

1-2018

Knowledge Gaps of the Health Benefits of Beans among Low-Income Women

Shelly M. Palmer

Iowa State University, spalmer@iastate.edu


Donna Winham

Iowa State University, dwinham@iastate.edu

Christine A. Hradek MPH

Iowa State University, hradek@iastate.edu

Follow this and additional works at: http://lib.dr.iastate.edu/fshn_ag_pubs

 Part of the [Food Science Commons](#), [Human and Clinical Nutrition Commons](#), [International and Community Nutrition Commons](#), [Molecular, Genetic, and Biochemical Nutrition Commons](#), and the [Nutritional Epidemiology Commons](#)

The complete bibliographic information for this item can be found at http://lib.dr.iastate.edu/fshn_ag_pubs/169. For information on how to cite this item, please visit <http://lib.dr.iastate.edu/howtocite.html>.

This Article is brought to you for free and open access by the Food Science and Human Nutrition at Iowa State University Digital Repository. It has been accepted for inclusion in Food Science and Human Nutrition Publications by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

Knowledge Gaps of the Health Benefits of Beans among Low-Income Women

Abstract

Objectives: We determined knowledge of the health benefits of consuming beans, and assessed if awareness varied by acculturation status among Hispanic and non-Hispanic low-income women. **Methods:** We used a self-administered survey with Iowa women aged 18-65 years who were eligible to receive income-based services through 2 healthcare 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.

Keywords

Acculturation, Chronic disease, Health disparities, Health information, Hispanics, Legumes, Nutrition education

Disciplines

Food Science | Human and Clinical Nutrition | International and Community Nutrition | Molecular, Genetic, and Biochemical Nutrition | Nutritional Epidemiology

Comments

This article is published as Palmer SM, Winham DM, Hradek C. Knowledge Gaps of the Health Benefits of Beans among Low-Income Women. *American Journal of Health Behavior*. 2018 Jan 1;42(1). Doi: [10.5993/AJHB.42.1.3](https://doi.org/10.5993/AJHB.42.1.3).

Creative Commons License



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 4.0 License](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Knowledge Gaps of the Health Benefits of Beans among Low-Income Women

Shelly M. Palmer

Donna M. Winham, DrPH, RD, MCHES

Christine Hradek, MPH

Objectives: We determined knowledge of the health benefits of consuming beans, and assessed if awareness varied by acculturation status among Hispanic and non-Hispanic low-income women. **Methods:** We used a self-administered survey with Iowa women aged 18-65 years who were eligible to receive income-based services through 2 healthcare 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

Am J Health Behav.™ 2018;42(1):27-38

DOI: <https://doi.org/10.5993/AJHB.42.1.3>

Low-income groups have a higher risk of chronic health conditions that 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

Shelly M. Palmer, Graduate Research Assistant, Department of Food Science & Human Nutrition, Iowa State University, Ames, IA. Donna M. Winham, Assistant Professor, Department of Food Science & Human Nutrition, Iowa State University, Ames, IA. Christine Hradek, EFNEP and SNAP-Ed, Human Sciences Extension and Outreach, Iowa State University Cooperative Extension, Ames, IA.

Correspondence Dr Winham; dwinham@iastate.edu

(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, and kidney 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 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 changes 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. Whereas 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 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 com-

munities 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 18-65 years, with a focus on Hispanic and non-Hispanic Whites. With agency permissions, participants were recruited between June and November 2016 at 2 healthcare 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. Although 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.

Instruments and Measures

The survey questions regarding Hispanic ethnic-

ity, 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 We also asked participants how often they eat beans over a one-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: (1) Hispanic-dominant (less acculturated); (2) bicultural; or (3) 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 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 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. Because 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. Because 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

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
Cohabiting	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
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

Note.

a: N = 156

b: N = 145

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

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
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 ($\mu \pm SD$) (Sum of questions 1-7)	2.0 \pm 1.4	1.7 \pm 1.1	2.1 \pm 1.3	2.1 \pm 1.5	

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

could aid in blood sugar control (25.6%). The bean health benefit knowledge scale was lower for the Hispanic-dominant (1.7 \pm 1.1) compared to the bicultural and English-dominant (2.1 \pm 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

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/m ² ; 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? 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

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

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. Most

participants self-reported their health status as good (50%), 30% poor-fair, and 20% very good-excellent. Whereas 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

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

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 other 4 self-efficacy Likert responses were not significantly different by acculturation categories. The Hispanic-dominant and bicultural groups had 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).

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 75% 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 like those observed in an earlier study of Hispanic and non-Hispanic female participants in the Expanded Food and Nutrition Education Program in Arizona.¹⁸ This research found that although Hispanic-dominant women did consume more beans than their peers (2.4 serv-

ings 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 like ones in 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 have 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 assessing the relationship of acculturation status on behaviors related to maintaining a healthy diet determined Hispanic-dominant participants had higher self-efficacy. However, fewer Hispanic-dominant women reported their health status in the 'very good - excellent' category compared to the bicultural or English-dominant 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 showing that Hispanics are more likely to seek information from traditional media (television, radio, newspapers, or magazines), family and friends, and medical professionals.²⁶ A Pew Research Center survey, found that 83% of Hispanic adults use traditional media, 71% receive in-

formation 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 healthcare 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. 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 indicate 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 also may have been reliant on public transportation, limiting the time they had to complete the entire survey. Because 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.

Human Subjects Statement

The Iowa State University Institutional Review Board approved this study (IRB#: 16-239).

Conflict of Interest Disclosure Statement

SMP declares no conflicts of interest. DMW and CAH were the recipients of a grant from the Iowa State University (ISU) College of Human Sciences, College of Agriculture and Life Sciences, and the Department of Human Sciences Extension and Outreach to fund the research. DMW and CAH are ISU employees. The views expressed are solely those of the authors.

Non-financial Conflicts of Interest

The authors have no non-financial conflicts of interest to declare.

Acknowledgements

The researchers thank Mary Krisco, and the Iowa

State University Human Sciences Extension and Outreach staff members who assisted with data collection. Taylor A. Roe provided project data management support.

Portions of this research were presented at the 2017 American Society of Nutrition Annual Conference by Winham DM, Palmer SM, Baier JL, Roe TA. Low-income Women in Iowa Lack Awareness of the Health Benefits of Beans. *The FASEB Journal*. 2017 Apr 1;31(1 Suppl):956.12.

References

1. Fitzgerald N, Morgan KT, Slawson DL. Practice paper of the Academy of Nutrition and Dietetics: role of nutrition in health promotion and chronic disease prevention. *J Acad Nutr Diet*. 2013;113:983.
2. Tach L, Amorim M. Constrained, convenient, and symbolic consumption: neighborhood food environments and economic coping strategies among the urban poor. *J Urban Health*. 2015;92(5):815-834.
3. US Department of Health and Human Services and US Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 8th ed. Available at: <http://health.gov/dietaryguidelines/2015/guidelines/>. Accessed June 13, 2017.
4. Mitchell DC, Lawrence FR, Hartman TJ, Curran JM. Consumption of dry beans, peas, and lentils could improve diet quality in the US population. *J Am Diet Assoc*. 2009;109:909-913.
5. Darmon N, Drewnowski A. Does social class predict diet quality? *Am J Clin Nutr* 2008;87:1107-1117.
6. Darmadi-Blackberry I, Wahlqvist ML, Kouris-Blazos A, et al. Legumes: the most important dietary predictor of survival in older people of different ethnicities. *Asia Pac J Clin Nutr*. 2004;13:217-220.
7. Keys A, Mienotti A, Karvonen MJ, et al. The diet and 15-year death rate in the seven countries study. *Am J Epidemiol*. 1986;124:903-915.
8. Winham DM, Hutchins AM, Johnston CS. Pinto bean consumption reduces biomarkers for heart disease risk. *J Am Coll Nutr*. 2007;26:243-249.
9. Ha V, Sievenpiper J, de Souza R, et al. Effect of dietary pulse intake on established therapeutic lipid targets for cardiovascular risk reduction a systematic review and meta-analysis of randomized controlled trials. *CMAJ*. 2014;186:E252-E262.
10. Thompson SV, Winham DM, Hutchins AM. Traditional bean and rice meals reduce postprandial glycemia in adults with type 2 diabetes: a cross-over study. *Nutr J*. 2012;11:23.
11. Hutchins AM, Winham DM, Thompson SV. Phaseolus beans: impact of glycaemic response and chronic disease risk in humans. *Br J Nutr*. 2012;108(Suppl 1):S52-S65.
12. Lanza E, Hartman TJ, Albert PS, et al. High dry bean intake and reduced risk of advanced colorectal adenoma recurrence among participants in the polyp prevention trial. *J Nutr*. 2006;136:1896-1903.
13. Kim S, Souza R, Choo V, et al. Effects of dietary pulse consumption on body weight: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr*. 2016;103:1213-1223.
14. Havemeier S, Erickson J, Slavin J. Dietary guidance for pulses: the challenge and opportunity to be part of both the vegetable and protein food groups. *Ann NY Acad Sci*. 2017;1392:58-66.
15. Dietary Guidelines Advisory Committee. Report of the dietary guidelines advisory committee on the dietary guidelines for Americans, 2010, to the Secretary of Agriculture and the Secretary of Health and Human Services. Washington, DC: US Department of Agriculture, Agricultural Research Service; 2010.
16. Messina V. Nutritional and health benefits of dried beans. *Am J Clin Nutr*. 2014;100(Suppl 1):437S-442S.
17. McCrory M, Hamaker B, Lovejoy J, Eichelsdoerfer P. Pulse consumption, satiety, and weight management. *Adv Nutr*. 2010;1:17-30.
18. Winham DM, Florian TA. Hispanic women in EFNEP have low adherence with dietary guidelines regardless of acculturation level. *Journal of Hunger & Environmental Nutrition*. 2010;5:498-509.
19. United States Census Bureau. Quickfacts for United States and Iowa. Available at: <https://www.census.gov/quickfacts/table/PST045215/19,00>. Accessed June 13, 2017.
20. State Data Center of Iowa/ A program of the state library of Iowa. Latinos in Iowa: 2016. Available at: <http://www.iowadatacenter.org/Publications/latinos2016.pdf>. Accessed July 12, 2017.
21. Valdivia C, Dozi P, Jeanetta S, et al. The impact of networks and the context of reception on asset accumulation strategies of Latino newcomers in new settlement communities of the Midwest. *Am J Agric Econ*. 2008;90(5):1319-1325.
22. Hernandez-Garbanzo Y, Chavez-Martinez A. Food choices and healthy eating in Hispanic adults. In Hernandez-Garbanzo Y, Chavez-Martinez A. eds. *Diet Quality*. New York, NY: Springer; 2013:199-211.
23. Martinez AD. Reconsidering acculturation in dietary change research among Latino immigrants: challenging the preconditions of US migration. *Ethnicity & Health*. 2013;18(2):115-135.
24. Thorn B, Huret N, Bellows D, et al. *WIC Food Packages Policy Options Study II*. Alexandria, VA: Food and Nutrition Service, US Dept. of Agriculture; 2015.
25. Torres-Aguilar P, Teran-Garcia M, Wiley A, et al. Factors correlated to protective and risky dietary patterns in immigrant Latino mothers in non-metropolitan rural communities. *J Immigr Minor Health*. 2016;18:652-659.
26. Guntzville L, King A, Jensen J, Davis L. Self-efficacy, health literacy, and nutrition and exercise behaviors in a low-income, Hispanic population. *J Immigr Minor Health*. 2016;2(19):489-493.
27. Yoo-Lee E, Rhodes T, Peterson G. Hispanics and public libraries assessing their health information seeking behaviors in the e-health environment. *Ref Serv Rev*. 2016;44(2):85-99.
28. Purdue University. Expanded Food and Nutrition Education Program Food Recall at Entry. Available at: <https://www2.ag.purdue.edu/programs/hhs/efnep/Resource/Adult%20Enrollment.pdf>. Accessed August 6, 2016.
29. Mosca L, Ferris A, Fabunmi R, Robertson RM. Track-

- ing women's awareness of heart disease. *Circulation*. 2004;109(5):573-579.
30. National Institutes of Health. US Department of Health and Human Services. Health Information National Trends Survey. 2014. Available at: https://hints.cancer.gov/docs/Instruments/HINTS_4_Cycle_4_English_Annotated_Form.pdf. Accessed October 19, 2016.
 31. Block G, Gillespie C, Rosenbaum EH, Jensen C. A rapid food screener to assess fat and fruit and vegetable intake. *Am J Prev Med*. 2000;18:284-288.
 32. Winham D, Armstrong Florian T, Thompson S. Low-income US women under-informed of the specific health benefits of consuming beans. *PLoS One*. 2016;11:e0147592.
 33. Marin G, Gamba R. A new measurement of acculturation for Hispanics: the Bidimensional Acculturation Scale for Hispanics (BAS). *Hisp J Behav Sci*. 1996;18:297-316.
 34. Luszczynska A, Tryburcy M, Schwarzer R. Improving fruit and vegetable consumption: a self-efficacy intervention compared with a combined self-efficacy and planning intervention. *Health Educ Res*. 2007;22(5):630-638.
 35. Beech B, Rice R, Myers L, et al. Knowledge, attitudes, and practices related to fruit and vegetable consumption of high school students. *J Adolesc Health*. 1999;24:244-250.
 36. Winham D, Quiroga S, Underiner T, et al. Integration of theatre activities in cooking workshops improves healthy eating attitudes among ethnically diverse adolescents. *ICAN: Infant, Child, & Adolescent Nutrition*. 2014;6(2):99-108.
 37. Field A. *Discovering Statistics Using SPSS*. 4th ed. Thousand Oaks, CA: Sage Publications Inc; 2013.
 38. Mattei J, Campos H. Perceptions and behaviors of legume consumption among Puerto Rican adults. *Health Behav Policy Rev*. 2014;1(1):38-49.
 39. Smith WE, Day RS, Brown LB. Heritage retention and bean intake correlates to dietary fiber intakes in Hispanic mothers—Qué Sabrosa Vida. *J Am Diet Assoc*. 2005;105(3):404-411.
 40. Armstrong Florian TL, Winham DM. Health risk factors and behaviors of limited-income Hispanic women in EFNEP and WIC. *J Nutr Educ Behav*. 2014 Jul 1;46(4):S170-S171.
 41. Sabogal F, Otero-Sabogal R, Perez-Stable E, et al. Perceived self-efficacy to avoid cigarette smoking and addiction: differences between Hispanics and non-Hispanic Whites. *Hisp J Behav Sci*. 1989;11(2):136-147.
 42. Abraido-Lanza AF, Chao MT, Florez KR. Do healthy behaviors decline with greater acculturation? Implications for the Latino mortality paradox. *Soc Sci Med*. 2005;61:1243-1255.
 43. Livingston G, Minushkin S, Cohn D. *Hispanics and Health Care in the United States: Access, Information and Knowledge*. Washington, DC: Pew Hispanic Center; 2008.
 44. American Diabetes Association. Statistics about diabetes. 2017. Available at: <http://www.diabetes.org/diabetes-basics/statistics/>. Accessed July 6, 2017.
 45. Abdullah M, Gyles C, Marinangeli C, et al. Cost-of-illness analysis reveals potential healthcare savings with reduction in type 2 diabetes and cardiovascular disease following recommended intakes of dietary fiber in Canada. *Front Pharmacol*. 2015;6:167. Available at: <https://doi.org/10.3389/fphar.2015.00167>. Accessed July 12, 2017.
 46. US Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. USDA National Nutrient Database for Standard Reference, Release 28. Version Current: 2016. Available at: <https://www.ars.usda.gov/northeast-area/beltsville-md/beltsville-human-nutrition-research-center/nutrient-data-laboratory/docs/usda-national-nutrient-database-for-standard-reference/>. Accessed September 18, 2017.
 47. American Heart Association. Statistical fact sheet 2014 update. Available at: http://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319586.pdf. Accessed July 6, 2017.