THE EFFECT OF SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM ON FRUITS AND VEGETABLES CONSUMPTION IN ARIZONA

by

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Abstract

The Supplemental Nutrition Assistance Program (SNAP) is the largest domestic hunger safety net program in the United States. It has been shown that SNAP increases households' purchasing power. However, only a quarter of Americans follow recommended healthy eating patterns. Hence, there is a question whether the additional income from SNAP transfers to healthier eating. This paper addresses three questions. First, what factors explain SNAP participation of low income individuals in addition to basic income eligibility requirements? Second, does SNAP participation increase fruit and vegetable consumption? Third, what effect does the Supplemental Nutrition Assistance Program Education (SNAP-Ed) in Arizona have on fruit and vegetable consumption for low-income households? The data used in this study were drawn from two waves of the Arizona Behavioral Risk Factor Surveillance System survey. The study found people in Arizona ate fruits, on average 1.4 times per day and vegetables 1.6 times per day. Marital and household arrangement status significantly affected both SNAP participation and fruit and vegetable consumption, but effects for men and women differed. Distance from services assisting with SNAP enrollment appeared to have no negative effect on eligible respondent enrollment. People living in counties with more SNAP-Ed contractors per person below 125% of the poverty line consumed more fruits and vegetables, but the effect was only marginally significant. Future research should consider more geographically specific measures of SNAP-Ed reach.

Chapter 1 Introduction

Healthy Eating

Eating enough fruits and vegetables is linked to a lower risk of many chronic diseases. Fruits and vegetables are important source of many nutrients that are required to live healthy such as potassium, dietary fiber, and wide variety of vitamins. The Diet Guidelines for Americans 2015-2020 (1) recommends to eat "A variety of vegetables from all of the subgroups – dark green, red and orange, legumes (beans and peas), starchy, and other" and "Fruits, especially whole fruits".

However, the Diet Guidelines for Americans reported that about three-fourth of the people in the United States (U.S.) have eating patterns that are lower in fruits and vegetables than the recommended volume. (1) As noted earlier, fruits and vegetables are closely related with ones' health status. Therefore, it is important to improve the people's eating pattern and to keep the nation healthy. The Supplemental Nutrition Assistance Program (SNAP) and Supplemental Nutrition Assistance Program Education (SNAP-Ed) are taking great roles along with the other government, public, and private agencies.

Supplemental Nutrition Assistance Program (SNAP)

SNAP, formerly known as 'Food Stamp Program (FSP)', is the largest program in the domestic hunger safety net provided by Food and Nutrition Service (FNP), United States Department of Agriculture (USDA). During fiscal year 2016, the program served over 44 million people in an average month at a total annual cost of nearly $67 billion in benefits (USDA, 2017). The average monthly benefit a SNAP participant receives is $126.81 in fiscal year 2015. Due to the fact that SNAP is the program with massive scope and scale, it is one of the most important topics to discuss for policy makers and researchers.

The main goal of SNAP is to permit low-income households to access more nutritious and healthier diet through providing additional purchasing power (USDA, 2017; Gregory et al.,

2013; Fox et al., 2004). Since the program started in 1964 as FSP, SNAP has demonstrated a remarkable antipoverty effect in the U.S. For example, USDA (2015) revealed that the program shifted the participants by 10 percent above the poverty line. Also numbers of studies showed that participating in FSP has positive impact on household food expenditure. The program has contributed to the low-income households in the U.S. by achieving its goals in its long history.

Supplemental Nutrition Assistance Program –Education (SNAP-Ed)

SNAP-Ed works with partners to provide food and nutrition education to support SNAP's role in addressing food insecurity. The SNAP-Ed goal is to improve the likelihood that persons eligible for SNAP will make healthy food choices within a limited budget and choose physically active lifestyles consistent with the current Dietary Guidelines for Americans and the USDA food guidance.

The population eligible for SNAP-Ed follows the other food benefit programs but also permits people residing in communities with a significant low-income population. SNAP-Ed is administrated by state agencies that administers and implements SNAP, and their sub-contractors. Each SNAP-Ed program is designed by the agencies and follows the State Agency Goals and Objectives set by each state.

SNAP-Ed Evaluation

While the evaluation of SNAP has a long history in broad disciplines, the evaluation of SNAP-Ed started in 2013 at eight states. Currently, there are priority outcome indicators that SNAP-Ed Evaluation Framework encourages to measure in all states. For instance, the four core indicators are healthy eating behaviors, food resource management behaviors, physical activity and reduced sedentary behaviors, and nutrition supports adopted in environmental settings. The evaluation measures the individual behavioral changes, the environmental changes in schools and local communities, and other corresponding factors to the goals.

One of the behavioral measurement is the change of the eating pattern of individuals who participate in SNAP-Ed. Limiting the behavioral change to the eating pattern of fruits and vegetables for the sake of argument, the ideal study will be designed with a dataset that includes SNAP-Ed intervention and participants, their characteristics, and their intake. For instance, Molitor et al (2015) has studied SNAP-Ed intervention on nutrition and physical activity in California using the Californian Health Interview Survey (CHIS). Also Molitor et al (2016) has studied about the nutrition intake of SNAP-Ed eligible mothers using survey data collected by the Automated Self-administered 24-Hour Recall. The survey respondents were selected from the California Department of Social Services, Medi-Cal Eligibility Data System. The further detail about the two papers is discussed in Chapter 2.

SNAP-Ed evaluation in Arizona and the study goal

In Arizona, the evaluation plan focuses on five areas: food systems, active learning, school health, early childhood, and direct education. The research of this paper is lead by Arizona Nutrition Network (AzNN) that administrates SNAP-Ed in Arizona. The purpose of study is to evaluate the effect of SNAP-Ed intervention on nutrition intake since the five areas of focus give nutrition education to the participants.

However, due to the availability of dataset, this study focuses on measuring the effect of SNAP-Ed intervention on the county level behavioral change instead of individual level. The outcome variables to measure the nutrition intake are estimated fruits and vegetables intake from Arizona Behavioral Risk Factor Surveillance System (BRFSS) conducted by Center for Disease Control and Prevention (CDC) for the waive of 2011 and 2013 which were collected through phone interviews.

Purposes of the study

In order to carefully measure the effect of SNAP-Ed, it is important to understand both SNAP and SNAP-Ed since SNAP has been found to affect on food consumption pattern in the past

studies. Therefore, this paper has three purposes: to understand the fruits and vegetable consumption of people in Arizona, to investigate the characteristics of people participate in SNAP, and to examine the effect of SNAP and SNAP-Ed on fruits and vegetables consumption.

Firstly, the fruits and vegetable consumption is briefly discussed to understand the eating patterns of people in Arizona.

Secondly, the factors of SNAP participation are going to be examined using probit model. According to the American Community Survey (ACS), 10.6% of population in Arizona were receiving SNAP benefits in 2011, and 13.1% of population were receiving SNAP benefits in 2013. However, we found there are significant amount of people who do not participate in SNAP even they are eligible to participate based on the eligibility screening. This means that SNAP and SNAP-Ed might not sufficiently reach out to the people in need. Therefore, this study researches the demographic difference of people who participate in SNAP and people who do not among SNAP eligible people. Further detail of eligibility is discussed in Chapter 4. Also, understanding SNAP participants is helpful to learn SNAP-Ed reach in future work.

Finally, the effect of SNAP on fruits and vegetables is analyzed using OLS. Although the study has limited information about SNAP-Ed, the study of SNAP itself is meaningful since the effect of SNAP on diet and nutrition intake is still ambiguous even this area has been studied by many researches. The detail of literature review of the effect of SNAP will be discussed in chapter 2.

In order to study the three goals of this research, this paper briefly review the literature in Chapter 2, describes the dataset and variables in Chapter 3, presents the basic descriptive statistics and the addresses to the eating pattern of people in Arizona in Chapter 4, examines factor affecting SNAP participation in Chapter 5, examines the factors affecting fruits and vegetable consumption in Chapter 6, and concludes the discussion at Chapter 7.

Chapter2 Literature Review

Studies on SNAP and health/income related outcome

The effect of SNAP on low-income households in US has been widely researched to examine the attainment of program's goal: income assistance and access to adequate diet.

SNAP performs significant contribution to improving food expenditure and decreasing food insecurity, which are the part of primary goals of the program. There is a large body of evidence that shows SNAP and FSP contributed more to increasing household food expenditure than when the household receives same amount of assistance as cash grant (Fox et al., 2004, Meyerhoefer and Yang., 2010). Likewise, existing researches showed consistent results on the relationship between SNAP and improvement of food insecurity when the selection bias is controlled (Fox et al., 2004). Mykerezi and Mills (2010) used simultaneous model, and Yen (2008) used instrumental variable to conclude FSP has negative and significant effect on food insecurity. The fact that SNAP sustains income level and food security for low-income households is supported by significant and consistent studies. However, there is an unfavorable consequence too. Meyerhoefer and Yang (2010) found there is a consistent and positive influence of FSP participation on obesity among women when it is examined with selection model. Zagorsky et al (2009) showed the typical female FSP participant has one unit larger Body Mass Index than nonparticipants with the same socioeconomic characteristics. Yen et al (2012) reported an inverse relationship between SNAP participation and self-assessed health. It is doubtful whether the additional income effect of SNAP is connected with positive health outcomes.

Importance of the study of the effect on diet and nutrient intake

Considering that FSP has positive impact on improving food expenditure as well as negative impact on health outcome, it is ambiguous whether the extra income on food transfers to

purchasing healthy diet or not. Therefore, it is undoubtedly important to study the effect of program participation on diet and nutrient intake. However, despite the fact that offering a better diet is another important objectives of the program, there is no clear answer for the question whether SNAP gives positive influence on diet and nutrient intake for the participants (Fox et al., 2004, Meyerhoefer and Yang., 2010). Hence, this area of study needs further attention and deeper focus than other impacts the program gives.

Literature review on dietary and nutrient intake

The impact of the program on diet and nutrient intake has been studied for decades.

There are several studies with consistent results. For example, as Wilde et al (1999) and Cason et al (2002) observed, the program participants consumed more meat than nonparticipants. Gregory et al (2013) and Wolfson and Bleich (2015) reported the participants consumed fewer servings of vegetables than nonparticipants with same socioeconomic status. Similarly, Yen (2010), Gregory et al (2013), and Butler and Raymond (1996) concluded negative association between the participation and nutrient intake such as fiber and sodium.

On the contrary, some studies gave contradicting results to each other. While Gregory et al (2013) noted that the participants consumed less saturated fat, Wilde et al (1999) and Cason et al (2002) claimed a positive relationship between the participation and fat intake. Also, Wolfson and Bleich (2015) reported the participants consumed less fruits than SNAP ineligible group whereas Gregory et al (2013) found positive impact of the program on whole fruits consumption.

Now the question is; what causes this inconsistence?

What causes inconsistence of the studies?

This weaker evidence on the program influence on diet and nutrient consumption is attributed on three reasons: Measurement error, regional difference, and model design.

Firstly, although most of the studies used data from National Health and Nutrition Examination Survey (NHANES) and Continuing Survey of Food Intakes by Individuals (CSFII), other studies conducted their analysis on different surveys with different measurement of diet and nutrient. Even within the same source of data, obviously there are too many types of diet and nutrient information to choose for one research. Hence, there are few studies targeted at exact same outcome variables. The variations in data source and type of food and nutrition are one of the reasons of inconsistent results from previous studies.

The second point is that the affordability of food varies across the areas and states. As Wolfson and Bleich (2015) emphasized, food price is one of the most important value for program eligible group when they make decision on purchasing food. However, the program benefits are based on national average prices except for Hawaii and Alaska. According to Guthrie et al (2007), the price difference across the country is statistically significant. While "about 17 percent of participants live in area where the cost of enough food is 10 percent above the national average or higher", "14 percent of participants live in a area with 10 percent below or lower" than national average price. Moreover, Yen (2010) addressed that residing regions have significant effects on the amount fo food consumption. The areas selected in NHANES or CSFII change every time the surveys were conducted. Overall, there is a significant difference in food price by region, which is not neglectable to consider food consumption pattern.

Finally, self-selection into the program inevitably impacts on one's choice of diet and nutrient. Meyerhoefer and Yang (2012) acknowledged that "household with either stronger preference for food in general or greater biological need of food self-select into SNAP".

Therefore, it is understandable that studies with selection model have different results from the studies without controlling the selection bias. Although a lot of studies did not control for selection, some recent studies constructed rigorous models. For instance, Butler and Raymond (1996) found that the number of children, health status and asset change the likelihood of participation for elderly. Also the study reported lower participation rate for those who live alone, and who have more education, assets, and income. The researchers should carefully examine the treatment effect controlling the bias.

How this paper overcomes the biases?

The outcome measurement is the daily servings of fruits and vegetables consumption, which would not be considerably affected by measurement error compared with nutrition. Also fruits and vegetable consumption are one of the most frequently used type of food for researches in dietary and nutrition intake. Secondly, this study uses data from Behavioral Risk Factor Surveillance System (BRFSS) to focus on the population in Arizona to eliminate any bias caused by state specific issues. Hence, this study is different from the literature using nation wide dataset, as well as the other local studies using business data that only available in specific regions. It is comparable to other states since BRFSS is conducted by Center for Disease Control (CDC) in all 50 states with taking account of region-based price difference. Finally, self-selection will be controlled by selection model once the study finds statistically significant effect of SNAP on fruits and vegetable servings.

Study on SNAP-Ed on nutrient intake and the measurement of the effect

There are fewer researches on the effect of SNAP-Ed on nutrient intake than the researches on the effect of SNAP. Molitor et al (2015) studied the effect of SNAP-Ed intervention on nutrition and physical activity for adults, teenagers, and children who were SNAP-Ed eligible in California. The study found adults and children with high-level intervention ate more fruits and vegetables than adult and children with no intervention. Also, adults with low, moderate,

or high levels of reach reported eating fast food less often than adults with no-intervention. Molitor et al (2016) examined the effect of SNAP-Ed on nutrition intake for mothers in California. The study found mothers with high-SNAP-Ed reach ate more cups of fruits and vegetables, consumed fewer calories from high-fat foods, and drank fewer cups of sugar-sweetened beverages. From the two studies, it is concluded that SNAP-Ed intervention has positive impact on fruits and vegetable consumption in California.

Molitor et al (2015) and Molitor et al (2016) measured the effect of SNAP-Ed intervention by creating the variable to capture the extent of the intervention reach by census tract. The intervention reach was determined the number of SNAP-Ed participants divided by the number of SNAP-Ed eligible people. In Molitor et al (2015), the number used to calculate intervention reach was obtained from the USDA's Education and Administrative Reporting System (EARS) and from the Nutrition Education and Obesity Prevention Branch (NEOPB) of the California Department of Public Health, the US Census and the American Community Survey. In Molitor et al (2016), SNAP-Ed participants were reported by EARS and SNAP-Ed eligible persons were computed based on the data from the US Census and American Community Survey. The intervention reach by census tract was a continuous variable, however, both studies created a categorical variable that describes the intervention reach from high, moderate, and low level intervention to no intervention and was assigned to each observation geocoded to each census tract.

How this paper works on SNAP-Ed evaluation?

Due to the data availability, this study examines the effect of SNAP-Ed intervention by county level instead of census tract. This study uses the number of SNAP-Ed contractors as a nominator of the reach, and uses the population under 125% poverty line as a denominator to compute the intervention reach. Further detail about the intervention reach in this study is discussed in Chapter 3.

Chapter3 Data and Variables

Primary Data

Data was used from two waves of Arizona Behavioral Risk Factor Surveillance System (BRFSS): 2011 and 2013. BRFSS is a national health-related survey that collects state-level data about health-related risk behaviors, chronic health conditions, and use of preventive services. It is a useful source to examine health- related issues such as measuring progress toward state and national health objectives.

The Center for Disease Control and Prevention (CDC) annually conducts BRFSS in 50 states, the District of Columbia, and three U.S. territories. The survey collects data by phone interview including both landline and cell-phone with respondents in Arizona. Since BRFSS is a phone survey, it is self-reported data.

The sample is drawn from 2011 and 2013 with 6,489 and 4,252 for each year.

Outcome variable

The dependent variable is the total fruits and vegetables consumption per day. There were two questions regarding fruits, 100% pure fruit juice and fresh, frozen, or canned fruit, and four questions regarding vegetables, cooked or canned beans, dark green vegetables, orange-colored vegetables, and other vegetables in BRFSS. The total fruits is an aggregated variable of two fruit variables and the total vegetables is an aggregated variable of four vegetable variables.

The questions asked for fruits were

- "During the past month, how many times per day, week or month did you drink 100% PURE fruit juices? Do not include fruit-flavored drinks with added sugar or fruit juice you made at home and added sugar to. Only include 100% juice" and
- "During the past month, not counting juice, how many times per day, week, or month did you eat fruit? Count fresh, frozen, or canned fruit".

The questions asked for vegetables were

- "During the past month, how many times per day, week, or month did you eat cooked or canned beans, such as refried, baked, black, garbanzo beans, beans in soup, soybeans, edamame, tofu or lentils. Do NOT include long green beans",
- "During the past month, how many times per day, week, or month did you eat dark green vegetables for example broccoli or dark leafy greens including romaine, chard, collard greens or spinach?",
- "During the past month, how many times per day, week, or month did you eat orange-colored vegetables such as sweet potatoes, pumpkin, winter squash, or carrots?", and
- "Not counting what you just told me about, during the past month, about how many times per day, week, or month did you eat OTHER vegetables? Examples of other vegetables include tomatoes, tomato juice or V-8 juice, corn, eggplant, peas, lettuce, cabbage, and white potatoes that are not fried such as baked or mashed potatoes".

The supplemental descriptions by an interviewer guided respondents to categorize the fruits and vegetables as shown in table 3-1.

The variables, total fruits and total vegetables, were "the calculated variable for total fruits consumed per day" derived from the two fruits variables and "the calculated variable for total vegetables consumed per day" derived from four vegetables variables. Therefore the variables, total fruits and total vegetables, are the count variables of the time each respondent ate fruits and vegetables per day. The variables specify the frequency of consumption and they are not related to the quantity of consumption. Also the variables include two decimal places. Hence, "300 total fruits" means "three consumption per day".

Independent variables

SNAP participation

The main indicator to measure the effect of SNAP is SNAP participation variable.

The question asked was “In the past 12 months, did you or anyone in your household get food stamps or a food stamp benefit card?” Since this study focuses on the effect of SNAP participation, only those respondents who clearly stated their participation status by answering “yes” or “no” are included in the study. The respondents who answered “don’t know/ not sure” and “refused” are excluded from the sample.

Demographic variables

Individual sociodemographic variables such as age, county, marital, education, employment, sex, race, and income are used as independent variables from BRFSS. The variables except for age are categorical variables (table3-2) and are converted to dummy variables for analysis. Also, a variable of number of household members are created by using variables, number of adults and number of children, from BRFSS. To capture the difference in effect of marital status by sex, the interaction term of marital status by sex were created.

Economic characteristics variables from ACS and NAICS

The amount of fruits and vegetables consumption depends on the area of residence. Therefore, some neighborhood characteristics are selected as independent variables. Population and Economic characteristics such as median household income by zip code area are selected from the American Community Survey (ACS) administered by the Bureau of the Census. The information about size and amount of grocery stores by zip code is selected from the North American Industry Classification System (NAICS). Both 2011 and 2013 data were used for ACS and NAICS.

SNAP and SNAP-Ed related variables

DES office distance

As one of the proxy of SNAP participation, the distance from each zip code to Arizona Department of Economic Security (DES) office that a person can register SNAP participation

was used. The data of the distance between DES office between zip code ("distance") was taken from both DES office locator on DES website and Google Map. Since DES office locator lacked or gave wrong results to some zip code, the following steps were taken to determine the distance variable. First, search the distance on DES office locator, and use it if it is smaller than 60 miles. Second, if it is larger than 60 miles, search the same distance on Google Map and take the smaller distance. Third, if the DES office locator did not return the results, take the distance between the DES office of the nearest zip code and the zip code on Google Map.

SNAP partnerships

The Arizona Community Action Association (ACAA) is the entity contracting with the Arizona DES responsible for enrolling and supporting SNAP partnerships. SNAP partnerships provide low-income households with information about the availability, eligibility requirements, application procedures, and benefits of SNAP. Data on SNAP partnership provided by the Arizona DES and ACAA includes the zip codes of SNAP partnerships sites providing SNAP enrollment information and coded as dummy variable.

SNAP-Ed intervention

Data about SNAP-Ed intervention, provided by Arizona Nutrition Netwrok (AzNN), includes the number of SNAP-Ed contractors by county in Arizona in 2011 and 2013. Although each SNAP-Ed contractor aims at different goals and the scale and scope of the intervention varies by each contractor, this research uses only the number of SNAP-Ed contractors as SNAP-Ed variable and ignored other aspects of the intervention due to the lack of dataset.

This study created two variables to measure the SNAP-Ed intervention reach. The first variable is the number of contractors per poor population in a county. The number of contractors is divided by the population under 125% poverty line, which is a proxy for

SNAP-Ed eligibility. The second variable is the number of contractors per square mile, which suggests the geographical reach of the intervention. Both variables are numerical variables.

Data merging steps

Datasets from BRFSS, ACS, NAICS, and ACAA are merged by zip code. When there is no matching zip code in ACS, NAICS, and ACAA, the following steps were taken to match dataset. First, if the zip code answered in BRFSS indicated a Post Office Box, the zip code was replaced with the zip code of the post office. Second, if the zip code indicates a specific place such as 86339, Sedona, the zip code is replaced by the zip code of nearest location such as 86336, Sedona, that exists in ACS, NAICS, and ACAA. The data of SNAP partnership was merged by county to BRFSS dataset.

The final sample size

The observations that have missing in SNAP status, age, marital status, income, education, employment, and county were dropped from the sample. The final sample is consisted of 7,521 observations: 4,667 from 2011 and 2,854 from 2013.

Chapter4 Analysis Settings and Descriptive Statistics

Analysis settings

Eligibility

Molitor et al (2015) and Molitor et al (2016) used only SNAP-Ed eligible sample to measure the effect of the intervention. Similarly, this study narrowed down the sample to respondents who are eligible to participate to SNAP to research the effect of SNAP. The eligibility screening was designed based on the SNAP eligibility that USDA determined (https://www.fns.usda.gov/snap/eligibility). This study took the upper limit of categorical income variable (income2) as one's income and ruled the eligibility as combination of income and the number of household members (table4-1).

The number of observations about eligibility and actual participation in SNAP is shown at table4-2. There are 127 people who are not eligible but are getting SNAP benefit. Those people are not included for analysis due to the following reasons. Firstly, they are small portion of sample, which is 2.6% of total sample size. Secondly, some responds are not realistic such as a person with more than $75,000 income and "unable to work". Hence, although they are getting SNAP benefits, the analysis targets only at eligible people.

Survey Outliers

CDC noted the responds with more than 16 servings of fruits and 23 servings of vegetables as survey outliers. Therefore, this study excluded those outliers.

Survey Weighting

BRFSS uses complex survey sampling design that requires a technique to make proper inferences from dataset. Although the survey aims at collecting a sample that completely represents the population, it is difficult to conduct a survey in such way. Hence the survey sample must be interpreted under a correct weighting scheme that represents the full population.

BRFSS utilizes the ranking weighting methodology. Hence, the analysis must account for the sampling design using sampling design variables. The variables are _STSTR which accounts for differences in the basic probability of selection among strata, _LLCPWT which is the final weight, and _PST which accounts for primary sampling unit. The variables are assigned to each observation. All the analysis in the following chapters is conducted by SAS University edition using proc surveymeans, proc surveyfreq, proc surveyreg, or proc surveylogistic. Since the sample is weighted, means are estimated means with standard error and 95% confidence interval.

Descriptive statistics

Fruits and vegetable servings by whole sample and the eligible group

Table 4-3 shows the estimated means and standard error of fruits, vegetables, and total servings for whole sample and eligible group. The t-test is conducted in table 4-4 for the difference in estimated means between eligible and ineligible groups for whole sample, and between SNAP participants and nonparticipants for eligible group.

Fruits consumption and vegetable consumption are larger in whole sample than the eligible group, and the difference between eligible and ineligible groups are statistically significant in both fruits and vegetables. Among the eligible group, there is no statistical difference in fruits and vegetable consumption between SNAP participants and nonparticipants.

The eligible group has lower means than whole sample by 7.2 point for fruits consumptions, 13.5 points for vegetables consumptions, and 20.9 points for total servings.

Independent variables by whole sample

In the whole sample (n=7516) , SNAP eligible people (n=2408) are more likely to be young, female, American Indian or Hispanic, and single (divorced, widowed, separated, or never married) than married with no job (unemployed or unable to work) (table4-5). Also their educational statuses are lower than college degree and their income is lower than ineligible

group. Geographically, they are more likely to live in Apache, La Paz, Mohave, and Yuma than ineligible group. There are more grocery stores in their zip code areas and the population density per zip code is higher. Also, the areas they live have more SNAP participation partners who help them sign up to participate in SNAP than the areas that ineligible group live as well as more SNAP-Ed contractors per person.

Independent variables by eligible group

In our sample, SNAP participants (n=815) among SNAP eligible people are more likely to be young, American Indian, separated, unable to work, and more likely to live in Apache county (table4-6). They have lower income than nonparticipants. However, there are no significant differences in educational status, and availability of grocery stores between SNAP participants and no participants.

Chapter5 Who Are the SNAP Participants?

In order to examine the determinants of SNAP participation among eligible people, the eligible group was used for the analysis with probit model. Table 5-1 shows the coefficient and t-value. The coefficients of probit model do not describe the magnitude of the likeliness of SNAP participation but describe the sign of the probability to participate in SNAP compared to the default person. In this model, the default person is set as age over 65, college graduate, retired, White, married female. The characteristics of default person are chosen based on the demographic of whole sample. They are the most frequent categories appeared in the sample. For example, "retired" was the category that appeared most in the employment variable.

Demographic variables

People who are younger than 65 and who have lower education than college graduate are more likely to participate in SNAP. Also people who are unable to work are more likely to participate than retired people. American Indians are more likely to participate than White. Unmarried couple regardless of sex, and divorced, separated, and never married female are more likely to participate in SNAP than married female.

SNAP related variables

Two variables, distance and SNAP partnership, were examined for the participation to SNAP. The distance variable was positive and significant, which means if the person lives further from the DES office, he or she is more likely to participate in SNAP. This was an unexpected finding since it was assumed that if the person lives closer to the office, he or she is more likely to participate. SNAP partner variable was not significant, which means whether the zip code site has SNAP partnerships or not does not affect on SNAP participation.

Prediction table

Table 5-2 shows the prediction accuracy from the probit model. The correct prediction rate is 71.8% including 73.6% true negative prediction and 64.3% true positive prediction.

Chapter6 The Effect of SNAP and SNAP-Ed on Fruits and Vegetables Consumption

The eligible group was used for analysis on fruits and vegetables consumption with OLS model. Table 6-1 shows the coefficient of demographic variables including SNAP participation and table 6-2 shows the coefficient of other variables. The variables in table 6-2 are run separately with the variables in table 6-1. The coefficient describes how many servings were consumed compared to the default person. The default is same as Chapter 5: a person who is age over 65, college graduate, retired, White, and married female. The coefficients have two decimals which means that the coefficient 141 equals to 1.41 consumption of total servings per day. This paper calls the frequency of daily consumption as "servings", however, it is not related to the amount of consumption.

Demographic variables

The intercept tells that the default person consumed fruits and vegetables 4.26 time a day. People who finished some high school and who finished some college consumed 1.13 and 0.83 fewer servings each than college graduate. Black people ate 1.13 more servings than White people. A divorced male ate 1.66, a separated male ate 2.22, a male who never married ate 1.52, and a married male ate 0.63 fewer servings than a married female. A female who never married ate 1.82 fewer servings than a married female. Therefore, male in most of the marital statuses consumed fewer servings than married female. People between 18 and 24 consumed 1.41, and people between 35 to 44 consumed 1.03 more than people over 65. It is intuitive that younger people eat more than old people.

SNAP variable

The SNAP variable was not significant, which means that SNAP does not affect on fruits and vegetable servings. This result is not consistent with the studies that found any positive or negative effect of SNAP on fruits and vegetables consumption, however, there are studies

that did not find any significant relationship between SNAP and fruits and vegetable consumption. However, most of the studies were conducted in national level. It is important to be careful that this result is limited to people in Arizona in 2011 and 2013.

Grocery store variables

Any of grocery store variables were not significant, which means the number of grocery store, and the density of the stores do not affect on fruits and vegetable consumption.

Income variables

Income variables were not significant, which means the income level do not affect on the fruits and vegetable consumption among SNAP eligible people. It is an understandable result considering that most of Americans eat fewer fruits and vegetables than recommended.

SNAP-Ed variable

The number of SNAP-Ed contractors per thousand person who are under 125% poverty line by county level was marginally significant, which means SNAP-Ed intervention could increase the number of fruits and vegetables servings. The effect of additional one contractor for the county which had one contractor is 6.67 more servings, for the county which had two contractors is 5.00 more servings, for the county which had three contractors is 4.45 more servings, for the county which had six contractors is 3.89 more servings, and for the county which had ten contractors is 3.67 more servings.

Robustness check

The demographic variables could be confounding of SNAP variable, therefore, additional regression on servings with only SNAP variable was run. As shown in table 6-3, SNAP variable was not significant.

Chapter 7 Conclusion and Future Works

Research findings and implications

This study showed that people in Arizona eat average 1.4 times of fruits, 1.6 times of vegetables, and 3.0 times of total fruits and vegetables per day. The recommended amount of fruits and vegetables to satisfy healthy eating pattern are two cups for fruits and two and half cups for vegetables for a person eats 2000 calorie a day. Although this study focused on the frequency of fruits and vegetables consumption, if one consumption is assumed to have one cup, people in Arizona would have eaten fewer cups than the recommended amount.

Also, the daily servings of vegetables and total fruits and vegetables are statistically different between people who are eligible for SNAP and people who are ineligible for SNAP. This fact suggests the importance of SNAP-Ed intervention on nutrition education for the eligible people.

There are people who participate and who do not participate in SNAP among SNAP eligible people. The probit model showed that people who are more likely to participate in SNAP are younger than 65, less education than college graduate, unable to work, American Indian, and unmarried couple, married men, or divorced, separated, never married women.

The SNAP partnership variable was not significant. The distance variable that takes the distance between the zip code of residing and the closest DES office was significant and the sign of the coefficient was positive that implies the farther you live from the office, the more likely you participate in SNAP. Although people in rural areas have to travel farther distance to the closest DES office than people in urban areas, the result suggests that it is not a barrier to participate in SNAP.

The results of demographic variables on the analysis of fruits and vegetable consumptions explain two findings. First, people with less education ate fewer fruits and vegetables than college graduates. The finding is consistent to many literatures that

emphasized the importance of education on better nutrition intake. Secondly, the effect of marital status for men and women on eating pattern was different. Men tended to eat less fruits and vegetables when they are single than women. Considering the facts that poor mothers have an access to Women, Infants, and Children, is one of USDA food assistance programs for pregnant women and mothers with children under five that restricts the use of benefit only to nutritious food, and most of SNAP-Ed classes targets at children and mothers, the program that reaches to single men may be demanded to improve the health status in the state.

There was no significant effect of SNAP on fruits and vegetables consumption. It is understandable that the extra income would not have an incentive to change their preference on food. Again, this suggests that SNAP-Ed on nutrition education is necessarily to inform the shift to healthy eating patter that the Dietary Guideline for American suggests.

This study found marginally significant effect of SNAP-Ed on fruits and vegetables consumption. SNAP-Ed in Arizona focused mainly on nutrition education until 2015. Therefore, the finding could be a piece of evidence that the program effectively provided knowledge of healthy food choices. However, there are some limitations mentioned in next section on this finding.

Limitation and future research

SNAP-Ed variable and analysis design

Compared with Molitor et al (2015) and Molitor et al (2016), the variable to explain SNAP-Ed intervention did not have enough information. First of all, it is ambiguous how much the county-level variable could capture the effect of the interventions that were provided at limited locations in each county. Secondly, the data provided by AzNN did not include SNAP-Ed subcontractors that play main role to implement the program together with contractors. The number of contractors decreased in 2013 in some county, however, this was

because the contracts were taken over by the subcontractors and it did not mean the number of intervention decreased. For future work, the data that represents individual SNAP-Ed participation and comprehensive SNAP-Ed interventions by census tracts or zip code area are essential to evaluate the effect accurately and to have better understanding on the intervention consequences. The data from EARS would be ideal for the evaluation.

In addition to the variable itself, there are two points to mention on the analysis of SNAP-Ed. Firstly, this study did not test the selection bias of SNAP-Ed among adults who chosen to attend the classes by themselves. This is related with the second point that the analysis should be conducted to the target population of SNAP-Ed interventions which are mainly mothers and children in poor neighborhood for current intervention reach. To sum up, the analysis design should incorporate the characteristics of SNAP-Ed participants and should address a possible selection bias.

Outcome variable

This study used the aggregated variable of fruits and vegetables consumption, however, it could be more intuitive to run the regression separately on fruits and vegetables. Fruits are easier to intake than vegetables because some fruits such as apples and bananas are available at most of the small grocery stores and they do not need preparation before eating. Therefore, the effect of nutrition education may be reflected more on fruits consumption than vegetables.

Also, the selection of outcome variables should be carefully examined to reflect the focus of SNAP-Ed in each year. For example, SNAP-Ed in Arizona shifted the programs from nutrition education to active exercise since 2014. In this case, the outcome variable will be related with the body conditions or exercise time and frequency rather than the food intake.

Tables

Table3-1: Description of fruits and vegetables variables

Fruits	
100% Pure Juice	
Include	• 100% pure juices including orange, mango, papaya, pineapple, apple, grape (white or red), or grapefruit • Only count cranberry juice if the R perception is that it is 100% juice with no sugar or artificial sweetener added • 100% juice blends such as orange-pineapple, orange-tangerine, cranberry-grape are also acceptable as are fruit-vegetable 100% blends • 100% pure juice from concentrate (i.e., reconstituted) is counted
Exclude	• Fruit drinks with added sugar or other added sweeteners like Kool-aid, Hi-C, lemonade, cranberry cocktail, Tampico, Sunny Delight, Snapple, Fruitopia, Gatorade, Power-Ade, or yogurt drinks • Fruit juice drinks that provide 100% daily vitamin C but include added sugar, vegetable juices such as tomato and V8.
Fresh, frozen, or canned fruit	
Include	• Apples, bananas, applesauce, oranges, grape fruit, fruit salad, watermelon, cantaloupe or musk melon, papaya, lychees, star fruit, pomegranates, mangos, grapes, and berries such as blueberries and strawberries • Fried raisins, cran-raisins.cut up fresh, frozen, or canned fruit added to yogurt, cereal, jello, and other meal items • Culturally and geographically appropriate fruits that are not mentioned (e.g. genip, soursop, sugar apple, figs, tamarind, bread fruit, sea grapes, carambola, longans, lychees, akee, rambutan, etc.)
Exclude	• Fruit jam, jelly, or fruit preserves • Dried fruit in ready-to-eat cereals
Vegetables	
Cooked or canned beans	
Include	• Round or oval beans or peas such as navy, pinto, split peas, cow peas, hummus, garbanzo beans, lentils, soy beans and tofu. • Soybeans also called edamame, TOFU (BEAN CURD MADE FROM SOYBEANS), kidney, pinto, garbanzo, hummus, lentils, black, black-eyed peas, cow peas, lima beans and white beans • Bean burgers • Garden burgers and veggie burgers • Falafel and tempeh
Dark green vegetables	
Include	• All raw leafy green salads including spinach, mesclun,romaine lettuce, arugula, bok choy, dark green leafy lettuce, dandelions, komatsuna, watercress, and arugula • All cooked greens including kale, collard greens, choys, turnip greens, mustard greens

Exclude	• Iceberg (head) lettuce
Orange- colored vegetables	
Include	• All forms of carrots including long or baby-cut. carrot-slaw (e.g. shredded carrots with or without other vegetables or fruit) • All forms of sweet potatoes including baked, mashed, casserole, pie, or sweet potatoes fries • All hard-winter squash varieties including acorn, autumn cup, banana, butternut, buttercup, delicate, hubbard, kabocha (Also known as an Ebisu, Delica, Hoka, Hokkaido, or Japanese Pumpkin; blue kuri), and spaghetti squash • All forms including soup • Pumpkin, including pumpkin soup and pie
Exclude	• Pumpkin bars, cake, bread or other grain-based desert-type food containing pumpkin (i.e. similar to banana bars, zucchini bars we do not include)
Other vegetables	
Include	• Corn, peas, tomatoes, okra, beets, cauliflower, bean sprouts, avocado, cucumber, onions, peppers (red, green, yellow, orange) • All cabbage including American-style cole-slaw; mushrooms, snow peas, snap peas, broad beans, string, wax-, or pole-beans • Any form of the vegetable (raw, cooked, canned, or frozen) • Culturally and geographically appropriate vegetables that are not mentioned (e.g. daikon, jicama, oriental cucumber, etc.)
Exclude	• Fried potatoes • Products consumed usually as condiments including ketchup, catsup, salsa, chutney, relish

Table 3-2: Categories for each variable from BRFSS

Variable	Description	Categories
MARITAL	Marital status	Married, Divorced, Widowed, Separated, Never married, A member of an unmarried couple, Refused
EDUCA	Educational status	Never attended school or only knedergarten, Grades 1 through 8 (Elementary), Grades 9 through 11 (some high school), Grade 12 or GED (High school graduate), College 1 year to 3 years (Some college or technical school), College 4 years or more (College graduate), Refused
EMPLOY	Employment status	Employed for wages, Self-employed, Out of work for more than 1 year, Out of work for less than 1 year, A homemaker, A student, Retired, Unable to work, Refused
INCOME2	Annual household income from all sources	Less than $10,000, Less than $15,000 ($10,000 to less than $15,000), Less than $20,000 ($15,000 to less than $20,000), Less than $25,000 ($20,000 to less than $25,000), Less than $35,000 ($25,000 to less than $35,000), Less than $50,000 ($35,000 to less than $50,000), Less than $75,000 ($50,000 to less than $75,000), $75,000 or more, Don't know/Not sure, Refused
SEX	Sex	Male, Female
_IMPRACE	Imputed race	White (Non-Hispanic), Black (Non-Hispanic), Asian (Non-Hispanic), American Indian/ Alaskan Native (Non-Hispanic), Hispanic, Other race (Non-Hispanic)
CTYCODE1	County	Apache (South/North), Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma, Don't know/Not sure, Refused

Table 4-1: Eligibility criteria

Income2	Description of income2	Eligible or not
1	Less than $10,000	Yes
2	Less than $15,000 ($10,000 to less than $15,000)	Yes
3	Less than $20,000 ($15,000 to less than $20,000)	Yes
4	Less than $25,000 ($20,000 to less than $25,000)	Yes if Family Size $\geq$2
5	Less than $35,000 ($25,000 to less than $35,000)	Yes if Family Size $\geq$3
6	Less than $50,000 ($35,000 to less than $50,000)	Yes if Family Size $\geq$5
7	Less than $75,000 ($50,000 to less than $75,000)	Yes if Family Size $\geq$8
8	More thant $75,000	No

Table 4-2: eligibility and SNAP participation

	SNAP participant	SNAP nonparticipant	Row sum
Eligible	815	1593	2408
Ineligible	127	4981	5108
Column sum	942	6574	7516

Table 4-3: Estimated means, minimum, and maximum of fruits and vegetables consumption by whole sample and eligible group

	Mean	Min	Max
Whole sample (n=7516)			
Fruits	141.96 (3.26)	0	1400
Vegetables	201.92 (3.62)	0	1807
Servings	344.53 (6.00)	0	2107
Eligible group (n=2408)			
Fruits	134.78 (6.53)	0	1400
Vegetables	188.46 (6.92)	0	1807
Servings	323.61 (11.96)	0	2107

Table 4-4: T-test for the estimated means of fruits and vegetables consumption

Whole sample			
	Eligible	Ineligible	t-value
Fruits	134.78	145.74	1.48
Vegetables	188.46	209.05	2.56**
Servings	323.61	355.58	2.35**
Eligible group			
	SNAP participants	Nonparticipants	t-value
Fruits	131.70	136.52	0.37
Vegetables	181.59	192.40	0.76
Servings	313.64	329.33	0.66

*p<.10, **p<.05, ***p<.01

Table 4-5: T-test for the estimated means of independent variables for whole sample Eligible and ineligible

Variable	ineligible	eligible	t-value
age	49.412	45.664	4.48***
Male	0.530	0.443	3.44***
Married	0.600	0.412	7.49***
Divorced	0.111	0.159	-3.24**
Widowed	0.057	0.075	-2.34**
Separated	0.011	0.044	-3.83***
Nevermarried	0.175	0.248	-3.01***
Unmarriedcouple	0.046	0.062	1.2
Noschool	0.000	0.000	-0.46
Elementary	0.010	0.131	-6.65***
Some high school	0.041	0.183	-6.5***
High school grad	0.209	0.319	-5.16***
Some college	0.390	0.288	4.44***
College grad	0.350	0.079	20.21***
Employed	0.527	0.340	7.54***
Selfemploy	0.081	0.080	0.09
Unemployed	0.035	0.150	-7.65***
Homemaker	0.071	0.104	-2.3
Student	0.037	0.040	-0.34
Retired	0.223	0.146	5.73***
Unablework	0.026	0.139	-6.21***
White	0.740	0.452	11.63***
Black	0.037	0.032	0.49
Asian	0.024	0.014	1.35
AmericanIndian	0.015	0.056	-5.58***
Hispanic	0.168	0.434	-10.31***
Less than 10000	0.000	0.162	-10.29***
Less than 15000	0.000	0.182	-10.77***
Less than 20000	0.000	0.248	-13.28***
Less than 25000	0.053	0.218	-9.32***
Less than 35000	0.122	0.136	-0.76
Less than 50000	0.204	0.047	10.53***
Less than 75000	0.222	0.007	19.68***
More than 75000	0.399	0.000	-
Apache	0.005	0.020	-4.11***
Cochise	0.018	0.023	-1.08
Coconino	0.017	0.017	0.03
Gila	0.008	0.012	-1.84
Graham	0.006	0.009	-1.3
Greenlee	0.002	0.002	-1.14
LaPaz	0.002	0.005	-2.4**
Maricopa	0.603	0.534	2.95***

Mohave	0.031	0.048	-3.65***
Navajo	0.014	0.019	-1.73
Pima	0.175	0.157	1.17
Pinal	0.057	0.066	-1.06
StCruz	0.005	0.009	-1.34
Yavapai	0.036	0.035	0.4
Yuma	0.022	0.044	-4.16***
Grocery store	3.976	4.438	-2.56**
Grocery store per sqmi	0.325	0.384	-2.62***
Population	33013.000	33806.000	-1.3
Population density	2364.979	2752.144	3.04***
SNAPEd dummy	0.945	0.916	4.23***
Number of contractor	4.841	4.741	0.5
Contractor per sqmi	0.001	0.001	0.28
Contractor per person	0.000	0.000	-3.99***
SNAP partner dummy	0.226	0.282	-2.27**

*p<.10, **p<.05, ***p<.01

Table 4-6: T-test for the estimated means of independent variables for eligible group SNAP participants and nonparticipants

Variable	Non-SNAP	SNAP	t-vaue
age	48.202	41.331	5.02***
Male	0.450	0.431	0.44
Married	0.462	0.327	3.05***
Divorced	0.147	0.180	-1.2
Widowed	0.095	0.041	3.96***
Separated	0.027	0.073	-2.45**
Nevermarri	0.224	0.289	-1.43
Unmarriedcouple	0.045	0.090	-1.94
Noschool	0.000	0.000	1
Elementary	0.130	0.133	-0.06
Some high school	0.170	0.204	-0.8
High school grad	0.321	0.315	0.15
Some college	0.282	0.298	-0.4
College grad	0.096	0.050	3.24
Employed	0.355	0.314	0.94
Selfemploy	0.091	0.062	1.31
Unemployed	0.138	0.172	-1.16
Homemaker	0.108	0.099	0.35
Student	0.032	0.055	-1.47
Retired	0.196	0.061	7.12***
Unablework	0.081	0.237	-3.84***
White	0.464	0.430	0.77
Black	0.033	0.030	0.28

Asian	0.017	0.009	0.7
AmericanIn	0.040	0.083	-2.82***
Hispanic	0.433	0.435	-0.05
Less than 10000	0.117	0.240	-3.44***
Less than 15000	0.156	0.226	-1.91
Less than 20000	0.261	0.226	0.87
Less than 25000	0.226	0.204	0.66
Less than 35000	0.166	0.083	2.92***
Less than 50000	0.065	0.016	2.84***
Less than 75000	0.008	0.006	0.26
More than 75000	0.000	0.000	
Apache	0.012	0.034	-2.38**
Cochise	0.023	0.023	-0.02
Coconino	0.019	0.013	1.08
Gila	0.011	0.014	-0.77
Graham	0.006	0.014	-1.19
Greenlee	0.003	0.001	1.4
LaPaz	0.003	0.008	-1.72
Maricopa	0.564	0.483	1.79
Mohave	0.048	0.049	-0.15
Navajo	0.016	0.023	-1.11
Pima	0.142	0.183	-1.53
Pinal	0.058	0.081	-1.41
StCruz	0.007	0.012	-1.1
Yavapai	0.040	0.025	1.95
Yuma	0.049	0.036	1.29
Grocery store	4.497	4.338	0.49
Grocery store per sqmi	0.387	0.377	0.27
Population	34346.000	32902.000	0.98
Population density	2810.330	2654.704	0.68
SNAPEd dummy	0.919	0.912	0.47
Number of contractor	4.810	4.623	0.52
Contractor per sqmi	0.001	0.001	0.43
Contractor per person	0.000	0.000	-1.49
SNAP partner dummy	0.279	0.288	-0.2

*p<.10, **p<.05, ***p<.01

Table 5-1: Probit model results

	(1)		(2)	
	Coefficient	Standard Error	Coefficient	Standard Error
intercept	-1.7864	(0.2212)***	-1.737	(0.2117)***
age18to24	0.7907	(0.2932)*	0.7954	(0.288)*
age25to34	1.0049	(0.2265)***	1.0069	(0.2251)***
age35to44	0.9881	(0.2196)***	0.9869	(0.2185)***
age45to54	0.6594	(0.199)***	0.6744	(0.1991)***
age55to64	0.4256	(0.1809)**	0.4352	(0.1792)**
Elementary of less	0.4582	(0.2354)*	0.439	(0.2337)*
Some high school	0.3671	(0.2097)*	0.3487	(0.2058)*
High school grad	0.3431	(0.1576)**	0.3577	(0.1555)**
Some college	0.4258	(0.1642)***	0.4342	(0.1628)***
Employed	-0.2434	(0.2111)	-0.2179	(0.2116)
Selfemploy	-0.3492	(0.2434)	-0.3455	(0.2442)
Unemployed	0.0845	(0.2092)	0.0674	(0.2093)
Homemaker	0.00356	(0.2637)	0.0212	(0.2588)
Student	0.068	(0.3467)	0.0829	(0.3419)
Unablework	0.698	(0.1979)***	0.6988	(0.1959)***
Black	-0.1115	(0.3452)	-0.1787	(0.3328)
Asian	0.2445	(0.5165)	0.1805	(0.5153)
AmericanIn	0.4018	(0.1782)**	0.4647	(0.1757)***
Hispanic	0.0254	(0.1358)	-0.0132	(0.1334)
male_divorced	0.3358	(0.2387)	0.3318	(0.2375)
male_widowed	-0.0479	(0.3624)	-0.0357	(0.365)
male_separated	0.5779	(0.4963)	0.6145	(0.4869)
male_nevermarried	0.2073	(0.2546)	0.1745	(0.2455)
male_unmarried couple	0.7293	(0.3065)**	0.7561	(0.3173)**
male_married	0.282	(0.2034)	0.2885	(0.2014)
female_divorced	0.6078	(0.1994)***	0.6026	(0.1956)***
female_widowed	0.1002	(0.2253)	0.106	(0.2213)
female_separated	1.0393	(0.3623)***	1.0193	(0.3589)***
female_never married	0.4461	(0.2176)**	0.4439	(0.2169)**
female_unmarried couple	0.691	(0.2953)**	0.4848	(0.3067)
distance	0.00816	(0.0046)*	-	-
SNAP partnership	-	-	0.0193	(0.1322)

*p<.10, **p<.05, ***p<.01

Table5-2: Prediction of SNAP participation

	SNAP nonparticipants	SNAP participants
Predicted nonparticipants	1424	510
Predicted participants	169	305

Table 6-1: OLS results for demographic variables

	Coefficient	Standard Error
intercept	426.16898	(37.291226)***
age18to24	141.24027	(81.945768)*
age25to34	59.34612	(52.491667)
age35to44	103.27141	(57.263386)*
age45to54	31.99428	(43.979772)
age55to64	-2.90796	(36.811236)
Elementary of less	-56.2838	(58.378213)
Some high school	-113.17117	(32.259612)**
High school grad	-68.65456	(33.879853)
Some college	-83.45067	(30.317335)***
Employed	-31.37685	(47.983363)
Selfemploy	88.94119	(81.630319)
Unemployed	-47.23553	(44.677988)
Homemaker	-88.55844	(59.414592)
Student	-74.21753	(66.151803)
Unablework	-48.57647	(42.67784)
Black	113.46486	(49.882696)**
Asian	102.12513	(127.474857)
AmericanIn	14.15077	(32.027639)
Hispanic	29.25723	(25.195867)
male_divorced	-166.31655	(40.880641)***
male_widowed	98.25025	(134.262747)
male_separated	-222.32858	(54.823686)***
male_nevermarried	-152.46701	(52.847346)***
male_unmarried couple	-87.55623	(66.792385)
male_married	-63.60981	(37.509355)*
female_divorced	-34.89841	(34.307891)
female_widowed	-32.63336	(30.795308)
female_separated	-69.63684	(62.567092)
female_never married	-182.77821	(42.770978)***
female_unmarried couple	67.17181	(68.587903)
SNAP	7.37186	(22.237055)

*p<.10, **p<.05, ***p<.01

Table 6-2: OLS results for non-demographic variables

	Coefficient (Standard Error)			
	(1)	(2)	(3)	(4)
Demographic variables	yes	yes	yes	yes
SNAP-Ed dummy	13.04893 (21.105064)	-	-	-
Contractor per sqmi	-	-8289.6854 (27070.1247)	-	-
Contractor per thousand poor person	-	-	333.853132 (175.386407)*	-
Grocery store	-	-	-	0.91834 (2.858503)

*p<.10, **p<.05, ***p<.01

Table 6-3: Robustness check on the effect of SNAP

	Coefficient	Standard Error
intercept	329.328347	(15.7920384)***
SNAP	-15.691429	(23.629444)

*p<.10, **p<.05, ***p<.01

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