

Do Food Assistance Programs Encourage More Fruit and Vegetable Intake? A Household Survey in the Northern Great Plains

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Extended Abstract

Scholars and public health authorities have recognized the issue of insufficient fruits and vegetables (F&V) consumption and its potential threats to Americans' short-term and long-term health. Deficient intake of food, fruits, and vegetables is one of the key reasons for dietary deficiencies that contribute to the rising chronic health issues and medical costs in the United States (Frazao, 1999). A report published by USDA-ERS (Dong & Lin, 2009) indicated that daily consumption was 1.03 cups for fruits and 1.58 cups for vegetables in 2004, despite the fact that the recommended daily intakes were 1.80 cups for fruits and 2.60 cups for vegetables, respectively. Realizing a healthy diet can prevent serious and chronic illness and might otherwise counteract increasing health costs and deteriorating quality of life, government health authorities and health educators have devoted tremendous effort in promoting healthy diets and more F&V consumption.

Nevertheless, even with all these efforts, recent data suggest the Corn Belt and Southeastern regions of the US have showed consistently low F&V consumption. For example, daily adults' vegetable intakes for Iowa, South Dakota, North Dakota, Iowa, Louisiana, and Mississippi were lower than 1.5 servings per day. We examined the effects of both the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) on households' F&V intake, with an emphasis on the influence of family characteristics, dietary habits, living environment, and household members' willingness to live healthily. The objectives of the study were to highlight and analyze how these factors affected households' F&V consumption as well as how these factors altered the effects of food assistance programs on households' F&V consumption in the northern Corn Belt region, with an emphasis on the impacts of selected food assistance programs (i.e., SNAP and WIC) on consumers' household F&V consumption.

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Hypotheses and Conceptual Model

This study proposed the following three hypotheses:

1. SNAP and WIC have positive impacts on households' F&V consumption, although such impacts may vary by family characteristics.
2. Households' socioeconomic and demographic background will affect F&V consumption, although we are not sure about the direction (i.e., positive or negative) of the impacts.
3. Healthy attitudes, willingness to eat more F&V, and healthy lifestyles will contribute to more F&V consumption.

The conceptual model of the study is as follows (see Table 1 for more information on variables included in Equation (1)):

Vegetable and fruit consumption = $f(\text{household demographic and socioeconomic characteristics, willingness and intention to live healthily, household environment, access to SNAP and WIC})$. (1)

Based on the normal distribution assumption by McElvery and Zavoina (1975), we chose to apply ordered probit as the empirical regression model for Equation (1). For each individual i , we estimated the F&V consumption (Y^*) by assuming Y^* is a latent preference variable. Let X_i be the independent variables included in Equation 1, then Y^* is shown as Equation (2) (Greene, 2000):

$$Y_i^* = \beta' X_i + \varepsilon_i \tag{2}$$

where $E[\varepsilon_i | X_i] = 0$ and $Var[\varepsilon_i | X_i] = 1$; we also assume ε_i are normally distributed.

The sample households' reported F&V consumption is a complete censoring of the latent variable Y^* , where $y_i = 0$ if $y_i \leq \chi_0$,

$$= 1 \text{ if } \chi_1 < y_i \leq \chi_2,$$

$$= 2 \text{ if } \chi_2 < y_i \leq \chi_3,$$

...

$$= J \text{ if } Y_i \geq \chi_{J-1}$$

Research Method and Data Collection

We developed a survey questionnaire to gather information on sample households' demographic and socioeconomic backgrounds, household health statuses, access to food assistance programs, perceived quality of F&V, nutrition and food knowledge, lifestyles, time required to reach grocery stores, a variable indicating the intention to eat more F&V, family dietary habits, and respondents' perceptions regarding the prices of available F&V. Following the suggestions by Dillman (2007), we developed and delivered questionnaires with some adjustments to increase the participation rate for the study. While the selection of sample participants was random, we selected the survey locations based on respondents' access to food as indicated by the Food Access Research Atlas (United States Department of Agriculture 2013). We deliberately oversampled households in communities with significant numbers of minority populations due to the lack of data in the region for the purpose of this study.

From the total 445 respondents included in this study, we deleted those with missing values and used the remaining 237 observations for the analysis. We pooled these 237 observations and used respondents' answers to the 14 questions regarding their perspectives towards consumption to break the sample into three sub-groups. Table 2 summarizes the characteristics of these three sub-groups.

Table 1

Definitions of Variables

Name	Definition	Notes
Vfintake	Daily F&V servings per person	1: none; 10: more than 8 servings
Male	Male or not,	1 = yes, 0 = no
Native	American Indians or not	1 = yes, 0 = no
Married	Married or live with a partner	1 = yes, 0 = no
Age	Age of respondent	1: 16 or younger; 2: 17- 25; 3: 26-35 ; 4: 36- 45 5: 46 – 55; 6: 56 – 65; 7: 66 and above
Dependent	N of dependents (except spouse)	1:0, 2: 1, 3: 2, ..., 6: 5 or more
SNAP	Does the household receive SNAP?	1 = yes, 0 = no
WIC	Does the household receive WIC?	1 = yes, 0 = no
Hincome	Household income	1: \$0-\$14,999; 2: \$15,000-\$29,999 3: \$30,000-\$44,999; 4: \$45,000-\$59,999 5: \$60,000-\$74,999; 6: \$75,000-\$89,999 7: \$90,000 or more
Hhealth	Numbers of household members who have any of the following health issues: overweight, high cholesterol, high blood pressure, heart disease, and stroke	0: none; 1: one member has one of the health issues; 15 means 15 or more possible health issues (not necessary from the same household member)
Knowledge	The total score of 5 F&V nutrition knowledge questions	0: answered all 5 questions incorrectly; 5: answered all 5 questions correctly
Vfquality	Average scores for the quality of fresh F&V available	1: terrible; 2 not so good; 3: just fine; 4: good; 5: excellent
Shoptime	How long, on average, does it take to travel to buy F&V	1: less than 5 minutes; 2: 6-10 minutes; 3: 11-15 minutes; 6: 26-30 minutes
History	“My family raised me to eat more F&V than other food”	1: Strongly disagree; 5: strongly agree
Exercise	Frequency of exercise per week	1: never; 2: once; 2: 2-3 times; 4: 4-5 times; 5: more than 5 times
Better	Compared to my parents, I think I am making healthier food choices	1: strongly disagree; 5: strongly agree
Intention	I encourage myself and my family to eat more F&V	1: strongly disagree; 5: strongly agree
Desert	Live in food desert area?	1 = yes, 0 = no

Overall, data suggest respondents in Group 1 had a higher percentage of Native Americans who also lived in food desert communities, although living in food desert communities was not included in the 14 questions that we used to create the three sub-groups. The respondents in Group 1 were relatively younger and more likely to be single compared to the other two groups, with 44% of them receiving SNAP and 22% receiving WIC. A majority of these respondents also came from poorer families. In contrast, households in Groups 2 and 3 shared very similar demographic and socioeconomic backgrounds. For example, the majority of them were Caucasians, slightly older, and more likely to be married compared to respondents in Group 1. On average, respondents in Groups 2 and 3 had 2-3 dependents other than their

Table 2

Characteristics of Households by Group

Variable	Group 1 (n= 78)	Group 2 (n= 72)	Group 3 (n= 107)	Kruskal-Wallis Test/Chi-Square
Vfintake	4.67 (1.57)	4.77 (0.95)	4.40 (1.25)	0.0193*
Male	0.29 (0.46)	0.29 (0.46)	0.22 (0.42)	0.4664
Native	0.56 (0.50)	0.33 (0.47)	0.23 (0.43)	<.0001 ***
Married	0.40 (0.49)	0.68 (0.47)	0.63 (0.49)	0.0007 ***
Age	4.37 (1.30)	4.58 (1.64)	4.49 (1.37)	0.5989
Dependent	3.45 (1.92)	2.66 (1.76)	2.53 (1.60)	0.0041***
SNAP	0.44(0.50)	0.17 (0.38)	0.19 (0.40)	0.0001***
WIC	0.22 (0.42)	0.21 (0.41)	0.08 (0.28)	0.0205*
Hincome	2.35 (1.54)	3.77 (2.11)	3.48 (1.93)	<.0001 ***
Hhealth	3.51 (3.59)	2.40 (2.54)	2.77 (2.14)	0.1217
Knowledge	2.64 (1.06)	2.99 (0.93)	2.93 (1.00)	0.0958 ≠
Vfquality	3.76 (1.01)	4.02 (0.81)	3.72 (0.81)	0.0292*
Shoptime	2.46 (1.64)	2.64 (1.69)	2.40 (1.51)	0.7460
History	3.55 (1.05)	3.88 (0.92)	3.46 (1.21)	0.0732 ≠
Exercise	2.44 (1.17)	3.15 (1.08)	2.74 (1.27)	0.0010***
Better	3.73 (0.91)	3.81 (0.90)	3.62 (1.09)	0.6662
Intention	3.90 (0.80)	4.40 (0.69)	4.17 (0.72)	0.0001***
Desert	0.57 (0.49)	0.43 (0.50)	0.36 (0.48)	0.0156*

Note. Standard deviations in parentheses. ≠p < 0.1. *p < .05. **p < .01. ***p < .001.

spouses in their households. Compared to Group 3, Group 2 had a higher proportion of men and consumed slightly more F&V. They also showed higher satisfaction with the quality of fresh F&V in the store, compared to Group 3. Respondents in Groups 2 and 3 tended to live in non-food desert communities, although more respondents in Group 2 lived in a food desert compared to Group 3. Moreover, compared to those in Group 3, respondents in Group 2 exercised more, had higher intention to consume F&V, and were more willing to live healthier life styles.

Results and Discussion

The study results support our first hypothesis: Food assistance programs such as SNAP and WIC had positive impacts on households' F&V consumption, although we also found that this conclusion could only be applied to those households with specific characteristics (i.e., SNAP for Group 1 and WIC for Group 2). On the other hand, data indicated the hypothesis stating that households' socioeconomic and demographic backgrounds will affect F&V consumption was not supported because most of the related variables were statistically insignificant. Finally, our findings strongly supported the hypothesis stating that healthy attitudes and healthy lifestyles could contribute to more F&V consumption.

Data suggest the Corn Belt and Southeastern United States have constantly showed low F&V consumption despite numerous efforts to promote and educate people to eat a healthier diet. One of the policy solutions to increase F&V consumption in the region is to implement government food assistance programs such as SNAP and WIC for low- and no income families. However, policy makers have long argued the connection between these food assistance programs and households' healthy food choice. In

this study, we hypothesized that SNAP and WIC programs created more F&V intake. We conducted a household food choice survey in the northern Corn Belt region and applied an ordered probit model to sample households with different characteristics, healthy attitudes and life styles, and dietary habits. Our regression results suggested SNAP and WIC had significant and positive impacts on F&V consumption for households, although the real impacts varied by family characteristics, dietary habits, living environments, and household members' willingness to live healthily. We also noticed that exercise habits, family support, and the willingness to make healthier choices had a more important role in F&V intake than other variables, such as demographic background, socioeconomic variables, and living environment variables. In addition, we found nutrition knowledge created opposite effects on F&V consumption for different households.

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