



Different Parts of Supplemental Nutrition Assistance Program (SNAP) Leads to Modest Changes in Food Security of Low-income Households

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Research Proposal

Abstract

The U.S. Department of Agriculture (USDA) introduced the Supplemental Nutrition Assistance Program (SNAP) which gives vulnerable households a monetary subsidy to improve food insecurity. The extension of SNAP, SNAP-Ed, provides low cost, and easy-to-prepare recipes and nutrition education materials that teach people to plan, shop, cook, and save to improve their health. This research examined:

1. whether SNAP's food subsidy improves the food security status for program participants and
2. whether SNAP-Ed leads to improvement of food security in low-income households. The objective of the research is to determine the impact of SNAP on low-income households and hence the need to involve eligible non-SNAP participants for comparison purposes.

Participants who had been in the program over the prior 6-7 months and new-entrant households involved the following four cohorts, **SNAP participants will be randomized to one of the 2)-4) conditions:**

- 1) A **control** group: **non-SNAP participants** who have experienced persistent poverty;
- 2) **Participants receive only food subsidies;**
- 3) **Participants receive only food subsidies and education** on food preparation and nutrition;
- 4) **Participants receive only food subsidies and a healthy recipes.**

Participants completed a suggested survey module developed by the U.S. Department of Agriculture, which are measured as indicators of their food security status and well-being.



Statement of the Problem

Background

Food insecurity is important and may have a negative impact on people's physical and mental health and future development .

The U.S. government introduced the Supplemental Nutrition Assistance Program (SNAP) to provide monetary subsidies to vulnerable households to reduce household food stress and improve food security.

The research questions

Whether and to what extent SNAP and SNAP-Ed programs have improved the food security status of participants and what other factors influence these relationships.



Importance of the Study and Social Impact

leads to improvement of food security in low-income households helps USDA to have a preliminary **understanding of the effectiveness of each subproject in SNAP**, and provides support for the general direction of which subproject to invest or reduce in the future. Future decision makers of the SNAP program can find insights from the result of the research and **develop more effective policies** supporting low-income families to reach food security and food sufficiency after the COVID-19 pandemic with limited resources.



Literature Review

Author/Publication & Year	Conclusion	SNAP's Effect	SNAP-Ed's Effect
Mabli, J., & Worthington, J. (2014)	SNAP has improved child food security		
Mabli, J., & Ohls, J. (2014)	SNAP has improved food security for national households		
Center on Budget and Policy Priorities (2022)	SNAP helps low-income Americans access a nutritionally balanced diet		
Adedokun, O. A., Plonski, P., Jenkins-Howard, B., Cotterill, D. B., & Vail, A. (2018)	SNAP-Ed has improved participants' food resource management skills and food safety practices		

However, whether the **specific parts** of SNAP-Ed would have different effects on food security has **not been widely studied yet**.

Research Question

The study was designed to answer the following questions:

- Does **SNAP's food subsidy improve** the food security status and well-being for program participants?
- Do the **SNAP-Ed recipes** recommended diet **have a positive effect** on the food security status and well-being of program participants?
- Do the **nutrition education materials** offered by SNAP-Ed **improve** participating households' food security and well-being?



Population of Interest

- Persons who are **low-income earners** or live below the federal poverty line threshold (**130 percent**).
- The study populations included all households eligible for SNAP benefits based on the **income** and **resources criterion**.
 - Income \leq 130% poverty line **before** any program deductions are made.
 - Income \leq 130% poverty line **after** any program deductions are made.
 - Assets < specific limits, including without member \geq 60 years old and disabled member.



Sample Selection

- In this study, research will evaluate the sample's baseline characteristics using **self-identification** with US census categories.
- We will collect data on SNAP participants in a **survey**. In the study survey, **three questions** will be asked to determine sample participants (the inclusion criteria).
- These inclusion criteria help reduce the study population groups by eliminating participants not fit for inclusion in each study cohort.
- Participants who had been in the program over the **prior 6-7 months** and new-entrant households thus involved **four** cohorts.
- The selection is critically based on **income**.



Sample Size & Statistical Power

- $H_0: \mu_T - \mu_C \leq 0$: The study hypothesized that SNAP benefits improve the food security status and well-being of the program participants.
- Set **statistical power = 90%**.
- We assumed that **effect size=2**, confidence level=95%, standard deviation=10 and level of significance =95%.
- Given that the $\alpha = 0.05$ we will reject the null hypothesis if $Z > Z(1-\alpha) = 1.645$
- $n = \{[z_{1-\alpha} - \Phi^{-1}(\beta)] / \mu_A/\sigma\}^2$
- Then $n = (1.645 - (-1.28)/2/10)^2 = 855.5625$



Operational Procedures

- **Process of conducting the study:**
 - We will request USDA approval and will work with the SNAP program director.
 - Recruited subjects will be **randomly assigned to treatment groups** and will receive different treatments for 6 consecutive months.
 - The study will conduct an **online survey** to assess participants' food security status and well-being after the six months .
 - Subjects in the control group will be recruited via **Survey Sampling International**.
 - Subjects in the treatment groups will take the survey via **official SNAP email**.
- **Risk of Bias:**
 - Participants in the control group who are most affected by food insecurity would be more likely to complete the survey.
 - Participants in the treatment groups who have strong positive or negative opinions about the program would be more likely to complete the survey.
- **Rewards:** Participants will receive a variety of rewards, including cash, food vouchers and lottery tickets.
- **Training:** The data collection team will be trained over two consecutive days prior to collecting the data.



Brief Schedule

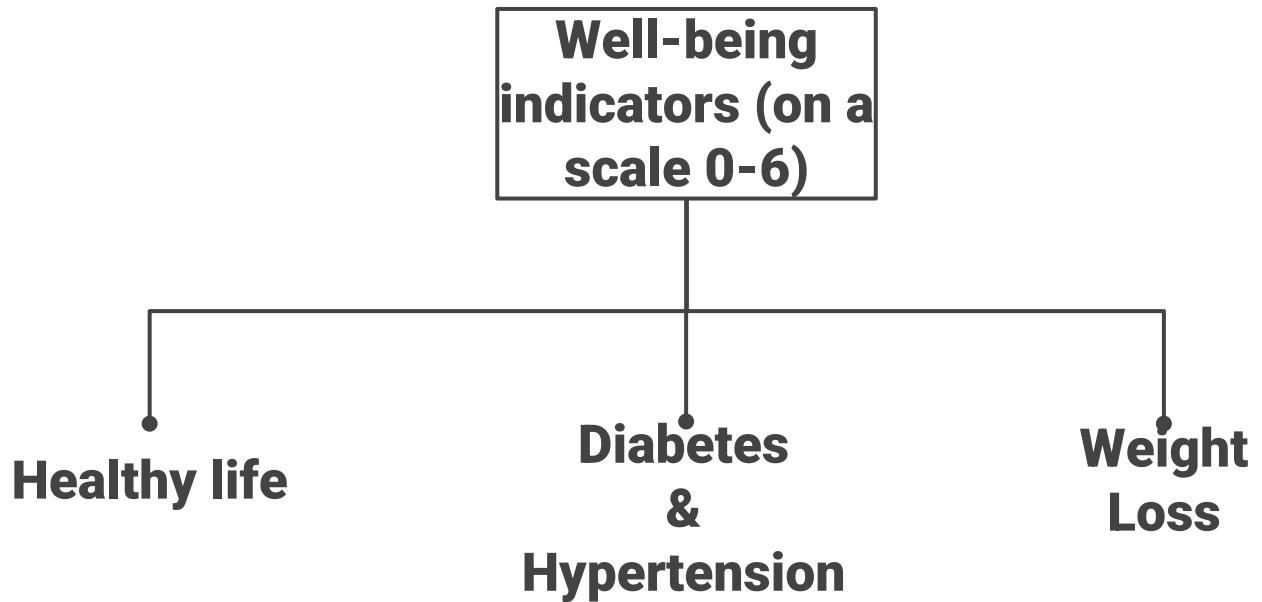
- The estimated **maximum duration of the project** is ~ 359 days.
- The estimated **minimum duration of the project** is ~ 302 days.

Stage	Activity	Estimated duration	Deliverable
Research planning and set-up	Identify research problem	1-3 days	Confirmed research problem
	Formulate hypothesis	1 day	Confirmed hypothesis
	Review published literature	3-5 days	Notes from the review of relevant literature
	Prepare research design	1-2 weeks	Draft research proposal
	Gather peer/reciprocal review	1-2 weeks	Confirmed research proposal
Data collection	Develop sampling plan	2-3 days	Sampling plan
	Develop data collection Instrumentation plan	1 weeks	Draft data collection instrumentation plan
	Conduct a pilot study on a small sample	1-2 weeks	Confirmed data collection instrumentation plan
	Provide training for data collection personnel	2 days	Instructions or training for those who are collecting information
	Conduct the experiment	6 months	Confirmed experiment
	Conduct data collection	1 month	Raw survey data
Data analysis	Prepare data for analysis	2-3 weeks	Data ready for analysis
	Analyze data	1-2 weeks	Draft outcomes/results from analysis
	Draw conclusions	2-3 days	Draft conclusions
Writing up	Final report	3-4 weeks	Final draft
	Review draft with supervisor	3-5 days	Feedback notes
	Final editing	1-2 weeks	Final report
	Final submission	1 day	Final submission of report

Data Collection - six-item short form of the food security survey module developed by the U.S. Department of Agriculture

Topic	Questions	Metric of Performance
Household Food Situation	<ul style="list-style-type: none">“The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?“(I/we) couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?	
Affordability and Meal Size	<ul style="list-style-type: none">“In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn’t enough money for food?”“[IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?”“In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money for food?”“In the last 12 months, were you ever hungry but didn’t eat because there wasn’t enough money for food?”	<ul style="list-style-type: none">Households with high or marginal food security (0-1 affirmative responses)Households with low food security (2-4 affirmative responses)Households with very low food security (5-6 affirmative responses)

Data Collection - additional three survey questions



The expected average completion time is ~ 15 minutes



Data Security

- 1. The participants' confidentiality and health**
- 2. Researcher training and the security of the firms that collaborate**
- 3. The storage of survey data**

Variables



Dependent Variables (S_F)

Food Security Status (S_F):
sum of affirmative responses for food
insecurity questions
(range: 0~6)

Well-being Indicators (S_2):
average score of well-being
measurement questions
(range: 0~6)



Independent Variables

SNAP Participation Status:

Treatment Groups:

- 1)SNAP participants (food subsidy only)
- 2)SNAP participants (food subsidy + education on food preparation),
- 3)SNAP participants (food subsidy + education on healthy diet)

Control Group:

- 4)Non-SNAP participants



Other Variables

Demographic Factors:
gender, age, height, weight,
ethnicity, race, education level,
occupation, history of illness in the
household, and the state or region in
which they reside in the United
States.



Statistical Analysis Plan

1. S_F (Low (6) to High(0)) is transformed to S_1 (Low(0) to High(6))
2. Dependent Variable used: $S_T = S_1 + S_2$; (S_1 : Transformed Food Security Score; S_2 : Well-being Score)

Purpose: To reflect small improvements caused by the each component of SNAP Program

Mean Test

One-sided Two Sample t-test

Test whether significant improvement exists

Alternative Test

ANOVA + Linear Regression

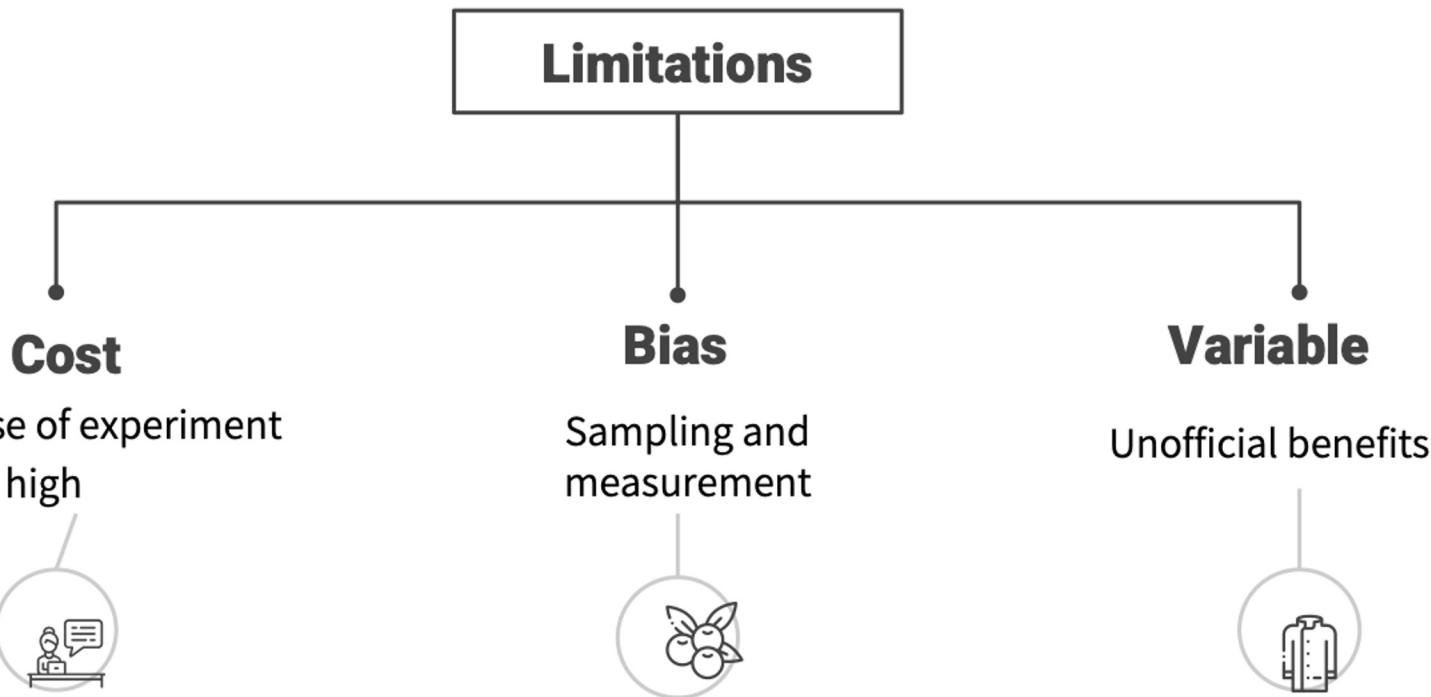
Accounts for potential Confounding Variables

Other Choices

Proportion Test

Can be applied if using categorical dependent variable

Limitations and Uncertainties





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Simulation of Effects

Simulations - Results from 1000 simulated studies

Premise: 1). Power: 0.9; 2). Sample Size: 900 per group

	Research Question	Scenario	Mean Effect	95% CI of Mean Effect	% of False Positives	% of True Negatives	% of False Negatives	% of True Positives
1	Question 1	No Effect	0.001108	[-0.3132, 0.3154]	5.1%	94.9%	-	-
2	Question 1	Effect	0.22416	[-0.0803, 0.5367]	-	-	56.8%	43.2%
3	Question 2	No Effect	0.002935	[-0.3098, 0.3157]	5.4%	94.6%	-	-
4	Question 2	Effect	0.116618	[-0.1952, 0.4285]	-	-	81.4%	18.6%
5	Question 3	No Effect	0.008035	[-0.3017, 0.3178]	5.3%	94.7%	-	-
6	Question 3	Effect	0.11453	[-0.1836, 0.4277]	-	-	80.4%	19.6%

Key Findings from the Simulation

- Perform well in scenario 1 (no effect) - High Percentage of True Negatives
- Poor performance in scenario 2 (Effect) - Low Percentage of True Positives
- The smaller the effect size, the lower percentage of True Positives
- Possible solution - Pick a higher significance level for example 0.1

Sensitivity Test

- Smaller Assumed Standard Error leads to
higher % of True Positives with tiny change in % of True Negatives

SE =6	Research Question	Scenario	Mean Effect	95% CI of Mean Effect	% of False Positives	% of True Negatives	% of False Negatives	% of True Positives
1	Question 1	No Effect	-0.0019454	[-0.2890, 0.2851]	4.5%	95.5%	-	-
2	Question 1	Effect	0.57412	[0.28130, 0.8669]	-	-	2%	98%
3	Question 2	No Effect	0.0003583	[-0.2934, 0.2941]	5.2%	94.8%	-	-
4	Question 2	Effect	0.2799	[-0.0218, 0.5816]	-	-	42%	58%
5	Question 3	No Effect	0.00838	[-0.2961, 0.3128]	6.6%	93.4%	-	-
6	Question 3	Effect	0.2846	[0.0055, 0.5747]	-	-	40.1%	59.9%

Thanks!



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