PERCEPTIONS, SATISFACTION, AND EXPERIENCE OF LOW-INCOME, RURAL PATIENTS WHO PARTICIPATED IN A PILOT FARM TO CLINIC (F2C) PROGRAM UTILIZING LOCAL, DONATED PRODUCE

by

Madeline Tripp

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Madeline Tripp

Greenville, NC

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Approved by:

Dr. Jeff Popke

Department of Geography, Planning, & Environment, Thomas Harriet College of Arts & Sciences

Dr. Lauren Sastre

Department of Nutrition Science, College of Allied Health Sciences

ABSTRACT

Rural, southern, low-income households are more likely to experience food insecurity, related poor diet quality, and chronic disease. This study examined the experiences of patients from a charitable clinic in rural North Carolina who participated in “Farm 2 Clinic,” a produce prescription program supplied by donations from local farmers. Survey data collected during the eight-week program demonstrated a relationship between produce use and familiarity, and use of the provided recipes and interest in using the produce again. These findings suggest factors associated with produce use which may guide similar programs and highlight the complexity of food choices even when barriers to access are mediated.

KEYWORDS: produce prescription, food waste, household food insecurity, rural areas, chronic disease

INTRODUCTION

Nearly 15.6 million American households (12.3 percent) were reported to be food insecure in 2016 [1]. Food insecurity is defined as inadequate access to food due to limited money or other resources [1]. Rural and southern households were also more likely to experience food insecurity, at 15.0 and 13.5 percent, respectively. North Carolina, as a predominantly rural southern state, is at heightened risk and falls 15^{th} nationally for food insecurity [1]. In addition to living in the rural South, poverty is one of the greatest predictors of food insecurity [1].

Food insecure individuals are more likely to fill in the gaps in their diets with nutrient-deficient, energy dense foods due to their lower cost compared to healthier foods [2]. This is especially true in rural communities, which typically have higher poverty rates and less access to stores offering fresh produce [3, 4, 5, 6]. In addition, transportation and accessibility are common barriers for rural residents shopping for food [5].

Intake of healthful food, particularly fruits and vegetables, is critical for maintaining overall health, and is associated with a reduced risk of many chronic diseases including type 2 diabetes, heart disease, and hypertension [7]. Despite the benefits of consuming fruits and vegetables, less than a quarter of Americans consume the recommended 5 daily servings, and rural individuals have been found to consume even fewer servings [5]. Low fruit and vegetable intake and nutrient deficiencies are heightened in food insecure households and are associated with increased chronic disease risk [8].

The relationship between social and environmental factors, such as food security and poverty on health outcomes has led to an increased emphasis on the "social determinants of health" (SDOH). These SDOH are defined as "conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks" [9]. Food insecurity is a critical SDOH, as food insecure households spend an average of $1,800 more per individual on medical costs annually [10]. Furthermore, the Center for Disease Control and Prevention reports 90% of healthcare expenditures are allocated to treating people with one or more diet and lifestyle related chronic diseases [11].

Individuals residing in rural areas experience a troubling paradox within these overlapping chronic disease risk factors, where, while the majority of fresh produce is grown in rural areas, the poverty inherent in this area limits attainment of fruits and vegetables, leading to food insecurity and poor diet quality. For example, North Carolina (NC), has one of the highest food insecurity rates despite it also being a top ten fruit and vegetable producing state [12].

It is critical that local food supply resources be examined for gaps to address SDOH like food insecurity. Case in point, an estimated 40 percent of food produced is lost along the supply chain; due to timing, cosmetic imperfections, or fluctuations in demand [13]. The produce lost in the supply chain ends up in landfills, wasting the resources that were used to grow, harvest, process, and transport them [13]. According to a 2017 estimate, North Carolina farmers lost nearly 11 percent of marketable produce (by average volume per acre), which represents a total net loss of $8.6 million of income for N.C. growers [14]. Food waste accounts for about 21 to 33 percent of the water used for agriculture in the U.S. and contributes a minimum of 2.6 percent of the country's greenhouse gas emissions (through production and decomposition) [13]. Identification of avenues to redirect usable food from the landfill to the table could reduce agricultural waste and greenhouse gas emissions, while providing critical nutritional supplements to those with limited food access and poor diet quality [15].

Local produce offers nutrient dense food which may alleviate the impact of food insecurity on poor diet quality and associated chronic diseases. Produce prescription programs are becoming more prominent and are one approach which helps connects primarily low-income, food insecure patients with fresh, local produce, which also supports patients efforts to adhere to their health care provider's nutrition advice by bridging gaps in food access and diet quality [16]. his framework utilizes a "partnership model of care," by building relationships between physicians, patients, and community food resources to improve health outcomes [17, 18]. Within this model, food insecure patients are identified and usually prescribed a waiver to use at local farmer's markets [17]. These emerging programs seek to address SDOH, with the majority relying on large amounts of funding. To our knowledge, no programs have been conducted in rural, medically underserved areas (MUAs) which utilize unsold, surplus donated produce from local farmers.

This study includes a unique and potentially sustainable framework for a produce prescription program relying completely on donated, local produce. The Farm to Clinic (F2C) feasibility and acceptability pilot included an eight week program conducted in collaboration with a free and charitable clinic serving rural, low-income patients. Patients were provided weekly bundles of surplus, local farm donated produce and recipes. The objective of this study was to examine the use of specific types of produce, promoters, barriers to use as well as participant's overall satisfaction with the program.

METHODS

Study Design

This study included weekly surveys which were distributed by clinical staff when patients arrived to pick up their produce bundles. Surveys were collected during all eight weeks and focused on the previous week's produce, participant's use of specific types of produce, promoters and barriers to produce use, experience with recipes provided during the program, and overall satisfaction with the program. The survey was developed specifically for this project and was content validated prior to use (see subsequent section below for survey development). Study information was provided at the beginning of the survey, no identifiers were collected, and the study was approved and deemed to be exempt by the Institutional Review Board at "blinded for review" prior to all data collection.

F2C Program Description

The Farm to Clinic (F2C) pilot program ran for eight weeks from June 10 through August 12, 2019, excluding the week of July 4th. The goal of the initial pilot was to explore the feasibility and acceptability of the F2C model. The program recruited farmers from local farmers markets. Six local farmers agreed to donate a selection of their unsold produce at the end of each market (Wednesday and Saturday).

Unsold produce was picked up from farmers markets by volunteers at the end of Farmer's Markets every Saturday and Wednesday, sorted for freshness and usability, and distributed into bundles. Produce type varied, but most frequently provided produce were cucumbers, zucchini, yellow squash, corn, cabbage, potatoes, peppers, tomatoes, eggplant, and carrots.

After each Farmer's market on subsequent days, the bundles of produce were dropped off at the clinic to be picked up. Each participant picked up one bundle per week during the clinic's hours (8:00 a.m. through 4:30 p.m.). Patients were also provided a set of recipes focusing on the produce included in the bundle. The recipes were adapted specifically for the project from a variety of resources and focused on simple, quick, limited/low ingredient options for utilizing the produce. The recipes focused on preparation of dishes with vegetables which were the primary donated produce items during the F2C program.

Farmers were provided the opportunity to track their donations for tax filing purposes (the clinic is a 503(c) nonprofit) under the Path Act, Pub. L. 114-113 [19, 20]. The Good Samaritan Food Donation Act (Pub. L. 104-210) also extends protection to individuals donating food and the nonprofits using that food "in good faith" from liability associated with donations [21]

Study Site Description

Wayne County is a predominately rural county in eastern North Carolina with a minority population above the state average (36 percent) [22]. In a 2017, Wayne County's poverty rate was higher than the state and country at 21.8 percent, and nearly 16,400 people were without health insurance [23]. Over six percent of households are without a car and live more than half a mile from the nearest grocery store; in some areas that rate is as high as 22.6 percent [24]. The U.S. Department of Health and Human Services classified Wayne County as a Medically Underserved Area, indicating that it has "too few primary care providers, high infant mortality, high poverty or a high elderly population" [25]. These factors increase the likelihood of poor health outcomes for the county, as evidenced by the county's elevated mortality rates for heart disease, diabetes, and cancer when compared to the state and country [26].

This study was conducted in partnership with clinicians at the WATCH Healthcare Program in Goldsboro, North Carolina. This clinic is a member of the North Carolina Association of Free & Charitable Clinics [27]. WATCH serves as a primary medical home for the uninsured of Wayne County through the provision of primary, acute and preventive health care to include labs and medications for chronic disease management. All services are provided free of charge to the patients, who are generally low-income, rural residents [28].

Participant Eligibility

Eligibility for participation in the study was determined by the patient's clinician and were based on the patient having at least one diet-related, chronic disease risk with primary conditions including diabetes and/or hypertension. Patients were randomly identified and invited to participate until the pilot program target of thirty was reached. Participation was voluntary, and dependent on the patient's ability to pick the produce up from the clinic's location on the Wayne Memorial Hospital Campus. A total of 30 participants were enrolled in the program and divided into two groups based on their assigned pick-up day, either Monday or Thursday.

Survey Development

A draft survey was sent via email to nutrition researchers (n=5) with expertise in food security and community nutrition programming and 80% responded (n=4). Suggested changes included broadening the questions about consumption of the produce to include use by individuals other than the participant, such as family or friends. In the recipe portion of survey, a question was added to consider the possible limitations a participant might face in preparing the produce. Four compound questions were edited for clarity or subdivided. The resulting semi-quantitative survey contained eleven questions and focused on: produce and recipe use, effects on produce and recipe use, produce familiarity, and interest in using the recipes and the produce provided that week (See Appendix A).

Statistical Analysis

All close-ended data were analyzed using SPSS 26.0 for descriptive and bivariate analysis. Closed-ended data were grouped by week for descriptive analysis as the surplus produce bundles provided to patients varied weekly. Bivariate analysis explored the associations between produce use and recipe use. Fischer's Exact test were used to show statistical significant at the 5 percent level. The responses to open-ended questions were categorized and coded utilizing inductive content analysis or thematic content outlined by Elo and Kyngäs [29]. Two research team members independently reviewed open-ended survey responses, and consensus was reached for all reported themes.

RESULTS

The majority of survey respondents used all or most of the produce provided weekly (Table 1). Eggplant and squash were reported as the most frequently left unused. However, barriers to using

the produce—such as a dislike of the produce, lack of time to prepare, or not knowing how to prepare it—varied greatly. The majority of respondents every week reported that "none" of the produce was unfamiliar, with eggplant being the most common type of produce listed as unfamiliar. When asked if they would be interested in using any of the produce again, more than 70% of the responses were "yes" every week.

[Table 1]

Most of the respondents (60 or greater percent each week) did not try the recipes provided with the bundles. Most participants had the necessary equipment, and only two reported not having the necessary ingredients and not being familiar with one or more ingredients. This suggests that participants did not use the provided recipes for an unlisted reason, such as personal preferences. However, most of the participants who did use the recipes reported that they would likely use one or more of the recipes again and that the understandability of the recipes was "very easy" or "somewhat easy," excluding nonresponses.

Patient's familiarity with a type of produce was significantly ($p=.000$, Table 2) tied to the overall amount of produce that they reported they used each week. Patients were also more likely to express interest in using the produce provided in a given week again if they tried the corresponding recipes ($p=.007$) and were more likely to use the recipes if they reported a low level of unfamiliarity with the produce ($p=.039$, Table 3).

[Tables 2 & 3]

DISCUSSION

The objective of this study was to examine the use of specific types of produce, the promoters, barriers, and predictors of produce use (cooking barriers, use of recipes, influence of type of produce and produce preferences) by patient participants, as well as the patient participant's overall satisfaction with the program. Our results suggest high satisfaction and use of produce by patients who participated in the F2C pilot program which utilized donated, surplus local produce. This unique model has potential to increase produce (e.g. vegetable) consumption in an at-risk patient group while possibly addressing food waste. Findings from this study may be utilized to guide produce prescription programs which are expanding throughout the U.S. while attention on S.D.O.H. continues to grow. Further discussion of the study findings are included below.

This study found that participants were less likely to attempt recipes if they were unfamiliar with the produce, suggesting that methods to increase use might require additional tools such as cooking demonstrations or educational materials highlighting specific health benefits. Culinary skills are associated with higher vegetable intake in both men and women and culinary skills may greatly support the participant's use of produce [30]. Nutrition education with a focus on culinary skills have been found to increase both participants' willingness to try new produce, as well as overall fruit and vegetable intake [31]. Participants in this study reported use of recipes and recipes were also associated with increased interest in produce again. These findings in combination with established benefits of culinary support and nutrition education on vegetable consumption supports efforts to provide easily accessible resources. Online and/or social media delivered culinary support and cooking examples may be a particularly successful avenue as these would reduce time and transportation barriers low-income patients commonly face to demonstrations or cooking classes/nutrition education classes.

While culinary support offers increased consumption options, it may not always overcome taste preferences. Findings from this study indicated that taste—one of the greatest drivers to food choice —was often a barrier to use [32, 33]. There is evidence that individuals who provide a higher rating of the importance of taste, are more likely to consume lower intakes of fruits and vegetables [32]. Taste preferences are complex and shaped by individual desires, sociocultural factors, income, and availability, and may be difficult to influence taste through culinary support and/or nutrition education [33]. While improving fruit and vegetable intake clearly requires improved access for poor, food insecure households, nutrition education and culinary support may be warranted to address both taste and preparation barriers.

Although overall participants reported high use of the produce, the lack of individual choice could have impacted intake and is an inherent limitation within a donation-reliant model. The type and amount of each donation varied each week throughout the 8-week pilot. Nevertheless, this variation ensured a variety of mixed produce was provided to participants, and it may have exposed participants to produce that they would not have chosen if given the choice to "design their bundle." In contrast, programs that used vouchers for participants to "cash in" at farmers markets address these problems by supporting individual choice. The sustainability of these "choice-based" produce prescription programs is often uncertain, as many rely on large amounts

of funding to support the provision of produce. The F2C model- which recovers unsold produce at the end of farmer's markets, offers promise of a sustainable, low-cost program model.

Limitations and Future Research

This study was limited by sample size and suffered from sample attrition over the 8-week duration. Respondents could have suffered from sample fatigue stemming from the length of the weekly survey and may have given more detailed responses if the survey had been shorter and/or the survey distribution had been less frequent. The choice to survey weekly was made to track the use of the variety of produce provided per week and reduce the risk of memory (loss) bias associated with recall with an end of program survey. Furthermore, the nature of a study based on self-reported data introduces the potential for over- or under-reporting due to social desirability bias or a concern that the program under study will lose resources due to negative responses [34].

The F2C model could be expanded and improved by increasing the number of farmers involved in donation and increasing the duration of food dispersal. While growing seasons and crop yield are not always predictable, tracking both average yield from farmers and total usage from patients would provide insight into supply and demand fluctuations. While the farmers receive a tax incentives for all donated items, devising a mutually advantageous incentive scheme would ensure reliability, sustainability and strengthen community capacity [35]. Additional areas for research include the examination of optimal culinary support and nutrition education, socio-demographic and cultural variances, as well as health outcomes for patients who participate in produce prescription programs. Finally, additional lines of investigation should explore reduction in food waste and possible avenues to improve F2C's impact on the local food cycle and the environment.

Conclusion

This study outlines a successful produce prescription program piloted in a rural, medically underserved area. The F2C pilot is unique in that it relied on produce donated by local areas farmers and provided utilization information to patients receiving surplus produce. To our knowledge, there have been few studies on produce prescription programs in southern, rural settings and even greater gaps regarding donation-based programs. Results suggest that

participants were satisfied with the program and utilized the majority of provided produce. Food assistance programs, like F2C, face the challenge of providing a consistent fresh food supply while ensuring the utilization and nutrient supplementation of farm-raised produce. Findings from this study may guide the expansion and refinement of future related programs intended to alleviate food insecurity and associated health disparities.

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