Community Preventive Services Task Force

Social Determinants of Health: Fruit and Vegetable Incentive Programs

Community Preventive Services Task Force
Finding and Rationale Statement
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CPSTF Finding and Rationale Statement

Intervention Definition

Fruit and vegetable incentive (FVI) programs offer people financial incentives to purchase fruits and vegetables. These programs aim to improve affordability and access to fruits and vegetables for participants with lower incomes. Examples include produce prescriptions, bonus dollars, market bucks, produce coupons, and nutrition incentives.

People can use incentives to help pay for fruits and vegetables at a range of venues, including farmers markets, mobile markets, or grocery stores.

Incentive models may include:

- Point-of-sale discounts (i.e., percentage off regular price)
- Rebates (i.e., cash back for future purchases)
- Matches (i.e., money tied to the dollar amount spent)
- Subsidies (i.e., a fixed amount of money available to purchase fruits and vegetables)

Programs may be implemented by community-based organizations; local, state, territorial, or tribal governments; or health systems. Programs may also offer participants nutrition education, such as cooking lessons or demonstrations.

The impact of the federal nutrition assistance programs such as the Supplemental Nutrition Assistance Program (SNAP); the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); and the Food Distribution Program on Indian Reservations (FDPIR) are outside the scope of this review.

CPSTF Finding (December 2023)

The Community Preventive Services Task Force recommends FVI programs for households with lower incomes based on strong evidence of effectiveness in reducing household food insecurity and increasing household fruit and vegetable consumption.

Programs in which incentives were provided to participants who were at risk for or had diet-related health conditions improved blood glucose as measured using A1C levels.

Fruit and vegetable incentive programs are expected to improve health equity across the United States by improving affordability and access to healthier foods for households with lower incomes.

Rationale

Basis of Finding

The CPSTF recommendation is based on evidence from a systematic review of 30 studies conducted in the US.

To assess intervention effectiveness, a team of specialists in systematic review methods and subject matter experts synthesized outcomes for household food insecurity (i.e., percent who were food insecure), fruit and vegetable consumption (e.g., servings per day, cups per day, times per day), overall diet quality, sugar sweetened beverage consumption, and physical health (e.g., blood glucose, blood pressure, body mass index).

Evidence from the included studies showed FVI programs reduced household food insecurity and improved fruit and vegetable consumption. Evidence also showed that programs in which incentives were provided to participants who were at risk for or had diet-related health conditions improved blood glucose as measured using A1c levels. Studies did not show consistent and meaningful improvement in overall diet quality, blood pressure, or body mass index. There were not enough studies to determine whether FVI programs affected sugar sweetened beverage consumption, self-reported health, or cholesterol (Table 1).

Table 1. Summary of Findings for FVI Programs

Outcome	Number of Studies	Summary Effect Estimates	Direction of Effect
Household food insecurity (measured using United States Department of Agriculture (USDA) U.S. Household Food Security)	12	7 studies with 8 data points **Absolute difference:** Median decrease of 18.00 pct pts (IQI: -25.95, -12.30) **Relative difference:** Median decrease of 23.03% (IQI: -38.71%, -18.10%) 5 studies with 6 datapoints provided narrative results: 3 favorable and significant, 2 favorable, and 1 no change	Favors the intervention
Fruit and vegetable consumption (servings, cups, and times per day)	23	***Servings per day*** 5 studies with 7 data points **Absolute difference:** Median increase of 1.10 serv/d (IQI: 0.30, 1.60) **Relative difference:** Median increase of 27.37% (IQI: 17.04%, 48.44%) 1 study provided narrative result that was favorable and significant ***Cups per day*** 8 studies with 10 data points **Absolute difference:** Median increase of 0.13 cups/d (IQI: 0.10, 0.30) **Relative difference:** Median increase of 7.30% (IQI: 4.78%, 22.10%)	Favors the intervention

Outcome	Number of Studies	Summary Effect Estimates	Direction of Effect
		1 study provided narrative results that showed no change ***Number of times per day*** 5 studies with 5 data points **Absolute difference:** Median increase of 0.49 times/d (IQI: -0.07, 0.61) **Relative difference:** Median increase of 12.73% (IQI: -0.03%, 17.61%) 4 studies with 5 data points provided narrative results: 1 favorable and significant, 1 favorable, 1 no change, 2 unfavorable	
Overall diet quality	4	3 studies with 6 data points **Absolute difference:** Median increase of 1.50 pct pts (IQI: 0.93, 4.88) on the Healthy Eating Index **Relative difference:** Median increase of 3.08% on the Healthy Eating Index (IQI: 1.50%, 9.41%) 1 study provided narrative result that was favorable and significant	Inconsistent results
Sugar sweetened beverage consumption	2	2 studies provided narrative results that were favorable and significant	Too few studies
Blood glucose as measured using hemoglobin A1c	6	6 studies with 6 data points **Absolute difference:** Median decrease of 0.64 pct pts in A1c levels (IQI: -1.33, 0.08) **Relative difference:** Median decrease of 6.67% in A1c levels (IQI: -12.91%, 1.03%)	Favors the intervention

Outcome	Number of Studies	Summary Effect Estimates	Direction of Effect
Blood pressure	5	***Systolic Blood Pressure*** 5 studies with 5 data points **Absolute difference:** Median decrease of 0.49 mmHg (IQI: -2.49, 3.45) **Relative difference:** Median decrease of 0.38% in mmHg (IQI: -1.88%, 2.67%) ***Diastolic Blood Pressure*** 5 studies with 5 data points **Absolute difference:** Median decrease of 0.40 mmHg (IQI: -1.19, 0.83) **Relative difference:** Median decrease of 0.58% in mmHg (IQI: -1.52%, 1.18%)	Inconsistent results
Body Mass Index	7	6 studies with 7 data points **Absolute difference:** Median decrease of 0.05 kg/m2 (IQI: -0.57, 0.10) **Relative difference:** Median decrease of 0.22% in kg/m2 (IQI: -1.98%, 0.37%) 1 study provided narrative result that was favorable and significant	Inconsistent results
Self-reported health	1	1 study provided narrative result that was favorable	Too few studies
Cholesterol	1	1 study provided narrative results for cholesterol measures that showed no change	Too few studies

cup/d: cups per day
kg/m2: kilogram per meter squared
IQI: Interquartile interval
mmHg: millimeters of mercury

pct. pts.: percentage points
serv/d: servings per day
times/d: times per day

Applicability and Generalizability Issues

Intervention Settings

The CPSTF finding is applicable to FVI programs implemented across the United States (30 studies). Three studies were conducted in multiple U.S. regions and the remainder were distributed across the Western (11 studies), Midwestern (7 studies), Northeastern (7 studies) or Southern (2 studies) regions as defined by the U.S. Census Bureau [https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf]. Over half of the included studies evaluated FVI programs in urban areas (16 studies). The remaining studies were conducted in a combination of urban, suburban, and rural settings (9 studies), rural areas alone (4 studies), or tribal lands (1 study).

Population Characteristics

The CPSTF finding is applicable to participants with lower incomes. It is also applicable regardless of participants' sex, race or ethnicity, age, or educational attainment.

All studies evaluated programs that were designed and implemented among people with lower incomes. In the 14 studies reporting participation in the Supplemental Nutrition Assistance Program (SNAP), 55% of participants received SNAP benefits. In the 11 studies reporting participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), 16% of participants received WIC benefits. In the study that reported participation in the Food Distribution Program on Indian Reservations (FDPIR), 84% received FDPIR benefits.

Twenty-five studies provided data on sex and reported most of their participants were female (median 72% female). Studies included participants who self-identified as Hispanic or Latino (median 37%; 24 studies), Black or African American (median 28%; 26 studies), White (median 27%; 25 studies), Native Hawaiian or Other Pacific Islander (14% from one study), Asian (9%; 7 studies), two or more races (median 3%; 4 studies), American Indian or Alaska Native (2%; 4 studies), and other race or ethnicity (median 4%; 16 studies). One study was conducted on Tribal Lands in the Navajo Nation.

Twenty-two studies reported participant age (median 42 years). Four studies enrolled children as participants. Eleven studies reported educational attainment that were summarized into three categories: greater than high school (median 30%; 11 studies); high school graduate or equivalent (median 35%; 9 studies); and less than high school (median 18%; 9 studies).

Intervention Characteristics

The CPSTF finding is applicable across most intervention characteristics examined, including the organization that offered the program, incentive redemption venue, whether programs offered intervention components in addition to incentives, incentive frequency, some incentive models, and intervention duration.

Incentive programs were offered through local government or community organizations (16 studies), health care providers (13 studies), or a mix of both (1 study). Incentives could be redeemed in farmers markets (16 studies), grocery stores (3 studies), or a mix of both (9 studies). Two studies did not report the redemption venue.

Of studies reporting additional components, programs offered nutrition or diet-related disease prevention education (16 studies), activities or materials in multiple languages (6 studies), and retailer training or support (4 studies). Other

components offered were vendor signage (2 studies) and participant training on how the program works (2 studies). One study each reported having community health workers to follow up on progress of goals, kitchen cooking supplies kit, customized informational mailings, and transportation to the intervention venue. Fourteen studies did not report any additional intervention components.

Participants received incentives monthly (7 studies), weekly (4 studies), at the time of their visit to the program implementation or redemption venue site (12 studies), all incentives at one time (3 studies), or without a formal schedule (4 studies).

Programs were effective when incentives were offered using a subsidy model (i.e., a fixed amount of money available to purchase fruits and vegetables; 21 studies) and matches (i.e., money tied to the dollar amount spent; 6 studies). Few studies reported on point-of-sale discounts (i.e., percentage off regular price; 1 study) or rebates (i.e., cash back for future recipes; no studies) so applicability could not be determined for these models. Two studies reported using more than one type of incentive models.

Of the 22 studies reporting program duration, the median duration was 6 months [Interquartile interval (IQI): 3 to 6 months].

CPSTF could not draw a conclusion regarding the applicability of the incentive amount due to lack of reporting. Incentive amount offered was reported in various ways and most studies did not report the total offered. For the nine studies that did report in terms that could be translated to a monthly maximum amount, the median was $40 (IQI: $20 to $60). Seven studies reported the incentive amount was scaled for household size.

Data Quality Issues

Study designs included single group pre-post (18 studies), randomized control trial (5 studies), pre-post with concurrent comparison group (5 studies), retrospective cohort (1 study), and time series with no comparison group (1 study).

The most assigned study limitations, according to Community Guide quality scoring methods, were loss to follow up and sampling issues due to unclear description of the sampling frame or screening criteria, or low participation rate.

Other Benefits and Harms

CPSTF considered potential additional benefits and harms from exposure to FVI programs.

Postulated potential benefits of the intervention could include the following:

- Expanded economic benefits for local farmers and food retailers which may lead to improved food environment, including an improvement in the quantity and quality of the fresh fruits and vegetables made available to communities (Leng et al. 2022, GusNIP 2023, Vericker et al. 2019);
- Increased awareness and use of farmers markets (Durward 2019);
- Participants feeling more connected to the community (Bowling et al. 2016, Herman et al. 2008); and
- Enhanced fruit and vegetable variety in participants' diets (Trapl et al. 2018).

One postulated potential harm of the intervention could be increased consumption of unhealthy foods due to increased budget for food purchases (Bowling et al. 2016, Harnack et al. 2016, Trapl et al. 2018). However, two included studies

found decreases in consumption of sugar sweetened beverages. One study did not find an increase in consumption of foods with added sugar, candies, sweet baked goods, and fast food.

Considerations for Implementation

The following considerations for implementation are drawn from studies included in the existing evidence review, the broader literature, and expert opinion.

Program participation and retention may be improved by:

- Tailoring the program so that it carefully considers the culture and context of specific populations (Saxe-Custack et al. 2021, Jones et al. 2020).
- Offering additional program components such as cooking demonstrations, grocery store tours, and activities for children (Anliker et al. 1992, Fertig et al. 2021, Bowling et al. 2016).
- Including reinforcing messages about the benefits of increased fruit and vegetable consumption from healthcare providers in programs that offer produce prescriptions (Cavanagh et al. 2017).

Incentive use may be improved by:

- Identifying redemption venues that are accessible to participants and reduce distance and transportation barriers (Bartlett et al. 2014, Veldheer et al. 2021).
- Providing participants with information about how incentives work, which items are eligible for redemption, and where incentives can be redeemed (Atolye et al. 2021, Vericker 2019).
- Providing more flexibility to participants in terms of where incentives can be redeemed.

Other implementation considerations include:

- FVI programs may be of increased relevance in U.S. regions and states with higher rates of household food insecurity (Rabbitt et al. 2023).
- Engaging with community partners (e.g., faith communities, community-based organizations) in program design and recruitment to improve program implementation (Fertig et al. 2021, Lyonnais et al. 2022).
- Supporting participants after the program has ended so they may sustain behavior change without financial incentives.
- Providing implementers with access to technological tools to improve tracking of participants' incentive use and products purchased.

Implementation Resources

The following publicly available resources provide guidance on FVI implementation:

- CDC: Priority Nutrition Strategy: Fruit and Vegetable Voucher Incentives and Produce Prescriptions [https://www.cdc.gov/nutrition/state-and-local-strategies/priority-incentives-prescriptions.html]
    - Provides strategies for state and local partners to expand existing programs
- Nutrition Incentive Hub [https://www.nutritionincentivehub.org/about/nutrition-incentive-hub]
    - Provides training, technical assistance, reporting, and evaluation support to strengthen fruit and vegetable incentive programs

- How to Run a Nutrition Incentive Nutrition Program: A Toolkit for Wholesome Wave's National Nutrition Network [https://www.mainefarmersmarkets.org/wp-content/uploads/2015/10/How-to-Run-a-Nutrition-Incentive-Program-Toolkit_FINAL-8.11.15.pdf]
    - Designed for market managers, electronic benefit transfer (EBT) coordinators, and other program administrators interested in bringing programs to farm-to-retail venues.
- How Does the Gus Schumacher Nutrition Incentive Program (GusNIP) Work? A Theory of Change [https://www.nutritionincentivehub.org/media/cgvfsday/how-gusnip-nutrition-incentives-work_a-theory-of-change.pdf]
    - GusNIP funds government agencies and non-profit organizations to FVI programs. This article provides an overview of how GusNIP nutrition incentives work.
- An Introduction to Incorporating Diversity, Equity, and Inclusion (DEI) into Nutrition Incentive Program Research and Evaluation [https://www.nutritionincentivehub.org/media/rliah2qb/mensch_souza_msu-crfs_dei-in-ni-research-and-evaluation_2021-02.pdf]
    - Provides strategies for incorporating DEI into FVI program research and evaluation
- Supporting Food & Nutrition Security through Healthcare [https://nopren.ucsf.edu/sites/g/files/tkssra5936/f/Supporting F%26N Security_FINAL_0.pdf]
    - Serves as resource for healthcare systems and their public health and community partners to support food and nutrition security in their communities through programs, policies, and practices, including produce prescription programs.
- No Kid Hungry Rural Produce Prescription Toolkit [https://bestpractices.nokidhungry.org/resource/rural-produce-prescription-toolkit]
    - Provides toolkit for people planning and operating produce prescription programs in rural areas
- Food Sovereignty, Health, and Produce Prescription Programs: A Case Study in Two Rural Tribal Communities [https://www.foodsystemsjournal.org/index.php/fsj/article/view/1088/1056]
    - Describes the implementation of produce prescription programs in two rural tribal communities.
    - Provides strategies for addressing unique challenges of implementing FVI programs in tribal communities

Evidence Gaps

CPSTF identified several areas that have limited information. Additional research and evaluation could help answer the following questions and fill remaining gaps in the evidence base.

CPSTF identified the following questions as priorities for research and evaluation:

- What is the long-term impact of FVI programs and how can improvement in outcomes be sustained after the program ends?
- How does effectiveness vary among population groups (e.g., children, recipients of SNAP or WIC, people with or at risk for diet-related health conditions)?
- How can programs best be tailored to participants to improve incentive redemption and program effectiveness?

Remaining questions for research and evaluation identified in this review include:

- How can researchers use consistent dietary measures for fruit and vegetable consumption to enable comparisons across studies?

- How does the seasonality of farmers markets impact participants' fruit and vegetable purchases and consumption? How can improvements in outcomes be sustained during the off-season?
- What is the total incentive amount provided by programs? Does program effectiveness vary by the amount provided?
- Does program effectiveness vary by the incentive model? Specifically, do point-of-sale discounts and rebates work as well as subsidies and matches?
- What are the best strategies for recruiting people who are eligible for nutritional assistance programs (e.g., SNAP), but not enrolled?

References

Anliker JA, Winne M, Drake LT. An evaluation of the Connecticut Farmers' Market coupon program. *Journal of Nutrition Education*. 1992;24(4):185-91.

Arnotti K et al. Fruit and vegetable consumption in overweight or obese individuals: a meta-analysis. *Western Journal of Nursing Research* 2019; 42(4).

Atoloye AT, Savoie-Roskos MR, Durward CM. Higher Fruit and Vegetable Intake Is Associated with Participation in the Double Up Food Bucks (DUFB) Program. *Nutrients*. 2021;13(8):29.

Bartlett S, Klerman J, Olsho L, Logan C, Blocklin M, Beauregard M, et al. *Evaluation of the Healthy Incentives Pilot (HIP): Final Report*. Prepared by Abt Associates for the U.S. Department of Agriculture, Food and Nutrition Service. 2014.

Bowling AB, Moretti M, Ringelheim K, Tran A, Davison K. Healthy Foods, Healthy Families: combining incentives and exposure interventions at urban farmers' markets to improve nutrition among recipients of US federal food assistance. *Health Promot*. 2016;6(1):10-6.

Cavanagh M, Jurkowski J, Bozlak C, Hastings J, Klein A. Veggie Rx: an outcome evaluation of a healthy food incentive programme. *Public Health Nutr*. 2017;20(14):2636-41.

Dagfinn A, Giovannucci E, Boffetta P, et al, Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. *International Journal of Epidemiology*, Volume 46, Issue 3, June 2017, Pages 1029–1056.

Durward CM, Savoie-Roskos M, Atoloye A, Isabella P, Jewkes MD, Ralls B, et al. Double Up Food Bucks Participation is Associated with Increased Fruit and Vegetable Consumption and Food Security Among Low-Income Adults. *J Nutr Educ Behav*. 2019;51(3):342-7.

Fertig AR, Tang X, Dahlen HM. The effect of a fresh produce incentive paired with cooking and nutrition education on healthy eating in low-income households: a pilot study. *Public Health Nutr*. 2021;24(9):2704-14.

Grigsby-Toussaint, D. S., et al. Availability of commonly consumed and culturally specific fruits and vegetables in African-american and Latino neighborhoods. *J Am Diet Assoc*. 2010; 110(5): 746-752.

GusNIP NTAE. Gus Schumacher Nutrition Incentive Program (GusNIP): Impact Findings Y3: September 1, 2021 to August 31, 2022. Prepared for U.S. Department of Agriculture, National Institute of Food and Agriculture; 2023. Accessed on February 27, 2024. https://nutritionincentivehub.org/gusnip-ntae-y3-impact-findings.

Harnack L, Oakes JM, Elbel B, Beatty T, Rydell S, French S. Effects of Subsidies and Prohibitions on Nutrition in a Food Benefit Program: A Randomized Clinical Trial. *JAMA Intern Med*. 2016;176(11):1610-8.

Healthy People 2030. Current Population Survey Food Security Supplement. Accessed on February 5, 2024. https://health.gov/healthypeople/objectives-and-data/data-sources-and-methods/data-sources/current-population-survey-food-security-supplement-cps-fss.

Herman DR, Harrison GG, Afifi AA, Jenks E. Effect of a targeted subsidy on intake of fruits and vegetables among low-income women in the Special Supplemental Nutrition Program for Women, Infants, and Children. *Am J Public Health*. 2008;98(1):98-105.

Jones LJ, VanWassenhove-Paetzold J, Thomas K, Bancroft C, Ziatyk EQ, Kim LS, et al. Impact of a Fruit and Vegetable Prescription Program on Health Outcomes and Behaviors in Young Navajo Children. *Curr*. 2020;4(8):nzaa109.

Lee SH, Moore LV, Park S, et al. Adults meeting fruit and vegetable intake recommendations— United States, 2019. *Morbidity and Mortality Weekly Report* 2022; 71: 1-9.

Leng KH, Yaroch AL, Nugent NB, Stotz SA, Krieger J. How Does the Gus Schumacher Nutrition Incentive Program Work? A Theory of Change. *Nutrients*. 2022; 14(10):2018.

Lyonnais MJ, Rafferty AP, Spratt S, Jilcott Pitts S. A Produce Prescription Program in Eastern North Carolina Results in Increased Voucher Redemption Rates and Increased Fruit and Vegetable Intake among Participants. *Nutrients*. 2022;14(12):11.

Ma, H., et al. Food insecurity and premature mortality and life expectancy in the US. *JAMA Internal Medicine*. 2024.

Mozaffarian, D., et al. A Food is Medicine approach to achieve nutrition security and improve health. *Nat Med* 2022; 28: 2238-2240.

Ploeg, M. V., et al. (n.d.). "Access to affordable and nutritious food-measuring and understanding food deserts and their consequences: Report to congress." Retrieved January 17, 2024, from http://www.ers.usda.gov/publications/pub-details/?pubid=42729.

Rabbitt MP, Hales LJ, Burke MP, & Coleman-Jensen A. *Household Food Security in the United States in 2022* (Report No. ERR-325), U.S. Department of Agriculture, Economic Research Service. 2023.

Saxe-Custack A, LaChance J, Jess J, Hanna-Attisha M. Influence of a Pediatric Fruit and Vegetable Prescription Program on Child Dietary Patterns and Food Security. *Nutrients*. 2021;13(8):29.

Seligman, H. K., et al. Food insecurity is associated with chronic disease among low-income NHANES participants. *Journal of Nutrition* 2010; 140(2): 304-310.

Trapl ES, Smith S, Joshi K, Osborne A, Benko M, Matos AT, et al. Dietary Impact of Produce Prescriptions for Patients With Hypertension. *Prev Chronic Dis*. 2018;15:E138.

Veldheer S, Scartozzi C, Bordner CR, Opara C, Williams B, Weaver L, et al. Impact of a Prescription Produce Program on Diabetes and Cardiovascular Risk Outcomes. *J Nutr Educ Behav*. 2021;53(12):1008-17.

Vericker T, Dixit-Joshi S, Taylor J, Giesen L, Gearing M, Baier K, et al. *The Evaluation of Food Insecurity Nutrition Incentives (FINI) Interim Report*. Prepared by Westat, Inc. for the U.S. Department of Agriculture, Food and Nutrition Service. 2019.

Wang, P., et al. Higher intake of fruits, vegetables or their fiber reduces the risk of type 2 diabetes: A meta-analysis. *Journal of Diabetes Investigation* 2016; 7: 56-59.

Zenk, S. N., et al. Neighborhood racial composition, neighborhood poverty, and the spatial accessibility of supermarkets in metropolitan Detroit. *American Journal of Public Health* 2005; 95(4): 660-667.

Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. CPSTF evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

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