



VeggieRx: Utilization and Outcomes of Promise Clinic's Produce Prescription Program Addressing Food Insecurity in Uninsured Communities

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Abstract

Background: Food insecurity has profound implications for health outcomes and can exacerbate health disparities in vulnerable communities. VeggieRx is a fruit and vegetable produce prescription program implemented by the Homeless and Indigent Population Health Outreach Project's Promise Clinic (PC), a student-run free clinic for the uninsured, with the goal of increasing access to fresh produce in this population.

Methods: PC patients were enrolled in VeggieRx by volunteer Student Doctor teams and completed an intake survey. During the VeggieRx season, participants received up to four \$30 to \$60 prescription vouchers redeemable for fresh produce at the local farmer's market. Post-surveys administered at the conclusion of the season assessed preliminary outcomes and areas for program improvement. We use descriptive statistics to describe survey responses of VeggieRx participants enrolled over three recent seasons (2021-2023), assessing baseline diet perceptions, program utilization, and self-reported diet outcomes.

Results: Of all established PC patients, Student Doctor teams enrolled a total of 50 participants in the 2021-2023 VeggieRx seasons. Nearly half of patients reported not eating enough fruits and vegetables at 42%, with 58% of participants reporting affordability as a barrier to access and 22% reporting limited availability nearby. After VeggieRx, 61.9% of participants reported improvement in their fresh produce consumption, with 19.0% eating "a lot more" and 42.9% eating "somewhat more." Consecutive seasons had an increase in returning users, where nearly 41% of VeggieRx 2023 users had been enrolled in a previous season.

Conclusion: Veggie Rx provided PC patients with increased access and affordability to fresh produce, demonstrating the feasibility of implementing produce prescription programs in student-run free clinics. This innovative care model integrates medical education with the ability to address food insecurity in diverse populations and form long-lasting relationships with community health partners. Future efforts will be aimed at increasing program accessibility and expanding its reach.

Background

Food insecurity, the inability to regularly access enough food to sustain an active, healthy life, plays an extensive role in influencing health outcomes.¹ United States Department of Agriculture

(USDA) measures of food insecurity reference households experiencing reduced diet quality, reduced food intake, or concerns about food insufficiency due to financial constraints.¹ In 2020, an estimated 7.4% of individuals in New Jersey were determined to be food insecure, totaling 657,320 residents⁽²⁾. Rates were highest in Black and Hispanic communities, where 17% of households were reported to be food insecure.² In recent years, the coronavirus disease 2019 (COVID-19) pandemic has contributed to increasing rates of food insecurity among New Jersey households, which, in 2020, was projected to rise 56% from pre-pandemic levels.³ Thus, addressing food insecurity becomes a public health priority when considering its well-established association with poor health outcomes.⁴ This includes an increased risk of metabolic dysfunction and chronic conditions like diabetes, obesity, and heart disease associated with increased healthcare utilization.⁵⁻⁷

Hospitals and clinics nationwide are taking action to address food insecurity and its adverse outcomes.⁸ Several fruit and vegetable prescription programs, in which patients receive a prescription for fresh produce from their healthcare provider, have emerged and promise to improve food access, health outcomes, and healthcare costs.⁹⁻¹⁰ Such programs can provide financial incentives to obtain healthier foods by offsetting produce costs, thereby addressing one driver of the relationship between low income and comorbid health conditions.¹¹ Program participants have seen numerous health benefits, including decreased HbA1c, BMI, and blood pressure.¹¹ Furthermore, produce prescription programs establish community partnerships that support local markets and food distributors.¹² Promise Clinic (PC) is a student-run free clinic that provides medical and social services to the under-resourced greater New Brunswick community. PC was founded in 2005 under the Homeless and

Figure 1. VeggieRx Voucher



Left: English version; Right: Spanish version. Individuals were provided a \$30 voucher while those living in shared family households received \$60. Vouchers were exchanged for MarketBucks at New Brunswick Community Farmers Market (NBCFM), which functioned as artificial cash limited to the purchase of fruits and vegetables. Information not pictured but included on the voucher: address, days, and times of the NBCFM.

Indigent Population Health Outreach Project (HIPHOP) at Rutgers Robert Wood Johnson Medical School. PC exclusively serves uninsured clients of Elijah's Promise (EP), a community soup kitchen in New Brunswick that provides free, cooked meals to food-insecure individuals throughout central New Jersey. Patient recruitment occurs during weekly blood pressure screenings conducted outside of EP. PC operates once weekly for 50 weeks out of the year, excluding Thanksgiving and Christmas, seeing up to 12 patients each week. The clinic handles over 200 appointments for around 60 patients per year. PC patients receive free medications, diagnostic testing, and subspecialist referrals within the Rutgers Health system. PC is run by medical students who play diverse healthcare professional roles, including over 180 Student Doctors and 80 steering committee members. Each patient is cared for by the same team of four Student Doctors, one from first to fourth year, following a longitudinal primary care model. There are 16 licensed volunteer physician/resident preceptors, PharmD students, and social work students for interdisciplinary education.

The VeggieRx produce prescription program was established in 2018 in partnership with the New Brunswick Community Farmers Market (NBCFM) and Rutgers Cooperative Extension. VeggieRx offers PC patients prescription vouchers redeemable for fresh fruits and vegetables. Due to the unique student-run clinic model, VeggieRx eliminates restrictive eligibility criteria seen in traditional nutrition incentive programs, such as citizenship or a diet-related comorbidity diagnosis. The longitudinal, trusting relationships between patients and Student Doctors also allow VeggieRx to serve a broad uninsured and homeless population with increased compliance and follow-up. This study aimed to evaluate the usage and outcomes of VeggieRx's recent 2021 to 2023 seasons, assessing its impact on health equity-centered approaches to addressing food insecurity.

Methods

Program Overview

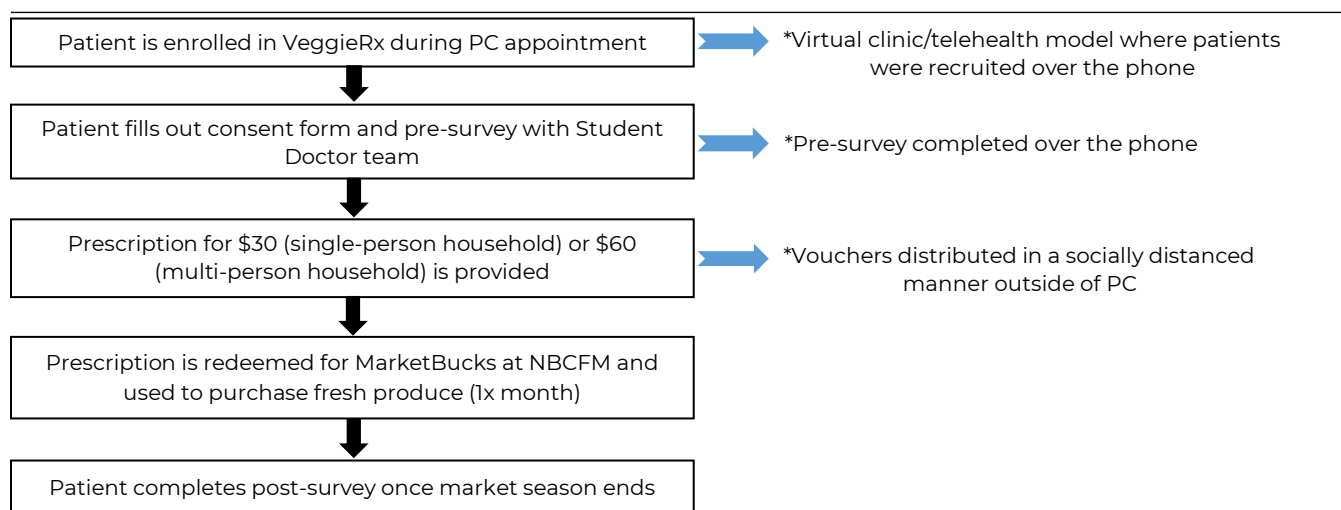
All established PC patients were eligible to be enrolled in VeggieRx by Student Doctors and study staff during regularly scheduled appointments regardless of their socioeconomic status. Patients were not enrolled if they declined services or did not schedule a clinic visit during the summer market season. Interested participants completed an intake survey before receiving their first prescription voucher (Figure 1). Vouchers were distributed by Student Doctors who, along with physician preceptors, routinely provide dietary counseling supplemented by video education to patients with chronic health conditions. Individuals were provided a \$30 voucher while those living in shared family households received \$60.

Vouchers were exchanged for MarketBucks at NBCFM, which functioned as artificial cash limited to the purchase of fruits and vegetables. Patients could receive additional MarketBucks by speaking with dietetic interns or qualified staff at NBCFM for additional nutrition education. Prescriptions were assigned a "VeggieRx number" to de-identify them and track MarketBucks redemption. Participants visited two NBCFM locations on Saturday, Tuesday, or Wednesday and renewed their prescription at PC monthly from July through October, receiving up to four prescriptions. Post-intervention surveys were later administered via phone to assess participant's experience. Due to the COVID-19 pandemic, several virtual adaptations were introduced to VeggieRx 2021 that returned to standard workflow in subsequent seasons (Figure 2).

Data Collection and Analysis

Intake and post-intervention survey data were analyzed for PC patients who participated in any VeggieRx season from 2021-2023. The intake survey obtained demographics (age, gender, highest level of education, housing status) and health history. Participants used multiple choice options ("very healthy" to "very unhealthy") to describe their diet based on their perceptions of a healthy diet. They also reported their baseline fruit and vegetable consumption, food security status since COVID-19, and any barriers to fresh produce consumption. Participants could select multiple barriers or free-write

Figure 2. Flow Diagram Depicting VeggieRx Workflow



Step-by-step workflow of VeggieRx in the clinic setting, from patient enrollment to post-survey completion. *Several virtual or socially distanced adaptations were adopted during the 2021 VeggieRx season, which occurred during the peak of the coronavirus disease 2019 pandemic. PC: Promise Clinic; NBCFM: New Brunswick Community Farmer Market

Table 1. Study demographics, N=50

Characteristic	N (%)
Age, years (mean ± standard deviation)	52.7 ± 11.7
Sex	50 (100)
Female	23 (46)
Male	27 (54)
Race/Ethnicity	
Asian or Pacific Islander	2 (4)
Black	7 (14)
White	3 (6)
Hispanic	37 (74)
Biracial	1 (2)
Highest level of education	
5th grade or less	5 (10)
Middle school	9 (18)
High school	22 (44)
Some college	7 (14)
College Degree	7 (14)
Comorbid Conditions	
Hypertension only	10 (20)
Type II Diabetes only	10 (20)
Both	10 (20)
Neither	20 (40)
Housing Status	
Renting	41 (82)
Temporary Shelter	4 (8)
Living with family	4 (8)
Homeowner	1 (2)

their own. Post-intervention surveys assessed changes in produce consumption, ease of voucher redemption, and program satisfaction. NBCFM staff tracked the number of VeggieRx participants who filled at least one prescription, number of refills, and total dollar amount in MarketBucks redeemed. Participants also provided feedback on their experience with the program and suggestions for future improvement.

Only participants who completed the intake survey were included in the analysis. For returning VeggieRx users, responses from only their most recent participating year were used to ensure only unique participants were included. Descriptive statistics summarized findings. This study was approved by the Rutgers Institutional Review Board and followed all guidelines.

Results

Demographics and Baseline Diet Perceptions

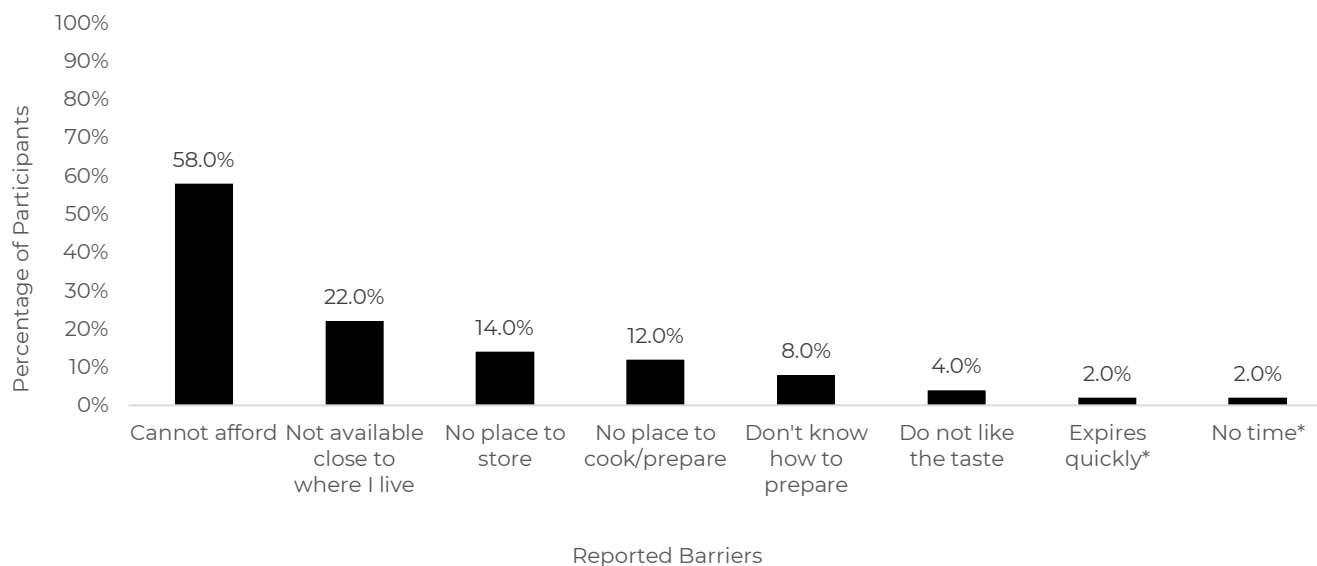
Among 67 total participants enrolled in the 2021-2023 VeggieRx market seasons, 50 completed the intake survey and were included in the study, yielding a response rate of 74.6%. The study population, averaging 53 years old, was 54% male and 74% Hispanic. When describing the highest level of education completed, 72% of participants had a high school education or less (Table 1).

At baseline, 50% of participants perceived their diet to be healthy ("very healthy" or "somewhat healthy") compared to 18% who considered it to be somewhat or very unhealthy. However, when asked to characterize their consumption of fruits and vegetables ("I eat more than I need," "I do not eat enough," or "I eat about what I need"), 42% of participants acknowledged not eating enough. This was followed by 38.0% reporting eating about as needed and 20.0% reporting eating more than they needed.

Barriers to Fresh Produce Consumption

Prior to VeggieRx enrollment, 84% of participants reported having barriers to consuming fresh

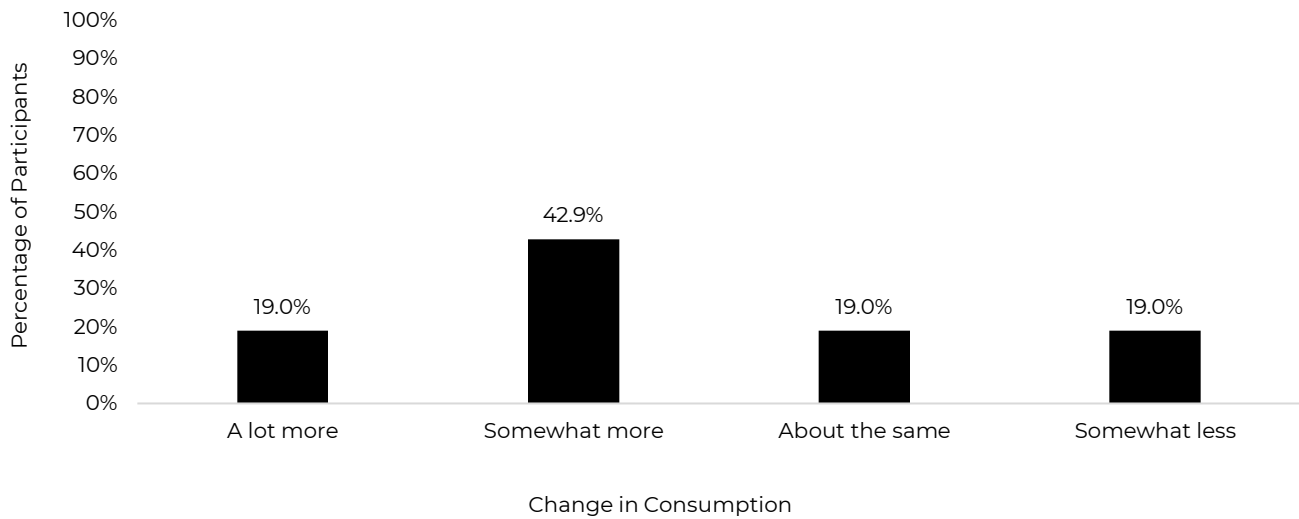
Figure 3. Barriers to fresh produce consumption (N=50)



Pre-program intake surveys asked VeggieRx participants to report any barriers they faced to consuming fresh produce. Most commonly reported barriers included lack of affordability and access nearby.

*Participants could select from multiple choice answers as well as free-write responses.

Figure 4. Change in Fruit and Vegetable Consumption Post-VeggieRx (N=21)



Post-program surveys asked VeggieRx participants to report any changes in their intake of fruit and vegetables. Participants could select from five choices including: a lot more, somewhat more, about the same, somewhat less, and a lot less. Most saw a modest improvement.

Table 2. Trends in VeggieRx 2021-2023 Voucher Redemptions at NBCFM

Year	Total participants (n)	Returning participants (n)	Filled ≥1 prescription (n)	Used ≥1 “refill” (n)	MarketBucks redeemed (\$)
2021	25	-	16	10	1325
2022	29	9	25	13	2214
2023	37	15	26	17	1672

Refills refer to repeat voucher redemptions for VeggieRX. Vouchers were exchanged for MarketBucks at NBCFM, which functioned as artificial cash limited to the purchase of fruits and vegetables.
NBCFM: New Brunswick Community Farmers Market

fruits and vegetables. Most commonly, 58.0% reported an inability to afford produce, 22.0% reported limited access to produce nearby, and 14.0% reported a lack of storage space among others. The only two free-response answers represented barriers of produce expiring quickly and no time to buy fresh produce (Figure 3).

Results also demonstrated that disparities in food insecurity may have been exacerbated by the COVID-19 pandemic. During the 2021 and 2022 seasons, 45.8% of participants reported worrying about their food running out before they had money to buy more since the pandemic. About 37.5% of participants reported that the food they bought did not last and they did not have money to buy more. Although as of May 2023, COVID-19 was no longer a public health emergency, these rates did not improve during VeggieRx 2023, possibly due to lasting pandemic effects.

Program Outcomes and Utilization

Among the 50 participants who filled out the intake survey, 21 filled out the post-survey. Notably, 61.9% reported an improvement in fresh fruit and vegetable consumption after VeggieRx, with 19.0% of participants reporting they ate “a lot more” and 42.9% of participants reporting they ate “somewhat more.” Of the remaining participants, 19.0% reported eating about the same, while 19.0%

reported eating somewhat less (Figure 4). Many participants noted that redemption of VeggieRx vouchers at NBCFM was “very easy,” at 61.9% of our overall cohort.

Overall utilization of VeggieRx from 2021-2023, irrespective of whether the user had completed the intake or post-intervention survey, was collected by NBCFM administrators to provide a broader sense of program utilization. Increasing trends in total program participants, filled prescriptions, and refills were seen with each season, although the highest monetary redemption was seen in 2022 (Table 2). Consecutive seasons had an increase in returning users, where nearly 41% of VeggieRx 2023 users had been enrolled in a previous season.

Program Feedback

In addition to general support for program continuity and expansion, users reported increased ability to afford vegetables, positive impacts on well-being, weight loss attributed to healthier eating, and satisfaction with services:

“It has been helping me buy more vegetables since they are usually expensive.”

“The program had positive impacts on my wellbeing. I was able to eat healthier and lose weight that I needed to.”

“The farmers market had excellent variety and the staff was very friendly and helpful.”

Barriers to using MarketBucks included a lack of consistent transportation to NBCFM and inconvenient market hours. Participants suggested that the market be made accessible all year round, provide indoor services during cold and rainy weather, and expand MarketBucks redemption to include dairy and meat products.

“I could not get to the market during the open hours.”

“Would like the farmers market to be accessible all year round and to have access to eggs, meat, and milk.”

“... good to have a farmers market indoors, so they don't have to close during winter.”

Discussion

The high utilization and satisfaction with VeggieRx among participants suggests the need for similar programs addressing food insecurity. Nearly half of VeggieRx users, including many with comorbidities (hypertension, type 2 diabetes mellitus) that require adherence to a healthy diet, reported increased fruit and vegetable intake. This highlights VeggieRx's role in contributing to health equity initiatives for vulnerable populations experiencing food insecurity and limited healthcare access. By addressing cost and accessibility barriers to purchasing nutritious food, patients are provided more equitable opportunities to adopt healthier dietary patterns that support disease prevention and management.

The utility of such produce prescription programs is echoed by previous studies highlighting increased daily fruit and vegetable consumption through similar community-based programs.⁹⁻¹³ However, most current models operate on a referral basis or maintain strict eligibility requirements,¹⁴ such as having a diet-related diagnosis (e.g., diabetes, obesity) and screening positive for food insecurity.¹⁵ Other local and government-funded food stamp programs, like Supplemental Nutritional Assistance Program, may restrict benefits to United States citizens. To our knowledge, VeggieRx is the first produce prescription program managed by a student-run clinic. Participants are not required to disclose their citizenship status nor meet other eligibility criteria outside of being a PC patient. This allows us to provide services to a broader patient population, including those currently facing the consequences of food insecurity and those at risk. The student-run free clinic service-learning model

allows medical student volunteers to learn about strategies to mitigate social determinants of health in clinical practice, increase their awareness of community resources, and practice dietary counseling. Through strategic partnerships with the community market, soup kitchen, and local farmers, VeggieRx also contributes to broader community health initiatives focused on chronic disease prevention through nutrition. This highlights the potential of such programs and can guide the development of health policies that expand nutrition assistance programs and promote partnerships between healthcare providers, community organizations, and local food systems. Creating a scalable, replicable framework for other student-run clinics requires establishing continuity in the patient-student doctor relationship, creating partnerships with local food suppliers, securing sustainable funding through grants, and incorporating routine dietary counseling into clinic workflows to help integrate the program into existing services.

This study is not without limitations. First, there was a small sample size due to low survey responses that limited generalizability. PC serves a special population with limited financial resources, time constraints, and low literacy, which presented a challenge for survey completion and study follow-up. Not all eligible PC patients enrolled in VeggieRx, for some did not schedule a clinic visit during the summer market season. Selection biases may influence the available data considering only participants who were self-motivated or had Student Doctor teams that followed up to complete surveys were included. Similarly, many participants who filled out the post-intervention regarding program outcomes were multi-year users who were more likely to express satisfaction given their retention rate. Nonetheless, Student Doctor teams offered dedicated assistance to participants who were pending survey completion (e.g. filling out forms together, phone reminders), without which response rates would have been lower. Additionally, our survey instrument was only generally based on validated instruments, which could result in subjective interpretation of survey questions. The self-reported data may have introduced recall and observer-expectancy biases if participants inaccurately reported or overstated improvements to align with program goals. Varying levels of health literacy could also influence baseline diet perceptions. While PC patients receive dietary counseling at every office visit, first-time patients were less likely to receive pre-study education regarding a healthy diet compared to long-term patients. Future studies should feature a larger sample size, validate the survey instrument, and track health metrics (body mass index, hemoglobin A1c, lipid profile, waist circumference, etc.) to report measurable outcomes.

Conclusions

The VeggieRx program successfully increased self-reported fruit and vegetable consumption for most participants, primarily by alleviating the key barrier of affordability, though several barriers to MarketBuck redemption were reported involving transportation. The two NBCFM locations were determined based on nearby availability of bus routes. While these locations were within 1.5 miles of PC (a five-minute car drive), travel by bus took approximately 30 minutes one-way. Participants also reported market hours that conflicted with work schedules. While NBCFM operated three days a week, including a weekend, market hours were limited (9am–1pm or 11am–3pm).

Expansion efforts aimed at increasing the program's reach and accessibility will play a pivotal role in bridging these gaps.¹⁶⁻¹⁷ Collaborating with local rideshare services may shorten commute times by offering public transportation alternatives. For example, RIDE On Demand (Middlesex County Department of Transportation, New Brunswick, NJ) is a new app that offers on-demand rides anywhere in New Brunswick for a flat price of \$3 per rider. Future seasons can offer this service and leverage crowdfunding to reimburse costs. Other viable options include mobile markets, such as pop-up markets in alternate locations or a produce truck parked outside of PC during clinic hours.¹⁸ Offering extended or evening operating hours will require further coordinated efforts with our community partner. Broader goals include increasing the monetary value of vouchers, extending the

program's availability year-round by partnering with local supermarkets, and expanding reach to the New Brunswick community at large.

These future directions underscore the program's commitment to evolving in response to the needs of its participants and broader community. As such, VeggieRx is poised to make a significant impact on reducing food insecurity and improving health outcomes among the underserved populations it serves.

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Disclosures

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