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Assessment of a New Approach for Measuring the Impact of Community Programs on Fruit and Vegetable Accessibility

Nicolas Jean Dupont[1*], Antoine Louis Petit[1], Camille Sophie Morel[1]

[1]Department of Management, IAE Paris–Sorbonne Business School, Paris, France.

***E-mail** ✉ n.dupont.paris@gmail.com

Abstract

Traditional evaluation instruments often fall short in capturing the effects of localized interventions, such as community meal programs or farmers' markets, on fruit and vegetable intake. This study presents pilot findings from a newly developed tool designed to measure the impact of community-based programs on dietary behaviors, specifically addressing the lack of effective evaluation methods in underserved populations. Using a participatory research framework, the survey was co-designed with stakeholders and community members. It was piloted across four community programs, with results validated and compared to the Behavioral Risk Factor Surveillance System for benchmarking. The survey achieved a 98.2% completion rate. Among participants, 62.5% reported eating more fruits and vegetables after engaging with the programs, identifying cost, time, and access as the main barriers. A strong correlation ($r = 0.876$, $p = 0.12$) was observed between the pilot data on daily fruit and vegetable consumption and national averages, though it did not reach statistical significance. The findings indicate that the survey can effectively capture both dietary behaviors and the influence of community interventions, highlighting the need for further research to refine its application across diverse settings.

Keywords: Dietary behaviors, Fruit consumption, Vegetable consumption, Community-based programs, Social determinants of health, Survey methods

Introduction

Adequate fruit and vegetable intake is essential for reducing the risk of cardiovascular diseases (CVDs), as confirmed by extensive research highlighting their pivotal role in maintaining cardiovascular health [1, 2]. Studies such as the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) consistently indicate that higher consumption of plant-based foods is linked to improved health outcomes and lower CVD risk [3]. Despite clear evidence, promoting and accurately measuring healthy eating, particularly in underserved populations, remains a major public health challenge [4-6].

Programs that enhance access to nutritious foods within communities—such as mobile produce deliveries or farm-to-table initiatives—have emerged as critical tools for improving dietary behaviors and overall community health [7-9]. Traditional dietary assessment methods, including extensive food frequency questionnaires (FFQs), 24-hour recalls, or dietary logs, often prove impractical for broad community implementation due to their complexity, high cost, and participation barriers [10-12].

Underserved communities, often residing in "food swamps" where unhealthy food options are prevalent, face unique challenges that these traditional tools fail to capture [13-15]. Insights from prior research and lived experiences show the need to address affordability, accessibility, and the quality of healthy foods. Program design and evaluation must therefore prioritize equity,

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cultural sensitivity, and responsiveness to community-specific needs [16].

Participatory research approaches, which actively involve stakeholders and community members, provide a valuable pathway for designing evaluation tools that reflect the realities of community settings [17]. Engaging local participants ensures that instruments are not only relevant and culturally appropriate but also capable of capturing nuanced impacts of programs on dietary behaviors.

Sustainable interventions must consider both immediate and long-term effects on community resilience and health outcomes. To address this, our study posed two central questions: (1) How can a concise survey effectively measure the impact of community-based food programs on fruit and vegetable consumption? (2) What obstacles do participants face in increasing their intake, and how can these insights inform program design? By exploring these questions, this study provides a tailored evaluation framework that links dietary behavior, public health, and sustainable food access.

This study developed and piloted a brief, community-centered survey tool to assess fruit and vegetable intake [18]. Key stakeholders—including funders, program staff, public health experts, and community participants—were engaged in the development process. The survey achieved face validity through stakeholder input, content validity via expert review, and construct validity through comparative analysis, resulting in a scientifically robust instrument that is accessible and meaningful for diverse populations served by community-based food access programs.

Materials and Methods

Survey development and validation

The cross-sectional survey aimed to capture participants' fruit and vegetable consumption patterns, obstacles to healthy eating, and the impact of involvement in community-based food access programs. The questionnaire included sections on demographics, program participation, and consumption frequency, as well as items exploring whether engagement influenced dietary behaviors and what factors contributed to any changes.

The survey design was informed by an extensive review of dietary assessment instruments and related literature, targeting challenges specific to evaluating fruit and vegetable intake in heterogeneous community settings [19-21]. Literature searches and expert consultations emphasized the importance of addressing socioeconomic and cultural considerations in survey development.

To maximize clarity and accessibility, the survey was translated into Spanish and culturally reviewed by program staff. Its brevity and straightforward design aimed to enhance participant comprehension, facilitate high response rates, and generate reliable, actionable data.

Stakeholder engagement was integral to refining the survey. Funders, program staff, and public health experts reviewed the questionnaire to ensure clarity, relevance, and completeness. Community members provided feedback during data collection, supplemented by an open-text field for additional input. This approach confirmed the survey's feasibility, cultural appropriateness, and ability to capture meaningful dietary behavior data.

Pilot survey implementation

In April 2024, the survey was piloted across four community sites selected through the American Heart Association's Social Impact Funds. These included: a free meal truck in Clearwater, Florida (Program A); a conventional farmers' market stall in Atlanta, Georgia (Program B); a mobile farmers' market in Antioch, California (Program C); and a farm bag distribution initiative in Richmond, California (Program D).

Participants were approached during their program visits and given the choice to complete the survey via tablet, smartphone, or through a read-aloud option provided by the research team to accommodate different literacy levels and accessibility needs. Upon completion, respondents received a $10 produce voucher redeemable at the respective program.

All procedures, including recruitment, consent, and incentives, were reviewed and approved by the University of Washington Institutional Review Board (STUDY00020152). Participants were informed of the study purpose before enrollment and were free to discontinue participation at any stage.

Survey content and measures

The survey was designed to capture patterns of fruit and vegetable consumption, identify barriers to healthy eating, and assess the impact of participation in community-based programs.

Demographic information—including age, gender, race, and ethnicity—was collected to contextualize

consumption trends across participant subgroups. Household food security was assessed with a single-item question asking respondents whether they had enough food at home, enough but not the types they wanted, sometimes insufficient food, or often insufficient food [22].

Questions regarding fruit and vegetable intake requested participants to report consumption frequency on a scale from five or more times daily to a few times per month or never [21]. Definitions were provided, specifying that only fresh or frozen fruits and vegetables were included, while canned or processed items were excluded, in alignment with the BRFSS fruit and vegetable module. Distinguishing between fruits and vegetables is essential for dietary analysis and supports adherence to recommended intake guidelines.

Participants were asked to compare their consumption before and after joining the programs, rating any changes as "increased significantly," "increased slightly," "remained the same," or "decreased." These items were intended to evaluate whether participation influenced dietary behavior and to identify reasons for any changes. Barriers to consuming more fruits and vegetables were assessed using options such as cost, limited accessibility, lack of preparation knowledge, insufficient time, taste preferences, and availability of preferred varieties.

Open-ended questions allowed participants to provide qualitative insights regarding program experiences, attitudes toward fruits and vegetables, and suggestions for improvement. These qualitative responses complemented quantitative data, offering a richer understanding of factors affecting dietary habits.

Data analysis

Quantitative analyses assessed the survey's reliability and validity. Descriptive statistics summarized participant characteristics and responses. Face and content validity were evaluated through expert input and feedback obtained during the pilot. Criterion validity was determined by comparing survey responses to the BRFSS fruit and vegetable module, with Pearson's correlation coefficient used to examine the association between reported daily fruit or vegetable intake and the national benchmark.

Open-ended responses were manually coded into categories due to the limited dataset, with themes including positive or negative feedback, program delivery experiences, and survey administration observations.

Feasibility assessment

Feasibility was evaluated through survey completion rates, administration methods, and participant feedback regarding the survey process. This assessment aimed to determine whether the tool could be effectively deployed in diverse community contexts and engage the target population.

Results and Discussion

Demographic profile of participants

A total of 111 individuals completed the pilot survey across the four programs. Age distribution **(Table 1)** indicated the largest group was 30–49 years (44%), followed by 50–69 years (31.2 percent), 18–29 years (14.7 percent), and 70+ years (10.1 percent). The majority of respondents were female (83.8 percent), with males comprising 16.2%.

Regarding race and ethnicity, White, non-Hispanic participants were the largest group (40.5 percent), followed by Black, non-Hispanic (24.3 percent), Latino/a (15.3 percent), Asian (8.1 percent), multi-racial (7.2 percent), Pacific Islander (0.9 percent), and 3.6% who declined to answer. Concerning food security, most participants (68.9 percent) reported having enough of the foods they preferred, 19.8% had sufficient food but not always the types they wanted, and 11.3% reported sometimes or often lacking adequate food.

Table 1. Participant demographics

Characteristic	Category	Number (%)
Age Group	18–29 years	16 (14.7)
	30–49 years	48 (44.0)
	50–69 years	34 (31.2)
	70 years and above	11 (10.1)
Sex	Female	93 (83.8)
	Male	18 (16.2)
Race / Ethnicity	White, non-Hispanic	45 (40.5)
	Black, non-Hispanic	27 (24.3)
	Latino/a	17 (15.3)
	Asian	9 (8.1)
	Multi-racial	8 (7.2)
	Pacific Islander	1 (0.9)
	Declined to answer	4 (3.6)
Household Food Security	Enough food, including preferred types	73 (68.9)

	Enough food, but not always preferred types	21 (19.8)
	Sometimes or often insufficient food	12 (11.3)

Survey completion and mode of administration

The survey achieved a very high completion rate, with 98.2% of respondents finishing the questionnaire, demonstrating strong engagement and willingness to participate.

Regarding the method of completion, 62 participants (55.9%) used a tablet, spending an average of 8.3 minutes completing the survey, whereas 49 participants (44.1%) completed it on a smartphone, taking an average of 5.1 minutes.

Feasibility and participant feedback

Participants generally reported positive experiences with the survey. Many expressed appreciation for both the programs and the incentive provided. Several respondents noted that the survey was straightforward to complete, with one individual stating they were "glad to participate" and suggested that similar surveys "should be conducted more often to understand community dietary habits." Administering the survey in-person was particularly valuable, as some participants preferred having the questions read aloud rather than navigating the tablet independently.

Fruit and vegetable intake

On average, participants reported consuming fruits 1.6 times per day (SD = 1.3) and vegetables 1.9 times per day (SD = 1.4). As illustrated in **Figure 1**, 65 participants (59.6%) indicated that they eat fruit at least once daily, with 6 participants (5.5%) consuming fruit five or more times per day. Vegetable consumption was slightly higher, with 78 participants (71.6%) reporting daily intake and 8 participants (7.3%) consuming vegetables five or more times per day.

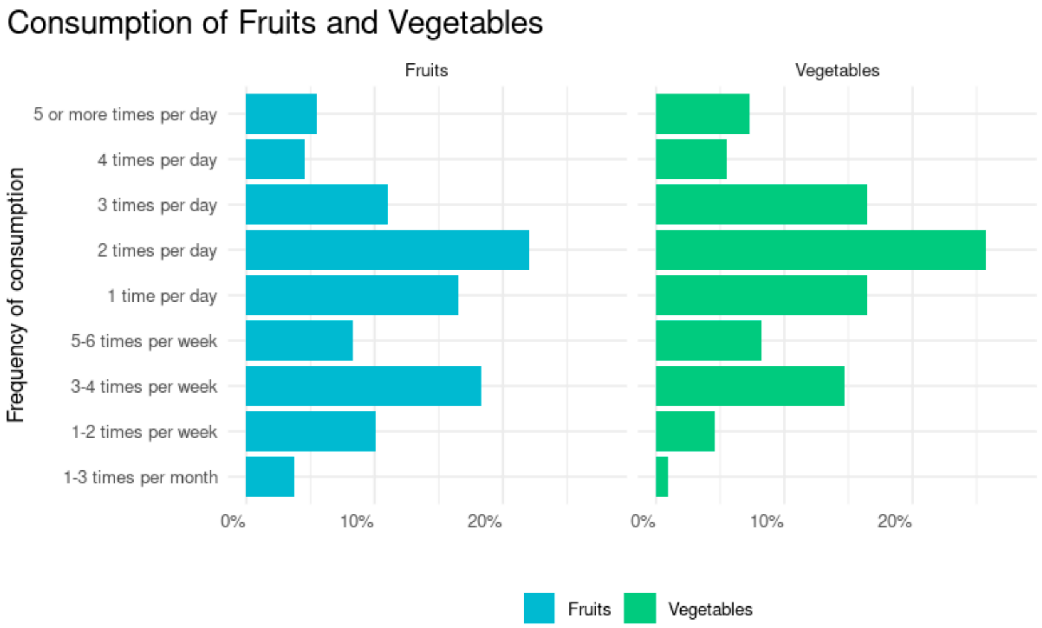

Figure 1. Patterns of fruit and vegetable consumption. **Figure 1** illustrates the distribution of participants' fruit and vegetable intake across different frequencies, ranging from 1–3 times per month to five or more times per day. Notably, none of the participants reported never consuming fruits or vegetables.

The survey also asked participants whether their fruit and vegetable consumption had changed since joining the program. Results showed that 33 participants (37.5%) experienced a substantial increase, while 2 participants (25%) reported a slight increase. Another 33 participants (37.5%) indicated that their intake remained unchanged, and no respondents reported a decrease in consumption after participating in the programs.

Barriers to increased consumption

When examining obstacles to consuming more fruits and vegetables, several challenges were identified **(Figure 2).** Cost was the most frequently cited barrier, with 47 participants (50%) indicating that high prices limited their intake. Time constraints for preparing fruits and vegetables were reported by 22 participants (23.4%), highlighting the role of busy schedules in shaping dietary habits. Accessibility issues, such as long distances to stores or transportation difficulties, were reported by 18 participants (19.1%), emphasizing the structural challenges that can impede healthy eating.

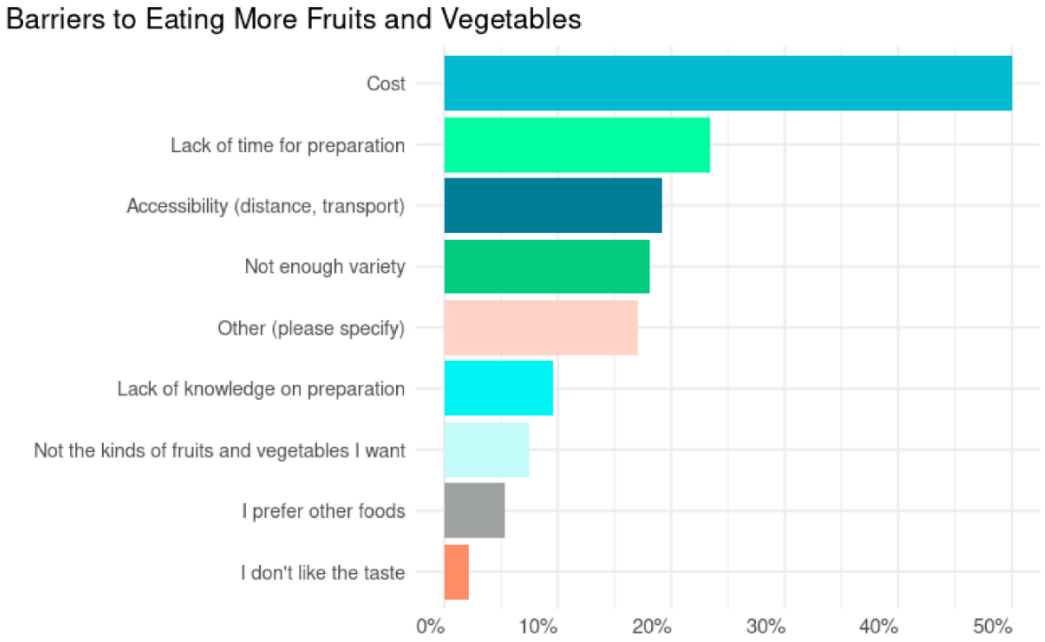

Figure 2. Obstacles to increasing fruit and vegetable intake. **Figure 2** presents the proportion of participants reporting factors that limited their consumption of fruits and vegetables. Participants were allowed to select more than one barrier. Data come from a pilot study conducted in April 2024, with 111 individuals participating across four community-based food access programs.

Among the barriers, 17 participants (18.1%) indicated that having a limited variety of fruits and vegetables available restricted their intake. Similarly, 16 respondents (17%) selected the "Other" category, pointing to unique or unspecified challenges not captured by the predefined options. A smaller number, 9 participants (9.6%), reported that insufficient knowledge on preparing fruits and vegetables made it difficult for them to consume more, highlighting a potential area for nutrition education interventions.

Taste preferences and the desire for other types of food were reported as obstacles by few participants—2 (2.1%) and 5 (5.3%), respectively. Additionally, 7 participants (7.4%) noted that they could not find the specific fruits or vegetables they wanted, emphasizing that variety plays a role in supporting higher consumption.

Criterion validity

To examine criterion validity, we compared the survey's fruit and vegetable consumption data with national data from the Behavioral Risk Factor Surveillance System (BRFSS). A strong positive correlation was observed ($r = 0.876$), though it was not statistically significant ($p = 0.124$), likely due to the modest sample size. These results indicate that the survey can reliably reflect dietary behaviors in line with established BRFSS benchmarks.

Figure 3 compares daily fruit and vegetable consumption prevalence among participants in each of the four programs with the BRFSS national average. For fruit intake, Program D had the highest proportion of participants consuming fruit at least once per day (80%), while Program A had the lowest (45.5%). The national BRFSS average for daily fruit consumption is 60.1%.

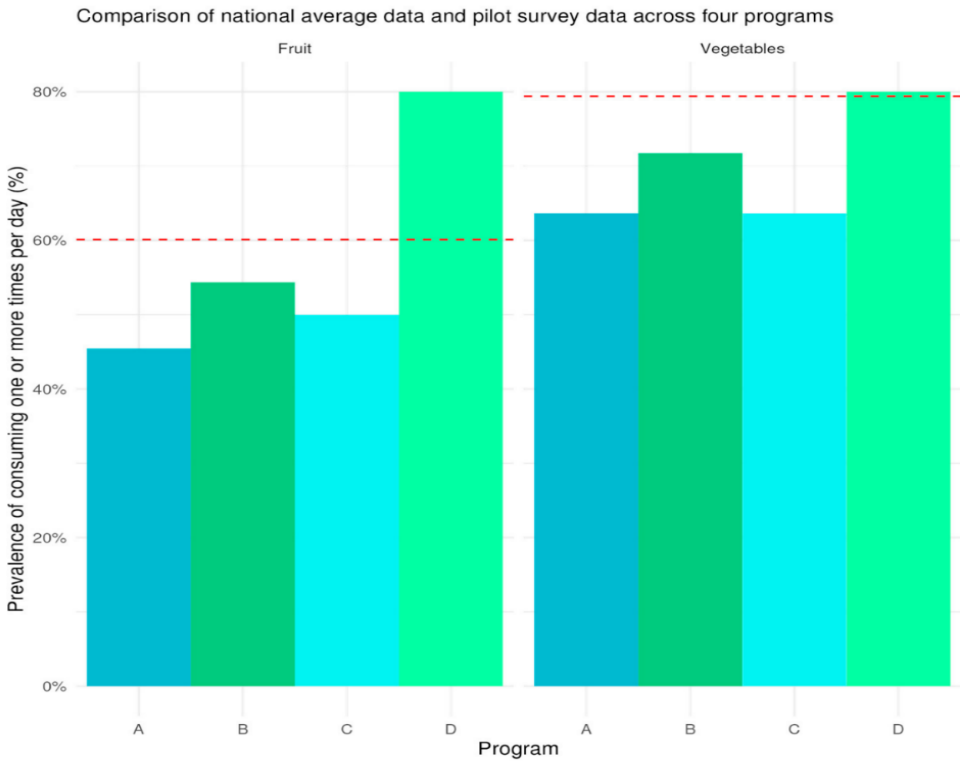

Figure 3. Prevalence of daily fruit and vegetable consumption compared to national data.

Figure 3 compares the proportion of participants in each community program who reported consuming at least one fruit or vegetable daily with the national average. The national benchmark comes from the 2023 Behavioral Risk Factor Surveillance System (BRFSS), and program-specific data are drawn from the April 2024 pilot study of 111 participants across four community-based food access programs.

For vegetables, Program D again exhibited the highest prevalence at 80%, while two other programs reported the lowest prevalence at 63.6%. The BRFSS national average for daily vegetable intake is 79.4%, which is higher than the rates observed in most program sites, except for Program D, which aligns with the national estimate.

This study was designed to create and pilot a concise survey instrument aimed at assessing fruit and vegetable consumption among participants of community-based food access programs. Findings from the pilot indicate that the tool successfully captured relevant dietary behaviors, with a high completion rate suggesting that it is both practical and engaging for the target population. While prior research emphasizes the need for accessible evaluation tools to measure the outcomes of nutritional interventions, few studies provide a clear methodology for engaging with hyperlocal, community-based programs [19, 23-28]. Such small-scale programs play a crucial role as points of access for individuals who might not typically participate in larger research efforts.

In the pilot, 62.5% of participants reported increased fruit and vegetable consumption since engaging with their respective programs, and none reported a decline. This demonstrates the potential effectiveness of these interventions, which aligns with findings from other studies showing improvements in produce intake among low-income populations through community-centered programs [8, 11, 27, 29].

Unlike broader studies, our work specifically targets smaller, locally focused programs and the unique demographics they serve. This targeted approach is critical for developing scalable solutions that address the needs of populations often overlooked in dietary research. By employing a participatory research framework, the survey ensures cultural sensitivity, relevance, and the inclusion of community perspectives—addressing a notable gap in existing surveillance methodologies.

The pilot also highlighted the primary barriers to increased fruit and vegetable intake, with cost and affordability emerging as the most significant

constraints. These results corroborate the literature demonstrating that economic factors strongly influence dietary choices [25, 29]. The observed correlation between our pilot data and BRFSS national averages suggests that the survey can effectively reflect dietary behaviors consistent with established public health monitoring standards. Notably, the program with the highest reported consumption—a discounted farm box initiative—illustrates that affordability and accessibility together can significantly reduce barriers.

While national surveys such as the BRFSS provide valuable insights at the population level, they are not designed to evaluate the specific impact of small, localized interventions. Unlike large-scale epidemiological studies, which capture broad trends, our survey is tailored to measure the direct effects of community-based programs on individual consumption patterns. This specificity enables more precise assessment of localized interventions and emphasizes the need for evaluation tools that match the scale and focus of the programs they aim to study.

Our methodology further targets participants who are often excluded from conventional research frameworks, which require extensive data inputs spanning individual, community, environmental, and policy factors [24, 30]. By streamlining data collection to be efficient, user-friendly, and inclusive, this approach bridges the gap between complex systems-level research and the practical realities of participants' lived experiences. Grounding research in the experiences of the community ensures relevance and enhances the utility of findings for shaping effective interventions.

Limitations

The pilot study was conducted across a relatively small number of community settings, which may limit the extent to which the findings can be generalized and may not fully reflect the variety of participant experiences. Additionally, the survey captured data at a single time point; extending data collection over a longer period could increase both sample size and participant diversity, thereby enhancing the robustness and generalizability of the results. The reliance on self-reported responses also introduces the potential for selection bias. Nevertheless, the survey was designed to be scalable for larger populations, which could mitigate bias and increase the likelihood of identifying statistically significant patterns. Future studies should aim to validate this tool across more diverse populations and consider incorporating objective measures to complement self-reported dietary data.

Conclusion

This study introduces a novel survey instrument developed to evaluate fruit and vegetable consumption within the framework of community-based food access programs. Initial validation indicates that the tool can reliably capture dietary behaviors and provide actionable insights for interventions aimed at promoting public health nutrition. Beyond the pilot settings, the survey has practical applications for program administrators and funders seeking to assess the impact of food access initiatives. Policymakers can also benefit from understanding the specific barriers to fruit and vegetable intake, which may inform targeted support measures or subsidy programs. The flexibility of the tool allows it to be adapted for assessing additional social determinants of health, broadening its utility for public health research. Further research and refinement are recommended to optimize its effectiveness and applicability across a variety of community contexts.

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