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Produce prescription projects: Challenges, solutions, and emerging best practices – Perspectives from health care providers

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ABSTRACT

Produce prescription projects are becoming increasingly common. This study explores perspectives and experiences of a sample of health care providers throughout the United States participating in implementing produce prescription projects with funding from the United States Department of Agriculture. Surveys (N = 34) were administered to collect demographic and descriptive data. Subsequently, individual key-informant interviews with participating health care providers (N = 16) were conducted via videoconference. Participants in this study included physicians and clinical staff (e.g., nursing, nutrition, social work) who work at health care organizations that facilitate a produce prescription project. Interview transcripts were coded using thematic qualitative analysis methods. Four cross-cutting key themes emerged. First, interviewees shared operational challenges, including lack of time/staff, difficulty with provider/patient engagement (some related to COVID-19), steep “trial and error” learning curve, and formidable barriers related to data sharing and research-related requirements (e.g., Institutional Review Board approvals). Second, interviewees elucidated their solutions, lessons learned, and emerging best practices as a response to challenges (e.g., importance of having a full-time paid staff member to manage PPR within clinic). Third, interviewees expressed satisfaction with produce prescription projects, particularly related to positive patient experiences (e.g., improved clinical outcomes and improved food security). Fourth, interviewees also shared appreciation for rigorous program evaluation to establish sustained funding and advance policies. However, they contextualized this appreciation within challenges outlined regarding collecting and sharing patient-related data outcomes.

Findings provide emergent best practices and inform additional resources that are needed to sustainably implement and rigorously evaluate produce prescription projects.

1. Introduction

Diet-related chronic health conditions, including cardiovascular disease, some cancers, type 2 diabetes, and obesity, account for half of all annual deaths in the United States (US) and more than half of the \$383.6 billion in government health care spending. (U.S. Government Accountability Office, 2021) Food and nutrition insecurity are social determinants of health that can worsen prevention and management of these diet-related chronic conditions. (Marcone et al., 2020; Berkowitz

et al., 2013; Seligman et al., 2009) Produce prescription projects are increasingly common interventions to address poor health outcomes associated with food insecurity, limited healthy food access, and diet-related chronic disease. (United States Department of Agriculture, 2020) These projects allow health care professionals to “prescribe” fruits and vegetables (FVs) for patients experiencing food insecurity and often a chronic disease condition. Between 2010 and 2020, nearly 100 produce prescription projects were launched throughout the US; (Wave et al., 2021) these programs vary widely in terms of priority audience,

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screening and eligibility procedures, prescription distribution protocol and value, format (e.g., produce box, voucher), and implementation/evaluation components.

The US Department of Agriculture (USDA) funds produce prescription (PPR) projects through the Gus Schumacher Nutrition Incentive Program (GusNIP). Grantees are required to have a health care partner or be a health care entity (e.g., hospital, federally qualified health center) and to enroll individuals who (1) are eligible for income-qualifying benefits like Supplemental Nutrition Assistance Program (SNAP) or Medicaid, (2) have low-income, and (3) have, or are at risk of developing, a diet-related health condition. (United States Department of Agriculture, 2020) Prescriptions are typically redeemed at collaborating farmers markets, grocery or corner stores, and in health care settings (e.g., ‘food pharmacies’). (Wave et al., 2021) Finally, nutrition education and/or auxiliary services (e.g., transportation) are commonly added to augment program engagement and effectiveness. (Jones et al., 2020; Stotz et al., 2019).

Growing evidence suggests produce prescription projects offer wide-ranging benefits, including increasing FV purchasing (Xie et al., 2021) and consumption; (Bhat et al., 2021) reducing household food insecurity; (Oronce et al., 2021; Ridberg et al., 2019) improving clinical health outcomes including hemoglobin A1c, (Bryce et al., 2021; Veldheer et al., 2021) diastolic blood pressure, (Cook et al., 2021) and body mass index; (Cavanagh et al., 2017) decreasing health care costs; (Lee et al., 2019) and improving patient experiences. (Schlosser et al., 2019) Several reviews have identified primary care physicians as the key referring providers in such programs, but many other members of the health care team are often involved, including community health workers, registered dietitian nutritionists, nursing professionals, pharmacists, social workers, medical assistants, and even medical students. (Veldheer et al., 2021; Swartz, 2018; Forbes et al., 2019; Friedman et al., 2014; Goddu et al., 2015) Only a few studies focus on the experiences of those health care providers (HCP) who order the prescription – despite the standard practice that these programs are integrated into health care delivery. These studies highlight both beneficial experiences, such as increased positive interactions with patients, as well as challenges, including integrating the program into clinic workflow (Schlosser et al., 2019) or the hindrance of staff lacking “prescribing privileges.” (Newman and Lee, 2021) These studies also focus on a single geographic region or health care system. (Schlosser et al., 2019; Newman and Lee, 2021; Sekhon et al., 2017).

As PPR projects scale beyond short-term, grant-funded interventions to county-wide, state-wide, and/or health-system levels, it is critical to develop best practices for engaging, training, and working with HCPs in clinical settings. (Stake, 1995) These best practices must consider the perspective of the HCP, including their perceived challenges and proposed solutions. (Stake, 1995) The purpose of this multiple methods study was to investigate perspectives of HCPs, specifically those participating in 2019–2020 USDA-funded GusNIP PPR projects, to explore barriers and facilitators that define program success and to determine emerging best practices for program improvement. The authors are members of the USDA-supported National Technical Assistance, Evaluation, and Information Center’s (NTAE) Reporting & Evaluation team, created alongside GusNIP to support grantees with implementation, outreach and communications, and reporting and evaluation. We are not aware of other studies that explore these questions across multiple programs and throughout the US or synthesize experiences of many providers.

2. Methods

2.1. Conceptual framework

This study is guided by the Theory of Acceptability of Healthcare Interventions, which emphasizes the importance of exploring attitudes and perceptions of HCPs to preemptively assess how health care

interventions may work within any given community. (Stake, 1995) Additionally, data collection and analysis were informed by a constructivist approach to qualitative research. Constructivists claim that truth is relative and dependent on one’s perspective; this paradigm recognizes the importance of the subjective human creation of meaning. (Baxter and Jack, 2008) Constructivism is built on the premise of a social construction of reality, and one of the advantages of this approach is close collaboration between the researcher and the participant, while enabling the participant to talk about their experiences. It is through this discourse that participants are able to describe their views of reality, and this enables the researcher to better understand the participants’ actions. (Palinkas et al., 2015) Constructs from these two frameworks informed the moderator guide and deductive portion of data analysis.

2.2. Data collection

HCPs from all 18 GusNIP-funded PPRs (2019–2020) were recruited through maximum variation and snowball sampling methods. (Sobal, 2001; Coward et al., 2021) Maximum variation sampling ensured the sample included a variety of types of HCPs (e.g., physician, social worker), types of health care organizations where the provider worked, and geographic regions. Specifically, we contacted all GusNIP PPR grantees through their NTAE program advisor and invited them to share this research opportunity with their collaborating health care organization partners, who then shared the opportunity with their HCP staff. Snowball sampling included HCP interviewees recommending and recruiting additional HCPs by email who they thought would provide insight to the dataset. (Sobal, 2001) In the scripted recruitment email, all participants were asked to complete a 22-item descriptive survey via Qualtrics. At the end of the survey, HCPs could opt in to a subsequent 1:1 interview. The lead qualitative researcher then contacted interested HCPs via email to set up an individual interview. One trained qualitative researcher used a semi-structured moderator guide with probes to facilitate the interviews (Table 1). The moderator guide was informed by existing literature (Sekhon et al., 2017; Janghorban et al., 2014) and the theoretical framework. For example, moderator guide questions #1 and #2 are informed by the constructivist epistemology in that they are specifically seeking information on the participants’ experiences based

Table 1
Moderator Guide Used for Health Care Provider Interviews.

Question	Probes
Tell me about your role within the GusNIP Produce Prescription Project (PPR) at (NAME OF SITE/ORGANIZATION)	Probes: director, prescriber, management, coordinator, full time, part time
Walk me through how your PPR program works at NAME OF SITE/ ORGANIZATION.	Probes: recruitment, referral, retention, electronic health record (EHR), clinical visits/data collection, challenges, facilitators/strengths
What resources or support would help improve your PPR?	Probes: funding, time, experts, data collection infrastructure, partnerships
If a new group or organization was interested in PPR, what advice would you give them?	Probes: best practices, what not to do, resources to request, collaborators
Tell me about challenges you’ve encountered with your PPR.	Probes: funding, engagement, recruitment, time, collaborators, resolved challenges) Note: encouraged discussion of challenges beyond COVID-19-related challenges
Please share any patient outcomes or experiences as related to your PPR.	Probes: improved clinical metrics, mental health, food security, program critiques from patients, program-specific requests from patients
Is there anything else related to your experience with this or other PPR that you think would be helpful for others working in this area or those just starting projects that you would like to share with me?	

on their positionality within the health care organization and in relation to the PPR. Interviews were conducted from May–August 2021 and averaged 36 min in length (range 30–42 min). We conducted all interviews using Zoom videoconferencing. We followed best practices for conducting reliable and valid remote-access interviews; (Lupton, 2020; Vasileiou et al., 2018) for example, our introductory script included language about features in Zoom, recommendations to stay ‘off mute’ for the entirety of the interview, and recognition that interviewees were often at home with unusual workday distractions (e.g., pets, children). We sought to create a safe space for interviewees to break temporarily if necessary due to distractions. Our goal was 20 interviews or until we reached saturation; we reached saturation at 16 individual interviews when no additional codes or themes were being generated from the transcribed data. (Dworkin, 2012) This is consistent with qualitative sampling literature which suggests ~20–30 participants to reach saturation and redundancy. (Baker and Edwards, 2012; Morse, 2000; Saldaña, 2012) In recognition of their time, \$50 gift cards were provided to those who completed both the survey and interview. Interviews were recorded using Zoom and professionally transcribed verbatim. Prior to analysis, each transcript document was verified against the audio-file for accuracy and de-identified. The study protocol was approved by the University of Nebraska Medical Center Institutional Review Board (IRB) and determined exempt; therefore, we provided an information sheet prior to each interview rather than informed consent.

2.3. Analysis

Three researchers independently double coded 25% of the transcripts, and all transcripts were coded by one researcher. (Hager and Mozaffarian, 2020) Two of the coders are HCPs and two are PhD-trained PPR evaluation experts. Coders used a multi-stage coding and analysis process including both inductive and deductive coding. First, coders independently read one transcript and applied inductive codes (i.e., those that arose directly from the transcripts). Next, coders worked together to draft a codebook which delineated each code name and code definitions. This codebook included deductive codes (i.e., pre-determined codes based on the research questions, theoretical frameworks, and relevant literature). (Wave et al., 2021; Swartz, 2018; Janghorban et al., 2014; Hager and Mozaffarian, 2020; Anfarra et al., 2002) For example, the code “satisfaction_workflow” was informed by the Theory of Acceptability of Healthcare Interventions. (Stake, 1995) Codes were next grouped into a hierarchical code system, which led to development of categories and subsequent overarching themes. For example, satisfaction was a hierarchical code (category) including several codes: satisfaction_workflow, satisfaction_time required; satisfaction_pt outcomes. The codes were originally used without the root “satisfaction” and were grouped together in this way after first round coding was complete to add hierarchical codes and categories. Coders reached >80% concordance in their independent coding on double coded transcripts and met bi-monthly via Zoom to discuss their analytic process. (Paulus et al., 2014) All qualitative data management and analysis was conducted using Atlas.ti (Version 8.1.1). (Tong et al., 2007) The analysis followed COREQ (Consolidated Criteria for Reporting Qualitative Research) guidelines. (Cutts and Cook, 2017) Descriptive statistics were calculated for survey responses using JMP (Version 16).

3. Results

3.1. Descriptive survey results

In total, 34 HCPs completed surveys (Tables 2 and 3). Participants reported a mean age of 42 years (31 – 52 years). A majority identified as female (97%) and white (68%), with 12% reporting Hispanic, Latino/a, or Spanish origin. Nearly half of participants (47%) had been in the health care profession for more than ten years, and about a third (31%) practiced for less than five years. Most participants agreed that their PPR

Table 2
Demographic and Professional Characteristics of Participating Health Care Providers.

Characteristics	All Survey Respondents (n = 34)		Survey + Interview Respondents (n = 16)	
	n	%	n	%
Gender				
Women	33	97.06	15	100
Prefer not to answer	1	2.94	0	0
Ethnicity – Hispanic, Latino/a, or Spanish origin				
Yes	4	11.76	1	6.67
No	29	85.29	14	93.33
Prefer not to answer	1	2.94	0	0
Race				
American Indian or Alaska Native	4	11.76	0	0
Asian	1	2.94	0	0
Black or African American	2	5.88	0	0
Native Hawaiian or Pacific Islander	0	0	0	0
White	23	67.65	14	93.33
Other race	3	8.82	1	6.67
More than one race	1	2.94	0	0
Primary clinical training/profession				
Case manager, care coordinator (enrollment specialist, care coordinator, case management, program coordinator)	4	11.76	2	13.33
Health educator	1	2.94	1	6.67
Medical Doctor	5	14.71	1	6.67
Mental health professional	2	5.88	0	0
Nurse practitioner/physician assistant	3	8.82	1	6.67
Nursing professional (registered nurse, nurse educator, certified nursing assistant)	5	14.71	2	13.33
Registered dietitian nutritionist/registered diet technician	7	20.58	5	33.33
Social worker/case manager	4	11.76	2	13.33
Other	3	8.82	1	6.67
Years in practice				
<5 years	10	31.25	5	33.33
5–10 years	7	21.88	2	13.33
>10 years	15	46.88	8	53.33
Missing	2	5.88	0	0

project changed how or if they talk with patients about healthy eating (71%); and strongly agreed that PPR projects were beneficial for patients and recommended to other clinics (71%).

As a result of their PPR project, 44% of HCPs implemented new screening tools, survey measures, or questions in clinical visits; 22% added nutrition education components to clinical visits; 19% integrated new screeners or surveys in electronic health records (EHRs); and 19% added a patient follow-up visit or saw patients more frequently. About a third of respondents (35%) reported top challenges implementing their PPR projects as limited training for providers and/or limited time for patient encounters. Participants reported that support staff essential for feasible program implementation included registered dietitians (66%), nursing or health care techs/assistants (41%), and social workers/case managers (38%). Overall, participants indicated positive (82%) experience offering the PPR project, with the majority noting they would participate again (73%). Of those HCPs who participated in both the survey and interview (n = 16), geographic representation from where the HCP worked at the time of their interview includes the following regions of the United States: Northeast (4); Southeast (6); Southwest (2); Northwest (3); Alaska/Hawaii (1).

Table 3
Health Care Providers' Survey Responses (N = 34).

Survey Question	n	%
My clinical training prepared me to address social determinants of health, including those related to food insecurity with my patients.		
Strongly disagree	1	2.94
Disagree	8	23.53
Neither disagree nor agree	6	17.65
Agree	5	14.71
Strongly agree	10	29.41
Does not apply to me	4	11.76
The program has changed how I talk with my patients about healthy eating or whether I talk to my patients about healthy eating.		
Strongly disagree	0	0
Disagree	3	8.82
Neither disagree nor agree	3	8.82
Agree	16	47.06
Strongly agree	8	23.53
Does not apply to me	4	11.76
There were/are significant barriers to program implementation at our site.		
Strongly disagree	3	8.82
Disagree	12	35.29
Neither disagree nor agree	12	35.29
Agree	5	14.71
Strongly agree	2	5.88
PPR negatively impacted the clinical workflow.		
Strongly disagree	8	23.53
Disagree	14	41.18
Neither disagree nor agree	10	29.41
Somewhat agree	1	2.94
Strongly agree	0	0
Missing	1	2.94
The project has been beneficial for patients, and would recommend this program to be used at other similar clinics.		
Strongly disagree	0	0
Disagree	0	0
Neither disagree nor agree	4	11.76
Agree	6	17.65
Strongly agree	24	70.59
Missing	1	2.94
Which of the following did you add in response to your produce prescription program (PPR)? Select all changes that apply.		
Implemented new screening tools, survey measures or questions in clinical visit (e.g., 2-item food insecurity screener, dietary intake items, others)	12	44.44
Integrated new screeners or survey in electronic health record (e.g., food insecurity)	5	18.52
Added a patient follow-up visit or increased the duration or timing of a patient follow-up visit	5	18.52
Added nutrition education components to clinical visits	6	22.22
Added auxiliary services to accommodate patients (e.g., free transportation to clinic)	3	11.11
Added or expanded clinical/administrative personnel	2	7.41
Other	5	18.52
Did not change	5	18.52
Did your clinic experience any of the following challenges in implementing your PPR? Select all that apply.		
Inadequate staffing	4	23.53
Limited training for providers	6	35.29
Limited time for patient encounters	6	35.29
Insufficient resources for nutrition education	3	17.65
Insufficient resources for EHR abstraction	1	5.88
Insufficient resources for survey administration	2	11.76
Other	4	23.53

Table 3 (continued)

Survey Question	n	%
On average, how many additional hours per week would you estimate you've added to engage in direct patient facing encounters for your clinic's PPR? (Please include additional time spent in clinic encounters, enrollment, recruitment, direct patient communication)		
None	8	23.53
1-3 h	15	44.12
4-6 h	2	5.88
7-10 h	1	2.94
More than 10 h	2	5.88
Missing	6	17.65
On average, how many additional working hours per week would you estimate you've added to administer your clinic's PPR? (Please include additional time spent in charting and administrative tasks)		
None	10	29.41
1-3 h	12	35.29
4-6 h	1	2.94
7-10 h	1	2.94
>10 h	3	8.82
Missing	7	20.59
What support staff do providers think are most essential for feasible program implementation? Select all that apply.		
Clinic coordinator	8	27.59
Front desk	7	24.14
Nursing/health care tech/assistant	12	41.38
Registered Dietitian	19	65.52
Scheduler	6	20.69
Social worker/case manager	11	37.93
Other	7	24.14
Overall, how would you rate your experience as a clinician offering the PPR?		
Very negative	0	0
Negative	0	0
Neutral	2	5.88
Positive	11	32.35
Very positive	17	50.00
Missing	4	11.76
If available, would you participate again in the PPR?		
Yes	25	73.53
No	2	5.88
Don't know	3	8.82
Missing	4	11.76

3.2. Qualitative findings

We grouped participant responses into four themes: 1) operational challenges; 2) solutions and emerging best practices; 3) satisfaction with PPR projects; and 4) appreciation of evaluation needed for program sustainability.

Themes #1 (Operational Challenges) and #2 (Solutions and Emerging Best Practices) are intricately interrelated, yet distinct in nature, and are reported in tandem in [Table 4](#). Challenges of incorporating PPR projects into workflow included lack of time/staff, difficulty with provider and patient engagement (some related to COVID-19), a steep “trial and error” learning curve, and formidable barriers related to data sharing and research-related requirements (e.g., IRB approvals). PPR project solutions, ‘lessons learned,’ and emerging best practices included having a clinic-based staff member funded specifically to manage the PPR project, diversifying recruitment efforts (e.g., give non-physician HCPs prescription privileges), bundling visits to improve the patient experience (e.g., physician visit, produce pickup, and nutrition education in one visit), and enhancing support for navigating IRB, data sharing, and other administrative processes.

[Table 4](#). Theme #1 (Operational Challenges) and Theme #2 (Solutions and Emerging Best Practices) with Exemplifying Quotations.

Table 4
Theme #1 (Operational Challenges) and Theme #2 (Solutions and Emerging Best Practices) with Exemplifying Quotations.

Theme #1 – Operational Challenges	Theme #2 – Solution and Emerging Best Practices	Exemplifying Quotations
<p>There is limited time and staffing at PPR-participating clinics in general.</p> <p>There is a need for consistent, ongoing training for HCPs who “prescribe” produce prescriptions.</p> <p>Patient engagement is challenging because patients need many prompts for engagement including reminders for: calls on nutrition education sessions, voucher issuance, voucher redemption, follow up visits to conduct evaluation/collect data.</p>	<p>Hire a full-time staff member to manage all aspects of the PPR project. This staff member does not need to be a clinician.</p> <p>This staff member can: manage HCP training, recruitment, enrollment, voucher issuance, and patient education on voucher redemption; coordinate nutrition education, transportation, and other required auxiliary services; conduct reminder/support calls to PPR participants; and manage all aspects of evaluation (e.g., EHR data abstraction, survey collection and administration, process evaluation).</p>	<p><i>We’re so lucky we have [NAME] – she runs the whole program. She gets people signed up and calls them to follow up – and reminds all of us [providers] to keep referring our patients. [physician]</i></p> <p><i>It’s just staffing and time. I mean – we don’t have either to really recruit well or explain to patients everything they need to get the vouchers, where to spend the vouchers, get to the classes. It’s a lot. It’s like we need one person hired to do that job. [physician]</i></p> <p><i>I have a social work background. I worked in a trauma field and this is kind of a complete shift for me. So I don’t know the best way to explain myself to other folks doing this program, but certainly not a specialized person, which I think is a nice reminder that you don’t need anyone like super educated in this field or with a lot of experience, like it’s doable. And it’s something that with some minor education you can definitely get up and running. [outreach coordinator]</i></p> <p><i>Because that’s how we get a lot of pregnant women signed up, it’s word of mouth. Someone else has already been a part of this program. So, I think just the more folks we can get the word out to the better. [registered nurse]</i></p> <p><i>When we were first enrolling, their point was, we want this to be easy, simple. As health care providers, as a social worker, I’m ready for whatever connections I can make, but most health care providers are like, “I got two minutes, make it quick.” [social worker]</i></p>
<p>Challenges with recruitment primarily pertain to difficulty to get HCPs to “prescribe” or refer patients to the PPR project.</p>	<p>Include social determinants of health screener with validated, standardized food insecurity questions in standard medical intake form – to ‘flag’ eligible participants for full-time PPR staff member to engage and enroll.</p> <p>Include community-based marketing and ‘self-referral’ opportunities such as flyers in clinic, word of mouth, and patient text-message blasts.</p> <p>Ensure the referral process is seamless, within EHR, and quick to complete.</p> <p>Full-time PPR staff member can enhance utilization of the EHR for participant recruitment, enrollment, and program evaluation.</p>	<p><i>I think that that’s really powerful for patients, getting the food, the support, and the education all in one place and kind of connecting it to those</i></p>
<p>Patients have competing barriers to PPR engagement, some related to COVID-19.</p>	<p>Include transportation services, expand redemption sites, have on-site (at clinic) redemption opportunities.</p>	<p><i>I think that that’s really powerful for patients, getting the food, the support, and the education all in one place and kind of connecting it to those</i></p>

Table 4 (continued)

Theme #1 – Operational Challenges	Theme #2 – Solution and Emerging Best Practices	Exemplifying Quotations
<p>In almost all cases, actualized PPR workflow does not match the envisioned workflow, and the “trial and error” process to establish the actual workflow was time consuming and negatively impacted buy-in and engagement from providers.</p>	<p>Bundle visits – so patient sees provider, gets vouchers, and nutrition education at the same visit, or nutrition education and opportunity for voucher redemption at the same visit. Bundling visits with COVID-19 testing or vaccination opportunities was beneficial as well.</p> <p>Offer additional resources, including assistance with federal food assistance programs (e.g., SNAP or WIC enrollment), emergency food resource (e.g., food pantry).</p> <p>To mitigate COVID-19-related engagement barriers, provide telehealth medical visits, remote nutrition education opportunities, mailed vouchers, produce delivery opportunities.</p> <p>Offer new funding mechanism (e.g., through USDA GusNIP) for new PPR projects eligible for one year pilot/planning funding, followed by full PPR grant if pilot objectives are met.</p> <p>Expand PPR community of practice for new-to-field PPR projects.</p> <p>Incentivize ‘veteran’ or experienced PPR grantees to mentor/coach new PPR grantees.</p>	<p><i>health markers. [diabetes educator]</i></p> <p><i>People just have a hard time getting around, so we offer [NAME OF TRANSIT SERVICE] free of charge for medical appointments, but then since we are right here on campus, they can also see the dietitian, get their food at the market with their vouchers, and even we had a COVID-19 testing site available right at the market out there.</i></p> <p><i>We were a completely brand new program and we had to develop the program and work out all of the kinks and enroll participants and get everything moving in a very short timeframe with very limited funding for staff because the grant itself laid out that majority of the funding had to be used for vouchers. (...) We could have used the first two years and all of the funding to develop the program and just get like a handful of people in like a pilot program and focus more on making sure that program was solid and then expanding in another funding cycle to really focus on getting vouchers out. But we kind of have just been trying to keep our feet under us as best as possible as we develop everything with limited resources and money for development. We have plenty of money for vouchers right now, but that doesn’t do us any good when we don’t have staff or participants to spend them on. [social worker]</i></p>
<p>Data sharing, EHR abstraction, and IRB approval are time consuming and hard to navigate.</p>	<p>New PPR projects should have a one-year pilot planning period to establish these protocols and approvals – prior to full project launch.</p> <p>A full-time, clinic-based PPR staff member can manage IRB-required training (e.g., protection</p>	<p><i>I think for us, certainly the process of getting IRB approval has been a challenge. (...) So certainly additional staff support, additional funding for staff time, so that we could bring on more staff. [community health worker]</i></p>

(continued on next page)

Table 4 (continued)

Theme #1 – Operational Challenges	Theme #2 – Solution and Emerging Best Practices	Exemplifying Quotations
	of human subjects), and facilitate EHR data abstraction. Hospital or health care administrators can include letter of support for data sharing as requirement of grant application. PPR projects to work with NTAE program advisors who specialize in these topics and an extra 6 months and additional funding to support these efforts.	<i>But I will say that we have been running this [NAME OF PROGRAM] since 2013. So it's not a new program for us. It's just a little bit new in the intensive evaluation and the IRB approval, but we've been running this as a community-based program for years. And we have, in the past, worked directly with health clinics as we are now to recruit from their patient population, but we haven't collected the level of health metric data that we're going to be doing for this project. So we have the benefit of having a well-established program before we try to get this health record data sharing stuff lined up. [registered dietitian nutritionist]</i>

EHR = electronic health record.

GusNIP = Gus Schumacher Nutrition Incentive Program.

HCP = health care provider.

IRB = Institutional Review Board.

NTAE = National Technical Assistance, Evaluation, and Information Center.

PPR = produce prescription program.

SNAP = Supplemental Nutrition Assistance Program.

USDA = United States Department of Agriculture.

WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Theme #3. HCPs are Strongly Satisfied with PPR Projects. Most interviewees expressed satisfaction with PPR projects and their positive impact on overall care of patients. In all interviews, HCPs described multiple social determinants of health negatively impacting their patients and appreciated a tangible resource to mitigate health disparities related to food insecurity, as demonstrated by these two quotations:

We definitely have a lot of patients that come in with diabetes use the coupons, changed their diet around, lost weight, lowered their A1C. We have quite a few that have made some very good improvements with our program and the food bucks being able to utilize the fresh produce. [registered dietitian nutritionist]

We can have a whole nutrition class on why fresh food is best, and then I get to give them these vouchers – like, “okay, now go out and get some fresh food in your house.” And that feels like, so much more powerful than education alone. [physician]

Theme #4. HCPs Appreciate Evaluation Needed for Program Sustainability. Many interviewees expressed appreciation for rigorous evaluation needed to sustain or expand PPR projects, but contextualized this with challenges collecting and sharing patient-related data outcomes. One interviewee shared:

So, and then having that access to their electronic medical record, we can look at any type of nutrition-related labs. (...) It just takes time, like it's not automatic. So we're looking at those kind of outcome drivers to see how do we improve your health through this program and to make the case that these programs work and need to be continued longer than just this one grant. [social worker]

Regarding program evaluation and sustainability, discussion ensued about what programs and HCPs would need to actualize more rigorous

evaluation. One interviewee said:

What else would we need? I think we're pretty small scale in terms of the patients that we're reaching in a pilot [PPR] program. So I would be really interested in piloting this in more demographics of patients in terms of their medical diagnosis and seeing what's more effective – like the dose and length of the program they'd need? [food pharmacist].

4. Discussion

The themes from these interviews include operational challenges to PPR projects within clinical settings, emerging best practices to mitigate these challenges, and satisfaction with and understanding of the need for rigorous PPR impact evaluation for program sustainability.

Researchers have explored HCPs and other key stakeholder perspectives in previous studies, but were limited to one geographic region or health systems network within the US. (Sekhon et al., 2017; Janghorban et al., 2014) A qualitative study with HCPs (N = 15) in Mississippi suggested HCPs wanted more streamlined screening and enrollment processes for their produce prescription project; needed more training on food insecurity, nutrition education, and the relationship between food insecurity and disease management; and were concerned about the logistics of program administration. (Janghorban et al., 2014) Similarly, most HCPs in this study suggested a quick, simple screening and ‘flagging’ system within the EHR was widely appreciated, and ongoing training for HCP ‘prescribers’ was imperative to keep produce prescriptions (and presumably other food access interventions) and food insecurity on the forefront of their minds. The literature suggests that screening is a key first step in addressing food insecurity, and our survey findings suggest that PPR projects might motivate the implementation of such screening programs, and that quality improvement efforts to bolster screening rates for social determinants of health might also bolster referral rates. (Taher et al., 2022; Stotz et al., 2019) Interviewees working with PPR projects that had both an EHR-based screening system and a designated, paid staff member to manage the PPR project voiced the least concerns with logistics. In addition to having implications for food insecurity screening, these results may also be important for screening for other social determinants of health.

One critical suggestion for running PPR programs effectively was to have a paid staff member responsible for addressing myriad associated challenges. This individual could be a HCP, but could also be a community health worker, patient care coordinator, or “food pharmacist.” As reflected in the literature, PPR projects require considerable time to implement and maintain. (Veldheer et al., 2021; Stotz et al., 2021) Quality improvement or evaluation efforts are necessary to ensure patient engagement, maintain referrals, and support program sustainability. Without a full-time staff member to facilitate these aspects of the PPR project, clinics rely on a volunteer ‘program champion’, a responsibility that is neither sustainable nor equitable. (Stotz et al., 2021; Cummings et al., 2013) Challenges to funding staff members for this work are limited by financial resources and already over-extended staff responsibilities. Most PPRs are grant funded, and therefore dedicated staffing for these positions may reduce the amount of money available to patients in the form of the financial incentive. There is therefore an important balance that must be sought between successful program administration and maximal patient support for food purchases. Literature suggests that community health workers and peer educators can be affordable and fundamental members of health care teams – for these types of duties. (Spencer et al., 2011; Simmons et al., 2008; Au et al., 2016).

Patients receiving produce prescriptions generally had numerous social complexities besides food insecurity, which was also identified as a challenge. Newman and Lee indicated transportation, child care, and unreliable methods to contact patients as concerns to patient engagement, (Sekhon et al., 2017) and the present study reveals similar concerns. As interviewees indicated, offering bundled services (e.g., medical

appointments and food access at the same location), ancillary services (e.g., transportation), and other food aid or social supports at the same visits (e.g., assistance with SNAP enrollment) may mitigate some challenges with patient engagement. Interviewees suggested that bundling visits can also help increase patient engagement in nutrition education classes and health care visits, as was also found by Veldheer et al. (Veldheer et al., 2021) Further, HCP survey respondents in our study indicated that because of their PPR, nutrition education components were added to clinical visits (22%) and HCPs saw patients more frequently or had more patient follow-up visits (19%). Increased engagement in nutrition education (Miller et al., 2002; Rivera et al., 2016; Association, 2020; Rose et al., 2019) and medical visits (Bodenheimer et al., 2002; Shi et al., 2002; Wilson et al., 2003) may improve downstream health outcomes. For example, nutrition education for people with diabetes improves blood glucose management. (U.s., 2020).

Of note, participating programs were notified of GusNIP funding in September 2019. With the subsequent onset of the COVID-19 pandemic, transition to remote visits created workflow challenges, and provision of ancillary social services was limited or eliminated as priorities shifted to an influx of sick patients, COVID-19 testing, and COVID-19 vaccinations. (Corlette et al., 2022; xxxx) The upheaval may have impacted the PPR workflow and increased challenges with HCP roles.

As reflected in both the survey and interview findings, almost all HCPs are largely satisfied with the PPR projects at their facility. As stated in the Theory of Acceptability of Healthcare Interventions, affective attitude, or satisfaction, is one of seven multi-faceted constructs of health care intervention acceptability and a key predictor of program success within a clinical setting. (Stake, 1995) Though survey-based data collection (e.g., fruit and vegetable intake, food security) was described as “time consuming,” it was not perceived as a formidable barrier to project implementation, especially given recognition of the importance of rigorous evaluation of clinical outcomes. However, many participants in this study overwhelmingly shared challenges and barriers to collecting, and more importantly, sharing collected data. Those PPR implementers heavily engaged in and knowledgeable about clinical research may also question weaknesses in common evaluation designs, including retrospective chart reviews, lack of control group, small sample size, and high rates of attrition. (Jones et al., 2020; Veldheer et al., 2021; Cook et al., 2021) To support these program evaluation challenges, the NTAE provides web-based resources (Lavrakas, 2008) and technical assistance for topics such as navigating IRB approval, establishing data flow protocols, and securing data sharing agreements.

Our recruitment for this study relied on personal outreach by community partners. This strategy, while having numerous advantages, may also have enriched our participant sample with people who had favorable opinions of and experiences with produce prescription programs. Future studies should seek to engage providers who are not interested in or less enthusiastic about participating in these programs to assess how their perspectives differ. (Patton, 1999) Further, given the recruitment strategy relied on collaborating GusNIP grantees to reach out to their collaborating health care organizations, and the health care organization contact then reached out to HCPs, researchers are not confident how many HCPs were actually approached to participate in this study (e.g., survey response rate). However, snowball sampling methods (Coward et al., 2021) may have mitigated this bias, and as is the case with qualitative research, these findings are not meant to be generalizable to wider audiences.[61] Additionally, survey findings reveal limited diversity in the HCPs who participated. The key strength of this paper is that it identifies cross-cutting themes across HCPs in various geographies who work with PPRs. We recognize that many PPR programs in the US are funded by other entities (e.g., Medicare, private health insurance) (Anfara et al., 2002) and that GusNIP-funded PPRs are unique in their NTAE support, but we believe these findings can serve as a first hypothesis-generating step to inform program design for all PPR programs and guide future research that further explores PPR programs that are supported by non-GusNIP mechanisms. Though the purpose of

the NTAE is specifically to support GusNIP-funded PPR projects, we can leverage the knowledge gained from this unique USDA-funded resource to benefit all PPR projects, regardless of their funding source.

5. Conclusion

Together, these qualitative themes and survey findings indicate high HCP satisfaction in PPR projects, despite discussed challenges, and high provider initiative to implement innovative solutions to mitigate challenges to program administration. A key lingering challenge, for which the providers in this study did not have clear solutions, was how to integrate clinical outcomes program evaluation into the clinical workflow. Though HCPs understand the importance of these data, additional support and guidance is needed. For GusNIP-funded PPR projects, the NTAE can support logistical and methodological concerns related to reporting and evaluation. Funding a clinic-based staff member to manage HCP training, recruitment, enrollment, and patient education on voucher redemption; coordinate nutrition education and other required auxiliary services; conduct reminder/support calls to PPR participants; and manage all aspects of evaluation (e.g., EHR data abstraction, survey collection and administration, process evaluation) may be crucial for the success and sustainability of many PPR projects. Establishing additional federal, foundation, or other funding for clinic-based staff to oversee each clinic’s internal PPR reporting and evaluation PPR requirements is an important next step to guarantee the success and sustainability of GusNIP PPR projects.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Conflicts of interest

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