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**Impact of SNAP Fruit and Vegetable Incentive Programs: An Analysis of
USDA FINI Projects**

By Katherine Engel

A Thesis Submitted in partial fulfillment of the requirements for the degree of
Master of Science in Science, Technology, and Public Policy

Department of Public Policy

College of Liberal Arts

Rochester Institute of Technology

Rochester, NY

June 2018

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By Katherine Engel

Master of Science, Science, Technology and Public Policy

Thesis Submitted in Partial Fulfillment of the Graduation Requirements for the

College of Liberal Arts/Public Policy Program at

ROCHESTER INSTITUTE OF TECHNOLOGY

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Abstract

As diet-related chronic diseases continue to jeopardize public health in the United States, improving the dietary quality of Supplemental Nutrition Assistance Program (SNAP) participants is essential. One strategy that has been proposed as a means of doing so is utilizing fruit and vegetable incentives. Incentives serve to lower the cost of these foods for participants and thus theoretically encourage and enable them to purchase and consume more fruits and vegetables. The existing research indicates that incentives are an effective approach for increasing fruit and vegetable purchase and consumption. However, there is lack of research on the factors that influence the outcomes of incentive programs, including the retail venues in which programs are implemented, other interventions that are deployed in conjunction with incentives, the advertising used to attract participants, the ways in which the benefits used to incentivize participants are distributed, and the value of these benefits. This research addresses this gap in the literature by examining each of these factors through a case study of completed United States Department of Agriculture (USDA) Food Insecurity Nutrition Incentive (FINI) grant projects in an effort to identify pathways for positively impacting participants' fruit and vegetable purchase and consumption behaviors and perceptions of the affordability of these foods. Specifically, this study explores conditions and combinations of conditions that are potentially necessary and sufficient for positive program impacts.

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I. Introduction

The increasing rates of obesity and other diet-related chronic diseases in the United States coupled with the ongoing challenge of mitigating food insecurity demonstrates the need for policies that improve both food access and the dietary quality of low-income individuals (Ogden, C., Carroll, M.D., Fryar, C.D., & Flegal, K.M., 2015; Economic Research Center, 2017). One way of addressing these concerns is altering the food assistance programs. There are currently numerous food assistance programs in place that provide low-income households with benefits for purchasing food. It is vital that these programs not only enable low-income households to acquire sufficient amounts of food but also support these households in eating healthy diets. As a result, multiple strategies have been employed to encourage participants in food assistance programs to purchase and consume healthy foods. These strategies include restrictions on the types of foods that participants can purchase with their government benefits, nutrition education, and healthy food incentives. Restrictions on the types of foods that are benefit eligible and nutrition education have been implemented in some federal food assistance programs with varying degrees of success (Food and Nutrition Service, 2013b). In addition, the federal government as well as private organizations and state and local governments have begun to experiment with healthy food incentives as an approach for improving the diets of federal food assistance participants. Accordingly, understanding the impact of these incentives is critical for informing future policies and ultimately improving the dietary quality of federal food assistance participants.

There are currently fifteen United States Department of Agriculture (USDA) domestic food assistance programs: the Senior Farmers' Market Nutrition Program, the Commodity

Supplemental Food Program, the Nutrition Services Incentive Program, the Elderly Nutrition Program, the Food Distribution Program on Indian Reservations, the Emergency Food Assistance Program, the Child and Adult Care Food Program, the Fresh Fruit and Vegetable Program, the National School Lunch Program, the Special Milk Program, the Summer Food Service Program, the School Breakfast Program, the Special Supplemental Nutrition Program for Women, Infants, and Children, the Farmers' Market Nutrition Program, and the Supplemental Nutrition Assistance Program. Taken together, these programs are intended to create a "nutritional safety net" for low-income individuals and households and are the main mechanisms for reducing food insecurity, defined by the USDA Food and Nutrition Service (FNS) as "reduced food intake or disrupted eating patterns in a household due to a lack of money or other resources" (Food and Nutrition Service, 2013a). Altogether, food assistance programs make up about 75% of the USDA budget (Morgan, 2015). It is estimated that approximately 25% of United States citizens participate in one federal food assistance program every year (Morgan, 2015). Although the USDA provides the funding for these programs, state agencies are tasked with their implementation. As such, participant eligibility requirements vary not only from program to program but also from state to state.

Federal food assistance programs are structured in a variety of ways based on the type of assistance they provide and the populations they serve. For instance, the Senior Farmers' Market Nutrition Program provides grants to states, territories, and Native American tribal governments to provide low-income seniors with coupons to purchase food from farmers' markets, roadside stands, and community supported agriculture programs (Food and Nutrition Service, 2016). There are also food distribution programs, which issue agricultural products to participants. These programs include the Commodity Supplemental Food Program, the Food Distribution

Program on Indian Reservations, and the Emergency Food Assistance Program (Food and Nutrition Service, 2016). Moreover, child nutrition programs aim to reduce hunger and obesity among children by providing reimbursements to organizations that provide this population with healthy foods. These programs include the Child and Adult Care Food Program, the Fresh Fruit and Vegetable Program, the National School Lunch Program, the Special Milk Program, the Summer Food Service Program, and the School Breakfast Program (Food and Nutrition Service, 2016). In addition, there are food assistance programs exclusively for pregnant and post-partum women, infants, and their young children. These programs are intended to protect the health of these populations by providing monthly benefits for purchasing nutritious foods as well as healthy eating information and healthcare referrals. This category of programs includes the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and the Farmers' Market Nutrition Program (Food and Nutrition Service, 2016). Similar to WIC, the Supplemental Nutrition Assistance Program (SNAP) provides monthly benefits to participants to purchase food. However, this program is not specific to a particular demographic population. Moreover, WIC provides vouchers for very specific foods included in the WIC Foods Package, whereas SNAP benefits can be used to purchase nearly any food or beverage item with limited restrictions.

Currently, SNAP is the largest federal food assistance program in the United States and is thus the cornerstone of the United States' nutritional safety net. The mission of the program is to "increase food security and reduce hunger by providing children and low-income people access to food, a healthful diet and nutrition education in a way that supports American agriculture and inspires public confidence," and its stated goal is to ensure that no Americans experience hunger (Food and Nutrition Services, 2016). SNAP provides monthly electronic benefit transfers (EBT)

to millions of low-income households as means of expanding the financial resources that they have available to purchase food. Households qualify for SNAP based on income and countable resources. These countable resources are defined differently from state-to-state but generally include vehicles, pension plans, and other government assistance benefits (Food and Nutrition Service, 2017a). Traditionally, households that are SNAP eligible have gross incomes of less than 130% of the federal poverty line. SNAP therefore assists low-income households that are or are at risk for experiencing food insecurity. As of June 2017, 41,310,785 people participate in SNAP, with the average recipient receiving \$124.91 each month (Food and Nutrition Service, 2017b). Importantly, these people are frequently members of vulnerable populations. Nearly 70% of SNAP participants are members of households with children, and over 25% of participants are members of households with seniors or disabled people (Center on Budget and Policy Priorities, 2017). In fiscal year 2016, the Program costs totaled \$66,539,351,219 (Food and Nutrition Service, 2017b).

It is worth noting that compared to other federal food assistance programs, SNAP has relatively few restrictions in terms of what the benefits can be used for as well as little emphasis on nutrition education. Specifically, SNAP benefits can be used for any food product, including plants and seeds to grow food to be consumed by the receiving household, with the exception of hot foods and foods that are intended to be eaten in stores. Additionally, SNAP benefits cannot be applied to the purchase of nonfood items, alcohol and tobacco, or vitamins and medications (Food and Nutrition Service, 2017c). In contrast to SNAP, WIC restricts the foods that can be purchased using benefits to milk, cheese, yogurt, fruits and vegetables, canned fish, tofu, breakfast and infant cereal, whole wheat breads and grains, infant food meat, soy-based beverages, juice, infant formula, mature legumes, eggs, peanut butter, and certain nutritionals

and has strict specifications that these foods must meet to be WIC eligible (Food and Nutrition Service, 2017d). Furthermore, unlike WIC, which has nutrition education requirements that participants must fulfill in order to receive benefits, SNAP does not require participants to complete any nutrition education to receive benefits. A nutritional educational component was added to SNAP through the 1990 Food Stamp Act as a means of equipping participants with the knowledge and tools necessary to use their benefits to purchase nutritious foods within their budgets and ultimately to encourage the consumption of healthy foods. Today, this nutritional education component is called SNAP-Ed and operates as a grant program funded by FNS and the National Institute of Food and Agriculture (NIFA). SNAP-Ed supports projects and interventions directed towards obesity prevention and nutrition education for SNAP participants. However, there is no federal requirement for SNAP participants to take-part in SNAP-Ed, and it has not been implemented in all states (National Institute of Food and Agriculture, n.d.a). Thus, although SNAP plays an integral role in ensuring that millions of people have the resources they need to access sufficient amounts of food, it lacks specific restrictions that dictate the nutritional quality of foods that participants can purchase as well as a consistent and reliable way to educate participants on how to use their benefits to maximize the quality of their diets. As such, the Program has few mechanisms in place for encouraging participants to purchase and consume healthy foods when compared to other federal food assistance programs.

The impact of SNAP on healthy food consumption and overall dietary quality is widely disputed. Without restrictions on food purchases, SNAP may make food more accessible to low-income individuals, but it does not result in an increase in the consumption of nutritious foods (Tanner, 2013). It has been shown that even individuals who receive SNAP benefits have poor diets, and, in some instances, SNAP has been associated with negative health outcomes (Yen,

Bruce, & Jahns, 2012; Gregory, 2013; Gleason, 2000; Yen, 2010). Specifically, Yen et al. (2012) found that SNAP participation is inversely correlated to self-assessed health status. Although the negative correlation between SNAP participation and self-assessed health status may occur because people who are in poorer health are more likely to participate in SNAP, Yen et al. (2012) noted that this finding may indicate that the Program has a negative effect on the well-being of participants. In particular, they speculated that the observed relationship between SNAP participation and self-assessed health status may be attributable to the “boom and bust cycle” created by monthly benefit distribution, as participants tend to have fewer resources to purchase food at the end of the month, and thus their nutrient intake is irregular. In addition, SNAP participants often have lower quality diets compared to both low-income non-participants as well as to the entirety of the American population, and it has been shown that participants consume few whole grains and vegetables and do not meet dietary recommendations for key minerals, such as iron and potassium, as well as fiber (Gregory, 2013; Gleason, 2000; Yen, 2010). In particular, Gregory (2013) found that SNAP participants have lower Healthy Eating Index scores, a measure of adherence to the federal *Dietary Guidelines for Americans*, than other low-income individuals who do not participate in the Program. However, in contrast to these findings, Nguyen, Shuval, Bertmann, and Yaroch (2015) demonstrated that SNAP plays a role in supporting individuals who are at risk for experiencing food insecurity to eat healthy diets and avoid obesity. Specifically, these researchers found that among individuals experiencing marginal food security, SNAP participants had lower BMI and lower probability of obesity than non-participants and that among individuals experiencing marginal, low, and very low food security, SNAP participants had better Healthy Eating Index scores than non-participants.

Regardless of the current impact SNAP has on the diets and health of low-income individuals, inducing SNAP participants to eat high-quality diets is vital for improving health outcomes, as it has been demonstrated that the consumption of nutritious food, particularly fruits and vegetables is essential for good health. For instance, there is an association between diet and chronic diseases, such as certain cancers, type 2 diabetes, high blood pressure, cardiovascular disease, and obesity (United States Department of Health and Human Services and United States Department of Agriculture, 2015). In the *2015-2020 Dietary Guidelines for Americans*, the United States Department of Health and Human Services and the USDA note that a high intake of fruits and vegetables serves as a marker of healthy eating patterns and is associated with a lower risk of cardiovascular disease as well as protects against certain cancers (United States Department of Health and Human Services and United States Department of Agriculture, 2015). For this reason, increasing the consumption of healthy foods, primarily fruits and vegetables, is a logical focus of efforts directed toward improving the diets and subsequently the health outcomes of SNAP participants.

Due to the health benefits of nutritious foods like fruits and vegetables, implementing strategies for improving the dietary quality of SNAP participants is a salient area of focus for researchers and policymakers. Among the many strategies that have been utilized are healthy food incentives. Incentives are potentially appropriate for improving dietary quality because they are a tool for facilitating behavior change. The theory that incentives serve as a strategy for inducing changes in behavior centers on the standard direct price effect (Gneezy, Meier, & Rey-Biel, 2011). This effect is observed when the behavior being incentivized becomes more attractive to people as they are rewarded with a financial reward for exhibiting the desired behavior. As a result of the direct price effect, incentives have the capacity to instill new,

positive habits as well as end pre-existing, negative habits. Thus, when applied on a large enough scale, incentives may have the ability to shift cultural norms (Gneezy, Meier, & Rey-Biel, 2011). Moreover, incentives may be particularly useful for promoting healthy behaviors, such as consuming healthy foods, since the benefits of healthy behaviors are often uncertain and delayed, while the cost of these behaviors is immediate. As people value current costs and benefits more than future costs and benefits, it is rational to choose not to engage in healthy behaviors, since the present value of these behaviors is low. By creating short-term or immediate, certain rewards for healthy behaviors, incentives serve to make these behaviors more appealing by increasing their present value and in turn encourage people to exhibit them (Loewenstein, Brennan, & Volpp, 2007).

Incentives also create an immediate benefit because they lower the cost of healthy foods for consumers. In general, the cost of food plays a critical role in how people make food choices. In fact, Glanz, Basil, Maibach, Goldberg, and Snyder (1998) found that behind taste, price is the second most important influence on food choice. For SNAP participants specifically, it has been demonstrated that the cost of healthy foods is a barrier for improving dietary quality (Leung, Hoffnagle, Lindsay, Lofink, Hoffman, Turrell, Willett, & Blumenthal, 2013; Blumenthal, Hoffnagle, Leung, Lofink, Jensen, Foerster, Cheung, Nestle, & Willett, 2017). To overcome this barrier, researchers have suggested incentivizing the purchase of healthy foods, as incentives expand the financial resources participants have available to purchase healthy foods and thus address the barrier that the cost of healthy food poses to dietary quality (Leung et al., 2013; Blumenthal et al., 2017; Richards & Sindelar, 2013).

Incentivizing the purchase of healthy foods has been explored as a strategy for improving the dietary quality of federal food assistance participants through several programs. One of the

most prominent examples of the use of incentives in SNAP is the Health Incentives Pilot (HIP). As part of the 2008 Farm Bill, the USDA allocated \$20 million for evaluating the efficacy of implementing incentives as a means of increasing fruit and vegetable purchases by SNAP participants, and in conjunction with this funding, HIP was initiated as a pilot project. HIP was administered by the Massachusetts Department of Transitional Assistance in Hampden County, MA from November 1, 2011 until December 31, 2012. The Pilot tested the effectiveness of financial incentives for the purchase of targeted fruits and vegetables by giving program participants an additional \$0.30 of EBT to spend on any SNAP-eligible food or beverage for every \$1.00 of EBT that they spent on targeted fruits and vegetables. The *Evaluation of the Healthy Incentives Pilot (HIP): Summary of Findings* published by FNS maintains that HIP households reported higher total spending on fruits and vegetables than non-HIP households and that HIP households spent 11% more of their SNAP benefits on targeted fruits and vegetables than non-HIP households. In addition, the report states that HIP participants consumed about 26% more targeted fruits and vegetables than non-HIP participants. In terms of overall dietary quality and health, FNS reported that HIP participants had higher Healthy Eating Index scores than non-HIP participants. Moreover, FNS concluded that the HIP was feasible from a technical and operational standpoint (Food and Nutrition Service, 2014). As such, HIP illustrates the effectiveness of incentive programs as tool for improving the dietary quality of SNAP participants as well as highlights the potential for incorporating incentives in federal food assistance policy.

The USDA has not modified SNAP based on the results of HIP. Rather, in response to the apparent success of the pilot, the USDA established the Food Insecurity Nutrition Incentive (FINI) grant program. This program awards funding to nonprofits for the design,

implementation, and evaluation of programs that incentivize the purchase of fruits and vegetables by SNAP participants (National Institute of Food and Agriculture, n.d.b). The continued experimentation with fruit and vegetable incentives by the USDA indicates that incentives may be one policy mechanisms utilized by the federal government to support the health of food assistance program participants in the future. Consequently, further investigation of the use of incentives in this context is pertinent to current policy considerations and is useful for understanding the effectiveness and impact of incentive programs. As such, this research examines the impact of FINI projects on SNAP participants' fruit and vegetable purchase and consumption behaviors and perceptions of affordability.

II. Literature Review

The following literature review provides an analysis of incentives as an approach for encouraging and enabling federal food assistance program participants to increase their purchase and consumption of healthy foods. There is a relative lack of research surrounding the use of incentives for promoting the dietary quality of SNAP participants, and many of the investigations that have been performed have studied incentive programs that were open to individuals who participated in other types of federal food assistance programs, such as WIC and FMNP, in addition to SNAP participants. As such, this literature review is not exclusively focused on incentive programs for SNAP participants. However, its scope is limited to studies that were conducted on incentive programs offered to federal food assistance programs. State, local, and private food assistance programs were not considered because of the relatively small reach of these programs as well as the substantial variations in their eligibility requirements. Moreover, when discussing healthy foods, this review primarily considers fruits and vegetables, as much of

the literature has focused on these foods as the target of incentive programs and used their consumption as a proxy for dietary quality. The reason for this focus is presumably related to association that exists between consuming fruits and vegetables and overall dietary quality and health, as discussed in greater detail above. A small minority of the literature has accounted for other foods, including eggs, meat, and bread, in addition to fruits and vegetables.

This review considers a total of nineteen papers, as illustrated in Table 1. These papers include twelve empirical studies that have examined the use of different incentive programs for federal food assistance participants. Additionally, three papers evaluating HIP and analyzing the expansion of the program nationwide using mathematical and economic models were identified, and four papers involving current SNAP policy were considered. Several other papers were also reviewed for background information regarding the justification for the use of incentive programs as well as the relevance of certain factors involved in their design and implementation. All of the papers were identified using RIT Summon, Google Scholar, ProQuest, and Sage Journals Online as search tools. The search terms that were used include “SNAP incentives,” “WIC incentive,” “food benefits incentive,” and “food assistance incentive.” The focus on SNAP and WIC is appropriate, as these programs are structured such that they provide participants with monthly benefits for purchasing food. This structure is conducive to the implementation of incentive programs, because it provides participants with considerable autonomy in deciding what foods to purchase. Thus, incentives can be used to influence the individual food purchasing behavior of participants in these programs. In addition to the use of these search terms, papers were identified by examining the articles cited by the papers found in the preliminary search. The papers considered are primarily peer-reviewed journal articles, however, a government report

detailing HIP was also reviewed. Due to the relative lack of research on this topic, papers were not excluded based on their publication date.

Table 1: Papers Reviewed

	Research Focus	Method	Finding
Amaro & Roberts (2017)	Characteristics, needs, and benefits of SNAP households participating in a farmers' market incentive program	Quasi-experiment	Incentive program enabled participants to use their SNAP benefits at farmers' markets
Andreyeva & Luedicke (2015)	Impact of incentives on FV purchases by WIC participants	Quasi-experiment	Incentives increased FV purchases
Bowling et al. (2016)	Impact of FV exposure activities and incentives on FV purchases and consumption	Quasi-experiment	Incentives and other exposure activities increased FV purchases and consumption
Dimitri et al. (2015)	Efficacy of incentives for increasing FV consumption by low-income individuals	Quasi-experiment	Incentives increased consumption overall. Groups responded to incentives differently based on level of food insecurity and education
Food and Nutrition Service (2014)	Whether incentives make FV more affordable for SNAP participants	Quasi-experiment	Incentives increased FV consumption
Freedman et al. (2014)	Impact of incentives on FV purchases by food assistance participants	Quasi-experiment	Incentives increases farmers' market revenue and improves access to FV
Hanbury et al. (2017)	Determine how Mexican-heritage households in CA Central Valley respond to incentives	Quasi-experiment	The type of FV participants purchased was tied to their cultural history and values
Lindsay et al. (2013)	Outcomes of the Fresh Fund incentive program	Quasi-experiment	Incentives increased daily FV consumption and weekly FV spending
Olsho et al. (2015)	Efficacy of Health Bucks incentive program for increasing awareness of and access to farmers' markets and FV purchase and consumption	Quasi-experiment	Health Bucks increased awareness of farmers' markets and FV purchases. No significant change in FV consumption was detected.
Savoie-Rosko et al. (2016)	Impact of farmers' market incentive program on food security and FV intake	Quasi-experiment	Incentives decreased food insecurity-related behaviors and increased intake of select FV
Young et al. (2013)	Impact of Philly Food Bucks on FV purchase and consumption by SNAP participants	Quasi-experiment	Incentives were tied to increases in FV consumption and sales
Herman et al. (2008)	Efficacy of incentives for increasing FV intake by WIC participants	Randomized experiment	Incentives increased FV consumption
An (2015)	Cost-effectiveness of the expansion of HIP nationwide cost-effective	Modeling	Changes in FV consumption are proportional to price changes. HIP is unlikely to affect health outcomes if expanded nationwide
Klerman et al. (2014)	Short-term impact of HIP on FV intake	Modeling	HIP increased FV intake
Olsho et al. (2016)	Statistical significance of the increase in FV intake by SNAP participants as a result of HIP	Modeling	The increase in FV intake associated with HIP was statistically significant
Blumenthal et al. (2017)	Barriers SNAP participants face in eating a healthy diet and strategies for improving the dietary quality of SNAP participants identified by SNAP stakeholders	Survey	Barriers include the marketing of unhealthy foods, the high-cost of healthy foods, and lifestyle challenges. Strategies include incentives and excluding soda from SNAP
Lueng et al. (2015)	Acceptable strategies for improving nutritional intake of SNAP participants	Survey	The majority supported the use of incentives and restricting sugary drink purchases with SNAP
Richards & Sindelar (2013)	SNAP policy recommendations in response to the obesity epidemic	Literature review and theory	Propose use of incentives, raffles for prizes, and healthy food defaults to encourage healthy eating by SNAP participants
Lueng et al. (2013)	Identify barriers to nutritious eating for low-income individuals and strategies for improving the diet and health of SNAP participants	Interviews	Barriers to nutritious eating include the high-cost of food, inadequate benefits, access to purchasing healthy food, environmental factors resulting from poverty. Strategies for improving the nutrition of SNAP include incentives, restrictions on purchases, modifications to benefit distribution, nutrition education, improved retail environments, and increased state and federal coordination.

*FV=fruits and vegetables

**Table is organized by the method employed in each study

The literature points to several factors that may influence the impact of incentive programs on federal food assistance program participants' fruit and vegetable purchasing and consumption behaviors. This review details the ways in which the literature has evaluated the impact of these incentives. It also outlines the outcomes reported in the literature. This review then assesses the literature to evaluate key factors involved in the design and implementation of incentive programs, including the structure of the programs, the fruits and vegetables targeted by the programs, the venues in which the programs are deployed, and the demographics of program participants.

A. Outcomes

All of the studies included in this review considered the effectiveness of incentives in terms of their impact on fruit and vegetable purchases and/or consumption. However, the empirical studies employed a variety of approaches for measuring these outcomes, as shown in Table 2. The literature has largely depended on self-reported spending on fruits and vegetables, diet patterns, and perception of health status in addition to sales data from food retailers to evaluate incentive program outcomes. The most common strategies utilized were surveys and interviews in which participants reported their perceived fruit and vegetable consumption and health status (Food and Nutrition Service, 2014; Bowling, Moretti, Ringelheim, Tran, & Davison, 2016; Savoie-Roskos, Durward, Jeweks, & LeBlanc, 2016; Freedman, Mattison-Faye, Alia, Guest, & Hébert, 2014; Dimitri, Oberholtzer, Zive, & Sandolo, 2015; Lindsay, Lambert, Penn, Hedges, Ortwine, Mei, Delaney, & Wooten, 2013; Olsho, Payne, Walker, Baronberg, Jernigan, & Abrami 2015; Young, Aquilante, Solomon, Colby, Kawinzi, Uy, & Mallya, 2013). Thus, one of the limitations that appears consistently throughout the literature is that the impact

of incentives has largely been judged based on self-reports, as described in greater detail below in the “Additional Research” section of this review.

Table 2: Measuring Fruit and Vegetable Purchases and Consumption

	Surveys	Interviews	Sales Tracking	Health Data Tracking	Focus Groups
Herman et al. (2008)	X	X		X	
Lindsay et al. (2013)	X		X		
Young et al. (2013)		X	X		
Food and Nutrition Service (2014)	X	X	X		X
Freedman et al. (2014)	X		X		
Andreyeva & Luedicke (2015)			X		
Dimitri et al. (2015)	X				
Olsho et al. (2015)	X	X	X		
Bowling et al. (2016)	X				
Savoie-Rosko et al. (2016)	X				
Amaro & Roberts (2017)	X				
Hanbury et al. (2017)	X		X	X	

As demonstrated in Table 3, four of the empirical studies reviewed focused exclusively on fruit and vegetable purchases, and four focused exclusively on fruit and vegetable consumption (Amaro & Roberts, 2017; Bowling et al., 2016; Dimitri et al., 2015; Herman, Harrison, Afifi, & Jenks, 2008; Savoie-Rosko et al., 2016; Freedman et al., 2014; Hanbury, Gomez-Camacho, Kaiser, Sadeghi, & de la Torre, 2017; & Andreyeva & Luedicke, 2015). Notably, each of these eight studies reported increases in either fruit and vegetable purchases or consumption in conjunction with incentive programs. Thus, all of the studies that assessed changes in either purchases or consumption reported that incentives were associated with an increase in these behaviors. These findings demonstrate the efficacy of incentives for enhancing the dietary quality of federal food assistance participants.

The remaining four empirical studies considered in this review accounted for both fruit and vegetable purchases and consumption (Lindsay et al., 2013; Food and Nutrition Service, 2014; Young, et al., 2013; Olsho et al., 2015). Of these studies, three reported that the use of incentives is associated with both increases in purchases and consumption (Lindsay, et al., 2013; Food and Nutrition Service, 2014; Young, et al., 2013). The remaining study, Olsho et al., 2015, reported an increase in purchases but concluded that there was no observable difference in consumption between incentive program participants and non-participants. With this exception, these studies further illustrate that incentives are an effective approach for improving the dietary quality of federal food assistance program participants.

Table 3: Observed Increases in Fruit and Vegetable Purchases and Consumption

	Increase in FV Purchases	Increase in FV Consumption
Herman et al. (2008)	Not reported	Yes
Lindsay et al. (2013)	Yes	Yes
Young et al. (2013)	Yes	Yes
Food and Nutrition Service (2014)	Yes	Yes
Freedman et al. (2014)	Yes	Not reported
Andreyeva & Luedicke (2015)	Yes	Not reported
Dimitri et al. (2015)	Not reported	Yes
Olsho et al. (2015)	Yes	No
Bowling et al. (2016)	Not reported	Yes
Savoie-Rosko et al. (2016)	Not reported	Yes
Amaro & Roberts (2017)	Yes	Not reported
Hanbury et al. (2017)	Yes	Not reported

*FV=fruits and vegetables

B. Factor 1: Program Structure

A variety of types of incentives have been explored as approaches for increasing the purchase and consumption of fruits and vegetables by federal food assistance program participants. Table 4 summarizes the types of benefits that have been granted to participants through incentive programs. Generally, programs discussed in the literature provided participants

with a financial incentive in the form of coupons/vouchers, tokens redeemable at farmers' markets, or EBT credits. These incentives were typically granted either as a result of healthy food purchases or before purchases were made as a means of discounting the cost of healthy food. As such, these benefits serve to induce participants to increase their fruit and vegetable purchases by providing them with financial rewards for these purchases or resources that enable them to purchase these foods at a lower price.

Table 4: Types of Benefits

	Farmers' Market Tokens	EBT	Vouchers/ Coupons	Not Specified
Herman et al. (2008)			X	
Lindsay et al. (2013)	X			
Young et al. (2013)			X	
Food and Nutrition Service (2014)		X		
Freedman et al. (2014)			X	
Andreyeva & Luedicke (2015)			X	
Dimitri et al. (2015)			X	
Olsho et al. (2015)			X	
Bowling et al. (2016)		X		
Savoie-Rosko et al. (2016)				X
Amaro & Roberts (2017)	X			
Hanbury et al. (2017)			X	

In most of the incentive programs discussed in the literature, participants were required to make a purchase before they received a benefit (Food and Nutrition Service, 2014; Olsho et al., 2015; Young et al., 2013; Dimitri et al., 2015; Bowling et al., 2016; Freedman et al., 2014; Savoie-Rosko et al., 2016; Lindsay et al., 2013; Amaro & Roberts, 2017). In these cases, the value of the benefit was either pre-determined or determined by the value of participants' purchases. For example, in the incentive program studied by Freedman et al. (2014), participants received benefits valued at \$5 regardless of the cost of their initial purchases. However, many

incentive programs evaluated in the literature functioned such that the value of the benefit was determined by the magnitude of participants' spending (Lindsay et al., 2013; Food and Nutrition Service, 2014; Savoie-Roskos et al., 2016; Olsho et al., 2015; Young et al., 2013; Amaro & Roberts, 2017; Bowling et al., 2016; Dimitri et al., 2015). In these cases, the value of the benefit was either equal to participants' spending or a percentage of their spending. In many instances, such as in the Double-Up Bucks programs, 100% of participants' spending was matched, meaning that the value of the benefits was equal to the amount of money spent by participants (Amaro & Roberts, 2017; Lindsay et al., 2013; Savoie-Roskos et al., 2016). Other programs provided benefits that were valued as a percentage of participants' spending. For instance, the Health Bucks and Philly Food Bucks programs provided \$2 vouchers for every \$5 participants spent, and thus acted as a 40% match of participants' spending (Young et al., 2013; Lindsay et al., 2013). Notably, incentives that are granted in proportion to participants' spending are designed to encourage participants to purchase more fruits and vegetables, since with these programs, the more participants spend on these foods, the more they are rewarded.

In cases in the literature in which participants were not required to make a purchase to receive benefits, the benefits had a pre-determined value. They were either awarded when participants signed up for the program, handed out when participants visited a farmers' market, or distributed on a regularly scheduled basis (Herman et al., 2008; Hanbury et al., 2017; Bowling et al., 2016; Andreyeva & Luedicke, 2015). Accordingly, these types of incentive programs are designed to increase participants' healthy food purchases solely by increasing the financial resources they have available to purchase these foods.

It is also worth noting that multiple forms of incentives have also been implemented in the same programs. Notably, Bowling et al. (2016) studied a program that matched 40% of the

cost of participants' purchases as well as provided \$20 for fruit and vegetable purchases every third farmer's market visit. As such, some of programs utilize multiple types of incentives and thus have employed several strategies to increase healthy food purchases.

Another difference between incentive programs is that while some of the programs provide benefits that can be utilized to purchase only fruits and vegetables, others provide benefits that are applicable to a more diverse range of foods, such as any SNAP-eligible food or any food sold at a participating farmers' market. It is important to note that one drawback of awarding benefits that can be used for a broad range of foods is that participants do not necessarily utilize the benefit to purchase healthy foods. For example, in the HIP program, participants were awarded additional EBT after purchasing fruits and vegetables and therefore could use the benefits to purchase any SNAP eligible product. Since SNAP has very few restrictions on what foods can be purchased with benefits, participants had more resources to purchase food, but there were no mechanisms in place for ensuring that these foods were healthful. As such, Richards and Sindelar (2013) note that creating nationwide incentive programs for SNAP participants by extending HIP raises concerns related to the use of bonus EBT for unhealthy purchases. Accordingly, these researchers suggest that other types of interventions that encourage participants to spend their benefits on healthy food may also be necessary if this type of incentive program is utilized (Richards & Sindelar, 2013).

Consequently, the literature indicates that incentive programs that provide participants with additional benefits to purchase any SNAP qualifying food may not be as effective in improving dietary quality absent of other interventions when compared to programs that only provide benefits for purchasing additional fruits and vegetables.

C. Factor 2: Definition of Fruits and Vegetables

The incentive programs discussed in the literature varied in how they defined fruits and vegetables, as shown in Table 5. HIP incentives, for example, could be applied to targeted fruits and vegetables, which were defined as any fresh, canned, frozen, and dried fruit or vegetable as long as it did not contain added sugars, fats, oils, and salts. In addition, the pilot excluded fruit juice, mature legumes, and white potatoes (Food and Nutrition Service, 2014). These specifications were selected to mirror the restrictions that WIC places on the produce items that can be purchased with benefits (Olsho, Klerman, Wilde, & Bartlett, 2016). In contrast, other fruit and vegetable incentive programs applied only to fresh fruits and vegetables (Dimitri et al., 2015; Bowling et al., 2016; Herman et al., 2008; Lindsay et al., 2013; Freedman et al., 2014; Olsho et al., 2015).

Table 5: Fruit and Vegetables Targeted by Incentive Programs

	Exclusively Fresh FV	Fresh, Frozen, Canned, and/or Dried FV	Not Specified
Herman et al. (2008)	X		
Lindsay et al. (2013)	X		
Young et al. (2013)	X		
Food and Nutrition Service (2014)		X	
Freedman et al. (2014)			X
Andreyeva & Luedicke (2015)		X	
Dimitri et al. (2015)	X		
Olsho et al. (2015)	X		
Bowling et al. (2016)	X		
Savoie-Rosko et al. (2016)			X
Amaro & Roberts (2017)			X
Hanbury et al. (2017)		X	

*FV=fruits and vegetables

The definition of fruits and vegetables may be especially relevant when considering issues related to food access. Notably, the literature surrounding the relationship between the

effectiveness of incentives and physical access to food retailers is conflicting (Beaulac, Kristjansson, & Cummins, 2009; Grindal, Wilde, Schwartz, Klerman, Bartlett, & Berman, 2016). In the case of incentive programs that include fresh, frozen, canned, and dried fruits and vegetables, offering incentives for these products may be a more effective pathway for increasing fruit and vegetable purchases and consumption for participants who live in areas where access to these foods is limited. These environments tend to contain small convenience stores rather than supermarkets, and thus, residents may only have access to canned, frozen, or dried fruits and vegetables (Beaulac et al. 2009). Therefore, incentives that are not exclusive to fresh fruits and vegetables may be more easily utilized in these communities. In contrast, the literature has demonstrated that distance from food retailers has a negligible effect on the ability of participants to use incentives and therefore does not impact the outcomes of the programs (Grindal et al. 2016). In the case of HIP, Grindal et al. (2016) found that distance to HIP-participating grocery stores had no influence on the impact of the incentives. Specifically, these researchers noted that households that were located farther from participating grocery stores did spend fewer of the benefits they received from incentive programs on fruits and vegetables, reporting that every additional mile that a household was from a participating retailer was correlated with a \$0.69 reduction in fruit and vegetable spending per month. However, they concluded that the magnitude of this reduction was insignificant. Accordingly, it is unclear whether the definition of fruits and vegetables affects the likelihood that participants will use the benefits they acquire through incentive programs.

The literature also indicates that incentives that apply only to fresh fruits and vegetables are often administered at farmers' markets, where fresh fruits and vegetables tend to be abundant. These incentive programs thus have the advantage of supporting local farmers and

food vendors in addition to incentivizing fruit and vegetable purchases, as they increase market sales and the revenue of local food producers (Lindsay et al., 2013; Freedman et al., 2014).

Furthermore, the utilization of farmers’ markets by program participants has been reported to positively impact dietary quality, as discussed in greater detail in the following section.

D. Factor 3: Venues

Table 6 illustrates that the majority of the literature has examined farmers’ markets as a venue for incentive programs. In addition, some programs have been implemented at grocery stores in addition to farmers’ markets or as an alternative venue to markets (Amaro & Roberts, 2017; Bowling et al., 2016; Dimitri et al., 201; Herman et al., 2008; Lindsay et al., 2013; Savoie-Rosko et al., 2016; Freedman et al., 2014; Olsho et al., 2015; Food and Nutrition Service, 2014; & Young et al., 2013).

Table 6: Venues Used for Incentive Programs

	Farmers’ Markets	Grocery Stores
Herman et al. (2008)	X	X
Lindsay et al. (2013)	X	
Young et al. (2013)	X	
Food and Nutrition Service (2014)	X	X
Freedman et al. (2014)	X	
Andreyeva & Luedicke (2015)		X
Dimitri et al. (2015)	X	
Olsho et al. (2015)	X	
Bowling et al. (2016)	X	
Savoie-Rosko et al. (2016)	X	
Amaro & Roberts (2017)	X	
Hanbury et al. (2017)		X

Farmers’ markets serve as a particularly attractive venue for implementing incentive programs as a means of improving dietary quality. In particular, the literature indicates that

incentives attract federal food assistance participants who otherwise might not shop at the markets to these venues (Olsho et al., 2015; Lindsay et al., 2013; Freedman et al., 2014). Notably, Freedman et al. (2014) found that 57% of participants in a farmers' market incentive program had never been to a farmer's market. Similarly, Olsho et al. (2015) noted that SNAP participants' awareness of farmers' markets rose in relation to their exposure to the Health Bucks. These researchers also found that 54% of Health Bucks participants who used their benefits at farmers' markets strongly agreed that "I shop at farmers' markets more often because of Health Bucks." Lindsay et al. (2013) also found a correlation between incentive programs and farmer's market attendance, noting that 82% of participants in the Farmers Market Fresh Fund Incentive Program had never attended a farmer's market prior to participating in the program. They went on to note that many participants reported that incentives were "important" or "very important" in their decision to shop at farmers' markets. These researchers also demonstrated that in addition to drawing more SNAP participants to farmers' markets, the incentive program had the potential to impact participants' long-term shopping behavior. In particular, the majority of participants reported that they would be "somewhat likely" or "completely likely" to shop at farmers' markets even without the continuation of the incentive program (Lindsay et al., 2013). Accordingly, there is evidence that farmers' market incentive programs increase participants' exposure to markets as venues offering affordable, healthy food and in turn have the potential to positively influence their long-term food purchasing behavior.

Another potential benefit of implementing incentive programs at farmers' markets is that the consumption of fruits and vegetables may be positively impacted by the utilization of these venues. The literature has demonstrated that farmers' market use is linked to increased fruit and vegetable consumption, and thus offering incentives at farmers' markets has the capacity to

improve dietary quality beyond merely increasing the financial resources participants have to purchase fruits and vegetables (Pitts, Gustafson, Wu, Mayo, Ward, McGuirt, Rafferty, Lancaster, Evenson, Keyserling, & Ammerman, 2014). Specifically, Olsho et al. (2015) found that even absent of incentives, both SNAP participants and non-participants who shopped at farmers' markets reported higher fruit and vegetable consumption than other residents in their neighborhoods. Moreover, incentives seem to maximize the positive effect that shopping at farmers' markets has on fruit and vegetable consumption. Herman et al. (2008) evaluated the same incentive program in both grocery stores and farmers' markets and noted that participants who utilized their benefits at farmers' markets reported consuming more fruits and vegetables than those who used their benefits at grocery stores. Notably, the benefits used as an incentive in this program could only be applied to the purchase of fruits and vegetables, and as such, the discrepancy in fruit and vegetable consumption among participants who used their benefits at farmers' markets and those who used them at grocery stores cannot be explained by participants using the benefits to purchase other SNAP eligible foods at grocery stores. Thus, this study demonstrates that farmers' markets may have a positive impact on the effectiveness of incentive programs.

Despite the potential benefits that farmers' markets may have on the outcomes of incentive programs, it is important to consider access issues in this context. Specifically, farmers' markets are not as abundant as other types of food retailers, such as grocery stores, and may not exist in certain communities. Moreover, many markets are not open year-round. In this regard, Klerman, Bartlett, Wilde, & Olsho (2014) cited HIP's implementation in grocery stores as well as farmers' markets as one of the Program's strengths, since participants' access to fruits and vegetables was not dependent on seasonality. Similarly, Amaro & Roberts (2017) suggested the

creation of other programs and discounts for low-income families in addition to farmers' market incentives, as many regions of the United States have relatively short farming seasons.

E. Factor 4: Participant Demographics

The literature indicates that the outcomes of incentive programs may be connected to certain demographic characteristics (Hanbury et al., 2017; Dimitri et al., 2015; Herman et al., 2008). Notably, Hanbury et al. (2017) reported that incentive program participants' fruit and vegetable purchases were influenced by their ethnic and cultural backgrounds, noting that many of the foods Mexican-heritage households purchased most frequently, including tomatillo, chayote, chili/jalapeño peppers, and Mexican squashes, were culturally-significant. Additionally, Hanbury et al. (2017) compared their results to those of Herman et al. (2008). While both studies included participants that were Latino, the population considered by Hanbury et al. (2017) resided in a rural area, while the population considered by Herman et al. (2008) resided in an urban area. Through the comparison of the studies, Hanbury et al. (2017) determined that Latinos in rural areas purchased more culturally-significant foods with the benefits they received as a result of incentive programs than Latinos in urban areas. They attributed this difference to the preservation of culture that more often occurs in rural communities than in urban communities. These researchers also compared their findings to those of Andreyeva and Luedicke (2015). They assumed that since the analysis performed by Andreyeva and Luedicke (2015) was conducted on an incentive program in New England, their sample included a high proportion of non-Hispanic whites. Subsequently, Hanbury et al. (2017) assessed the significance of ethnicity of fruit and vegetable purchases in conjunction with incentive programs. They reported that Mexican-heritage households spent 55% of their benefits on fruits and 45% of their benefits on vegetables, while non-Hispanic white households spent 63% of their benefits on fruit and 37% of

their benefits on vegetables. Similarly, Herman et al. (2008) noted that English-speaking African American and white participants consumed more vegetables as a result of incentives, while Spanish-speaking non-Hispanic white participants consumed more fruits as a result of incentives. They attributed this difference to the association between recent immigration status and Spanish language preference and thus concluded that participants who have a strong attachment to their cultural heritage are more likely to maintain culturally-significant eating behaviors. These findings demonstrate that ethnicity and cultural background may affect which foods participants choose to purchase with the benefits they acquire through incentive programs. In turn, they suggest that incentivizing culturally-significant fruits and vegetables for a particular population may increase the effectiveness of programs.

Several demographic factors have also been linked to incentive program retention. Specifically, Dimitri et al. (2015) noted that participants who were more reliant on food banks, very income restrained, and lived in areas where access to food was limited were more likely to drop out of the incentive program they studied. These researchers were not able to determine whether these factors directly caused participants to drop out of the program. However, their finding suggests that the presence of these factors may impact the effectiveness of incentive programs, as participant retention is essential for incentives to influence fruit and vegetable purchases and consumption.

Although the literature illustrates that demographic characteristics may impact which fruits and vegetables participants purchase as well as program retention, it indicates that these characteristics do not substantially impact the degree to which incentives increase total fruit and vegetable purchases and consumption. Notably, Klerman et al. (2014) examined HIP's impact on fruit and vegetable consumption in relation to gender, age, education, race/ethnicity, disability

status, employment status, household composition, WIC status, and SNAP benefit amount. They found that differences in total consumption between these demographic subgroups were not statistically significant. Accordingly, the literature suggests that demographic characteristics may affect which fruits and vegetables participants' purchase and consume as well as program retention but do not impact overall changes in the amount of fruits and vegetables that participants purchase and consume as a result of incentive programs.

F. Additional Research

Although the literature indicates that incentive programs positively impact fruit and vegetable purchases and consumption by federal food assistance participants, it also reveals several areas that require additional research in order to understand how to create effective programs. For instance, other interventions, such as nutrition education, cooking demonstrates, and food tastings, are often deployed in conjunction with incentives. These interventions not only equip participants with the knowledge they need to make healthy eating decisions and integrate healthy foods into their diets but may also contribute to participant retention. For example, Bowling et al. (2016) reported that exposure interventions such as cooking demonstrations, tastings, recipe card offerings, and children's educational activities was equally important for retention as incentives. In addition, Dimitri et al. (2015) hypothesized that the integration of education or health consultations may improve participant retention. As retention is a key determinant of program effectiveness, these findings highlight the need for additional research to understand the interplay between incentives and other interventions in increasing fruit and vegetable purchases and consumption.

Another area in which additional research is needed is the actual impact that incentives have on health outcomes. Incentives have been demonstrated to improve program participants'

perceptions of their health (Lindsay et al, 2013; Food and Nutrition Service, 2014). However, with the exception of Hanbury et al. (2017) and Herman et al. (2008), which evaluated participants' weights, BMIs, and other relevant health metrics, few studies have used health data to draw conclusions about the actual effect of incentives on health. Instead, most of the research has relied on self-reported assessments of health status as well as inferences about health based on the established relationship between fruit and vegetable intake and chronic disease. Consequently, the actual impact of incentives on health remains unclear. In addition, the magnitude of fruit and vegetable consumption increases in relation to health outcomes requires further study. Specifically, in evaluating HIP, An (2015) determined that although expanding HIP nationwide would likely increase fruit and vegetable purchases and consumption, changes in diet are proportional to changes in the price of fruits and vegetables. Thus, An concluded that even reducing the cost of fruits and vegetables by 30% would not increase consumption enough to generate substantial changes in weight, disease prevention, and quality of life. Accordingly, identifying the point at which incentives create a tangible difference in health outcomes is key for creating programs that promote participants' well-being.

Another gap in the literature relates to the long-term effects of incentives. Few studies have investigated the capacity of incentive programs to influence long-term food consumption and purchasing behavior. Thus, the long-term efficacy of incentives is uncertain (Savoie-Roskos et al., 2016; Olsho et al., 2016). While Herman et al. (2008) reported that incentives increased participants' fruit and vegetable consumption even six months after the program's conclusion, the majority of the literature has only measured changes in fruit and vegetable purchases and consumption while the program is still in progress and immediately after its conclusion. Moreover, the research that has considered the long-term impacts of incentive programs has

relied on self-reported predictions of future food purchasing behavior (Lindsay et al., 2013). As no longitudinal studies of the impact of incentive programs have been performed, additional research is required to determine the long-term impact of these programs.

Overall, studies of incentive programs reveal the potential effectiveness of incentive programs for improving the dietary quality of federal food assistance program participants. The literature indicates that incentive programs have a positive impact on both fruit and vegetable purchases and consumption. However, the research regarding the application of incentives to the food purchasing and consumption behavior of federal food assistance participants has been fairly limited, as there are only twelve empirical papers examining the use of incentives. Moreover, there are several challenges regarding the effective design and implementation of incentive programs that require additional research, including ensuring that benefits are spent on healthy foods, establishing the parameters for the foods targeted by incentives, employing incentives in venues in which they will have a maximum impact, and appealing to certain demographic subgroups. In addition, there is a need for additional investigation regarding the impact of incentives on long-term food consumption behavior and health outcomes. Exploring these factors is critical for understanding how to effectively design and implement effective incentive programs.

III. Methods

Although a number of studies have explored incentives as a strategy for improving the dietary quality of low-income individuals by studying the design and implementation of individual programs (Amaro & Roberts, 2017; Bowling, Moretti, Ringelheim, Tran, & Davison, 2016; Dimitri, Oberholtzer, Zive, & Sandolo, 2015; Lindsay, Lambert, Penn, Hedges, Ortwine,

Mei, Delaney, & Wooten, 2013; Savoie-Roskos, Durward, Jeweks, & LeBlanc, 2016; Freedman, Mattison-Faye, Alia, Guest, & Hébert, 2014; Olsho, Payne, Walker, Baronberg, Jernigan, & Abrami 2015; Hanbury, Gomez-Camacho, Kaiser, Sadeghi, & de la Torre, 2017; Young, Aquilante, Solomon, Colby, Kawinzi, Uy, & Mallya, 2013; Andreyeva & Luedicke, 2015), these studies have largely utilized pretest-posttest designs in which one type of incentive program is implemented and evaluated. As such, no studies have evaluated the outcomes of multiple incentive programs simultaneously, and no comparative case studies have been conducted.

Using a comparative case study, this research contributes to the literature by employing a novel approach to assess the impact of incentive programs on SNAP participants' behaviors related to the purchase and consumption of fruits and vegetables and perceptions of the affordability of these foods. While this research has as a similar objective as the existing literature—to evaluate incentives as a strategy for increasing the purchase and consumption of fruits and vegetables by SNAP participants—rather than the pretest-posttest studies that have been used previously, it evaluates incentive program outcomes through a case study of completed FINI pilot grant projects. By doing so, this research addresses several gaps in the literature by comparing different incentive programs that have been implemented across the country.

Moreover, this research builds on the existing literature by using a case study approach to verify the impact of various factors on program outcomes. Some of these factors, including type of retailer and benefit distribution, have been previously identified as influencing program outcomes using single-case quasi-experiments but have not been the primary focus of previous investigates. In addition to previously identified factors, this research considers the impacts of

factors that have not been considered in past studies, such as program advertising. Subsequently, it expands understanding of the potential of incentive programs to positively impact SNAP participants' behaviors concerning fruit and vegetable purchase and consumption as well as their perception of fruit and vegetable affordability.

A. Analytical Framework

In this research, the impact of incentive programs is assessed through a case study approach. Specifically, programs are evaluated by analyzing the relationship between factors that were identified as potentially impacting incentive program outcomes in the literature. Qualitative comparative analysis (QCA) is utilized for the analysis. QCA is an approach through which cases can be compared by considering their similarities and differences using logic rules (Shalev, 2007). Through this method, it is possible to identify conditions and combinations of conditions that result in a certain outcome. To identify these conditions and combinations, conditions are assessed by considering their presence and absence in each case. In turn, conditions and combinations are linked to specific outcomes using truth tables (Shalev, 2007). As such, QCA acts as an alternative to regression analysis for analyzing a medium number of cases for which a variety of combinations of factors may lead to the same outcome. In addition, QCA is useful for comparing heterogeneous cases and is thus particularly effective for understanding nuanced social phenomena (Hudson & Kühner, 2013).

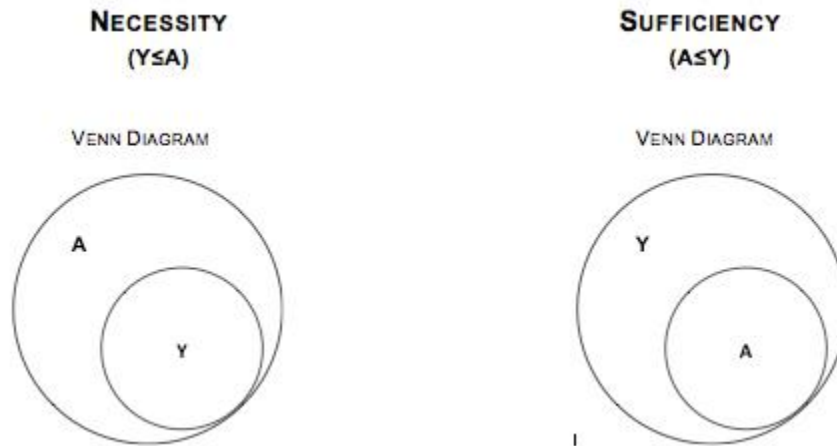
As this research is focused on whether several conditions and combinations of conditions influence the outcomes of incentive programs, QCA is an appropriate methodology because it allows for the evaluation of multiple combinations of factors that potentially give rise to a particular outcome. Therefore, by using this approach, it is possible to identify relationships

between factors in the design and implementation of incentive programs and programs that positively impact participants' behaviors concerning fruit and vegetable purchase and consumption and perceptions of fruit and vegetable affordability. Furthermore, by allowing for the consideration of multiple combinations of conditions, utilizing QCA increases the external validity of this case study and provides a means of understanding the complex relationship between conditions that explain participants' behaviors and perceptions of affordability regarding fruit and vegetable purchase and consumption. In addition, QCA is appropriate due to the number of cases being analyzed. Specifically, this research considers nineteen cases, and consequently, utilizing a small-n case study approach and obtaining detailed information about the history of the design and implementation of each program is not feasible. Moreover, taking a large-n case study approach and utilizing statistical analyses is not suitable due to the limited number of cases. QCA does not require a minimum number of cases for statistical significance and therefore allows for nineteen cases to be considered in this analysis. Furthermore, the data used for this research make the use of QCA appropriate. Specifically, the incentive programs considered used a variety of metrics to assess and report their impacts. QCA allows for the studies to be evaluated despite the variation in the ways in which they assess and report their outcomes by creating a framework in which potential causal factors are systematically coded based on their presence and absence in each of the cases considered. More specifically, crisp-set QCA (csQCA) was chosen for this analysis. For csQCA, conditions are coded dichotomously based on their presence or absence in each case. This approach was chosen over fuzzy-set QCA (fsQCA), an approach for which conditions are coded using values based on 0 and 1 to represent partial membership in a set, because fsQCA requires establishing a greater number of thresholds

for the decision rules, which was not possible due to limitations in the amount of information available about each case.

QCA provides insight into which conditions are necessary and sufficient to produce a specific outcome and thus can be used to establish causal pathways. A condition is considered necessary if it is present in all cases in which the outcome under study occurs (Roig-Tierno, Gonzalez-Cruz, & Llopis-Martinez, 2016). In this research, necessary conditions are those that are present in all projects that have demonstrated positive impacts, although not every project with the condition has a demonstrated positive impact. A condition is considered sufficient if the outcome emerges whenever the condition is present (Roig-Tierno, Gonzalez-Cruz, & Llopis-Martinez, 2016). In this research, sufficient conditions are those that are always present in projects with positive impacts, but not every project that has a positive impact has the condition. Figure 1 represents the relationship between outcomes and conditions for both necessity and sufficiency where A is the condition and Y is the outcome (Legewie, 2013). As this figure illustrates, a condition is necessary when the cases with the outcome are a subset of all cases with the condition, and a condition is sufficient when the cases with the condition are a subset of the those with the outcome.

Figure 1: Necessity and Sufficiency



Source: Legewie, N. (2013). An Introduction to Applied Data Analysis with Qualitative Comparative Analysis. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 14(3). <http://dx.doi.org/10.17169/fqs-14.3.1961>

For the purposes of QCA, consistency is the percentage of conditions or combinations of conditions associated with the same outcome, and coverage is a percentage of cases in which the condition or configuration of conditions is present in all cases with a certain outcome. In other words, consistency provides an indication of the significance of necessity and sufficiency, and coverage represents the variance of necessity and sufficiency. Thus, calculating consistency scores is useful for identifying conditions that are significant for predicting a particular outcome, and calculating coverage scores is useful for determining which conditions are most relevant for predicting a certain outcome. Notably, sufficiency coverage is mathematically equivalent to necessity consistency, and thus practical applications of QCA often use these scores for both necessity and sufficiency interchangeably to assess the relationship between potential predictor conditions and outcomes (Roig-Tierno et al., 2016; Cooper & Glaesser, 2016). In this research, identifying conditions and combinations of conditions with high consistency and coverage scores serves as an avenue for determining which characteristics of incentive programs appropriate for predicting whether a project has a positive impact.

B. Case Selection

As stated previously, the USDA is currently administering the FINI grant program to further explore incentives as a strategy for increasing fruit and vegetable purchase and consumption by SNAP participants. FNS and NIFA launched FINI in 2015 to expand understanding of the effectiveness of incentives for improving the dietary quality of SNAP participants. The stated goal of FINI is to “fund and evaluate projects intended to ‘increase the purchase of fruits and vegetables by low-income consumers participating in SNAP by providing incentives at the point of purchase’” (National Institute of Food and Agriculture, 2017, 3). These incentives are “intended to increase the consumption of qualifying fruits and vegetables” (National Institute of Food and Agriculture, 2017, 12). FINI defines incentives as “any financial or non-financial inducement that would increase the purchase and consumption of fruits and vegetables by SNAP participants” (National Institute of Food and Agriculture, 2017, 4). Moreover, FINI defines fruits and vegetables as “any variety of fresh, canned, dried, or frozen whole or cut fruits and vegetables without added sugars, fats, or oils, and salt (i.e. sodium)” (National Institute of Food and Agriculture, 2017, 3).

Through FINI, the USDA has granted \$65.1 million in funding to non-profits and government agencies for designing, implementing, and evaluating a variety of point-of-sale incentive programs aimed at increasing the purchase of fruits and vegetables by SNAP households (United States Department of Agriculture, 2015; United States Department of Agriculture, 2016a; United States Department of Agriculture, 2017). FINI funds projects based on three distinct categories: pilot projects, which are no more than one year in duration and receive \$100,000 or less in USDA funding, multi-year community-based projects, which are no more than four years in duration and receive \$500,000 or less in USDA funding, and multi-year

large-scale projects, which are no more than five years in duration and receive \$500,000 or more in USDA funding. According to FINI's *2018 Request for Applications*, pilot projects "support the development of projects with an infusion of federal dollars to pilot innovative strategies to increase the purchase of fruits and vegetables...by low-income consumers participating in the Supplemental Nutrition Assistance Program (SNAP) by providing incentives at the point of purchase" (National Institute of Food and Agriculture, 2017, 6). Moreover, these projects are intended to "inform the Department of potential new strategies and promising new programs to consider in future funding cycles" and serve as an initial indicator of program effectiveness at the early stages of development, they are not designed to test overall program effectiveness (National Institute of Food and Agriculture, 2017, 7). Multi-year community-based projects are intended to "create or support local community-based food projects with objectives, activities, and outcomes that are in alignment with the FINI grant program's primary goals" (National Institute of Food and Agriculture, 2017, 7). Specifically, they are designed to "inform future efforts, and develop effective and efficient benefit redemption technologies" (National Institute of Food and Agriculture, 2017, 7). These projects have pre-established relationships with community partners and expand the scope or reach of existing programs ((National Institute of Food and Agriculture, 2017, 7-8). Multi-year large-scale projects "create or support multi-county, State-wide and regional incentive programs" with the goal of "test[ing] strategies that could contribute to our understanding of how best to increase the purchase of fruits and vegetables by SNAP participants to inform future efforts" (National Institute of Food and Agriculture, 2017, 8). In some cases, grantees have been awarded funding for pilot projects and received additional FINI funding in subsequent years. In addition, grantees may be given extensions to continue their projects beyond the originally specified duration of time, however,

they are not granted additional USDA funding to do so. The USDA has awarded FINI funding on a yearly basis since 2015. Consequently, as of the time of this writing, ninety projects have been awarded funding (United States Department of Agriculture, 2015; United States Department of Agriculture, 2016a; United States Department of Agriculture, 2017).

The focus of this research on FINI projects is timely for several reasons. Firstly, the specifications in place by the USDA for FINI funding serve as a means of standardizing the cases and the subjects to SNAP participants. While most of the literature has focused on participants in federal food assistance programs generally, FINI grant programs are limited to SNAP participants, and thus provides an opportunity to study how this group responds to fruit and vegetable incentives. Moreover, FINI has set specifications for how incentives and fruits and vegetables are to be defined, which eliminates additional potential for variation between the cases studied in this research. Secondly, information about each of the FINI projects is readily accessible through the USDA Current Research Information System (CRIS). Thirdly, it is possible that the USDA will use the outcomes of FINI projects to alter SNAP in ways that enable the program to better address the dietary quality of its participants, and therefore, focusing on FINI projects increases the relevance of this research for current policy considerations.

This research specifically considers FINI projects that were granted funding in 2015 and 2016. In 2015, FINI grants were awarded to sixteen pilot projects, seven multi-year community-based projects, and eight multi-year large-scale projects. In 2016, there were twelve pilot projects, eleven multi-year community-based projects, and four multi-year large-scale projects. Projects that were granted funding in 2017 are excluded, as the 2017 grantees were not announced until August 7, 2017 and therefore have no results to report as of the time of this writing. The FINI projects awarded funding in 2015 and 2016 were identified using press

releases from the USDA (United States Department of Agriculture, Office of Communications, 2015; United States Department of Agriculture, Office of Communications, 2016a).

Accordingly, fifty-eight projects were initially considered to understand the evaluation measures most commonly used by programs as well as to identify potentially salient variations in how the programs were designed and implemented.

FINI grantees are required to provide yearly reports in which they detail their progress, report any challenges, and discuss the impact of their projects. These project reports were used to identify which projects have been completed. Projects for which the status was noted as “terminated” were considered complete and utilized in the analysis. On-going projects were not included in the analysis, as it is difficult to accurately predict what the outcomes of these projects will be in the upcoming years. Thus, nineteen of the fifty-eight projects have been completed and were analyzed in this research. As a result of the relative recency of the FINI grant, all of the projects considered in this analysis are pilot projects, as no multi-year large-scale projects or multi-year community-based projects had been completed at the time of this writing. The inclusion of only pilot projects limits the scope of this research, as pilot projects are designed to test program efficacy rather than effectiveness. Accordingly, this research seeks to determine whether certain factors and combinations of factors affect the outcomes of incentive programs and result in programs positively impacting SNAP participants’ behaviors and perceptions relating to fruit and vegetable purchase and consumption.

C. Data Collection

Information about the design and outcomes of each project was obtained from the project completion reports authored by the grantees of the nineteen completed projects using CRIS. These reports were identified using the name of the grantee organizations as the search terms. In

some cases, the websites of organizations that received FINI funding were also consulted for additional information about the incentive programs and their outcomes. In addition, the directors of each project were contacted to verify the accuracy of the data. Of the nineteen directors that were contacted, seven were responsive to the request and verified the accuracy of the data.

To evaluate the incentive programs, factors in the design and implementation of projects that have a potential impact on the outcomes of incentive programs were selected for analysis. The factors were selected firstly by reviewing the existing literature surrounding the use of incentives to improve the dietary quality of federal food assistance participants. Through this review, several factors in need of additional research were identified. Secondly, by reviewing the fifty-eight completed or in-progress project reports to identify recurring characteristics of incentive program design and implementation as well as the types of outcomes that have been measured and recorded in the project report, it became apparent which of the factors would be possible to study using the FINI project reports. Subsequently, the type of retailers in which programs were deployed, other interventions employed in conjunction with incentives, advertising used to promote the programs, the value and distribution of the benefit used to induce participants to purchase fruits and vegetables were selected as factors to consider in the analysis. These factors created the framework for the subsequent data collection.

After the factors were identified, conditions in the design and implementation of incentive programs were selected in order to operationalize these factors. Data for these conditions were obtained from the project reports and project directors as well as from grantee websites in instances where information about a condition was not included in the project report.

The factors and their corresponding conditions as well as the data sources and number of projects considered are described in Table 7.

Table 7: Factors for Analysis

Factor	Definition	Conditions	Data Sources
Type of Retailer	Type of retail environment in which program was deployed	<ul style="list-style-type: none"> • Farmers’ market • Grocery store • Mobile retailer • CSA/Co-op 	Project reports from CRIS Grantee Websites Project Directors
Other Interventions	Efforts used to affect behavior in addition to offering incentives	<ul style="list-style-type: none"> • Education • Healthcare Services 	Project reports from CRIS Grantee Websites Project Directors
Advertising	Strategies used to recruit and encourage participation	<ul style="list-style-type: none"> • Printed advertising • Community partners • Signage • Personal communication • Social media • Mass media 	Project reports from CRIS Project Directors
Benefit Value	Magnitude of food purchasing resources that participants received	<ul style="list-style-type: none"> • Low value • High value 	Project reports from CRIS Grantee Websites Project Directors
Benefit Distribution	What participants had to do to receive the benefit used to incentivize fruit and vegetable purchases	<ul style="list-style-type: none"> • Participate in the program • Make a purchase • Engage in an activity 	Project reports from CRIS Grantee Websites Project Directors

In order to collect outcome data, the project reports and directors as well as the grantees’ websites in some cases were consulted to understand how the projects measured their outcomes and evaluated their impact. The projects used a variety of different outcome indicators to assess their impact, including benefit redemption rates as well as the number of participants reporting increases in the affordability of fruits and vegetables and increases in fruit and vegetable

purchase and consumption as a result of incentives. Table 8 details the outcomes considered in this analysis.

Table 8: Outcomes Considered

Outcomes	Data Source	Number of Projects
Benefit redemption rates	Project reports from CRIS Project Directors	3
Participants reporting increases in fruit and vegetable consumption	Project reports from CRIS Grantee Websites Project Directors	7
Participants reporting increases in fruit and vegetable purchases	Project reports from CRIS Grantee Websites Project Directors	5
Participants reporting that incentives made fruits and vegetables more affordable	Project reports from CRIS Grantee Websites Project Directors	2

D. Data Coding

After the data were collected, decision rules were created in order to code each condition as present or absent in each case. The decision rules corresponding with the identified factors are listed in Tables 9-13. The conditions for type of retailers, other interventions, advertising, and benefit distribution were coded based on their presence and absence in each case. For benefit value, the monetary value of additional food purchasing resources that participants would receive for purchasing \$10 of fruits and vegetables in a single shopping trip was calculated and recorded as a percentage to determine the extent to which the benefit discounted their purchases.

It is important to note that the coding was performed using the data obtained from the project reports and the grantees' websites and, when possible, verified with the project director. As such, a project was only coded as present in a set if a condition was specifically mentioned as

present in the project by at least one of these sources. Notably, a project could be coded as present for more than one of the conditions for each factor. For instance, if a project was conducted at both a farmers’ market and a grocery store, it was coded as present in both of these sets.

Table 9: Decision Rules for Type of Retailers

Condition	Decision Rule
Farmers’ Market	If the project administered the incentive program in at least one farmers’ market, it was coded as present in the set.
Grocery Store	If the project administered the incentive program in at least one grocery store, it was coded as present in the set.
Mobile Retailer	If the project administered the incentive program using at least one form of mobile retailer, such as a food truck or temporary farm stand, it was coded as present in the set.
CSA/Co-op	If the project administered the incentive program using community supported agriculture (CSA) or agricultural co-ops through which participants regularly received local, seasonal produce, it was coded as present in the set.

Table 10: Decision Rules for Other Interventions

Condition	Decision Rule
Education	If the project provided healthy eating classes, information about nutrition, or guidance about how to plan healthy meals, it was coded as present in this set. Furthermore, if the project provided cooking demonstrations, recipe handouts, or food samples, it was coded as present in this set. If the project included tours of farmers’ markets or grocery stores, it was also coded as present in this set
Healthcare Services	If the project provided participants with access to healthcare services, such as screenings or consultations, it was coded as present in this set.

Table 11: Decision Rules for Advertising

Condition	Decision Rule
Printed Materials	If the project utilized printed materials, such as flyers, mailings, brochures, and posters, it was coded as present in this set. If the type of advertising a project used was not specified, it was coded as present in this set, as it was assumed that at a minimum, projects would create some printed materials.
Community Partners	If the project partnered with other organizations in the community to share information about the project through word of mouth, referrals or recommendations, or the dissemination of advertising materials, it was coded as present in this set.
Signage	If the project utilized large-scale signage, such as billboards or bus ads, it was coded as present in this set.
Personal Communication	If the project advertised to people individually through phone calls, text messages, or emails, it was coded as present in this set.
Social Media	If the project used Facebook, Twitter, or Instagram, it was coded as present in this set.
Mass Media	If the project used TV, radio, or newspaper advertisements or was featured on a TV, radio, or newspaper report or story, it was coded as present in this set.

Table 12: Decision Rules for Benefit Value

Condition	Decision Rule
Low	If the project provided a benefit that saved participants 50% or less on a single purchase of fruits and vegetables worth \$10, it was coded as present in this set.
High	If the project provided a benefit that saved participants 51%-100% on a single purchase of fruit and vegetable worth \$10, it was coded as present in this set.

Table 13: Decision Rules for Benefit Distribution

Condition	Decision Rule
Participate in the Program	If a project automatically provided participants with a benefit as a result of their participation in the program, it was coded as present in this set.
Make a Purchase	If a project provided participants with a benefit after they purchased fruits and vegetables, it was coded as present in this set.
Engage in an Activity	If a project provided participants with a benefit after they engaged in an activity, such as a health screening or farmers' market visit, it was coded as present in this set.

The project outcomes were analyzed to determine whether each project had a positive impact on participants' behaviors concerning fruit and vegetable purchase and consumption and

perceptions of fruit and vegetable affordability. To code the outcome data, thresholds for benefit redemption rates, percentage of participants reporting increases in fruit and vegetable spending and consumption, and percentage of participants reporting that the incentives made fruits and vegetables more affordable, as described in Table 14. These thresholds were chosen based on the results of HIP, as the USDA concluded that the HIP successfully increased fruit and vegetable intake by SNAP participants and that these increases improved participants’ Healthy Eating Index scores (Food and Nutrition Service, 2014). As such, for the purposes of this research, the impact of FINI projects is compared to that of HIP. Although the HIP data used to establish thresholds was specific to grocery stores, for the purpose of this analysis, it is used for programs implemented in all the type of retailers. Furthermore, although these thresholds had the potential to conflict with one another (e.g. a project could have a high redemption rate but a small increase in fruit and vegetable consumption), no such conflicts arose in the coding process.

Table 14: Decision Rules for Outcomes

Condition	Decision Rules
Positive Impact Demonstrated	If the project resulted in an 11% or greater increase in the purchase of fruits and vegetables at either the participant level or the retailer level, it was coded as present in this set. If the project resulted in a 26% or greater increase in the consumption of fruits and vegetables, it was coded as present in this set. If a project reported redemption rates of 51% or more, it was coded in this set. If a project reported that 70% or greater of participants noted that the incentive made fruits and vegetables more affordable, it was coded as present in this set.
No Positive Impact Demonstrated	If a project did not meet at least one of the conditions specified for “Positive Impact Demonstrated,” it was coded as present in this set. Additionally, if the projects used vague statements about its impact, and these statements were not supported with measured indicators, it was coded as present in this set.

Table 15 shows the coded data. The projects are identified by their USDA grant number, and for each project, each of the conditions is coded as present or absent, as indicated by 1s and 0s, respectively.

Table 15: Coded Data

Grant Number	Type of Retailer				Other Interventions		Advertising					Benefit Value	Benefit Distribution			Positive Impact Demonstrated
	Farmers' Market	Grocery Store	Mobile Retailer	CSA/Co-op	Education	Healthcare Services	Printed Materials	Signage	Personal Communication	Social Media	Mass Media	High	Participate in Program	Make a Purchase	Activity	
1006111	0	0	1	0	1	0	1	1	1	1	1	1	0	1	0	1
1006112	1	0	0	0	1	0	1	0	1	0	0	1	0	0	1	1
1006113	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	1
1006139	1	0	0	1	1	0	0	0	0	0	0	1	0	1	0	1
1006145	1	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0
1006148	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1
1006163	0	0	1	0	1	0	1	0	1	1	1	1	0	1	0	1
1006169	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0
1006216	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1
1006235	0	0	1	0	1	0	1	1	1	1	1	1	1	0	0	1
1009415	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
1009421	1	1	0	0	1	0	1	0	0	0	0	1	0	1	0	0
1006250	1	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0
1006283	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1
1006183	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	1
1006153	0	1	0	1	1	0	1	0	1	1	1	0	0	1	1	1
1006118	1	0	1	0	1	0	0	1	0	0	0	1	0	1	0	0
1009399	1	0	0	0	1	1	1	0	1	1	0	0	0	0	1	1
1009408	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0
Totals	12	6	7	5	14	4	12	4	7	7	7	13	4	12	4	13
Percent	63.16%	31.58%	36.84%	26.32%	73.68%	21.05%	63.16%	21.05%	36.84%	36.84%	36.84%	68.42%	21.05%	63.16%	21.05%	68.42%

IV. Analysis

A. Necessity

Preliminary analysis of the data included calculating necessity coverage and consistency scores for each of the conditions considered in this analysis with R using the QCA(GUI) package, as shown in Table 16 (Dusa, 2007). Importantly, the negations of the conditions were not considered, as it was hypothesized that the presence, rather than the absence, of each of the conditions would be predict positive program impacts. As such, the selection of conditions and the context of the research made the consideration of condition negations illogical.

Table 16: Condition Necessity Scores

Factor	Condition	Consistency	Coverage
Retailer	Farmers' Market	0.54	0.58
	Grocery Store	0.31	0.67
	Mobile Retailer	0.46	0.71
	CSA/Co-op	0.38	0.85
Other Interventions	Education	0.77	0.71
	Healthcare Services	0.23	0.75
Advertising	Printed Materials	0.69	0.75
	Signage	0.23	0.75
	Personal Communication	0.54	1.00
	Social Media	0.54	1.00
	Mass Media	0.46	0.86
Benefit Value	High	0.69	0.69
Benefit Distribution	Participate in Program	0.31	1.00
	Make a Purchase	0.46	0.50
	Activity	0.31	1.00

As this table shows, none of the conditions included in this analysis have a consistency score of 1, and thus, none of the conditions are necessary for positive program impacts. For the purposes of QCA, 0.80 is typically used as a threshold for establishing quasi-necessity (Cooper & Glaesser, 2016). None of the consistency scores of the conditions meet this threshold, and thus, there are no quasi-necessary conditions for positive program impacts. In terms of coverage, personal communication, social media, participate in a program, and engage in an activity have maximum scores of 1, and CSA/co-op and mass media meet the threshold for quasi-necessity. As coverage is a measure of how relevant a necessary condition is for an outcome, this finding demonstrates that the relationship between each condition and positive program impact indicated by the consistency score are more relevant than the relationships found between conditions with lower coverage scores. Thus, there is more evidence for the nature relationships between the conditions and outcomes represented by the consistency score. However, since all of the

consistency scores of the conditions fall below the threshold, there is no evidence that any one condition is significantly related to positive program impact. Specifically, the cases with positive program impacts are not a subset of the cases with any one condition. This finding suggests that there are no conditions that occur in all or a significant number of projects that have demonstrated positive outcomes. Notably, as no single conditions are necessary for positive program impacts, there are also no combinations of conditions that meet the requirements for necessity.

B. Sufficiency

a. Multi-Factor Analysis

Initially, the entire dataset was analyzed to determine whether individual conditions and combinations of conditions from different factors are predictors of positive program impacts. An analysis of all possible combinations of present and absent conditions was not possible, because the number of combinations of conditions is represented by 2^k , where k is the total number of conditions. Thus, there are 65,536 potential combinations, which vastly exceeds the computational power of any software program. As such, logical reminders, which are the possible combinations of conditions that are not represented in the dataset, were not considered in this analysis. Notably, an examination of the coded data revealed that each of the cases has a unique combination of conditions, demonstrating that there is maximum diversity in the dataset. As such, the truth table for the entire dataset is identical to the coded data table shown in Table 15, with each of the combinations of conditions having a frequency of one. This finding may be the result of the small number of cases relative to the number of conditions considered, however, it also demonstrates the complexity that exists in incentive program design and implementation.

To investigate the condition combinations that were present in the dataset, the QCA(GUI) R package was employed to create a truth table of all the conditions. This truth table was then minimized to determine which combinations of conditions are sufficient for positive program impacts (Dusa, 2007). Minimization involves using Boolean algebra to identify prime implicants based on which conditions are sufficient to produce the outcome. Subsequently, conditions that are not sufficient were eliminated, and the remaining combinations of conditions are prime implicants (Ragin, 2010). Accordingly, the truth table was reduced from nineteen combinations to twelve combinations, as shown in Table 17. Importantly, this reduction was performed by considering the consistency scores of sufficient conditions, and thus the combinations listed in this truth table are associated with positive program impacts. However, as the coverage scores of the remaining combinations of conditions remain very low, there is not strong evidence for the relationships indicated by the consistency scores. As such, the combinations listed in the table are likely not relevant for positive program impacts.

Table 17: Minimized Truth Table of All Factors

Combination of Conditions	Consistency Score	Coverage Score
farmers'market*grocerystore*MOBILERETAILER*csa/co-op*EDUCATION*healthcareservices*PRINTEDMATERIALS*PERSONALCOMMUNICATION*SOCIALMEDIA*MASSMEDIA*HIGH*participateinprogram*MAKEAPURCHASE*activity	1.00	0.15
farmers'market*grocerystore*MOBILERETAILER*csa/co-op*EDUCATION*healthcareservices*PRINTEDMATERIALS*SIGNAGE*PERSONALCOMMUNICATION*SOCIALMEDIA*MASSMEDIA*HIGH*PARTICIPATEINPROGRAM*makeapurchase*activity	1.00	0.08
farmers'market*GROCERYSTORE*mobileretailer*csa/co-op*education*healthcareservices*PRINTEDMATERIALS*signage*personalcommunication*socialmedia*massmedia*high*PARTICIPATEINPROGRAM*makeapurchase*activity	1.00	0.08
farmers'market*GROCERYSTORE*mobileretailer*CSA/CO-OP*EDUCATION*healthcareservices*PRINTEDMATERIALS*signage*PERSONALCOMMUNICATION*SOCIALMEDIA*MASSMEDIA*high*participateinprogram*MAKEAPURCHASE*ACTIVITY	1.00	0.08
FARMERS'MARKET*grocerystore*mobileretailer*csa/co-op*education*healthcareservices*printedmaterials*signage*personalcommunication*SOCIALMEDIA*massmedia*HIGH*participateinprogram*makeapurchase*ACTIVITY	1.00	0.08
FARMERS'MARKET*grocerystore*mobileretailer*csa/co-op*EDUCATION*healthcareservices*printedmaterials*signage*personalcommunication*socialmedia*massmedia*high*participateinprogram*MAKEAPURCHASE*activity	1.00	0.08
FARMERS'MARKET*grocerystore*mobileretailer*csa/co-op*EDUCATION*healthcareservices*PRINTEDMATERIALS*signage*PERSONALCOMMUNICATION*socialmedia*massmedia*HIGH*participateinprogram*makeapurchase*ACTIVITY	1.00	0.08
FARMERS'MARKET*grocerystore*mobileretailer*csa/co-op*EDUCATION*HEALTHCARESERVICES*PRINTEDMATERIALS*signage*PERSONALCOMMUNICATION*SOCIALMEDIA*massmedia*high*participateinprogram*makeapurchase*ACTIVITY	1.00	0.08
FARMERS'MARKET*grocerystore*mobileretailer*CSA/CO-OP*EDUCATION*healthcareservices*printedmaterials*signage*personalcommunication*socialmedia*massmedia*HIGH*participateinprogram*MAKEAPURCHASE*activity	1.00	0.08
FARMERS'MARKET*GROCERYSTORE*MOBILERETAILER*CSA/CO-OP*EDUCATION*HEALTHCARESERVICES*PRINTEDMATERIALS*SIGNAGE*PERSONALCOMMUNICATION*SOCIALMEDIA*MASSMEDIA*HIGH*PARTICIPATEINPROGRAM*makeapurchase*activity	1.00	0.08
FARMERS'MARKET*grocerystore*MOBILERETAILER*CSA/CO-OP*EDUCATION*healthcareservices*PRINTEDMATERIALS*signage*personalcommunication*socialmedia*MASSMEDIA*HIGH*participateinprogram*MAKEAPURCHASE*activity	1.00	0.08
FARMERS'MARKET*grocerystore*MOBILERETAILER*CSA/CO-OP*EDUCATION*healthcareservices*PRINTEDMATERIALS*signage*personalcommunication*socialmedia*MASSMEDIA*HIGH*participateinprogram*MAKEAPURCHASE*activity	1.00	0.08
farmers'market*GROCERYSTORE*mobileretailer*csa/co-op*education*HEALTHCARESERVICES*printedmaterials*signage*personalcommunication*socialmedia*massmedia*HIGH*PARTICIPATEINPROGRAM*makeapurchase*activity	1.00	0.08

*denotes “and”

Capital letters denote presence of condition, and lowercase letters denote absence of condition

As this table indicates, twelve combinations of conditions have maximum consistency scores, which suggests that they are sufficient for positive program impact. However, there is little evidence that the relationships between the combinations and positive program impacts indicated by the consistency scores are relevant due to the low coverage scores. This finding further demonstrates that there are no particular combinations of conditions that are associated with successful incentive programs.

b. Single-Factor Analysis

As the analysis of the entire dataset was complicated by the large number of conditions considered in this analysis, each of the factors was examined separately in order to further understand whether any conditions or combinations of conditions for each factor serve as predictors of positive program impacts. Although this analysis does not consider interactions between conditions from multiple factors, it indicates which conditions and combinations of conditions are associated with positive program outcomes for each factor individually.

To assess the relationship between each isolated factor and positive program impact, separate truth tables were constructed for each of the factors. Tables 18-22 show the truth tables for each of the factors. Contradictions were also identified by determining combinations of conditions that were associated with positive program impacts in some cases and in other cases were not associated with positive program impacts. These contradictions are denoted by Cs in the “Positive Impact” columns.

Table 18: Truth Table for Type of Retailer

Farmers' Market	Grocery Store	Mobile Retailer	CSA/Co-op	Positive Impact	N
1	0	0	0	C	6
0	0	1	0	1	4
0	1	0	0	C	2
0	1	0	0	1	1
0	1	0	1	1	1
1	0	0	1	1	1
1	1	0	1	1	1
1	1	1	1	1	1
1	0	1	1	1	1
1	0	1	0	0	1

Table 19: Truth Table for Other Interventions

Education	Healthcare Services	Positive Impact	N
1	0	C	11
0	0	C	4
1	1	C	3
0	1	1	1

Table 20: Truth Table for Advertising

Printed Materials	Signage	Personal Communication	Social Media	Mass Media	Positive Impact	N
1	0	0	0	0	C	4
0	0	0	0	0	C	4
1	1	1	1	1	1	3
1	0	1	1	1	1	2
1	0	1	1	0	1	1
1	0	1	0	0	1	1
1	0	0	0	1	1	1
0	1	0	0	0	0	1
0	0	0	1	0	1	1
0	0	0	0	1	0	1

Table 21: Truth Table for Benefit Value

High	Positive Impact	N
1	C	13
0	C	6

Table 22: Truth Table for Benefit Distribution

Participate in Program	Make a Purchase	Activity	Positive Impact	N
0	1	0	C	11
1	0	0	1	4
0	0	1	1	3
0	1	1	1	1

These truth tables demonstrate the frequency of each combination of conditions for each factor that emerged in the analysis and reveal contradictions in which the same combination of conditions exists in cases with demonstrated positive impacts and in cases without demonstrated positive impacts. The truth tables were minimized by removing contradictions and identifying sufficient combinations of conditions for positive program impacts using R. As part of this process, coverage and consistency sufficiency scores were calculated through the same process that was employed in the analysis of the entire dataset. Logical remainders were excluded from the minimized truth tables. The minimized truth tables and the scores are shown in Tables 23.

Table 23: Minimized Truth Table for Each Factor

Factor	Condition Combinations	Consistency Score	Coverage Score
Retailer	FARMERS'MARKET*CSA/CO-OP	1.00	0.31
	GROCERYSTORE*mobileretailer*CSA/CO-OP	1.00	0.15
	farmers 'market*grocerystore*MOBILERETAILER*csa/co-op	1.00	0.31
Other Interventions	education*HEALTHCARESERVICES	1.00	0.08
Advertising	PRINTEDMATERIALS*signage*PERSONALCOMMUNICATION*massmedia	1.00	0.15
	PRINTEDMATERIALS*PERSONALCOMMUNICATION*SOCIALMEDIA*MASSMEDIA	1.00	0.39
	PRINTEDMATERIALS*signage*personalcommunication*socialmedia*MASSMEDIA	1.00	0.08
	printedmaterials*signage*personalcommunication*SOCIALMEDIA*massmedia	1.00	0.08
Benefit Value	N/A	N/A	N/A
Benefit Distribution	participateinprogram*ACTIVITY	1.00	0.31
	PARTICIPATEINPROGRAM*makeapurchase*activity	1.00	0.31

*denotes “and”

Capital letters denote presence of condition, and lowercase letters denote absence of condition

As this table indicates, ten combinations of conditions were identified as sufficient for positive program impacts through this analysis. However, as was the case in the analysis of all the factors, the coverage scores for each combination of conditions fall well-below the 0.80 threshold, which indicates that none of these combinations are relevant for predicting positive program impacts.

V. Discussion

Regardless of the conditions present, the majority of the projects included in this analysis positively impacted SNAP participants’ fruit and vegetable purchase and consumption behaviors and perceptions of affordability. Specifically, 68% of the projects met one or more of the thresholds established for indicating that a project had a demonstrated positive impact. This finding further confirms that incentive programs have outcomes that positively affect SNAP participants’ fruit and vegetable purchases and consumption. As such, this analysis adds to the

growing evidence that incentive programs are an effective approach for increasing fruit and vegetable purchase and consumption.

This analysis also demonstrates the complexities of designing and implementing incentive programs that positively impact SNAP participants' fruit and vegetable purchasing and consumption behaviors and perceptions of affordability. Specifically, as no conditions were identified as necessary for positive program impacts, it suggests that none of the conditions or combinations of conditions considered are present in every project or a significant number of projects in which positive impacts were achieved. As each project has a unique combination of conditions, the nature of the dataset demonstrates that no one condition is sufficient for positive program impact. Although condition combinations were identified as sufficient, the low coverage scores of these conditions demonstrate that there is little evidence that they have strong associations with positive program impacts. As such, it is unlikely that the condition combinations identified as sufficient are predictors of positive program impact. Furthermore, when the conditions were analyzed for sufficiency by factor, no combination of conditions related to certain factors met the threshold for coverage, and thus, similar to analysis of the entire dataset, this analysis did not reveal that any particular combinations of conditions are adequate for predicting program impact. In addition, although the coverage scores of the combinations in benefit distribution and retailer type were slightly higher than those for the other factors, these scores still fall well-below the 0.80 threshold, suggesting that there is little evidence for the relationship between these combinations and positive program impact demonstrated by the consistency scores. In sum, although certain condition combinations emerged as sufficient, these combinations are poor models of program impact, as they explain very little of the variation in project conditions and associated impact. It is possible that the inability of this research to

identify potential causal pathways for positive program impact is due to limitations in the data, as described in greater detail below. Additionally, it is also possible that the conditions included in this analysis are not predictors of positive program impact and that other conditions serve to determine whether or not a program has a positive impact. Important conditions of study for future research are described in greater detail below as well.

Although no conditions or combinations of conditions emerged as necessary or sufficient for positive program impact, this analysis illustrates the potential importance of certain factors in designing and implementing programs that positively impact SNAP participants' fruit and vegetable purchase and consumption and perception of affordability. In particular, every project that used two or more forms of advertising had a demonstrated positive impact. This finding suggests that advertising may play a role in program outcomes, as it appears that employing multiple types of advertising is important for designing and implementing programs that positively impact SNAP participants' fruit and vegetable purchase and consumption behaviors and perception of affordability.

VI. Limitations

It is important to note that this research investigates the impact of incentive programs on the behaviors and perceptions of SNAP participants concerning the purchase, consumption, and affordability of fruits and vegetables. Its scope is thus limited in that it does not consider whether incentive programs resulted in participants increasing their purchasing and consuming of produce in amounts that are significant to their overall dietary quality, nor does it explore the impact of incentives on the health outcomes of participants. Although these considerations are essential for policymaking aimed at improving public health, limitations in the available data and

the exclusive use of pilot projects in this analysis restricted the analysis to the behaviors and perceptions of affordability of participants. Moreover, the USDA maintains that the goals of the FINI grant program are to increase SNAP participants' purchase and consumption of fruits and vegetables and does not explicitly state that the intent of the program is to improve dietary quality (National Institute of Food and Agriculture, 2017). Accordingly, it is important note that the program deemed as having a demonstrated positive impact in this research have been shown to positively impact purchase, perceptions of affordability, and/or consumption, not dietary quality.

This research is also limited by the variability in the ways that the projects considered measured and reported their outcomes. Each of the projects used a combination of different indicators to draw conclusions about the impact of their program. Thus, assessing the outcomes required establishing thresholds for several indicators. Moreover, many of the projects did not directly measure changes in fruit and vegetable purchase and consumption, but relied on less direct indicators of program impact, such as benefit redemption rates and perceptions of the affordability of fruits and vegetables, to evaluate their efficacy. Furthermore, the level of detail with which the projects reported their data and conclusions differed significantly, and not all project directors were responsive to the request for additional information. As such, it is possible that some conditions were coded as absent even though they were present in the project because of the limited degree of detail in the data sources. Moreover, projects that did not specifically record or report meeting the threshold for positive outcome were coded as such, even though it is possible that these projects did meet the thresholds but had no report of doing so. For example, projects that did not track individual participants were not able to assess changes in participants' consumption of fruits and vegetables. Thus, although these projects may have increased

participants' consumption by more than 26%, they did not assess and report this impact and thus may have not been coded as having a demonstrated positive impact. The projects also varied in terms of their enrollment guidelines. Although all the projects required program participants to be SNAP participants, some of the projects had additional eligibility requirements, such as participating in a baseline survey. These additional requirements may have resulted in lower redemption rates for certain projects, as people may have been more reluctant to participate in programs that required them to partake in additional activities. As the guidelines for enrollment were not clearly specified in each project report, they were not considered in this analysis.

Another important consideration to make when assessing the outcomes of each project is the differing levels of funding that each project received. As all of the projects considered in this analysis are pilot projects and therefore received at most \$100,000 in USDA funding, which they then had to match in their own monetary and non-monetary resources, there was a significant range in the total amount of funding that each project received (National Institute of Food and Agriculture, 2017; United States Department of Agriculture, Office of Communications, 2015; United States Department of Agriculture, Office of Communications, 2016a). The amount of funding each project received may be a determinant of the extent of its impact. However, as the focus of this research is understanding impact in terms of program design and implementation factors, funding was considered in this analysis. Moreover, there was a lack of available data to assess the effect of funding on program impact, as it is not guaranteed that each project utilized the total amount of funding they received. For instance, in cases where program enrollment was lower than anticipated, projects would be required to return unused government funds to the USDA. Since only the amount of funding granted by the USDA was publicized, additional

information about the total costs of each project would be required to accurately evaluate the impact of funding differences on program outcomes.

Generalizability may also be a limitation of this research due to the limited number of cases. As only nineteen FINI projects have been completed, the generalizability of this study is limited as a result of the small sample. Despite the limitations in its generalizability, this research elucidates which factors potentially influence the impact of incentive programs and thus provides a focus for future research once all FINI projects are completed. It is also possible that other factors than the ones identified may impact the outcomes of incentive programs. For instance, as discussed in greater above the literature review indicated that the type of food included in incentive programs and the ethnicity of participants may also impact the outcomes of programs, but it was not possible to study these factors in this research due to limitations in the available data. There are also additional barriers that may affect the ability of participants to utilize benefits, such as access to transportation and the internet. However, it was not possible to study these potential salient factors with the existing data. Thus, with more data and cases, it may be possible to develop a fuller understanding of the factors affecting incentive program impact.

VII. Future Research

Although the FINI pilot projects considered in this analysis are not intended to evaluate effectiveness but rather to demonstrate the efficacy of these programs, the results of this analysis highlight the relative importance of factors and combination of factors in designing and implementing programs that increase fruit and vegetable purchases. As additional FINI projects are completed, particularly multi-year community-based and multi-year large-scale, which are intended to evaluate program effectiveness in terms of increasing fruit and vegetable purchase

and consumption, it may be possible to use the project outcomes to determine whether incentive programs significantly increase fruit and vegetable purchase and consumption. Building on the approach used in this research, future studies should investigate program effectiveness as a product of the causal conditions and combinations of conditions considered in this study. Moreover, to supplement the findings of these studies, in-depth semi-structured qualitative interviews with program directors could be useful for determining the specific characteristics of conditions that impact program outcomes. In particular, the specific nature of conditions like retailer type, nutrition education, printed materials used, and social media employed may be relevant for program impact. For example, in this research, any project that had some form of education was coded as present in the education set. However, there may be some important distinctions between projects in this set in terms of the type of education provided and the extent to which education was a focus of the project, as some projects seemed to have merely distributed printed materials with nutrition information while others facilitated small group or one-on-one meetings in which participants met with nutrition experts. As such, interviews with program directors may be beneficial for gaining a more in-depth understanding of the particular characteristics of incentive programs that affect their impact. Thus, this study provides a basic framework for future research aimed at elucidating the effectiveness of incentives for increasing the consumption of fruit and vegetable by SNAP participants as a strategy for improving the dietary quality of these participants and elucidates areas of focus for future studies.

In addition to studying the effectiveness of incentive programs for increasing fruit and vegetable purchase and consumption, there is a need for additional research on the ability of programs to improve the diets and health outcomes of SNAP participants. While the existing literature indicates that incentive programs are effective for increasing fruit and vegetable

purchase and consumption, no longitudinal studies have been performed to elucidate the long-term impact of incentives on dietary quality and health outcomes. Similarly, few studies have investigated the significance of subsequent increases in fruit and vegetable consumption on diet and health after the incentive program ends. Thus, it remains unclear whether incentive programs serve as a pathway for addressing diet-related health issues. Future research should seek to determine if incentives have a long-term impact on SNAP participants' diets as a whole and whether any dietary improvements are substantial enough to result in positive health outcomes.

There are also several additional factors in the design and implementation of incentive programs that should be investigated in future research. For instance, the literature review indicates that the type of food included in incentive programs may impact the outcomes of programs. However, this factor was not included in this analysis, because FINI only considers fruits and vegetables, defined as “any variety of fresh, canned, dried, or frozen whole or cut fruits and vegetables without added sugars, fats, or oils, and salt (i.e. sodium)” (National Institute of Food and Agriculture, 2017, 3). Notably, given that ten out of nineteen projects were conducted exclusively at farmers' markets or mobile markets, it is likely that the incentives largely targeted fresh fruits and vegetables since frozen and canned are not typically sold at these types of retailers. Although a few of the project reports noted that the grantees limited their programs to fresh fruits and vegetables, the specifications for the types of fruits and vegetables included were not discussed in the majority of project reports. Thus, it was not possible to evaluate the impact of the inclusion of only fresh fruits and vegetables or fresh, canned, dried, frozen whole or cut fruits and vegetables included on the outcome of incentive programs. Similarly, the literature review indicates that the types of fruits and vegetables incentivized may impact the outcomes of incentive programs targeted to a specific ethnic population, as people tend to prefer culturally-

significant foods. However, only two projects were targeted toward a specific ethnic population, and very few projects reported any participant demographics. As such, evaluating the impact of ethnicity and cultural preferences on incentive program outcomes was not possible. As noted in the literature review, these factors may be key determinates in the success of programs and thus should be considered in future research. In addition, although this research assesses benefit distribution as a factor affecting incentive program impact, it does not evaluate the impact of the timing of the incentive due to the limited information about each project in the project reports. For instance, some programs required participants to use the benefit directly after receiving it at the point of purchase, whereas other programs may have allowed participants to accrue tokens or vouchers that they could use at any point in time. This difference in timing may be a salient factor in program outcome, because, as Yen et al. (2012) noted, the monthly distribution of EBT may result in SNAP participants becoming less food secure at the end of the month. Consequently, the ability to save benefits for periods of time during which participants have fewer food-purchasing resources available may make participants more likely to engage in the incentive program. Furthermore, it is also likely that the relative importance of each factor is determined in part by the environmental and social context in which programs are implemented. For instance, participants' access to transportation and the internet as well as ability to utilize benefits based on limited farmers' market hours may be salient for determining the extent to which people are able to actively participate in incentive programs.

It is also important to note that the focus of this research is the impact of incentive programs, rather than their economic viability. Part of this focus is attributable to the inclusion of exclusively pilot projects. Unlike multi-year community-based projects and multi-year large scale projects, pilot projects are intended to test the efficacy of incentive programs and involve

the development of new programs and the creation of new community partnerships. Thus, the total cost of pilot projects does not necessarily represent the potential costs of more permanent, long-term incentive programs, as they include the initial costs of launching the programs. With this in mind, future research evaluating multi-year community-based projects and multi-year large scale projects should include an analysis of the projects' costs to understand the economic viability of incentive programs. This analysis is an important component of the process of elucidating whether incentive programs as an economically efficient strategy for increasing fruit and vegetable purchase and consumption by SNAP participants.

VIII. Policy Recommendations

A. Recommendation 1: Continuation of Existing Incentive Programs

This study provides further evidence for the ability of incentive programs to increase SNAP participants purchase and consumption of fruits and vegetables. Notably, only six of the nineteen programs considered in this analysis did not meet any of the thresholds for positive impact, and thus about 68% of the projects had demonstrated positive impacts. Since the thresholds for positive impact were determined based on the results of HIP, and the USDA deemed HIP was effective in terms of significantly increasing fruit and vegetable purchase and consumption and positively impacting Healthy Eating Index scores, the number of projects found to have a positive impact in this study further confirms the effectiveness of incentive programs. As such, this research provides additional justification for the use incentive programs as part of an approach for improving the dietary quality of SNAP participants. Thus, the USDA should continue to pursue incentive programs as a potential addition to SNAP, and local governments

that have already adopted some form of incentive programs, such as New York City and the Health Bucks program, should ensure the continuation of these programs.

The evidence for the effectiveness of incentive programs is particularly important for policymakers as they seek to adopt interventions for improving SNAP participants' diets that are effective and equitable. In addition to incentive programs, policymakers have several options to consider for improving SNAP participant dietary quality, including expanding nutrition education programs like SNAP-Ed and restricting the foods that can be purchased with EBT. Although there is evidence for the effectiveness of each of these interventions (Kowalewski-Jones & Duncan, 2001; Food and Nutrition Service, 2013b; Koszewski, Sehi, Behrends, & Tuttle, 2011), incentive programs may better approach to improving dietary quality for a variety of reasons. Specifically, providing nutrition education to participants may enable them to better utilize their financial resources to purchase healthy foods, but it does not actually increase the financial resources participants have to purchase nutritious options, like incentive programs do. Additionally, unlike food restrictions, incentive programs allow participants access to the free-market absent of government action and thus give them greater autonomy over their food choices. This is an especially important consideration for designing policies geared toward ensuring that low-income peoples' individual freedoms and ability to choose are not limited as a result of their financial resources. As such, incentive programs may be a more equitable intervention than food restrictions. Moreover, as discussed in greater detail above, there is evidence that one of the primary barriers SNAP participants face in purchasing and consuming healthy foods is price, not a lack of education or desire. In particular, Anderson & Butcher (2016) found that increasing SNAP participants' monthly benefits by \$30 results in increased healthy food purchases and reduced fast food consumption, which suggests that participants

already have the knowledge and desire to eat healthy diets and are limited in terms of financial access. Thus, unlike other policy approaches, incentive programs directly address one of the underlying causes of poor dietary quality among low-income individuals, and the research has demonstrated that they are an effective pathway for increasing fruit and vegetable purchase and consumption.

B. Recommendation 2: Rigorous Research

This research highlights challenges in evaluating FINI projects. Specifically, this study highlights a lack of rigorous research methodologies employed by grantees. This issue first became apparent when collecting data about each project using CRIS and communications with project directors. In some cases, the project directors noted that certain factors were present in their programs which were not discussed at all in the project reports. Similarly, directors pointed out changes in programs that were made during the implementation phase that were not recorded on CRIS. Moreover, the relatively open-ended requirements of FINI for incentive program design and implementation has resulted in the development of diverse programs in terms of the retailer type, the use of other interventions, advertising, benefit value, and benefit distribution employed. This diversity in conjunction with a lack of consistent and reliable reporting results in challenges related to the identification of causal pathways associated with positive program outcomes, as individual projects are difficult to compare. For instance, although two projects both may have offered some form of educational resources, the projects may differ substantial in terms of the quality of these resources, as some may have merely handed out informational brochures and others may have offered meetings with professionals. These qualitative differences make it difficult to evaluate the impact of educational resources on program outcome. As this example illustrates, in order to better understanding the relative impact of retailer type,

the use of other interventions, advertising, benefit value, and benefit distribution on program impact, it may be beneficial for future government-funded research projects investigating incentive programs to place greater constraints around program specifications and grantee reporting requirements. In particular, as part of their receipt of funding, grantees should be required to report on the specific nature of the retail environment, including its size and location; the other interventions they employed, such as the type of educational materials provided and the ways these materials were made available to participants; the advertising they utilized, such as the number of flyers distributed and prominence of their social media presence; and whether benefits were provided for use at the point of sale or whether participants could save them for use at a future time. Similarly, requiring grantees to more-closely track participants may enable these projects to be used to better understand the role of certain demographic factors in program outcomes. Overall, by requiring this information to be reported in greater detail, it will be possible to compare projects more effectively in order to elucidate the relative impact of each of these factors on program outcomes.

Furthermore, as noted previously, the projects used a variety of approaches for tracking and assessing their outcomes, and in many cases, these approaches lacked scientific rigor. For instance, a few projects merely referenced positive conversations that they had had with participants to evaluate the impact of the program. In addition, many projects did not have a procedure for enrolling participants and thus had no means of tracking the impact of the programs on individual people. Without specifying which outcomes should be tracked and following a standardized approach for measuring these outcomes, it is difficult to compare the impact of programs. As such, the USDA should create standardized outcome reporting metrics

for future FINI grantees and use these metrics to compare the impact of different incentive programs.

The lack of rigorous methodology in FINI projects may be attributable to the fact that very few grants have been awarded to university or other research organizations. Instead, the vast majority of funding has been allocated to community-based organizations. These organizations may lack the resources to perform in-depth research and may be more concerned with utilizing the funds to benefit SNAP participants in their community. Thus, it may be beneficial for the USDA to require future FINI grantees that are community-based organizations to partner with academic institutions to design, implement, and evaluate their programs or to award a greater share of FINI funding to universities and other research organizations. Importantly, as part of the FINI program, grantees are required to provide data relating to “consumer knowledge, attitudes, perceptions, and purchase and consumption behaviors” to Westat, an independent USDA contractor, in order to create a framework for tracking and comparing programs (National Institute of Food and Agriculture, 2017, 28). With this data, Westat will focus on determining incentive program impact on “improving the nutrition and health status of participating households receiving incentives and increasing fruit and vegetable purchases in participating households” (National Institute of Food and Agriculture, 2017, 4). This analysis utilizes data that are not currently available to the public and will likely be more rigorous than the evaluations completed by grant recipients and the one included in this research. Thus, the results may partially address the need for a more rigorous analysis of incentive program impact. Regardless of the source of this analysis, in order to develop programs that successfully increase fruit and vegetable purchase and consumption by SNAP participants, the development of rigorous government-funded research programs is paramount.

IX. Conclusion

This research adds to the existing evidence demonstrating the effectiveness of fruit and vegetable incentives for improving the dietary quality of SNAP participants, as it underscores that incentives positively impact participants' purchase and consumption of fruits and vegetables and their perceptions regarding the affordability of these foods. Furthermore, although additional analyses are required, this research provides new insight into the design and implementation of effective incentive programs, as it reveals certain factors that may not be significant for increasing the likelihood that programs will positively impact participants' behaviors pertaining to fruit and vegetable purchase and consumption and perceptions of affordability. As such, it demonstrates the importance of the ongoing FINI grant program for identifying strategies for improving the diets of SNAP participants. As additional projects are completed and more data become available, it will increasingly become possible to identify specific aspects of incentive programs that result in participants purchasing and consuming more fruits and vegetables.

Continuing to increase understanding of how to effectively enable and encourage SNAP participants to eat more fruits and vegetables is of fundamental importance for addressing ongoing public health concerns involving diet-related chronic disease. Moreover, as the literature demonstrates that price is a key barrier to participants eating healthful diets, continued government action to make healthy foods more accessible to low-income individuals from a cost perspective is paramount. As incentives serve to lower the cost of these foods, they should continue to be explored as a policy tool for promoting equitable access to health-promoting food.

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