

# Food is Medicine: Peer-Reviewed Research in the U.S.

## *Medically Tailored Meals, Medically Tailored Food Packages, and Nutritious Food Referrals*

### OVERVIEW

The purpose of this table is to provide an overview of peer-reviewed research associated with Food is Medicine interventions. Food is Medicine refers to a spectrum of programs, services, and other interventions that recognize and respond to the critical link between nutrition and health. These services include both the provision of food itself or tailored food assistance (vouchers for produce, etc.) and a nexus to the health care system. Policymakers, health care providers, and social service organizations have begun to recognize that connecting people with complex health conditions to Food is Medicine interventions is an effective and low-cost strategy to improve health outcomes, decrease utilization of expensive health services, and enhance patient quality of life. While interest in Food is Medicine interventions has also been growing in the scientific community, notable opportunities exist to fill current gaps in Food is Medicine research. This summary of evidence is a working document and is a preliminary step to assess the state of research surrounding Food is Medicine services. The table below includes peer-reviewed research that focuses on three different categories of Food is Medicine services: medically tailored meals, medically tailored food packages, and produce prescription programs. The table uses the following definitions for these Food is Medicine services:

**Medically Tailored Meal:** Medically tailored meals are meals developed to address the dietary needs of an individual's medical condition by a Registered Dietitian Nutritionist. Individuals are referred by a health care provider or plan.

**Medically Tailored Food Packages:** Medically tailored food packages include a selection of minimally prepared grocery items selected by a Registered Dietitian Nutritionist or other qualified nutrition professional as part of a treatment plan for an individual with a defined medical diagnosis. The recipient of medically tailored food is typically capable of shopping for and picking up the food and preparing it at home, and is referred by a health care provider or plan.

**Nutritious Food Referrals:** Nutritious Food Referrals provide funds for free or discounted nutritious foods. Individuals must receive referrals from health care providers or plans after being identified as having or being at risk for diet-related diseases. These funds may be spent at a variety of retailers such as grocers, farmers' markets, or within Community Supported Agriculture programs.

### ABOUT THE AUTHORS

The [Center for Health Law and Policy Innovation of Harvard Law School](#) (CHLPI) advocates for legal, regulatory, and policy reforms to improve the health of marginalized populations, with a focus on the needs of people who are low-income and living with chronic illnesses and disabilities. CHLPI co-leads [Food is Medicine Massachusetts](#) (FIMMA), a multi-stakeholder coalition dedicated to enhancing the role of nutrition in health care to effectively address rising rates of chronic illnesses while controlling health care costs. CHLPI has also served as an advisor to [Food is Medicine Coalition](#), an national association of nonprofit medically tailored food and nutrition service providers.

### ABBREVIATIONS

**BMI** = body mass index; **BP** = blood pressure; **CG** = community garden; **CHF** = congestive heart failure; **CHW** = community health worker; **COPD** = chronic obstructive pulmonary disease; **CSA** = community-supported agriculture; **CVD** = cardiovascular disease; **ED** = emergency department; **ESRD** = end-stage renal disease; **FI** = food insecurity; **FM** = farmer's market; **FQHC** = federally qualified health center; **FV** = fruits and vegetables; **GF** = gluten-free; **HDL** = high-density lipoprotein; **HTN** = hypertension; **lb** = pound; **LDL** = low-density lipoprotein; **mo** = month; **MTM** = medically tailored meals; **NHANES** = National Health and Nutrition Examination Survey; **NP** = nurse practitioner; **NR** = Not reported; **Qual** = qualitative; **RD** = registered dietitian; **RDN** = Registered Dietitian Nutritionist; **Retro** = retrospective; **SES** = socioeconomic status; **T2D** = type 2 diabetes; **wk** = week; **yrs** = years.

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MEDICALLY TAILORED MEALS				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Berkowitz et al., 2020 <sup>1</sup>	<p><b>Design:</b> Semi-structured Interviews</p> <p><b>Length:</b> 3mo</p> <p><b>Sample:</b> Adults (20)</p> <p><b>Inclusion Criteria:</b> HbA1c &gt; 8%; FI (defined as at least one positive item on the two-item "Hunger Vital Sign<sup>TM</sup>").</p>	<p><b>MTM Delivery Program:</b> Community Servings participants received 12wks of home delivered MTMs (10 meals/week). The RDN tailors the meals to the participant's medical needs across 17 dietary 'tracks' (e.g., diabetes, renal, soft, etc.), with combinations of up to 3 'tracks' permitted (e.g., diabetes, renal, and soft).</p>	<p><b>Primary:</b> Dietary quality determined by evaluating satisfaction and experience with MTM, food preferences and cultural appropriateness; diabetes management and awareness; suggestions for improvement and co-interventions</p>	<p><b>Interview Data:</b> Participants were generally satisfied with MTM. They emphasized the importance of receiving culturally appropriate food and they reported improved quality of life, increased ability to manage diabetes, and stress reduction. Participants also suggested combining MTM and diabetes self-management education, or a lifestyle intervention, and providing additional financial assistance, particularly with medications.</p>
Berkowitz et al., 2019 <sup>2</sup>	<p><b>Design:</b> Retro Cohort using claims data and near/far matching</p> <p><b>Length:</b> 3yrs</p> <p><b>Sample:</b> Adults (1020)</p> <p><b>Inclusion Criteria:</b> Serious medical conditions; recipients of MTMs who had at least 360 days of pre-intervention claims data.</p>	<p><b>MTM Delivery Program:</b> Weekly delivery of 10 ready-to-consume meals tailored to the specific medical needs of the individual under the supervision of an RDN. The RDN tailors the meals to the participant's medical needs across 17 dietary 'tracks' (e.g., diabetes, renal, soft, etc.), with combinations of up to 3 'tracks' permitted (e.g., diabetes, renal, and soft). Participants referred by clinician based on nutritional and social risk.</p>	<p><b>Primary:</b> Inpatient admissions</p> <p><b>Secondary:</b> Admissions to skilled nursing facility and health care costs</p>	<p><b>Inpatient Admissions:</b> Intervention group saw 49% fewer inpatient admissions compared to matched control as a result of overall increase in diet quality and adherence to disease management plans designed to prevent the exacerbation of chronic conditions. [Absolute reduction, -519; 95% CI, -360 to -678].</p> <p><b>Admissions to Skilled Nursing Facilities and Health Care Costs:</b> Intervention led to 72% fewer admissions into skilled nursing facilities compared to matched control, indicating better post-acute care following inpatient admissions and an overall decrease in health care utilization. [Absolute reduction, -913; 95% CI, -689 to -1457 per 1000 person-yrs]. Receipt of MTM led to 16% reduction in total health care costs [Recipients \$80,617 vs. Non-recipients \$16,138] (p &lt; 0.001).</p>
Berkowitz et al., 2019 <sup>3</sup>	<p><b>Design:</b> Randomized Crossover</p> <p><b>Length:</b> 24wks</p> <p><b>Sample:</b> Adults (44)</p> <p><b>Inclusion Criteria:</b> Low SES; HbA1c &gt; 8%, and FI (defined as at least one positive item on the two-item "Hunger Vital Sign<sup>TM</sup>").</p>	<p><b>MTM Delivery Program:</b> "on-meal": Community Servings provided 12wks of home delivered MTMs (10 meals/week). The RDN tailors the meals to the participant's medical needs across 17 dietary 'tracks' (e.g., diabetes, renal, soft, etc.), with combinations of up to 3 'tracks' permitted (e.g., diabetes, renal, and soft).</p> <p><b>Control:</b> "off-meal": 12wks usual care and a Choose MyPlate healthy eating brochure.</p>	<p><b>Primary:</b> Healthy Eating Index 2010 score</p> <p><b>Secondary:</b> FI; hypoglycemia</p>	<p><b>Healthy Eating Index Score:</b> Participants experienced improvements in almost all sub-categories of HEI score, with increased consumption of vegetables, fruits, and whole grains and decreased solid fats, alcohol, and added sugar consumption.</p> <p><b>FI and Hypoglycemia:</b> Participants also reported lower FI (42% "on-meal" vs. 62% "off-meal," p = 0.047), less hypoglycemia (47% "on-meal" vs. 64% "off-meal," p = 0.03), and fewer days where mental health interfered with quality of life (5.65 vs. 9.59 days out of 30, p = 0.03).</p>
Henstenburg et al., 2019 <sup>4</sup>	<p><b>Design:</b> Retro Chart Review</p> <p><b>Length:</b> 6mo</p> <p><b>Sample:</b> Adults (103)</p> <p><b>Inclusion Criteria:</b> MANNA clients who answered the 2016 Client Satisfaction Survey who received at least 6mo of the intervention between 2015-2016. Primary diagnoses were cancer (55%), renal disease (15.7%), diabetes (7.8%), HIV/AIDS (3.9%), heart disease (3.9%), and "other" (16.7%). 52% reported having insufficient money to buy food and 2/3 had decreasing weight before the program, 28.9% had stable weight and 7.8% had increasing weight.</p>	<p><b>MTM Delivery Program:</b> MANNA provides nutritional support for community members at nutrition risk from serious illness. Client receive home-delivered medically-tailored meals and nutritional counseling.</p>	<p><b>Primary:</b> BMI</p> <p><b>Secondary:</b> Hospitalizations</p>	<p><b>BMI:</b> Change in BMI between initial intake and recertification was: median = 0.04; IQR (-0.84, -1.02). Analysis of variance followed by a multiple comparisons with a Bonferroni adjustment found no evidence of any difference in BMI change between diagnoses. Bivariate analysis with t-tests found no evidence of any difference in BMI change between clients with enough money for food and those without (P = 0.4277). Manna's program was associated with stable BMI. Change in BMI was not significantly different based on primary diagnosis or insufficient money to buy food.</p> <p><b>Hospitalization:</b> McNemar's Test found evidence of a significant decrease in the proportion of clients who had recent hospitalizations at follow-up compared to the start of services (P = 0.0077).</p>

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MEDICALLY TAILORED MEALS <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Berkowitz et al., 2018 <sup>5</sup>	<p><b>Design:</b> Retro Matched Cohort using claims data for each intervention</p> <p><b>Length:</b> 6mo</p> <p><b>Sample:</b> Adults (1134)</p> <p><b>Inclusion Criteria:</b> Individuals dually eligible for Medicare/ Medicaid with at least 6 months of continuous enrollment in one of the 2 meal delivery programs over a 2 yr period.</p>	<p><b>MTM Delivery Program:</b> Community Servings provided customized meals to the participant's home weekly, 5 days of lunches, dinners, and snacks. The RDN tailors the meals to the participant's medical needs across 17 dietary 'tracks' (e.g., diabetes, renal, soft, etc.), with combinations of up to 3 'tracks' permitted (e.g., diabetes, renal, and soft).</p> <p><b>Non-tailored Meal Delivery Program (Non-MTM):</b> Provided 5 days of prepared lunches and dinners each week, usually delivered daily. Meals are generally nutritious but not tailored to medical needs.</p>	<p><b>Primary:</b> ED visits</p> <p><b>Secondary:</b> Inpatient admissions; use of emergency transportation; medical spending from 5 service categories: inpatient, outpatient, ED, pharmacy, and emergency transportation</p>	<p><b>ED Visits:</b> Compared with matched nonparticipants, participants had fewer ED visits in both the MTM and Non-MTM program. (MTM program was associated with 70% fewer ED visits (<math>p &lt; 0.001</math>); NTF program was associated with 44% fewer ED visits, (<math>p &lt; 0.001</math>)).</p> <p><b>Inpatient Admissions:</b> Participants in the MTM program also had fewer inpatient admissions (52% fewer inpatient admissions (<math>p &lt; 0.05</math>)), as a result of improved dietary quality, increased adherence to disease management protocols, and consequently fewer disease-related complications.</p> <p><b>Medical Spending:</b> Participation in MTM and Non-MTM programs was associated with lower medical spending. Overall, the MTM program was associated with 16% savings as a result of lower medical expenditures. Subtracting the program costs from the estimated savings yielded a net savings of \$220 for the MTM program and \$10 for the Non-MTM program.</p>
Hummel et al., 2018 <sup>6</sup>	<p><b>Design:</b> RCT</p> <p><b>Length:</b> 4wk intervention at 3 sites; 12wk follow up for readmissions, deaths and the composite of post-discharge days hospitalized or dead</p> <p><b>Sample:</b> Adults <math>\geq</math> 55yrs (66)</p> <p><b>Inclusion Criteria:</b> Patients discharged from heart failure hospitalization.</p>	<p><b>Sodium-Restricted DASH-Diet Meal Delivery Program:</b> Patients received 4wks of home-delivered sodium-restricted Dietary Approaches to Stop HTN (DASH/SRD) meals versus usual care. Meals were delivered once a week by Mom's Meals NourishCare and included 3 daily meals, snacks, and some beverages for a daily calorie count of 2100. Intervention and control groups were given a standardized educational pamphlet.</p>	<p><b>Primary:</b> Disease-specific quality of life assessed via change in the Kansas City Cardiomyopathy Questionnaire summary score from discharge to 4wks post discharge</p> <p><b>Secondary:</b> Cardiac biomarkers via Kansas City Cardiomyopathy Questionnaire clinical summary score and rehospitalization burden</p>	<p><b>The Kansas City Cardiomyopathy Questionnaire summary score:</b> Scores increased similarly between groups (DASH/SRD <math>46 \pm 23</math>–<math>59 \pm 20</math> versus usual care <math>43 \pm 19</math>–<math>53 \pm 24</math>; <math>P=0.38</math>).</p> <p><b>Kansas City Cardiomyopathy Questionnaire clinical summary score:</b> Score increase tended to be greater in DASH/SRD participants (<math>47 \pm 22</math>–<math>65 \pm 19</math> versus <math>45 \pm 20</math>–<math>55 \pm 26</math>; <math>P=0.053</math>).</p> <p><b>Rehospitalization Burden:</b> By 12wks post discharge, 11 DASH/SRD patients had 15 total all-cause rehospitalizations, whereas 14 usual care patients had a total of 22 all-cause hospitalizations and 1 death (<math>P=0.45</math> for comparison). At 12wks, there were 8 HF rehospitalizations in 7 DASH/SRD patients, as compared to 18 HF rehospitalizations in 13 usual care patients (<math>P=0.11</math>). Potentially diet-related adverse events were uncommon; 30-day HF readmissions (11% versus 27%; <math>P=0.06</math>) and days re-hospitalized within that timeframe (17 versus 55; <math>P=0.055</math>) trended lower in DASH/SRD participants.</p>
Palar et al., 2017 <sup>7</sup>	<p><b>Design:</b> Pre-post Intervention</p> <p><b>Length:</b> 6mo</p> <p><b>Sample:</b> Adults (52)</p> <p><b>Inclusion Criteria:</b> HIV; T2D; being (or in the process of becoming) a current Project Open Hand (POH) client, certified by a physician as living with HIV and/or T2D, English- or Spanish-speaking, age 18 or older, and low SES under ~300% federal poverty line; and service adherence <math>&gt;75\%</math> for pre-existing POH clients.</p>	<p><b>MTM Pick Up Program:</b> Project Open Hand clients picked up food 2x a week that supplied breakfast, lunch, and dinner. Average energy requirements used to design daily meals were 1800–2000 kcal for people living with HIV and 1800 kcal for people with T2D.</p> <p>Meal plans were based on the Mediterranean diet featuring fresh FV, lean proteins, healthy fats (e.g., olive oil), and whole grains, and were low in refined sugars and saturated fats. The carbohydrate and saturated fat levels were set based on current recommendations from the American Diabetes Association and American Heart Association, respectively.</p>	<p><b>Primary:</b> FI and nutrition, mental health and psychosocial outcomes, substance use, health care behaviors, and health status</p>	<p><b>FI and Nutrition:</b> Comparing baseline to follow-up, very low FI decreased from 59.6% to 11.5% (<math>p &lt; 0.0001</math>). Frequency of consumption of fats (<math>p = 0.003</math>) decreased, while frequency increased for FV (<math>p = 0.011</math>). Among people with diabetes, frequency of sugar consumption decreased (<math>p = 0.006</math>).</p> <p><b>Mental Health:</b> Decreased depressive symptoms and decreased binge drinking at the end of the intervention for all diagnoses. Also observed decreased depressive symptoms (<math>p = 0.028</math>) and binge drinking (<math>p = 0.008</math>).</p> <p><b>Health Care Behaviors:</b> At follow-up, fewer participants sacrificed food for health care (<math>p = 0.007</math>) or prescriptions (<math>p = 0.046</math>), or sacrificed health care for food (<math>p = 0.029</math>) once they were connected to MTM. Adherence to antiretroviral therapy for HIV patients increased from 47% at baseline to 70% at follow-up (<math>p = 0.046</math>).</p> <p><b>Health Status:</b> Among people with T2D, distress (<math>p &lt; 0.001</math>), and perceived self-management (<math>p = 0.007</math>) improved.</p>

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<b>MEDICALLY TAILORED MEALS (Continued)</b>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Gurvey et al., 2013 <sup>8</sup>	<p><b>Design:</b> Pre-post Intervention with a comparison group using claims data</p> <p><b>Length:</b> 1yr</p> <p><b>Sample:</b> Adults (698)</p> <p><b>Inclusion Criteria:</b> MANNA clients battling chronic disease that received continuous services for at least 3mo in 2008-2010 and were enrolled in coverage by a local Medicaid Managed Care Organization (MCO).</p>	<p><b>MTM Delivery Program:</b> MANNA provided each client 3 nutritionally balanced meals a day, 7 days a week, free of charge. Meals could also be modified to accommodate various dietary restrictions and cultural preferences. MANNA's RDNs provided medical nutrition therapy to the clients and offered support through nutrition counseling and meal planning.</p>	<p><b>Primary:</b> Overall health care costs</p> <p><b>Secondary:</b> Specific health care cost-related factors including inpatient costs, length of stay, and number of hospital admissions</p>	<p><b>Pre- and Post-MANNA Analysis:</b> Overall health care costs decreased among all MANNA clients over the 12-month time frame with the greatest decrease occurring in the first 3 months following the initiation of MANNA services. Average monthly health care costs of the MANNA client group overall was 28% lower in the 6 months following initiation of MANNA services compared with the 6 months prior to beginning services.</p> <p>Average monthly inpatient costs for all MANNA clients decreased as well, with a significant drop observed during the first 3 months following the initiation of MANNA services from \$174,320/month to \$121,777/month.</p> <p><b>Comparison Group Analysis:</b> Compared to the comparison group, receipt of MANNA services was associated with lower mean monthly health care costs (\$28,000 vs. \$41,000), inpatient costs (60% reduction), number of inpatient visits, inpatient length of stay, and percentage of individuals discharged to home (93% vs. 72%) (p&lt;0.05).</p>
<b>MEDICALLY TAILORED FOOD PACKAGES</b>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Cheyne et al., 2020 <sup>9</sup>	<p><b>Design:</b> Pilot Program Evaluation</p> <p><b>Length:</b> 16mo</p> <p><b>Sample:</b> Adults (244)</p> <p><b>Inclusion Criteria:</b> Clinical history of prediabetes or high score on CDC's Prediabetes Risk Test, existing or new food pantry client, aged 18 or older, and English or Spanish verbal fluency.</p>	<p><b>Diabetes- Appropriate Food Package Intervention:</b> Participants received monthly diabetes-appropriate food packages, text-based health promotion education addressing physical activity and nutrition, text-based administrative and engagement messages, and referrals to health care and community-based diabetes prevention programs (DPPs).</p>	<p><b>Primary:</b> Food security status</p> <p><b>Secondary:</b> dietary intake, physical activity (PA), health status and depression scores</p>	<p><b>Food Security Status:</b> The percentage of participants reporting that household adults skip meals decreased from 43.6% at baseline to 29.3% at midpoint. The percentage of participants with low or very low food security status decreased from 68.8% at baseline to 62.5% at midpoint.</p> <p><b>Dietary Intake:</b> Consumption of healthy foods increased significantly among participants, and consumption of unhealthy foods decreased significantly.</p> <p><b>Physical Activity:</b> Minutes of PA per week reported increased from 95.6 to 145.1, and percentage of participants who reported regular PA at least once per week increased from 62.5% to 80.7%.</p> <p><b>Health Status and Depression Scores:</b> The percentage of participants who reported their health status as poor or fair declined from 73.9% to 60.1%. The frequency of PHQ-2 depression scores &gt;3 among participants declined from 25% to 15.1%.</p>
Greenthal et al., 2019 <sup>10</sup>	<p><b>Design:</b> Semi-structured interviews, cross-sectional survey</p> <p><b>Length:</b> June and July 2018</p> <p><b>Sample:</b> Adult Patients (30); Adult health care providers (89)</p> <p><b>Inclusion Criteria:</b> Participants had to have had at least one previous visit to the pantry and be proficient in English. Providers worked at the hospital.</p>	<p><b>Hospital-based Pantry Intervention for Chronic Disease:</b> Food insecure patients in a hospital were referred to a hospital-based food pantry with chronic disease listed on referral form. Patients who used the pantry had cancer, HIV/AIDS, HTN, diabetes, obesity, heart disease, and other chronic conditions. Pantry clients received 3-4 days' worth of food for their entire households up to 2x per month.</p>	<p><b>Primary:</b> Patient experience and satisfaction</p> <p><b>Secondary:</b> Provider perspectives of FI and of the hospital-based pantry</p>	<p><b>Patient Experience and Satisfaction:</b> Compared with their experiences at other food pantries, patients expressed more trust in the food provided by the hospital pantry, higher satisfaction with the nutritional quality of food, greater convenience, and less stigma at the hospital-based pantry.</p> <p>Patients listed lack of money as a barrier to adhering to medically-prescribed diets and to eating a healthy and varied diet. Many cited the pantry's role in helping them eat more FV, but expressed concerns about the healthfulness of other foods distributed.</p> <p><b>Providers Perspectives:</b> Providers believed they should discuss FI with patients (99%) and that the pantry improves the health of patients (97%), but faced barriers to consistently screening for FI and referring patients to the pantry, such as insufficient training on FI (53%) and time constraints (35%).</p>
Ferrer et al., 2019 <sup>11</sup>	<p><b>Design:</b> RCT</p> <p><b>Length:</b> 6mo</p> <p><b>Sample:</b> Adults (43)</p> <p><b>Inclusion Criteria:</b> HbA1c &gt;9, FI</p>	<p><b>Food Bank Produce and Can Program for Diabetes:</b> Participants received 10lbs of food bank produce and 10lbs of canned food including beans, vegetables, and fish or chicken delivered 2x monthly to the practice site, brief teaching from a food bank dietitian, and home-based education from a community health worker.</p>	<p><b>Primary:</b> HbA1c</p> <p><b>Secondary:</b> Diet, BMI</p>	<p><b>Hba1c:</b> After 6 months, glycosylated hemoglobin decreased (absolute change) by 3.1% in the intervention group vs 1.7% in the control group (P = .012).</p> <p><b>Diet and BMI:</b> Scores on Starting the Conversation–Diet, a brief dietary measure, improved in the intervention group by 2.47 on a 14-point scale (P &lt; .001). BMIs were unchanged.</p>

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MEDICALLY TAILORED FOOD PACKAGES <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Seligman et al., 2018 <sup>12</sup>	<b>Design:</b> RCT <b>Length:</b> 11mo <b>Sample:</b> Adults (568) <b>Inclusion Criteria:</b> Diabetes (HbA1c Longitudinal Retro cohort using NHIS data linked to 2012-2013 MEPS 7.5).	<b>Diabetes- Appropriate Food Package Intervention:</b> Participants were eligible to receive 11 food packages with diabetes-appropriate foods, picked up twice-monthly, diabetes education, health care referral, and glucose monitoring.	<b>Primary:</b> HbA1c levels  <b>Secondary:</b> FI, FV intake, diabetes self-management	<b>HbA1c Levels:</b> No significant differences in HbA1c levels.  <b>FI, FV Intake, and Diabetes Self-Management:</b> Statistically significant improvements in the intervention compared with the control group in outcomes related to food, including FI (p = .03), food stability (p = .01), and FV intake (p = .04). There were no differences in self-management (depressive symptoms, diabetes distress, self-care, hypoglycemia, self-efficacy).
Wetherill et al., 2018 <sup>13</sup>	<b>Design:</b> Pilot Program Evaluation <b>Length:</b> 12mo <b>Sample:</b> Adults (80) <b>Inclusion Criteria:</b> Patients accessing 1 of 2 test site clinics who either self-enrolled in the program or was identified by a health care or social work provider.	<b>Clinic-Based Food Pharmacy to Support Chronic Disease Self-Management:</b> Upon enrollment, participants received an initial food package, an educational booklet, and 5 recipe cards. Participants were eligible to receive another food package during clinic hours 6 additional times with visits limited to once per month.	<b>Primary:</b> Food security status, dietary intake  <b>Secondary:</b> BP	<b>Food Security Status:</b> No change.  <b>Dietary Intake:</b> Significant improvement in daily dietary fiber intake among participants (mean 14.0-17.1), and a slight yet nonsignificant increase in daily fruit and vegetable intake (mean 3.4-3.6 cups).  <b>BP:</b> Among participants who accessed food assistance at least 4 times and who had high BP at enrollment (n=17), diastolic BP significantly improved (mean 90.9-83.9).
Gany et al., 2016 <sup>14</sup>	<b>Design:</b> Nested Cohort, Observational <b>Length:</b> 14mo <b>Sample:</b> Adults (351) <b>Inclusion Criteria:</b> Cancer patients who visited pantry Oct. 2011- Jan. 2013; low SES	<b>Hospital-based Food Pantry for Low-Income Cancer Patients:</b> Immigrant Health and Cancer Disparities (IHCD) Service's Cancer Portal Project. Cancer patients were offered enrollment in the Portal Project, a program to facilitate access and use of health, social and financial services. IHCS opened 5 medically-tailored, hospital-based food pantries for low-SES urban cancer patients, which worked to accommodate patient schedules. Participants in the food bank could receive weekly bags of healthy, nutritious, non-perishable foods.	<b>Primary:</b> Pantry utilization	<b>Pantry Utilization:</b> The median number of return visits in the 4mo period after a patient's initial visit was 2 and the mean was 3.25 (SD=3.07). The GEE model showed that younger patients used the pantry less, immigrant patients used the pantry more (than US-born), and prostate cancer and Stage IV cancer patients used the pantry more.
Seligman et al., 2015 <sup>15</sup>	<b>Design:</b> Pre-post Intervention <b>Length:</b> 6mo <b>Sample:</b> Adults (687) <b>Inclusion Criteria:</b> Pantry clients of low SES with HbA1c $\geq$ 6.5% or a self-reported diagnosis of diabetes plus presentation of one or more diabetes medication bottles)	<b>Diabetes-Appropriate Food Package Program:</b> The intervention had 4 major components: screening for diabetes and monitoring of glycemic control, distributing diabetes-appropriate food once or twice monthly (enough to last 1 or 2wks, depending on household size), referring clients who lacked a usual source of care to primary care providers, and providing diabetes self-management support and education. The intervention was implemented at 3 food banks in conjunction with their pantry networks.	<b>Primary:</b> HbA1c levels  <b>Secondary:</b> Diabetes self-management: hypoglycemic episodes, diabetes self-efficacy, medication adherence	<b>HbA1c Levels:</b> Significant improvement in mean HbA1c from baseline (8.11%) to follow-up (7.96%) (p<0.001). Among participants with elevated HbA1c (at least 7.5 percent) at baseline, HbA1c improved from 9.52 percent to 9.04 percent.  <b>Diabetes Self-Management:</b> The proportion of participants with very poor glycemic control (HbA1c >9%) declined from 28% to 25%. Diabetes self-efficacy and medication adherence increased. FV intake increased from 2.8 to 3.1 servings per day.  <b>Food Box Satisfaction:</b> 60% reported eating more FV and 88% of participants reported that they preferred the diabetes food box to regular food pantry options.

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NUTRITIOUS FOOD REFERRALS				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Ridberg et al., 2020 <sup>16</sup>	<p><b>Design:</b> Pre-post intervention with comparison group</p> <p><b>Length:</b> Up to 14mo (majority enrolled during first trimester)</p> <p><b>Sample:</b> Adults (592)</p> <p><b>Inclusion Criteria:</b> pregnant; &gt;18yrs; enrolled in WIC participants; intent to remain in San Francisco &gt;3mo; ability to complete surveys; informed consent</p>	<p><b>FV Vouchers for Pregnant WIC Participants:</b> Pregnant WIC participants received an extra \$40 in vouchers redeemable for fruits and vegetables. These FV vouchers complimented the standard WIC benefit of \$11/mo for fruits and vegetables. Enrollment occurred at the second WIC clinic visit after pregnancy confirmation. FV vouchers were distributed at the same visit the patient would receive WIC vouchers. FV vouchers could be received for up to 5mo post-partum. These could be redeemed at 19 retail partners.</p>	<p><b>Primary:</b> FI</p> <p><b>Secondary:</b> Dietary intake; reduced preterm birth rates compared to historic control</p>	<p><b>FI:</b> Mean continuous food security weighted raw scores for women in the intervention group decreased from 3.32 to 2.32 (became more food secure) between baseline and follow up compared to the comparison group which decreased from 2.5 to 2.4 during the same period (mean change score difference=0.88; p&lt;.001 intervention vs. comparison).</p> <p><b>Dietary Intake:</b> Avg intake frequency of whole fruit, salad, total fruit, and combined FV here higher for intervention group vs. comparison. Intervention group had larger change in mean intake frequency of total vegetables (0.59x/day), combined FV (0.73), salad (0.23), non-fried potatoes (0.19), and fruit juice (0.27), indicating greater consumption of these foods.</p> <p><b>Preterm Births:</b> Compared to births in historical control group (n=2299), odds of preterm delivery were 37% lower in intervention group (10.0% vs. 6.5%, p=0.18).</p>
Burrington et al., 2020 <sup>17</sup>	<p><b>Design:</b> Prospective convenience sample, pre/post-tests; no control</p> <p><b>Length:</b> 5mo</p> <p><b>Sample:</b> Families (10)</p> <p><b>Inclusion Criteria:</b> Recommendation by health care providers in school-based health care center; low SES with one or more children at risk for chronic disease related to obesity</p>	<p><b>Online Produce Market Produce Prescription:</b> Combined a FV prescription program with family cooking/nutrition classes and an online produce shopping pilot. Each family was given a weekly online produce credit for 5 months. \$15 for a family of three, \$20 for four, and \$25 for five or more. Online orders were picked up by families at local sites.</p>	<p><b>Primary:</b> Redemption and Class Attendance</p> <p><b>Secondary:</b> Purchasing patterns, participant experience and satisfaction</p>	<p><b>Rx Redemption and Class Attendance:</b> Redemption of online produce credit was 94% and class attendance was 80%.</p> <p><b>Purchasing Patterns:</b> Most families ordered produce suggested by the provided recipes. Three months after program completion, 60% of the families continued weekly online produce shopping without the prescription.</p> <p><b>Participant Experience and Satisfaction:</b> The program increased confidence with cooking, tasting new foods, and cooking/following new FV-based recipes. Average FV intake rose for children to 5+ servings/day. Confidence, culinary skills, and food literacy increased slightly.</p>
Berkowitz et al., 2019 <sup>18</sup>	<p><b>Design:</b> RCT</p> <p><b>Length:</b> 19mo</p> <p><b>Sample:</b> Adults (122)</p> <p><b>Inclusion Criteria:</b> Community health center patients, obese (BMI&gt; 25 kg/m<sup>2</sup>), living in program area</p>	<p><b>CSA Prescription Program:</b> Individuals were given \$300 they could either put towards a “full” CSA share (\$690) or a “small” share ((\$480). SNAP eligible participants were eligible for a discounted share. Shares included weekly farm produce pickup from June to November, recipes, and information about the foods.</p> <p><b>Control:</b> Received \$300 and healthy eating information.</p>	<p><b>Primary:</b> Healthy Eating Index 2010</p> <p><b>Secondary:</b> Participant-reported outcomes, anthropometric and laboratory measurements</p>	<p><b>Healthy Eating Index:</b> The intervention increased the mean Healthy Eating Index total score relative to the control group (60.2 in the intervention group vs 55.9 in the control group; difference, p=0.03).</p> <p><b>Participant-Reported Outcomes:</b> The difference between groups, adjusting for baseline FI, was in favor of the intervention (RR=0.68, 95% CI=0.48, 0.96). Patient-Reported Outcomes Measurement Information System scores were in favor of the intervention but were not statistically significant.</p> <p><b>Anthropometric and Laboratory Measurements:</b> Anthropometric and biomarker point estimates were favorable with regard to weight, BP, and HbA1c, but differences were not statistically significant with the exception of diastolic BP. No significant differences in lipid profiles.</p>
Emmert-Aronson et al., 2019 <sup>19</sup>	<p><b>Design:</b> Longitudinal data with linear mixed models</p> <p><b>Length:</b> 4mo</p> <p><b>Sample:</b> Adults (49)</p> <p><b>Inclusion Criteria:</b> Behaviorally mediated conditions, including cardiovascular disease, diabetes, and depression, as well as poor social determinants of health, such as FI.</p>	<p><b>Clinic-based Food Farmacy Program:</b> The Open Source Wellness (OSW) model Groups met for 2 h each week for 16 weeks to complete 30 min of socially engaging physical activity, 5 min of mindfulness meditation, a 10-min interactive, didactic health lesson, a 5-min nutrition lesson, and 60 min of small-group coaching over a plant-based meal. Participants received a \$10 voucher to Food Farmacy, which provided free produce.</p>	<p><b>Primary:</b> BP, BMI, Diet, Exercise, Mood</p> <p><b>Secondary:</b> Acute care utilization</p>	<p><b>BP and BMI:</b> Hypertensive patients (n = 24) saw reductions in systolic blood pressure, b = -4.04, (p&lt;0.01), but not diastolic blood pressure, b = 0.04, (p=0.95). Participants showed significant, but marginal reductions in body mass index, b = -0.10 (p =0.05)</p> <p><b>Diet, Mood, Exercise:</b> Participants demonstrated significant increases in daily servings of fruits and vegetables, b = 0.31, p &lt; 0.01, about 1 serving more compared to baseline. Exercises increases were also observed b = 11.50 (p&lt;0.01). Depressed patients (n = 11) saw reductions in depression, b=-1.72 (p&lt;0.01).</p> <p><b>Acute Care Utilization:</b> Overall acute care utilization decreased by 77%, from 22 emergency department visits/days of unplanned hospitalizations for the entire group in the 6mo before joining the group to 5 visits in the 6mo following group.</p>

# FOOD IS MEDICINE: PEER-REVIEWED RESEARCH IN THE U.S.

NUTRITIOUS FOOD REFERRALS <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Lee et al., 2019 <sup>20</sup>	<p><b>Design:</b> Microsimulation Model (CVD-PREDICT) using data from NHANES 2009-2014</p> <p><b>Length:</b> Participant lifetime</p> <p><b>Sample:</b> Adults (1 million)</p> <p><b>Inclusion Criteria:</b> Nationally representative Medicare, Medicaid, and dual-eligible population using NHANES data to determine sociodemographic characteristics and cardiometabolic risk factors of participants</p>	<p><b>FV Incentive:</b> 30% subsidy on FV (F&amp;V Incentive).</p> <p><b>Healthy Food Incentive:</b> 30% subsidy on broader healthful foods (FV, whole grains, nuts/seeds, and plant oils) (healthy food incentive).</p>	<p><b>Primary:</b> Health and cost impacts of each intervention</p> <p><b>Secondary:</b> Incremental cost-effectiveness ratios (ICERs) two policy scenarios for adults within Medicare and Medicaid</p>	<p><b>F&amp;V Incentive:</b> Prevent 1.93 million CVD events, gain 4.64 million QALYs, and save \$39.7 billion in formal health care costs.</p> <p><b>Healthy Food Incentive:</b> Prevent 3.28 million CVD and 0.12 million diabetes cases, gain 8.40 million QALYs, and save \$100.2 billion in formal health care costs.</p> <p><b>Incremental Cost-Effectiveness Ratios:</b> Health care perspective: Both scenarios were cost-effective at 5yrs and beyond, with lifetime ICERs of \$18,184/QALY (F&amp;V incentive) and \$13,194/QALY (healthy food incentive). Societal perspective (including informal health care costs and lost productivity): respective ICERs were \$14,576/QALY and \$9,497/QALY.</p> <p><b>Additional Findings:</b> Results were robust in probabilistic sensitivity analyses and a range of one-way sensitivity and subgroup analyses, including by different durations of the intervention, food subsidy levels, insurance groups, and beneficiary characteristics within each insurance group.</p>
Orsega-Smith et al., 2019 <sup>21</sup>	<p><b>Design:</b> Pre-post Qualitative Evaluation</p> <p><b>Length:</b> 1yr</p> <p><b>Sample:</b> Adults (41)</p> <p><b>Inclusion Criteria:</b> Patient of 1 of 2 health care centers; FI; and meet one of the following criteria: Medicaid enrollee, overweight, or be a family with 2+ children.</p>	<p><b>Clinic-based Mobile Market Produce Prescription:</b> Prescription from doctor made a participant eligible to pick up fresh produce 1x/month from a mobile market pantry truck at doctor's office. Each household received 15-25 lbs/mo of produce for free. The intervention included nutrition education, food demonstrations, and taste testing.</p>	<p><b>Primary:</b> FV intake; purchasing behavior; perceptions of FI related to produce; demographics</p>	<p><b>FV Intake:</b> Adult FV intake significantly increased. Child fruit consumption also significantly increased, but there was no difference in child vegetable consumption.</p> <p><b>Purchasing Behavior:</b> Participants' report of whether or not money allotted to the purchase of FV ran out decreased (80.5% to 68.3%) over the course of the program.</p> <p><b>Perceptions of FI Related to Produce:</b> FV purchase avoidance because of costs decreased (65.0% to 51.2%).</p>
Paolantonio et al., 2019 <sup>22</sup>	<p><b>Design:</b> Nested Cohort Study</p> <p><b>Length:</b> 6mo</p> <p><b>Sample:</b> Adults (33)</p> <p><b>Inclusion Criteria:</b> Patients at 1 of 4 cancer clinics; within 2wks of starting radiation therapy or within 1mo of starting chemotherapy; "low" or "very low" food security on USDA screener.</p>	<p><b>Food Voucher for Hospital-based Pantry for Food Insecure Cancer Patients:</b> Hospital-based pantry + Food voucher: program provided patients with a debit card credited with \$230 each month to purchase food and healthy beverages. While only cigarettes and alcohol were restricted purchases, participants were encouraged to use the voucher on healthy foods. Patients also received clinic-based nutrition counseling.</p>	<p><b>Primary:</b> Food category purchases</p>	<p><b>Food Category Purchases:</b> Patients spent the largest portion of the voucher money on animal protein (22%), fruits (15%), and vegetables (13%). Those three categories accounted for 50% of all the voucher funds used by patients. On average, voucher recipients spent more than 25% of their voucher funds on FV, more than the average SNAP household (12%) and Non-SNAP household (16%). Patients spent, on average, 77% of voucher funds on items categorized as "healthy" and 70% of patients reported eating most or all of the food themselves.</p>
Ridberg et al., 2019 <sup>23</sup>	<p><b>Design:</b> Retro cohort</p> <p><b>Length:</b> 4-6mo</p> <p><b>Sample:</b> Children (883); 12 nationwide clinic sites</p> <p><b>Inclusion Criteria:</b> Overweight or obese; parental consent, patient willingness to participate, and family intent to make at least 3 program visits</p>	<p><b>Farmers' Market Produce Prescription:</b> Wholesome Wave's pediatric FV prescription program (FVRx) provided \$0.50-\$1.00/household member/day in FM vouchers that could be redeemed up to 6x. The program provided in-clinic nutrition education and obesity treatment counseling.</p>	<p><b>Primary:</b> FV intake</p> <p><b>Secondary:</b> The average value of FVRx prescribed and redeemed</p>	<p><b>FV Intake:</b> The increase from first to last visit in the percentage of federal dietary guidelines being met was 93% to 100% for fruits, 64% to 70% for vegetables, and 78% to 86% for combined FV. Dose propensity-adjusted increase of 0.32 cups (95% confidence interval, 0.19–0.45 cups) for each additional visit while holding constant the predicted number of visits and site.</p> <p><b>FVRx Prescribed and Redeemed:</b> Average household redemption of FVRx prescriptions during the program was \$361. Average FVRx redemption proportion was 59%.</p>

# FOOD IS MEDICINE: PEER-REVIEWED RESEARCH IN THE U.S.

NUTRITIOUS FOOD REFERRALS <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Ridberg et al., 2019 <sup>24</sup>	<p><b>Design:</b> Pre-Post Intervention</p> <p><b>Length:</b> 4-6mo</p> <p><b>Sample:</b> Households (578)</p> <p><b>Inclusion Criteria:</b> Households with children 2-18 yrs who were clinically obese or overweight; low SES;</p>	<p><b>Farmers' Market Produce Prescriptions:</b> Wholesome Wave participants received nutrition education, health education, dietary recommendations, and prescriptions for fruits and vegetables that could be used at participating farmers' markets. Providers distributed prescriptions allocated by household size (\$0.50 to \$1.00/person per day; for example, \$28/wk for a family of 4) and shared details of partnering farmers' markets for redemption.</p>	<p><b>Primary:</b> FI</p> <p><b>Secondary:</b></p>	<p><b>FI:</b> 72% of households increased their summative food security score over the course of the program. In adjusted regression models, participants had higher change scores with 5 or 6 clinical visits, compared with 1 or 2 visits (<math>\beta = .07</math>; 95% confidence interval, 0.01–0.14), and college education of the primary caretaker, compared with less than college (<math>\beta = .05</math>; 95% confidence interval, 0.01–0.09).</p>
Marcinkevage et al., 2019 <sup>25</sup>	<p><b>Design:</b> Mixed-Methods Process and Outcome Evaluation</p> <p><b>Length:</b> 2yrs</p> <p><b>Sample:</b> Adults (144)</p> <p><b>Inclusion Criteria:</b> Participants: SNAP beneficiaries at clinics. Process: 14 implementing partners and 185 prescribers in 86 prescribing sites in the program</p>	<p><b>SNAP-based Nutrition Incentive Prescription for Supermarkets:</b> During clinic visits, patients who were SNAP beneficiaries received a \$10 voucher redeemable for FV (fresh, canned, or frozen) at any one of 169 participating supermarkets. Patients could receive unlimited prescriptions (in some settings patients received a prescription once per week for 6 months), and patients could receive prescriptions from more than one implementing partner. Disease management and health education classes were also included.</p>	<p><b>Primary:</b> Intervention implementation</p> <p><b>Secondary:</b> FV purchases and patient satisfaction</p>	<p><b>Program Implementation:</b> Offering FV prescriptions improved patient visits; providing a method to identify high-need patients helped connect these patients to additional services; working in the community enhanced program support and uptake; and eliminating administrative burden helped ease program implementation.</p> <p><b>FV Purchases and Patient Satisfaction:</b> Overall redemption rate was 54.4% (15,481 of 28,481) by at least 3,688 unique shoppers. Of the 144 survey respondents, 88.9% of participants reported that the program was easy to use; 74.3% reported food in their home was less likely to run out as a result of the prescription; and 86.8% reported increased ability to afford balanced meals.</p> <p>Health seemed to improve as well with 88.2% reported eating more FV than previously, 71.5% reported managing their health conditions better, and 81.2% reported improvement in meeting nutrition, diet-related, or meal plan goals.</p>
Schlosser et al., 2019 <sup>26</sup>	<p><b>Design:</b> Qualitative Interviews</p> <p><b>Length:</b> 3mo</p> <p><b>Sample:</b> Adults (23)</p> <p><b>Inclusion Criteria:</b> Patients at 1 of 3 safety net clinics; FI; HTN</p>	<p><b>Produce Prescription Program for Hypertension:</b> Patients of the produce prescription for HTN program (PRxHTN) met with the provider monthly for 3mo during the FM season (July- Dec 2015) to check their BP, receive tailored counseling on ways to improve their diet toward better BP control, and were prescribed fresh FV in the form of free produce vouchers (\$40/mo for 3 months) to be redeemed locally at participating FMs.</p>	<p><b>Primary:</b> Participant experience</p>	<p><b>Participant Experience:</b> Transportation issues shaped shopping and eating patterns and limited participant ability to access FMs to utilize PRxHTN vouchers. Limited and unstable income shaped participant shopping and eating behavior before, during, and after PRxHTN. Participants emphasized individual-level influences like personal or perceived motivations for program participation, despite significant structural constraints, such as economic hardship, shaping their program engagement.</p> <p><b>Recommendations:</b> Train clinical staff in how to assess patient's level of structural vulnerability and needs for extra-clinic support; produce prescription programs referring patients to community-based services must consider structural constraints limiting patient's ability to engage with such programs. Research should aim to understand the impact of addressing structural needs of low SES patients on management of chronic disease.</p>
Joshi et al., 2019 <sup>27</sup>	<p><b>Design:</b> Mixed-Methods Process Evaluation</p> <p><b>Length:</b> 3mo</p> <p><b>Sample:</b> NR</p> <p><b>Inclusion Criteria:</b> Electronic process tracking database, patient enrollment screener forms, provider-prompted documentation, client pre- and post-visit survey, monthly FM redemption logs</p>	<p><b>Farmers' Market Produce Prescription for Hypertension:</b> Clinics participating in the produce prescription for HTN program (PRxHTN) received training on implementation. Providers identified and referred patients based on a diagnosis of HTN and FI screening. Monthly provider visits included a BP check, targeted nutrition counseling, and the provision of 4 \$10 FM produce vouchers. Providers would also review PRxHTN redemption guide and a Community Food Guide.</p>	<p><b>Primary:</b> Intervention implementation</p>	<p><b>Intervention Implementation:</b> A total of 7 diverse providers screened 266 patients over 3 months; 224 were enrolled. Twelve FM, including one newly established at a clinic through provider-FM manager collaboration, redeemed over \$14,500 of the \$10 PRxHTN vouchers.</p> <p><b>Recommendations:</b> Identify and involve multiple clinical key decision makers as part of the team to be involved throughout project development. Use nonclinical staff, care coordinators, or staff champions enthusiastic and engaged with similar initiatives as much as possible. Develop a routine communication plan to address implementation issues. Pay attention to process flows evaluating availability of staff, their time commitment for the program, and coverage during vacation.</p>

# FOOD IS MEDICINE: PEER-REVIEWED RESEARCH IN THE U.S.

NUTRITIOUS FOOD REFERRALS <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Trapl et al., 2018 <sup>28</sup>	<p><b>Design:</b> Pre-Post, No Control</p> <p><b>Length:</b> 1mo</p> <p><b>Sample: Adults (137)</b></p> <p><b>Inclusion Criteria:</b> HTN; FI</p>	<p><b>Produce Prescription Program for Hypertension:</b> PRxHTN involved 3 monthly, non-physician provider visits, comprising blood pressure measurement, nutrition counseling, and four \$10 farmers market produce vouchers (\$120 total in vouchers).</p>	<p><b>Primary:</b> FV intake</p> <p><b>Secondary:</b> Voucher Use</p>	<p><b>FV Intake:</b> Daily fruit consumption increased from a mean (SD) of 1.6 (1.3) servings to 2.4 (1.2) servings (P &lt; .001), and daily vegetable consumption increased from a mean (SD) of 1.7 (1.1) servings to 2.5 (1.3) servings (P &lt; .001). Farmers market visits and voucher redemption were not associated with fruit and vegetable consumption.</p> <p><b>Voucher Use:</b> 86% visited a farmers' market to use their produce vouchers, with one-third reporting it was their first farmers market visit ever. Median number of farmers' market visits was 2 (range: 0–6), and median number of vouchers redeemed was 8 (range: 0–12).</p>
Bryce et al., 2017 <sup>29</sup>	<p><b>Design:</b> Pre-Post Intervention</p> <p><b>Length:</b> 13wks</p> <p><b>Sample:</b> Adults (65)</p> <p><b>Inclusion Criteria:</b> Non-pregnant patients; previous T2D diagnosis or HbA1c &gt; 6.5</p>	<p><b>Produce Prescription Program for Diabetes:</b> Primary care providers enrolled participants in the Fresh Prescription program. They were given a Fresh Food debit card worth \$40 (\$10/week for up to 4wks). Participants could go to the Mercado 4x during the 13-week program. A \$5 incentive was added if health goals sheet was completed. Eligible purchases were limited to fresh produce and vendors offered patients extended program education and cooking demonstrations.</p>	<p><b>Primary:</b> HbA1C levels</p> <p><b>Secondary:</b> BP; weight</p>	<p><b>HbA1c Levels:</b> A statistically significant (p = 0.001) decrease in HbA1C was found (9.54% to 8.83%) compared to baseline.</p> <p><b>BP and Weight:</b> Weight (208.3 lbs. to 209.0 lbs.) and BP (135.1/79.3 mm Hg to 135.8/77.6 mm Hg) did not change from pre- to post-study (p &gt; 0.05).</p>
Cavanagh et al., 2017 <sup>30</sup>	<p><b>Design:</b> Retro Pre-Post Intervention with Control using medical records</p> <p><b>Length:</b> 13wks</p> <p><b>Sample:</b> Adults (54)</p> <p><b>Inclusion Criteria:</b> Low SES, hypertensive, obese and/or diabetic; individuals who had participated in VeggieRx for 1+ month</p>	<p><b>Mobile Market Produce Prescription:</b> Participants of the Veggie Rx program received a prescription coupon booklet; 13 \$7 coupons, each for 1wk worth of FV to be redeemed at a Capitol Roots mobile produce market. Patients must return to clinic for routine quarterly appointment with nutritionist and primary care doctor to receive more Veggie Rx coupons.</p>	<p><b>Primary:</b> BMI</p> <p><b>Secondary:</b> Coupon redemption</p>	<p><b>BMI:</b> The Veggie Rx case group members experienced a mean decrease in BMI of 0.74 kg/m<sup>2</sup>, whereas the non-Veggie Rx control group members reported a mean increase in BMI of 0.35 kg/m<sup>2</sup>.</p> <p><b>Coupon Redemption:</b> The mean number of coupons redeemed among the 54 program participants was 22, with a range of 5–87 redemptions</p>
Trapl et al., 2017 <sup>31</sup>	<p><b>Design:</b> Mixed-Method Evaluation</p> <p><b>Length:</b> 16wks</p> <p><b>Sample:</b> Adults (40)</p> <p><b>Inclusion Criteria:</b> &lt;24wks gestation within high poverty area</p>	<p><b>Comparing 3 Produce Prescription Program Models for Pregnant Adults:</b> Four provider sites (1 FQHC, 2 WIC sites, and 1 community health center) utilized ten providers to implement three produce prescription program (PRx) models (home-visit, clinic-based individual, clinic-based group). Clients across all 3 models were counseled and guided to create monthly nutrition-related implementation goals with a focus on FV intake; received 4 \$10 vouchers, redeemable at any of 22 local FMs, to address financial access to locally grown fresh FV; and assisted with educational and supplemental resources at each monthly visit.</p>	<p><b>Primary:</b> Participant characteristics and program utilization</p> <p><b>Secondary:</b> Relevance of prescription vouchers and program materials; feasibility of integrating the program into current provider practice</p>	<p><b>Participant Characteristics and Program Utilization:</b> 61% of participants had never been to an FM, but 78.1% reported living near one. 56% of PRx participants redeemed ≥1 voucher, and 95% reported that program materials were relevant and useful. Redemption didn't vary significantly by model of care or by perceived barriers to FV intake. Living closer to a FM increased redemption (88.1%). 95% found PRx materials were useful; 63% said that eating FV was more important because of the program, and 84% said that they will shop at an FM in the future.</p> <p><b>Relevance of Prescription Vouchers and Program Materials:</b> Majority of SNAP-eligible participants learned about the possibility of utilizing federal food benefits while using the program. Half of health care providers made connections with nearby FM managers and either gave a presentation to group prenatal visit participants or left information pamphlets about other incentive programs.</p> <p><b>Feasibility of Integrating the Program into Current Provider Practice:</b> Providers (n = 10) indicated that PRx created opportunities to talk about diet with participants, greater awareness about FMs, and new shopping habits.</p>

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NUTRITIOUS FOOD REFERRALS <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
George et al., 2016 <sup>32</sup>	<p><b>Design:</b> Pre-post Intervention with Qualitative</p> <p><b>Length:</b> 8wks</p> <p><b>Sample:</b> Families (4)</p> <p><b>Inclusion Criteria:</b> Patients at a weight loss clinic; low SES; overweight and/or obese.</p>	<p><b>Farmers' Market Produce Prescription with Med Student Mentor:</b> Families part of the FVRx program were given 4 \$50 vouchers redeemable for produce at a weekly FM at the Penn State College of Medicine. Each family had the support of a medical student mentor trained with healthSLAM. Mentors and families visited the market and a community garden together 4x during the intervention.</p>	<p><b>Primary:</b> Participant characteristics and program utilization</p> <p><b>Secondary:</b> Benefits for families; benefits for mentors; benefits for vendors</p>	<p><b>Participant Characteristics and Program Utilization:</b> Families had an average income of \$33,000/yr and participants reported their biggest barrier to consuming produce as "affordability" (75%). Two families completed all visits. On average, families spent \$40.68 at the market and reported one weekly produce item going unused.</p> <p><b>Benefits for Families, Mentors, and Vendors:</b> Transportation and unpredictable work schedules were major barriers for both families and mentors. Families valued on-site mentoring, and students felt that it provided opportunities for professional development and improved self-care while also benefiting vendors. It appeared that families with children recently diagnosed with a diet-related disease enhanced their program engagement.</p> <p>Integrating medical student nutritional mentoring into an FVRx program was feasible and conferred benefits to participating families, students, and vendors.</p>
Omar et al., 2016 <sup>33</sup>	<p><b>Design:</b> Pre-post Intervention, survey-based</p> <p><b>Length:</b> 12wks</p> <p><b>Sample:</b> Adults (27) for survey data and Adults (16) for bio measures</p> <p><b>Inclusion Criteria:</b> Adults with BMI &gt;25</p>	<p><b>Farmers' Market and Boxed Delivery Produce Prescription Program:</b> The Fresh Prescription program provided patients with \$10 on a rechargeable debit card for completing a nutrition educational counseling session, cooking demonstrations, and other events. They could redeem their reward at local farmer's markets or with boxed food deliveries to receive a maximum total of \$40 in fresh produce. Patients underwent a total of 4 counseling sessions over 6 weeks and received an additional \$20 boxed food delivery for returning for a 12 wk follow up.</p>	<p><b>Primary:</b> Chronic disease management, diet, nutrition knowledge, barriers to produce consumption</p> <p><b>Secondary:</b> Weight; BP</p>	<p><b>All Survey Data:</b> 6% of participants reported they were better able to manage their health and their chronic conditions. 78% of participants reported an increase in their daily intake for fresh fruits and vegetables, with an average increase of 2 cups/day. 48% of participants reported a decrease in their intake of unhealthy food items, with an average decrease of 1 item/day. There was an increase in measures of knowledge base, which included ability to select, prepare, and store fresh produce. 85% of participants reported better knowledge of where to buy fresh produce. Price, access, and transportation were still noted to be barriers for many participants.</p> <p><b>Weight &amp; BP:</b> Of the 39 patients who completed the program, 16 returned for follow up on biometrics, including weight and blood pressure. 5 of 16 participants had weight loss, and 5 of 16 had improvement in blood pressure.</p>
Goddu et al., 2015 <sup>34</sup>	<p><b>Design:</b> Qualitative Evaluation</p> <p><b>Length:</b> NR</p> <p><b>Sample:</b> Adults (NR)</p> <p><b>Inclusion Criteria:</b> Patient at 1 of 6 clinics in a low income, urban neighborhood; in need of healthy food, especially diabetic patients</p>	<p><b>Multi-site Produce Prescription:</b> Patients of Food Rx, a food prescription collaboratively developed by a university research team, Walgreens, a local FM, and 6 health centers on the South Side of Chicago, received a user-friendly prescription during a clinic visit. The prescription document included a \$5 coupon off \$20 purchase at 9 Walgreens, a \$10 voucher at FM, nutrition information, and a map of redemption locations.</p>	<p><b>Primary:</b> Development of a produce prescription program</p> <p><b>Secondary:</b> Preliminary lessons learned from implementation</p>	<p><b>Development of a Produce Prescription Program:</b> Design of intervention used a four-prong approach: highlighting "doctor's orders," providing a coupon for healthy purchases, raising awareness of local resources, and providing education to patients. The novel collaboration between community organizations, the health centers, and the university team was key to the success.</p> <p><b>Preliminary Lessons Learned from Implementation:</b> Integrating Food Rx into the health care setting is challenging but may be powerful; the value and convenience of the Food Rx are strong determinants of use; participating in Food Rx may have brought positive culture changes to community partners; a small and diverse coordinating team is key; and university-community food partnerships can accommodate research methodology.</p>
Watt et al., 2015 <sup>35</sup>	<p><b>Design:</b> Quasi-experimental prospective with comparison group</p> <p><b>Length:</b> 6mo</p> <p><b>Sample:</b> Adults (61)</p> <p><b>Inclusion Criteria:</b> Low SES; Hispanic women in their first trimester.</p>	<p><b>Farmers' Market Vouchers for Pregnant, Low-Income Individuals:</b> Pregnant women were recruited during first trimester prenatal visits in a primary care setting serving primarily low SES. Spanish-speaking women. Participants enrolled in group classes that ran until their infant's 6-month well check. Classes included general nutritional information and cooking classes, and participants received vouchers for fruits and vegetables at the local FM.</p>	<p><b>Primary:</b> Infant weight (maternal weight gain; breastfeeding at 6mo; infant height; weight-for-height percentiles birth-6mo; infant development)</p> <p><b>Secondary:</b> Mediating Factors (maternal diet, maternal substance use, maternal exercise, maternal social support)</p>	<p><b>Infant Weight/Health:</b> The program was not associated with infant weights. Participants were more likely to breastfeed (<math>p = .07</math>) and their infants were more likely to pass the ages and stages developmental screen (<math>p = .06</math>) than women in the comparison group.</p> <p><b>Mediating Factors:</b> Despite similar profiles at baseline, women in the intervention group were more likely than women in the comparison group to have significant improvements in diet, exercise, and depression (<math>p \leq .05</math>).</p> <p><i>It should be noted that results revealed wide variation in redemption of the food vouchers.</i></p>

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NUTRITIOUS FOOD REFERRALS <i>(Continued)</i>				
SOURCE	STUDY DETAILS (n)	INTERVENTION	OUTCOMES	FINDINGS
Friedman et al., 2014 <sup>36</sup>	<p><b>Design:</b> Mixed-Methods, Community-Based Participatory Research</p> <p><b>Length:</b> 22wks</p> <p><b>Sample:</b> Adults (44); Providers (13)</p> <p><b>Inclusion Criteria:</b> Enrolled in a diabetes education program at a FQHC; diagnosed with T2D as of March 2011</p>	<p><b>Farmers' Market Produce Prescription Program for Diabetes:</b> The produce prescription program occurred through provider-initiated communication focused on pre-printed prescriptions that stated the current recommendations for FV intake. Each prescription could be redeemed at the FM for \$1 off their purchase. Additional vouchers were provided as incentives for attending diabetes self-management classes for continuing the study.</p>	<p><b>Primary:</b> Patients' utilization of the FM</p> <p><b>Secondary:</b> Patient-provider communication and social interactions</p>	<p><b>Patients' Perceptions and Utilization of the FM:</b> Out of the 3,747 receipts recorded at the market, 7.6% were paid in full or part with the prescription \$1 off coupon, 4.6% included payments of both prescriptions and vouchers, and 80% of the prescriptions were spent at the FM on the same day the patients received them.</p> <p><b>Patient-Provider Communication and Social Interactions:</b> Data from patient interviews and provider surveys revealed that patients enjoyed social aspects of the market including interactions with their health care provider; providers distributed prescriptions and vouchers to patients, shopped at the market, and believed that the market had potential to improve the health of staff and patients.</p> <p>While provider communication about diet decreased over time, provider modeling of healthy behaviors may influence patients' food-related perceptions and dietary behaviors.</p>
Freedman et al., 2013 <sup>37</sup>	<p><b>Design:</b> Mixed methods, one-group, repeated measures</p> <p><b>Length:</b> 22wk</p> <p><b>Sample:</b> Adults (41)</p> <p><b>Inclusion Criteria:</b> Diabetes diagnosis; low SES</p>	<p><b>FQHC-based Farmers' Market Intervention for Diabetes:</b> Participants had to complete surveys to receive vouchers. They received \$25 at baseline (May/June), \$25 at midpoint (August), \$40 at follow-up (November) to spend at a produce-only FQHC-based FM.</p>	<p><b>Primary:</b> FV Intake</p>	<p><b>FV Intake:</b> A marginally significant (<math>p=0.07</math>) average increase of 1.6 servings of total FV consumption per day occurred. The odds of achieving significant improvements in FV consumption increased for diabetics using financial incentives for payment at the FM (OR: 38.8, 95% CI: 3.4–449.6) and for those frequenting the FM more often (OR: 2.1, 95% CI: 1.1–4.0).</p>

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