UNDERSTANDING THE PRODUCE PRESCRIPTION PROGRAM IN THE U.S.: A FOCUS ON PROGRAM MODELS, FACILITATORS AND BARRIERS, AND PARTICIPANT EXPERIENCES

by

TAYLOR NEWMAN

(Under the Direction of Jung Sun Lee)

ABSTRACT

Produce prescription programs (PPPs), in which healthcare providers "prescribe" subsidies for fruits and vegetables, are a strategy for addressing the increased risk for diet-related diseases, low fruit and vegetable consumption, and food insecurity that individuals with a low socioeconomic status face. PPPs have grown in number across the country in the past decade, yet there is a stark understanding of PPP models and of the PPP participant experience. This dissertation utilized mixed methods to understand how U.S. PPPs are designed and implemented, what strategies help or hinder program success, and the PPP experience of participants and their families from the perspectives of the participants themselves. The dissertation findings highlight the wide variety in PPPs models nationwide, though programs tended to have three main arms: a produce prescription, usually in the form of a voucher redeemable at farmers markets; a healthcare visit, for which programs mainly partnered with a safety net clinic; and nutrition education, largely delivered in the form of one-on-one counseling/advice or a class by a registered dietitian. Programs had clinical and non-clinical positive impacts on participants, though the need in communities was higher than what most programs can currently meet. A lack

of funding was the most common barrier to sustaining programming. At the state level, a process evaluation of Georgia PPPs suggested that provider dedication and program accessibility were major facilitators for positive program outcomes, while key barriers included participants' challenging life circumstances and issues around program sustainability. Finally, at the individual level, participants experienced a unique, interactive shopping experience at the market, though program locations could be more convenient to access. Participants' access to produce increased, and they experienced physical and mental health benefits. For some, the programs "came at the right time" and catalyzed meaningful change after a hardship. The findings of this dissertation highlight the positive impacts of PPPs on participants and the need to continue supporting programs in their wide variety of models across the country. The findings further suggest various strategies and models for PPP design and implementation to equip nationwide PPP providers to best serve their communities.

INDEX WORDS: Produce Prescription Program, Food Access, Fruit and Vegetable Consumption, National Survey, Mixed Methods, Program Design, Participant Experiences

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BS, Florida State University, 2015

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2020

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December 2020

DEDICATION

This dissertation is dedicated to my parents. For my mother, who taught me everything I know about gardening and cooking. You have gifted me with a love for food. For my father, who took me to volunteer at food pantries and kitchens growing up. You have showed me the value of serving others. I could not have made it to this point without your love and encouragement.

ACKNOWLEDGEMENTS

I'd like to acknowledge my mentor, Dr. Jung Sun Lee, for being there for me every step of the way on this journey. I have always felt supported by you. You have taught me perseverance, patience, and grace. To my committee: Dr. Caree Cotwright, Dr. Jennifer Jo Thompson, Dr. Janani Rajbhandari-Thapa, and Dr. Chen Zhen, for your wisdom and guidance over the years. I'd like to thank my sister, Erin, and my brother, PJ, for making sure that I do not take life too seriously. To my partner, Carson, for keeping me laughing. Your love of life teaches me every day. To my best friends, Rebecca and Isabelle, for always picking up the phone and checking in. I am so grateful we met in that courtyard 17 years ago. To my grandparents, who have always believed in me. I'd also like to thank my study participants across the country for their time, energy, and heart. I am honored that you shared your stories with me. I'd like to thank the University of Georgia Department of Foods and Nutrition for their enduring support. I am so lucky to have walked through the doors of Dawson Hall and into my academic family four years ago. Thank you to my lab mates for your support as we figured out this journey together. To my UGA SNAP-Ed team, thank you for being such thoughtful, hardworking colleagues and for letting me take chances. Thank you to all of the Athens Food as Real Medicine Program partners for being a shining example of dedication and resourcefulness. I have loved serving alongside you. Finally, I'd like to thank the city of Athens for showing me what community looks like. Athens has taught me more about how to love my neighbor than any classroom could have.

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CHAPTER 1

INTRODUCTION

A low socioeconomic status (SES) increases the risk for certain diet-related diseases (Clark et al., 2009; Kivimäki et al., 2007; Leng et al., 2015). While produce consumption may protect against some diet-related diseases (Aune et al., 2017; Boeing et al., 2012; Shaw et al., 2016; Utsugi et al., 2008), individuals in the low SES groups are less likely to consume fruits and vegetables (F&V) (Giskes et al., 2010). Further, a low SES is associated with food insecurity (Coleman-Jensen et al., 2019; Seligman et al., 2009), which can independently increase the risk for diet-related disease (Seligman et al., 2009).

A major reported barrier to produce consumption by populations with a low-income is cost (Bartlett et al., 2014; Buyuktuncer et al., 2014; Cahill et al., 2020; Schlosser, Joshi, et al., 2019; Slagel, 2020; Trapl et al., 2018). Nutrition incentives, which subsidize the price of F&V and other healthful foods, are one of many strategies to address these complex disparities. One type of nutrition incentive is a produce prescription program (PPP), where healthcare providers "prescribe" F&V, often to patients with a low-income or to those experiencing food insecurity and/or a diet-related disease. Nutrition education and cooking classes often accompany the prescription. Various health measures, such as weight, body mass index, and blood pressure are measured to assess the intervention impact of PPPs. Research shows that PPPs can increase produce consumption (Cook et al., 2019; Jones et al., 2020; Seligman et al., 2015; Trapl et al., 2018), improve diet quality (Berkowitz, O'Neill, et al., 2019), reduce food insecurity (Berkowitz, O'Neill, et al., 2019; Jones et al., 2020; Marcinkevage et al., 2019; Ridberg et al., 2019a), and

modestly improve conditions of diet-related disease (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Cavanagh et al., 2017; Jones et al., 2020; Seligman et al., 2015; York et al., 2020) in underserved populations.

PPPs have grown in numbers across the country in the past decade, with little standardization across programs. Given the novelty and variety of programs, there is a lack of insight into the current landscape of PPP design and implementation in the United States. An overview of what program models exist are scarce, with a single literature review of 19 PPPs (Swartz, 2018). The small sample size of the review and the limited programmatic information in published PPP articles underscore the need for insight into PPP design and implementation in the United States. Key information required to start or refine a PPP is needed, such as program components to include, budget costs, required labor, evaluation measures, outcomes, funding sources, and program sustainability. There is also a dearth of knowledge about where these programs are located, who "owns" or operates them, who they serve, and what their goals are. Furthermore, the reasons why programs expire or stop operating, have not been explored. Further, research is needed to determine the facilitators that make it easier for PPPs to produce positive outcomes, such as retaining participants or improving health measures, and the barriers that PPPs face. Sharing these strategies and existing barriers can strengthen future PPP design and implementation.

Finally, few studies have explored experiences in PPPs from the perspective of the participants themselves (Cahill et al., 2020; Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019; Slagel, 2020). The qualitative studies that have been conducted to understand the participant experience have found PPPs to positively impact participants lives (Cahill et al., 2020; Slagel, 2020), including an increase in their produce consumption (Schlosser, Joshi, et al.,

2019; Schlosser, Smith, et al., 2019) and exposure to positive social interactions (Cahill et al., 2020; Schlosser, Smith, et al., 2019; Slagel, 2020). Participants also pragmatically saw their access to market produce as a temporary luxury (Schlosser, Smith, et al., 2019). Economic insecurity influenced their program participation and limited their ability to maintain behavior change after the program ended (Schlosser, Smith, et al., 2019). Still, more research is needed to better understand the holistic impact of PPPs on participants and their families within the context of their lives. Insight into previously unknown program effects and how participants' did or did not alter their daily lives as a result can provide a more comprehensive understanding of PPP impacts and their sustainability. The findings can inform future PPP evaluation and policymakers' support of PPPs given the value of their impacts.

The purposes of this dissertation study were to better understand how U.S. PPPs are designed and implemented, what strategies help or hinder program success, and what the experience of participating in a PPP is like for participants and their families. The specific aims of this dissertation were to: 1) Determine what current models of PPPs exist across the country, 2) Determine what resources are required to design, implement, evaluate, and sustain a PPP, 3) Determine the facilitators and barriers affecting positive outcomes of PPPs, and 4) Understand the PPP experience of participants and their families from the perspectives of the participants themselves.

This dissertation describes the mixed-methods evaluation of PPPs at the national, state, and individual levels. Chapter 2 includes a review of the literature, which highlights how the increased risk for diet-related disease and food insecurity experienced by populations with a low SES can be addressed by PPPs, as they make F&V more affordable. Participant experiences in PPPs reported in the literature, and key analytic methods for the dissertation are also explored.

Chapter 3 includes the findings of the national mixed-methods survey of current PPP models and required resources. Chapter 4 includes the qualitative findings regarding facilitators and barriers affecting positive outcomes in Georgia PPPs. Chapter 5 includes the qualitative findings regarding the PPP experience from the perspective of participants from two programs, one located in the Southeast and one in the Midwest. Chapter 6 discusses the overall findings of the dissertation and their broader significance in relation to future PPP program design and implementation, research, and policy.

CHAPTER 2

LITERATURE REVIEW

Low-Socioeconomic Status and Health

Socioeconomic status (SES) is measured by determining education, income, occupation, or a combination of these indicators (Winkleby et al., 1992, p. 523). The three indicators are interrelated but not wholly overlapping. Often, just one of the three indicators is used as the measure of SES (Adler et al., 1994).

In particular, the relationship between health and low SES has been of focus. The Whitehall study, which included 17,350 British civil servants, found that the relative risk of mortality over 10 years significantly increased as employment grade decreased (Adler et al., 1994). The relative risk ratio of mortality was 1.6 for the professional-executive grades, 2.2 for the clerical grades, and 2.7 for the lowest grades. Further, a study with white American men and women aged 25 to 64 found years of education to be inversely related to morality (Adler et al., 1994). Socioeconomic status has also been linked to prevalence of disease, with the frequency of health conditions greater for those with lower educational attainment (Adler et al., 1994). Higher SES has been associated with a decrease in stressful events and stress perceptions, possibly due to reduced exposure to negative life events and increased social and psychological resources to deal with stress (Adler et al., 1994). Conversely, populations with a low SES are at a higher risk for poverty-related stress that manifests mentally and physically (Santiago et al., 2011). Populations with a low SES are also at an increased risk for unhealthy behaviors such as cigarette smoking, drinking, physical inactivity, and poor diet quality (Adler et al., 1994; Louie

& Ward, 2011; Nandi et al., 2014). These behaviors reduce the effect of SES on health, but they do not eliminate the relationship (Adler et al., 1994). A lack of insurance coverage, poor access to services, and unaffordable costs have served as notable barriers to quality healthcare for populations with a low-income (Devoe et al., 2007). An increased risk for job insecurity also contributes to disease burden for populations with a lower SES (Landsbergis et al., 2014). While many studies focus on low-SES on health, there appears to be a graded relationship at all levels of SES (Adler et al., 1994). The effect of SES on disease burden can be seen throughout the lifespan (Louie & Ward, 2011).

Low SES has been associated with a higher burden of disease, including an increased risk for chronic diseases like hypertension (Leng et al., 2015) and coronary heart disease (Mobley et al., 2006), with mixed results for obesity (Levine, 2011; Robert & Reither, 2004; Wang & Zhang, 2006). A recent study found that participants of the Supplemental Nutrition Assistance Program (SNAP) have twice the risk of all-cause and cardiovascular mortality compared to SNAP ineligible individuals (Conrad et al., 2017). SNAP offers nutrition assistance to over 42.2 million eligible Americans with a low-income per month that are at or below 130% of the federal poverty level (Oliveira, 2018). SNAP participants also have a three-fold increased risk for diabetes mortality over a 10-year period (Conrad et al., 2017). In a study based on the Boston Behavioral Risk Factor Surveillance System (BRFSS), public housing residents reported poorer general health status than city residents by virtually all measures including diagnosed hypertension, diabetes, obesity, disability, and feelings of depression for 15 days or more in the past month (Digenis-Bury et al., 2008). Public housing residents in this study were only slightly more likely than others to be without health insurance (9.6% vs. 7.1%, respectively) or to report financial barriers to medical care (11.5% vs. 8.2%, respectively).

The mixed, complex relationship between obesity and low SES is worth noting. A CDC analysis of 2011–2014 NHANES data found that the higher the household income, the lower the rate of overweight or obesity (Centers for Disease Control and Prevention, 2016, p. 216). However, those living below the federal poverty line (below 100% FPL) had lower rates of overweight or obesity (69.1%) than those 100-199% FPL (73.9%) and 200-399% FPL (71.6%). The highest income bracket (400% of the FPL or more) had the lowest rates of overweight or obesity at 65.6%. This suggests that income may have a protective effect from overweight and obesity only after it increases above the FPL. Levine (2011) reviewed poverty rates and obesity across 3,139 counties in the United States and found that the most poverty-dense counties were those most prone to obesity. Counties with poverty rates of >35% had obesity rates 145% greater than wealthy counties. Further, Robert and Reither (2004) found that community socioeconomic disadvantage and community income inequality were related to an increased body mass index (BMI) among women, particularly among African American women. The relationship between poverty and increased weight is inconsistent, however. A study of the National Health and Nutrition Examination Surveys (NHANES) between 1971 and 2002 for U.S. children aged 2-18 found that not all low SES groups were at increased risk of being overweight (Wang & Zhang, 2006). A low SES was only associated with obesity in white children, and only then among white girls. African Americans with a high SES were twice as likely to be overweight than their counterparts with a medium SES. No consistent association was found for Mexican American children and adolescents. The incongruent evidence suggests that differences in socioeconomic status alone do not account for disparities in obesity.

Food insecurity, defined as a “household-level economic and social condition of limited or uncertain access to adequate food” (Economic Research Service, 2020b), disproportionately

affects populations with a low-income. For example, 27.6% of households with annual incomes under 185% of the poverty line were food insecure in 2019 compared to 5.1% of households with incomes above 185% of the poverty line (Coleman-Jensen et al., 2019). Food insecurity was strongly associated with income, with the lowest income households experiencing the highest rates of food insecurity. Over a third (34.9%) of households with annual incomes below the official poverty line were food insecure in 2019. The burden of food insecurity compounds on the already increased risk for certain chronic diseases among populations with a low-income. Food insecurity has been significantly associated with higher risks for hypertension and diabetes compared with food-secure households, and has been associated with other barriers to health such as low educational attainment, lack of health insurance, increased tobacco use (Seligman et al., 2009). Food insecurity has also been associated with increased healthcare use (Fitzpatrick et al., 2015), higher annual healthcare costs compared to food secure adults (Berkowitz, Basu, et al., 2019), and poor mental health (Bergmans et al., 2019; Martin et al., 2016).

Low-Income and Diet Quality

Poor dietary quality can also threaten health. Diet quality can be assessed by several indicators, including by nutrients, adherence to national dietary guidelines, or the variety of intake within healthful food groups (Wirt & Collins, 2009). Several scoring systems and indices have emerged to measure diet quality; they are increasingly used to evaluate the association between dietary intake and diet-related health outcomes (Wirt & Collins, 2009). An example is the Healthy Eating Index (HEI), an index which assigns points to dietary intake based on density (amounts per 1,000 kcal), with a maximum score of 100 and aligns with the most recent Dietary Guidelines for Americans (DGA) (Krebs-Smith et al., 2018).

Just one in 10 American adults meet the national recommendations of 1.5–2 cup equivalents of fruit and 2–3 cup equivalents of vegetables a day (Centers for Disease Control and Prevention, 2017). The 2015 BRFSS data used an income-to-poverty ratio (IPR) to cluster fruit and vegetable intake among individuals, with an IPR of <1.25 indicating individuals living at or below the poverty level and an IPR of >3.49 as the highest income group (Lee-Kwan et al., 2017). Overall, there was a significantly higher percentage of individuals with an IPR of >3.49 meeting recommendations for vegetable intake compared to those with an IPR ≤3.49. Interestingly, there were no significant differences among IPR groups for meeting recommendations for fruit intake. From 1999–2008, few adult SNAP recipients consumed the recommended amounts of whole grains, fruit, vegetables, fish, and legumes (Leung et al., 2012). About 13–22% of adults with a low-income failed to meet any of the following dietary guidelines: 2010 DGA, the 2006 American Heart Association dietary guidelines for foods and food groups, and the Institute of Medicine's age- and sex-appropriate Estimated Average Requirements or the Adequate Intakes for nutrients. A negligible few recipients met all the guideline recommendations. Inversely, many adults with a low-income exceeded recommended limits for processed meats, sweets and bakery desserts, and sugar-sweetened beverages (Leung et al., 2012).

Between 1999 and 2014, SNAP participants aged 20 or older, income-eligible non-participants (IPR ≤1.30) and higher income individuals (IPR >1.3) all had low ideal diet scores based on the American Heart Association 2020 Strategic Impact Goals, which have been validated to be associated with cardiovascular and metabolic outcomes (Zhang et al., 2018). SNAP participants did see some improvements during this time: increased whole grains, whole fruits, and dark green vegetables and decreased sugar-sweetened beverages. However, they

experienced the smallest improvements in these foods compared to the other two income groups. Further, SNAP participants had the lowest consumption of fruits and vegetables, whole grains, fish and shellfish, nuts, seeds, legumes, and sodium out of the three income groups (Zhang et al., 2018). SNAP participants also encountered increasing disparities in processed meats, added sugars, nuts and seeds, and fish and shellfish. Overall, the diet quality of SNAP participants insignificantly increased, while diet quality score significantly increased for both income-eligible nonparticipants and higher-income individuals (Zhang et al., 2018). The researchers concluded that disparities persisted or worsened for SNAP participants for most dietary components over time.

Further, a cross-sectional study conducted by French et al. (2019) found that low-income households (IPR ≤ 1.3) purchased significantly less ($p < .01$) vegetables than high-income households (IPR = 3.5+) after adjusting for education, race, and marital status. There were no significant differences between income levels for fruit purchases nor between low- and middle-income household (IPR = 1.4–3.4) purchases of fruits and vegetables. The study suggests that low-income households appear less likely to purchase recommended healthful foods such as vegetables compared to high-income households (French et al., 2019).

Diet quality can be threatened by barriers like perceived and actual cost of healthful foods (Kasprzak et al., 2020; Rao et al., 2013). Increased access to energy-dense foods (Larson & Story, 2009), and perceived lower access to quality and affordable healthful foods (Kasprzak et al., 2020) in lower-income neighborhoods are also reported barriers to produce consumption. The general trend in real food prices (prices adjusted for inflation or deflation) has declined between 1950 and 2007, but this is not the case for fruits and vegetables (Christian & Rashad, 2009). The real price of fresh fruits and vegetables has climbed since the 1980s (Finkelstein &

Strombotne, 2010), which is when the real price of sugar, sweets, and carbonated drinks began to decline (Christian & Rashad, 2009). The prices of fresh fruits and vegetables have increased an average of 2.4% each year over the past 20 years, while the cost of sugar and sweets has increased 1.9% (Economic Research Service, n.d.). In summary, sugar and sweets have remained more affordable than fresh fruits and vegetables on average over the past two decades with trends in contrasting food prices beginning in the 1980s.

Further, Kirkpatrick and Tarasuk (2003) found that low-income households with housing payments in the form of mortgages or rent spent significantly less on milk, meat, and on food in total (Kirkpatrick & Tarasuk, 2003). While the presence of payments did not make a difference in purchases of fruit, vegetable, or grain servings, low-income households in general purchased fewer servings of fruits and vegetables than higher-income households. These findings could explain why low-income households have been found to have significantly lower intakes of several vitamins and minerals compared to higher-income counterparts (Cole & Fox, 2008).

Fruit and Vegetable Consumption and Chronic Disease

Health disparities in low-income households may be partially explained by inadequate fruit and vegetable consumption (Hung et al., 2004). Diets rich in fruits and vegetables are widely recommended for their health-promoting properties. In addition to their low-energy density, fruits and vegetables provide the body with valuable vitamins, minerals, fiber, and antioxidants (Slavin & Lloyd, 2012).

"Poor nutrition" is one of four modifiable health risk behaviors identified by the Centers for Disease Control and Prevention (CDC) to be largely responsible for chronic disease (National Center for Chronic Disease Prevention and Health Promotion, 2009). Fruit and vegetable consumption specifically has been associated with a decreased risk for the very diseases that are

more likely to affect low-income households—hypertension (Boeing et al., 2012; Utsugi et al., 2008) and coronary heart disease (Boeing et al., 2012). Fruit and vegetable consumption has also been found to reduce the risk for stroke (He et al., 2006) and metabolic syndrome (Esmaillzadeh et al., 2006), though perhaps only weakly by influencing blood pressure (Shin et al., 2015).

Fruit and vegetable consumption has been more consistently related to decreased risk for all-cause and cardiovascular mortality (Wang et al., 2014). In a study of 71,706 men and women, just 1 serving/day of fruit and 3 servings/day of vegetables showed to have protective effects against mortality (Bellavia et al., 2013). Meeting the U.S. Department of Agriculture's (USDA) recommendations of 5 servings a day of fruits and vegetables further decreased the risk of mortality compared to those who consume zero servings, though the exact size of effect is inconsistent (Steffen et al., 2003). Wang et al. (2014) conducted a meta-analysis of 16 cohort studies to examine the potential dose-response relationship between fruit and vegetable consumption and risk of all-cause, cardiovascular, and cancer mortality. The authors found that the risk of all-cause mortality decreased by 5% for each additional serving a day of fruits and vegetables with a ceiling effect of 5 servings a day. While higher consumption was not significantly associated with the risk of cancer mortality, they found a significant inverse association for cardiovascular mortality. A 2017 systematic review and meta-analysis of 95 prospective cohort studies across four continents found an inverse association between fruit and vegetable intake, and the risk of coronary heart disease, stroke, cardiovascular disease, total cancer, and all-cause mortality (Aune et al., 2017). For each 200 g/day increment in intake of fruit, vegetables, and fruits and vegetables combined, there was an 8–16% reduction in the risk ratio (RR) of coronary heart disease, 13–18% reduction in the RR of stroke, 8–13% reduction in the RR of cardiovascular disease, 3–4% reduction in the RR of total cancer, and 10–15%

reduction in the RR of all-cause mortality (Aune et al., 2017). Fruit and vegetable consumption is therefore a key dietary target for reducing the risk for certain chronic diseases.

Limited and mixed evidence is available on the impact of fruit and vegetable consumption on type 2 diabetes and weight loss. The EPIC-Norfolk study examined the influence of fruit and vegetable consumption on type 2 diabetes and used combined plasma vitamin C, lutein, and beta-carotene levels to serve as a composite-biomarker (CB) score for consumption (Cooper et al., 2015). A higher recorded CB-score reflected a higher consumption of fruits and vegetables. In a 10-year follow-up, the highest quartile of CB-scores had a strong inverse association with the odds of having type 2 diabetes (odds ratio (OR) = 0.13; 95% CI = 0.08, 0.21) compared to the lowest quartile. Generalizability of the study is limited as the population was almost entirely white, and the many possible determinants of plasma biomarker levels. Some studies have only found an inverse relationship between type 2 diabetes and dark leafy green or deep yellow vegetable consumption (Liu et al., 2004), or between fruit and dark leafy greens, but not other vegetables (Sargeant et al., 2001).

Fruits and vegetables have been promoted for weight loss due to their low-energy density and the hunger satiating effects due to their fiber content (Bertoia et al., 2015). The relationship between fruit and vegetable consumption and adiposity, however, has had mixed results. The Nutrition Evidence Library of the USDA determined that there is “moderate evidence that adherence to a dietary pattern that emphasizes vegetables, fruits, and whole grains is associated with modest benefits in preventing weight gain or promoting weight loss in adults” (Evidence Analysis Library Division, 2014, p. 5). However, the conclusion statement was based on a dietary pattern, not solely on fruit and vegetable consumption.

A 12-year follow-up study with 74,063 middle-aged female nurses, known as the Nurses Health Study, found that those with the highest increase in vegetable intake (+1.86 servings/day) had a 25% lower risk for obesity than those with the largest decrease in intake (-1.27 servings/day) (He et al., 2004). This association was not significantly altered after adjustment for age, physical activity, and total energy intake. There was also an association between a decrease in fruit and vegetable intake over time and a higher risk for long-term major weight gain (defined as weight gain of 25 kg or greater during the 12-year follow-up). However, for those that were not overweight or obese at baseline, the magnitude of less weight gain over time by increasing the intake of fruits and vegetables was relatively small (.52 kg).

A 2011 review found that most experimental and longitudinal studies among adults showed either an inverse relationship between fruit and vegetable consumption and adiposity (8 of the 11 experimental and 3 of the 7 longitudinal studies) or mixed results (3 of the 7 longitudinal studies) (Ledoux et al., 2011). It was unclear whether the inverse relationship was due to higher fruit and vegetable consumption alone or if weight loss was influenced by behavior changes like lower energy intake and increased physical activity. No relationship between fruit and vegetable consumption and adiposity was found in the studies that focused on children. The relationship between higher vegetable consumption (compared to lower intakes) and weight loss in overweight adults was explored in a 2013 review of 16 randomized controlled trials (RCTs) ranging from four weeks to four years long in duration (Tapsell, Dunning, et al., 2014). Results were inconclusive: five reported greater weight loss effects between an intervention group with higher vegetable intake compared to a control group, nine found no difference, and one showed weight gain. The RCT with a four-year follow-up found greater weight loss in the intervention group after one year (−0.05 kg; $p < 0.001$) but not after four years. Studies with a positive

association between vegetable intake and weight loss paid attention to total diet, including energy intakes (Tapsell, Dunning, et al., 2014). The latter findings were confirmed in an RCT by Tapsell, Batterham, Thorne, O'Shea, Grafenauer, and Probst (2014). The authors found no significant difference in weight loss for overweight adults on energy deficit diets, differing only in the portion sizes of vegetables consumed. Total dietary energy was found to be the most important dietary variable for weight loss (Tapsell, Batterham, et al., 2014).

In summary, there is inconclusive evidence that simply consuming more fruits and vegetables leads to significant, lasting weight loss (Casazza et al., 2015; Evidence Analysis Library Division, 2014; Tapsell, Batterham, et al., 2014; Tapsell, Dunning, et al., 2014), though increased consumption may slow weight gain (Evidence Analysis Library Division, 2014; He et al., 2004). Substituting fruits and vegetables for more energy-dense foods may improve results, as total energy intake appears to be more important for weight loss than fruit and vegetable consumption alone (Casazza et al., 2015; Tapsell, Batterham, et al., 2014; Tapsell, Dunning, et al., 2014).

Fruit and Vegetable Incentive Programs

Consumer choices regarding food purchasing habits are influenced by accessibility and affordability of food retailers, including the time it takes to travel to a store, the availability of foods, and food prices (Economic Research Service, 2020a). In particular, populations with a low-income have found the cost of fruits and vegetables to be the biggest barrier to purchasing them (Bartlett et al., 2014; Buyuktuncer et al., 2014; Cahill et al., 2020; Cook & Webb Girard, 2018a; Kasprzak et al., 2020; Trapl et al., 2018).

Financial nutrition incentives subsidizing produce purchases have taken the form of discounts or subsidies (Buyuktuncer et al., 2014; Goddu et al., 2015); vouchers, exchangeable for

produce (Anderson et al., 2001; Esquivel et al., 2020; Goddu et al., 2015; Trapl et al., 2018); a matched amount spent on produce (Fair Food Network, 2009); and rebates, or a partial refund for money spent on produce (Bartlett et al., 2014). Incentives can help individuals achieve health behaviors. A review of 47 RCTs found a 74% success rate for incentives ranging from gifts to coupons that targeted simple health-related behavior changes, or those that can be accomplished through a single action at a point in time (e.g., attending a doctor's visit) (Kane et al., 2004). A similar result (72%) occurred for complex behavior changes that required effort over a period of time, such as weight loss, but the changes were not sustained over time (Kane et al., 2004).

The CDC recommended providing discount coupons or vouchers redeemable for healthier foods as one of its Community Strategies and Measurements to Prevent Obesity in the United States (Khan et al., 2009). Research shows that reducing the cost of healthier foods has been found to increase the purchase of healthier foods (An, 2013; French et al., 2001; Seymour et al., 2004). A 2009 Economic Research Service Report found that low-income households responded to reductions for fruits with a price elasticity of -0.52, and -0.69 for vegetables (Dong & Lin, 2009). Price elasticity refers to how much consumers with a low-income increase purchases in response to lower fruit and vegetable prices. This means that if prices for produce were lowered by 10%, it is estimated that households would increase their demand for fruit purchases by 5.2% and their vegetable purchases by 6.9%. Such elasticity is deemed "inelastic," meaning that the low-income consumers' reaction to a change in price of fruits and vegetables would be slight. Using Nielsen Homescan data and "small" and "large" elasticities determined in two previous studies, Dong and Lin found that a 10% discount would have a modest but statistically significant impact on produce consumption. Small elasticities were -.32 were vegetables and -.34 for fruit, while large elasticities were -.70 for vegetables and -.65 for fruit.

Total consumption for the smaller (larger) elasticity was estimated to increase consumption from .96 to 0.98 cups (1.01) a day for fruits and an increase from 1.43 to 1.46 (1.50) cups a day for vegetables. A 20% discount increased the consumption to 1.49 (1.57) cups in vegetables and 1.01 (1.05) cups of fruit. Still, consumption fell below the 2 cups of fruit and 2.5 cups of vegetables a day recommended in the Dietary Guidelines for Americans (Dong & Lin, 2009). The modest effect may be due to the small incentive values (5, 10, and 20%) tested (French et al., 2001; Leibtag & Kaufman, 2003).

A variety of incentive interventions have aimed to increase fruit and vegetable consumption among populations with a low-income. Leibtag and Kaufman (2003) with the USDA Economic Research Service found that low-income households purchase more discounted items and take greater advantage of volume discounts compared with higher-income households (Leibtag & Kaufman, 2003). Utilizing these trends, mothers from three Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) sites in Los Angeles received $10 worth of vouchers a week to be redeemed for produce at either a farmers market or a supermarket (Herman et al., 2008). A control group received monthly coupons for a lesser value of $13 a month redeemable for diapers. After 6 months, participants at the farmers market reported consuming an average of 3.9 servings (vs. 2.2 servings at baseline) of fruits and vegetables per 1,000 kcal; supermarket participants reported 4.1 servings (vs. 2.9 servings at baseline) per 1,000 kcal; and control site participants reported 3.0 servings (vs. 2.6 servings at baseline) per 1,000 kcal. The difference in consumption between each of the intervention sites and the control site was statistically significant (p = .001). Importantly, the increase in fruit and vegetable intake reported by participants at the intervention sites was sustained six months after

the intervention ended. Another incentive program is the doubling of SNAP benefits spent at participating farmers markets and grocery stores (Fair Food Network, 2009).

Another intervention, the Healthy Incentives Pilot (HIP), suggested that financial incentives can increase fruit and vegetable consumption among SNAP participants (Bartlett et al., 2014). SNAP participants received on their SNAP EBT card an incentive of 30 cents for every dollar of SNAP benefits that they spent on targeted fruits and vegetables in participating retailers. Of the 55,095 SNAP households in Hampden County, MA, 7,500 households were randomly assigned to participate in HIP, while the remaining 47,595 SNAP participating households continued to receive their usual SNAP benefits. HIP participants consumed a statistically significant 26% more (.24 cup more) of the targeted fruits and vegetables than non-HIP participants at the end of the 12-month intervention. The probability of consuming dark green vegetables was higher among HIP participants than non-participants (16% vs. 12%), which may be clinically significant considering the previously discussed association between dark leafy greens and a reduced risk for type 2 diabetes (Sargeant et al., 2001).

In a review of 20 field experiments, all but one study found that subsidies for healthier foods led to significantly increased purchases and consumption of the promoted products (An, 2013). The magnitude of the discount can affect the success of an intervention as well. Research suggests that the larger a financial incentive is, the higher the response to the incentive (French et al., 2001). French et al. (2001) found discounts to have a dose-response. Price reductions of 50%, 25%, and 10% were associated with sales increases of 93%, 39%, and 9%, respectively for low-fat vending machine snacks at secondary schools and worksites (French et al., 2001). Dong and Leibtag (2010) with the USDA Economic Research Service found that effects on consumption depended on coupon usage (Dong & Leibtag, 2010). A 10% coupon with a 10% usage rate could

result in a 2% average weekly increase in fruits and 2.1% increase in vegetables. A 30% and 50% usage rate of the same coupon increased fruit and vegetable purchases by 6-10% and 6.5-10% increase, respectively. A 10% price discount may serve as the minimal level of reduction required to influence healthier purchase changes (French et al., 2001), though the effect on fruit and vegetable consumption may not be meaningful (Dong & Leibtag, 2010; French et al., 2001). Based on 2004 Nielson Homescan data, NHANES (1999-2002), and the 2004 Bureau of Labor Statistics Consumer Expenditure Diary Survey, Dong and Lin (2009) predicted that a 10% price discount would increase at-home fruit consumption from an average of 0.72 cup without a discount to 0.74 cup ($p < .05$) (Dong & Lin, 2009). At-home vegetable consumption was predicted to increase from 1 cup to 1.03 cups ($p < .05$). A 20% discount would significantly increase at-home consumption from 0.72 cups of fruit to 0.77 cups and 1 cup of vegetables to 1.07 cups.

In 2019, 29 studies were included in a systematic review of healthy food pricing initiatives (Healthy Food America, 2019). The authors found that overall, adults increased fruit and vegetable consumption by 0.18–1.8 servings/day, or 0.11 - 0.24 cups/day, in response to financial incentives. Vegetable outcomes appeared more likely to be impacted by the incentives than fruit outcomes. Certain incentive features were associated with significantly impacting either healthy food consumption, purchase, sales, or expenditure data at the consumer level (Healthy Food America, 2019). The following features were associated with at least one significant outcome out of the measures of interest: electronic incentives delivered at the point of sale, providing the incentive more than once and for longer periods of time (more than 24 weeks rather than less), inclusion of a broader selection of healthy foods (e.g. all fruit and vegetable types rather than fresh only or additional types of healthy foods), and redemption in stores (rather

than farmers markets). However, the sample size was too small to complete statistical analyses and the authors warn that the findings should be considered tentative qualitative conclusions.

Two years after An reviewed the 20 field experiments of monetary subsidies for healthy foods (2003), they conducted a cost-effectiveness analysis on the nationwide expansion of HIP, the financial incentive program on fruit and vegetable purchases among SNAP participants (An, 2015). The analysis found the 30% rebate to effectively nudge SNAP participants to purchase a modest amount more of fruits and vegetables and indeed be cost-effective from a societal perspective, but the beneficial impact on participants' quality-adjusted life years (QALY) was limited (an estimated 0.082 QALY per person). A societal perspective estimates all gains and losses of a population, reflecting the safety, effectiveness, and costs of an intervention (Russell et al., 1999). A societal perspective is recommended for public health economic analyses (AB et al., 2017). Choi et al. (2017) found the 30% rebate of HIP to be cost saving with a net savings of $824 (95% CI = 4821, 827) per capita from a societal perspective. The authors estimated a higher QALY gain than An (2015), at 0.52 (95% CI = 40.51, 0.53) QALY per SNAP user, or about .24 QALY per capita for the general U.S. population over a lifetime (Choi et al., 2017).

Mozaffarian et al. (2018) also found a 30% fruit and vegetable subsidy to be cost saving from a societal perspective over a lifetime (Mozaffarian et al., 2018). However, from a government affordability perspective, providing incentives to all SNAP participants would cost about $2.6 billion/year, including administrative costs. The subsidy would not be cost-effective (<$150,000/QALY) at the 5-year mark for any populations, but providing incentives to adult SNAP recipients aged 35+ would be cost-effective after 10 years. Incentives provided to all SNAP recipients (including adults under age 35 and children) only reached the cost-effectiveness threshold when examined from a lifetime perspective ($66,525/QALY) (Mozaffarian et al.,

2018). Le et al. (2020) simulated the potential impact of a 30% subsidy for fruits and vegetables for all adults enrolled in Medicare and Medicaid (average simulated years = 18.3 years). The produce incentive was estimated to prevent 1.93 million cardiovascular disease events, gain 4.64 million QALYs, and save $39.7 billion in healthcare costs. Impacts were even larger for a 30% subsidy on broader healthful foods (fruits and vegetables, whole grains, nuts/ seeds, seafood, and plant oils) over the same period of time. Both scenarios were cost-effective from a healthcare perspective at 5 years and beyond with $18,184/QALY for the produce incentive and $13,194/QALY over a lifetime. A healthcare perspective takes into account policy costs and formal healthcare costs (Lee et al., 2019).

Not only do nutrition incentives appear to affect purchasing behavior, but they may also be a cost-effective health intervention to implement through government programs.

Produce Prescription Programs

Another health-related financial incentive program aimed at increasing fruits and vegetables among populations with a low-income is the produce prescription program (PPP). In a PPP, there is an intentional connection between diet—specifically fruits and vegetables—and healthcare with the assumption that subsidized produce will have some kind of impact on the recipients' health or well-being. The programs involve healthcare providers "prescribing" a subsidy for produce to patients that often have a low-income and who are experiencing food insecurity and/or a diet-related disease. A nutrition education and healthcare visit component often supplements the prescription.

While there is no standard definition of a PPP, three main components appear necessary to achieve the connection between diet and healthcare: 1) The program must include a healthcare provider or be housed in a healthcare facility (e.g., clinic, hospital, mobile health clinic, etc.), 2)

Participants must be provided a prescription that subsidizes produce (e.g., coupon, vouchers, discount, packaged produce, etc.), and 3) The prescription must be prescribed to address something specific to the individual (e.g., food insecurity, diet-related disease, low-income, etc.). This definition of a PPP is based off of PPPs described in the literature but has not be recognized elsewhere.

Produce Prescription Program Models

The earliest known PPP started in 2001 when Boston Medial Center opened the first hospital-based therapeutic food pantry in the country (Boston Medical Center, n.d.). PPPs have since popped up all over the United States, particularly since 2016, with unique and varying program designs and implementation methods. The closest programs have come to being standardized are Produce Prescription Programs (previously termed Fruit and Vegetable Prescription® Program, or FVRx®), a model developed by the innovative food access non-profit, Wholesome Wave (Wholesome Wave, n.d.). While Produce Prescription Programs all share the same name and receive guidance from Wholesome Wave, the programs still vary in regard to who they're serving and how they're serving them based on location (Cook & Webb Girard, 2018a; Jones et al., 2020; Wholesome Wave, 2014). This variety has resulted in different PPP models, or different ways of designing and implementing a program. Factors that contribute to a program model include program components, budget costs, required labor, evaluation measures, outcomes, funding sources, and program sustainability. A better understanding of the current landscape of PPPs in the United States can provide a blueprint for new and existing programs to learn from one another based on what's already been done, making it easier to improve and expand PPPs across the country.

At this time, no single model appears to work best for all locations (uptake of proven best practices; however, may enhance an existing model for better outcomes). Still, there appear to be consistencies across programs. There are three main components in a PPP:

- A healthcare component where participants meet with a healthcare provider to receive a produce prescription and perhaps other medical care, such as having their blood pressure measured
- The produce prescription worth a financial value that can be redeemed for fruits and vegetables at a food retailer
- A nutrition education component

The first two components are necessary to meet the above definition of a PPP. Nutrition education, though arguably essential, is not required to meet the PPP definition but is often included in a program. Programs have also been known to provide cooking demonstrations, transportation aid, childcare, and incentives like cooking tools. Programs tend to be short-term, ranging from one (Buyuktuncer et al., 2014) to six months (Saxe-Custack, LaChance, et al., 2020), with time-limited funding (Trapl et al., 2018).

How do the three main components vary across programs? First, healthcare partners for PPPs have included hospitals (Snook, 2016), public and private health care systems (Marcinkevage et al., 2019), pediatric clinics (Saxe-Custack et al., 2018), and safety net clinics (Bryce et al., 2017; Trapl et al., 2018), which offer services to patients regardless of their ability to pay (Institute of Medicine, 2000). Programs may partner with and recruit participants from more than one type of healthcare partner (Jones et al., 2020; Marcinkevage et al., 2019). Healthcare providers tend to prescribe the produce prescription in conjunction with regular healthcare visits, and they may or may not track specific clinical measures throughout the

duration of the program to determine the program's impact on their patients' health. Previous programs have measured changes in blood pressure (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017), hemoglobin A1C (HbA1C) (Bryce et al., 2017), weight (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017), waist circumference (York et al., 2020), BMI (Cavanagh et al., 2017), and BMI percentile for children (Jones et al., 2020).

Programs have often prioritized participants who might benefit the most from increased access to produce: participants who are experiencing food insecurity (Musicus et al., 2019; Trapl et al., 2018), have a low-income (Bryce et al., 2017; Cavanagh et al., 2017), and/or have a diet-related disease like obesity (Jones et al., 2020), diabetes (Bryce et al., 2017), or hypertension (Trapl et al., 2018). Some programs recruited pregnant women (Jones et al., 2020; Trapl et al., 2017). For instance, the WIC program in Cuyahoga County, Ohio recruited pregnant women to promote healthy diet during prenatal care (Trapl et al., 2017). A PPP implemented across the state of Washington through the Washington State Department of Health required participants to be SNAP recipients (Marcinkevage et al., 2019). While most PPPs prioritize adults, there are also programs that provide prescriptions to children and adolescents (Esquivel et al., 2020; Jones et al., 2020; Ridberg et al., 2019a; Saxe-Custack, LaChance, et al., 2020). Whereas PPPs more often address individuals experiencing overweight or obesity, one pediatric program provided a prescription to children who were undernourished with a BMI percentile for age and sex <5% (Esquivel et al., 2020). A program in Flint, Michigan provided prescriptions to all children during office visits, regardless of their weight (Saxe-Custack, Sadler, et al., 2020). Other programs left the eligibility criteria intentionally broad (Buyuktuncer et al., 2014; Goddu et al., 2015; Jones et al., 2020). In the U.K., clinicians were asked not to prioritize particular patient or disease groups (Buyuktuncer et al., 2014; Jones et al., 2020; Marcinkevage et al., 2019). One

PPP provided prescriptions to all patients over the age of 16 attending their regular visits who were mentally and physically able to use the prescription (Buyuktuncer et al., 2014). Jones et al. (2020) recruited families in the Navajo Nation that either had a pregnant woman ("maternal group") or a child less than 6 years old ("pediatric group") (Jones et al., 2020). Healthcare providers could further narrow their site-specific enrollment criteria should they wish to.

Prescriptions can be redeemed at one or more food retailer locations. PPPs have most commonly partnered with farmers markets (Swartz, 2018). Farmers markets have been seen as a viable intervention location due to their association with increased fruits and vegetables consumption (Kunkel et al., 2003; Pitts et al., 2014). Farmers markets have also been highlighted for their role in local and regional food systems and their sense of community (Gillespie et al., 2007). Despite the benefits of farmers markets, there may be social and cultural barriers to access: they have been critiqued as elite social spaces (Fang et al., 2013), unwelcoming to members of underserved communities (Guthman, 2008), and are perceived as more expensive (Fang et al., 2013; Jilcott Pitts et al., 2015). Additionally, interventions at farmers markets for populations with a low-income can experience a high attrition rate (49%) (Dimitri et al., 2015). Implementing incentive programs at farmers markets can reduce barriers like cost and increase participation in the local food community, as well as encourage retention. Wholesome Wave's Produce Prescription Programs have also been shown to increase farmers market attendance and sales for individual farmers (Payne et al., 2013) and for the overall market (Baronberg et al., 2013). Participating in farmers market incentive programs has been found to be positive experience for both participants (Herman et al., 2008; Saxe-Custack et al., 2018; Schlosser, Joshi, et al., 2019) and vendors (Kunkel et al., 2003), though some farmers negatively perceive the effort required to participate (Payne et al., 2013). Some programs partner with grocery stores

(Jones et al., 2020; Swartz, 2018), either in addition to or in replace of farmers markets. Partnering with grocery stores can provide year-round access to produce and a larger variety of fruits and vegetables (Buyuktuncer et al., 2014; Marcinkevage et al., 2019).

Prescriptions themselves also vary across programs in value, form, and what they can be redeemed for. Continuing with the example from Jones et al. (2020), Navajo Nation families in the "maternal" or "pediatric" group received prescriptions in the form of a voucher, which worked like cash and didn't require participants to spend their own money. The voucher was valued at $1 per household member per day, with a maximum value of $5 a day. Families could redeem their vouchers for fruits, vegetables, and healthy Diné (Navajo) foods such as blue cornmeal, dried steam corn, and sumac berries. The vouchers were accepted at 25 participating supermarkets, trading posts, convenience stores, and farmers markets. Another program provided $40 a month in vouchers to be spent at over 20 farmers markets on produce (Trapl et al., 2017). Prescriptions can also come in the form of a pre-packaged box of produce paired with various other shelf-stable and fresh healthy food items (Seligman et al., 2015). The first known RCT of a PPP provided a subsidy to purchase two years' worth of a seasonal Community Supported Agriculture (CSA) membership for its intervention group while a control group received the equivalent of the membership in financial incentives and nutrition education materials (Berkowitz, O'Neill, et al., 2019). In a CSA, individuals purchase a "share" of the produce from a local farm before the start of a growing season in exchange for an allotment of seasonal produce during harvest (Berkowitz, O'Neill, et al., 2019).

Whereas nutrition incentive programs have been known to include a coupon or a rebate form of a prescription, which require some financial buy in from the participants, few PPPs choose this form. One PPP with a partnership between six referring health centers in the south

side of Chicago provided any patient in need of healthy food with a card that could be redeemed either as a coupon to Walgreens (worth $5 off a $20 purchase) or as a voucher for the farmers market (worth $10) (Goddu et al., 2015). In Washington state, $10 vouchers were redeemable at point-of-sale for qualifying items, which included fresh, canned, or frozen fruits and vegetables without added fats, oils, sugars, or salt at any one of 169 participating locations of a large supermarket chain (Marcinkevage et al., 2019). It was suggested that participants purchase at least $10 of qualifying items per transaction, though no additional purchase was necessary to redeem the prescription.

The final main component, nutrition education, is not required for a program to meet the definition of a PPP. However, some form of nutrition education is often included to aid participants' use of the produce that they are receiving with their prescription (Burrington et al., 2020; Musicus et al., 2019) or to address prevention, management, or treatment of diet-related diseases (Jones et al., 2020). Nutrition education in PPPs can take different forms. Programs have taught nutrition education classes (Musicus et al., 2019), delivered counseling (Ridberg et al., 2019b; Schlosser, Smith, et al., 2019; Trapl et al., 2017), and/or provided paper materials like handouts with information about topics like low-cost healthy meal plans (Goddu et al., 2015) and substitutions for less healthy foods (Joshi et al., 2019). Physicians (Jones et al., 2020; Ridberg et al., 2019b; Swartz, 2018), clinic staff (Joshi et al., 2019), dietitians (Jones et al., 2020), nutritionists (Jones et al., 2020; Ridberg et al., 2019b), trained health educators (Ridberg et al., 2019b), nurses (Jones et al., 2020), and community health representatives (Jones et al., 2020) were among the providers who delivered the various forms of nutrition education, as well as non-clinical providers like Head Start (Jones et al., 2020) and Cooperative Extension staff (Burrington et al., 2020). For instance, in the Navajo Nation program, an evidence-based

childhood obesity prevention curriculum utilizing motivational interviewing was provided individually in homes or in a group in a clinic or community settings (Jones et al., 2020). The curriculum was adapted to the Navajo context to involve children in sessions and goal setting and to include Diné foods and language (e.g., a memory game with Diné words for fruits and vegetables). Another five-month long program in two small, rural communities in upstate New York hosted nutrition classes taught by Cooperative Extension to teach meal planning, food literacy, and cooking skills to promote the use of produce (Burrington et al., 2020). Participants were also instructed to use provided disposable cameras or their phones to take photos that answer the question: "How has the Fruit and Vegetable Prescription program affected my family?" At the end of the program, all of the program's families presented their photos over a shared meal.

Other program components that can be included are incentives like cooking utensils and transportation. Research shows that limited access to transportation is a barrier to purchasing and consuming F&V for populations with a low-income or those experiencing food insecurity (Haynes-Maslow et al., 2013; Schlosser, Joshi, et al., 2019; Strome et al., 2016). Participants of an Ohio-based PPP confirmed these findings when they reported not having a car or a reliable vehicle as a barrier to accessing the market (Schlosser, Joshi, et al., 2019). Even those with cars had difficulty getting to the market due to the cost of gas. Public transportation, rides through the healthcare site, a mobile farmers market bringing the market to participants, and rides from friends or family were some solutions to the transportation challenges. Still, market access remained a barrier for many and was reported to preoccupy their program experience (Schlosser, Joshi, et al., 2019).

The different program models discussed showcase the extreme variation in PPP design and implementation across the country. An overview of what program models exist are scarce, with a single literature review of 19 PPPs (Swartz, 2018). Of the 19 programs, Swartz (2018) found that 14 featured patients with a low SES at either federally qualified health centers (FQHC) or community health clinics. Farmers markets were the primary food retailer partner, located either onsite at the healthcare site (n = 4) or local off-site markets (n = 5). Two programs partnered with grocery stores, either locally owned (n = 1) or a local branch of a national store (n = 1). Programs also partnered with community gardens (n = 2) and a mobile market (n = 1). Nine of the 19 programs used a voucher model for the prescription with varying values between $10 and $50 a week. The most common healthcare providers were general or primary care practitioners (n = 12), community health workers (n = 7), and registered dietitians (n = 5). Most articles (n = 10) used a household income at or below the poverty level for recruitment. Programs most commonly recruited participants with obesity (n = 5) and diabetes (n = 5).

The small sample size of the review and the limited programmatic information in published PPP articles underscore the need for insight into the current landscape of PPP design and implementation in the United States. Key information required to start or refine a PPP is needed, such as program components to include, budget costs, required labor, evaluation measures, outcomes, funding sources, and program sustainability. There is also a dearth of knowledge about where these programs are, who "owns" or operates them, who they serve, and what their goals are. Further, the reasons why programs expire, or stop operating, have not been explored.

Produce Prescription Program Impacts

Overall, PPPs have been shown to have neutral to positive impacts on participants. Programs have been shown to increase produce consumption (Cook et al., 2019; Freedman et al., 2013; Jones et al., 2020; Marcinkevage et al., 2019; Saxe-Custack, LaChance, et al., 2020; Seligman et al., 2015; Trapl et al., 2018), though the change is not always significant (Freedman et al., 2013; Saxe-Custack, LaChance, et al., 2020). One study did not find any difference in consumption of fruit and vegetable portions across three time points (Buyuktuncer et al., 2014). Research shows that PPPs can also improve diet quality (Berkowitz, O'Neill, et al., 2019), reduce food insecurity (Berkowitz, O'Neill, et al., 2019; Jones et al., 2020; Marcinkevage et al., 2019; Ridberg et al., 2019a), and modestly improve conditions of diet-related disease (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Cavanagh et al., 2017; Jones et al., 2020; Seligman et al., 2015; York et al., 2020) in underserved populations. Improvements in diet-related diseases were not consistent across studies, however, nor were they always significant.

Further, few studies follow up with participants more than three months after the program ends (Bryce et al., 2017; Burrington et al., 2020; Ridberg et al., 2019b; Schlosser, Smith, et al., 2019), leaving the long-term impact unknown. Still, the positive health outcomes seen during PPPs may reflect the direction of long-term outcomes. These questions call for longitudinal studies to determine the long-term impact of PPPs on produce intake and diet quality, food security, and diet-related disease.

Produce Intake and Diet Quality.

Overall, produce consumption increased in PPP participants. One hundred and forty-four participants in a program serving at least 3,688 SNAP recipients across the state of Washington responded to an online survey with questions regarding their fruit and vegetable consumption and food security (Marcinkevage et al., 2019). The prescription they received was worth $10 for

fresh, frozen, or canned produce without any added sugar, salt, or fat with no limit on how many times a patient could receive a prescription. Participants were eligible to take the survey each time they received a prescription. Around 88% (n = 127) reported eating more fruits and vegetables than before as a result of receiving the produce prescription, and 70.1% (n = 101) reported that they tried a new fruit or vegetable. Further, 76.4% (n = 110) reported an increase in their family member's fruit and vegetable consumption. Most purchased items (94% of total dollar amount spent) were fresh fruits and vegetables, with limited canned and frozen produce purchases (4% and 2%, respectively). However, due to logistical challenges collecting patient-level data for such a large program, the data were self-reported and may be subject to bias. The lack of standardization on the prescription amount also makes it difficult to determine what size prescription influenced the program's outcomes.

Saxe-Custack et al. (2020) found that mean daily servings of whole fruit increased significantly (p = 0.029) from baseline (0.62 ± 0.69, range 0.00–3.31) to 6-month follow-up (0.81 ± 0.64, range 0.00–3.31) among 108 pediatric patients of varying socioeconomic statuses in Flint, Michigan who received a $15 voucher for produce during each clinic visit (Saxe-Custack, LaChance, et al., 2020). Of the 108 children, 47 (43.5%) reported an increase in mean daily consumption of whole fruit by at least a ¼ cup, and 37 children (34.3%) reported an increase in mean daily consumption of whole fruit by at least ½ cup. Mean daily total fruit intake increased, but the change was not significant (p = 0.548). The program had no impact on the consumption of fruit juice or vegetables.

Fruit and vegetable servings have increased 0.3 (Seligman et al., 2015), 0.6 (Freedman et al., 2013), and 1.6 servings (Jones et al., 2020; Trapl et al., 2018) in PPP participants. Seligman et al. (2015) found fruit and vegetable servings to increase from 2.8 servings at baseline to 3.1

servings among 677 food insecure individuals with diabetes six months after enrollment in a food box prescription program (value of $16 a box, provided once or twice monthly) (Seligman et al., 2015). Fruit and vegetable consumption increased significantly from 5.2 to 6.8 servings per day ($p < 0.001$) among 243 children up to 6 years old and their caregivers enrolled in multiple six-month Navajo FVRx programs (Jones et al., 2020). The increase in servings brought participants closer to the American Academy of Pediatrics' recommendations for fruit and vegetable consumption, up to 82% at follow-up compared to 66% at baseline ($p < 0.001$). Prescription size was $1 per household member per day with a maximum value of $5/day. A 22-week PPP provided 41 low-income adults with diabetes at an FQHC in rural South Carolina up to $50 in vouchers for fruits and vegetables to shop at a farmers market (Freedman et al., 2013). Total fruit and vegetable intake increased from 5.9 servings/day before the intervention to 7.5 at the program mid-point ($p = 0.07$), and then down to 6.5 servings per day immediately after the program ended. Fruit and vegetable intake was about half a serving higher than baseline after the market ended, though the increase was not statistically significant ($p = .52$). The authors note that the increase in servings compared to baseline is noteworthy; however, because produce consumption patterns tend to be higher in the summer, when baseline measures were taken, compared to the fall and winter months, when the intervention ended. Consumption surprisingly increased, though non-significantly, despite the change in seasons.

In Ohio, adults with hypertension ($N = 137$) reported consuming a combined average of 4.9 servings of fruits and vegetables per day compared to 3.3 servings at baseline, an increase of 1.6 servings of fruits and vegetables a day (Trapl et al., 2018). Patients received up to $120 in vouchers to spend on fresh produce at farmers markets for attending three clinic visits over the course of six months. Interestingly, farmers market visits and voucher redemption were not

associated with fruit and vegetable consumption. In Georgia, participants across four six-month PPPs consumed 0.79 more unique fruits (95% CI = 0.4, 1.2; p = 0.0004) and 0.95 unique vegetables (95% CI = 0.5, 1.4; p < .0001) in the previous 24 hours compared to baseline, accounting for an average increase of 50% for both (Cook et al., 2019).

A PPP in the United Kingdom offered 621 patients at the Castlefields Health Centre a coupon for £1 for every £3 (or more) spent on fresh fruits and vegetables over 4 weeks at a superstore (Buyuktuncer et al., 2014). A phone questionnaire was administered at baseline (T0: 7–14 days after provision of the prescription; n =124), mid-way (T1: 3– 6 weeks, n = 84), and at the end of the program (T2: 16 weeks, n = 54). Participants reported consuming five portions of fruits and vegetables at T0 and T1, although it was decreased to 4.5 portions at the T2. There was no significant difference in consumption across the three time points nor between any two time points. Patients provided insight into why their consumption may not have increased: they were "already eating lots of fruits and vegetables", "insufficient value of vouchers", and "quality of fruits and vegetables in the shops." Twenty-two participants suggested increasing the value and time validity of vouchers and extending the number of outlets where they can be used as ways to improve the program.

The use of a nutrition education component in conjunction with coupons can promote positive behavior changes and fruit and vegetable consumption, more so than coupons alone (Anderson et al., 2001). A study in France found that fruit and vegetable consumption significantly increased among adults with a low-income in the "dietary advice and vouchers" (0.74 ± 1.90, p = 0.002) and the "dietary advice only" (0.62 ± 1.29 times/day, p = 0.0004) group after 3 months, with no significant difference between the two groups (Bihan et al., 2012). A systematic review of 44 studies with interventions of greater intensity, like those that included

face-to-face education and counseling, were found to be more effective among adults (Pomerleau et al., 2005). These results support the use of face-to-face nutrition education and counseling to increase fruit and vegetable consumption. In fact, almost two-thirds (58%) of participants in a New York FVRx® program reported significantly increased knowledge of the importance of fruits and vegetables by the end of the intervention (Wholesome Wave, 2014). Nutrition education classes that engage the whole family may be particularly important for rural areas in which there are few educational opportunities (Burrington et al., 2020). All ten of the participating families in a rural PPP agreed that the nutrition classes were essential to using the produce that they received through their prescription (Burrington et al., 2020).

Diet quality as a whole has also been evaluated in regard to PPPs. Berkowitz, O'Neill, et al. (2019) conducted an RCT and compared diet quality in 122 participants either assigned to the intervention, in which they received two years' worth of subscriptions to a produce box from a CSA (n = 56), or to the control group (n = 66), which received the equivalent of the subscription in financial incentives ($300 per growing season). The authors used the HEI 2010 which ranges from 0 to 100 and measures adherence to USDA's dietary recommendations across 12 subscores. A higher HEI value indicates a better adherence and thus a higher diet quality. The authors examined changes in total HEI score as well as changes in HEI subscores. There was significant improvement in the total HEI score during the growing season when the intervention was occurring (60.2 in the intervention group vs. 55.9 in the control group; difference = 4.3; 95% CI = 0.5, 8.1, p = 0.03). A similar benefit was found in analyses that included both in-season and out-of-season data (difference = 4.1, 95% CI = 0.3, 7.9, p = 0.03). Analyses of HEI subscores showed significant improvements in the categories of food provided by the CSA share (total vegetables, total fruit, and whole fruit).

Food Insecurity.

PPPs have also had a positive impact on food insecurity. Berkowitz, O'Neill, et al. (2019) conducted an 18-month RCT with the intervention group receiving two years' worth of CSA shares and the control receiving the equivalent in financial incentives and nutrition education materials. Using the six-item short form of the USDA Household Food Security Survey Module (HFSSM), baseline food insecurity prevalence was 31% in the intervention group and 42% in the control group. During the intervention, food insecurity prevalence fell to 11% in the intervention group and 32% in the control group. The difference between groups, adjusting for baseline food security, was in favor of the intervention (RR = 0.68, 95% CI = 0.48, 0.96). However, it is unclear if the changes were statistically significant.

Ridberg et al. (2019a) evaluated changes in food insecurity among 578 families with a low-income that participated in one of six Wholesome Wave FVRx programs across five states and the District of Columbia between 2013–2015 (Ridberg et al., 2019a). Change in food security was measured in five household-level behaviors, adapted from the USDA's 18-item HFSSM. Because these five items did not comprise a validated tool on their own, a summative scale was created to calculate a change score. The 5-item scale was scored based on the food security categories favored by the USDA, with "sometimes" and "often" responses counted as affirmative answers and summed: *high/marginal* food security (0–1); *low* (2–3); and *very low* (4–5). More than two-thirds of households (72%) increased their summative food security score from baseline to the end of the program. The percentage of participating families with very low food security decreased from 9% to 1% and those experiencing low food security decreased from 33% to 22%. Those with high/marginal food security increased from 58% to 76%. The changes reflect that families shifted to a category of higher food security by the end of the program. The

five individual questions in the food security questionnaire improved significantly at the last program visit compared to baseline ($p < .001$): fewer households reported that they sometimes or often worried food would run out (53% vs. 66%), could not afford balanced meals (51% vs. 65%), cut or skipped meals (25% vs. 41%), children did not eat for a whole day (8% vs. 15%), and households reporting that they had enough of foods they liked to eat (32% vs. 62%). Food security improved more in families who attended a higher number of clinical visits (5-6 visits) compared to those who attended less visits (1-2 visits). The authors hypothesize that the increased points of contact with the participant could stimulate the change in food security. However, neither visit proportion (visits made / total possible) nor redemption proportion (prescriptions redeemed / total prescribed) was associated with the food security change score.

A mixed method process and outcome evaluation for a fruit and vegetable prescription program across the state of Washington was conducted (Marcinkevage et al., 2019). SNAP participants could receive a $10 fruit and vegetable voucher redeemable at any one of 169 participating supermarkets, with no limit on the number of times a patient could receive a prescription. Of the 144 participants that completed a web-based survey, 74.3% ($n = 107$) reported food in their home was less likely to run out as a result of the prescription, and 86.8% ($n = 125$) reported increased ability to afford balanced meals. Information on the perceived benefit was self-reported and is subject to bias, however. Further, because there was no limit on the number of prescriptions a participant could receive, it's difficult to determine the threshold in prescription value to have an impact on food security. Interestingly, prescription redemption rates were the highest during the last ten days of the month when SNAP benefits might be running low. Out of the 15,481 prescriptions redeemed, 29%, 33%, and 38% were redeemed during the first, second, and third ten days of the month, respectively. The pattern in redemptions

highlights how produce prescriptions could fill in the gaps in need left by federal nutrition assistance programs.

In Jones et al. (2020), the proportion of households in the Navajo Nation FVRx program reporting adequate food security (not defined) significantly increased from 18% at baseline to 35% at the end of the program using the six-item short form of the USDA HFSSM ($p = 0.001$) (Jones et al., 2020). However, 65% of families remained food insecure at the end of the program, a rate 17 times higher than the U.S. national rate of food insecurity at the time (11.1%). The high need for food security calls for increased nutrition assistance in the Navajo Nation.

A year after a Flint, Michigan clinic implemented a pediatric PPP, researchers assessed a convenience sample of 157 caregivers of children who were active patients at the clinic (Saxe-Custack, Sadler, et al., 2020). The program provided $10 to every child at every office visit to spend at the farmers market on produce. Caregivers completed the six-item short form of the USDA HFSSM to assess food security a year after the intervention. Almost half of all caregivers (45%) who completed the survey indicated low or very low levels of household food security. Food security scores among caregivers of children who did receive a produce prescription were not significantly different from caregivers of children who had not received a prescription. The results are not surprising, as it's possible that a child who participated the year before only received a single $10 prescription. Such a low, one-time prescription cannot be expected to influence household food security a year later.

Overall, produce prescriptions appear to increase food security (Jones et al., 2020; Marcinkevage et al., 2019; Ridberg et al., 2019a), particularly among households with high levels of food insecurity (Jones et al., 2020; Ridberg et al., 2019a). Two programs that used the validated six-item short form of the USDA HFSSM also provided the percent change in food

security. These two programs saw a 17% (Jones et al., 2020) and 20% increase in household food security among those receiving a produce prescription. In the Navajo Nation program, the majority of families (65%) still remained food insecure at the time of program completion despite improvements in food security for the other 35% of families. One program with a low, potentially one-time prescription ($10) did not see a difference in household food security between those who did and did not receive a prescription. A larger prescription over a longer period of time may be necessary to impact food security. It should also be noted that the difference in food security between the intervention and the control group in the RCT favored the intervention group, despite the control group receiving the equivalent of the CSA shares in financial incentives and nutrition education materials (Berkowitz, O'Neill, et al., 2019). The findings suggest that the PPP has a valuable impact on food security beyond its financial worth.

Diet-Related Disease.

PPPs have largely focused on tracking clinical measures related to blood pressure, weight, and HbA1c. Two studies have found statistically significant reductions in blood pressure in individuals who participated in a PPP. Exploratory analyses of anthropometric and laboratory measurements of 122 participants of an RCT PPP found statistically significant differences between the intervention and the control group for diastolic blood pressure (Berkowitz, O'Neill, et al., 2019). The Farming for Life pilot program examined the impact of providing produce prescriptions to 21 Latino adults with non-insulin treated type 2 diabetes (York et al., 2020). Over 12 weeks, there was a significant decrease in systolic ($p = 0.03$) and diastolic ($p = 0.01$) blood pressure. Participants with normal blood pressure (<120/80 mmHg) increased from four at baseline to 10 post-intervention. It is noteworthy that the improvements in blood pressure occurred without any nutrition or diabetes education, care management, or information on how

to prepare the vegetables (York et al., 2020). There also was no control group. A third study by Bryce et al (2017) found no change in blood pressure (135.1/79.3 mm Hg to 135.8/77.6 mm Hg) after 13-weeks of a produce prescription compared to baseline ($p > 0.05$) among 65 patients with a low-income and uncontrolled type 2 diabetes (Bryce et al., 2017).

Results varied for PPP impact on measures related to weight. In the Farming for Life pilot program, there was a non-significant median weight loss of 1.9 pounds among 14 (67%) of the 21 Latino adults with type 2 diabetes over 12 weeks (York et al., 2020). Waist circumference decreased by a median of 1.5 inches in 9 (47%) of 19 responders. There was no change in weight (208.3 lbs. to 209.0 lbs.) in a 13-week produce prescription compared to baseline ($p > 0.05$) among 65 patients with a low-income with uncontrolled type 2 diabetes (Bryce et al., 2017). A retrospective case–control study in Albany, New York found a statistically significant difference in mean BMI change ($p = 0.02$) between 54 individuals with obesity, hypertension, and/or diabetes receiving $7 a week to spend on produce at a mobile farmers market for at least five weeks and a control group matched on age, ethnicity, and co-morbidity status (Cavanagh et al., 2017). The intervention group saw a mean decrease in BMI of 0.74 kg/m whereas the control group members reported a mean increase in BMI of 0.35 kg/m. A pediatric program for children in the Navajo Nation that recruited from various hospitals and clinics did not see a significant difference in BMI percentile (BMI ≥5th percentile and <85th percentile) at the end of the six-month program ($n = 107$) (Jones et al., 2020). In a subgroup of the children classified as having overweight or obesity ($n = 58$) at baseline, 38% had a BMI percentile that fell in the healthy range by the end of the program. The average BMI percentile declined from 95.6 to 73.1 ($p < 0.001$). The authors note that children who had overweight or obesity for their age may particularly benefit from enrollment in the Navajo program. Of note, the proportion of children

who were underweight (BMI <5th percentile) increased from 1% to 4%, a statistically significant increase.

Three studies also examined changes in HbA1c. An HbA1c ≥ 6.5% indicates diabetes (American Diabetes Association, n.d.). The 65 patients with a low-income and uncontrolled type 2 diabetes in the study by Bryce et al. (2017) experienced a statistically significant decrease in HbA1C (9.54% to 8.83%; $p = 0.001$) after 13 weeks. The 21 Latino patients with type 2 diabetes in the Farming for Life program did not experience a significant change in HbA1C after 12 weeks of vegetables (6.7 ± 1.1% at baseline versus 7.0 ± 1.1% post-intervention) (York et al., 2020). However, the majority of patients already had well controlled diabetes at baseline. Finally, Seligman et al. (2015) recruited 687 individuals with diabetes who were experiencing food insecurity from food pantries and clinics in three states for a six-month pilot PPP. Individuals were provided diabetes-specific food boxes of shelf stable and perishable food, including fruits and vegetables. There was significant improvement in mean HbA1c from baseline (8.11%) to follow-up six months after enrollment (7.96%). The proportion of participants with very poor glycemic control (HbA1c > 9%) declined from 28% to 25%. Among the subgroup of participants with uncontrolled HbA1c (HbA1c ≥ 7.5%) at baseline, mean HbA1c declined from 9.52% to 9.04%.

Overall, there is limited evidence that PPPs modestly improve conditions of diet-related disease, namely blood pressure and HbA1c. There is inconsistent evidence of PPPs significantly improving measures related to weight. More evidence is needed to confirm the role of program length, program design (e.g., inclusion of a nutrition education component), prescription size, and prioritized populations on diet-related disease outcomes. Further, only one study involved clinical measures for children. Research examining the impact of PPPs among children and

adolescents is needed, with special attention to avoid weight loss among children who are food insecure but are not experiencing overweight or obesity, as seen in Jones et al. (2020).

Additional impacts.

PPPs have also evaluated a number of other measures. Of the 137 participants that completed a hypertension-focused PPP, 88% indicated they visited farmers markets more than before the program, 95% reported that they would shop at farmers markets after the program ended, and 82% reported trying a new fruit or vegetable (Trapl et al., 2018)**.** Jones et al. (2020) found no significant difference in average daily minutes of physical activity, hours of sleep, or hours of screen time between baseline and a six-month follow-up among 121 Navajo children (Jones et al., 2020). Caregivers of children who received a produce prescription were significantly more likely to report recently shopping at the farmers market compared to caregivers of children that did not receive a prescription (50.6% vs. 26.8%, respectively; $p = 0.005$) approximately one year after the implementation of the prescription program (Saxe-Custack, Sadler, et al., 2020).

Seligman et al. (2015), using a variety of questionnaires, found significant improvements in self-efficacy (individuals' perception of their ability to manage their diabetes; $p < 0.001$), diabetes distress (measure of the emotional burden of chronic disease self-management; $p < 0.001$), and medication non-adherence ($p < 0.01$) among over 600 individuals with diabetes experiencing food insecurity (Seligman, 2015). Two studies examined changes in putting off buying medications to afford food. One study found a significant reduction in tradeoffs between food and medication or medical supplies after a six-month intervention ($p < 0.001$) (Seligman et al., 2015). The other study found a non-significant ($p = 0.14$) reduction in risk among the intervention group compared to a control group (RR = 0.73, 95% CI = 0.48, 1.11) (Berkowitz,

O'Neill, et al., 2019). Berkowitz, O'Neill, et al. (2019) did not find any statistically significant differences in lipid profiles between an intervention group receiving two years' worth of CSA shares and a control group that received the equivalent value in financial incentives and nutrition education materials. The authors also found no significant difference in means for depressive (–0.57, 95% CI = –1.31, 0.18, p =13) and anxiety symptoms (–0.53, 95% CI = –1.21, 0.16, p = 13) between the intervention and control group. There were no significant changes in cost-related medication underuse (RR = 1.01, 95% CI = 0.66, 1.53, p = .97).

Overall, produce prescriptions appear to be associated with increased farmers market shopping and improved self-efficacy, diabetes distress, and medication non-adherence. More evidence is needed to determine how a PPP impacts the tradeoffs between food and medication, lipid profiles, depressive and anxiety symptoms, and cost-related medication underuse.

Experiences of Produce Prescription Program Participants

PPPs are intended to have a positive impact on their participants' fruit and vegetable consumption, food insecurity, diet-related health conditions, and more, depending on the goals of the program. Surveys and clinical measures tell part of the story—the part that anticipates specific impacts and measures them accordingly. PPPs can have impacts on participants that are not usually tracked by programs, such as social and mental health impacts. Hearing directly from participants about their experience in a PPP can provide a holistic view into program impacts and provide an opportunity for the participants to share their stories.

There are three peer-reviewed papers that discuss participants' program experiences from the perspective of the participants themselves. Two papers stem from the same three-month long PPP called "PRxHTN," which recruited food insecure adults diagnosed with hypertension in three safety net clinics in Cleveland, OH (Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al.,

2019). Between the two papers, researchers interviewed patients (n = 23), program providers (n = 5), and market managers (n = 2) 3–8 months after the program ended to determine how effective PRxHTN was based on its goals and how the program translated to patients' everyday lives. Patients were asked about their beliefs around food, healthy eating, and farmers markets; experiences of PRxHTN at clinics and at the markets; as well as food histories, eating patterns, and grocery shopping routines. The study found that both providers and patients reported that the discussions about food and healthy eating communicated that providers "care" for patients, though patients reported a short amount of time to ask questions during these conversations (Schlosser, Joshi, et al., 2019). Patients reported greater knowledge about produce and farmers markets. They also increased their fruit and vegetable intake during the program. The prescriptions provided an opportunity for patients to take risks and try new produce. Patients developed relationships with market vendors and saw it as a positive social experience that they could share with their family, whom they brought along to shop. Transportation was determined to be a barrier to market access (Schlosser, Smith, et al., 2019). About half of the patients did not have a car or unreliable vehicles (n = 11), with some relying on program coordinated transportation, public transportation, and rides from friends or family. The sustainability of the program's impact on fruit and vegetable consumption was called into question when patients shared that due to tight budgets, they limited their market shopping to what could be purchased with program vouchers. Many patients viewed the market produce as a temporary luxury.

While participants experienced increased produce consumption and farmers market shopping during the program, most patients were unable to maintain these changes after the program ended due to economic hardships. The authors recognized the short-term relief the prescriptions provided. They suggested the importance of addressing other critical needs in

individuals' lives in addition to access to produce, such as the structural influences on the patients' health, and future programs partnering with local grocery stores for year-round produce access. However, this study was limited by the fact that participants were selected after responding to a postcard invitation, potentially biasing the results by hearing from participants who were more engaged with the program (Schlosser, Joshi, et al., 2019).

The third paper interviewed 18 participants who had been enrolled in a safety net hospital-based PPP in Georgia (Cahill et al., 2020). Participants were interviewed six months after the program ended to assess barriers to participation, challenges to maintaining a healthy diet, and the participant's ability to sustain behavior change during and after the program. Most participants reported joining the program because of the desire to eat healthier and lose weight. Almost all participants mentioned an increase in their nutrition knowledge, such as reading nutrition labels and understanding correct portion sizes. Some participants mentioned enjoying meeting new people and a sense of comradery among their fellow participants. Most participants reported that they continued to eat "a good amount" (Cahill et al., 2020, p. 3) of fruits and vegetables, and they still used the knowledge that they gained in the nutrition education and cooking classes. Barriers to program participation included transportation challenges getting to the nutrition classes and having to pay a co-pay for the classes. Cost was the biggest reported barrier to eating healthy.

Two additional studies explored participant experiences from the perspectives of program providers or patient caregivers. Trapl et al. (2017) interviewed 10 providers for Produce Prescription Program for Pregnant Women (PRx) in Cuyahoga County, OH to assess perceived impact of PRx on participants and their relationship with their providers (Trapl et al., 2017). Providers were community health workers, patient advocates, registered dietitians, midwives,

and a supervisor. The providers' perspectives on the program's impact were limited the 5–7-minute discussion that they had with participants during the healthcare visits. Providers reported that PRx promoted awareness about local farmers markets for participants by providing information about market locations and hours of operation. They felt better as providers to encourage patients to eat more produce, knowing that they had a tangible resource to help make that suggestion a reality. PRx provided a platform to discuss fruits and vegetables with their patients more so than before the program. Overall, the providers' response shed light on what happened during the healthcare visits but was missing depth as to what the participants experienced and how it impacted their daily life.

Saxe-Custack et al. (2018) interviewed 32 caregivers of pediatric patients of Hurley Health Center, a pediatric training clinic in Flint, Michigan that provided $10 vouchers to purchase produce at the farmers market after every visit (Saxe-Custack et al., 2018). Caregivers who had a child receive a produce prescription through the clinic were interviewed using a narrative qualitative methodology to investigate and account for the caregiver's experiences with the PPP, opinions of the FFM, the impact of the prescription on their child's fresh produce consumption, and suggestions for improvement. Caregivers reported gratitude for the program, noting how the prescription helped them afford healthy food in times of need, like when their SNAP benefits ran out. They felt cared for by the pediatricians when their children received fruits and vegetables instead of treats following healthcare visits. Caregivers were also grateful to get to shop at the farmers market, where they enjoyed interactions with the market vendors. When asked how the program could improve, they asked for programs and recipes to guide how to prepare the foods that they purchase with the prescriptions. Caregivers did not find the limited operating hours of the market to be a barrier to shop. Rather, caregivers timed their clinic visits

for when the market was open. Once again, selection bias may have been present as caregivers elected to be a part of the study. Despite being the guardians of the children and the main food purchasers, the caregivers were still speaking on behalf of the program's priority population: the children themselves.

The studies above indicate the need to hear directly from those recruited by the intervention rather than by program providers or family proxies to better understand how the program impacted the participants themselves. This dissertation will contribute to the growing literature of PPP participant experiences.

Policy, Law, and Fruit and Vegetable Consumption

Policy can have a significant influence on fruit and vegetable consumption, as well as the establishment and sustainability of nutrition incentive programs and produce prescription programs. A review of policies that impact these three areas can inform the future direction of produce prescription programs.

A policy is "a course of action proposed or implemented by a government, party, business, or individual" (English Oxford Dictionary, n.d.). Laws set out standards, procedures and principles that must be followed. A statute is a law enacted by the legislative branch of a government (e.g., U.S. Congress) (Merriam-Webster, n.d.-b). Policy defines the goals and outlined activities of an authority, though it may be necessary to pass a law to facilitate government to implement the necessary institutional and legal scaffolds to achieve their aims.

There are other legal and non-legal routes governments use to implement rules. A regulation is a rule or order explaining the operational, technical, or legal details regarding how a law will be implemented. Regulations are issued by an executive authority or governmental agency at the municipal, county, state, or federal level. Although they are not laws,

regulations are adopted under authority granted by statutes (laws) and therefore have the force of law. An ordinance is a law set forth by a municipal governmental authority, such as at the city, county, village, or town level (Merriam-Webster, n.d.-a). At the federal level, regulation becomes a rule when it is published into the Federal Register after final consideration of comments and edits (Academy of Nutrition and Dietetics, n.d.). Entities design their policies on the basis of both rules applied by regulatory authorities and their goals.

When is Government Intervention Appropriate?

Economic theory states that government intervention should be limited to instances of market failure (Finkelstein & Strombotne, 2010; Karnani et al., 2016). Market failure is the failure of the private sector to conform to assumptions that allow it to deliver efficient outcomes (Finkelstein & Strombotne, 2010). When these assumptions are violated and efficiency is not achieved, market failure can occur (Karnani et al., 2016). As a result, less welfare (utility or profit) is created than could be generated given the available resources. Government intervention is justified in correcting market failure provided that the "societal cost of correcting the failure is less than the cost of the failure itself" (Karnani et al., 2016, p. 451).

The obesity epidemic has been considered a market failure due to the violation of two assumptions: absence of externalities and symmetric information (Karnani et al., 2016). An externality exists when some party's welfare is directly affected by the actions of another party, either a consumer or producer. There are significant financial costs associated with obesity (Tsai et al., 2011), but due to medical expenses paid by taxpayers and the sharing of insurance pools, these costs are not allocated solely to obese individuals (Karnani et al., 2016). Instead, many of the costs of obesity are often paid for by individuals who are not experiencing obesity. Therefore, government intervention would be appropriate to correct this market failure.

Asymmetric information occurs when one agent in a transaction has more or better information than the other party. An example of asymmetric information would be restaurants knowing the nutritional content of their meals but consumers not having access to this information. Imperfect information, on the other hand, is when one agent or both agents in a transaction have imperfect information rather than less information than the other. They are less than 100% certain about the qualities of what is being bought and sold.

Both asymmetric information and imperfect information may lead to market failure and can be applied to children in the case of obesity (Finkelstein & Strombotne, 2010; Karnani et al., 2016). Children are unable to weigh the future consequences of their actions and therefore cannot act rationally in their self-interest (imperfect information) (Finkelstein & Strombotne, 2010; Karnani et al., 2016). Food manufacturers developing advertisements targeting children have more information regarding the nutritional implications of their items than children do (asymmetric information). Given increased risk for youth with overweight or obesity to become adults with overweight or obesity (Singh et al., 2008), government intervention is not only justified, but needed in the modern obesogenic environment. One way government can intervene is to effectively limit food advertisements directed at children.

Government intervention may be appropriate for similar assumption violations in the case of fruit and vegetable consumption. Poor nutrition, including low fruit and vegetable intake, can promote the development of diet-related chronic diseases (Aune et al., 2017; National Center for Chronic Disease Prevention and Health Promotion, 2009) and directly increase healthcare costs (Candari et al., 2017). Diet-related diseases such as type 2 diabetes, coronary heart disease, and stroke also contribute to negative externalities by increasing medical expenses in public and private healthcare (Candari et al., 2017). Individuals without a diet-related disease will still have

to bear the healthcare cost of those who do. Suggested policy solutions to correct healthcare related externalities associated with obesity can apply to externalities at the hand of other diet-related diseases. These solutions include a healthcare tax (directly addresses the externality; ranked the best option); obesity tax (directly addresses obesity, second best), calorie tax (directly addresses obesity inputs, third best); fruit and vegetable subsidies, nutrient taxes, and nutrient subsidies (indirectly addresses obesity inputs, fourth best) (Alston & Okrent, 2017). Government can also reduce the information gap in the marketplace that exists between food producers and food consumers (Karnani et al., 2016) through policies like menu labeling mandates (U.S. Food and Drug Administration, 2020b) and more consumer-friendly nutrition facts labels (U.S. Food and Drug Administration, 2020a). While evidence so far has shown menu labeling to non-significantly reduce calorie intake (-7.63 calories) in restaurant settings, it can still serve as a relatively low-cost education strategy (Long et al., 2015). Imperfect information is no surprise given the potentially long lag time between consumption and consequences, the variation in responses among people with different genetic make-up, and ever-shifting diet and nutrition information (Alston & Okrent, 2017). Further, people tend to underestimate calories consumed and overestimate calories burned from exercise (Karnani et al., 2016). The USDA references a study highlighting how even registered dietitian nutritionists underestimated the calorie content of restaurant meals by an average of 37% and the fat content by 49% (Kulcher et al., 2005). In 2017, five FVRx® programs in Georgia found significant increases pre- and post-program regarding knowledge of how to prepare fresh produce (35% increase), where to buy produce (38.9%), and the importance of fruits and vegetables in their family's diet (27.3%) (Cook & Webb Girard, 2018b). All five programs provided some form of nutrition education to participants. These changes highlight how a gap in knowledge existed, and how education can

shrink these gaps so that individuals can make well-informed decisions in their self-interest.

An alternative rationale for government intervention outside of market failure is the "public health rationale" (Alston & Okrent, 2017). This rationale considers health to be a public good, or a good that would generally not be supplied by the private sector (Finkelstein & Strombotne, 2010). The need for public goods can also justify government intervention (Alston & Okrent, 2017). The DGA, MyPlate, and SNAP-Ed are examples of government-provided public goods.

The threat of paternalism (Alston & Okrent, 2017), government overreach (Drenkard, 2011), and unintended consequences (Drenkard, 2011; Kuchler et al., 2005) can make government interventions unattractive. Private sector efforts, such as industry self-regulation (Karnani et al., 2016), or joint efforts through public-private partnerships (Buse & Waxman, 2001) are alternatives to meeting public health needs. However, when the interests of the industry and society are divergent, industry is unlikely to voluntarily sacrifice profits for public interests. Self-regulation, though weak without standards or enforcement (Sharma et al., 2010), can be more appealing to the private sector if it replaces burdensome government regulation (Karnani et al., 2016).

Examples of Policies and Laws Affecting Fruit and Vegetable Consumption

Laws and policies at the federal, state, tribal, and local levels can shape the environment and systems that influence health behaviors, access to healthier choices, and health outcomes, including fruit and vegetable intake (Crawford et al., 2018). Recognizing this significance, the Healthy People 2020 Law and Health Policy Project developed a 2018 report highlighting legal and policy interventions that impact public health and aid in reaching national health objectives. The report identified the main areas where law and policy have an impact on fruit and vegetable

consumption. These areas are food availability, population food security, supplemental nutrition programs, food labeling requirements, and patterns of food production and sales initiatives (Figure 1) (Crawford et al., 2018). The mechanisms in which different levels of government influence fruit and vegetable intake were identified:

- Taxing and spending on specific programs
- Direct regulation of persons, professionals, and businesses
- The power to shape the built environment (the physical aspects of where we live and work, such as homes, buildings, streets, open spaces, and infrastructure (Centers for Disease Control and Prevention, 2011)
- The power to shape the socioeconomic environment (systems and structures that impact the distribution of resources, money and power in a community (Walker & Hepp, 2016)
- The power to shape the educational environment
- Deregulation when laws act as a barrier to health (Crawford et al., 2018)

These mechanisms can come in many forms, including bills, laws, acts, statutes, agency implementation (e.g., rules and regulation), court decisions, guidelines, and directives internal to an institution (Zhang et al., 2018).

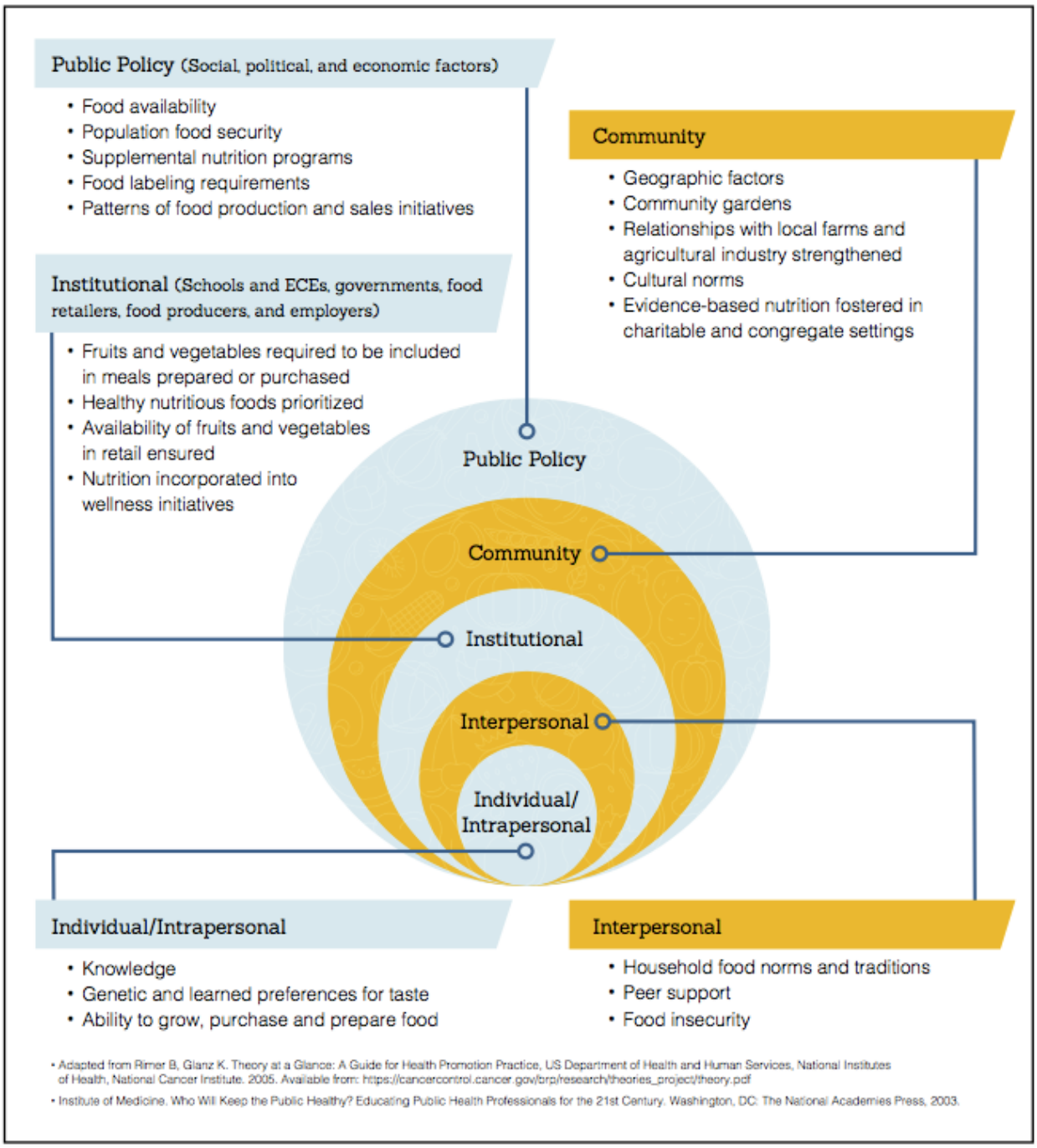


Figure 1. Factors that shape fruit and vegetable access and intake from Crawford, Dunning, Kappagoda, and O'Connor (2018).

All levels of government authority have the power to impose taxes and spend funds. The federal government can influence state-level policy by setting conditions that states must accept in order to receive federal funds. States can then pass these conditions down to the local-level. For example, the USDA reimburses states for participating in the National School Lunch Program (NSLP) and the National School Breakfast Program (NSBP). States then allocate reimbursement to participating schools that comply with program requirements, most notably following national nutrition standards that include serving requirements for fruits and vegetables (Crawford et al., 2018). A taxation example at the tribal level includes the elimination of an existing 5% sales tax on healthy foods in the Navajo Nation in 2014. Healthy foods relieved of the tax included fresh fruits and vegetables, nuts, water, and culturally significant foods. Further, a separate ruling issued a 2% sales tax on foods and beverages of "minimal-to-no nutritional value" sold within the borders of the Navajo reservation (Crawford et al., 2018). Proceeds are funneled towards community wellness projects, including farming and vegetable gardens, farmers' markets, and convenience stores stocking healthful products.

The Farm Bill is an omnibus, multi-year federal law that governs an array of agricultural and food programs, including, but not limited to, nutrition assistance, commodity support, conservation programs, research, and rural development. Approximately 80%, or nearly $391 billion, of the funding allocated for the 2014 Farm Bill (the Agricultural Act of 2014, P.L. 113-79) was dedicated to mandatory nutrition programs (Johnson & Monke, 2008). Mandatory spending programs in the Farm Bill (e.g., SNAP) generally operate as entitlements and receive money every year, whereas discretionary spending programs (e.g., WIC) are authorized but not funded by the Farm Bill. Instead, they are subject to annual appropriations (Johnson & Monke, 2008). The Farm Bill also includes funding for SNAP-Ed, the nutrition education and obesity

prevention arm of SNAP, and the Gus Schumacher Food Insecurity Nutrition Incentive Program (GusNIP; formerly the Food Insecurity Nutrition Incentive, or FINI, Grant Program) ("Agriculture Improvement Act of 2018," 2018). GusNIP grants fund nutrition incentives, including produce prescriptions, to help SNAP recipients purchase fruits and vegetables (National Institute of Food and Agriculture, n.d.).

Government also has the power to alter the built and socioeconomic environment. Local government can determine land use and zoning laws that play an important role in access to fruits and vegetables (Crawford et al., 2018). For example, zoning laws determine where grocery, farmers markets, and other food retail businesses may be located, as well as the walkability of the routes to these locations (Crawford et al., 2018). The Law and Health Policy Project report provides a few examples of how cities have taken steps to modify the built and socioeconomic environment. In Los Angeles County, the zoning code was updated to allow farmers markets to locate in all zones within the county and required that farmers markets accept SNAP as a form of payment. Minneapolis exercised their regulatory powers by enacting a Staple Foods Ordinance. The Ordinance requires most small food stores and grocery stores to stock a minimum amount of healthy foods with specific requirements for fruits and vegetables. Providing resources is another way government can increase access to produce. For example, the Illinois Farmers' Market Technology Improvement Program Act set aside funds to help farmers markets acquire wireless Electronic Benefit Transfer (EBT) terminals, pay for fees associated with SNAP card use, and provide education to SNAP recipients (Crawford et al., 2018).

Government also has the power to provide information to consumers. In 2010, Congress passed the Patient Protection and Affordable Care Act of 2010 ("Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act," 2010), which, in

part, added a national menu labeling provision to the Federal Food, Drug, and Cosmetic Act ("Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act," 2010). Four years later, the Food and Drug Administration finalized and published the federal menu labeling rule requiring calorie count information to be posted on menus at chain restaurants with more than 20 locations (U.S. Food and Drug Administration, 2020b). Menu labeling is based on the argument that consumers have a right to calorie count information so that they can make healthier choices. As mentioned above, while evidence so far has shown menu labeling to non-significantly reduce calorie intake (-7.63 calories) in restaurant settings, it can still serve as a relatively low-cost education strategy (Long et al., 2015).

Sometimes existing laws directly or indirectly limit fruit and vegetable intake. For example, before 2012, federal school meal standards were not aligned with serving recommendations found in the 2010 DGA (Crawford et al., 2018). This contributed to lower intake of fruits and vegetables among school children. Policies can also impact several environments, including schools, retail settings, and locations on government grounds. Notable programs in the school environment include the NSLP and the NSBP, administered by the USDA. Government policies not only affect how fresh fruits and vegetables arrive on a child's plate, but also the nutrition content of the food they are receiving. The Healthy Hunger-Free Kids Act of 2010 ("Healthy, hunger-free kids act of 2010," 2010) granted the USDA the authority to align the serving sizes for fruit and vegetables in school meals with the most recent DGA. The USDA also provides funding for technical support, training, kitchen equipment, and research to ensure implementation of nutrition standards in school meal programs (Crawford et al., 2018). The USDA directly impacts fruit and vegetable consumption through the Fresh Fruit and Vegetable Program, which provides free fresh produce to elementary school students during the

school day outside of mealtimes. Federal agencies can combine efforts to meet public health needs. The Department of Defense (DoD) harnesses their procurement and distribution experience to provide fresh produce to schools at an affordable price for their meal programs through the DoD Fresh Fruit and Vegetable Program (Crawford et al., 2018).

Facilities owned or controlled by the government can also be a platform for increasing access to fruits and vegetables for the estimated 22 million people in the United States who work for the federal, state, or local government (Bureau of Labor Statistics, 2017). According to the Law and Health Policy Project report, another 2.2 million people are incarcerated in jails and prisons across the country, and millions travel through government-owned properties, such as parks and forests, every year (Crawford et al., 2018). In Washington, the governor issued a statewide executive order in 2013, titled "Improving the Health and Productivity of State Employees and Access to Healthy Foods in State Facilities" (Inslee, 2013). The order mandates all state agencies to implement food and beverage policies consistent with the state's Healthy Nutrition Guidelines, based on the DGA. Delaware state park vending machines and concessions classified food items as "Go," "Slow," or "Woah" as a part of their "Munch Better" Policy (Crawford et al., 2018). The classifications make it easy for park visitors to recognize healthier options.

In the retail environment, laws and policies can influence how affordable produce is, how geographically accessible grocery and food retail establishments are, and the marketing of fruits and vegetables within grocery and food retail establishments (Crawford et al., 2018). For example, in 2015 the Partnership for a Healthier America started a fruit and vegetable marketing campaign titled "FNV" (Partnership for a Healthier America, n.d.-a). The campaign essentially branded fruits and vegetables, using proven marketing techniques practiced by successful brands

to increase demand and consumption of produce. The use of celebrities and famous athletes to promote fruits and vegetables is one of the most notable marketing strategies for FNV. The Partnership for a Healthier America is an example of non-profit, public, and private sectors working together towards national health goals; in this case, ending the childhood obesity epidemic (Partnership for a Healthier America, n.d.-b). Public-private partnerships can combine skills and resources to better address global issues, though they come with their own challenges (Buse & Waxman, 2001).

Gauging Policy Success

It is important to understand what determines whether a policy is considered "successful" or not to highlight the unique complexities of policymaking. Successful policy has been simply defined as measures that meet targets and achieve outcomes (McConnell, 2010). A more critical definition is a policy which "redresses power imbalances, reduces inequalities and involves stakeholders in formulating policy goals and evaluating results" (McConnell, 2010, p. 347). McConnell (2010) crafted a definition that acknowledges both the objective goal achievement and subjective value and belief contributions to policy success: "A policy is successful if it achieves the goals that proponents set out to achieve and attracts no criticism of any significance and/or support is virtually universal" (McConnell, 2010, p. 351).

Further, McConnell recognizes that success can also be subdivided into policy, process, and program success, and then again along a grey spectrum of success including resilient success (shortfalls do not undermine core achievements), conflicted success (significant modifications were needed), and precarious success (on the edges of failure). Puzzlingly, striving for success in one realm can mean sacrificing, intentionally or by lack of prudence, success in another. For example, well-run programs (program success) can backfire on political desires (political

success). For example, the European Union's Common Agricultural Policy to support farmers and improve agricultural output was so successful by the mid-1980s in achieving the aim of self-sufficiency that it produced the notorious "butter mountains" and "wine lakes" (McConnell, 2010). That is to say that even with stakeholder support of policies, there is potential for varying degrees of policy "failure" during the different stages of policy development. This intertwining of success and failure is a constant complication of policymaking.

Policies Surrounding Nutrition Incentive Programs

Policy plays a role in nutrition incentive programs, namely in their funding and the creation of programs that support the incentive delivery. Various nutrition incentive programs, including produce prescription programs, have been affected by policies. Some of these policies are discussed here.

Policies through Local, State, and Federal Government

The most notable policy regarding nutrition incentives is the FINI grant, established by the 2014 Farm Bill and renamed in 2018 to GusNIP (National Institute of Food and Agriculture, n.d.). Wholesome Wave received funding from the FINI grant in 2015 ($3.77 million) and in 2016 ($499,720) (Food and Nutrition Service, n.d.-a). Wholesome Wave Georgia was a 2018 recipient ($442,134) (Food and Nutrition Service, n.d.-a). Most FINI grant programs offer a $1 incentive to spend on produce at a farmers market for every $1 in SNAP a shopper spends (Farmers Market Coalition, 2017). During FINI's first year, 13 projects were funded to conduct produce incentive programs at farmers markets in 27 states and the District of Columbia. Incentives were offered to SNAP shoppers at almost one in eight of every farmers market in the United States (Farmers Market Coalition, 2017). The FINI grant has improved access to food insecure individuals and stimulated at least $14.3 million in economic activity for participating

rural economies (Farmers Market Coalition, 2017). In 2018, FINI was renamed GusNIP and was allotted $250 million over the following five years ("Agriculture Improvement Act of 2018," 2018).

The 2018 Farm Bill also included a Produce Prescription Program in the likeness of FVRx® under GusNIP. Up to $25 million of GusNIP's funding will be set aside for Produce Prescription Programs. The funding will provide federal grants to non-profit organizations or a state or local government entity partnered with a healthcare provider, such as a hospital or federally-qualified health center ("Agriculture Improvement Act of 2018," 2018). The goal of the grants and subsequent programs are to evaluate the impact of a produce prescription program on 1) The improved dietary health 2) The reduction of individual and household food insecurity, and 3) The reduction in health care use and associated costs. The priority population is similar to those of FVRx®: individuals with a low-income that suffer from, or are at risk of developing, a diet-related disease. Participants will be prescribed fresh fruits and vegetables and may receive financial or non-financial incentives to purchase the produce. Nutrition education resources and additional accessible locations for members to procure fresh produce may also be provided ("Agriculture Improvement Act of 2018," 2018).

The 2018 Farm Bill will allow produce prescription programs to apply for grants through the U.S. Department of Health and Human Services for program funding. A Wholesome Wave toolkit (Wholesome Wave, 2016) suggests other avenues of funding, including resources from community economic development and redevelopment agencies and city and state departments of health. Other resources listed were the USDA's Community Foods Project, the CDC's Racial and Ethnic Approaches to Community Health (REACH) program and Community Transformation Grant Program, the Department of Health and Human Services' National

Institutes of Health's RO1 or R21 Grants, and Office of Community Services' Healthy Food Financing Initiative (Wholesome Wave, 2016).

Efforts have even begun at the state level. In 2018, Harvard Law School began exploring a Food is Medicine State Plan for Massachusetts (The Center for Health Law & Policy Innovation, 2019). The school assessed the need for and access to "Food is Medicine interventions" across the state, including prescriptions for CSAs or produce. The final report included strategies that organizations and state agencies in Massachusetts can use to improve access to Food is Medicine services.

Policies through Health Insurance Entities

While the Farm Bill funding represents a huge step for the future of produce prescription programs, there have been multiple isolated attempts to use nutrition incentive programs to achieve better health outcomes in both the public and private sectors, particularly among health insurance providers. Nutrition incentives can be mutually beneficial with decreased healthcare costs for health insurance companies, through improved diet quality and decreased food insecurity, and improved health status for individuals. Among a broad range of SES characteristics, one large population-based study found that food insecurity among 55,734 Ontario adults to be the most associated with becoming a high-cost healthcare user (Fitzpatrick et al., 2015). This meant that they ranked in the top 5% according to total annual healthcare spending. Those experiencing food insecurity were 46% more likely to become a high cost user within five years compared to individuals from food-secure households (Fitzpatrick et al., 2015).

For public health insurance, Section 4108 of the Affordable Care Act mandated the creation of the Medicaid Incentives for Prevention of Chronic Diseases (MIPCD) program ("Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation

Act," 2010). Between 2011 and 2015, ten States were awarded MICPD grants to implement chronic disease prevention approaches using incentives with the hopes of reducing the financial burden of chronic diseases on Medicaid (Hoerger et al., 2017). The final report for the MICPD program found that while program participants used significantly more of a preventive service if they received a financial incentive, there were few statistically significant changes in total, inpatient, or emergency department Medicaid expenditures associated with receiving incentives (Hoerger et al., 2017). While only one of the ten states provided incentives for produce, we can learn about implementation challenges and successes of delivering incentives through Medicaid from the MICPD model. The report concluded that changing patterns of healthcare often takes time to achieve, so five-year MIPCD programs may not necessarily have an immediate impact on healthcare expenditures. However, there was evidence that some of the states were trending towards reductions in Medicaid expenditures and healthcare use. Whether those trends would result in discernable savings in the long-run is unknown (Hoerger et al., 2017).

With MICPD complete, Medicaid programs have another route they can go through to offer their beneficiaries incentives for adopting healthier lifestyles. States can alter or enhance the coverage Medicaid provides to certain populations by applying for a State Amendment Plan (SPA) or a Section 1115 Demonstration Waiver (Downer et al., 2015). An SPA can propose permanent changes to any aspect of a Medicaid program with no cost or budget requirement (National Center for Healthy Housing, n.d.). Waivers on the other hand “waive” certain federal Medicaid requirements for a specified time and must be cost effective or cost neutral (National Center for Healthy Housing, n.d.), meaning that expenditures will not be more than federal spending without the demonstration (Centers for Medicare and Medicaid Services, n.d.) . Proposing the delivery of nutrition incentives would be fitting under the “Healthy Behavior

Incentive" category of the Section 1115 Demonstration waiver. The goal of Section 1115 demonstration waiver is to "give states additional flexibility to design and improve their programs" (Centers for Medicare and Medicaid Services, n.d.) by allowing states to create innovative demonstration projects that "often expand Medicaid coverage to new populations or provide services not typically covered by Medicaid" (Blumenthal et al., 2013). Section 1115 waivers are often approved for a five-year period and can be extended, typically for three years (Centers for Medicare and Medicaid Services, n.d.). Previously, Medicaid programs have used healthy behavior incentives to encourage beneficiaries to engage in health-promoting activities such as exercise, smoking cessation, disease prevention, and health screenings (Crawford & Onstott, 2014). Examples of incentives include $15-$25 credits for targeted healthy behaviors and a $100 voucher that could be spent on a gym membership or nutrition counseling (Crawford & Onstott, 2014). Enrollment in the past tended to be low and success was mixed (Blumenthal et al., 2013; Crawford & Onstott, 2014). Some of the states that participated in MIPCD programs utilized the 1115 section demonstration to sustain some of the program components (Hoerger et al., 2017).

In 2018, the Centers for Medicare & Medicaid Services (CMS) expanded how it defines the "primarily health-related" benefits that insurers are allowed to include in their Medicare Advantage policies (Jaffe, 2018). Medicare Advantage is a privately-run alternative to the traditional Medicare program that patients can opt into. It served 20 million of the 61 million people enrolled in Medicare in 2017. Under the new definition, CMS will allow supplemental benefits if they "compensate for physical impairments, diminish the impact of injuries or health conditions, and/or reduce avoidable emergency room utilization" (Centers for Medicare and Medicaid Services, 2018a). Benefits may vary by plan and must be approved by CMS (Jaffe,

2018). Given the impact of diet quality on health, nutrition incentives could be considered a relevant supplementary benefit under the "impact of health conditions" clause of the new guidelines.

Private health insurance companies have also implemented nutrition incentives for their beneficiaries. South Africa's largest private health insurance company, Discovery, created a nationwide health promotion program called "HealthyFood" in 2009 with up to a 25% cash back on healthy food purchases (An et al., 2013). HealthyFood was associated with more consumption of fruit, vegetables, and whole-grain foods, and less consumption of unhealthy foods like those high in sugar and salt, but the incentive was not associated with lower BMI or obesity. United States based Humana, a Medicare Advantage healthcare organization, originally partnered with Discovery for its own HealthyFood program offered through their behavioral economics-based healthcare rewards program, Go365 (Humana, 2018). Humana members with the Healthy Foods Card as part of their plan receive a card loaded with $25 or $50 a month to spend like a credit card on approved healthy items at thousands of stores, including Walmart, Walgreens, and Family Dollar (Humana, 2020). The goal of the program is to overcome financial barriers that may limit members' access to an adequate food supply.

In 2014, New England insurance provider Harvard Pilgrim Health Care introduced EatRight Rewards to their employer customers in Connecticut, Massachusetts, Maine, and New Hampshire (NutriSavings, 2014c). The initiative was geared towards lowering health claims by encouraging healthy food choices. The rewards system was implemented by employee wellness vendor, NutriSavings. Partnering with large supermarket chains, participants' grocery purchases were tracked through Eat Right Rewards loyalty cards. A nutritionist-developed 100-point healthiness scale was used to calculate cash rewards for healthier purchases. Foods high in fiber,

protein, vitamins and minerals score high on the scale, while foods high in added saturated fat, sugar, and sodium scored low. Participants received up to $20 a month in cash rewards for buying healthy foods at participating grocery stores: $10 for making at least one shopping trip a month with their card, and another $10 for reaching an average score of 60 points or higher for purchasing healthy foods. Rewards are deposited into employee's savings or PayPal account. The program also utilized a mobile app that provided healthy recipes, practical tips, and nutritional scores on more than 100,000 products (NutriSavings, 2014a). When Harvard Pilgrim launched the pilot EatRight Rewards program in April of 2014, one third of its employees chose to participate, 65% of which scored high enough to earn the cash reward (NutriSavings, 2014a). MaineHealth also implemented NutriSavings for its employees and their families in the same year (2014b). Unfortunately, there is minimal information regarding the outcomes of these programs or whether they are still offered. While the NutriSavings interventions did not prioritize populations with a low-income and diet-related diseases, they show that large-scale nutrition incentives are can be feasibly delivered through private health insurance companies.

Delivering nutrition incentives through public and private health insurance companies each have their own benefits and drawbacks. Expanding incentives through private health insurance companies may relieve tax dollars and government intervention from the equation, sparing the incentives from the negative political commentary around federally-funded entitlement programs (Ubaldi, 2018; Weixel, 2017). However, individuals with private health insurance are less likely to be the prioritized population– those with a low-income– that the incentives are meant to serve (Barnett & Berchick, 2017). Utilizing public health insurance options like Medicare and Medicaid may reach populations with a low-income nationwide, but as the programs are state and federally-funded (Center on Budget and Policy Priorities, 2016;

Centers for Medicare and Medicaid Services, n.d.-b), public costs may increase to support the incentives. It also still leaves the 12.2% of Americans that are uninsured without access to the produce prescriptions (Auter, 2018). Comprehensive public and private solutions to increasing access to fruits and vegetables for populations with a low-income need to be sought.

Policies through Healthcare Systems

The first hospital-based therapeutic food pantry in the country was the Preventive Food Pantry, housed in the basement of Boston Medical Center (Boston Medical Center, n.d.). Since its doors opened in 2001, over one million patients with conditions ranging from HIV/AIDS to heart disease have been served to promote physical health and prevent future ailments. Families visit the pantry a maximum of twice a month and receive three to four days of food, including fresh fruits and vegetables, for their household. The pantry staff members are fluent in four languages to better assist refugee and immigrant patients. The clinic also recently opened a teaching kitchen with cooking classes prioritizing specific health conditions, such as diabetes (Snook, 2016). However, health outcomes are difficult to track due to the limited amount of food received a month.

Pennsylvania-based Geisinger Health System opened their Fresh Food Farmacy in 2016 with the aim to optimize the treatment and management of type 2 diabetes and food insecurity (Feinberg et al., 2017). Patients who are identified as having HbA1C levels greater than 8 and as experiencing food insecurity are given a "prescription" or referral by their primary care physician for the Fresh Food Farmacy (Feinberg et al., 2017). Once enrolled, patients receive free food, including fresh fruits and vegetables, onsite at a clinic; 15 hours of diabetes education; cooking tools; and recipes. Each week, patients receive enough food to prepare healthy and nutritious meals for their whole family, twice a day for five days. In 2017, the Fresh Food

Farmacy was serving more than 80 patients and their families, for a total of about 250 people (Feinberg et al., 2017). The program is funded through grants (40%); in-kind reciprocal contributions with Geisinger Health Plan, the health insurance company of Geisinger (30%); and private donations (30%). Before the Farmacy program, participants' care cost Geisinger $8,000 to $12,000 average per person per month. After the Farmacy program, payer-side claims data shows that payer costs have decreased by two-thirds on average across the program. However, it is noted that the participants are a particularly complex set of patients. Participants' HbA1c levels have dropped of about three points for many (Aubrey, 2017). According to David Feinberg, the president and CEO of Geisinger Health System, the savings with this change are significant— about $24,000 in healthcare savings per patient, or $8,000 per 1 point decrease in HbA1C (Aubrey, 2017). Significant improvements in patients' cholesterol, blood sugars, and triglycerides have also occurred (Feinberg et al., 2017). Program costs average about $2,200 per patient per year without taking into consideration clinical gains.

Two food pharmacies were established by ProMedica (Sensenig & Miller, 2016), a nonprofit health system that serves 28 counties in northwest Ohio and southern Michigan (Epic, 2016). Their physicians "prescribe" patients identified as food insecure to visit one of their food pharmacies once a month for up to six months, receiving two to three days' worth of food per visit (Sares, 2015). After six months, patients can return to their physician for another referral. Patients also receive healthy food, recipes, and nutrition coaching. Since opening in April 2015, more than 2,000 households have been assisted. Of the 4,000 Medicaid patients with food pharmacy referrals, there has been a 3% reduction in emergency department use, 53% reduction in readmission rates, and 4% increase in primary care visit rates (Petee & Cihon, 2017).

Other suggested routes for healthcare providers to fund nutrition incentives include through Community Benefits Programs (Downer et al., 2015; Wholesome Wave, 2016) and Accountable Care Organizations (ACOs) (Downer et al., 2015). Section 501(c)(3) of the Federal Internal Revenue Code established in the Affordable Care Act mandates that non-profit hospitals and healthcare systems must meet certain requirements to maintain a tax-exempt or charitable status (United States Congress, 2010). One requirement is to conduct a community health needs assessment. Upon completion of the assessment, the organizations must report "how the organization is addressing the needs identified in each community health needs assessment" every three years (United States Congress, 2010). IRS regulations state that hospitals and healthcare systems may consider "not only the need to address financial and other barriers to care but also the need to prevent illness, to ensure adequate nutrition, or to address social, behavioral, and environmental factors that influence health in the community" (Internal Revenue Service, 2014). As about 51% of America's hospitals are non-profit (American Hospital Association, 2018), the Community Benefits Program could have a meaningful impact on food insecurity and diet-related diseases if hospitals chose to direct their efforts towards reducing the price of fruits and vegetables for community members.

ACOs offer another route to connecting prescription programs to healthcare providers. The Affordable Care Act created the Medicare Shared Savings Program under CMS, which encourages doctors, hospitals, and other healthcare providers to voluntarily come together to form an ACO and coordinate care for their Medicare patients, particularly the chronically ill (Centers for Medicare and Medicaid Services, 2020b). The goal of an ACO is to prevent the duplication of services, avoid medical errors, and save healthcare costs (Centers for Medicare and Medicaid Services, 2020a). ACOs are key to moving CMS's payment systems "away from

paying for volume and towards paying for value and outcomes, as ACOs are held accountable for the total cost of care… and quality outcomes for the assigned beneficiary patient population they serve" (Centers for Medicare and Medicaid Services, 2018d). Geisinger Health System is an example of an ACO. On the provider side, there are financial benefits for becoming an ACO and meeting quality and cost reduction measurements. An ACO that reduces costs while maintaining quality for patients will prompt Medicare to "share" a portion of the savings with the ACO. These shared savings can be distributed among the ACO primary care providers, specialists, and hospitals in the ACO or put towards infrastructure, as most programs in 2015 did (Schulz et al., 2015). Medicare ACOs have flexibility in how they use the shared savings though, as long as use is consistent with the ACO program mission to reduce cost and ensure quality care (Schulz et al., 2015). Fruit and vegetable prescriptions would be a desirable option for these discretionary funds, as produce prescriptions provided to patients may further reduce healthcare costs through improved diet quality. This could potentially lead to higher shared savings and help ACOs avoid the shared risk aspect of their agreement with CMS, which include the ACO paying the agency if Medicare expenditures are not reduced (known as shared losses) (Centers for Medicare and Medicaid Services, 2018c). Spending savings on a prescription program, if extended to the community, could also help non-profit hospitals and healthcare systems in the ACO meet their Community Benefits Program requirements ("Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act," 2010). There are 561 Shared Savings Program ACOs across 50 states providing care for 10.5 million beneficiaries in 2018 (Centers for Medicare and Medicaid Services, 2018b). Therefore, the reach of ACOs could have a meaningful impact if a produce prescription program was pursued.

There are limitations to these various ventures, however, namely in the availability of the incentives, low enrollment, and a lack of rigorous longitudinal evaluations. For the MICPD program, the low rate of incentive redemption suggested that there was a lack of understanding about the program among beneficiaries, or that the incentives were not significant enough to be considered worth redeeming (Blumenthal et al., 2013). For example, between 2006 and 2011, only 52% of the incentives set aside for a Medicaid incentive program in Florida were redeemed, and only 54% of those enrolled in the program redeemed credits (Blumenthal et al., 2013). Less than one percent of the incentives earned were for participating in a weight loss or smoking cessation program (Blumenthal et al., 2013). Further, these programs operate in silos and endure individual administrative complexities (Blumenthal et al., 2013) that could be streamlined for efficiency. The populations served through these incentive programs also only represent a share of those in America that could benefit. The opportunities and limitations discussed in this section highlight how policy has connected produce and healthcare in the past and can inform how produce prescription programs are designed and implemented to continue supporting improved food access, diet quality, and health for vulnerable Americans.

Qualitative Methodology and Methods

Thematic Analysis

Thematic analysis is a broad analytic method for identifying, analyzing, and reporting patterns—or themes— within data (Braun & Clarke, 2006). While some have argued that thematic analysis is a method within other analytic traditions, Braun and Clark (2006) counter that thematic analysis is a method in its own right. Thematic analysis does not need to "subscribe to the theoretical commitments" (Braun & Clarke, 2006, p. 81) of the better branded grounded theory if the purpose of analysis is not to develop a theory grounded in the data. In fact, they

argue, thematic analysis should be viewed as the foundational method for qualitative research. It should be the first method new researchers learn (Braun & Clarke, 2006), as "thematizing meanings" (Holloway & Todres, 2003, p. 347) informs many other qualitative analysis methods.

A benefit of thematic analysis is its flexibility. Thematic analysis is not tied to one particular theoretical or epistemological position and can be applied across various qualitative approaches (Braun & Clarke, 2006). This flexibility has led to wide application and ambiguity around how exactly to conduct thematic analysis. Therefore, Braun and Clark (2006) sought to clearly outline how to conduct thematic analysis in a way that is methodologically sound while retaining the flexibility of the method.

First, a theme must be defined. A *theme* represents an important patterned response or meaning within the data (Braun & Clarke, 2006). While a *category* is a word or phrase that explicitly describes a segment of the data, a theme is a phrase or sentence describing more "subtle and tacit processes" (Rossman & Rallis, 2003, p. 282). Saldaña (2015) clarifies that themes are "an outcome of coding, categorization, and analytic reflection, not something that is, in itself, coded" (p. 13). Figure 1.1 in Saldaña's *The Coding Manual for Qualitative Researchers* shows how codes are grouped into categories and subcategories which all inform the overarching themes and if desired, theory (Saldaña, 2015, p. 12). As the researcher moves to the right of the figure from codes towards themes, the analysis goes from real to abstract, from particular to general. Visually put, themes are "a unifying 'red thread' running through several categories that brings meaning to a recurrent topic or experiences and its various manifestations" (Graneheim et al., 2017, p. 32).

There are no clear rules for what counts as a theme—no threshold for how many people need to mention a phenomena or at what length it must be mentioned (Braun & Clarke, 2006). It

is up to the researcher to determine the themes, with the one guiding star being that the theme capture something important to the research question. Theme identification and selection is an active process conducted by the researcher and thus contradicts the description of themes being "discovered" or "emerging" from the data (Braun & Clarke, 2006, p. 80) "like Venus on the half shell" (Ely et al., 1997, p. 208). Ely et al. (1997) contends that "if themes 'reside' anywhere, they reside in our heads from our thinking about our data and creating links as we understand them" (p. 208).

When reporting thematic analysis in the methods section, a researcher must be sure to acknowledge a number of actions for a transparent understanding of how the analysis was conducted. The purpose of thematic analysis must be acknowledged (Braun & Clarke, 2006). Was the goal of analysis a rich description of the data set or a detailed account of one particular aspect? The approach used to identify the themes should also be mentioned. Were themes data-driven and coded inductively, meaning that the data was coded without trying to fit it into pre-existing frameworks or preconceptions? Or were the themes coded deductively, where coding was driven by testing existing theories about the topic of interest against the data (Graneheim et al., 2017) or by themes previously identified in the literature (Braun & Clarke, 2006)? Both approaches have their limitations. Inductive analysis can produce surface level descriptions and paraphrased summaries that do not add any new insight (Graneheim et al., 2017). On the other hand, researchers conducting deductive analysis may find themselves deciding how to treat "left-over data" (Graneheim et al., 2017, p. 30) that does not fit the selected theory.

The researcher should also explain whether themes were identified at a semantic (explicit) level or at a latent (interpretative) level (Boyatzis, 1998; Braun & Clarke, 2006). Thematic analysis is typically approached largely or wholly from one level (Braun & Clarke,

2006). A researcher using a semantic approach would identify themes based on the surface level of the data. Meanings beyond what was explicitly said or written are not explored. The researcher then interprets the surface level meanings and explains them in relation to their broader implications within the literature. Latent level thematic analysis codes beyond the surface content of the data. Researchers identify the underlying ideas or assumptions that are shaping the semantic content of the data. Essentially:

> If we imagine our data three-dimensionally as an uneven blob of jelly, the semantic approach would seek to describe the surface of the jelly, its form and meaning, while the latent approach would seek to identify the features that gave it that particular form and meaning. (Braun & Clarke, 2006, p. 84)

With their approach to thematic analysis outlined, the researcher can then conduct thematic analysis. A number of practical guides to coding and thematic analysis exist (Braun & Clarke, 2006; Linneberg & Korsgaard, 2019; Saldaña, 2015). Braun and Clark's (2006) six-phase process for thematic analysis is summarized and expanded upon here (p. 87):

1. Familiarize yourself with the data: Transcribe, read, and re-read the data.
2. Generate general codes: Code interesting data in a systematic fashion across the data set.
3. Search for themes: Organize codes according to patterns in the data, or themes. Remember that the researcher determines what counts as a theme.
4. Review themes: Check if the themes fit both the coded extracts and the data set as a whole. Generate a thematic "map" of the analysis. During this phase, some potential themes won't have enough data to support them or the data will be too diverse to "fit" under a representative theme. Themes might need to be collapsed into each other while

others might need to be broken down into separate themes. There should not be too much overlap between the themes.

5. Define and name themes: Refine the specifics of each theme (e.g., name, definition) and the overall story that the analysis is going to tell. Researchers must not just paraphrase the content of the data extracts presented, but identify what is of interest about them and why. Sub-themes, or themes-within-a-theme, may become evident during this stage.
6. Produce the report: The last phase is the final opportunity for analysis. Select extract examples to support analytic claims and relate them to the research question and the literature.

Analytic claims need to go beyond the surface of the data. Even with semantic level analysis, the researcher must interpret the broader meaning or significance of themes (Braun & Clarke, 2006). Researchers near the end of analysis should ask themselves: "'What does this theme mean?' 'What are the assumptions underpinning it?' 'What are the implications of this theme?' 'What conditions are likely to have given rise to it?'" (Braun & Clarke, 2006, p. 94). Frith and Gleeson's (2004) thematic analysis of how undergraduate men's feelings about their bodies' influence their clothing practices is a great example of analysis that goes beyond the surface level (Frith & Gleeson, 2004). Their analysis of questionnaire responses produced four themes that did not just paraphrase the data, but interpreted it in both the results and discussion section to explain its broader significance. For instance, under the theme "Men should not care how they look," the authors interpreted participants' responses to stem from male gender stereotypes which suggest men should not be interested in shopping or their appearance (Frith & Gleeson, 2004). Their analytic claim brought a deeper understanding about male clothing practices that went beyond the semantic content of the data.

To check for sound thematic analysis, Braun and Clark (2006) created a 15-point checklist of criteria. Criteria include, for example, that "themes are internally coherent, consistent, and distinctive" and that "the researcher is positioned as active in the research process; themes do not just emerge" (Braun & Clarke, 2006, p. 96). Researchers conducting thematic analysis should refer to this checklist to ensure the rigor of their analytic process.

Thematic analysis offers a number of benefits to researchers. The flexibility of the method allows researchers from various fields to implement it (Braun & Clarke, 2006). Thematic analysis is also a relatively easy and quick method to learn, it can be used to compare cases across a data set, and it can generate unexpected insights (Braun & Clarke, 2006). However, given its broad use and murky boundaries, researchers conducting thematic analysis can experience a number of pitfalls. As mentioned above, researchers may only paraphrase the data rather than trudging on to make an analytic comment about what the data actually means. Themes may have too much overlap with one another, or the themes may not be internally coherent. Analytic claims may not be supported by, or even contradict, the data extracts presented. To increase the credibility of the researcher's claims, alternative explanations of the themes can be explored and evaluated against the findings (Merriam & Tisdell, 2015; Patton, 1999). However, a data set is never without contradiction (Braun & Clarke, 2006). Inconsistencies in the data do not need to be "smooth[ed] out" (Braun & Clarke, 2006, p. 89). Braun and Clark (2006) state that instances that do not align with the overarching story in the analysis should be preserved, though exactly how to do this was not discussed. Perhaps one could increase transparency by mentioning in the results or discussion section that there were additional data that did not fit the themes. Finally, another pitfall of the method is for the theoretical assumptions underpinning the thematic analysis to go unmentioned in the final report

(Braun & Clarke, 2006). Researchers must explain how analysis was undertaken and for what purpose.

Similarly, the researcher's theoretical assumptions must be compatible with the study's method and analytic claims. If the research method and analytic claims are not consistent with the researcher's epistemological assumptions and theoretical approach, the findings of the study will be limited and superficial (Gephart Jr & Rynes, 2004) with questioned validity (Avenier & Thomas, 2015). For this dissertation, a constructivist epistemology with an interpretive approach was used. A constructivist paradigm assumes that knowledge emerges through the individuals' interaction with the environment (Crotty, 1998). Thematic analysis is compatible with a constructivist paradigm in that it can examine "the ways in which events, realities, meanings, experiences and so on are the effects of a range of discourses operating within society" through themes (Braun & Clarke, 2006, p. 81). The constructivist epistemology informed the choice of an interpretivist approach. Interpretivism stems from a phenomenological base which specifies that the individual and the world are "inextricably related" (Sandberg, 2005, p. 43) through lived experience in the world. Interpretivists assume that knowledge is constituted through lived experience, the product of constant interaction with the world rather than reality being an objective truth outside the human mind (Sandberg, 2005). In Chapter 5, thematic analysis was used to achieve the interpretivist tradition's goals to describe meanings and understanding of the participant's PPP experience (Gephart Jr & Rynes, 2004). Thus, the current studies are theoretically and methodologically consistent.

Narrative Analysis

> Narrative is present in myth, legend, fable, tale, novella, epic, history, tragedy, drama, comedy, mime, painting...stained glass windows, cinema, comics, news item, and

> conversation. Moreover, under this almost infinite diversity of forms, narrative is present in every age, in every place, in every society; it begins with the very history of mankind (sic) and there nowhere is nor has been a people without narrative...it is simply there, like life itself. (Barthes & Duisit, 1975, p. 237)

In addition to the thematic analysis, the current study also employed the analytic method of narrative analysis. To tell and understand stories is a fundamental part of the human experience. The study of narrative is the study "of the ways humans experience the world" (Connelly & Clandinin, 1990, p. 2).

Narrative inquiry is a type of qualitative research methodology in which stories are used to understand human action (Polkinghorne, 1995). Narrative research has been traced back to the 1920s and 1930s when sociologists in the Chicago School took interest in personal life records, and anthropologists sought to understand the life histories of people in other cultures (Butler-Kisber, 2010). In the 1940s and 1950s, the ethics of studying others were questioned while quantitative methods overshadowed narrative inquiry. A resurgence occurred during the liberation movements in the 1960s and 1970s, when narrative was used to amplify marginalized voices and question power, authority, and voice within research. Now, narrative inquiry spans multiple approaches across various fields in which the personal narrative holds insight into the human experience (Butler-Kisber, 2010).

The term *narrative* has held a variety of meanings for qualitative researchers. Narrative can be prosaic text, or any text that consists of sentences connected into a coherent statement (Polkinghorne, 1995). In line with this definition, qualitative researchers have used *narrative* to describe the form of the data they have collected for analysis. Narrative can also have a narrower definition in which narrative refers to the story in a text (Connelly & Clandinin, 1990). In the

context of narrative inquiry, narrative refers to "a discourse form in which events and happenings are configured into a temporal unity by means of a plot." (Polkinghorne, 1995, p. 5).

A story is a type of narrative in which events and actions come together into an organized whole through a plot (Polkinghorne, 1995). A *plot* is a configuration of a story that links data elements as parts of an unfolding temporal development culminating in a conclusion. Stories are grounded in "the phenomenon of individual protagonists engaged in an ordered transformation from an initial situation to a terminal situation" (Polkinghorne, 1995, p. 7). There is a beginning, middle, and end with a progression over time.

Bruner (1986) proposed two irreducible modes of thought in which we know about the world: paradigmatic cognition and narrative cognition (Bruner, 1987). These two ways of knowing the world inform two different types of narrative inquiry: paradigmatic type and narrative type (Polkinghorne, 1995). Paradigmatic type narrative inquiry starts with stories as its data and analytic process yields typologies or categories across the data, producing knowledge of concepts. This type of narrative inquiry is also known as *analysis of narratives*. An example of this type of paradigmatic analysis is used in grounded theory (Glaser et al., 1968). The second type of narrative inquiry is narrative type narrative inquiry. For this type, the researcher starts with data other than stories (Polkinghorne, 1995). The body of data consists of descriptions of events or happenings found in sources like interviews, documents, artifacts, or observations (Butler-Kisber, 2010). Narrative analytic procedures are then employed to produce emplotted stories (e.g., biographies, case studies, histories), resulting in knowledge of particular situations. The process keeps the story intact instead of dissecting it. This type of narrative inquiry is called *narrative analysis* (Polkinghorne, 1995). The current dissertation employs narrative analysis and the remainder of this section will focus on this type of narrative inquiry.

In narrative analysis, descriptions of events and happenings are collected, synthesized, and configured in relation to one another in the advancement of a plot (Polkinghorne, 1995). Narrative analysis does not simply reproduce observations; rather, it connects data elements and arranges them into a coherent, interesting, and explanatory way (Du Preez, 1991). Stories are made of elements like character, point of view, temporal context, spatial context, and context of other people (Connelly & Clandinin, 1990).

There is no one way of conducting narrative analysis; however, Polkinghorne (1995) provides an outline of how to analytically develop a story from data. The process starts with going back and forth between the data until a plot emerges that connects the data elements. If major events described in the data clash with the emerging plot, then the plot must be adapted to better fit the data. Polkinghorne (1995) compares the process of developing a plot to the hermeneutic circle: "The creation of a text involves the to-and-fro movement from parts to whole that is involved in comprehending a finished text" (p. 16). Elements that contribute to the story's conclusion are included in the plot, while details that are not pertinent to its development, yet do not contradict the plot, are set aside. The process of keeping some story elements and obscuring others for the sake of the plot is called *narrative smoothing* (Spence, 1986). While narrative smoothing can cloak the messy, non-linear complexities of everyday life, it allows the researcher to create a final story that fits the data and brings significance that is not apparent in the raw data (Polkinghorne, 1995).

Dollard (1935) proposed seven criteria for judging a life history, one type of story (Dollard, 1935). According to the criteria, a story should address the following:

1. Cultural setting: Cultural context gives meaning to the events in the story and allows their contribution to the plot to be understood. To address the cultural context of a story is to

insert the values, social rules, meaning systems, and language of the culture in which the story was developed.

2. The protagonist's body: The protagonists' physical features should be included, such as their height, physique, or age so the reader can locate the protagonist spatially and temporally.
3. Other people: An explanation of how other people— parents, siblings, friends, antagonists—influence the protagonist's actions to develop the plot.
4. Protagonist's thought processes for decisions: The reader must understand the protagonist's meanings, motivations, and ways of seeing the world that lead to their actions and decisions that advance the plot. To do this, the researcher can illuminate the protagonist's inner struggles, emotional states, and values.
5. How history impacts now: Attention needs to be given to historical events that have impacted the protagonist and the plot being developed. For example, those who experienced the Great Depression are expected to bring that historical event with them to the present day.
6. Temporality: A story must be bounded by a time period. A story needs a beginning, middle, and end.
7. A meaningful plot: Finally, the story produced by the data should be plausible and understandable.

Butler-Kisber (2010) recounts yet another way to craft a narrative using the example of Linda Furlini's doctoral dissertation about living with chronic dementia from a caregiver's perspective. Furlini (2006) interviewed five individuals about their caregiving experience (Butler-Kisber, 2010; Furlini, 2005). The author approached analysis of the interview transcripts

from two angles: 1) a constant comparison angle, in which she coded and categorized the caregivers' experiences to produce themes, and 2) a narrative approach to construct and represent a holistic understanding of the stories (Butler-Kisber, 2010). The researcher then crafted short, compelling narratives around a core dilemma (Furlini, 2005).

Stories hold power in the way that they touch an emotional and irrefutably human piece of us. Lawmakers are not immune to this power, and stories can play an important role in impacting policy. Research shows that legislators' interests are impacted by party priorities but also by "real world" stories from their constituents (Brownson et al., 2018). Davidson (2017) urges that storytelling is a vital communications tool for "researchers seeking uptake of their evidence into policy" (Davidson, 2017, p. 4). Stories can lead to changes in attitudes, behavior, culture, and policy by playing a role in organizing (mobilizing people around an issue), advocating (as powerful persuasive tools), and educating (helping people better understand an issue) (Davidson, 2017; Van De Carr, 2013). Policymakers want to hear from their constituents, as it informs them of how their decisions are impacting the people that they represent (Grounded Solutions Network, 2015). The studies presented here will utilize narrative analysis as a mechanism for sharing with legislators the personal stories of participants who are directly impacted by PPPs in order to inform health and agriculture policy.

Despite these benefits, narrative analysis is not without critique. Connelly and Clandinin (1990) explain the danger of the "the Hollywood plot," the plot where everything works out well in the end (Connelly & Clandinin, 1990). The phenomenon recalls what Spence (1986) referred to as narrative smoothing, in which parts of the narrative may be censured, distilled, or shined for narrative purposes (Spence, 1986). The researcher must judicially balance the smoothing contained in the plot with what is obscured in the smoothing (Connelly & Clandinin, 1990).

Acknowledging narrative smoothing can point out to the reader that not all elements have been presented for the sake of the narrative.

Another critique of narrative analysis also revolves around obfuscation, this time of the researcher's role in the narrative. A researcher helps guide the narrative during the interview by asking participants questions that elicit story elements (Rhodes, 2000). The researcher's fingerprints also coat the final story after choosing what data elements to include, how to string them together in a plot, and by presenting the overall message of the story that the reader is to walk away with. Despite the role of the researcher, a finished story can come across as if it "came out of a vessel, uncontaminated by human interaction" (Riessman, 2008, p. 58). The story can appear to have come from the narrator themselves with the co-construction process between participant and researcher erased (Riessman, 2008, p. 58). Rhodes (2000) calls the practice of a researcher writing on behalf of their participants *ghostwriting*. He argues that researchers must reflexively acknowledge their position as a ghostwriter in their methodological explanation. The end result would be that the researcher is "not apparent in the text, but the ghostwriting leaves an image of the ghost" (Rhodes, 2000, p. 523). Thus, the co-construction between the researcher and the participant is clear.

Narrative analysis aligns with the researcher's epistemological and theoretical perspectives. Constructivism, interpretivism, and narrative analysis all emphasize the individual's experience. The constructivist belief that knowledge emerges through the individuals' interaction with the environment (Crotty, 1998) is evident in narrative analysis' emphasis on context. In a story, elements of the environment like place, setting, and other characters interact with the protagonist to ground or progress the story. As mentioned above, interpretivism assumes that the individual and the world are "inextricably related" through lived

experience in the world (Sandberg, 2005, p. 43). Interpretivists assume that knowledge is constituted through lived experience, the product of constant interaction with the world we live in rather than reality being an objective truth outside the human mind. Narrative analysis aligns with this assumption by not only focusing on the individual's experiences but also on the individual's experience "*in the world*-- the social, cultural, and institutional narratives within with the individual's experiences are constituted, shaped, expressed, and enacted" (Clandinin & Rosiek, pp. 6–7). Clandinin and Rosiek (2007) argue that narrative is an ideal mode of inquiry because it "illustrates the selectivity of experience, uses the narrative mode to represent the iterative and continuous aspects of experience, and emphasizes the social and contextual aspects of understanding"(Clandinin & Rosiek, pp. 39–2). In sum, the common threads of 1) emphasizing the individual experience and 2) recognizing the individual experience as the result of interacting with one's environment, flow throughout the constructivist epistemology, interpretivist paradigm, and narrative analysis methodology. These shared assumptions support the choice of narrative inquiry methodology.

Rationale, Study Purpose, and Specific Aims

Rationale

PPPs have grown in numbers across the country in the past decade, with little standardization across programs. Given the novelty and variety of programs, there is a lack of insight into the current landscape of PPP design and implementation in the United States. An overview of what program models exist are scarce, with a single literature review of 19 PPPs (Swartz, 2018). The small sample size of the review and the limited programmatic information in published PPP articles underscore the need for insight into U.S. PPP design and implementation. Key information required to start or refine a PPP is needed, such as program components to

include, budget costs, required labor, evaluation measures, outcomes, funding sources, and program sustainability. There is also a dearth of knowledge about where these programs are located, who "owns" or operates them, who they serve, and what their goals are. The reasons why programs expire or stop operating, have not been explored. Further, research is needed to determine the facilitators that make it easier for PPPs to produce positive outcomes, such as retaining participants or improving health measures, and the barriers that PPPs face. Sharing these strategies and existing barriers can strengthen future PPP design and implementation.

Finally, few studies have explored experiences in PPPs from the perspective of the participants themselves (Cahill et al., 2020; Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019; Slagel, 2020). The qualitative studies that have been conducted to understand the participant experience have found PPPs to positively impacted participants lives (Cahill et al., 2020; Slagel, 2020), including an increase in their produce consumption (Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019) and exposure to positive social interactions (Cahill et al., 2020; Schlosser, Smith, et al., 2019; Slagel, 2020). Participants also pragmatically saw their access to market produce as a temporary luxury (Schlosser, Smith, et al., 2019). Economic insecurity influenced their program participation and limited their ability to maintain behavior change after the program ended (Schlosser, Smith, et al., 2019). Still, more research is needed to better understand the holistic impact of PPPs on participants and their families within the context of their lives.

Study Purpose

The purposes of this dissertation were to better understand how U.S. PPPs are designed and implemented, what strategies help or hinder program success, and what the experience of participating in a PPP is like for participants and their families.

Specific Aims

The specific aims of this dissertation were to:

1. Determine what current models of PPPs exist across the country
2. Determine what resources are required to design, implement, evaluate, and sustain a PPP
3. Determine the facilitators and barriers affecting positive outcomes of PPPs
4. Understand the PPP experience of participants and their families from the perspectives of the participants themselves.

CHAPTER 3

CURRENT LANDSCAPE OF PRODUCE PRESCRIPTION PROGRAMS IN THE UNITED STATES: 2020 NATIONAL PRODUCE PRESCRIPTION PROGRAM STUDY[1]

[1] Newman, T., & Lee, J.S. To be submitted as a research article to the American Journal of Public Health.

Abstract

Background: Little is known about how produce prescription programs (PPPs), in which a healthcare provider "prescribes" a subsidy for produce, design, implement, or evaluate their programming, nor what resources are needed to sustain a program. This study sought to understand the current landscape of PPPs in the United States.

Methods: This mixed-methods study employed a national online survey and individual, semi-structured phone interviews with 26 PPPs in the United States. Twenty three existing PPPs completed an online survey about their program's general characteristics, components, budget, labor, evaluation, outcomes, funding, and sustainability. Twenty (87%) program providers were then interviewed by phone regarding program operations. Four PPPs no longer in operation completed a survey regarding sustainability barriers. Descriptive statistics were conducted for survey data and interview transcripts were coded.

Findings: Various PPP models operate across the country, and no one model appears to work best. Existing programs usually included three main arms: a produce prescription (100%), a healthcare visit (87%), and nutrition education (82.6%). Programs were funded by multiple funding streams, most commonly by foundation grants (52.2%). Programs have clinical and non-clinical positive impacts on participants, though the need in communities was higher than what most programs could currently meet. The median total programming cost was $33,500 (IQR = $12,021–$156,400), a median of $387 per participant (IQR = $211–$790). Lack of funding was the most common barrier to sustain programming.

Conclusion: The novel insights into the characteristics and operations of PPPs provided by the study can serve as a practical blueprint for new and existing programs.

Keywords: National survey, produce prescription program, food access, mixed methods, program design

Introduction

Individuals with a low socioeconomic status (SES) are at an increased risk for certain diet-related diseases (Clark et al., 2009; Kivimäki et al., 2007; Leng et al., 2015; Shaw et al., 2016) and food insecurity (Coleman-Jensen et al., 2019; Seligman et al., 2009). Low SES groups are also less likely to consume fruits and vegetables (Giskes et al., 2010), which may protect against some diet-related diseases (Aune et al., 2017; Boeing et al., 2012; Utsugi et al., 2008).

Produce prescription programs (PPPs) are one of a myriad of strategies to address these complex disparities. The programs involve healthcare providers "prescribing" a subsidy for produce to patients who often have a low-income or who are experiencing food insecurity and/or a diet-related disease. A nutrition education and healthcare visit component tend to supplement the prescription. PPPs have been shown to significantly increase produce consumption (Cook et al., 2019; Jones et al., 2020; Marcinkevage et al., 2019; Trapl et al., 2018), improve diet quality (Berkowitz, O'Neill, et al., 2019), reduce food insecurity (Berkowitz, O'Neill, et al., 2019; Ridberg et al., 2019a), and modestly improve conditions of diet-related disease (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Cavanagh et al., 2017; Jones et al., 2020; Seligman et al., 2015; York et al., 2020) in underserved populations.

The earliest known model of a PPP started in 2001 when Boston Medial Center opened the first hospital-based therapeutic food pantry in the country (Boston Medical Center, n.d.). PPPs have since increased in number across the United States with varying program design and implementation models. An overview of what program models exist are scarce, with a single literature review of 19 PPPs highlighting a variety of program components (Swartz, 2018). The small sample size of the review and the limited programmatic information in published PPP articles underscore the need for insight into U.S. PPP design and implementation. Key

information required to start or refine a PPP is needed, such as program components to include, budget costs, required labor, evaluation measures, outcomes, funding sources, and program sustainability. There is also a dearth of knowledge about where these programs are, who "owns" or operates them, who they serve, and what their goals are. Further, the reasons why programs expire or stop operating, have not been explored.

The purpose of the study was to better understand what current models of PPPs exist across the United States and what resources are required to design, implement, evaluate, and sustain a program. The study will not only provide a snapshot of the current PPP landscape, but it can provide a blueprint for programs to learn from based on what's already been done. The blueprint can inform communities that are interested in starting a PPP and do not know where to begin or those who are seeking alternative strategies in their existing programs. A better understanding of program budgets can also inform economic models that estimate the potential program impacts on healthcare costs and diet-related chronic diseases, which could influence nutrition and health policy.

Methods

Design

This mixed-methods study involved a national online Qualtrics survey and individual, semi-structured phone interviews with PPPs across the United States. Program providers first completed the online survey consisting of 29 initial questions and 36 potential follow-up questions regarding the following categories: general program characteristics, program components, budget, labor, evaluation, outcomes, funding, and sustainability. A shorter, eight-question survey with two potential follow-up questions was provided to programs no longer in operation to identify barriers faced in programming. Phone interviews were conducted after the

completion of the survey. Interviews served to clarify any questions about the survey and to understand how the program components discussed in the survey came together and flowed. Interviews were also an opportunity to discuss additional program aspects that were not captured by the survey. A case study was conducted to highlight programs in depth and within their context. Providers were asked to provide any supplemental program documents that would help the researcher better understand their programs, such as outcome reports or educational materials. Providers were also provided with the option to have their program details highlighted as a case study to showcase how a program functioned in its entirety or to remain anonymous. This study was exempt by the University of Georgia Institutional Review Board.

Sample and Recruitment

With no existing list of PPPs to reference, the authors developed the first known database of national PPPs based on the best available resources at the time. PPPs were identified through a thorough search for PPP-based peer-reviewed journal articles, program reports, news articles, and through snowball sampling between October 2019 and February 2020. Google and PubMed alerts provided real-time updates of any new PPP developments. All programs that could be identified were included in the database and recruited for the study. Program providers who were listed as the main coordinators, authors of published works, or as a spokesperson for the program were identified as the point of contact. If there was someone who could better provide details about their program, it was requested that they provide the researcher with that person's contact information to pass along the study opportunity.

Programs were considered eligible if they were an active or expired PPP, which met the following criteria: 1) The program must include a healthcare provider or be housed in a healthcare facility (e.g., clinic, hospital, mobile health clinic, etc.), 2) Participants must be

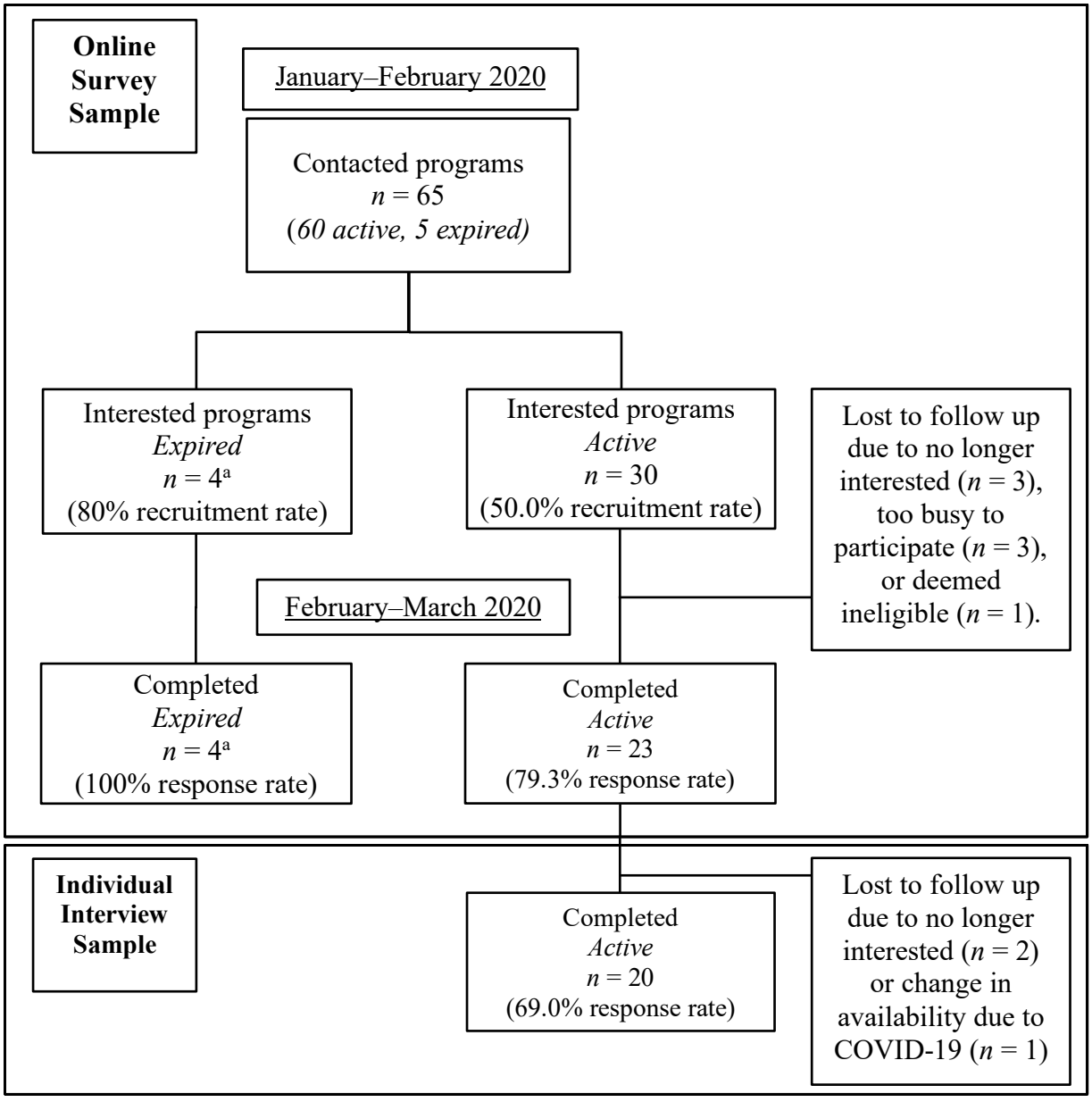
provided a prescription that subsidizes produce (e.g., coupon, vouchers, packaged produce, etc.), and 3) The prescription must be prescribed to address something specific to the individual (e.g., food insecurity, diet-related disease, low-income, etc.). A program was considered active if it offered programming in 2019 and expired if it was active in the past but was no longer in operation in 2019.

Program providers were contacted by email requesting their participation in the study from January 2020 to February 2020 (Figure 3.1). Sixty-five active programs were contacted (60 active and 5 expired). Of those, 30 active programs and four expired programs agreed to participate (50.0% and 80.0% recruitment rate, respectively). Six programs dropped out between agreeing to participate and completing the online survey due to no longer being interested in participating (n = 3) or being too busy (n = 3). One program was deemed ineligible because their 2019 programming was not tied to healthcare. One provider's organization had an active and an expired program, as they started a new program after one of their earlier programs ended, and completed the study requirements for both; this program was counted as both an active and expired program.

A total of 23 active programs completed the online survey and 20 completed the interview, for respective response rates of 79.3% and 69.0% (Figure 3.1). All four of the expired programs completed the survey (100% response rate).

Figure 3.1

Recruitment of Produce Prescription Program Study Sample



[a]One program provider oversaw a program that expired and a new active program and completed surveys for both.

Data Collection

Program providers were given three weeks to complete the survey. Consent was collected at the beginning of the survey. Since the survey covered various program components, providers were encouraged to collaborate with their team members to answer the questions. Providers also received a digital copy of the survey questions so they could gather information ahead of time. Questions included “I don’t know” and “Other”, with a text entry option for providers to offer an answer not already provided in the survey. Expired programs were identified by an early question asking if the program was still in operation. Providers that answered no were provided a different link to complete the expired program survey, which concluded their participation in the study.

When the survey was completed, the researcher reached out to the providers of active programs to schedule an interview, which lasted between 30 minutes and one hour. In a few cases, more than one provider of a program elected to join the interview. Interviews followed up on any missing or incomplete information in the survey and discussed how program components came together and flowed in real life. Following an iterative approach, additional questions about the geographic impact on programming and future program plans were added as areas of interest after initial interviews.

Phone calls were recorded with permission using the Rev Call Recorder App. Survey data was updated according to clarifications provided in the interview, such as additional eligibility requirements or corrections for budget amounts, and included in the statistical analyses. Participants received a $20 check to complete all parts of the study.

The credibility of the study was enhanced by the triangulation of two data collection methods spanning qualitative and quantitative approaches to confirm the consistency of the

findings (Merriam & Tisdell, 2015). Alternative explanations of the themes were also explored and evaluated against the findings to increase credibility (Merriam & Tisdell, 2015; Patton, 1999). Research decisions and progress were documented in memos, also known as an audit trail, to explain how the results came to be (Merriam & Tisdell, 2015). The audit trail can highlight why the results make sense or are dependable, given the data collected.

Data analysis

Quantitative Methods

Online survey responses were exported into an Excel file. Program lengths were converted into weeks to have a standard unit for analysis. Prescription values were converted to their weekly value, if possible, for the same reason. Weekly prescription values were determined by dividing the total prescription value over the course of the program by the number of weeks the program was in operation. This was not possible when prescriptions were based on household size, as prescriptions could vary by participant. The program cost per participant was determined by dividing each program's total cost by the number of participants that started their program in 2019. The same method was used to determine the cost of each program component per participant. Retention rates were determined by dividing the number of participants reported to complete a program by the number of participants who started the same program. Prescription redemption rates were determined similarly by dividing the value of prescribed prescriptions by the value of the redeemed prescriptions for each program.

An exploratory descriptive analysis was conducted using SPSS (Version 26, Armonk, NY: IBM Corp). For categorical variables, frequencies were calculated. For continuous variables, minimum, maximum, mean, standard deviations, median, and interquartile range were determined.

Qualitative Methods

Recordings of phone interviews were transcribed verbatim using an audio-to-text software service. Transcriptions were reviewed alongside audio recordings to check for accuracy and to redact identifying information. Transcriptions were then coded using Atlas.ti (version 8.2.4, Berlin, Germany: Scientific Software Development GmbH) to achieve two goals: 1) To provide context for the quantitative data collected in the surveys, and 2) To explore any patterns in design or implementation across programs that the survey did not capture. After all interviews were coded, the first ten interviews were recoded to apply codes that were developed later in the analytic process.

To achieve the first goal, the transcripts were coded to identify examples that expanded on the data collected in the survey. For instance, a section of data describing how participants received nutrition counseling aboard a mobile clinic was coded "Nutrition education example" and was used to provide context for the descriptive statistics around the types of nutrition education that programs offered. In essence, the quantitative data answered, "How many programs included this feature?", and the qualitative examples answered the follow-up question, "And what did it look like?".

Deductive and inductive coding (Graneheim et al., 2017) were conducted to achieve the second goal of exploring any patterns in design or implementation across programs that the survey did not capture. For example, many programs mentioned how they scheduled multiple program elements to occur in the same place at the same time. This data was coded "One-stop shop" and was reported to be a common element in program design.

After coding each interview, the key components of each program were summarized and used as the body of data for a case study of the programs. A case study is an investigation of a

phenomenon (the "case") in depth and within its real-world context (Robert K Yin, 2014; R.K. Yin, 2014). In this study, each program served as a case. The design or implementation of the programs that gave permission to be featured as case studies were compared and contrasted. Cases that provided unique insight into PPP operations and funding—a known barrier to programming– were selected to be featured. The selected case studies were intentionally diverse to highlight the various ways a program can be operated and funded. Each case description was provided to the accompanying program for review and approval to confirm that their program had been accurately depicted.

Finally, reports and other program documents, if provided, were reviewed for information that could contribute to an understanding of the program's structure or flow.

Findings

The study sample includes 23 active PPPs across the nation that were diverse in location, design, and implementation (Table 3.1). Programs were based in the Mid-Atlantic (26.1%), Northeast (8.7%), Midwest (30.4%), Southwest (17.4%), and Western regions (17.4%). Program lengths ranged from 8 to 52 weeks (median: 20 [IQR = 12–36] weeks), with five (21.7%) programs running year-round. The most frequently cited program goal was to increase fruit and vegetable consumption (69.6%), followed by the goal to increase health outcomes (60.9%). Programs were owned, or mainly operated by, a healthcare organization (34.8%), non-profit (30.4%), or a government agency (21.7%), though it often took a range of partnerships to implement each program.

PPP models varied across the country, with multiple models operating within the same program at times. Though delivered differently by each program, three main programmatic arms tended to be consistent: 100% (n = 23) provided a produce prescription worth a financial value

that could be redeemed for fruits and vegetables, if not more types of food; 87% (n = 20) of programs included a healthcare visit where they received some kind of care; and 82.6% (n = 19) delivered nutrition education through handouts, one-on-one counseling or advice, or classes. Almost 70% (n =16) included a cooking demonstration, and 52.2% (n =12) provided some form of incentives. Only one program offered childcare.

About a third of the programs provided transportation. Transportation issues were a problem for many programs (45%), with three programs citing it as their biggest problem. Transportation was especially an issue in rural areas or those outside a main city.

Overall, no one model appeared to work best. However, two key features did appear to make programming more successful: 1) Being a "one-stop shop", or scheduling multiple program components to occur at the same time and place to ease participation and, 2) Addressing transportation issues for participants.

Programs served areas that needed it the most, namely food deserts or rural areas with low access to produce and areas with high poverty, chronic disease, wage inequality, or food insecurity. Despite having a positive impact on the participants they were able to serve during the duration of the program, the majority of interviewed programs found that the need in their community was higher than what they could currently meet. Sixteen (69.6%) out of 23 of the total participating programs wanted to expand by partnering with more sites or serving more people, though more than two-thirds of those programs noted a lack of funding and staff to do so. Some programs had a waitlist.

Table 3.1

Characteristics of Active Produce Prescription Programs: 2020 National Produce Prescription Program Study (n = 23)

Active program characteristics	Number of programs	% of programs
Location		
Mid-Atlantic	6	26.1%
Northeast	2	8.7%
Midwest	7	30.4%
Southwest	4	17.4%
Western	4	17.4%
Years in operation as of 2019		
8+	2	8.7%
5–7	7	30.4%
2–4	13	56.5%
1	1	4.3%
Program goals[a]		
To increase fruit and vegetable consumption.	16	69.6%
To improve health outcomes.	14	60.9%
To increase access to healthy food.	10	43.5%
To increase nutrition knowledge.	3	13.0%
To increase confidence in shopping for and eating F&V.	3	13.0%
To reduce food insecurity.	6	26.1%
To support local food system.	3	13.0%
Program owner		
Healthcare organization (non-profit healthcare system, non-profit clinic, HRSA clinic)	8	34.8%
Non-profit (focused on agriculture, health outreach, or anti-hunger; food bank, farmers market association)	7	30.4%
Government agency (state or county departments of health, municipal department of health or office of sustainability)	5	21.7%
Co-owned	3	13.0%

[a] *Participants could choose multiple options*

Table 3.2

Healthcare, Transportation, and Childcare Features of Active Produce Prescription Programs: 2020 National Produce Prescription Program Study (*n = 23)*

Program feature	Number of programs	% of programs
Healthcare visit	**(*n* = 20)**	**87.0%**
Healthcare site partner[a]	(*n* = 19)	
Safety net clinic	11	57.9%
Primary care clinic	9	47.4%
Hospital	6	31.6%
Other	6	31.6%
Specialty clinic (e.g., diabetes clinic)	3	15.8%
Community-based clinic	3	15.8%
Provider during healthcare visit[a]	(*n* = 13)	
Physician	9	69.2%
Nurse practitioner	8	61.5%
Nurse	6	46.2%
Registered dietitian	4	30.8%
Community health worker	3	23.1%
Administrator	3	23.1%
Pharmacist	2	15.4%
Other	2	15.4%
Occurred during healthcare visit[a]	(*n* = 14)	
Measured weight	12	85.7%
Measured blood pressure	11	78.6%
Measured height	10	71.4%
Finger prick taken for blood glucose test	7	50.0%
Nutrition education or counseling	6	42.9%
Blood taken for lipid panel test	4	28.6%
Other	2	14.2%
Frequency of healthcare visit[a]	(*n* = 15)	
Pre-and post-program	7	46.7%
Monthly	3	20.0%
Beginning, middle, and end of program	3	20.0%
Weekly	2	13.3%
Biweekly	2	13.3%
Every 3 months	2	13.3%
Every 6 months	1	6.7%
Transportation	**(*n* = 8)**	**34.8%**

Type of transportation aid offered[a]	(*n* = 7)	
Bus passes	2	28.6%
Ride share service using an app	2	28.6%
Medicaid transportation	2	28.6%
Transportation through healthcare site	2	28.6%
Other	2	28.6%
Childcare	**(*n* = 1)**	**4.3%**

[a]Participants could choose multiple options

Healthcare

The majority of programs used more than one criterion to recruit participants, namely health-related criteria (*n* = 18, 78.3%)— of which 94.4% (*n* = 17) was diabetes– or economic-based criteria (*n* = 18, 78.3%)— of which 77.8% (*n* = 14) was food insecurity and 55.6% (*n* = 10) was a low-income. Three programs (13.0%) used a sociodemographic criterion, such as age, gender, or race-ethnicity. Five programs used electronic medical records to identify eligible patients and/or to refer eligible patients to the program coordinators for enrollment.

Programs with a healthcare visit component (*n* = 19) partnered with one to 16 healthcare partners, with a median of 3 partners per program (IQR = 1–8). Programs mostly partnered with a safety net clinic (*n* = 11, 57.9%) or a primary care clinic (*n* = 9, 47.4%) (Table 3.2). A variety of healthcare providers could prescribe the produce prescriptions in programs, and often more than one provider prescribed in a single program. Prescribing providers included a physician (73.9%), nurse practitioner (56.5%), nurse (47.8%), registered dietitian (47.8%), community health worker (43.5%), social worker (39.1%), and a pharmacist (21.7%). If a program had a single prescriber, it was almost always a physician.

During the healthcare visit, a provider may have provided counseling or measured height, weight, blood pressure, conducted a finger prick for a blood glucose test, or taken blood for a

lipid panel test. Measures could vary by site and those taken could be tailored to what was relevant to an individual participant based on their health history.

Program providers explained that healthcare providers were often excited about the program because the prescription is "the most tangible thing that they can give somebody who's struggling." In some program cases, however, competing priorities and demands on the providers' time limited their ability to recruit participants and collect data.

Table 3.3

Case Studies of the Operations and Funding of Two Produce Prescription Programs

Case study 1: Utah Produce Rx, Salt Lake City, Utah
The Utah State Department of Health piloted a 10-week long PPP in 2019, called Utah Produce Rx. **How it works:** Using Behavioral Risk Factor Surveillance System data, the Utah Department of Health created a new measurement tool called the Health Improvement Index to identify communities across the state with the highest need for health improvement. The department used this tool to identify three communities across Utah to recruit individuals with a low-income who were experiencing food insecurity to Produce Rx. Participants were recruited from a mobile screening unit, a safety net clinic, and social service agencies that referred eligible individuals to community health workers for enrollment. Patients were provided five initial $20 vouchers that could be spent on fresh, frozen, or canned fruits and vegetables without any added salt, fat, or sugar at farmers markets or at any of the nine locations of a locally owned, small chain grocery store catered to the Latinx community. After five weeks, participants were encouraged to return to their healthcare provider to complete a midpoint survey, at which point they would receive five more $20 vouchers. Nutrition education was required but the sites chose how to deliver it. The mobile screening unit provided one-on-one counseling with the registered dietitian on board. The social service agency and the safety net clinic provided either information about additional food resources or a conversation about nutrition with a community health worker. Surveys were used to collect data regarding fruit and vegetable consumption, food insecurity, and participant feedback about their experience in the program. The program provided affordable produce to 280 Utahans in 2019. **Funding:** The 2019 Produce Rx pilot program was funded by state appropriations that the health department requested through the House Agriculture and Natural Resources Committee in the Utah state legislature. The department received $400,000 in appropriations for produce

incentives over the next four years, which also serves as the required match in funding for the GusNIP grant that they received in August 2019. The majority of the GusNIP funding and appropriations will go towards doubling SNAP benefits but will also fund Produce Rx.

Case study 2: Food Farmacy, Fishersville, Virginia

Food Farmacy is a 12-week long produce prescription program developed in 2018 by Augusta Health, a hospital in Virginia. The program partners with an agriculture-focused nonprofit that partners with the hospital to run the onsite farm and provides participants with produce.

How it works: There are two models for the Food Farmacy program: the hospital and the community model. In the hospital model, patients with diabetes were referred by healthcare providers through their EMR to a Food Farmacy program that took place on the hospital campus. In the community model, patients were referred through their EMR for pre-diabetes and food insecurity to a program that took place at a community-based location. Once enrolled, participation looked similar for the two models. Physicians, health educators, dietitians, and the hospital's community outreach staff delivered weekly nutrition education at the hospital or a community site. Education topics included cooking with less salt and cooking healthfully on a budget. A cooking demonstration that aligned with the nutrition topic discussed followed the education. The demonstrations were led by one of the hospital's chefs and included fresh produce that had been harvested from the farm. Then, participants went to shop at the onsite farm stand where they could find the produce highlighted in the cooking demo. Each program component flowed into the next. Biometrics (waist circumference, hemoglobin A1c or fasting blood glucose, lipid panels, blood pressure, height, and weight) were measured at the first and last class with an optional biometric day mid-way through the program. Participants were invited back six months after the program ended to test their A1c again. In 2019, Fresh Farmacy served 30 residents. At the end of the program, participants experienced a decrease in blood pressure (74%), A1c or fasting blood glucose (74%), and waist circumference (63%).

Funding: Funding for the Food Farmacy program comes from the Community Benefit Endowment of the hospital, which is overseen by the hospital's Community Partnership Committee and Board of Directors. The program addresses the strategic priorities of "diabetes" and "nutrition and physical activity" identified by the hospital's community health needs assessment. Hospital and non-profit partners staff the program as a part of their regular job duties.

Table 3.4

Prescription Features of Active Produce Prescription Programs: 2020 National Produce Prescription Program Study (*n = 23)*

Program feature	Number of programs	% of programs
Prescription	**(*n* = 23)**	**100%**
Prescription prescriber[a]	(*n* = 23)	
Physician	17	73.9%
Nurse practitioner	13	56.5%
Nurse	11	47.8%
Registered dietitian	11	47.8%
Community health worker	10	43.5%
Social worker	9	39.1%
Pharmacist	5	21.7%
Other	3	13.0%
Form[a]	(*n* = 23)	
Voucher	17	73.9%
Box or bag of food	8	34.8%
Coupon	2	8.7%
Debit card	1	4.3%
Food source[a]	(*n* = 23)	
Farmers market	12	52.2%
Farm stand	8	34.8%
Grocery store	7	30.4%
Mobile market	6	26.1%
Community Supported Agriculture (CSA)	5	21.7%
Garden or farm at the healthcare site	5	21.7%
Convenience store	2	8.7%
Other	2	8.7%
Redeemed for[a]	(*n* = 23)	
Fruits and vegetables	23	100%
Seeds and plants, including herbs	6	26.1%
Eggs	3	13.0%
Food in general, no restrictions	3	13.0%
Meat, poultry, and fish	2	8.7%
Breads and cereals	2	8.7%
Frequency participants could redeem prescription	(*n* = 23)	
Weekly	14	60.9%
Multiple times a week	6	26.1%
Everyday	2	8.7%
Every other week	1	4.3%

[a]Participants could choose multiple options

Produce Prescriptions

All 23 programs included prescriptions that could be redeemed for fresh fruits and vegetables (Table 3.4). A number of programs also allowed prescriptions to be exchanged for meat, poultry, fish; breads and cereals; seeds and plants, including herbs; eggs; and food in general. Food for the prescriptions was either sourced from, or directly redeemed at, the following locations: a farmers market (52.5%), a farm stand (34.8%), a grocery store (30.4%), a mobile market (26.1%), a Community Supported Agriculture model (21.7%), an onsite garden or farm at the healthcare location (21.7%), a wholesaler (17.4%), a convenience store (8.7%), a food bank (4.3%), or a food pantry at the healthcare site (4.3%). Nineteen of the 20 interviewed programs prioritized locally sourced produce by tailoring their program timeline around the peak growing season when local produce was most available, by partnering with farmers markets that sell local produce, by buying locally-sourced produce from wholesalers, or by choosing to partner with grocery stores that sold local produce.

Two programs partnered with large scale grocery chains that accepted the prescriptions. These stores require sorting through every fresh, canned, and frozen item in stock to see which options did not contain salt, sugar, or fat. Items were identified as eligible in the store's Universal Product Code (UPC) system and recognized at check out. One program saw an increase in prescription redemption rates after partnering with a grocery store with many locations; the provider explained that the increase in access points likely led to the uptick in prescriptions spent. Three programs partnered with smaller, locally owned grocery stores that often had an ethnic focus (e.g., a Latinx market). One of these partnerships was initiated by a program's participants requesting a store they were "more familiar with and that sell[s] culturally appropriate food."

Produce prescriptions took different forms, with some programs utilizing more than one way to provide produce to participants. Close to three-quarters of programs (73.9%) used a voucher that could be spent like cash at a participating food retailer. Over a third (34.8%) provided participants with a bag or box of pre-organized food. Two programs had prescriptions that operated like a coupon (8.7%) and one program's prescription worked like a debit card (4.3%). Prescriptions were sometimes numbered, color-coded, or had a bar code to help track how many of the prescribed prescriptions were redeemed, and from what referral site they originated from.

For the sixteen (69.6%) programs in which a weekly amount could be determined, the value of the prescription varied widely from $7 a week to $30 with a median of $15 a week (IQR = $7.81–$20). Some programs based the prescription value on household size, providing a prescription worth a higher value to a participant with a larger family. Other programs provided a flat rate per enrolled participant. Examples of prescription values include $20 a week, $15 worth of food in a bag every other week, $10 a visit for up to 10 visits, $40 a month for up to 1 year, and $35 month for a household of 1 or $60 per household of 2 or more people for four months.

Programs that served those that lived in rural areas or areas outside a main city tended to bring produce to participants, either by pre-packaged bags or boxes of produce to be picked up at a partnering healthcare site or by scheduling a farm stand or mobile market to be outside the healthcare site for participants to shop at. A program in an urban setting also utilized the box model and tailored boxes of produce based on participants' health needs. The process included pre-cutting items and choosing produce specific to their diet-related disease. Other programs intentionally arranged for participants to shop for their own produce so they could gain confidence shopping for fruits and vegetables and have the "dignity of choice."

Table 3.5

Nutrition Education Features of Active Produce Prescription Programs: 2020 National Produce Prescription Program Study (n = 23)

Program feature	Number of programs	% of programs
Nutrition education	**(*n* = 19)**	**82.6%**
Form[a]	(*n* = 19)	
One-on-one counseling or advice	12	63.2%
Classes	10	52.6%
Handouts	9	47.4%
Counseling provider[a]	(*n* = 12)	
Registered dietitian	9	75.0%
Other	3	25.0%
Nurse	2	16.7%
Physician	2	16.7%
Class teacher[a]	(*n* = 10)	
Registered dietitian	7	70.0%
Non-profit staff	4	40.0%
Cooperative Extension staff	4	40.0%
SNAP-Ed staff	3	30.0%
Other	3	30.0%
Physician	2	20.0%
Farmers market staff	2	20.0%
Health educator	2	20.0%
Class frequency[a]	(*n* = 10)	
Weekly	7	70.0%
Monthly	3	30.0%
Nutrition education topics across forms[a]	(*n* = 14)	
Nutrients to limit	12	85.7%
Chronic disease management	12	85.7%
Cooking healthy recipes	11	78.6%
Food resource management	9	64.3%
Nutrients to increase	7	50.0%
How to be more physically active	6	42.9%
Weight management	5	35.7%
Food safety	4	28.6%
Gardening	3	21.4%
Skills taught across nutrition education forms[a]	(*n* = 14)	
How to read a nutrition facts label	11	78.6%
How to make healthy food swaps	11	78.6%
How to meal prep	6	42.9%

How to carbohydrate count	6	42.9%
How to preserve food	5	35.7%
Other	4	28.6%
How to use a food thermometer	3	21.4%
Safe cooking temperatures for meat	3	21.4%
How to garden	3	21.4%
Cooking demonstrations	**(*n* = 16)**	**69.6%**
Demo timing[a]	(*n* = 14)	
Occurred during a nutrition class	7	50.0%
Occurred separate from a nutrition class	7	50.0%
Type of recipes prepared during demo[a]	(*n* = 14)	
Healthy recipes	13	92.9%
Recipes tailored to produce prescription	13	92.9%
Recipes using seasonal produce	11	78.6%
Affordable recipes	10	71.4%
Low-sodium recipes	6	42.9%
Vegetarian recipes	6	42.9%
Recipes tailored to a certain cultures	4	28.6%
Recipes tailored to the program's region	3	21.4%
Incentives	**(*n* = 12)**	**52.2%**
Type of incentives provided[a]	(*n* = 12)	100%
Cooking utensils (e.g., spatula, knife)	11	91.7%
Cooking tools (e.g., skillet, crockpot)	5	41.7%
Spices	4	33.3%
Exercise tools (e.g., pedometer, Fitbit)	4	33.3%
Staple foods (e.g., olive oil, legumes)	3	25.0%
Reusable shopping bags	2	16.7%

[a]Participants could choose multiple options

Nutrition Education

Of the 19 programs that provided nutrition education, 63.2% provided nutrition education in the form of individual counseling or advice, 52.6% provided a class, 47.4% provided informational handouts, and 17.4% did not provide any form of nutrition education (Table 3.5). Some programs also held brief educational presentations at the farmers market. Nutrition education was sometimes left up to the individual healthcare sites and could vary. A registered dietitian was the most common provider to teach the nutrition education classes and to provide individual counseling or advice (in 70.0% and 75.0% of programs, respectively).

Counseling and advice looked different across programs: it occurred as a discussion of a patient's diet-related disease in a hospital setting, goal setting with a physician in a clinic, answering questions from participants about health and produce at a farmers market, or creating a plan for healthier habits with a dietitian aboard a mobile screening clinic.

The various forms of nutrition education covered topics like nutrients to limit or to increase consumption of, chronic disease management, cooking healthy recipes, and shopping healthfully on a budget. They also taught a number of skills including how to read a nutrition facts label, how to choose healthier food alternatives, how to meal prep, and mindfulness and stress reduction. Seven (50.0%) of the 14 programs that provided details about their cooking demonstrations held their demos during a nutrition education class, while the other half held them at the farmers market.

When the 10 programs with nutrition education classes met, they met mostly on a weekly basis (70.0%), though some programs had classes that met monthly (30.0%). Multiple programs mentioned how the nutrition education classes provided a space for participants to share and receive peer or provider support.

Some programs made group nutrition education class attendance optional rather than mandatory, with two programs noting retention issues when classes were previously mandated. One of those programs pivoted to offer different "pathways" instead, where participants were connected to a variety of nutrition education options that best fit their needs. Another unique approach by one program was to provide multiple consecutive 30-minute classes at the clinic where an onsite farm stand was open for participants to shop at, allowing them to join at any of the offered times in between shopping. At another site in the same program, participants with

diabetes attended a group medical visit in which complications of the disease were discussed and then addressed with foot and eye exams. The group medical visits were billed to insurance.

Table 3.6

Estimated 2019 Active Program Budgets and Costs Per Participant: 2020 National Produce Prescription Program Study (n = 23)

Budget Item	***N***	***n* (%)**	**# of initially enrolled participant estimate Median (min, max)**	**# of zeros or don't know**	**Non-zero responses**	
					Total Budget for Program Components Median (min, max)	**Cost/initially enrolled participant Median (min, max)**
Total program cost	23	20 (87.0%)	81 (9, 1017)	0	$33,500 ($2,850, $551,000)	$387 ($39, $3,867)
Produce prescription	23	20 (87.0%)	82 (9, 1017)	0	$13,159 ($1,800, $380,000)	$218 ($21, $918)
Nutrition education	19	12 (63.2%)	280 (50, 624)	2	$1,435 ($200, $36,500)	$21 ($0.45, $61)
Cooking demonstration	16	11 (68.8%)	280 (45, 624)	5	$760 ($200, $4,000)	$5 ($0.45, $12)
Incentives	12	6 (50.0%)	82 (45, 624)	1	$1,700 ($500, $5,866)	$6 ($0.80, $130)
Transportation	8	4 (50.0%)	124 (17, 441)	0	$575 ($300, $1,050)	$3 ($0.68, $5)
Meals	23	10 (43.5%)	441 (82, 624)	7	$400 ($100, $400)	$0.64 ($0.23, $5)
Childcare	1	1 (4.3%)	82	0	$160	$2
Supplies	23	12 (52.2%)	82 (32, 480)	2	$713 ($50, $24,000)	$6 ($4, $9)
Equipment	23	8 (34.8%)	50 (45, 165)	5	$3,000 ($1,500, $4,700)	$30 ($18, $104)
Personnel and labor	23	12 (52.2%)	165 (9, 624)	1	$45,000 ($1,000, $182,000)	$40 ($37, $241)
Events	23	7 (30.4%)	45	6	$4,500	$100
Travel for providers	23	9 (39.1%)	243 (45, 441)	7	$4,000 ($1,500, $6,500)	$74 ($3, $144)
Facility fees	23	10 (43.5%)	441 (283, 480)	7	$10,000 ($545, $73,500)	$23 ($2, $153)

Budget and Labor

Twenty programs provided information about the total amount that they spent on their programming in 2019. Total programming costs ranged from $2,850 to $551,000, or a median cost of $33,500 (IQR = $12,021–$156,400) to run a PPP with a varying number of partnering sites (Table 3.6). For example, the program with the largest budget of $551,000 operated at 16 sites, whereas the program with the smallest budget of $2,850 operated at three. The largest expense for most programs was for produce prescriptions, which ranged from $1,800 to $38,000, or a median cost of $13,159. Three programs reported difficulty estimating exact program costs due to not having a line item budget, trouble tracking voucher redemptions, or issues determining the cost of produce production on shared land.

Seventy-four percent of programs provided enough information to calculate the program cost per participant. Programs spent between $39 and $3,867 per participant initially enrolled in their programming, or a median cost of $387 (IQR = $211–$790) per participant.

Forty eight percent of programs spent about what they budgeted, 26.1% spent less, and 21.7% spent more. When programs were asked how strongly they agreed or disagreed with the following statement: “Our program had enough funds to meet the need for our services in our community,” 34.8% either strongly agreed (8.7%) or agreed (26.1%), while 56.5% disagreed (30.4%) or strongly disagreed (26.1%). Two programs responded neutrally (8.7%).

Various staff and volunteers were involved in designing, implementing, and evaluating the produce prescription programs. Most programs involved program coordinators (73.9%), food retail managers (e.g., farmers market manager; 69.6%), registered dietitians (62.5%), community health workers (65.2%), students or interns (56.5%), physicians (52.2%), program evaluators

(52.2%), nutrition educators (52.2%), participant liaisons (47.8%), and nurses (47.8%). Various other staff also contributed at lower frequencies.

Table 3.7

Evaluation Measures Tracked by Active Produce Prescription Programs: 2020 National Produce Prescription Program Study (n = 23)

Evaluation Measures	Number of participants (*n* = 23)	% of programs
Food and nutrition-related measures[a]	**(*n* = 23)**	**100%**
Fruit and vegetables consumption	18	78.3%
Food insecurity	15	65.2%
Food purchasing habits (e.g., frequency of shopping at a farmers market)	12	52.2%
Nutrition knowledge	10	43.5%
Cooking skills	10	43.5%
Program did not track food-related measures	2	8.7%
I don't know	1	4.3%
Health measures[a]	(*n* = 23)	100%
HbA1C	12	52.2%
Blood pressure	10	43.5%
BMI	9	39.1%
Lipid profile	4	17.4%
Blood glucose	4	17.4%
Waist circumference	2	8.7%
Mental health	1	4.3%
Program did not track health measures	5	21.7%
Healthcare utilization measures[a]	(*n* = 22)	95.7%
Change in medication use	4	18.2%
Healthcare use costs	1	4.5%
Frequency of ER visits	1	4.5%
I don't know	2	9.0%
Program did not track healthcare use measures	14	63.6%
Program experience measures[a]	(*n* = 22)	95.7%
Participant feedback about the program	19	86.4%
Participants' experiences in the program	17	77.3%
Participant satisfaction with the program	17	77.3%
Provider experiences	2	9.1%

[a]Participants could choose multiple options

Evaluation

Most of the programs (91.3%) tracked food-related measures—namely fruit and vegetable consumption (78.3%), food insecurity (65.2%), and food purchasing habits (e.g., frequency of shopping at a farmers market; 52.2%) (Table 3.7). The majority of programs (78.3%) tracked health-related measures– namely HbA1c (52.2%) and blood pressure (43.5%). The majority (63.6%) of programs did not track any healthcare utilization measures, such as healthcare expenditures. All but one program requested some form of feedback about their program from participants or providers. Many programs experienced evaluation challenges due to issues like inconsistent clinical and budget data tracking, variations between multiple sites within a program, and a lack of standardization in program requirements.

Outcomes

Programs enrolled a median of 81 (IQR = 42–323) participants, ranging from 9 to 1,017 participants (78.3% response rate). A median of 67 (IQR = 24–199) participants completed the program, ranging from 9 to 1,017 (56.5% response rate). Retention rates ranged from 61.7% to 100% for the 13 programs that provided data on the number of participants who completed their programming.

About half (52.2%) of programs provided the monetary value of both their prescribed and redeemed prescriptions for prescription redemption rates to be calculated. Redemption rates ranged from 69.0% to 100%, and a median of 90.1% (IQR = 76.5%–100%).

Various program outcomes were discussed in the interviews, including reported improvements in HbA1c, blood pressure, and total cholesterol; weight loss; reduced medication use; improved food security; and increased consumption of produce. One program owned by a hospital system that is also a self-insured healthcare company saw per member per month cost savings and health outcomes for those with access to produce prescriptions.

According to providers, participants also experienced benefits beyond clinical measures. Participants tasted new foods, learned about nutrition, gained social connections with each other and with program staff, and became more confident in shopping for produce. There was a "community building effect" and an "enrichment piece for families" that shopped at the farmers markets.

Table 3.8

Funding Sources for Active Produce Prescription Programs: 2020 National Produce Prescription Program Study (n = 23)

Funding source	Number of programs	% of programs
Foundation grants	12	52.2%
Non-profit funding	10	43.5%
Government funding - Federal	8	34.8%
Government funding - State	8	34.8%
Community Benefits funding through hospitals	8	34.8%
Private donations	7	30.4%
In-kind contributions from partners	6	26.1%
Contracts with health insurer	3	13.0%
Government funding - County or municipal	3	13.0%
Fundraisers	2	8.7%
Government funding - Tribal Council	1	4.3%
Contracts with healthcare provider	1	4.3%

Funding and Sustainability

Almost 83% of programs used multiple funding streams from different sources to fund their programming. Over half of the programs were funded by foundation grants, which are typically financially sourced by a family or corporate entity (52.2%) (Table 3.8). Programs also received funding through various forms of government. Three programs received federal government funding through the GusNIP; a fourth received GusNIP funding at the end of 2019. One site used revenue from a municipal sugar-sweetened beverage tax to fund their program.

Two programs owned by state departments of health sought and received state appropriations for produce incentives. The appropriations funded both produce prescriptions and SNAP doubling programs, which double the value of SNAP benefits spent at participating farmers markets. The appropriations completely or partially funded their PPPs. Programs also received funding from non-profits (from their revenue or budget; 43.5%), private donations (30.4%), fundraisers (8.7%), contracts with health insurers (13.0%) or healthcare providers (4.3%), and a tribal council (4.3%).

Community benefits funding through a hospital was allocated to 34.8% of programs to address a number of strategic priorities determined by a community health needs assessment. Programs were funded to address a variety of priorities: obesity, population health, nutrition and physical activity, lack of nutrient-dense food, food access, diabetes, chronic disease management, hypertension, and food insecurity. Three programs were completely funded by a single source: community benefits funding through a hospital (n = 2) or by state appropriations (n = 1).

Twenty-two programs (95.7%) responded as to whether or not they struggled to sustain their programming, with the responses split down the middle (n = 11 for both). The majority of programs who struggled to sustain their programming most commonly reported a lack of funding as a reason why (n = 7, 63.6%). Inconsistent funding (n = 4, 36.4%) and limited staff (n = 4, 36.4%) were both reported to be barriers to sustainability by over a third of participants. One provider described how her PPP was mandated by the state legislature to be operated by her department but the same legislature did not provide them consistent funding to do so. Seven of the 11 programs (85.7%) that reported struggling most commonly indicated that continuous funding would help them sustain their programming.

Programs that do not run year-round tried to continue to impact participants after their program ended by connecting them to food and other social resources, or by extending their growing season. A third of the 20 interviewed programs (n = 7) partnered with farms that are planning to or already do extend the growing season, therefore access to produce, by growing indoors in hoop houses, green houses, or through aquaponics during the shoulder season. Prescriptions were not always provided into these extended seasons.

Expired Programs

Of the four programs that completed the expired program survey, two programs intended to continue but ended for different reasons. The other two programs were meant to be a short-term pilot research project, one of which ended when a grant ran out. Both programs that intended to be ongoing reported a lack of funding as a barrier to sustaining their programming. One of those programs also reported inconsistent funding, limited and inconsistent staff, and challenging community partnerships as barriers. This program also noted how the partnering farmers market could not apply for grants due to its for-profit status.

Discussion

This national mixed-methods study highlights the variety of produce prescription programs operating across the United States in 2019. Despite variations, all programs had a produce prescription, usually a voucher that could be spent at a farmers market. Programs tend to have a healthcare visit and some form of nutrition education. Numerous healthcare, non-profit, and food retailer staff were involved in the operation of these programs. Programs were funded by multiple funding streams with the most common funder being foundation grants. Programs provided both clinical and non-clinical positive impacts for participants, though the need in the communities being served was higher than what the majority of programs can currently meet. A

lack of funding was the most common barrier to sustaining programming. The findings provide insight into the current state of PPP design and implementation nationwide, as well as key resources required to operate and sustain programming.

The findings of the study have numerous implications for programming. Consistency in program design and evaluation would contribute to a standardized body of evidence and allow for comparisons across programs to better understand how PPPs are impacting Americans. However, programs appear to adapt their model based on their local setting, partnerships, and available resources, resulting in a variety of program models. Many programs reported evaluation challenges such as inconsistent clinical and budget data tracking across sites. These findings support research reporting how data collection can be logistically challenging for a large PPP due to the number of implementing partners and prescribers (Marcinkevage et al., 2019). The opportunity cost of adapting programs to local settings over collecting standardized data should be evaluated and inform future program design and implementation. A potential solution might be to allow flexibility among program sites but require the implementation of staple intervention elements and evaluation measures (Seligman et al., 2015).

The variety across programs echoes an earlier review of PPPs (Swartz, 2018). The current study extends the understanding of PPPs by including in-depth logistical information about PPP design and implementation. The data reported about program budgets, average cost per participant, and the roles of various staff and volunteers provide novel insight into what resources are required to maintain a PPP. Existing programs can consider what it would cost to add an additional feature to their budget, while new programs have a blueprint for estimating total programmatic costs. The compilation of program designs created by this study is a first step towards answering the call for best practices in PPP design (Ridberg et al., 2020). By

establishing what approaches exist, we can begin to compare strategies to determine which design has the highest impact.

Programs often used more than one form of nutrition education, though the most common form was individual counseling or advice delivered most frequently by a registered dietitian. These findings are in line with research suggesting the use of "physician extenders," which shift nutrition education delivery from primary care physicians to ancillary healthcare providers (Schlosser, Smith, et al., 2019). A little over half of the programs provided a nutrition education class. Though some providers reported attendance challenges when classes were mandated, the benefits of a group setting should be considered. A prescription program in Ohio reported how a group education setting encouraged peer information exchange and a sense of social belonging that appeared to enhance patient engagement (Schlosser, Smith, et al., 2019). However, stand-alone classes may be more difficult to attend considering the reported challenge of transportation, a known barrier to participation in PPPs (Schlosser, Smith, et al., 2019). Many programs used the "one-stop shop" strategy of aligning nutrition education classes with a healthcare visit and/or onsite produce shopping to ease this burden of attending multiple program components. Future programs should consider various program models to best serve their patients.

Two of the most common food retailer partners were farmers markets and grocery stores. Each site came with their own benefits and challenges. According to providers, participants and their families experienced a community building effect when they shopped at the farmers markets that differed from the experience of shopping at a grocery store. Farmers markets have also been critiqued for inconvenient locations and hours (Jilcott et al., 2010), though limited hours are not always a barrier for participants (Saxe-Custack et al., 2018). The wide operating

hours of grocery stores allowed participants the "dignity of choice" for when they shopped. Stores also provided culturally appropriate options that participants requested. As most U.S. adults purchase their food at stores (rather than markets) (Drewnowski & Rehm, 2013), grocery stores may be a familiar and accessible food retailer option for participants. The convenience of shopping at grocery stores for the shoppers came at the expense of the program partners who had to sort through and identify eligible products, a list that required updating as products changed. Further, stores may need to update their point of sale systems to incorporate an incentive program (Parks et al., 2019). Programs should consider food retailer partnerships with these considerations in mind.

The findings also have implications for research and health policy. The fact that only 26.1% of programs tracked healthcare utilization measures highlights a gap in the data that could contribute to a better understanding of how PPPs impact healthcare costs. If healthcare utilization and costs can be shown to be reduced by PPPs, public and private insurance companies may be interested in covering the cost of produce prescriptions or full programs for their clients. Economic models have found an expansion of produce incentives alone to be cost-effective, preventing 1.93 million cardiovascular disease events and saving $39.7 billion in healthcare costs over a lifetime for Medicare and Medicaid patients (Lee et al., 2019). Healthcare utilization data could inform future economic models that can simulate the healthcare cost savings and health impacts of PPPs in their entirety, including key program features beyond the produce incentive like nutrition education. The program budgets and program costs per participant provided by this study can inform the programmatic costs considered by these models. The one program in the study that had access to payer side expenses saw per member per month cost savings among patients with access to produce prescriptions. These findings align with reported healthcare cost

savings elsewhere of about $24,000 per patient after being provided a produce prescription (Aubrey, 2017).

A lack of consistent funding impacted a number of PPPs and contributed to the end of two programs. Even programs that have been institutionalized into a local or state government agency were not guaranteed funding. For example, in 2019 the state of Washington mandated the Washington Department of Health to assume the operations of the state's PPP after their GusNIP funding ran out. However, they did not provide consistent funding to support those operations. The department of health will have to go to the state legislature every two years and request funding to continue the state-mandated program. Programs looking for funding should consider multiple funding streams to ensure programming costs are covered. Seeking state appropriations for produce incentives that could be allocated to both produce prescriptions and to the more established SNAP doubling program may be a helpful strategy, as policymakers are more likely to be familiar with the latter. Programs should also consider applying for funding from their local hospital community benefits program, which 35% of the programs in the current study received. More research is needed to determine the most dependable sources of PPP funding.

The findings of this study can be used to support sustainable PPPs to address health disparity and promote produce consumption in Americans with a low-income. The blueprints of PPP models can also support the development of burgeoning and existing programs to continue to provide access to affordable produce. The suggested programmatic costs can inform potential economic models that can be used to garner sustainable funding and justify the expansion of PPPs. Now more than any time in recent history, there is an urgent need for high-quality diets and to address diet-related diseases considering the impact of underlying conditions on the outcomes of COVID-19 infections (Garg, 2020), many of which are diet-related. The methods of

connecting vulnerable populations to produce outlined here can inform current food security responses during the COVID-19 pandemic, specifically the USDA's Farmers to Families Food Box Program. Through this program, the USDA is purchasing billions of dollars' worth of supply-chain impacted fresh produce, dairy, and meat products from American farmers (Agricultural Marketing Service, 2020). This study highlights how food distribution sites should be physically accessible (e.g., convenient, perhaps multiple, locations with wide distribution hours). If feasible, distributors should consider dropping the boxes off at participants' doorsteps to alleviate any transportation challenges. Recipe cards suggesting ways to prepare the fruits and vegetables should also be included in the boxes to encourage easy use of produce. The pandemic has only exacerbated the high need for produce access discussed in this study. Therefore, the 2023 Farm Bill should increase the amount of allocated funding available for PPPs that was originally established in the 2018 version of the bill ("Agriculture Improvement Act of 2018," 2018). Continued PPP support can contribute– even if in a modest way– to a healthier, more resilient population in the long-run.

The findings should be considered in the context of the study's limitations. Some survey questions had low response rates, including the number of participants who completed the programs (56.5% response rate). Since this number was needed to calculate program retention rates, the reported rates only represent about half of the programs in the study. Dollar amounts for certain budget line items also had lower response rates, like events (30.4%) and meals (43.5%). These lower rates could reflect the evaluation challenges mentioned by programs earlier around inconsistent tracking of budget and voucher data as well as a lack of standardization in program requirements. The lower rates could also be due to confusion around the survey questions. While most of the survey questions had a response rate of at least 75%, the lower rates

mean that some responses may be underreported. Twenty (87.0%) of the 23 programs did report two of the most important figures for creating a program budget, however: total program cost and the cost of the produce prescription. Another limitation is that providers responded to some survey questions by typing an answer into a text box. While this allowed the survey to capture additional answers, it also means that not all providers were able to confirm whether or not they too included the additional program features. Therefore, the self-reported responses may be underrepresented. The variation in produce prescription values also made it difficult to compare data across programs. Some produce prescriptions were based on household size and could not be converted into a standard weekly amount for comparison. As such, the weekly prescription values do not reflect all prescription values offered by programs. Finally, the study was not able to include any of the limited number of PPPs in operation in the Southeast or the Mountain Plains regions. The findings may not be generalizable to these unique regions.

Despite these limitations, the study is the largest known national survey of produce prescription programs. The majority of programs in the study started in the last five years, indicating a potentially increasing trend in PPPs in the future that may benefit from centralized, practical insight into what program structures and resources already exist that could be transferred to their own programming. The diversity of recruited programs' geographical regions, communities served, and program design increases the transferability of the study's findings. The study's credibility was enhanced by triangulation of data collection methods and approaches. The qualitative interviews added detail and nuance to the survey results for a pragmatic understanding of program functionality. The case study design allowed PPPs to be presented holistically for a better picture of how program components come together in real life.

Including expired programs also provided unique insight into the barriers of program sustainability.

Conclusion

The study's findings highlight what current models of PPPs exist across the United States and what resources are required to operate and sustain programming. As program numbers continue to grow, the study provides new and existing PPPs with a timely outline for the various ways to design, implement, evaluate, and sustain a program. The program blueprints, programmatic costs, and the need for consistent and increased funding suggested by this study can inform future program design as well as nutrition and health policy to support sustainable PPPs to address health disparity and promote produce consumption in Americans with a low-income.

CHAPTER 4

STRATEGIES AND CHALLENGES: QUALITATIVE LESSONS LEARNED FROM GEORGIA PRODUCE PRESCRIPTION PROGRAMS[2]

[2] Newman, T & Lee, J.S. To be submitted as an original research paper to Preventive Medicine Reports.

Abstract

Background: Produce prescription programs (PPPs) have sprung up across the country in the last decade, empowering healthcare providers to issue subsidies for produce to vulnerable patients. However, little research has been conducted on the facilitators that make it easier for PPPs to succeed or the barriers that programs face, which could provide guidance on how to improve future PPP design and implementation. Therefore, the study sought to identify the facilitators and barriers affecting positive outcomes in Georgia PPPs, called Fruit and Vegetable Prescription (FVRx®) Programs.

Methods: A process evaluation with a qualitative comparative case study approach was conducted. Fifteen FVRx® providers who possessed intimate knowledge of and experience with FVRx® programs, ranging from nutrition educators to farmers market managers, were interviewed in a focus group interview or on the phone between 2016 and 2017. FVRx® providers were interviewed, two nutrition education classes and an FVRx® best practices meeting were observed, and program documents were collected. Interview transcripts, field notes from observations, and documents were then thematically analyzed.

Findings: Four overall themes were determined regarding facilitators and barriers experienced by FVRx® programs: 1) Creating accessible programming may encourage FVRx® participation, 2) Provider dedication to the program is important, 3) Participants' challenging life circumstances can make participation difficult, and 4) The sustainability of the program is a concern.

Conclusions: The findings of this study suggest helpful strategies and challenges to consider for future PPP development and implementation in Georgia and beyond. Research on the long-term program impact is needed and policy options for sustainable, scaling up of PPPs should be explored.

Keywords: Produce prescription programs, process evaluation, facilitators and barriers, qualitative research, food access

Introduction

A low socioeconomic status (SES) increases the risk for certain diet-related diseases (Clark et al., 2009; Kivimäki et al., 2007; Leng et al., 2015; Shaw et al., 2016). While produce consumption may protect against some diet-related diseases (Aune et al., 2017; Boeing et al., 2012; Utsugi et al., 2008), low SES groups are less likely to consume fruits and vegetables (F&V)(Giskes et al., 2010). Further, a low SES is associated with food insecurity (Coleman-Jensen et al., 2019; Seligman et al., 2009), which can independently increase the risk for diet-related disease (Seligman et al., 2009).

A major reported barrier to produce consumption by individuals with a low-income is cost (Bartlett et al., 2014). Nutrition incentive programs subsidize the price of F&V and have been shown to significantly increase produce consumption (Bartlett et al., 2014; Herman et al., 2008) and improve diet quality (Berkowitz, O'Neill, et al., 2019), reduce food insecurity (Berkowitz, O'Neill, et al., 2019; Ridberg et al., 2019a), and modestly improve conditions of diet-related disease (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Cavanagh et al., 2017; Jones et al., 2020; Seligman et al., 2015; York et al., 2020) in underserved populations.

One type of nutrition incentive is a produce prescription program (PPP), where healthcare providers “prescribe” F&V to patients who often have a low-income and/or who are experiencing food insecurity and/or a diet-related disease. In Georgia, PPPs are called Fruit and Vegetable Prescription® (FVRx®) programs (now termed, “Georgia Food for Health”). During this four to six month-long intervention, healthcare providers prescribe local produce worth $1 per household member per day. Nutrition education and cooking classes often accompany the prescription. Various health measures, such as weight, body mass index, and blood pressure are

measured to assess the intervention impact. In 2016-2017, there were six FVRx® programs across Georgia.

Sharing helpful strategies and identifying barriers to overcome can provide guidance on how to improve program outcomes. Little research has been conducted on the facilitators that make it easier for FVRx® programs to produce positive outcomes, such as retaining participants or improving health measures, or the barriers FVRx® programs face. Available studies have been largely quantitative with limited focus on the perspective of the providers—the farm and farmers market managers, the nutrition educators, the healthcare professionals, and the administrators who are on the ground implementing FVRx® programs.

The purpose of the study was to examine the facilitators and barriers affecting positive outcomes of FVRx® programs in Georgia between 2016-2017 from the perspective of program providers. Sharing these strategies and existing barriers can strengthen PPP development and implementation in Georgia and beyond.

Methods

Design

A process evaluation with a qualitative comparative case study approach was conducted, informed by a constructivist epistemology (Crotty, 1998) and an interpretivist theoretical perspective (O'Donoghue, 2007). A process evaluation can illuminate why a program was or was not successful (Saunders et al., 2005), which can inform the future direction of FVRx® programs. A qualitative comparative case study approach (Goodrick, 2014) was used to examine each FVRx® program "case" within their contexts with the goal of discovering similarities, differences, and patterns across facilitators and barriers, which extends beyond multiple case study design (Yin, 2014) to explain why an intervention succeeds (Goodrick, 2014).

Sample and Recruitment

Purposive, criterion-sampling (Given, 2008) was used to recruit individuals who possessed intimate knowledge of and experience with FVRx® programs (Palinkas et al., 2015). Criteria sought providers for Georgia FVRx® programs that had been in operation for at least two years. Providers from three programs in Georgia met the criteria. After difficulty recruiting one of the programs, a pilot program was included in its place. All were in urban settings. Programs were de-identified and termed Program A, Program B, and Program C. Program administrators recruited interested providers and worked with the researcher to schedule interviews and observations between November 2016 and July 2017.

Data Collection

The study's credibility was increased by triangulation (Merriam & Tisdell, 2015): the use of multiple data sources and methods to provide a more comprehensive understanding than a single source or method could (Patton, 1999). Interviews, observations, and program documents were collected from different programs to cross-check the consistency of the findings.

Three semi-structured focus group interviews and one individual phone interview were conducted to learn what providers perceived to be facilitators and barriers for their programs. Interviews included farmers market managers, nutrition educators, program administrators, community coordinators (liaison between the participants and providers), researchers, students, and a dietitian, physician, and nurse practitioner. The interview guide was based on the six process evaluation elements from Saunders et al. (2005)— recruitment, dose delivered, fidelity, reach, dose received, and context—to ensure all critical areas of the FVRx® program were examined (Table 4.1)(Saunders et al., 2005). Questions were open-ended to control potential response bias (Choi & Pak, 2005).

Observations of the nutrition education classes for Program A and C provided program context; Program B did not have a class to observe. A field guide protocol based on Spradley's (1980) suggested ethnographic domains for participant observations directed the observations (Spradley, 1980). The guide focused on broad aspects of the class, like the setting, as well as more specific aspects, like the cooking demo recipes. A best practices meeting with multiple FVRx® programs in attendance was also observed.

Additional context for the reported facilitators and barriers was provided by each program's "plan of action," documents which outlined how sites planned to implement their program. The dual role of the researcher as an FVRx® program administrator for one of the sites under study was critically analyzed in a statement of subjectivity to acknowledge any potential bias on the research process (Preissle, 2008). Research decisions were tracked in an audit trail to increase study dependability (Merriam & Tisdell, 2015). This study was deemed exempt by the University of Georgia Institutional Review Board.

Table 4.1

Key Process Evaluation Components and Interview Questions for 15 Georgia FVRx® Providers Regarding FVRx® Program Facilitators and Barriers

Key Process Evaluation Components
1. Recruitment: Methods used to contact and attract participants. 2. Dose delivered: Extent to which intervention components were delivered. 3. Fidelity: Quality of program delivery. 4. Reach: Extent to which the participants attend and/or participate in the intervention. 5. Dose received: Extent to which participants actively engage with intervention. 6. Context: Environmental features that may influence intervention implementation or outcomes.
Interview Questions
1. What did you consider to be positive outcomes for your program last year? 2. What planned and actual recruitment procedures were used to attract participants to

your program? (Recruitment)
3. What components did you include in your program last year? (Dose delivered)
4. How did you encourage continued involvement throughout the program? (Reach, Dose received)
5. How closely did you stick to your plan of action once the program started? (Fidelity)
6. What proportion of the participants attended all of the components of your program? (Fidelity, Reach)
7. For those that attended the components, to what extent were participants engaged in the program activities? (Dose received)
8. How did participants like or dislike parts of the program? (Dose received)
9. What factors of your organization or community affected your program last year? (Context)

Facilitators and barriers

10. Was there anything that helped you have a better FVRx® season? Please tell me about it.
11. Was there anything that made your FVRx® season more difficult? Please tell me about it.

2017 Program Changes

12. What have you planned to do differently this year compared to last year?
    a. Probe: Why did you make those changes?
13. Pilot program only: If you could do it again, what would you do differently?
    a. Probe: Why would you make those changes?

Data Analysis

Interview transcriptions, field notes from observations, and plans of action were de-identified and coded using first and second cycle coding methods described by Saldana (Saldaña, 2015) to generate themes. During first cycle coding, evaluation codes of "facilitator" or "barrier" were paired with descriptive codes (summarizing a primary topic) or process codes (gerunds denoting action). For example, a section of data describing how a participant didn't have a car to attend class was coded, "Barrier-lacking car." Here, the evaluation code of "Barrier" was paired with the process code, "lacking car."

During the second cycle of coding, first cycle codes were combined or discarded to reduce redundancy. The "Barrier-lacking car" code, for instance, was grouped into the larger

code of "Barrier-transportation issues." Codes with similar content were then grouped into more broad categories (Table 4.2).

Data sorted under the categories were compared and contrasted to identify patterns and unifying "red threads" of meaning weaved throughout the data, or themes (Graneheim et al., 2017, p. 32). Alternative explanations of the themes were explored and evaluated against the findings to increase credibility (Merriam & Tisdell, 2015; Patton, 1999).

Findings

Fifteen FVRx® providers (73% female) from three FVRx programs® were interviewed in a focus group (n = 14) or individually (n = 1). Providers' roles fell into four main categories: healthcare (33.3%), farmers market (13.3%), nutrition education (20%), and program administration (33.3%).

Themes are expanded and supported by quotes that concisely represent the themes in the following sections.

Table 4.2

Theme Development Related to Facilitators and Barriers Affecting Positive Outcomes in Three Georgia FVRx® Programs

	Major themes	Categories	Codes
Facilitators	Program accessibility encourages participation	Ease and convenience of programming	• Providing transportation • Providing childcare • Recruiting from neighborhoods • Providing participant reminders • Ensuring participant understanding

			• Easing use of produce • Engagement • Flexibility
		Welcoming environment	• Encouraging community leadership • Fostering a sense of community • Encouraging nutrition education classes • Encouraging environment • Utilizing community partnerships
	Provider dedication to the program is important	Provider dedication	• Provider team health beliefs • Provider team strength • Provider team thoughtfulness • Provider team resourcefulness
Barriers	Participants' challenging life circumstances can make participation difficult	Ongoing and unforeseen participant challenges	• Participant emergencies • Difficulty contacting participants • Perceived time commitment • Transportation issues • Childcare issues • Challenges with paperwork
	Sustainability of the program is a concern	Temporary programming	• Short-term intervention • Post-program food security measures
		Scarce programming resources	• Limited funds • Limited staff

		Challenges working with local food systems	• Limited produce options • Growing season challenges

Facilitators

Program Accessibility Encourages Participation

It was important to make participating in FVRx® as accessible as possible for participants, who were facing many challenges outside of the program, by making participation easy, convenient, and welcoming.

Programs made an effort to ease access to and use of the produce. One program opened its on-site market before and after the nutrition education classes to make shopping more convenient. Programs used seasonal produce in their cooking demonstrations, which showed participants how to cook the produce that was available to purchase at the market. Classes also provided cooking tools, such as cutting mats and skillets, that could be used to cook the recipes at home.

Relationships with program providers and fellow participants helped create a welcoming environment in the program. For example, nutrition educators who were "engaging", "relatable", and "down to earth" helped create a comfortable atmosphere:

> *"I think they really enjoyed our PA's [nutrition educators]. I think [they] are very engaging. I felt like I saw a real natural rapport and just easy back and forth."*
>
> *(Dietitian)*

Relationships among participants were also fostered. One provider noted that friendships formed over the course of the program that weren't there when the program started, giving credit to the nutrition education classes:

> *"We did… create a community with those who took the classes together. They looked forward to seeing each other and became friends. We just created this comradery that communities need to have". (Nutrition educator)*

Provider Dedication to the Program is Important

Many providers volunteered their time for FVRx® on top of their regular job responsibilities. Providers' dedication to the concept of "food as medicine" kept them motivated, particularly in regard to using a produce-centric diet to prevent and treat diet-related diseases. One provider explained FVRx® was so appealing to her:

> *"It closes the gap between flowing information to people and expecting them to figure out how to enact that themselves, and actually helping people have access to the food they need to enact the positive behavior change*." (Researcher)

Dedication to the programs' success encouraged providers to get resourceful and creative in the face of limited resources, like funding and staff. One strategy was to utilize relationships with other community partners to pool resources. For example, programs handed out fliers at partners' facilities to recruit and utilized students and dietetic interns to help with programming.

Providers were also dedicated to supporting the well-being of the participants. They anticipated and addressed participant needs, such as adding extra money to bus passes ahead of time. Providers called participants to check in on them and some even took participants home in their personal vehicles. The thoughtfulness of one community coordinator was applauded by another provider:

"You went to the hospital to visit clients who were in the hospital and you sat with them as they received treatment... You devised creative ways for people to get food when they weren't able to due to incarceration or health emergencies or… not being able to take care of children. You advocated for them." (Farmers market manager)

Barriers

Participants' Challenging Life Circumstances Can Make Participation Difficult

Ongoing and unforeseen challenges in participants' lives permeated into their participation in FVRx®. Not having reliable transportation served as a major barrier, with one program citing it as their "biggest barrier." Some participants did not own a vehicle and relied on public transportation. Participants who did own a vehicle struggled with their car breaking down or gas being too expensive. All three programs provided some form of free transportation, including bus passes, rideshare services, and a local church's van. However, some participants, especially solo riders, were hesitant to use a rideshare because they were unfamiliar with or did not trust rideshares.

Providers discussed several situations where it was difficult to contact participants. Participants would run out of minutes and their phones would be turned off. They also experienced unexpected, serious life events over the course of the program, including eviction, homelessness, hospitalization, deportation, and incarceration. FVRx® participation was hindered as a result:

"We had a system for people to get rides through the church and the church van but if you can't call them because their phone, they're out of minutes… then you can't figure out where they're at. People get evicted and you don't know where they're at." (Physician)

Providers had to navigate these personal hardships when trying to help participants succeed in the program.

Sustainability of the Program is a Concern

FVRx®'s sustainability, or the ability to maintain program delivery and impact at a certain level, may be affected by the programs' short duration, finite resources, and challenges of working with local food systems.

Programming was only four to six months long. When the program ended, providers attempted to extend participants' access to produce. One program arranged a community-supported agriculture box for participants post-program, while another program created a stand-alone produce stand to provide F&V after the market closed.

The program's impact on health, specifically weight, was questioned though optimistically:

> *"…although the program length is of course not really enough time to look for sort of statistically significant change in weight we do see people losing some weight and then they hopefully will carry that with them." (Physician)*

Strained resources also restricted program capacity and growth. Providers mentioned lacking funding for certain components that they wanted to include, like health measurement tools. Another program wanted to expand but they needed more staff, noting that their volunteers had limited hours. Community coordinators underscored the need for more staff when they explained not having the capacity to engage with all of their participants:

> *"I want to keep it personal but just realistically, it's hard… to call 80 people every week." (Community coordinator)*

While supporting local food systems was a keystone of the FVRx® program, it also came with limitations. The farmers markets operated seasonally, condensing produce access to certain times of the year. Two programs offered limited amounts of produce due to a small number of vendors selling and unpredictable weather and pests impacted what made it to market. Low vendor numbers also reduced produce variety, which one program assumed was the reason why their participants had a hard time spending all of their tokens.

Discussion

This process evaluation gathered the perspectives from 15 FVRx® providers in Georgia regarding what facilitators and barriers were impacting the successes of their PPPs alongside program documents and observations. The results of the study suggest that provider dedication and program accessibility can be major facilitators for positive outcomes in Georgia FVRx® programs, while participants' challenging life circumstances and issues around program sustainability may be barriers. Future and existing programs looking to improve their programming and anticipate pitfalls can learn from these helpful strategies and challenges experienced by Georgia FVRx® programs.

The finding that program accessibility can ease participation in FVRx® can inform future PPP design. The intentional preparation of seasonal recipes to ease produce use is supported by the findings of a PPP in New York where participants explained how the nutrition classes informed what produce they purchased and prepared (Burrington et al., 2020). The FVRx® nutrition education classes were also found to cultivate a sense of community among participants, joining findings that group education is important for creating a sense of social belonging (Schlosser, Joshi, et al., 2019). Programs should consider including a nutrition education component to both provide ideas about how to use market produce and to foster

community. As nutrition experts, dietitians can play an important role in creating seasonal curriculum and recipes to guide participants' use of market produce. Dietitians can also provide nutrition counseling tailored to participants with diet-related diseases. Research strongly suggests that nutrition counseling delivered by a dietitian significantly improves diet-related clinical markers (Lennon et al., 2017; Pastors et al., 2002; Riegel et al., 2018; Sikand et al., 2018).

The transportation issues reported by providers are consistent with research showing that limited access to transportation is a barrier to purchasing and consuming F&V for individuals with a low-income or who are experiencing food insecurity (Haynes-Maslow et al., 2013; Schlosser, Joshi, et al., 2019; Strome et al., 2016). These findings support the continued provision of transportation in FVRx® programs. Beyond transportation, challenges often related to economic constraints and health concerns made participating in FVRx® difficult. Providers were flexible in program delivery to account for personal hardships, frequently putting participant well-being above adherence to program activities. Future efforts to support FVRx® participants should be approached from a whole-person perspective. Programs should accommodate both known and unforeseen challenges and connect participants to needed services, such as affordable housing and access to medication. FVRx® providers should be adequately paid for their work or have FVRx® responsibilities worked into their compensated job duties.

The study suggests potential challenges in FVRx® program design related to working with local food systems, including seasonal farmers market operations and limited quantity and variety of produce. Despite these challenges, participating in farmers market incentive programs has been found to be a positive experience for both participants (Herman et al., 2008; Saxe-Custack et al., 2018; Schlosser, Joshi, et al., 2019) and farmers (Kunkel et al., 2003), who have

reported higher sales and an increase in new customers (Payne et al., 2013). Participants have described positive interactions with farmers (Saxe-Custack et al., 2018; Schlosser, Joshi, et al., 2019), high quality produce (Saxe-Custack et al., 2018), and excitement about being at the market (Schlosser, Joshi, et al., 2019). Therefore, the positive market experience and impact on local communities may justify potential challenges. PPPs can invest in local food systems while also addressing year-round food security needs. PPPs could partner with grocery stores, perhaps when markets are seasonally closed, to preserve local benefits while expanding food access.

The short program length brings into question the sustainability of FVRx®'s delivery and impact on participants. After FVRx® ended, participants lost access to program benefits like financial incentives, transportation, and community support. Findings from other PPPs are mixed, with some participants continuing to shop at the market without the prescription (Burrington et al., 2020) and other participants struggling to maintain produce consumption due to economic constraints (Schlosser, Smith, et al., 2019). Few studies follow up with participants more than 3 months after the program ends (Bryce et al., 2017; Burrington et al., 2020; Ridberg et al., 2019b; Schlosser, Smith, et al., 2019), leaving the long-term impact unknown. Still, the positive health outcomes seen during FVRx® may reflect the direction of long-term outcomes. These questions call for longitudinal studies to determine the long-term impact of PPPs on produce consumption, food security, and health.

Programs' limited funding to hire staff and cover programming needs emphasizes the need for increased support. The 2018 Farm Bill set aside up to $25 million dollars over five years to directly fund PPPs ("Agriculture Improvement Act of 2018," 2018); however, it's too soon to say if this amount of funding is enough to adequately support programs. Future policies should

consider expanding the short-term nature of PPPs to better address large scale problems of food insecurity and diet-related diseases.

There are considerable strengths to the study. Trustworthiness of the study was enhanced by collecting data using multiple methods and by including perspectives of providers from different program designs (Merriam & Tisdell, 2015). Study limitations include not having a representative from each program component present for each site during the interviews, leaving room for unheard perspectives. The findings are also limited to the context of Georgia FVRx® programs and may not apply to all PPP settings. However, PPPs can learn from the facilitators and barriers that impacted program outcomes in Georgia and transfer applicable findings to their own programming.

Conclusion

This process evaluation with a qualitative comparative case study approach suggests facilitators and barriers in relation to Georgia FVRx® program design and implementation, highlighting unique opportunities to improve programming. Research on the long-term program impact is needed and policy options for sustainable, scaling up of PPPs should be explored.

CHAPTER 5

PARTICIPANT EXPERIENCES IN MIDWEST AND SOUTHEAST PRODUCE PRESCRIPTION PROGRAMS[3]

[3] Newman, T & Lee, J.S. To be submitted as an original research article to Translational Behavioral Medicine.

Abstract

Introduction: Little is known about the experience of participating in a produce prescription program (PPP) where healthcare providers "prescribe" subsidies for produce. This qualitative study sought to understand the PPP participant experience.

Methods: Ten 2019 participants were recruited from two PPPs in the Midwest and the Southeast. Semi-structured individual interviews were conducted in person or by phone to determine participants' experiences, including programming components, interactions with staff, program impacts, and participation challenges. Two analytic methods, thematic analysis and narrative analysis, were conducted on interview transcripts for a general and holistic understanding of the participant experience, respectively.

Findings: Four themes were determined: 1) The market provided a unique experience, 2) The program increased access to produce, 3) The program had physical and mental health benefits, and 4) The program locations could be more convenient. The farmers market provided an interactive, community-centered shopping experience. The program improved participants' access to produce by increasing its affordability and by encouraging new produce and preparation techniques. Participants experienced health improvements in hemoglobin A1c, produce consumption, and mental health. Finally, participants experienced difficulties in accessing program locations. The narratives highlighted how, for some, the programs "came at the right time" and catalyzed meaningful change after a hardship.

Conclusion: PPPs provided a unique experience and improved ten participants' access to produce and health, despite transportation challenges. The findings underscore the everyday realities that shape the participant experience and call for holistic programmatic support and policies to achieve long-term health and access to healthful food.

Keywords: Produce prescription program, qualitative research, narrative analysis, participant experiences**,** food access

Introduction

In a produce prescription program (PPP), healthcare providers "prescribe" produce to patients to address food insecurity and/or diet-related chronic diseases. The prescription helps patients with a low-income to afford to purchase produce, usually sourced from farmers markets, for a specified time period with the intent to improve their food security and/or health.

Overall, PPPs have been shown to increase produce consumption (Cook et al., 2019; Freedman et al., 2013; Jones et al., 2020; Marcinkevage et al., 2019; Saxe-Custack, LaChance, et al., 2020; Seligman et al., 2015; Trapl et al., 2018), improve diet quality (Berkowitz, O'Neill, et al., 2019), reduce food insecurity (Berkowitz, O'Neill, et al., 2019; Jones et al., 2020; Marcinkevage et al., 2019; Ridberg et al., 2019a), and modestly improve conditions of diet-related disease (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Cavanagh et al., 2017; Jones et al., 2020; Seligman et al., 2015; York et al., 2020) in underserved populations. These reported outcomes reflect what programs anticipated to impact and therefore measured. Few studies have also examined participants' experiences in the program, which can reveal impacts that program administrators may have not expected.

Few studies have explored experiences in PPPs from the perspective of the participants themselves (Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019; Slagel, 2020). A process evaluation of a three-month long PPP prioritizing adults experiencing food insecurity and diagnosed with hypertension in Cleveland, OH was conducted to determine how the program translated to patients' everyday lives. Participants reported how the program positively impacted their lives, including an increase in their produce consumption and farmers market shopping (Schlosser, Smith, et al., 2019). Participants also pragmatically saw their access to market produce as a temporary luxury. Economic insecurity influenced their program participation and

limited their ability to maintain behavior change after the program ended. For a better understanding of the PPP participant experience, more research is needed.

The purpose of the study is to add to the scarce literature around the participant experience in PPPs from the perspective of the participants themselves. Narrative analysis of interviews with participants about their experiences can provide a holistic view into PPP impacts within the context of participants' lives. These insights underscore ways program providers and policymakers can continue to support participants in their journey towards long-term health and access to healthful food.

Methods

Approach

The study utilized in-depth, semi-structured individual interviews in person or by phone with ten past participants of PPPs to better understand participants' experiences. The study was conducted with an interpretivist approach based on the assumption that knowledge is constituted through lived experience in the world (Sandberg, 2005). Thus, two analytic methods were employed to fully capture the program experience within the context of participants' lives (Gephart Jr & Rynes, 2004).

Thematic analysis was conducted to determine common elements of the participant experience and contribute to general knowledge about the nascent topic (Braun & Clarke, 2006). However, fragmenting the data into codes and categories and producing abstract generalities through themes can erase the highly personal and particular experience of each participant (Polkinghorne, 1995). Therefore, narrative analysis was also conducted to provide a holistic, or whole person, understanding of participants' experiences within the contexts of their lives. The study of narrative is the study "of the ways humans experience the world" (Connelly &

Clandinin, 1990, p. 2). In narrative analysis, descriptions of events and happenings are collected, synthesized, and configured into a story, or "an organized whole by means of a plot" (Polkinghorne, 1995, p. 7). The narratives also serve to humanize the participants' experience by retaining the complexity of the experience and the emotional meaning participants connected with it (Polkinghorne, 1995). Participants' voices can be amplified by bringing their stories center stage.

The study was deemed exempt by the University of Georgia Institutional Review Board.

Sample and Recruitment

Participants from two PPPs were purposively (Given, 2008) recruited to share their experiences for the study. A PPP was defined as one that included a healthcare provider or was housed in a healthcare facility where participants were provided a prescription that subsidizes produce with the intent to address something specific to the individual (e.g., food insecurity or health). Individuals who had been enrolled in a PPP since 2018 were eligible for the study to enhance the likelihood that participants could recall their experiences. Those that had not participated since 2018 were excluded.

Initially, administrators from five PPPs in the Southeast were contacted about recruiting their participants to share their experiences. Three administrators did not respond. One program's administrators were interested, but access to their participants was not granted within the study timeline. The researcher directly recruited one participant from the fifth and final program through a personal connection, as the researcher had previously interacted with the participant as an administrator of the PPP they participated in. Sixty additional PPPs from across the country were contacted by email for a separate study regarding their program design and implementation. Program administrators were asked to participate in this sub-study by sharing the research

opportunity with their past program participants. Of the 30 programs that were interested in participating in the main study, only one program also participated in the sub-study. This program, located in the Midwest, emailed their participant listserv notifying them of the opportunity to share their program experiences. Interested participants directly emailed the researcher and were assigned numbers. The researcher invited those chosen by a random number generator to participate in the study.

A total of ten participants were recruited. One participant of a PPP in the Southeast and nine participants from a program in the Midwest agreed to participate in the study (90% female; gender determined by the researcher by conversation, name, and visually if possible).

Data Collection

Participants chose from multiple provided time slots to schedule an interview. Before the interview began, participants were read the consent form, and verbal consent was collected. Interviews were recorded using the Rev Call Recorder app.

The semi-structured interview guide asked about how participants felt about fruits and vegetables; what their program expectations were; their experiences with the healthcare, food retailer, and nutrition education aspects of the program; their interactions with program staff and other participants; their proudest change related to the program and how those changes have been sustained; how it impacted their lives and their family members; food and nutrition issues that they care about; challenges to participating; and suggested changes. Information about the setting and flow of the two programs was ascertained from the interviews and summarized to provide context for the findings. Interviews took place between October 2019 and March 2020.

The researcher critically self-reflected on her dual role as the researcher and a program administrator for the one participant from the Southeast in research memos to acknowledge any

potential bias during the research process (Preissle, 2008). Power distribution was also analyzed. Research decisions were tracked in a series of research memos to increase study dependability, similar to an audit trail (Merriam & Tisdell, 2015).

Data Analysis

Thematic Analysis

Interview recordings were transcribed using a voice-to-text software service. Transcripts were reviewed for accuracy and to remove any identifying information. Sections in the data were then coded, or assigned summative, "essence-capturing" short words or phrases to interpret the data's meaning (Saldaña, 2015). Deductive coding was used to apply existing concepts from the literature to the data (Linneberg & Korsgaard, 2019). For example, research shows that PPPs can impact participants' health, so information about the impact on one's health was looked for and coded accordingly. Codes were also developed without a preconceived framework, or inductively (Linneberg & Korsgaard, 2019), to capture the complexity and novelty of the participants' experiences.

Codes were then categorized into larger groups of information based on similar content. Categories were compared and contrasted to identify any patterned responses or meaning throughout the data, or themes (Braun & Clarke, 2006). Themes were concepts that were either mentioned frequently or that captured something important in relation to the participant experience (Braun & Clarke, 2006). Themes were identified at a semantic level where explicit or surface meanings of the data were interpreted to theorize the broader meanings of the patterns (Braun & Clarke, 2006). Alternative explanations of the themes were explored and evaluated against the findings to increase credibility (Merriam & Tisdell, 2015; Patton, 1999).

Narrative Analysis

After coding each interview, summaries of the individuals' unique experience in their PPP were created for all ten participants. The summaries then needed to be configured into stories, which are grounded in "the phenomenon of individual protagonists engaged in an ordered transformation from an initial situation to a terminal situation" (Polkinghorne, 1995, p. 7). These three key points in the story—the beginning, transformation, and end—served as the guide map to configure a coherent story. The two most compelling summarized experiences that included a transformation element were configured into stories and served to represent the impact the program can have on a participant's life.

Configuring the stories began with identifying their conclusions, which established a direction for the plot to progress towards. Each story concluded in the present with how the program still impacts the participants' lives today. One participant was a year out of their program, and the other program had ended two months before. With the ending in mind, the researcher then identified the beginning of their stories, or how the participants first became involved with the program. Participants were introduced with some of their history and how they embodied the world (e.g., age, gender, disposition) so that the reader could locate them spatially and temporally (Dollard, 1935). The final element in the guide map was the transformation, defined here as a turning point after a complicating action that results in meaningful change. For both participants, their complicating action was intertwined with their introduction: a health or financial hardship that deemed them eligible to initially enroll in the program. The middle of the stories included rich visual details about the participants' process of transformation following the complicating action, which consisted of their engagement with the program once enrolled. The result of the transformation was the impact of the program on the participant: the change in produce consumption, the improved mental health, the knowledge they gained. The change

produced from the transformation either aligned temporally with the conclusion if the changes had been sustained or were bridged to the present by a description of what happened since the program ended.

After plotting these key elements, the stories were reviewed to ensure a coherent and meaningful progression. Details were added or removed based on their contribution to this progression. Third-person voice was used to acknowledge that the narratives were configured by a third-party— the researcher—and not directly by the participants themselves (Rhodes, 2000). Rather, the final product is a co-construction between researcher and participant. Participants' verbatim words support the narratives when possible.

Findings

Program background

Participants described their program structure and flow during the interviews. Both the Southeast and Midwest programs prescribed participants a produce prescription through a healthcare provider ($1 per household member/day in the Southeast; ten $10 vouchers in the Midwest). The Southeast program was in an urban setting while the Midwest program spanned urban and rural areas.

The larger of the two programs, the Midwest program operated in three cities and partnered with multiple farmers markets, a brick and mortar farm store, and farms stands to accept the produce prescriptions over seven months (June-December). When participants got to the market, they would check in with the community health workers, the program's staff, to create a health goal or to check in on their goal progress. They would then exchange their paper prescription for tokens and shop for produce like asparagus, pears, and kale. Participants could flip through a featured book of recipe cards for inspiration or watch a cooking demonstration

with a sample tasting. Once a month, the markets would host a "special event" with a brief presentation on a healthy eating topic and a raffle. This program allowed participants to reenroll each year.

In the Southeast program, prescriptions were accepted at a single farmers market during a six-month time frame (July-December). Participants attended six nutrition education classes taught weekly by the Supplemental Nutrition Assistance Program Education (SNAP-Ed) at a separate location from the market. On Wednesdays or Saturdays, participants would arrive at the market pavilion. Music from the band would mingle with the chatter from the shoppers as participants picked out produce like collard greens or watermelon radishes with their tokens. Participants could not reenroll.

Themes

Thematic analysis determined four main themes: 1) The market provided a unique experience, 2) The program increased access to produce, 3) The program had physical and mental health benefits, and 4) The program locations could be more convenient (Table 5.1).

Table 5.1

Themes and Categories from Interviews with 10 Participants of Produce Prescription Programs in the Southeast and the Midwest Regarding their Program Experiences

Themes	The market provided a unique experience	The program increased access to produce	The program had physical and mental health benefits	The program locations could be more convenient

Categories	Family joined Market interactions Market activities Comparisons to grocery stores	Increase in produce affordability Increase in new produce consumption Preparing produce in new ways	Clinical outcome improvements (Hemoglobin A1c) Increase in produce consumption Mental health improvements	Far locations Transportation issues

The Market Provided a Unique Experience

Shopping at the farmers market was described as "more than just going to shop" by the participants (n = 5); it was an experience. Multiple participants took family members to the market where they shopped together. Their children picked out their own produce and asked farmers questions, like "How do you grow these? Where did you grow these?" Some of the children were inspired to grow their own garden after visiting to the market, or to help cook the produce that they bought.

Participants had positive interactions at the markets. The community health workers were a "helpful", "kind", and "encouraging" presence. Participants appreciated how the workers checked in on them and remembered things about their lives, which made them feel cared for:

> *"I just expected it to be a simple transaction and it's become more than that… The ladies [community health workers] remember you. That's the big one for me is that they remember me not only week to week, but year to year. They always make you feel like you're their friend." (PWAS03)*

Many enjoyed interacting with the farmers (n = 8), who shared their knowledge about gardening or how to prepare produce with participants. The market also had activities that added to the experience like bands playing, cooking demonstrations with recipes to sample, and drawings for prizes. One participant noted the multi-faceted and intentional structure of the program that extended beyond financial aid:

> *"I feel like the way it's set up, it's not like just the here's money, go buy this. It's set up in a way that they educate." (PWAS07)*

The market was an opportunity to get "out" into the community and socialize, which was seen as a benefit over shopping at grocery stores. Comparisons to grocery stores continued as market shopping was painted to be the right or correct place to shop by participants: market produce was "not coated," not "full of preservatives" and had "less pesticides." The implication was that produce from the grocery store wasn't as good as market produce because it wasn't as fresh or as healthy, though it was acknowledged to be cheaper. There was also talk of shopping at the farmers market as a way to support small business and local farmers and contribute to the community, with a sense of duty underlying some comments:

> *"[We] really should be shopping at the farmers market and buying the fresh produce and relying on our community more than stuff being trucked in from all over... I'd rather put money in my neighbor's pockets rather than CEOs." (PWAS05)*

The Program Increased Access to Produce

The programs improved access to produce by increasing produce affordability, broadening participants' palettes for new produce, and providing the knowledge of how to prepare it.

The produce prescription was a way to afford fresh produce or produce in general when participants otherwise wouldn't have been able to due to limited budgets, as highlighted by one participant:

> *"You make a way, you know what I mean? So we always had food. It just may not be the healthiest or the freshest food, but it was nice to be able to get those healthy, fresh foods, you know, and you knew you were going to be able to get $100 worth that season." (PWAS04)*

One participant explained how the prescription lowered their weekly food bill. Another participant was able to shift their financial resources to purchase other items now that their produce expenses were covered. The program's impact on produce affordability was noticeable for one participant after the program ended. Their produce consumption declined back to what it was before the program started because continuing to purchase produce wasn't in their budget.

Participants would often try previously unfamiliar items, many times after seeing a cooking demonstration of how to prepare the produce and tasting a sample. The majority of participants used their prescription to purchase and try new fruits or vegetables, like kohlrabi, ground cherries, and celery root (n = 6). The prescriptions allowed participants the financial freedom to take risks on new produce:

> *"We've tried the new products that we wouldn't have tried, you know, at the store cause I wouldn't have paid money in case I didn't like it. But makes it nice when you know, okay I can get some here out of the budget that they give you and try it." (PWAS04)*

The cooking demonstrations also provided participants with new ways to prepare produce through step by step visual instructions that they could recreate at home. The demonstrations made it easier for participants to branch out or give previously disliked produce another chance

with the assurance that they would like it after tasting a sample. For instance, one participant could finally enjoy collard greens after learning how to prepare them without "that tremendous bite of bitterness."

The Program had Physical and Mental Health Benefits

In addition to increasing produce access, some participants also experienced physical and mental health benefits. The most commonly reported physical benefit from participants was an increase in the amount of produce they consumed (n = 7). For instance, one participant doubled their fruit consumption during the program, up from 1–2 servings a day to 2–3 servings. The increase in consumption was also often participants' proudest reported change related to the program, alongside cooking with more produce (n = 5).

Participants also experienced positive clinical outcomes, specifically an improvement in HbA1c, a clinical marker of diabetes. Three participants with diabetes improved their HbA1c over the course of the program, often paired with more advanced medical treatment. For instance, one participant dropped his HbA1c from 11.3 to around 9.0 after six months in the program. He credits his healthier diet coupled with more aggressive insulin treatment for the improvements. Another participant received bariatric surgery and dropped their HbA1c from around 8.4 to 5.4 and is no longer a diabetic. She said the produce from the program played a "huge factor" in the 3-point drop and helped her replace sweets with fruit. A third participant dropped their HbA1c by a full point with no other medical intervention.

The program positively impacted some participants' mental health, an outcome that programs do not usually formally measure. Three participants explained how the program came at the right time in their life after financial hardship, changes in their health, or both had taken a mental toll:

"It just broke the overall hold that, that depression was having over me. Just the fact that most days I wouldn't want to leave the couch and yet those days I couldn't wait to get out." (PATH01)

"I felt like I didn't have control over pieces. And then I was getting pushed to be disabled. And so for me it was this huge mental piece as well. And this gave me some sort of control over, okay, well I can do this and I can work towards these goals, at least this portion of my life." (PWAS07)

A third participant, a 60-year-old woman, was sent into a cycle of depression and emotional eating after a bad hip replacement that was finally addressed when the program made healthier options more available. Though only impacting a few participants (n = 3), the program had a saving grace effect that defied what one might expect a program of such temporary nature and narrow focus on fruits and vegetables to elicit.

The Program Locations Could be More Convenient

Though they enjoyed the program overall, participants had a few suggestions when they were asked how the program could improve. The most common suggestion was to expand the program to include one of the major markets in the area because of its convenient location and produce variety (n = 6).

The most common barriers to participating revolved around access to program locations (n = 3), namely getting to the farmers markets and the nutrition education classes. Despite both programs providing transportation aid in the form of bus vouchers or ride share services, the distance to the farmers markets was a hassle for some. For two participants, getting to the market or class took multiple buses and hours of time:

"It takes me at least three buses to get to any of the locations… Like to go to the farmers market that's at least a half day I plan. That's the only thing I'll do all day is just go to the farmer's market, you know?" (PWAS02)

Other transportation issues challenged participants' access to the market. A changed bus route and having limited gas restricted which markets a couple of participants could attend. One program could only provide bus passes for a period of time, as they quickly ran out.

Narratives

The following two narratives of individual participants serve as exemplars of the programs' impact on participants within the context of their lives. All names are pseudonyms. Some details were changed to maintain the anonymity of the participants.

Sarah: Back in the Driver's Seat

Sarah presented as a female with a reassuring voice that alluded to her background in childcare. Her love for produce started when she was a child, growing up in a family with six kids that gardened and canned their harvest. Sarah has been in her PPP for the last four years. The program came at the right time in her life when she was being classified as disabled and her income was changing. She was also dealing with a number of health issues, including multiple sclerosis and diabetes. When the program came along, Sarah really needed control over some aspect of her life. The program gave her that control and, in her words, "kind of put me back into a driver's seat [of] some things that I felt like I had no control over."

Sarah is raising one of her nieces and often babysits her other nieces and nephews. She takes the children to the market with her. They ask if they can get produce like cherry tomatoes and berries for snacks, which they like to eat as soon as they get in the car. Sometimes the market will have activities for the whole family to do, such as making a craft out of vegetables.

After the market, the family will go to a nearby park for the kids to play. Sarah described shopping at the market as "more than just going to shop." It was an opportunity for her family to get out of the house and walk around in the community.

She found the program staff to be welcoming and encouraging. The farmers were also helpful, teaching her how to prepare produce in a way that tastes good. For example, she tried a type of squash for the first time and first prepared it by cutting it up and cooking it in a pan. It didn't work well in her dish. The next time she was at the market the farmers told her to try roasting a smaller version of the squash, just as they are, in the oven. It was delicious. She even started incorporating roasted vegetables into different recipes for her dad, who traditionally boiled all his vegetables, and now he's branching out a little more too.

Sarah's only difficulty participating in the program was her health. There were times after she had a surgery or when she wasn't feeling well that walking around in the heat of the farmers market was too much. Her health "would impact the other things in my life anyway too," she said. "So it's not just specifically the market."

Sarah keeps reenrolling in the program because she has a lower income and the prescription helps reduce her food bill. She also continues to learn from the nutrition education handouts and the recipes that the program provides. The program holds her accountable to eat well. Her grocery shopping habits have changed since enrolling to where she mainly purchases produce. Her A1c has also lowered, though not as much as she'd like. She's more cognizant about exercise and incorporating produce into her recipes. Her proudest change related to the program has been integrating more fresh produce into her family's meals.

Phillip: A Return to Himself

Phillip presented as a middle-aged man with a smile that could brighten the room and a warm, good-natured energy that disarmed. Phillip's mom made him try new foods at least once growing up in Florida. He credits her persistence for the love he has now for cooking with a variety of fruits and vegetables. He relies on disability as his only source of income, so even though he wanted to "cook healthier," packaged mixes of pastas and rice were much more affordable. He said that the program was a chance for him to be able to afford "to make the healthy choices."

Phillip moved to town a few years back, but not by choice. He was sick and spent much of 2016 in and out of hospitals, barely leaving his apartment. He sunk into a depression as a result. Shortly before the program began, Phillip was finally ready to explore his new community and sought out the farmers market. He enjoyed the community atmosphere of the market, getting to know people in the community, seeing the bands, and petting the customers' dogs. For him, the market "just creates an overall atmosphere of warmth, community, and friendliness."

Phillip's dedication to the program was evident in how he managed to get across town for the program's nutrition education classes. Without a car, Phillip relied on a patchwork of public transportation. It required a lot of planning to first get to the bus stop, to take the bus to the multimodal station, and then to transfer to another bus that got him to class. The process took several hours.

Not only did the program help Phillip afford the produce at the market, it also benefited his mental health. He said that the program "helped me to get back to being the person that I am… it got me social again. It got me interested in cooking again. It got me interested in wanting to be a part of a farmers market community again. It just brought out a bunch of aspects of my life that I have suppressed just due to depression."

Phillip lost weight and slightly improved his blood pressure over the course of the program. His A1c dropped from around 11.3 to roughly 9.0. Since the program ended a year ago, Phillip has been diagnosed with another illness and has been home a lot. His weight has gone up, but he reports having more energy because he's eating healthier: "I still don't feel anywhere near as lethargic. I'm not getting as fatigued as I was before I started eating better." Phillip continues to shop at the farmers market.

Discussion

Using thematic and narrative analysis, we were able to provide a holistic understanding of the experiences of the study participants in two produce prescription programs. Participants reported how the farmers market provided an interactive, community-centered shopping experience. The program improved participants' access to produce by increasing its affordability, encouraging novel produce consumption, and new preparation techniques. Participants experienced physical and mental health benefits involving improved hemoglobin A1c, increased produce consumption, and in some cases, a transformation. Finally, the study highlighted how long travel distances and transportation issues are challenges in accessing program locations. The two narratives highlight how the program can have a transformative impact that touches various aspects of participants' lives. The findings of the study contribute key insight into the experience of participating in a PPP.

The findings of the study echo previous research showing how farmers markets serve as a space for positive social interaction (Herman et al., 2008; Schlosser, Smith, et al., 2019; Slagel, 2020) and provide a sense of community (Brown & Miller, 2008; Gillespie et al., 2007; Slagel, 2020). Being "out" at the market and the relationships that the participants formed with the program staff and market vendors contributed to a shopping experience that was different than a

typical trip to the grocery store. The added value effect of the program experience is supported by research indicating that the produce prescription intervention in its entirety holds significance beyond its cash value (Berkowitz, O'Neill, et al., 2019). The increase in produce consumption alongside the prescription is underscored by the major restrictive role cost plays in produce consumption for adults with a low socioeconomic status (Bartlett et al., 2014; Buyuktuncer et al., 2014; Cahill et al., 2020; Schlosser, Joshi, et al., 2019; Slagel, 2020; Trapl et al., 2018). The programs' extended impact to include family members aligns with research showing how PPPs have been seen as a family intervention (Schlosser, Smith, et al., 2019). Research findings elsewhere echo the observed link between participants' experimentation with novel produce and preparation techniques with both the nutrition education and the risk tolerant financial freedom the prescriptions provided (Burrington et al., 2020; Schlosser, Smith, et al., 2019; Slagel, 2020).

Whereas the role of economic constraints has been documented elsewhere as an influential factor on the participant experience (Schlosser, Smith, et al., 2019), the current study expands the literature to include the role of health hardships on PPP engagement. Participants' health took precedent when they were hospitalized or feeling unwell, limiting their ability to attend program components. The study also links for the first-time physical health issues among PPP participants to detrimental mental health effects. Three participants experienced depressive symptoms linked to their health problems, which shaped how the program impacted them. These findings are supported by the bidirectional association between chronic medical conditions and depressive symptoms (Lindeman et al., 2000; National Institute of Health, n.d.; Patten, 1999; Steptoe et al., 2014), with various suggested explanations including physiological mechanisms of diseases and the influence of depression on medical management (National Institute of Health, n.d.; Patten, 1999). As PPP participants tend to have a diet-related chronic disease, providers

might approach participants holistically and consider incorporating mental health services into their programming.

Further, changes in mental health have rarely been measured PPPs. Our findings showed that some participants' mental well-being was positively impacted by their participation in the program. In addition to the role of chronic medical conditions, PPP participant's mental health may be at an increased risk due to the potentially bidirectional association (Martin et al., 2016) between food insecurity and mental illness (Bergmans et al., 2019; Martin et al., 2016), particularly among those who experience high levels of stress and weak community belonging (Martin et al., 2016). PPPs have the potential to improve mental health by modestly improving chronic medical conditions (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Seligman et al., 2015) and increasing food security (Berkowitz, O'Neill, et al., 2019; Jones et al., 2020; Ridberg et al., 2019a). PPPs can also reduce economic hardship—a stressor (Santiago et al., 2011) and contributor to depressive episodes (Lindeman et al., 2000)– with the provision of the incentive, and connect individuals to their community through farmers markets, nutrition education events, and healthcare visits. Similarly, SNAP recipients have reported that the ability to buy enough food to make ends meet was the primary strength of the assistance program, resulting in less stress and feelings of support during economic hardship (Leung et al., 2017). PPPs also provide access to fruits and vegetables, which may moderate the association between food insecurity and mental health, potentially through inflammatory mechanisms (Bergmans et al., 2019). However, the only study that examined depressive or anxiety symptoms in a PPP found no significant difference between PPP participants and a control group (Berkowitz, O'Neill, et al., 2019). Further, the relationship between PPP participation and mental health in the current study is based on a small sample size and should be interpreted as a tentative finding. More research is

needed to confirm the role of PPPs on mental health, the mechanism in which PPPs may impact mental health, and whether or not the positive impacts persist beyond the program. Still, the findings offer novel insight into the transformational impact these changes had on a few participants. Participants partially or largely credited the program for a turning point after a hardship. The program came "at the right time" in their lives and helped them get back to a state of being that they had lost.

The narratives highlight how programming does not operate within a void. Rather, PPPs function as a time-bound experience within the economic and health realities of participants' lives (Note: participants' realities also include positive features, like joy, strength, and triumph). The level of fruit and vegetable consumption obtained during programs has been found to be difficult to sustain after programming ends due to economic hardship (Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019), though some participants do report continuing to shop at the market (Burrington et al., 2020; Slagel, 2020) and consuming more vegetables (Cahill et al., 2020). Despite its brief tenure, the programs were still able to bring participants and their families a positive experience and contribute to improvements in physical and mental health, often in conjunction with medical interventions. Participants also sustained certain changes after programming ended despite the absence of a financial incentive. For instance, Sarah's grocery shopping habits changed and Phillip continued eating healthfully. Though the sample size of the study was small, these findings align with research showing how the nutrition knowledge, skills, and motivation to eat healthfully gained in the program can persist after programming ends (Cahill et al., 2020; Slagel, 2020).

The findings have implications for future programming and research. Our findings align with research consistently showing transportation issues— like not having a vehicle, car trouble,

or not being able to afford gas—to be barriers to participation (Cahill et al., 2020; Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019). Even when transportation aid like bus passes are provided, public transit poses challenges (Schlosser, Joshi, et al., 2019) or the distance to travel is long. Populations with a low-income have reported a preference for convenient food shopping as it led to less stress even if it cost more (Webber et al., 2010). Convenience was described as the physical closeness to home, a convenient time to shop, and the ability to maximize time by satisfying multiple needs while shopping, including a one-stop shop. Future programs should prioritize making program locations convenient for participants either by recruiting individuals who live nearby or by bringing program components to participants through, for instance, mobile markets or farm stands at the healthcare site. Further, programs should consider evaluating mental health measures to determine if and how their program impacts mental well-being. Finally, future research should explore the role of PPPs in addressing the structural inequities that impact participants' long-term health and access to healthful food.

The study's findings also have implications for policy. Research shows that legislators' interests are impacted by real-world stories from their constituents (Brownson et al., 2018). The personal narratives described here, as well as those from participants across the country, can be shared with policymakers to garner increased support for the Produce Prescription Program funding established in the 2018 Farm Bill ("Agriculture Improvement Act of 2018," 2018). Given their positive impact on participants lives, PPPs should receive continued support in the 2023 Farm Bill.

The study was not without limitations. The sample size was small and the researcher did not reach saturation. Further, due to difficulty recruiting, only one participant from the Southeast was included in the study. Therefore, there may be different perspectives from other participants

that were not captured, particularly from the Southeast program. Participants also selected to be in the study. It is possible that participants with an exceptionally positive experience or those with the greatest financial need for the $20 incentive offered may have elected to participate. The experiences shared may be skewed towards those who had a positive program experience and those who potentially were impacted the most, as individuals with the highest need may respond best to PPP interventions (Jones et al., 2020). Finally, despite its critical step in the narratives' configuration, narrative smoothing—or the process of including pertinent parts in the participants' stories and leaving unessential details out—only provides the reader with the story that the researcher has selected to share.

Despite these limitations, the authors used two different forms of analysis methods to seek credibility and trustworthiness (Merriam & Tisdell, 2015) of participants' experiences in PPPs. Rich, thick description in the narrative cases provided novel insight into the impact of the programs on participants within the context of their lives. Through the narratives, the previously unheard voices of the participants were given a platform to be amplified. Though a small sample size, participants were recruited from two PPPs that differ in geographic location, program design, and implementation to gather maximum variations on the participant experience and enhance the transferability of the findings (Merriam & Tisdell, 2015).

Conclusion

This qualitative study utilizing two forms of analysis contributes important insight into the participant experience of produce prescription programs from the perspective of the participant themselves. The programs were found to provide a unique program experience and have valuable impacts on participants' access to produce and physical and mental health despite transportation challenges. Narrative cases highlight how for some, programs can have a

transformative impact on overall health and well-being. However, the economic and health realities participants face before, during, and after the program provides a sober understanding that there is more work to be done. These challenges call for holistic programmatic support and continued federal funding for PPPs to achieve long-term health and access to healthful food.

CHAPTER 6

DISCUSSION AND CONCLUSION

Summary of Findings

This dissertation utilized mixed methods to better understand U.S. PPPs, specifically how programs were designed and implemented, what strategies help or hinder program success, and the PPP experience of participants and their families from the perspectives of the participants themselves. Three main findings summarize the dissertation.

First, PPPs were found to have positive clinical and non-clinical impacts on participants, though the need in communities was higher than what most programs could currently meet. In the study regarding PPP participant experiences, programs were found to improve participants' access to fruits and vegetables by increasing produce affordability and by encouraging novel produce consumption and new preparation techniques. Participants experienced physical and mental health benefits involving increased produce consumption, improved HbA1c, and in some cases, the program served as a saving grace, coming into participants' lives at the right moment after a hardship. These findings echo the link between PPPs and increased produce consumption (Marcinkevage et al., 2019; Saxe-Custack, Sadler, et al., 2020; Trapl et al., 2018) as well as modest improvements in conditions of diet-related disease (Berkowitz, O'Neill, et al., 2019; Bryce et al., 2017; Cavanagh et al., 2017; Jones et al., 2020; Seligman et al., 2015; York et al., 2020). Further, the experience of shopping at the farmers market provided an interactive, community-centered shopping experience that participants often shared with their family members. These findings underscore how the program in its entirety appears to have positive

impact on participants beyond the financial value of the produce prescriptions provided (Berkowitz, O'Neill, et al., 2019). PPP providers reported additional participant benefits in the national online survey, including increased nutrition knowledge, social connections with each other and with program staff, and increased confidence in shopping for produce. While PPPs could positively impact those enrolled, the majority of programs found that the need in their community was higher than what they could currently meet. Programs served the areas of greatest need, namely food deserts or rural areas with low access to produce and areas with high poverty, chronic disease, wage inequality, or food insecurity. A little over two-thirds of programs wanted to expand their programming by partnering with more sites or serving more people to better meet that need. However, the majority of those programs noted inadequate and inconsistent funding and staff to do so.

The second main finding was that PPPs vary widely in program design and implementation across the country, though programs shared some common aspects. Most programs included three main arms: a produce prescription redeemable for fruits and vegetables, if not more food; a healthcare visit in which care was provided; and a nutrition education component. How programs structured and delivered each of these components varied, with each method offering unique benefits and limitations. A key differentiation across programs was the partnerships with food retailers, particularly in regard to the concern around PPPs ability to address food access issues year-round (Trapl et al., 2018). The interviews with program providers about facilitators and barriers in Chapter 4 highlight the challenges of partnering with local farmers markets. Markets operated seasonally, condensing produce access to certain times of the year, and a small number of vendors and unpredictable weather impacted what made it to market. These limitations were countered by the social benefits and sense of community that the

market provided, outlined in Chapters 3 and 5. In Chapter 3, providers described a "community building effect" and "an enrichment piece for families" at the markets. Participants expanded on the market benefits in Chapter 5 when they reported positive interactions with program staff and market vendors, knowledge gained at the market cooking demonstrations, and experiential value of being "out" in the community. The findings of the study echo previous research showing how farmers markets serve as a space for positive social interaction (Herman et al., 2008; Schlosser, Smith, et al., 2019; Slagel, 2020) and provide a feeling of community belonging (Brown & Miller, 2008; Gillespie et al., 2007; Slagel, 2020). Farmers market shopping was juxtaposed by participants to shopping at a grocery store, with the perspective that market produce was fresher, healthier, and contributed to their community when purchased. Despite this, grocery stores offered more consistent hours of operation year-round. Smaller grocers provided familiar spaces to shop at and culturally appropriate options for participants to choose from. Stores' point-of-sale systems also allowed programs to track produce prescription redemption rates. Further, alternative strategies of bringing produce directly to participants through produce boxes, mobile markets, or farm stands set up at the healthcare location can address the critical barrier of physical distance in food access for participants.

Programs appeared to adapt to their local setting, partnerships, and available resources. These adaptions are a strength of PPPs as those in the community know how to best utilize their resources to serve their fellow community members. However, the variety in structure and program evaluation makes it difficult to compare impacts across programs for a wider understanding of PPP effects on participants.

Finally, the third main finding was that PPP participants experience challenging life circumstances before, during, and after the program that can influence their PPP experience and

the programs' impact on their long-term health and access to food. The findings of Chapters 4 and 5 show how health and economic realities like hospitalization, eviction, and limited financial resources can make it difficult to participate in PPP components and/or maintain behavior change after the program ends. A major challenge that participants experienced across all three studies was a lack of access to reliable transportation, a problem that has been consistently reported in PPPs (Cahill et al., 2020; Schlosser, Joshi, et al., 2019; Schlosser, Smith, et al., 2019). Participants either did not have a vehicle, had a vehicle but found high gas prices to be a barrier, or they had to rely on sometimes time-consuming and complicated public transportation. Despite programs providing transportation aid, such as bus vouchers or ride shares, transportation challenges still made it difficult for participants to attend program components. Bus routes changed, the physical distance to travel was long, multiple bus transfers were required, participants did not trust ride shares, or there were limited bus vouchers available.

Despite these challenges, the programs were still able to bring participants and their families a positive experience and contribute to improvements in physical and mental health. PPPs have been described elsewhere as temporary "relief" from their economic insecurity (Schlosser, Smith, et al., 2019, p. 2571). Research shows, however, that benefits can extend beyond program boundaries, with the nutrition knowledge, skills, and motivation to eat healthfully gained in the program persisting after programming ends (Cahill et al., 2020; Slagel, 2020). Participants' ability to maintain the same level of fruit and vegetable consumption has been mixed, with some participants sustaining produce consumption and market shopping (Burrington et al., 2020; Cahill et al., 2020; Slagel, 2020) while others report difficulties maintaining behavior change due to economic hardship (Schlosser, Joshi, et al., 2019; Schlosser,

Smith, et al., 2019). Whether or not the positive impacts on mental health seen in Chapter 5 persist beyond the program need to be explored.

An additional fourth methodological topic warrants discussion to inform future PPP and nutrition incentive research. There were considerable challenges undertaking this research. With no centralized database for PPPs, we had to sift through journal articles, webpages, program reports, and news articles to identify what PPPs existed and who to contact for the national PPP survey. While the recruitment rate was adequate (50.0%), some emails were outdated and returned to the sender, identified PPP administrators had transferred jobs, administrators were too busy to participate in the study, and some programs turned out to be duplicates that had been renamed. The providers that did participate in the study, however, were eager and excited to share about their programs. Recruitment for the study about PPP participant experiences was even more challenging. The original proposal for the study included recruiting past PPP participants from multiple programs in the state of Georgia. However, due to the structure of PPPs, it is difficult and ethically questionable to directly contact past participants given the vulnerable issues that the programs address. Rather, researchers must be connected to participants through their PPP providers, with whom participants already trust and have a relationship with. Thus, we reached back out to the providers interviewed in Chapter 4 in addition to providers at a large, hospital-based PPP in Atlanta. Only providers from the hospital-based PPP responded and were willing to recruit their participants. However, as they were based out of a large hospital, the study needed to be approved by the hospital's research oversight committee before beginning. The paperwork process began in October 2019 and involved the hospital's research oversight committee and legal team, UGA's Institutional Review Board and legal team, and the PPP providers at the hospital. After five months of back and forth, in

February 2020 we realized that a timely agreement was not going to be feasible and notified the PPP providers of the outcome. We needed to pivot and recruit participants from elsewhere. We then asked each program that we recruited for the national PPP survey if they would also be interested in connecting us to their participants. Few out of the 30 recruited program providers were interested and only one sent an email blast to their participant listserv, which is who was included in Chapter 5. The challenges of this dissertation highlight how difficult it is to access vulnerable PPP populations within the legal protections of the healthcare system and beyond. Finally, the variety of program models and incomplete data tracking made it difficult to compare certain data across programs, such as weekly prescription values. These evaluation issues are not surprising considering the logistical challenges of data collection across multiple program sites (Marcinkevage et al., 2019). Further, over half of the programs in Chapter 4 were owned by a non-profit or government agency. These entities may encounter challenges of accessing participant health records from healthcare partners for consistent tracking.

Limitations and Strengths

The findings of the dissertation should be considered within the contexts of its limitations. The two qualitative studies (Chapters 4 and 5) had small sample sizes, meaning that there may be different perspectives from other program providers and participants that were not captured by the studies. In Chapter 5, saturation was not reached and only one participant from the Southeast PPP was included in the study. Therefore, the full participant experience may not have been illuminated, particularly for the Southeast program. In Chapter 3, PPPs there are limited PPPs in the Southeast and the Mountain Plains regions and we were not able to recruit the few that were in operation. The findings of this chapter may not be generalizable to these unique regions. Further, some survey questions had low response rates in Chapter 3. These lower

rates could reflect the evaluation challenges experienced by programs around inconsistent tracking of budget and voucher data as well as a lack of standardization in program requirements. The lower rates could also be due to confusion around the survey questions, leading to underreporting. In the same study, self-reported text survey responses may be underrepresented as not all program providers had the opportunity to respond to them. However, the text options allowed the survey to capture additional, unanticipated responses. Finally, the variation in produce prescription values also made it difficult to compare data across programs.

Despite these limitations, the dissertation has considerable strengths. All three studies employed triangulation, utilizing multiple methods of data collection and/or analytic methods to confirm the findings and enhance study credibility (the credibility of the findings given the data) (Merriam & Tisdell, 2015). In each study, participants were recruited from multiple, differing sites to gather maximum variation and enhance the transferability of the findings (Merriam & Tisdell, 2015). The dissertation also gathered unique, previously unheard perspectives from participants and from active and expired PPP program providers to contribute to a larger understanding of U.S. PPPs. Finally, the potential for wide application of the dissertation's findings is of value. Chapter 3 is the largest known national survey of PPPs. The majority of programs in the study started in the last five years, indicating a potentially increasing trend in PPPs in the future that may benefit from centralized, practical insight into what program structures and resources already exist that could be transferred to their own programming. Further, the facilitators and barriers explored in Chapter 4 offer timely insight into what strategies may help program success and what barriers to anticipate. The participant perspective explored in Chapter 5 provides a holistic understanding of PPP impacts, which can inform future health and agriculture policy decisions.

Implications for Practice, Research, and Policy

The findings of the dissertation have implications for practice, research, and policy. For practice, the program components and resources required to design, implement, evaluate, and sustain a program discussed in Chapter 3 can serve as a blueprint for new programs wondering what models to consider and what financial and labor resources may be required. The findings can also provide existing programs with alternative options should they wish to alter or improve their current programming. For instance, a program that has had a hard time reaching their rural participants may consider adopting one of the methods discussed in the study, such as a mobile market that brings the produce directly to the participants. The facilitators and barriers discussed in Chapter 4 offer PPP providers with practical helpful strategies and challenges to anticipate during programming, such as the importance of making programming accessible for participants and the barriers of transportation. Further, programs should consider the benefits and challenges of certain food retailer partnerships, namely farmers markets and grocery stores. PPPs can invest in local food systems and preserve market shopping benefits while also addressing year-round food security needs by partnering with both farmers markets and grocery stores. This is not an uncommon strategy, as the programs in the national PPP survey that partnered with grocery stores also often partnered with farmers markets. Further, PPP impact on participants' mental health should be formally evaluated by future programs given the tentative findings of a positive impact on depressive symptoms in participants.

The role of mental health on participants' participation in PPPs underscores the need for programs to address participants holistically, or as a whole person. Participants' economic and health realities can influence the impact of PPPs on their food access and health both during and after the program. One such reality was the issue around the accessibility of program locations.

Transportation in particular was the biggest reported barrier that participants faced. Program providers should therefore prioritize adapting their programming to be as accessible for participants as possible. Simply offering transportation aid does not appear to be enough, as participants still encountered challenges despite provided bus vouchers and ride shares. The "one-stop shop" strategy of aligning nutrition education classes with a healthcare visit and/or onsite produce shopping may ease this burden of finding transportation to attend multiple program components. Additional options include recruiting individuals who live nearby program locations or by bringing program components to participants through mobile markets or farm stands located at the participating healthcare site. Finally, to support a standardized body of evidence for PPPs, programs should consider requiring the implementation of staple intervention elements and evaluation measures while still allowing for local adaptions among program sites (Seligman et al., 2015).

The findings of the dissertation also have implications for research. While Chapter 4 offered insight into helpful strategies for positive program outcomes, PPP best practices have yet to be determined. Research is needed to determine what models of program design and implementation can produce the highest level of impact on participants (Ridberg et al., 2020)**.** Further, the positive impacts of PPPs on mental health are largely unexplored. Only a single study has included mental health measures in their evaluation, with no significant differences found in depressive or anxiety symptoms between PPP participants and a control group (Berkowitz, O'Neill, et al., 2019). The findings of Chapter 5 indicate that PPPs may have a positive, sometimes transformative, impact on mental well-being that should be further explored with attention to the specific mechanism through which PPPs impact mental health and the persistence of those impacts post-program. Further, all three studies highlighted concerns about

the sustainability of PPP impact on participants within their health and economic realities that persist after programming ends. Therefore, longitudinal research on the long-term impacts of PPPs on participants' health and access to food is needed. In addition, economic models simulating the health impacts and healthcare cost savings of PPPs are needed to determine the cost-effectiveness of PPP expansion and to inform potential investments by public and private health insurance companies. Finally, while the 2018 Farm Bill provided federal support for PPPs, a Policy Delphi could be utilized to determine additional policies that could best sustain PPP programming and expansion. The Policy Delphi method employs a set of sequential surveys to allow a group of individuals to deal with a complex problem (Linstone & Turoff, 1975). The method can be used to ensure that all possible options have been put on the table for consideration, to estimate the impact and consequences of any particular option, or to examine and estimate the acceptability of any particular option. The Policy Delphi method could garner the opinions of critical PPP stakeholders such as PPP providers, participants, and policymakers to determine the most feasible, acceptable policy options for sustainable PPP programming.

Before initiating research around PPPs, researchers should consider the challenges of identifying PPPs and their point of contact, accessing vulnerable PPP populations within the legal protections of the healthcare system, the varied nature of PPP design and implementation, and the potential gaps in program-collected evaluation measures. The Nutrition Incentive Hub is an online technical assistance and support resource for GusNIP recipients (Nutrition Incentive Hub, n.d.) and may be a prime location to include a voluntary directory of programs who would be willing to participate in PPP research. This would effectively identify PPPs and their point of contact for future research studies. Further, PPP providers themselves are in the best position to conduct research on their own programs, as they can more easily access program data and have

existing relationships with their participants. Future PPP providers should consider a rigorous evaluation of their programming to contribute to the overall understanding of PPPs in the United States, including partnering with healthcare providers that are willing to dedicate time to effective data collection and sharing health outcomes.

Lastly, the dissertation has considerable implications for policy. The findings of the dissertation highlight benefits offered by PPPs that are not offered by other federal nutrition assistance programs, thus warranting continued PPP support. While SNAP prioritizes individuals with a low-income, PPPs often prioritizes an arguably more vulnerable population with compounding disparities: those who have a low-income, experience food insecurity, and/or have a diet-related disease. Further, most PPPs do not require participants to be eligible for or receive SNAP to enroll in their programs, which means that PPPs can reach those who might not qualify for other nutrition assistance programs (e.g., due to income, immigration status) but are still experiencing food insecurity and are in need of assistance (Berkowitz, O'Neill, et al., 2019; Marcinkevage et al., 2019). PPPs also primarily provide incentives for fruits and vegetables, which may be bypassed by individuals with a low-income for more shelf-stable items that can last longer. Produce incentives can provide a financial reserve for fruits and vegetables that can allow SNAP participants to stretch their food dollars (Parks et al., 2019). While restricting SNAP purchases to healthier foods has been criticized as paternalistic (Laraia, 2012), PPPs offer an alternative benefit that can be combined with SNAP for added nutritional impacts for recipients without restricting choice (Leung et al., 2017). Access to produce is particularly important among populations with a low-income, SNAP recipients or otherwise, as fruit and vegetable consumption has been associated with a decreased risk for the very diseases that are more likely to affect low-income households—hypertension (Boeing et al., 2012; Utsugi et al., 2008) and

coronary heart disease (Boeing et al., 2012). Further, we saw in Chapter 4 and 5, PPPs provide more than just financial assistance—their ties to healthcare providers and community food retailers provide a valued experience that can improve participants' physical and mental health. Nutrition incentive programs have been found to have a "trifecta of benefits" (Parks et al., 2019, p. 396), including an increase in sales of produce for farmers that gets channeled back into the local economy; an increase in produce sales at grocery stores that encourages an expansion of local produce offerings; and improvements in diet, food security, and health.

Despite the positive impacts of PPPs described above, the most common barrier to program sustainability in Chapter 3 was funding. The majority of the programs wanted to expand their programming to meet the high need in their communities by partnering with more sites or serving more people. However, they were limited by a lack of funding and staff. Further, many programs patchworked funding from multiple funding streams, with no guarantee that they would continue to receive funding the following year. Given the unique benefits of PPP programs and the financial barriers to their sustainability, the Produce Prescription Program funding established in the 2018 Farm Bill should be continued and increased in the 2023 Reauthorization of the Farm Bill. The need for access to a high-quality diet and to address diet-related diseases is more urgent now than ever before in recent history considering the impact of underlying conditions on the outcomes of COVID-19 infections (Garg, 2020), many of which are diet-related. PPP models discussed in Chapter 4 can inform current food security responses during the COVID-19 pandemic, specifically the USDA's Farmers to Families Food Box Program. Through this program, the USDA is purchasing billions of dollars' worth of supply-chain impacted fresh produce, dairy, and meat products from farmers and distributing it to hungry Americans (Agricultural Marketing Service, 2020). Taking what we've learned from

PPPs, food distribution sites should be physically accessible (e.g., convenient, perhaps multiple, locations with wide distribution hours) particularly in rural, geographically spread out areas. If feasible, distributors should consider dropping the boxes off at participants' doorsteps to alleviate any transportation challenges. Recipe cards suggesting ways to prepare the fruits and vegetables should also be included in the boxes to encourage easy use of produce. The importance of diet quality in addressing the diet-related chronic diseases that have put Americans at high risk should not be forgotten after COVID-19. Continuing to provide affordable fruits and vegetables through PPPs for our most vulnerable community members can contribute– even if in a modest way– to a healthier, more resilient population in the long-run.

The findings of this dissertation highlight positive clinical and non-clinical impacts of PPPs on participants as well as the need to continue supporting PPPs in their wide variety of models across the country. The findings further suggest various strategies and models for PPP design and implementation that can equip nationwide PPP providers to best serve their communities.

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Appendix A.1 Qualtrics Survey for Active Programs: 2020 National Produce Prescription Program Study

The following survey will ask about your **2019 produce prescription program's** components, funding sources, budget, evaluation, and sustainability**.** You will likely need to consult fellow program providers to answer some of the questions.

You may start and stop this survey as many times as you'd like up until the deadline. To save your answers, click the arrow and move on to the next page. Please use the same web browser you originally opened the link in to return to the survey.

1. **General characteristics of your program**

1) Is your produce prescription program still in operation (e.g., receiving funding, delivering programming)?
   a. Yes
   b. No

   If no to produce prescription program still being in operation,
   You indicated that your program is no longer in operation. Please complete this survey for expired programs:
   https://ugeorgia.ca1.qualtrics.com/jfe/form/SV_0lAkfwBnQpVCjs1

2) What is your name? (This is so the researcher knows you have completed the survey. Your name will be replaced with an ID number and your identity will remain anonymous.)

3) What is your email address? (This is so the researcher can contact you later about the interview. Your contact information will remain anonymous.)

4) What is the name of your **2019** produce prescription program? (This is for data management and analysis. Your program name will be replaced with an ID number and remain anonymous unless you indicate otherwise in the interview.)

5) Where is your program located (city(ies) or county(ies) and state)? (This is for data management and analysis. Your program location will be replaced with an ID number and remain anonymous unless you indicate otherwise in the interview.)

6) What year was your program started?

7) How long was your program last year?

8) What was the goal of your program (e.g., to reduce food insecurity, to increase fruit and vegetable consumption, to improve participants' HbA1C levels, etc.)? You may list more than one goal.

2. Program target audience

9) Did you use any eligibility criteria to select your participants?
   a. Yes
   b. No
   c. I don't know
   d. Other (please explain)

If yes to using eligibility criteria,

9a. What kinds of eligibility characteristics has your program used? Check all that apply.
   a. Sociodemographic characteristics (e.g, age, gender, race-ethnicity, etc.)
   b. Economic characteristics (e.g., food insecure, low income, SNAP-eligible, etc.)
   c. Health characteristics (e.g., presence of a diet-related disease)
   d. I don't know
   e. Other (please explain)

If yes to sociodemographic characteristics,

9a-i. Which of the following sociodemographic characteristics were used for eligibility criteria? Check all that apply.
   i. Age: Children
   ii. Age: Adults
   iii. Age: Older adults
   iv. Gender
   v. Race-ethnicity
   vi. I don't know
   vii. Other (please explain)

If yes to economic characteristics,

9a-ii. Which of the following economic characteristics were used for eligibility criteria? Check all that apply.
   i. Food insecure
   ii. Low income – no specific criteria
   iii. Low income -- at or below the 100% federal poverty level (FPL)
   iv. Low income -- at or below 130% FPL, or eligible for the Supplemental Nutrition Assistance Program (SNAP) or free school lunch
   v. Low-income -- at or below 185% FPL, or eligible for Special Supplemental Nutrition

Program for Women, Infants, and Children (WIC), Supplemental Nutrition Assistance Program - Education (SNAP-Ed), or reduced school lunch
vi. Enrolled in SNAP
vii. Enrolled in WIC
viii. Enrolled in Temporary Assistance for Needy Families (TANF)
ix. Enrolled in Medicaid
x. Enrolled in Medicare
xi. I don't know
xii. Other (please explain)

If yes to health characteristics,

9a-iii. Which of the following health characteristics were used for eligibility criteria? Check all that apply.
i. Obesity
ii. Diabetes
iii. Hypertension
iv. Cardiovascular disease
v. Pregnancy
vi. I don't know
vii. Other (please explain)

10) Can your participants re-enroll in the program the next time that it is offered?
a. Yes
b. No
c. I don't know
d. Other (please explain)

3. Program components

11) Please answer whether or not your program included the following components last year. Check all that apply.
a. Prescriptions for food
b. Nutrition education classes
c. Cooking demonstrations
d. Healthcare visits/assessments
e. Transportation for participants
f. Childcare
g. Additional incentives (e.g., cooking utensils, cookbook, food thermometer, etc.)
h. Other (please explain)

Prescriptions for food

If yes to food prescription,

11a-i. What form did your prescriptions take? Check all that apply.

a. Coupon worth a financial value redeemable for food (e.g., coupon for $5 dollars off a purchase of $20, deal requires purchase with own money)
b. Rebate worth a financial value redeemable for food (e.g., $0.30 rebate for every $1 spent, deal requires purchase with own money)
c. Voucher worth a financial value redeemable for food (e.g., $1 per household member per day, deal does not require purchase with own money)
d. Community Supported Agriculture (CSA) boxes or bags of food
e. Pre-organized boxes or bags of food (not through a CSA)
f. Pre-loaded debit card that could be spent on food
g. I don't know
h. Other (please explain)

11a-ii. What could participants redeem their prescriptions for? Check all that apply.

a. Fruits and vegetables
b. Meat, poultry, and fish
c. Dairy products
d. Breads and cereals
e. Other foods such as snack foods and non-alcoholic beverages
a. Seeds and plants, which produce food for the household to eat
b. Food in general (no restrictions)
c. Other (please explain)

11a-iii. Who prescribed the produce prescriptions? Check all that apply.

f. Program coordinator/administrator
g. Participant liaison (This might be someone besides a program administrator who serves as the liaison between participants and the program.)
h. Physician
i. Nurse practitioner
j. Nurse
k. Registered dietitian nutritionist
l. Pharmacist
m. Social worker
n. Community health worker

o. I don't know
p. Other (please explain)

11a-iv. How much was your prescription worth (e.g., $1/day per person in the household)?

11a-v. Where could participants redeem their prescriptions (or where did the produce for the prescriptions come from)? Check all that apply.

a. Farmers market
b. Grocery store (e.g., Kroger)
c. Supercenter (e.g., Target)
d. Community garden
e. Farm stand
f. CSA style delivery
g. Convenience store
h. Food bank
i. Garden or farm on-site at the healthcare location
j. Food pantry on-site at the healthcare location
k. Mobile market (e.g., a van that travels to certain locations selling food)
l. I don't know
m. Other (please explain)

11a-vi. How often could participants redeem their prescriptions?

a. Only one time
b. Every day of the week
c. Weekly
d. Multiple times a week
e. Monthly
f. Every six months
g. I don't know
h. Other (please explain)

b) Nutrition education

If yes to nutrition education

11b-i. What form did the nutrition education take?

a. A class
b. A pamphlet
c. One-on-one nutrition counseling with participants
d. I don't know
e. Other (please explain)

11b-ii. What topics were covered in the nutrition education? Check all that apply.

a. Nutrients to limit (e.g., sodium, added sugar, and saturated fat)
b. Nutrients to increase (e.g., vitamin D, calcium, and potassium)
c. Cooking healthy recipes
d. Food resource management (e.g., meal planning, shopping healthy foods on a budget, cooking healthy meals on a budget)
e. Food safety
f. Weight management
g. Chronic disease management (e.g., diabetes management)
h. How to be more physically active
i. Gardening
j. I don't know
k. Other (please briefly explain)

11b-iii. What skills were taught in the nutrition education? Check all that apply.

a. How to read a nutrition facts label
b. How to use a food thermometer
c. Safe internal cooking temperatures for meat
d. How to preserve food (e.g., canning)
e. How to choose healthier food alternatives (e.g., swap fried chicken for baked)
f. How to meal prep
g. How to use a pedometer
h. How to carbohydrate count (e.g., for someone with diabetes)
i. How to garden
j. I don't know
k. Other (please explain)

If yes to class,

11b-i-i. Who taught the nutrition education classes? Check all that apply.

a. Physician
b. Nurse
c. Registered dietitian nutritionist
d. Non-profit organization staff
e. SNAP-Ed or EFNEP staff (e.g., peer educator)
f. Cooperative Extension Staff (e.g., County Extension Agent)
g. Chef
h. Farmers market staff/volunteer
i. Student or intern
j. I don't know
k. Other (please explain)

11b-i-ii. How often were the nutrition education classes provided?

a. Just once
b. Weekly
c. Monthly
d. Every other month
e. I don't know
f. Other (please explain)

If yes to one-on-one nutrition counseling with participants,

11b-iii-i. Who provided the one-on-one nutrition counseling for participants? Check all that apply.

a. Physician
b. Nurse
c. Registered dietitian nutritionist
d. I don't know
e. Other (please explain)

c) Cooking demonstrations

If yes to cooking demonstrations,

11c-i. What kind of recipes were used for the cooking demonstration? Check all that apply.

a. Affordable recipes
b. Healthy recipes
c. Low-sodium recipes
d. Vegetarian recipes
e. Recipes using seasonal produce
f. Recipes tailored to the produce provided with the prescription
g. Recipes tailored to a certain culture
h. Recipes tailored to the program's region (e.g., southern food in the South)
i. I don't know
j. Other (please explain)

11c-ii. Was taste testing the recipe a part of the cooking demonstration?

a. Yes
b. No
c. I don't know
d. Other (please explain)

11c-iii. Did the cooking demos occur during a nutrition education class?

a. Yes
b. No, they occurred separate from a nutrition education class (e.g., at a farmers market)
c. I don't know
d. Other (please explain)

d) Healthcare visit

If yes to healthcare visits,

11d-i. What kind of healthcare site did your program partner with? Check all that apply.

a. A hospital
b. A primary care clinic
c. A safety net clinic (provides comprehensive primary care services to all patients, regardless of a person's ability to pay)
d. A specialty clinic (e.g., diabetes clinic)
e. A mobile health clinic
f. Other (please explain)

11d-ii. How many healthcare sites participate in your program?

11d-iii. Who conducted the healthcare visits? Check all that apply.

g. Physician
h. Nurse
i. Nurse practitioner
j. Lab technician (e.g., if participants got their blood drawn at a lab like LabCorp)
k. Registered dietitian nutritionist
l. Social worker
m. Community healthcare worker
n. Student or intern
o. Program coordinator/administrator
p. Participant liaison (This might be someone besides a program administrator who serves as the liaison between participants and the program.)
q. I don't know
r. Other (please explain)

11d-iv. What happened during the healthcare visits? Check all that apply.

a. Participants received nutrition education or counseling
b. Height was measured
c. Weight was measured
d. Blood pressure was measured
e. Finger prick for blood glucose test
f. Blood was taken for a lipid panel test
g. I don't know
h. Other (please explain)

11d-v. How often were the healthcare visits? Check all that apply.

a. Pre- and post-program
b. Weekly
c. Monthly
d. Every 6 months
e. I don't know
f. Other (please explain)

e) Transportation

If yes to transportation for participants,

11e-i. What transportation was provided for participants by the program?

a. Bus passes or vouchers
b. Train or subway passes or vouchers
c. Ride share (e.g., Uber or Lyft)
d. Ride in a community vehicle (e.g., a church van)
e. I don't know
f. Other (please explain)

f) Childcare

g) Additional incentives (e.g., cooking utensils, cookbook, food thermometer, etc.)

If yes to additional incentives,

g-i. What kind of additional incentives were provided? Check all that apply.

a. Cooking utensils (e.g., spatula, cutting mat, or food thermometers)
b. Cooking tools (e.g., crockpots or skillets)
c. Cookbook
d. Pedometer
e. Exercise bands
f. I don't know
g. Other (please explain)

5) Program budget and key resources

12) Where does the funding for your program come from? Check all that apply.

a. Government funding – Federal
b. Government funding – State
c. Government funding – County or municipal
d. Community Benefits funding through hospitals
e. Private donations
f. Non-profit funding
g. Foundation grants (Note: foundations differ from non-profits in that money for a foundation typically comes from a family or a corporate entity whereas money from non-profits come from their revenue and other sources.)

h. Contracts with healthcare provider
i. Contracts with health insurer
j. Fundraisers
k. I don’t know
l. Other (please explain and include funding amounts)

13) What was the total amount that you spent on your program last year?

14) Please enter the most accurate estimate you can for how much your program actually spent on each line item of your budget last year. If you did not spend any money on a line item, please enter $0. Type "I don't know" into the corresponding text box if you do not know a specific line item's budget.
    a. Food prescriptions
    b. Nutrition education (e.g., personnel, supplies, equipment, giveaways, facility/utility fee, etc. specific to nutrition education).
    c. Cooking demonstrations (e.g., personnel, supplies, equipment, perishables for cooking demos, giveaways, facility/utility fee, etc. specific to cooking demonstrations)
    d. Additional incentives (e.g., spatula, food thermometer, cutting mat, etc.)
    e. Meals and refreshments
    f. Childcare
    g. Supplies (e.g., paper and pens)
    h. Equipment (e.g., scale for healthcare visits)
    i. Personnel and labor
    j. Events (e.g., graduation party)
    k. Transportation for participants
    l. Travel for providers
    m. Facility fees
    n. Utility fees
    o. I don’t know
    p. Other (please explain and include the budget amounts)

15) How did your total program spending compare to what you originally budgeted?
    a. My program spent LESS than budgeted
    b. My program spent MORE than budgeted
    c. My program spent about what we budgeted
    d. I don’t know
    e. Other (please explain)

16) Rate how strongly you agree or disagree with the following statement: “Our program had enough funds to meet the need for our services in our community.”
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree

e. Strongly disagree

17) Were there any features that you wanted to include in your programming that you couldn't afford to include?
    a. Yes
    b. No
    c. I don't know
    d. Other (please explain)

If yes to not being able to afford features,

17a-i. What features did you want to include in your programming that you couldn't afford to include? Check all that apply.

a. A larger food prescription (e.g., a larger subsidy or more produce)
b. Food prescriptions over a longer period of time
c. Food prescriptions for more people
d. Nutrition education
e. Cooking demonstrations
f. Giveaways (e.g., spatula, food thermometer, cutting mat, etc.)
g. Meals and refreshments
h. Childcare
i. Supplies (e.g., paper and pens)
j. Equipment (e.g., scale for healthcare visits)
k. Personnel and labor
l. Events (e.g., graduation party)
m. Transportation for participants
n. Travel for staff/volunteers
o. Facility fees
p. Utility fees
q. Other (please explain)

18) Please select the kind of staff and volunteers involved in designing, implementing, evaluating, and sustaining your produce prescription program. Check all that apply.

a. Participant liaisons (This might be someone besides a program administrator who serves as the liaison between participants and the program.)
b. Food retailer managers (e.g., farmers market manager, grocery store manager)
c. Physicians
d. Nurses
e. Nurse Practitioners
f. Registered dietitian nutritionists
g. Nutrition educators
h. Translators
i. Program evaluators (e.g., researchers)

j. Program coordinators/administrators
k. Students/interns
l. Volunteers (excluding students)
m. Social workers
n. Community health workers
o. Pharmacists
p. I don't know
q. Other (please explain)

6) Program evaluation

19) What food and nutrition-related measures did your program track last year? Check all that apply.
   a. Fruits and vegetables consumed
   b. Food insecurity
   c. Food purchasing habits (e.g., frequency of shopping at a farmers market pre- and post-program)
   d. Nutrition knowledge
   e. Cooking skills
   f. My program did not track food-related measures last year
   g. I don't know
   h. Other (please explain)

20) What health measures did your program track last year? Check all that apply.
   a. BMI
   b. Waist circumference
   c. Blood pressure
   d. HbA1C
   e. Lipid profile
   f. Blood glucose
   g. Mental health
   h. My program did not track health measures last year
   i. I don't know
   j. Other (please explain)

21) What healthcare use measures did your program track last year? Check all that apply.
   a. Healthcare use costs
   b. Medication use
   c. Frequency of ER visits
   d. My program did not track healthcare use measures last year
   e. I don't know
   f. Other (please explain)

22) What program experience measures did your program track? Check all that apply.
    a. Participants' experiences in the program
    b. Participant satisfaction with the program
    c. Participant feedback about the program
    d. I don't know
    e. Other (please explain)

23) Did your program track any other measures not listed?
    f. Yes
    g. No
    h. I don't know
    i. Other (please explain)

If yes to other measures,
23a-i. Please list the other measures your program tracked below.

7) Program achievements

24) How many participants (not including family members) did you *start* your program with in 2019?
    a. Initial participants: ___
    b. I don't know

25) How many participants (not including family members) *completed* your program in 2019? Consider participants who "completed" your program to mean those who met your program's minimum requirements and remained involved throughout the duration of your program.
    a. Completed participants: ___
    b. I don't know

26) Did family members of the participants also benefit from the program?
    a. Yes
    b. No
    c. I don't know
    d. Other (please explain)

If yes to family members benefitting,
26a-i. How did family members of participants benefit from the program?

26a-ii. How many *total people* (participants + their family members) did you start your program with in 2019?
    a. Total people started: ____
    b. I don't know

26a-ii. How many *total people* (participants + their family members) completed your program in 2019?

a. Total people completed: ____
b. I don't know

27) What was the total value of prescriptions that were *prescribed* in 2019 (in dollars)?

a. Total value prescribed: ____
b. I don't know

28) What was the total value of prescriptions that participants *redeemed* in 2019 (in dollars)?

a. Total value redeemed: ____
b. I don't know

8) Program sustainability

29) Has your program struggled with sustaining its programming?

a. Yes
b. No
c. I don't know
d. Other (please explain)

If yes to struggling with sustaining programming,

29a-i. What barriers have you encountered to sustaining your programming? Check all that apply.

a. Lack of funding
b. Inconsistent funding
c. Limited staff
d. Staff turnover
e. Not enough time to deliver program components
f. Not enough produce vendors
g. Not enough participants
h. Challenging community partnerships
i. I don't know
j. Other (please explain)

29a-ii. What would help improve or maintain your program's sustainability? Check all that apply.

a) More funding
b) Continuous funding
c) More staff
d) Consistent staff
e) More time to deliver program components
f) More produce vendors
g) More participants

h) Better community partnerships
i) I don't know
j) Other (please explain)

Thank you for completing the survey!

Appendix A.2 Qualtrics Survey for Expired Programs: 2020 National Produce Prescription Program Study

The following survey will explore the general characteristics of your expired produce prescription program and the barriers you faced when trying to sustain your programming. If your program is still in operation, please select "Yes" in the question below to be redirected to the active program survey.

You may start and stop this survey as many times as you'd like up until the deadline. To save your answers, click the arrow and move on to the next page. Please use the same web browser you originally opened the link in to return to the survey.

1. **General characteristics of your program**

30) Is your produce prescription program still in operation?
   a. Yes
   b. No

   If yes to produce prescription program still in operation,
   You indicated that your program is still in operation. Please copy and paste the following link into a browser to complete the survey for active programs:
   https://ugeorgia.ca1.qualtrics.com/jfe/form/SV_1NcI4x5xE1hlaV7

31) What is the name of your produce prescription program? (This will be replaced with a secure ID number for data analysis. Your program name will remain anonymous unless you indicate otherwise to the researcher.)

32) Where is your program located (city(ies) or county(ies) and state)? (This is for data analysis. Your program location will remain anonymous unless you indicate otherwise to the researcher.)

33) How many years was your produce prescription program in operation?

34) What was the duration of your program while it was in operation (e.g., one-time prescription, six months of programming, year-round)?

35) What was the goal of your program (e.g., to reduce food insecurity, to increase fruit and vegetable consumption, to improve participants' HbA1C levels, etc.)? You may list more than one goal.

2) Program sustainability

36) Has your program struggled with sustaining its programming?
   a. Yes
   b. No

c. I don’t know
d. Other (please explain)

If yes to struggling with sustaining programming,

a-i. What barriers have you encountered to sustaining your programming? Check all that apply.

a. Lack of funding
b. Inconsistent funding
c. Limited staff
d. Staff turnover
e. Not enough time to deliver program components
f. Not enough produce vendors
g. Not enough participants
h. Challenging community partnerships
i. Program outcomes did not justify the effort to run the program
j. I don’t know
k. Other (please explain)

a-ii. What would help improve or maintain your program's sustainability? Check all that apply.

k) More funding
l) Continuous funding
m) More staff
n) Consistent staff
o) More time to deliver program components
p) More produce vendors
q) More participants
r) Better community partnerships
s) Program outcomes did not justify the effort to run the program
t) I don’t know
u) Other (please explain)

37) Is there anything else you would like to say about your produce prescription program?

Thank you for completing the survey!

Appendix A.3 Interview Guide: 2020 National Produce Prescription Program Study

Research Questions
What is the current state of produce prescription programs in the U.S.?
#1: What kinds of produce prescription program models are currently employed in the U.S.?
#2: What resources are required to design, implement, evaluate, and sustain a produce prescription program in the U.S.?
#3: What are the experiences of individuals and their families who participated in produce prescription programs in Georgia?

[click to turn on audio recorder if in person or activate Rev call recorder]
Thank you for participating in this phone interview. My name is Taylor and I am a graduate student at the University of Georgia working on my dissertation, which aims to explore what kind of produce prescription program models exist across the country. Over the next hour I would like to learn more about how the many program components that you told me about in the survey came together and "flowed" in real life. Please know that a call recorder has been turned on to record this interview, but your answers will be anonymous.
I want to remind you that there are no right or wrong answers to any of my questions-- just your opinion. You can skip any questions you feel uncomfortable answering at any time. Remember that what you say will be deidentified, meaning no identifying information like your name or city will be included in the final report.
Are there any questions before we get started? [answer questions]
Okay. We're going to get started. Ready?
Today is [DATE].

Overall

1. Tell me about how your 2019 program flowed. If I were a participant, what would participating in the program look like? Start at recruitment to the end of the program.
    a. Probes: Where would I go, what would I do, and when would I need to do it?

Healthcare

Now that I have a good idea about the overall flow of your program, I wanted to touch more on each of the main components of the program. Let's start with the healthcare component.

2. Tell me more about the healthcare portion of your program. Was there any aspect of that program that you want to expand on?
    a. Probes: Did registered dietitians consult with your participants at any time during the program? Did participants have to attend the healthcare visits in order to receive their prescriptions?

Nutrition Education
Thank you for the information on your program's healthcare component. I would like to hear more about your nutrition education component now.

3. Tell me more about the nutrition education portion of your program.
    a. Probes: Were participants able to participate in the cooking themselves? How long were the lessons? Where were the classes and demos taught? What kind of giveaways were provided in class?

Food retailer

Let's discuss how participants redeemed their prescriptions now.

4. When participants entered the food retailer (e.g., market), what was the process of redeeming their prescriptions, shopping, and checking out like?
    a. Probes: How did your food retailer accept the prescriptions? Did you use special tokens, a punch card system, a type of debit card, etc.? Did you use any special app or tracking system to track prescription redemptions (FM Tracks, Mass Farmers Markets' (MFM) E-token Program, Farm 2 Facts)? How many food retailer sites did you have?

Evaluation

Let's focus on the end of your program now.

5. What feedback did you receive from participants? How did participants respond to the end of the program?
6. What major outcomes did you see at the end of your program?
    a. Probes: How did the measures your program tracked change over the course of the program?

Sustainability

7. Moving on to the sustainability of your program, please describe any efforts to keep your program going year after year.
    a. Probes: What opportunities have you experienced trying to sustain your programming? What barriers have you experienced trying to sustain your programming? Did you try to provide the prescription beyond the length of the program? Did you permanently embed the program into an organization? What funding opportunities did you apply for?
8. Were there any other major challenges your program experienced?

Meeting the need

9. How did your program get started?
10. Where is your program going from here?
11. Could you give me some context about your state's produce availability?
    a. Probes: What's grown, and when? How does that impact your programming?
12. Tell me about the need for a program like yours in your community.
13. To what degree has your program met that need in your community?

Closing

14. Is there anything else you want to tell me that I may have missed?
15. Do I have permission to feature your program as a case study in the final report? This would involve publishing select information collected in the survey and in this phone interview alongside your program name and location. Your personal information and the personal information of your fellow program providers will remain anonymous even if you opt for your program to be featured as a case study.

16. Are there any program reports or documents that might be help me better understand your program that you'd be willing to share?

Appendix A.4 Additional Case Studies of Programs: 2020 National Produce Prescription Program Study

Case study 3: Fresh Bucks Rx, Seattle, Washington

Seattle's Office of Sustainability and Environment began their year-long Fresh Bucks Rx PPP in 2016 as a branch of their program, Fresh Bucks, which doubled Supplemental Nutrition Assistance Program (SNAP) benefits.

How it works: In 2019, food insecure patients were recruited to Fresh Bucks Rx through multiple participating healthcare systems and clinics. Participants received four $10 vouchers a month for up to one year that could be spent at four small neighborhood grocers, at any location of a large grocery store chain, or at farmers markets and farm stands across Seattle. At the large grocery store chain, the prescription worked like a $10 off coupon on any qualifying purchase of fresh, canned, or frozen produce without any added sugar, salt, or fat. Eligible items were pre-identified in the store's UPC system and recognized as eligible at the point of sale. The city is invoiced monthly by the stores for reimbursement. Nutrition education was not mandatory and delivery was left up to the healthcare sites. In 2019, Fresh Bucks Rx served 1,017 people.

Funding: The program was funded through the Washington State Department of Health's Gus Schumacher Nutrition Incentive Program (GusNIP) funding– which ran out in 2019 and was replaced by state appropriations for future years. The program also received revenue from the city of Seattle's sugar-sweetened beverage tax. Being a municipal tax, the latter could only fund Seattle residents, while GusNIP funding supported non-city residents on SNAP.

Case study 4: Prescription for Health, Bay Mills, Michigan

Bay Mills Prescription for Health serves the Bay Mills Indian Community, home of the Ojibwa tribe, in Northern Michigan. The program is 16 weeks long and is owned by the local Indian health service clinic.

How it works: This program serves a tribal community. While the program mainly recruits health center patients with diabetes, women through the women's clinic and families through the Boys and Girls Club can also join the program. The prescription is a booklet of $2 vouchers worth $30 total to be spent at the local farmers market. Prescriptions can be spent on local traditional and traditionally preserved foods, such as wild harvested berries, morel mushrooms, and even fish and meats. The community created its own cottage food law to allow the sale of these traditional and traditionally preserved foods at the farmers market within the confines of the tribal community. There are cooking demonstrations at the market and nutrition education classes throughout the year at a farm near the health clinic. In 2019, the program increased food access for 280 community members.

Funding: Any organization within the tribal community can enroll their patients or clients in the program as long as they provide their own funding. Different health divisions and organizations in the community receive tribal, federal, state, and non-profit grant funding that

allows for the purchase of some kind of incentives, like water bottles. The Prescription for Health staff advocate that these organizations use their incentive funding to purchase the produce prescriptions to provide to their patients and clients. The program then prints the vouchers and handles the reimbursements for vendors.

Case study 5: Veggie Rx, Bend, Redmond, and Prineville, Oregon

Veggie Rx is a PPP that serves Bend, Redmond, and Prineville, Oregon and is housed by The High Desert Food and Farm Alliance, a nonprofit which supports a thriving and healthy food and farm network in Central Oregon.

How it works: Veggie Rx serves communities with high food insecurity, a growing wealth inequality, and high food costs due to its arid climate, challenging farm-ability, and infrastructure of transportation. Food insecure participants with a diet-related disease are referred by one of the program's fifteen healthcare partners as well as through community-based organizations and various media outlets. Participants can be enrolled in one of two models depending on the location. The first is the market model where participants receive $20/week for 8 weeks to spend at the farmers market on fruits and vegetables. They receive nutrition handouts on topics such as food storage, creating a balanced meal, understanding macronutrients, and more. The program director, a registered dietitian-nutritionist also holds a brief conversation about food and health topics, relevant to each participants personal questions and goals, at the market. The second model uses a meal kit model. The kits mirror the model of Blue Apron, Hello Fresh, or other meal delivery models. Though are sourced with locally grown produce and recipes geared towards the specific VeggieRx clientele. This model takes place in a rural county without a farmers market. Due to COVID 19, all program locations became kit models in 2020 to maximize physical distancing. Participants come to one of the partnering healthcare sites to receive a box of pantry staples and local vegetables that are meant to come together as a meal based a paired recipe card. A mobile food pantry truck also stops at the site and participants can shop from the truck. Participants receive the same nutrition education as the market model. However, the kit model is four months long since participants receive kits every other week. The program enrolls multiple cohorts of participants throughout the year. Since its pilot in 2018, HDFFA's VeggieRx has served over 400 participants and spent over $35,000 on locally grown produce. Veggie Rx participants experienced increased F&V consumption by 1.4 cups/day, increased motivation to eat fresh foods, and participants prioritized buying vegetables even after the program ended.

Funding: In addition to small grants, the program was mainly funded through foundation grants supported by funding from a coordinated care organization (CCO). A CCO is a network of health care providers who work together in their local communities to serve Medicaid recipients in their state. A CCO differs from ACOs in that they're state organized and they have both medical and non-medical (social determinants of health) goals. They have a global budget with shared savings if certain quality measures are met. HDFFA's VeggieRx was funded through their CCO's Regional Health Improvement Plan (RHIP) initiative.

Appendix B.1 Field Guide Protocol for Observations of Nutrition Education Classes in Georgia FVRx programs

A modified version of Spradley's (1980) ethnographic domains for Participant Observations

Project title: Facilitators and Barriers of Positive Outcomes in Georgia FVRx Programs **Name of observer: Taylor Newman** **Date:** **Beginning time:** **Ending time:** **Location:** **Event:**		
Guide	**Objective Observations** ***Concrete, factual, descriptive information***	**Reflections** ***Interpretation, thoughts, questions, ideas***
Setting *Record size, physical features, internal organization, location of room*		
Space *What space do the actors occupy and how are the actors situated in the space, objects and their meaning*		
General ambiance		
Actors *Who is present, estimate of the number, sex, age, ethnicity, ht, wt, skin color, physical features, dress*		
Interactions between participants *Frequency, how, where, with whom, body language, conversations, moods, attitudes, formal or informal*		
Interactions between participants and Provider Teams *Frequency, how, where, with whom, body language,*		

conversations, moods, attitudes, formal or informal		
Activity *What people do, planned and unplanned*		
Objects *Physical things that are present, how are they arranged or situated*		
Action *Single actions that people do*		
Event *Purpose of the event*		
Time *Sequencing of event, hours of the day, days of the week, specific months or seasons of the year*		
Goal *What are participants/Provider Teams trying to accomplish? Any goals, motivations, or agendas associated with the behavior of the actors*		
Emotions *Do behaviors seem to be carried out with any level of emotions or feelings?*		
Language *What words are used be the actors in the setting, content, participation, method, location, time and routinization, rationale, gestures, non-verbal communication*		
Lessons *Topic, likeability, participation, reaction of participants, ambiance*		

Cooking demo *Seasonal recipes, samples, participation, likeability, reaction of participants, ambiance*		
Incentives *Presence, what kind, likeability, reaction of participants*		
Other domains		

Appendix C: Interview Guide for Past Produce Prescription Program Participants

Research Questions
What is the current state of produce prescription programs in the U.S.?
#1: What kinds of produce prescription program models are currently employed in the U.S.?
#2: What resources are required to design, implement, evaluate, and sustain a produce prescription program in the U.S.?
#3: What are the experiences of individuals and their families who participated in produce prescription programs in Georgia?

[click to turn on audio recorder if in person or activate Rev call recorder]
[read consent form and receive verbal consent before moving forward]
Are there any questions before we get started? [answer questions]
Okay. We're going to get started. Ready?
Today is [DATE].

Icebreaker

1. First, because [program name] was all about produce, I wanted to hear how you feel about fruits and vegetables.
    a. Probes: How do you like or not like fruits and vegetables? Has it been that way all of your life? How would you describe the amount of fruits and vegetables that you eat? What are your favorite vegetables? Are there any vegetables you won't eat and why? How do various members of your families feel about eating fruits and vegetables?

Experiences

1. Thank you for sharing. Now I want to move on to the program. When you were first told about the program and enrolled, what did you expect the program to be like?
    a. How was that different from what actually happened? Was there anything you hoped to learn or get out of the program that did not happen?
2. So you expected it to be like ____. Tell me about your overall experience in the [program name] program when you were a part of it.
    a. What did you learn? What did you gain from participating in the program? Were there any drawbacks for you?
3. Now we're going to walk through the specific parts of the program.
    a. Can you walk me through the experience of getting a food prescription from a healthcare provider.
        i. Probes: What was the process of getting your prescription like?
    b. Walk me through the process of redeeming your prescriptions.
        i. Probes: Where did you redeem your prescriptions? How did you feel about the produce options available? How were the interactions you had at the farmers market?
    c. Did you attend any of the special events at the farmers market, where they taught about things like reducing salt intake and exercising more? Tell me about how those events were.

        i. Probes: Can you walk me through what a typical class was like? What kind of topics did you learn about? How did you feel about the recipes? What was your favorite thing you learned about in class? Why was it your favorite? Was there anything that you wish you would have learned more about? Tell me about your teachers. How were your interactions with the teachers leading the class?
    d. How were your interactions with the program staff? Farmers?
    e. Goals?
4. How did [program name] impact your life?
    a. Probes: Tell me about how [program name] impacted your health, if at all. How did the program impact your diet? Your medication use? Your skills? Your nutrition knowledge? Your food security? Your mood or emotions?
    b. Probes: Tell me about how [program name] impacted your schedule, if at all. How did-- or did not-- the program impact your relationship with your community?
    c. Follow-up question: Did anything else occur around the same time that might have also impacted these areas of your life?
5. What did you gain from participating in the program?
6. What is the one change that you've made related to the program that you're proudest of?
7. Was there anything that made it difficult for you to participate in the program?
    a. Probes: Can you tell me about a time where you had trouble going to class and/or the farmers market? Was there ever a time when you did not WANT to go, or could not go for some reason? Can you tell me more about that?

Family experiences

8. We've been talking about how [program name] has impacted you so far. Now I am curious about your families. Can you tell me about whether [program name] has had an impact on your family members?
    a. Probes: What was your children's experience with [program name]? Your partner's? Your grandchildren's? Provide a specific example of how your family interacted with the program.
    b. Follow-up questions: Did anything else occur around the same time that might have also impacted these areas of your family's life?
9. What are the most important issues related to food and nutrition in your family and community?
10. What does it mean to buy local?

Sustaining experiences

11. Now that you're out of the program, does your experience with [program name] still impact your life today?
    a. Probes: How long have you been out of the program? How has your health changed since the program ended, if at all? How do you incorporate the things you learned in the nutrition education class into your daily life, if at all? How have your grocery shopping habits changed, if at all, since the program?

b. Follow-up questions: Have you been able to make those changes last? What has kept you from making a lasting change? What would help you make those life changes last?

Feedback

12. What part of the program did you enjoy the most?
    a. Was there anything you did not enjoy or care for?
13. What suggestions do you have to help make the program better?
    a. If you were in charge of the [program name] program, what would you do differently?
    b. What would make the program better for you and others in the community?

Closing

14. Is there anything else you want to tell me that I may have missed?

Appendix D: Exemption Letter from the University of Georgia Institutional Review Board: 2020 National Produce Prescription Program Study

Phone 706-542-3199

The University of Georgia

Office of the Vice President for Research
Institutional Review Board

APPROVAL OF PROTOCOL

May 10, 2017

Dear JUNG SUN Lee:

On 5/10/2017, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	Facilitators and Barriers of Positive Outcomes in Georgia Fruit and Vegetable Prescription (FVRx) Programs
Investigator:	JUNG SUN Lee
IRB ID:	STUDY00004675
Funding:	Office of Sustainability;
Review Category:	Exempt 2

The IRB approved the protocol on 5/10/2017.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103).

Sincerely,

Dr. Gerald E. Crites, MD, MEd
University of Georgia
Institutional Review Board Chairperson

Appendix E: Statement of Subjectivity

Subjectivity is "a summary of who researchers are in relation to what and whom they are studying" (Preissle, 2008, p. 844). Peshkin (1988) described one's subjectivity to be "like a garment that cannot be removed" (p. 17). While there are benefits to addressing a researcher's subjectivity in any study, it is particularly important to address in qualitative research as the researcher is the main measuring instrument (Harris, 2008). Our personal experiences and biases as researchers have the capacity to "filter, skew, shape, block, transform, construe, and misconstrue" the data (Peshkin, 1988, p. 17). Acknowledging any pre-study biases allows for reflection and management of personal influence during research collection, analysis, and writing. Doing so allows other scholars to consider one's relation to the research while interpreting the study's "credibility, authenticity, and overall quality or validity" (Preissle, 2008, p. 844). I will address my own subjectivities now, with the plan to acknowledge them and monitor for their evolution throughout the research process.

Philosophy

I had the opportunity to choose my dissertation topic. I chose to assess U.S. produce prescription programs because I believe that food can and should be used as medicine. I want to see the programs expand across the country and lessen the burden of food insecurity and diet-related diseases for individuals with a low-income and their families. My personal philosophy, along with my role on an FVRx® provider team, makes me root for the programs' success. This may cause me to interpret interview findings in a positive light to justify supporting programs in the future. The result would be biased themes, narratives, and findings. When writing my

findings, I will judicially share both the triumphs and challenges of the programs and the participant experience for a more complete understanding.

Demographics

I am a white, young, female living in the South with a middle-class background. As I have never been a beneficiary of a nutrition assistance program, I cannot fully understand the nuances or challenges of receiving nutrition assistance. This may limit my scope when interpreting the participant experience in a produce prescription program. However, I have heard anecdotal stories about participant experiences while working with the FVRx® program in Athens. A review of the literature has also primed my understanding of the various ways programs can impact participants during programming and after it ends within their everyday realities. Therefore, I will consider the roles of societal and structural influences that enhance or limit the participant experience and impact of produce prescription programs on participants' everyday lives.

Experiences

I provide administrative and logistical assistance to the FVRx® program in Athens as a graduate research assistant at the University of Georgia. My work with the FVRx® programs in Athens and across Georgia over the years has granted me insight into the administrative and logistical details necessary for designing and implementing a produce prescription program. These experiences will inform how I structure my survey questions for the national study. For instance, I know based on my experience and research that many programs include certain features, like nutrition education and transportation aid. However, there are likely other program designs that I am not aware of and therefore will not include in the survey. I may miss out on important information because of this. To counter the likelihood that I will limit the findings to

what I anticipate programs to include, I will also include a text box at the end of each question for program providers to type in additional answers.

My goal for this subjectivity statement was to attune myself to where "self and subject are intertwined" (Peshkin, 1988, p. 20). The illumination of my personal attachment to my project does in no way relieve me of my bias. Rather, it allows me to manage my subjectivity in a way that does not confine or limit my research moving forward.