking field notes.[17,18] The Iowa State University Institutional Review Board approved the study procedures.

Qualitative Analysis

The sample size was determined by saturation, when no new reoccurring themes were mentioned in focus groups. Audio recordings were transcribed internally. The transcripts were uploaded into NVIVO version 12.0 (QSR International, Burlington, MA) for qualitative analysis. Two researchers read each transcript looking for themes between the groups. A codebook was developed that included four common themes reflecting the interview guide as well as the discussion content. The themes included: family or friends' consumption of pulses, individual food consumption, nutrition information, and policy. Inter-rater reliability between the two coders was high, 99.59, and a kappa value of 0.83.[24]

Quantitative Analysis

Survey results were entered into SPSS Version 24.0 (IBM, Armonk, NY). Frequency distributions of variables were examined for normality. Likert scale reponses from the bean perceptions questions were summarized into a scale. Self-reported heights and weights were used to calculate BMI values which were categorized into underweight,

normal, overweight, and obese based on current classifications.[25] Responses from the USDA food security module were totaled and categorized as high food security, low food security, and very low food security.[23]

Results

Quantitative Results

Table 1 includes demographic characteristics of the 36 women that participated in a total of 7 focus groups. Fifty-three percent identified as white (n=19), 39% (n=14) as African American, with the remaining 8% other (Asian, Puerto Rican, Other) (n=3). SNAP was the food assistance program used by the greatest number of participants, 47%, followed by WIC 36%, and child nutrition programs 31%, such as school breakfast or lunch and Child and Adult Care Food Program. Many of the participants received more than one food assistance program. The majority of the participants, 61% reported an annual household income of $19,999 or less. Overall food security was low among the participants as 36.1% were low food secure, and 33.3 % were very low food secure.

Only 17% of the women reported consuming pulses 4-6 times per week or more, or approximately the recommended amount per the DGA. While 36% ate pulses 2-3 times per week, the majority ate them once per week (14%), or less than once per week if at all (33%). Key components of table 2 indicate constructs of bean knowledge were missing: 56% did not know beans decreased some cancer risks, 39% did not know beans helped control blood glucose, and 33% did not know beans lowered LDL cholesterol and were a good carbohydrate for people with type 2 diabetes.

Qualitative Results

Policy

Participants reported that purchasing beans using SNAP benefits was simple as long as they had the funds to support it. Those receiving SNAP benefits noted funds do not last the whole month, and either their family waits until the funds are renewed, visit food distribution centers, or use other funds not used for other expenses. "*You buy the white bread instead of the wheat bread because it saves you the 12 cents a loaf... the 12 cents adds up."* [age 21, rural] WIC food purchasing habits were discussed in four of the seven focus groups. Legumes in 1-pound bags are eligible using WIC benefits; however, whether mothers buy them and know how to cook them appears to be a barrier. One participant noted *"...I have known several families that have been on WIC and when they get those checks typically they don't use the bean one... because they don't know what to do with them, or they just don't eat them."* [age 48, rural]

Participants had a difficult time identifying any nutrition guidelines that encourage pulse consumption. This lack of knowledge of the Dietary Guidelines is an awareness concern for nutritional practice. At least one participant in every group was aware of the MyPlate diagram. Participants reported seeing the diagram in grocery stores, WIC clinics, and Extension programming. The five food groups from MyPlate were discussed and participants had a general idea of each of the food groups. In every focus group the participants knew that beans fit in the protein group, some said the grains, and even fewer said the vegetable group.

Community

In each of the focus groups, participants noted beans being available in the grocery stores where they shop regularly. One participant mentioned them being available in the convenience store they regularly visit. Dry pulses were most frequently

found in the ethnic foods aisle, whereas canned beans were near the canned vegetables, or the rice and pastas.

Supermarkets were the most frequently mentioned place to buy groceries, because they can go to one place and purchase household needs and food. Discount grocery stores, such as Aldi, were mentioned in six of the focus groups as offering food at a reduced price. The major determinants for choosing which grocery store to shop at were: household influences, price of food, convenience of grocery stores, sales and advertisements for food products, and nutritional composition. "*I will go to four grocery stores in a week if it saves me money. I am not loyal to any grocery store."* [age 21, rural]

Interpersonal

Household characteristics have a major influence on food purchasing and consumption patterns. There are many factors pulling mother's time with work responsibilities, preparing meals, doctor's appointments, and possibly relying on federal assistance for food and healthcare. One mother responded *"I've got three little babies, and I mean you want something that's quick, easy, fast because I've got an hour and a half from when I get home and put my kids to bed... it's frozen pizza, fish sticks, chicken nuggets, crap like that."* [age 29, urban]

Participants reported consuming meat because their husband or children wanted meat as the main dish of the meal. *"...his philosophy is you plan the meal around the meat, not the other way around. I ate vegetarian for a couple of years, so I would eat that but he wouldn't, he would need a piece of meat."* [age 48, rural] During the focus group, two meal examples were shown; chicken, rice, peas, banana, and a glass of milk. This was most similar to what mothers would feed their families, making sure the chicken was

baked not fried and greater preference for white rice. When the chicken was replaced with kidney beans, participants suggested it was light and would not be satiating. The most frequent solution to the problem was to add the chicken to the meal and mix everything together (chicken, rice, beans, peas) and add some spice.

Despite the husband preferring meat at every meal, it was not always accessible or was considered too expensive at the end of the month to purchase. Participants reported buying beans at the end of the month because they were cost efficient to feed their families as well as satiating for their children. *"I would use beans as a poor meal at the end of the month. If I don't have any money, I'll get those smoked sausage rings... and cook them with the beans and rice and my children go to sleep pretty good too."* [age 29, urban]

Individual

Participants' knowledge of pulses and consumption patterns were discussed. During the focus group examples of canned black beans and garbanzo beans, dry lentils and green split peas. Participants were most familiar with the black beans. Some participants did not know that garbanzo beans and chickpeas were synonymous or how these pulses are used. In general, knowledge of lentils and split peas was very limited. Knowledge on preparation methods of dehydrated pulses was unknown unless it was part of individuals' tradition where they grew up rehydrating and preparing them. *"I don't really know how to use the ones in the bag. Like my mom always used the ones in the can... that's how I know how to cook with them."* [age 31, rural]

One major barrier to preparing dry pulses was the amount of time it takes to soak, cook, and prepare a dish using them. *"No one has ever taught me, if somebody did, then it*

would be a different story but I don't know what it's supposed to be like and when it's right and when it's not." [age 35, urban] Participants receiving WIC benefits were more likely to try preparing dry pulses, had a bad experience, such as not letting them soak long enough and having a hard texture. After a bad experience or their family's dislike, mothers were less likely to try them again.

Participants of different ethnicities were found to have higher pulse consumption as they have been incorporated in their diet from an early age. Overall pulses are widely available in the grocery stores and food pantries participants frequent. One of the most common pulse varieties consumed by participants were canned pork and beans. Participants noted they are convenient, satiating, inexpensive, and taste good with the sauce.

Knowledge of the health benefits of pulses remained low between the questionnaire and the qualitative responses. Overall participants knew pulses were a good source of protein and fiber. In two of the discussions, participants reported personal stories of pulses being a good source of iron, and through the addition of pulses in their diet were able to raise blood iron levels. Pulses were also discusses as being beneficial for the digestive system.

Discussion

The objective of this study was to examine barriers and motivators to bean consumption within the low-socioeconomic population using the socio-ecological model constructs. Results suggest major knowledge gaps in previous nutrition education. Current messaging may promote beans as a cheap replacement to animal-source proteins. Results indicate low-socioeconomic women do not want to identify their food as cheap,

nor thought of beans as a protein replacement. These findings should inform the development of tailored nutrition education programming for this audience. Previous research on a tailored interventions targeting cooking skills resulted a positive change among low-socioeconomic participants. Confidence of cooking skills was increased as well as the number of vegetables prepared.[26] Successful interventions among low-socioeconomic populations have a shorter timeframe with easily accessible foods.[27] Overall tailored nutritional messages have a greater effect on increasing fruit and vegetable consumption.[28]

As the average American household consumes more food outside the home, kitchen skills decrease.[28] One of the population groups that may consume a greater amount of convenience foods outside the home is the low-socioeconomic population. This population has an increased risk of heart disease, diabetes, and total number of chronic diseases.[1] Since these focus groups primarily focused on pulse consumption, a greater consumption can contribute to a healthful dietary intake. Overall participants did know beans are a good source of protein and fiber, and there were knowledge gaps in terms of specific health benefits including being an acceptable food for individuals with diabetes, lowering cholesterol, and lowering cancer risk. Similar findings were found in a knowledge, attitudes, and perceptions survey of Iowa participants as almost 60% did not know beans consumption could lowering LDL cholesterol, and 59% did not know about maintenance of blood glucose values.[16]

Barriers to pulse consumption include limited knowledge in cooking methods and not knowing how to incorporate them into their everyday diet. These findings contrast survey responses from WIC participants as they suggest confidence in bean preparation

and incorporation methods.[14] Many of the participants reported their spouse and children-influenced household grocery shopping practices. They were cautious in purchasing foods to limited food waste and keep their children satisfied through the night. Since participants did not know how to cook beans, they did not purchase them using their food assistance benefits. Beans were the most frequently known pulse; participants did not know much about chickpeas, split peas, or lentils. Consumption of canned pork and beans were most common because they preferred the taste and sauce, without thinking of consuming beans. Both of these results show that participants, especially those in WIC, are interested in learning how to incorporate these sustainable sources of protein in their everyday diets.[14]

When asked why beans should be purchased, participants reported they were good for the digestive system and they were a good addition to meals at the end of the month because they were inexpensive and nutritious. The most common dishes where participants used beans were soups and dips rather than a side on their plate. The versatility of beans in a wide variety of dishes is a motivator to increase the nutritional value of the dish. Beans were also widely available, and participants shared any grocery store or food pantry they frequented, had access to beans, but were unsure about lentils, peas, and chickpeas.

This study contributes to the current literature using a mixed methods approach to represent low-socioeconomic individual's perceptions on legumes. Results can be used to tailor nutrition messages for this target group to facilitate dietary behavior change, such as including legumes in the everyday diet. Due to the limited sample size and narrow geographic location, the generalizability of the findings are limited. These results

represent urban populations in Iowa, which are vastly different than larger urban areas. More rural communities may experience additional hardships in terms of food availability and accessibility.

Implications for Research and Practice

These mixed method results regarding legume consumption will be used to develop a tailored nutrition education plan to increase the use of pulses among low socioeconomic families. The best strategy to increase adherence of bean consumption is to focus on eliminating foods to decrease chronic disease risk. Replacing those foods with nutritious foods that decrease their overall chronic disease risk. These programs will address current knowledge gaps such as specific health benefits of beans and ways to incorporate legumes into their everyday diet.

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Table 1: Focus Group Interview Guide Questions Outlined by Socio-ecological Constructs

Question	SEM Construct
Why do you purchase bagged or canned beans, peas, chickpeas, or lentils?	Individual
On a scale from 1-5, how much do you know about the nutrients in beans, peas, chickpeas, or lentils?	Individual
Explain your family's attitude toward eating beans, peas, chickpeas, or lentils.	Interpersonal
Where do you/family shop for foods?	Community
Where are beans located in the stores you shop at?	Community
What are some nutrition guidelines that encourage bean consumption?	Policy
If someone wanted to buy beans and received supplemental food assistance, how is this done?	Policy

Table 2. Distribution of Demographic and Household Characteristics of Low-income Iowa Women (mean ± SD, or percentage) (N = 36).

Characteristics	Total
Age in years	34.7 ± 8.8
Race or Ethnicity	
African American	38.9
White	52.8
Asian	2.8
Other	5.6
Household Location	
Urban	63.9
Rural	36.1
Marital Status	
Married	25.0
Single	58.3
Living with Partner	5.6
Divorced/Separated	11.1
Living Arrangements	
With parents	8.3
With spouse	33.3
With other family members	16.7
By Yourself	36.1
With roommate in a dorm/house/apartment	5.6
Food Program Usage	
Child Nutrition	30.6
SNAP	47.2
WIC	36.1
Food Distribution	8.3
No Food Programs	11.4
Employment Status	
Employed	50.0
Homemaker	16.7
Student	8.3
Unable to work	13.9
Out of work <1 year	2.8
Out of work 1+ years	8.6
Years of Education	
Did not graduate HS	11.1
HS Gradaute	30.6
Some College Credit	13.9
1 or more years of college	5.6
Associate degree	16.7

Table 2 continued Characteristics	Total
Bachelor's degree	11.1
Master's degree	5.6
Doctorate degree	2.8
Professional degree	2.8
Number children under age 18	1.3± 1.5
Total Household Size	3.2±2.0
Household Income	
Under $10,000/yr	36.1
$10,000-14,999/yr	13.9
$15,000-19,999/yr	11.1
$20,000-24,999/yr	5.6
$25,000-29,999/yr	5.6
$30,000-34,999/yr	2.8
$35,000-39,999/yr	5.6
$40,000-49,999/yr	2.8
$50,000-74,999/yr	13.9
Prefer not to answer	2.8
Food Security	
High food security	30.6
Low food security	36.1
Very low food security	33.3

Table 2. Percentage of Responses Regarding Health Benefits of Bean Consumption Among Low-income Iowa Women by Acculturation Category (N = 36)

Eating beans can ….	***Strongly Disagree***	***Disagree***	***Agree***	***Strongly Agree***	***Do Not Know***
1. Improve Your Nutrition	0	2.8	66.7	19.4	11.1
2. Help You Feel Full	2.8	0	63.9	19.4	13.9
3. Lower Bad Cholesterol	0	2.8	52.8	11.1	33.3
4. Lower Cancer Risk	0	8.3	30.6	5.6	55.6
5. Control Blood Sugar	0	2.8	55.6	2.8	38.9
6. Healthy GI Tract	0	0	50.0	19.4	30.6
7. Help Lose Weight	0	8.3	47.2	13.9	30.6
8. Give You Gas	0	11.1	52.8	27.8	8.3
9. Be Good for Persons with Diabetes	2.8	2.8	47.2	13.9	33.3
Summary scale *Knowledge of bean health benefits (μ ± SD)*		***Total*** *20.2 ± 9.6*			

CHAPTER 6: SUMMARY AND CONCLUSIONS

The in-depth results from the two studies indicate a knowledge gap regarding the health benefits of legumes, preparation methods, and lack of resources regarding incorporation into the everyday diet. Incorporation of legumes in low-socioeconomic populations may increase dietary fiber intake, as well as several of the shortfall nutrients; magnesium, folate, iron, and potassium identified by the Dietary Guidelines.[1] By consuming a more nutritious diet, the prevalence of chronic diseases may decrease as a result.

In general, indivduals understand what a nutritious diet looks like, but may be limited by funds for groceries, transportation to the grocery store, household influences, and lack of cooking knowledge. As the United States population shifts to consuming more meals away from home, nutrition educators have a large role to fill by narrowing the knowledge gap between grocery shopping and food preparation methods. Low-socioeconomic individuals are interested in expanding their knowledge on legumes and incorporating them into their everyday diet. On all levels of the socioecological model there were barriers and motivators to legume consumption.

This research takes into account influences on four levels: individual, interpersonal, community, and policy. Nutrition educators can begin at the individual level by providing hands-on demonstrations of simple recipes incorporating legumes. The health benefits of legumes can be discussed to sustain legume consumption. By increasing knowledge at the individual level, it may lead to an overall increase in legume consumption in the household. Legumes were commonly found in grocery stores individuals shopped at, so no potential barriers in accessing legumes. Changes at the

policy level may include increasing awareness of the Dietary Guidelines or where legumes are in the MyPlate diagram. Individuals receiving WIC benefits are able to purchase one pound bags of dried legumes, but unable to purchase canned legumes. By increasing cooking knowledge or broadening political regulations, legumes can be more readily accessible to this population.

These results can be useful for all nutrition educators on spreading awareness of legumes as part of a nutritious diet. Rather than creating an entirely new program, information can be incorporated in developed areas of Extension or WIC education.

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APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVALS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

Date: 5/18/2016

To: Dr. Donna Winham
220 MacKay Hall

From: Office for Responsible Research

Title: Relationships between acculturation, food security, and attitudes towards traditional foods among low-income Hispanics in Iowa

IRB ID: 16-239

Study Review Date: 5/18/2016

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
  - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
  - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

  Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

  Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566

Date: 8/10/2017

To: Dr. Donna Winham
220 MacKay Hall

From: Office for Responsible Research

Title: Barriers and motivators to bean consumption among low income adults - a qualitative investigation

IRB ID: 17-292

Approval Date:	8/10/2017	**Date for Continuing Review:**	8/9/2019
Submission Type:	New	**Review Type:**	Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, **including the recruitment materials and informed consent documents that have the IRB approval stamp.**
- **Retain signed informed consent documents for 3 years after the close of the study,** when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.
- **Immediately inform the IRB of** (1) **all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) **any other unanticipated problems involving risks** to subjects or others.
- **Stop all research activity if IRB approval lapses,** unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- **Complete a new continuing review form** at least three to four weeks prior to the **date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **IRB approval in no way implies or guarantees that permission from these other entities will be granted.**

Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 202 Kingland, to officially close the project.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX B: FOCUS GROUP RECRUITMENT FLYER

Participants needed for focus groups!

What do we do?

Researchers from Iowa State University are holding small focus groups (5-10 people) with women to discuss health and disease topics.

Your personal views and experience on health topics will be discussed.

You do not need to know a lot about this subject

Who do we need?

- Women ages 18-50 years old
- Attend discussion for up to 2 hours
- Complete 2 questionnaires
- Eligible for supplemental food assistance or health care programs
- Primarily speak English

Are you interested?

- Participants will receive $40.00 for completion of focus group & questionnaires
- Please call (515) 294-5040 and leave a message OR email spalmer@iastate.edu or dwinham@iastate.edu to schedule a date & time.

Shelly - Health Study (515) 294-5040 spalmer@iastate.edu

APPENDIX C: PARTICIPANT PHONE SCREENER

Iowa Bean Focus Group Phone Screener- Questions

Date:_____ Time:_____

Initial:_____

1. Did you read verbal script consent form?
   ☐ Yes ☐ No
2. What is your first and last name?
   First:_____
   Last:_____
3. Do you have an e-mail address?
   E-mail address:_____
4. What is your contact number?
   Cell:_____
   Home: _____
   Work: _____
5. Are you a female?
   ☐ Yes ☐ No
6. Are you between the ages of 18-50?
   ☐ Yes ☐ No
7. There are 5 places where we can meet for the focus group. Which of the following locations would you be able to meet?
   Ames Public Library, Primary Health Care in Ames,
8. Which of the following days and times would you be able to meet?
   Weekdays-mornings-before noon
   Weekdays-afternoons-between noon and 5 pm
   Weekdays-evenings-after 5pm
   Saturday-mornings-before noon
   Saturday-afternoons-between noon and 5 pm
9. Do you qualify for any of the following programs?
   Child nutrition programs (free/reduced price school meals), Head start, Supplemental nutrition assistance program (SNAP), WIC, Food distribution programs (TEFAP)
   ☐ Yes ☐ No
10. Do you have any friends, family members, or coworkers who are qualified and willing to participate in one of our upcoming discussion groups?
    ☐ Yes ☐ No
    If yes, contact information
    Name:_____
    E-mail:_____
    Contact Number:_____

11. During the discussion groups, voices will be recorded. We use the voice recordings to write out the conversations for analysis. Only the discussion group part will be recorded. You will be told before the recorder is turned on and when it is turned off. The discussion taking place is the data that will be used for our research study. All material used in the discussion groups is confidential. Are you okay with having your voice recorded?

    ☐ Yes ☐ No

12. How did you hear about these focus groups?

    _____

    _____

APPENDIX D: FOCUS GROUP INTERVIEW GUIDE

1. **Welcome and introduction: introduce self and other project Welcome and Introduction: Introduce self and other project people (e.g. staff).**

Thank you for coming to this focus group discussion today. The purpose of our conversation is to get a better understanding of your thoughts and opinions about health topics and related chronic diseases.

This study is conducted through Iowa State University in the Food Science & Human Nutrition Department. Dr. Donna Winham is the principle investigator for Shelly Palmer's master thesis project.

2. Order of Business

Our discussion today will be at most two hours. After participating in the discussion and completing two questionnaires, you'll receive $40 as our way of saying thank you for your participation.

Please help yourself to the snacks and drinks. We won't be taking a formal break. Please feel free to leave the room if you need to use the restroom. The restrooms are located ---- ---.

3. **Explanation of a focus group**

Today you will be participating in a focus group. Simply put, a focus group is a guided discussion. I will be asking you a series of questions. There are no right or wrong answers to any of the questions you will be asked. We are interested in hearing your point of view even if it's different from what others have said. While your opinions may differ from others we hear today, it's likely that other people share your opinion, so we definitely want to hear it. Everyone's opinions and thoughts are important and we want everyone to feel comfortable sharing them. We will ask that you are respectful to one another when your opinions differ.

4. Group guidelines

There are a few important guidelines we are going to ask you to follow to ensure the success of the group.

a. First, we would like to hear from each of you, but only one at a time. We will be audio-taping the discussion because we don't want to miss any comments. If more than one person speaks at a time, it's hard to understand what is being said on the tapes. If you think of something to say while someone else is speaking and want to make sure you remember the point, you can make a note on the paper in front of you. You can then express your thoughts after the other person finishes.

b. Please share all your thoughts and opinions with us. We are interested in both positive and negative comments. There are no right or wrong answers.

c. Please be specific when you are discussing topics. Use examples whenever you can. There may be times when we ask you to expand on what you were saying. This is to ensure we accurately understand what you saying.

d. I will be guiding the discussion. I will make every effort to keep the discussion focused. If too much time is being spent on one question, I may move the conversation along so we can cover all the questions.

e. We would like all of you to participate in the discussion. All of your opinions count and are important to us. Please be respectful of one another and try not judge each other. It's OK to disagree. We may gently nudge people to talk if they are not participating in the discussion by directly asking them to express their thoughts about a particular topic.

f. You do not have to speak directly to me only. You may direct your comments to other members of the group.

g. This final guideline is really important. Before you speak each time, please say your first name or a nickname. If you don't remember to say your name, I'll say something like, "That was Mary," after you are done. Stating your name helps us to tell who is speaking on the tapes and is really important for our analyses.

5. Confidentiality

We will be on a first name basis today, which will later be written in a typed document. When reporting data results, names will not be associated with your responses and pseudonyms will be given to participants. Your responses will never be associated with your name once the tapes are transcribed. We also ask that whatever is discussed here today stays in this room – please do not repeat specific comments that others make today to preserve privacy.

Are there any questions about the discussion group or anything I've described?
I'd like to start to audio record this session. Is everyone OK with me doing that?

[If yes, begin audio recording]

Individual introductions

There are name cards in front of each of you. This will help everyone in the group remember each other's names. Let's begin by going around the room and getting to know each other a little bit. Please state your name and one thing/ hobby you like to do the most.

Now, I'd like to begin our discussion about health.

MODERATOR'S GUIDE
Introductions
Protocol
OPENING QUESTIONS

I. INDIVIDUAL CONSUMPTON PATTERNS

1. Who buys groceries in your house?

2. Where do you/family shop for these foods?

3. How do you/your family decide which foods to buy?
   a. Imagine you are at the grocery store, how do you decide what to buy?

4. If you could change the types of foods you eat, what would you change?

5. Why do some people choose to eat healthy foods?
   a. Probe: How do you define healthy?

6. Grocery shopping demonstration: Describe meal 1 (chicken, rice, peas, milk, banana)
   Show participants food demonstration of artificial foods with all 5 food groups represented. Visuals included a portion of rice, 1 chicken leg, a portion of peas, and a glass of milk. The moderator probed on perceptions of protein sources chicken vs. beans. Participants were asked about the willingness and frequency they would prefer to eat this meal.
7. Describe meal 2 (beans, rice, peas, milk, banana)
8. If you were to eat meal 1, what would you change?
9. If you were to eat meal 2, what would you change?

10. What population consumes the most dry beans, peas, chickpeas, or lentils?

11. In the populations mentioned, why do you believe they consume the most?

II. INDIVIDUAL KNOWLEDGE OF BEANS

12. What are beans, peas, lentils, and chickpeas used for? Show examples.

13. In this MyPlate diagram, how do these items fit into the food groups?
    a. Probe: Are they an acceptable replacement for any foods? Please name any foods.

14. How likely are you to purchase products with beans, peas, lentils, and chickpeas?

15. Do you purchase bagged or canned dry beans?

16. Why do you purchase bagged or canned dry beans?

17. Think back to a time when you ate dry beans, peas, chickpeas, or lentils. What was that experience like?

18. How likely are you to eat beans again?

19. How many times per week do you eat beans?

20. On a scale from 1-5, 1 being little know, and 5 being much known, how much do you know about nutrients in beans, peas, chickpeas, or lentils?

21. How much do you know about beans in relation to health?

22. Have you heard of any health benefits of beans, peas, chickpeas, or lentils?

23. Would you recommend people with any illness/diseases eat more/less beans?
24. What health conditions would affect how many beans a person eats?

25. Why do you recommend they eat more/less beans?

III. SOCIAL CONSUMPTION PATTERNS

26. Explain your family's attitude toward eating beans, peas, chickpeas, or lentils.

27. If you were getting together with friends, and you brought a dish with beans, how would your friends respond?

IV. PHYSICAL ENVIRONMENT

28. How likely are the stores you shop at to stock beans, peas, lentils, and chickpeas?

29. Where are the beans located in the stores you shop at?

V. POLICIES REGARDING BEANS

30. What are some nutrition guidelines that encourage bean consumption?

31. If someone wanted to buy beans and received supplemental food assistance, could they do this?

VI. INFORMATION DELIVERY

32. Where do you obtain general nutrition information?

33. If you were to find information on beans, peas, chickpeas, or lentils, where would you look?

34. Would you attend any programs to learn about these items?

35. What kind of information would you like to know about beans, peas, chickpeas, or lentils?

36. How would you like to receive these nutrition education messages?

37. Would learning about beans, peas, chickpeas, or lentils change your dietary habits?

VII. CONCLUSION:

This concludes our questions for you today. Does anyone have other comments or observations they would like to make about the topics we have discussed? Thank you! The audio recording will now stop.

APPENDIX E: MIXED METHODS QUALITATIVE CODEBOOK

Low-SES Food Purchasing Habits Codebook

1. Family or friends consumption of beans: Use when participants discuss their family's bean consumption
    a. Bean Knowledge: Use when discussing knowledge regarding the health benefits of beans
        i. Fiber: Use when discussing the fiber content of beans
        ii. Protein: Use when discussing the protein content of beans, or where they would be placed in the MyPlate diagram
        iii. Vegetables: Use when discussing beans being included in the vegetable food group.
    b. Bean Uses: Code this when participants are discussing recipes or ways they use beans in their lifestyle.
    c. Form: This node refers to the form of beans participants discuss purchasing, preparing, or consuming
        i. Bag: Use this node for when participants discuss preparing, purchasing, or consuming dehydrated dry beans, peas, chickpeas, or lentils. Also use this node for when participants discuss not knowing how to prepare dehydrated beans from a bag.
        ii. Can: Use this node for when participants discuss purchasing, preparing, or preferring can beans over dehydrated beans.
    d. Frequency consumed: Use this node when participants discuss how often their family consumes beans.
    e. High bean consumption: Use when asked who consumes the most beans? Categorize general responses here, such as low-income population, or anyone that goes to a food pantry
        i. Ethnicity: Use when participants discuss individuals of different ethnicities having high bean consumption or tradition of consuming beans.

f. Rice: Use when participants discuss the rice on the plate example.
    i. Brown: Code this when participants discuss purchasing, preparing, consuming, or family's preferences and opinions of brown rice.
    ii. White: Code this when participants discuss purchasing, preparing, consuming, or family's preferences and opinions of white rice.
g. Why buy beans: Use when discussing why to purchase and consume beans.
    i. Health benefits-nutritional value: Use when discussing why individuals purchase beans in terms of the nutritional value.
    ii. Price- Use when discussing the price of beans as a way to encourage bean consumption.
    iii. Satiety- Use when discussing how beans help you feel full and may aid in weight loss.
    iv. Versatility- Use when discussing how beans can be used in a variety of dishes or when discussing the wide availability in grocery stores.

2. Individual food consumption: Use when discussing grocery shopping patterns, and how to make food shopping decisions.
    a. Decide foods to buy: For when participants are discussing how they decide what foods to purchase
        i. Advertisements: Code here when participants discuss looking at advertisements/flyers that encourage grocery shopping habits.
        ii. Convenience: Code here when participants discuss the convenience of grocery stores and food availability in terms of deciding which foods to buy.
        iii. Household: Code here when participants discuss the influences of their household (children or husband) in terms of food purchasing habits.
        iv. Nutrition: Code here when participants discuss food's nutritional value having an influence on food purchasing decisions.
        v. Price: Code here when participants discuss prices of foods influencing grocery shopping patterns. Such as why they go to a particular store because it is inexpensive, or being unable to afford certain food items.
    b. Frequency of grocery shopping: Code here when participants discuss how often they go to the grocery store/ food pantry.
    c. Location: Code here when participants discuss where they purchase their groceries from and why they choose those locations.
    d. With who: Code here when participants discuss who they go grocery shopping with and who purchases the groceries in their household.
3. Nutrition information: This section focuses on where participants receive nutrition information and what they would like to expand on about beans.

a. Define healthy: Code here when participants are defining healthy in broad terms.
    i. Expensive: Code here when participants are defining healthy in terms of healthful food items being expensive.
    ii. Fresh: Code here when participants describe specific food items as healthy, such as fruits, vegetables, whole grains, or organic.
    iii. Nutrients: Code here when participants are discussing micronutrient breakdown of food components; such as the sodium or sugar content in specific foods.
    iv. Whole body approach: Code here when participants define healthy in terms of exercising or moods associated with being healthy; such as happiness or how the way food makes you feel.
b. Expanding bean knowledge: Use this for when participants are discussing future nutrition educational components discussing beans.
c. Health changes: Use this for when participants are discussing items they would like to change regarding their current health status or food intake.
d. Nutrition information sources: When participants are discussing where their general nutrition information comes from, if not defined in other categories.
    i. Doctor: When participants mention receiving nutrition advice from a doctor or health care professional.
    ii. Extension: When participants mention participating in extension programming and lesson plans.
    iii. Friend: Code here when participants discuss nutrition information with a friend or family member.
    iv. Internet: Code here when participants discuss using the internet, apps, or TV to receive nutrition information
    v. Nutrition labels: Code here when participants discuss using the labels on a food product to learn about the nutrition of that product.
    vi. WIC: Code here when participants discuss participating in WIC discussions and information sources.
e. Why people eat healthy: Use this for when participants discuss why some individuals eat healthy foods, if not defined by chronic disease or feelings.
    i. Chronic disease: Use for any chronic disease related conditions in terms of why they eat the way they do/ don't eat how they should.
    ii. Feelings: Code here when participants discuss the way in which food makes them feel.

4. Policy: Use when discussing WIC, SNAP, MyPlate, Dietary Guidelines in terms of government policies.
    a. MyPlate: Code here when participants discuss the food groups on the MyPlate or locations in which they have seen a MyPlate diagram. Also code here when participants report they have never seen a MyPlate diagram.

b. SNAP: Code here when participants discuss eligible foods and regulations they disprove of regarding SNAP guidelines.
    i. Run out of money: Code here when participants report SNAP benefits not being enough to get through each month, or having to go hungry.
c. WIC: Code here when participants discuss eligible food items individuals can purchase using WIC.

APPENDIX F: ADDITIONAL RESULTS FROM MIXED METHODS STUDY

Table 1. Health characteristics and risk factors of low-income Iowa women by acculturation category (mean ± SD, or percentage) (N = 36)

Characteristics	**Total**
Self-reported weight (lb; m ± SD) *(n=35)*	201.4 ± 61.9
Self-reported height (in; m ± SD) *(n=35)*	64.9 ± 3.6
BMI (kg/m2; m ± SD) *(n=35)*	33.8 ± 10.3
BMI Category (%)	
Underweight	0
Normal	22.2
Overweight	16.7
Obese 1	25.0
Obese 2	5.6
Obese 3	27.8
Self-reported Health Status (%)	
Poor	2.8
Fair	36.1
Good	36.1
Very Good	19.4
Excellent	5.6
Number days per week moderate physical activity (%)	
1 day per week	19.4
2 days per week	13.9
3 days per week	22.2
4 days per week	8.3
5 days per week	22.2
6 days per week	5.6
7 days per week	8.3
Smoking	
Never smoked	33.3
Used to smoke, but quit	38.9
Smoke, not every day	11.1
Smoke <10 cigarettes per day	11.1
Smoke 10+ cigarettes per day, less than 1 pack per day	5.6
Alcohol Consumption	
Every day	2.8
3-4 times a week	5.6
2 times a week	2.8
1 time a week	8.3
2-3 times a month	22.2
1 time a month	5.6

Table 1 continued **Characteristics**	**Total**
3-11 times per year	8.3
1-2 times per year	11.1
No alcohol in year, but have drank	22.2
Never drank alcohol	11.1

Note. BMI definitions are: underweight ≤ 18.5, Normal 18.5-24.9, Overweight 25.0-29.9, Class I Obesity ≥ 30.0-34.9, Class II Obesity ≥ 35.00-39.99, Class III Obesity ≥ 40.0 or higher.

Table 2. Percentage of low-income Iowa women reporting certainty in maintaining a healthy diet by acculturation category (%) (N =36)

I can manage to stick to healthful foods . . .	***Very Uncertain***	***Rather Uncertain***	***Certain***	***Very Certain***
. . .even if I need a long time to develop the necessary routines.	0	13.9	63.9	22.2
... even if I have to try several times until it works.	0	13.9	61.1	25.0
... even if I have to rethink my entire way of nutrition.	2.8	19.4	58.3	19.4
... even if I do not receive a great deal of support from others when making my first attempts.	2.8	25.0	52.8	19.4
… even if I have to make a detailed plan.	0	16.7	52.8	30.6
	Total			
Self-efficacy summary score (mean ± SD)	15.1±2.6			

Table 3. Consumption Frequency of Fruit/Vegetable/Fiber Foods by Low-Income Women in Iowa (n=36)

Food Item	**Less than 1 per WEEK**	**About once per WEEK**	**2-3 times per WEEK**	**4-6 times per WEEK**	**1 time per DAY**	**2+ times per DAY**
Fruit juice, like orange, apple, grape, fresh, frozen or canned	30.6	8.3	25.0	16.7	13.9	5.6
Fruit fresh or canned	8.3	5.6	33.3	19.4	16.7	16.7
Vegetable juice, like tomato or V-8,	61.1	8.3	13.9	11.1	2.8	2.8
Green salad (like lettuce or spinach)	22.2	16.7	38.9	13.9	5.6	2.8
Potatoes, incl. baked, mashed, fries	11.1	19.4	47.2	16.7	5.6	0
Vegetable soup or stew	30.6	41.7	11.1	8.3	5.6	2.8
Any other vegetables, including green beans, peas, tomatoes, corn, broccoli	11.1	19.4	30.6	11.1	11.1	16.7
Fiber cereals like Raisin Bran, Shredded Wheat or Fruit-n-Fiber	63.9	13.9	16.7	0	2.8	0
Beans such as baked beans, pinto, kidney, or lentils (not green beans)	33.3	13.9	36.1	13.9	2.8	0
Dark bread such as whole wheat or rye	36.1	13.9	30.6	2.8	11.1	5.6
Servings of fruits and vegetables per day 5 or more per day Less than 5 per day	 30.6 69.4					
Total Dietary Fiber Intake	15.6±5.7					

Table 4. Consumption Frequency of Fat by Low-Income Women in Iowa (n=36)

Food Item	**Once per MONTH or less**	**2-3 times per MONTH**	**1-2 times per WEEK**	**3-4 times per WEEK**	**5+ times per WEEK**
Hamburgers, ground beef, meat burritos, tacos	11.1	16.7	30.6	41.7	0
Beef or pork, steaks, roast, ribs, or in sandwiches	19.4	36.1	25.0	16.7	2.8
Fried chicken	41.7	30.6	19.4	5.6	2.8
Hot dogs, or sausage	33.3	44.4	16.7	2.8	2.8
Cold cuts, lunch meats, ham	33.3	30.6	11.1	16.7	8.3
Bacon or breakfast sausage	33.3	36.1	11.1	13.9	2.8
Salad dressings	27.8	25.0	16.7	25.0	2.8
Margarine, butter, or mayonnaise on bread or potatoes	11.1	27.8	13.9	36.1	11.1
Margarine, butter, or oil in cooking	8.3	13.9	13.9	27.8	36.1
Eggs	22.2	16.7	25.0	22.2	13.9
Cheese or cheese spreads	13.9	19.4	30.6	25.0	11.1
Whole milk	66.7	8.3	8.3	2.8	13.9
French fries, fried potatoes	22.2	38.9	19.4	16.7	2.8
Corn chips, potato chips, popcorn, crackers	25.0	30.6	19.4	13.9	11.1
Doughnuts, pastries, cake, cookies	33.3	47.2	5.6	5.6	8.3

Table 4 continued

Food Item	**Once per MONTH or less**	**2-3 times per MONTH**	**1-2 times per WEEK**	**3-4 times per WEEK**	**5+ times per WEEK**
Ice cream	55.6	36.1	5.6	2.8	0
Percent of calories from fat					
Less than 30%	16.7				
Average 30-35%	19.4				
High 36-40%	27.8				
Very high 40-50%	36.1				

Table 5. Distribution of responses to USDA Core Food Security Module[66] questions by Central Iowa low socioeconomic women (n=36)

Food Security Module Questions	%
The food that we bought just did not last, and we did not have money to get more.	
Often True	19.4
Sometimes True	58.3
Never True	22.2
I (we) could not afford to eat balanced meals.	
Often True	13.9
Sometimes True	63.9
Never True	19.4
Do not know	2.8
In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?	
Yes	38.9
No	58.3
Do not know	2.8
If yes above, how often did this happen?	
Almost every month	8.3
Some months but not every month	25.0
In only 1 or 2 months	5.6
Do not know	2.8
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	
Yes	30.6
No	61.1
Do not know	8.3
In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?	
Yes	38.9
No	52.8
Do not know	8.3
Core Food Security summary score (μ; SD)	2.97 ± 2.16
Food Security classification:	
High Food Security	30.6
Low Food Security	36.1
Very Low Food Security	33.3