INCREASING FOOD ACCESS IN HISTORICALLY REDLINED NEIGHBORHOODS IN DURHAM COUNTY, NC THROUGH MOBILE MARKETS WITH NUTRITION EDUCATION

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A Capstone Project submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Public Health in the Public Health Leadership Program, Nutrition, and Health Policy and Management.

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ABSTRACT

Jared C. Mathewson, Xiaorui Qu, Jacob Rains, Madison G. Roberts, and Ruihan Xu: INCREASING FOOD ACCESS IN HISTORICALLY REDLINED NEIGHBORHOODS IN DURHAM COUNTY, NC THROUGH MOBILE MARKETS WITH NUTRITION EDUCATION
(Under the direction of [Elizabeth R. Tomlinson]**)**

Neighborhood and Built Environment, one of the five social determinants of health, encompasses the living, working, and recreational space which influence health outcomes (US EPA, 2017). Food access is one top issue currently facing the residents of Durham County (Hicks & Mortiboy, 2021). Access is determined by availability (number of food sources), accessibility (transportation to a food source), and affordability (cost of food) (USDHHS, 2022). In several neighborhoods within Durham city limits, less than 1% of residents have access to a nearby grocery store (Data Works NC, 2023). Our proposal aims to alleviate food access concerns by providing direct access to fresh fruits and vegetables within select communities via a mobile market. By modifying the built environment of Durham County, this program will increase consumption of fresh fruits and vegetables and improve long term health outcomes.

Keywords: Food Access, Built Environment, Durham County, North Carolina, Social Determinant of Health

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LIST OF ABBREVIATIONS

CHR	County Health Rankings
CHA	Community Health Assessment
SDoH	Social Determinant of Health
DCDPH	Durham County Department of Public Health

SECTION 1: COMMON PROPOSAL

1.1 Social Determinant Analysis and Goals

As identified by Healthy People 2030, neighborhood and built environment is a primary social determinant of health (ODPHP, 2020). The overall health of an individual is significantly influenced by their neighborhood. Social, economic, and environmental features of neighborhoods have been linked with outcomes such as general health status, disability, chronic disease, mental health status, injuries, and exposure to violence (Pickett, 2001). In Durham North Carolina, food access is largely influenced by neighborhood and built environment (DCDPH, 2021). Food access is determined by availability (i.e., number of food sources), accessibility (i.e., transportation to a food source), and affordability (i.e., cost of food) (USDHHS, 2022). In Durham's Forest Hills (census tract 7.03), East Durham (census tract 9.02), and Old North Durham (census tract 2.01) neighborhoods, less than one percent of residents have access to a nearby grocery store (Data Works NC, 2023). In contrast, in Durham County, 13.9% of residents have access to a nearby grocery store (Data Works NC, 2023). The present-day challenges of food access in Durham are compounded by historic policies. The discriminatory practice of redlining, though now illegal, was once widespread in Durham County. Starting in the 1930s, the United States federal government evaluated and mapped neighborhoods on characteristics like race, immigration status, and socioeconomic status and determined whether they were eligible to receive loans or access mortgage financing. Neighborhoods that were home to primarily Black residents, immigrants, and those of any race with low socioeconomic status were almost always mapped red and deemed as financial high-risk areas—thus the term redlining (De Marco, A., & Hunt, H. 2018). Lack of food access is closely linked to redlined districts in the United States and remains a major source of inequity in Durham County (Li & Yuan, 2022). Further, as outlined in Figure 1 in A.3, many residents in the Forest Hills, East Durham, and Old North Durham neighborhoods live below the federal poverty line, rely on buses or walking to get around,

and use federal benefits such as supplemental nutrition assistance program (SNAP) or women infants and children (WIC) funds—factors that exacerbate the challenges of inadequate food access (DCDPH, 2021).

1.2 Policy and Programmatic Changes

We propose mobile markets that incorporate nutrition education as an evidence-based option to address limited access to healthy foods among residents in Forest Hills, East Durham, and Old North Durham. At a community level, the mobile market distributes reduced-priced produce in predominantly-Black and food-insecure neighborhoods, thereby promoting increased access to healthy food. The program also involves partnering with community organizations, like Durham's Innovative Nutrition Education (DINE) program, to connect families with community resources (i.e, food assistance programs), and enhance the influence of the program by distributing promotional materials. The target population can also access nutrition education at the mobile market (DeWit et al., 2020). An effective mobile market, Fresh to You, is a public-private partnership program that serves fresh produce at below-retail prices to community organizations that serve a majority of low-income households in Rhode Island (Gorham et al., 2015). At the five-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among parents (n=480) of children (Gorham et al., 2015). Given the success of the Fresh to You intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County.

1.3 Community Partners

There are numerous community partners that influence Durham's food access system. Priority partners include the Durham County Department of Public Health, the City of Durham, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represent a variety of sectors (i.e., health, social services, community resources, etc.), as well as both formal and informal influence (i.e., government agencies vs. neighborhood organizations and churches). Because of their experiential knowledge, Durham residents with inadequate food access are the most significant priority partners within the system. Lived experience perspectives from Durham residents can

be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program (Beames et al, 2021). However, despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners (Figure 2). Lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. A priority partner who can provide key support to Durham residents who are experiencing inadequate food access is the Durham County Food Security Coordinator. In the Spring of 2021, Durham County created this position to "create a strong and equitable food system for residents to find affordable and healthy food" (DCDPH, 2021). The Food Security Coordinator plays an important role in bridging the gap between residents with lived experience and governmental processes.

1.4 Budget

To implement the mobile market program with nutrition education, we are requesting $3,291,651 from the county commissioners to be allocated to the Durham County Department of Public Health for a duration of three years. Expenditures for the three-year program include funding for eight new full-time staff ($2,015,273) including two supervisors, four mobile market staff, and two registered dieticians. Other expenses food purchases ($668,391), office rent and utilities ($119,466), food transportation, storage, and insurance ($83,073), evaluation and advertising ($61,208). Assumptions include 30% for fringe benefits, 2% increase for all line items each year, and a 10% allocation of indirect costs ($299,241) to the Durham County Department of Public Health.

1.5 Engagement and Improvement Plan

To initiate, facilitate, and sustain community partnerships to transform food access in Durham, North Carolina neighborhoods, program staff will utilize four strategies as detailed in the methods, timing, and measures table in Figure 3 and summarized here:

Community Listening Conversations: During the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation (University of Kansas, n.d.). Insights from these conversations will be used to inform the design of the mobile markets.

Neighborhood Postal Survey: Later in the design phase, our team will conduct a postal survey of residents in the Forest Hills, East Durham, and Old North neighborhoods (Parker and Dewey, 2000). The postal survey will inform residents about the mobile market program and will collect data on food access challenges within each neighborhood.

Neighborhood Advisory Team: In the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team (NAT) (Arnos et al., 2021). The NAT will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design of the mobile market. The NAT will be comprised of residents from the Forest Hills, East Durham, and Old North Durham neighborhoods who have experienced food access challenges. The NAT will be responsible for compiling a minimum of five strategic priorities to guide the development of the mobile markets by the end of a six-month period.

Mobile Market In-Person Survey: Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets (CDC, 2014). After the first year of market operation, we will administer these surveys on a biannual basis. The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood. Future funding requests will be based on the opportunities and needs identified by respondents.

1.6 Program/Policy Evaluation

We plan to use surveys and focus groups to collect outcomes data on the mobile market program. There will be a baseline survey, progress surveys (every 6 months after program implementation), and an

end-of-program survey distributed at the market during our program implementation. Examples of validated survey questions can be found in Table 1 located in Appendix A.3. With three mobile market sites, we plan to recruit a total of thirty participants for three focus groups. Each post-intervention focus group session will last about two hours (Gorham et al. 2015). To recruit the participants, we will post our contact information in the community center, on the nutrition handouts, and on the surveys at our mobile markets. The ten participants from each site will be randomly registered for focus groups using the randomizer website (Research Randomizer, n.d.). A $15 value of fresh produce will be given to participants as an incentive for participating in the focus group session. This process will facilitate adequate representation of the community members that came to the mobile market. (Gorham et al. 2015)

Survey data will be gathered from monthly mobile market sales of fresh fruits and vegetables to assess daily consumption of fresh fruits and vegetables. Daily sales of fresh fruits and vegetables will be recorded by the on-site mobile market staff on the record sheet. Focus group data will provide feedback about the mobile markets and any suggestions for improvement. The focus group sessions will be recorded and categorized by identifying analytical coding/themes. The data collected will be stored on the computer at the program office. After the focus group sessions and all program evaluations are done, program effectiveness will be measured to assess the efficacy of the program for future use. We will be looking for the difference in fresh fruits and vegetable consumption as well as how applicable/sustainable the program is by comparing program cost and mobile market revenue.

1.7 Target Outcome

By May 1st, 2026, the total consumption of fresh fruits and vegetables will be increased by 0.4 cups per day from baseline within the first six months of the program implementation in the three targeted neighborhoods (Forest Hills, East Durham, and Old North Durham) in Durham County, as measured by surveys.

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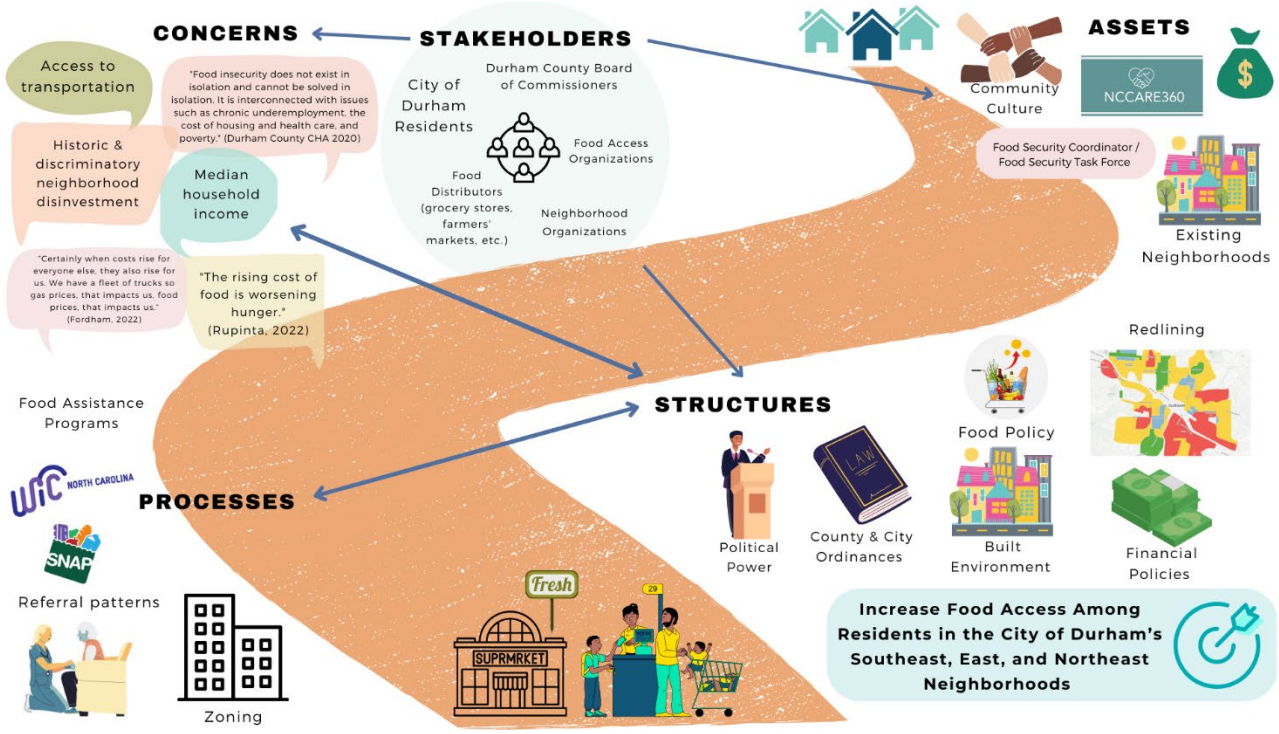
APPENDIX A: GROUP DELIVERABLES

A.1 RICH PICTURE



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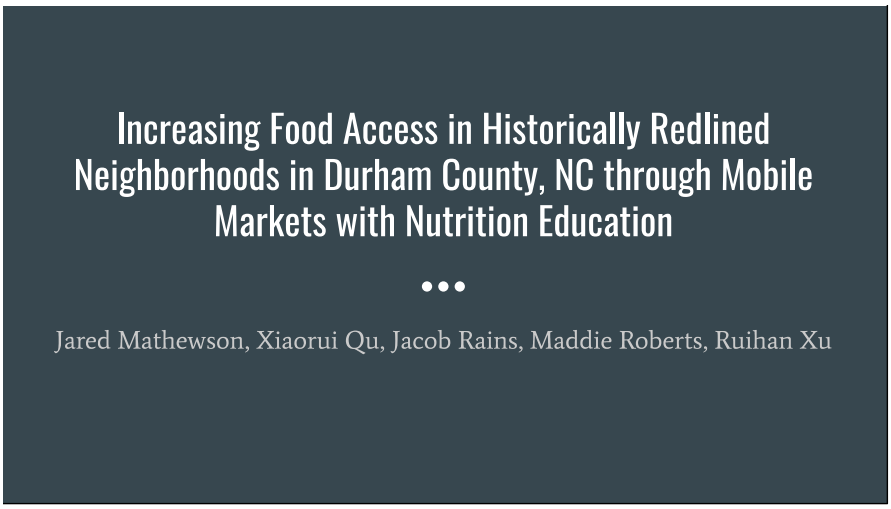
A.2 COMMON PROPOSAL PRESENTATION



Speaker: Jared Mathewson

Overview of the SDOH in the county

- Neighborhood and Built Environment
  - Living, working and recreational spaces
  - Link to long term health outcomes (Pickett, 2001)
    - Chronic disease
    - Exposure to violence
    - Mental health
- Food Access
  - Availability, accessibility, and affordability (USDHHS, 2022)
  - Durham's Forest Hills, East Durham, and Old North Durham
- Historically Redlined Neighborhoods
  - Closely linked to food access (Li & Yuan, 2022)
  - Black, immigrant, low SES neighborhoods (De Marco & Hunt, 2018)

Speaker: Jared Mathewson

Neighborhood and built environment is a key social determinant of health. It encompasses the spaces in which people live, work, eat, and play (USEPA, 2017). It is also linked to many long-term health outcomes.

Food access is one important aspect of built environment. Considered one of the key issues facing Durham County based on the 2020 community health assessment, food access encompasses food availability, accessibility, and affordability. Research also indicates that the built environment has a significant impact on people's ability to access food (DCDPH, 2021). Statistics from Data Works NC show that less than 1% of residents in Durham's Forest Hills, East Durham, and Old North Durham neighborhoods, where our program is focused, have access to nearby grocery stores. This is significantly lower than the average of Durham County at 13.9% (Data Works NC, 2023)

Redlining is also a contributing factor to the lack of food access in these neighborhoods (Li & Yuan, 2022). Redlining was the practice of deeming primarily black, immigrant, and low socio-economic status communities a high financial risk thus discouraging investment ((De Marco & Hunt, 2018). While it is now illegal, these historic practices still impact food access today; our program is designed with these injustices in mind.

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Speaker: Xiaorui (Jessica) Qu

Mobile markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address the key issue. Similar to the farmers market, the program will transport and distribute fresh fruit and vegetables at below-retail prices to the priority populations in our targeted neighborhoods (East Durham, Old North Durham, and Forest Hills). The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program) The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and will build a partnership with Durham's Innovative Nutrition Education (DINE program)

This program is designed based on an evidence-based mobile market program: *Fresh to You*, which is a public-private partnership program that serves fresh produce at below-retail prices to serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. At the 5-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among participants (Gorham et al., 2015). Given the success of the *Fresh to You* intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County County.

Reference:

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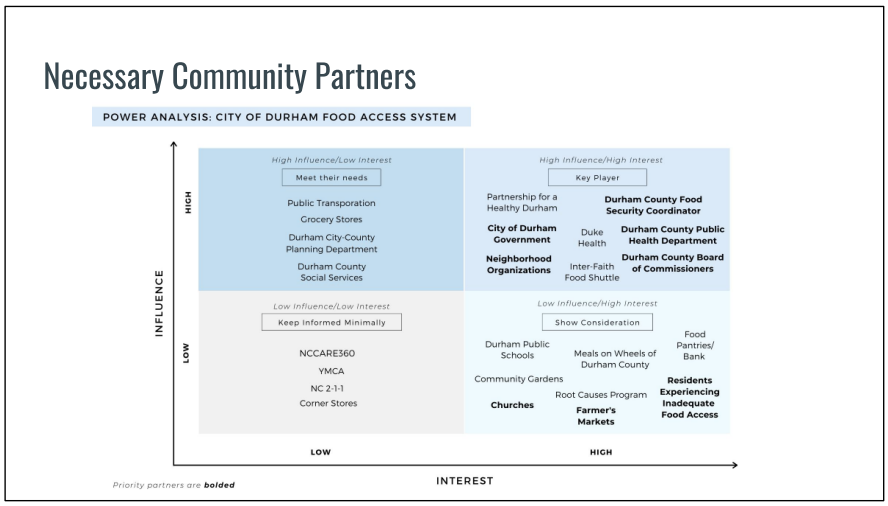
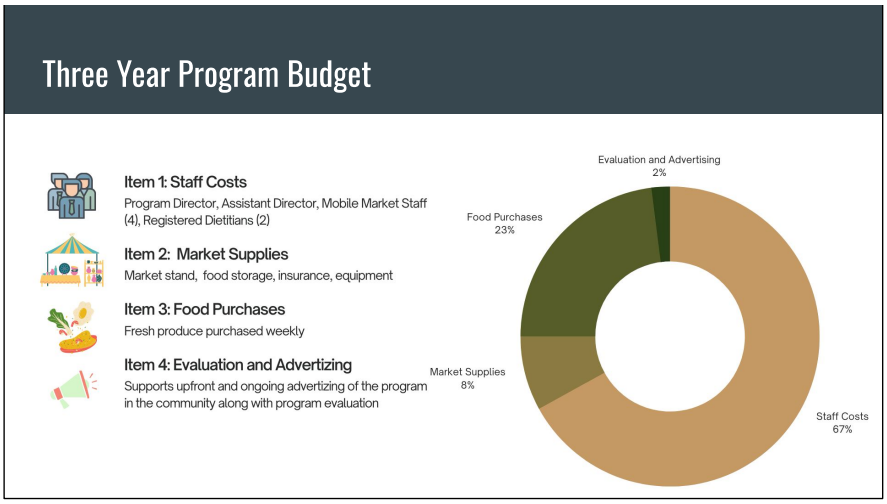


Speaker: Maddie Roberts

Numerous community partners influence Durham's food access system. As detailed within this power analysis, community partners have varying levels of influence and interest within Durham's food access system. Given the context of our proposed program, priority partners are bolded throughout the analysis and include the Durham County Department of Public Health, the City of Durham, the Durham County Board of Commissioners, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represents a variety of sectors, as well as both formal and informal influence. For instance, while the Durham Board of County Commissioners has governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches have relational influence with Durham residents.

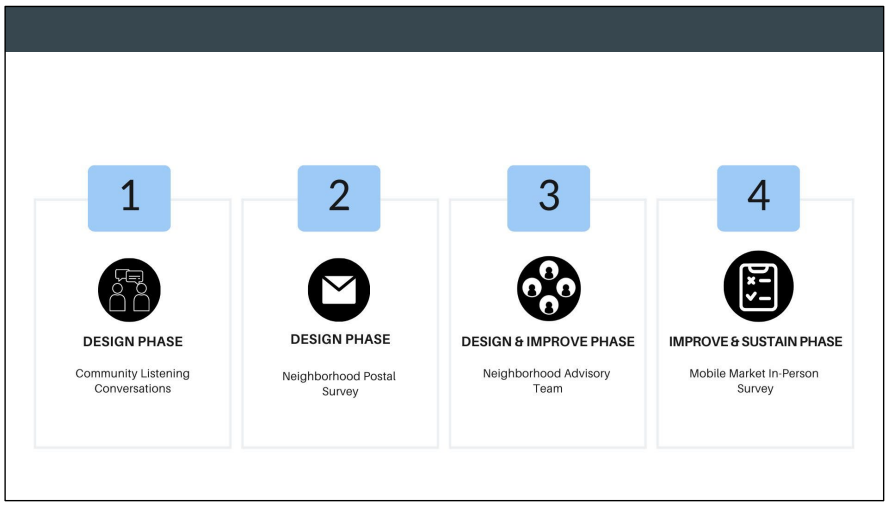
Of the priority partners within the system, Durham residents with inadequate food access are the most significant priority partners because of their experiential knowledge. Lived experience perspectives from Durham residents can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program. Despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners. The lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. Priority partners, like the Durham County Food Security Coordinator or the Durham County Department of Public Health, will play an important role in bridging the gap between residents with lived experience and governmental processes.



Speaker: Jacob Rains

Back to Agenda

We are requesting an increased appropriation of 3.29 million in county funds to the DCoDPH DINE program to administer the mobile market program for three years. These funds will be used to hire eight full time staff including a mobile market team with registered dieticians. Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) will purchased in line with other mobile market programs. Additional funds will be dedicated to covering the costs of advertising the program in the community and administering our comprehensive evaluation plan. Our mobile market budget is designed to be flexed to shift mobile market locations based on community needs at no additional cost to the County.



Speaker: Maddie Roberts

To initiate, facilitate, and sustain community partnerships to transform food access in the targeted neighborhoods, program staff will utilize the following engagement strategies throughout four phases:

1) First, during the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation. Insights from these conversations will be used to inform the design of the mobile markets.
2) Later in the design phase, our team will conduct a postal survey of residents in the targeted neighborhoods. The postal survey will inform residents about the mobile market program and collect data on food access challenges within each neighborhood.
3) Next, in the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team. The Neighborhood Advisory Team will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design and strategic priorities of the mobile market. The Neighborhood Advisory Team will be comprised of residents from the targeted neighborhoods who have experienced food access challenges.
4) Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets. After the first year of market operation, we will administer these surveys on a biannual basis.
1) The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood.

References:

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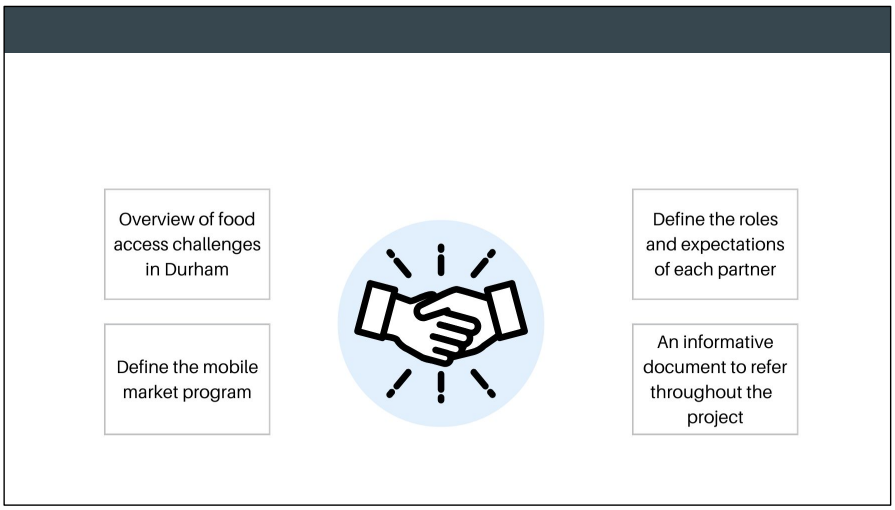
Centers for Disease Control and Prevention. (2014). Farmers Markets: Encouraging Farmers Markets in Underserved Areas . In *Healthier Food Retail: An Action Guide for Public Health Practitioners* (pp. 66–86). essay.

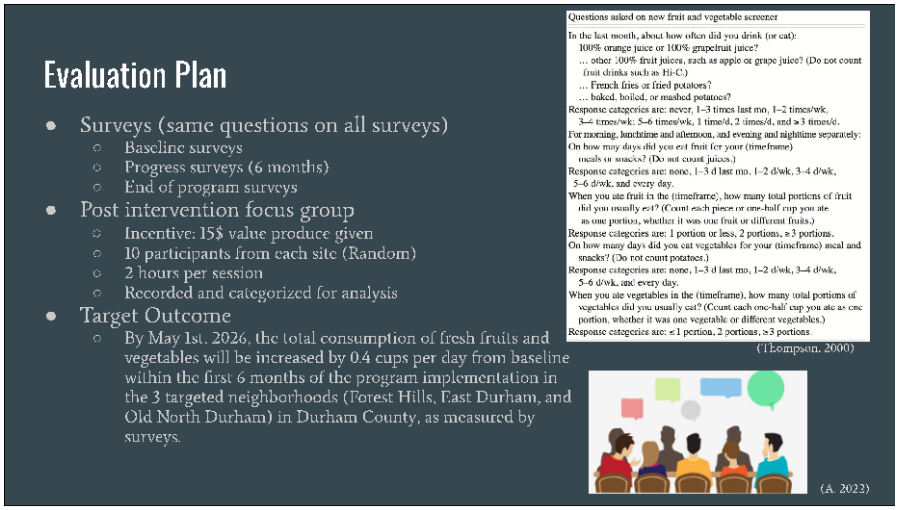
Parker, C., & Dewey, M. (2000). Assessing research outcomes by Postal Questionnaire with telephone follow-up. *International Journal of Epidemiology*, *29*(6), 1065–1069.

University of Kansas. (n.d.). *Section 17. leading a community dialogue on building a healthy community*. Chapter 3. Assessing Community Needs and Resources | Section 17. Leading a Community Dialogue on Building a Healthy Community | Main Section | Community Tool Box.



Speaker: Maddie Roberts

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding, or MOU, is crucial for success. An MOU is a formal agreement between community partners that outlines project and partner expectations. In the context of our program, an MOU will overview the history of food access challenges in Durham, with a particular focus on the targeted neighborhoods; outline how the establishment of mobile markets will effectively address food access challenges; define the trajectory of the mobile market program; define the roles and expectations of each partner; and act as an informative document to refer to throughout the entirety of the project. For example, given the context of the partners who are contributing to the mobile market program, an MOU between the Mobile Market Team and the Neighborhood Advisory Team will be necessary.



Speaker: Ruihan Xu

For program evaluation, we plan to use both surveys and focus groups for data collection. The examples of survey questions are listed on the top right figure, such as 'When you ate fruit in the last X month, how many total portions of fruits did you usually eat?'. There will be 3 survey collection periods, the baseline surveys, progress surveys (which will be collected every 6 months), and end of program surveys.

As for focus groups, we only plan to conduct post-intervention focus group sessions. Similar to what we see in other research studies, we expect to recruit 10 participants from each site for each focus group session (Gorham et al. 2015). To help recruit participants, we will provide fresh produce as an incentive. Each of the focus group sessions will last 2 hours, and the session will be recorded and categorized for later analysis.

One of the target outcomes of the program is listed here, which is related to fresh produce consumption measurement. So, after collecting the data from both surveys and focus groups, we will be able to analyze the data and see whether our target outcome is achieved. Some other data collected from focus groups might also be used to inform future modifications to the program.

References:

A. (2022a, March 4). *How Do Focus Group Works*. Spade Survey.

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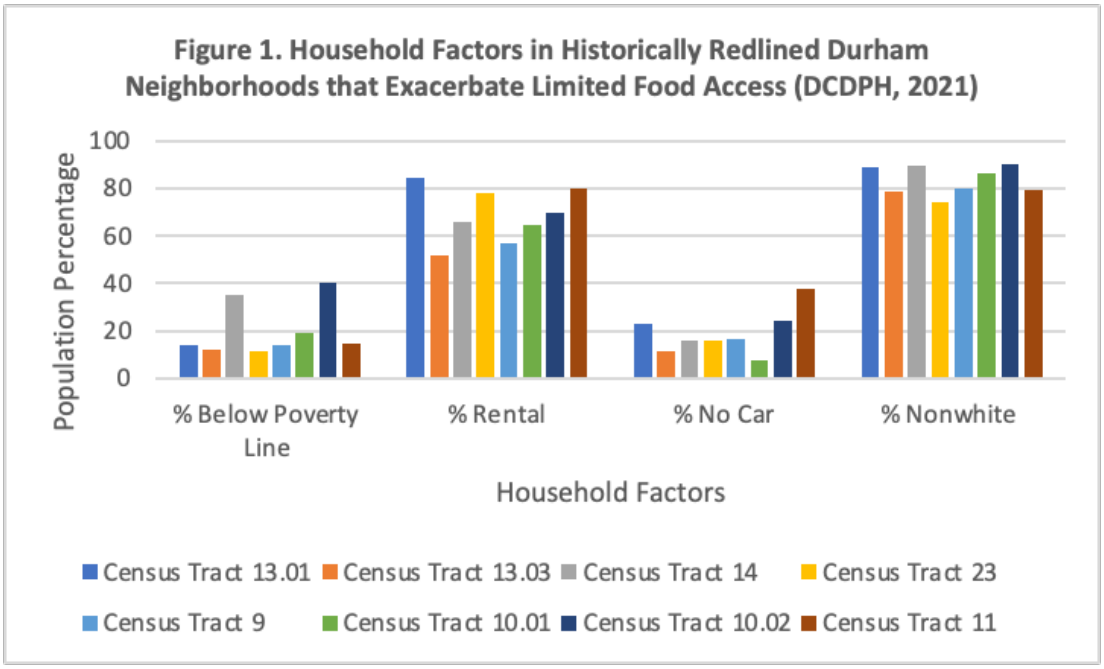
Thompson, F. E., Kipnis, V., Subar, A. F., Krebs-Smith, S. M., Kahle, L., Midthune, D., Potischman, N., & Schatzkin, A. (2000). Evaluation of 2 brief instruments and a food-frequency questionnaire to estimate daily number of servings of fruit and vegetables. The American Journal of Clinical Nutrition, 71(6), 1503–1510.

Speaker: Ruihan Xu

Lastly, here are our references. Thank you so much for your time and consideration. We hope our presentation on low food access in historically redlined neighborhoods of Durham has captured your attention and compelled you to respond. Your financial support will greatly help with our program development and those people in need. Thank you again for your valuable time.

A.3 COMMON PROPOSAL TABLES AND FIGURES

Figure 1. Factors in Durham Neighborhoods that Exacerbate Limited Food Access



(DCDPH, 2021)

Figure 2. Power Analysis: City of Durham Food Security System

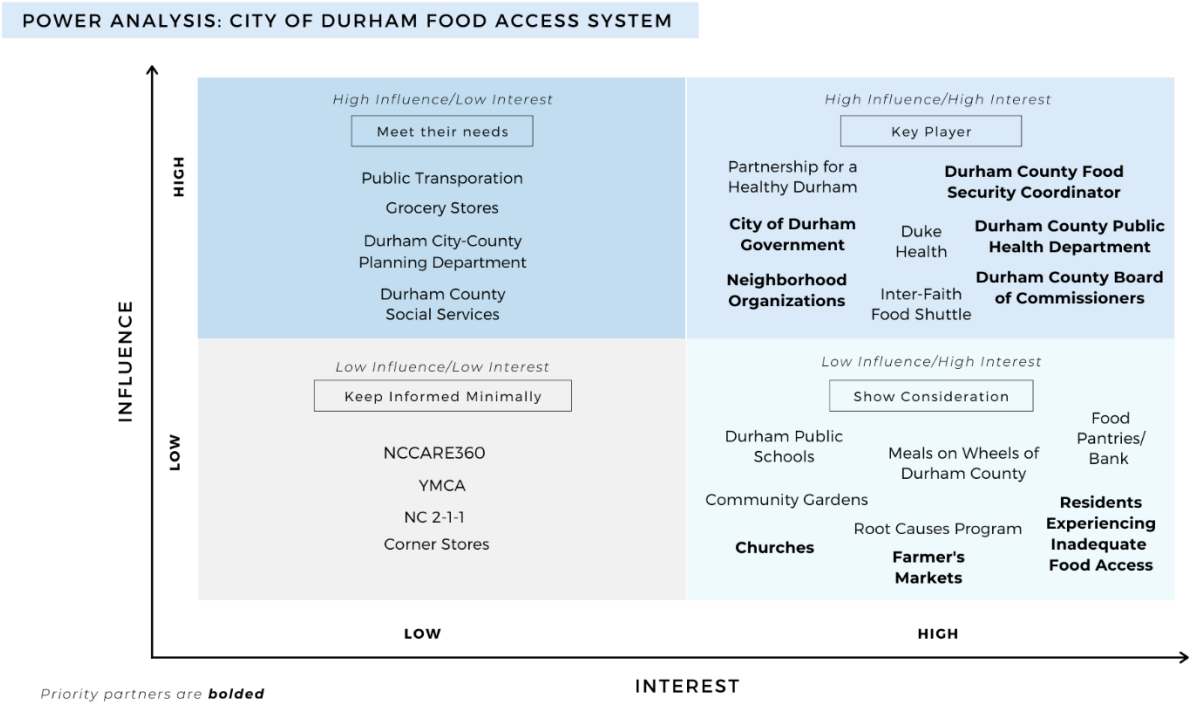


Figure 3. Methods, Measures, Timing Table

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Community Listening Conversations	Group	Inform, Consult, Involve	B: Lack of community trust to show up to/participate in conversation F: Desire to have a platform to share experiences and thoughts. Incentives like childcare, food, and/or gift cards.	Design	# of community listening conversations in each neighborhood # of attendees # of participants who show interest in joining the NAT	Qualitative analysis of transcripts and/or notes from each conversation	1-3 in each target neighborhood (Forest Hills, East Durham, and Old North Durham)	Although there are no policy implications for this step, county commissioners could be invited to come and *listen* to the conversations.

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Neighborhood Postal Survey (sent via mail)	Individual	Inform, Consult, and Involve	B: Survey requires intentionality to complete, potential language barrier F: No in-person requirement, anonymity, can do on own timeline	Design	# of responses (mail-in and online) # of participants who show interest in joining the NAT	Quantitative /qualitative analysis of survey responses (aggregate, as well as neighborhood specific)	Once in each target neighborhood	County Commissioners to be briefed on survey results.

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Establish Neighborhood Advisory Team (NAT)	Group	Collaborate and Empower	B: Requires commitment and may be difficult for team to rally around common objectives/project design. F: Opportunity to enact meaningful change in community, childcare, refreshments	Design and Improve	# of neighborhood blocks represented # of individuals who commit # of priority strategic goals that emerge from NAT	The NAT will create an advisory board charter that will be referenced throughout the project. Performance indicators which will inform the design of the mobile markets.	Monthly, for six months	County Commissioners to consider policy-related implications (I.e., Allowing mobile markets to operate year-round, rather than only April to October.)

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Mobile Market Survey (in-person at markets)	Individual	Consult and Involve	B: Survey requires intentionality to complete, potential language barrier F: Opportunity to share thoughts	Improve and Sustain /Scale	# of responses	Quantitative /qualitative analysis of survey responses (aggregate, as well as neighborhood specific)	Quarterly throughout year 1; biannual throughout year 2 and beyond	Expansion of DINE program funding to better meet the identified needs of community members County Commissioners to be briefed on survey results.

Table 1. Validated Survey Questions

Questions asked on new fruit and vegetable screener
In the last month, about how often did you drink (or eat):
100% orange juice or 100% grapefruit juice?
… other 100% fruit juices, such as apple or grape juice? (Do not count fruit drinks such as Hi-C.)
… French fries or fried potatoes?
… baked, boiled, or mashed potatoes?
Response categories are: never, 1–3 times last mo, 1–2 times/wk, 3–4 times/wk; 5–6 times/wk, 1 time/d, 2 times/d, and ≥3 times/d.
For morning, lunchtime and afternoon, and evening and nighttime separately:
On how may days did you eat fruit for your (timeframe) meals or snacks? (Do not count juices.)
Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day.
When you ate fruit in the (timeframe), how many total portions of fruit did you usually eat? (Count each piece or one-half cup you ate as one portion, whether it was one fruit or different fruits.)
Response categories are: 1 portion or less, 2 portions, ≥3 portions.
On how many days did you eat vegetables for your (timeframe) meal and snacks? (Do not count potatoes.)
Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day.
When you ate vegetables in the (timeframe), how many total portions of vegetables did you usually eat? (Count each one-half cup you ate as one portion, whether it was one vegetable or different vegetables.)
Response categories are: ≤1 portion, 2 portions, ≥3 portions.

(Thompson et al., 2000)

APPENDIX B: JARED C. MATHEWSON INDIVIDUAL DELIVERABLES

B.1 SOCIAL DETERMINANTS OF HEALTH ANALYSIS

Social Determinant of Health

Social determinants of health are conditions which impact a wide range of health outcomes and effect people's quality of life. Social determinants include: Economic Stability, Education Access and Quality, Health Care Access and Quality, Neighborhood and Built Environment, and Social and Community Context (USDHHS, 2023). Of these, Neighborhood and Built Environment is a key issue that the residents of Durham County are facing today. Built Environment is defined by the Environmental Protection Agency (EPA) as "the man-made or modified structures that provide people with living, working, and recreations spaces." (US EPA, 2017). As a rapidly growing urban area, the Durham built environment as it currently stands does not have the ability to meet the demands of all its citizens. Residents of Durham County voiced their collective desire to improve both sidewalk and bicycle facility maintenance in the county through the 2020 Community Health Assessment (Hicks & Mortiboy, 2021). In addition to bicycle and sidewalk facilities, it is also important to improve access to public motor transportation, such as buses, for longer commutes and people with disabilities (CDC, 2019).

Improving these facilities would provide many benefits to citizens. Any improvements would make transportation easier therefore improving food access for those within the county (Crowe, Lacy, & Columbus, 2018). Research also shows that having facilities that allow for active travel such as walking and biking improves mental health; these improvements would occur immediately following the creation of facilities allowing for this kind of travel (Gu & Chen, 2020 & Kroesen & De Vos 2020). On a longer term scale, cities where citizens are able to participate in active travel have lower incidence of obesity and higher odds of reporting better health. Only 10-15% of individuals using active transport for 50% of their trips report as obese compared to 20-25% of those using active transport for 10% of their trips (Pucher, Buehler, Bassett, & Dannenberg, 2010). Another study of almost 100,000 individuals found that active transport was associated with a significant improvement in self-reported health, however, they also found that active transport was significantly more common among white participants (Barajas & Braun, 2021).

Geographic and Historical Context

It is important when discussing this population of people to consider the historic inequality prevalent in the city of Durham. During the late 1960's, two prosperous black communities were completely removed stripping residents of housing and business resulting in a 300 million dollar loss of generational wealth (Addy, 2018). Intergenerational health is very important for the financial, and therefore for physical, wellbeing of families (Cheng, Johnson, and Goodman, 2016). Black American already fall far behind white Americans in their accumulation of generational wealth; the destruction of these two communities, combined with the lack of reparations, extubated the issue significantly leaving families at a much higher risk of poverty (Addy, 2018 & Weller and Roberts, 2021).

Durham County has been working on several programs to improve the ability of residents to navigate the city without having to use cars as a mode of transportation. Sidewalks are already required as a part of all new development, and GoDurham/GoTriangle are both working on bus stop and transit improvements. Numerous streets in the area of interest already have a "Shared Roadway With Wider Outside Lane", however, it is prudent for those streets to have full bike lanes, with protections, incorporated into their design (Durham County, 2018).

Priority Population

The priority population is Durham County residents that are living in South Central and South East parts of the city of Durham. People living in these communities make roughly $30,000 per year on average which is well below the county average of $61,000 per year (DataWorks NC, City of Durham, & Durham County, 2017). These communities are also disproportionately minorities, being between 40 – 70% black or African American and 19 – 60% Hispanic/Latino compared to the county averages of 35.2% and 13.7% respectively. (DataWorks NC, City of Durham, & Durham County, 2017). In contrast to wealthy neighborhoods, where builders develop wide lanes accommodating cars and bikes and communities have homeowners associations to ensure that sidewalks are well-maintained, low SES communities do not have advocates for active travel facilities. Individuals may feel uncomfortable walking at night with no street lights or may fear falling, mainly in older residents, due to poor facility

maintenance (Rajaee et al., 2021). These issues are significantly less frequent in communities with high SES.

Measures of SDOH

Incidence of both diabetes and deaths related to heart disease are a significant burden to non-Hispanic black people living in Durham County. Data on the incidence of these health outcomes compared to the United States can be found in tables 1 and 2 respectively. Notably, the prevalence of diabetes in the South East parts of Durham are between 16 – 19%; prevalence of heart attacks in these same regions are 2 – 3% (DataWorks NC, City of Durham, & Durham County, 2017). These prevalence are higher than those in the North West portions of the city where diabetes prevalence is between 5 to 10% and the prevalence of heart attacks is around 1% (DataWorks NC, City of Durham, & Durham County, 2017). These areas also have differing percentages of sidewalk coverage with the North West having an average of close to 85% sidewalk coverage while the South East part of the city has closer to a 70% coverage (DataWorks NC, City of Durham, & Durham County, 2017).

Rational / Importance

People living in poverty, such as those in the poorest areas of Durham, may not be able to afford motor vehicles as a mode of transportation due to the cost of the vehicles, cost of insurance, and/or cost of upkeep (gas, oil, tires, etc.) (Methipara, 2014). It can be difficult for them to be able to access jobs, health care services, and food simply due to lack of transportation. Improving facilities that already exist, and creating new ones, will provide more opportunities to access jobs, food, and health care for people living within these areas (Liu, & Wei, 2020). Such development will also come with the added health benefits for citizens that partake in active transports such as walking and biking.

Disciplinary Critique

It is important to include public health nutritionists in the process of developing better active travel options for residents because they understand how walking and biking impact food access. A public health nutritionist would be able to make cohesive, logical arguments for why these facilities should be included and how their inclusion could impact dietary outcomes of residents by providing an analysis of

local food environments. They would also be better able to provide reports on barriers that may differentially impact resident's decisions to buy foods such as fresh fruits and vegetables. As a result of improving these facilities, resident's long term health will continue to see benefits for future generations. Additionally, having more operational sidewalks and bike lanes will promote tourism to the city. Research shows that similar projects also lead to an increase in people's utilization of local food and retail locations. (Liu, & Wei, 2020). This infrastructure can remain as the city continues to expand, so long as facilities are maintained, which will improve the local economy for decades following.

B.1.a. Appendix from SODH Analysis

Table 2. Diabetes Prevalence by Race in Durham County, NC vs. United States

Race/Ethnicity	Diabetes Prevalence (percent) – Durham County	Diabetes Prevalence (percent) – United States
Non-Hispanic White	0.9	7.4
Non-Hispanic Black	17.8	12.1
Hispanic/Latino	6.4	11.8
Asian	5.8	9.5
American Indian/Alaskan Native	N/A	14.5

Adapted from (Spratt et al., 2015 & American Diabetes Association, 2022)

Table 3. Prevalence of Heart Disease Related Deaths per 100,000 Individuals in Durham County, NC as Compared to the United States

Race/Ethnicity	Prevalence of heart disease related Deaths (percent) – Durham County	Prevalence of heart disease related Deaths (percent)– United States
Non-Hispanic White	152.4	152.6
Non-Hispanic Black	251.3	189.2
Hispanic/Latino	N/A	71.9
Asian or Pacific Islander	N/A	68.6
American Indian/Alaskan Native	N/A	153.6

Adapted from (Hicks & Mortiboy, 2021 & KFF, 2022)

B.2 PROGRAM ANALYSIS

Introduction

Social determinants of health are the conditions of people's environment which affect both quality-of-life and a wide range of health outcomes (USDHHS, 2023). Of the five social determinants of health, neighborhood and built environment is a key issue that residents of Durham's poorest neighborhoods are currently facing. Built environment is defined by the Environmental Protection Agency (EPA) as "the man-made or modified structures that provide people with living, working, and recreation spaces." (US EPA, 2017). According to the Durham County community health assessment, one of top issues that Durham County residents are facing is food access (Hicks & Mortiboy, 2021). There are several areas of Durham that have been historically red-lined. This redlining discouraged economic development in areas that were home primarily to Black/African American families and immigrant families (Shadrick, 2018). These neighborhoods continue to feel the impact of redlining practices today through many avenues not the least of which is food access. Lack of food access is closely linked to redlined districts in the United States and remains a major source of inequity in Durham County (Li & Yuan, 2022). Concerns about the food access of these areas need to be addressed as food access has significant long term health effects. Lack of food access is known to be associated with higher rates of chronic disease such as diabetes, chronic kidney disease, and hypertension (Decker & Flynn, 2018 & Suarez et al. 2015). Additionally, chronic disease results in both a decrease in employment based income and an increase in medical expenses (Jayathilaka et al., 2020 & Sultana, Mahumud, & Sarker, 2016). The overall increase in financial burden leads people to living in areas where there is a lack of food access perpetuating a cycle of disease. We have decided to target East Durham (Census Tract 9 – Block Group 2), Forest Hills (Census Tract 7 – Block Group 2), and Old North Durham (Census Tract 2 – Block Group 1) because less than 1% of residents living in those neighborhoods have access to nearby grocery stores as compared to the county average of 13.9% (Data Works NC, 2023). Improving that access will improve both long term health outcomes as well as the day-to-day quality of life of the residents in those neighborhoods (Hanmer, DeWalt, and Berkowitz, 2021).

Evidence Based Nutrition Policy or Program

A proven way to address the issue of food access, without simply building new markets and subsidizing fresh fruits and vegetables, is to create mobile markets or, in our case, pop-up markets. One of the best examples of how a program like this can work is "Fresh to You", a program created out of a partnership between Brown University and other private entities to bring fresh fruits and vegetables to low-income communities in Rhode Island year-round (Gorham et al. 2015). We specifically chose this program because it focused not only on census tracts that were further than 1 mile from a supermarket but also communities with low access to vehicles which could be a concern in low-income communities (Gorham et al. 2015). Additionally, the populations Gorham et al. worked with were also primarily black, indigenous people of color (BIPOC) which also holds true for the red-lined neighborhoods of Durham.

Evidence Based Outcomes

We expect this program to have two important short term outcomes. First, we expect that families in the East Durham, Forest Hills, and Old North Durham neighborhoods will increase their consumption of fresh fruits and vegetables by 0.4 cups per day by May 1st, 2025, 6 months following the program's start date. This outcome is based on the increase in vegetable consumption that Gorham et al. saw during their mobile market intervention (Gorham et al. 2015). Information to confirm this outcome will be collected via validated survey and interpreted by the program's director and assistant director. We also expect that by May 1st, 2025 at least 50% of those served in the East Durham, Forest Hills, and Old North Durham neighborhoods will have traveled less than 1 mile indicating that there is improved food access in those areas. Gorham et al. did not investigate other short term outcomes, so our second outcome is based on the outcome of a similar program conducted in Springfield MA (Hsiao et al., 2018). This outcome specifically measures the effect that the pop-up markets are having on food access in the neighborhoods; this information will be collected and interpreted using the same methodology.

Neither of the programs we looked at studied their participants long enough to have distinct long term outcomes. Therefore, we do not currently have an expected long term outcome for this program.

Evidence Based Implementation Strategies and Activities

The public health department will be the organization leading the implementation of the pop-up markets which will consist of two major components. The first component is obtaining the fruits and vegetables from a distributor. Durham is fortunate to have many local food distributors which could be utilized to fill inventory for the markets (Dunning et al., 2017). Utilizing these local organizations would be mutually beneficials for farms/businesses in and around Durham county (Gorham et al., 2015). Additionally, refrigerated storage space will be required to keep fruits and vegetables fresh for markets that are not yet delivered. The second major component of Pop-up markets are the markets themselves; markets for our program will be physical stands that are set up by program staff in specified areas that have low access to healthy foods in the city (Gorham et al. 2015). This process will involve driving a van loaded with market items to the location, setting up the market stand, conducting sales with community members, breaking the market stand down, and unloading/loading the van. Considering that pop-up markets will occur at independent times, only one van will be needed to set up the markets. Any left-over fruits and vegetables will be returned, assessed for quality and, if still acceptable, returned to refrigerated storage to be sold at future markets.

The Pop-Up Market Program will be nested within the Durham County Department of Public Health. While this is not the original implementation for Fresh to You, we feel that having it sponsored by the county affords important advantages, mentioned later, and staying power within the county. Our program will have its own Director and Assistant Director overseeing the implementation process with a small team of individuals responsible for the day-to-day activities of the program (Gorham et al. 2015). By being organized within the Department of Public Health, we can utilize some of the programs already in place with Durham's Innovative Nutrition Education (DINE) program. For example, having the double bucks program, which enables supplemental nutrition assistance program (SNAP) and women, infants, and children (WIC) participants to double their benefits at participating farmers markets, active at our markets would be incredibly impactful for the communities (Double Bucks, 2023). Double bucks would enable SNAP and WIC benefits to go twice as far and empower community members to obtain more fresh fruits and vegetables at the pop-up markets (Gorham et al. 2015). It could also be negotiated to

expand the markets to include nutrition classes through the DINE program in the future which would offer community members some education on how to store and use specific fruits and vegetables as well as why it is important to eat, and how often they should be eating, fruits and vegetables (Double Bucks, 2023).

Based on Gorham et al.'s program, we anticipate that each market will attract roughly 40 buyers (Gorham et al. 2015). There will be a total of 6 market locations meaning that pop-up markets will have 240 total market attendees per week. Unfortunately, no information was provided as to if any of these attendees were repeat versus how many were new attendees. We expect to have served a total of 5,760 families at the end of our six month period, however, several of these are bound to be repeat attendees. Assuming that roughly 50% of those will be people coming to the market more than one time, we will have served roughly 2,900 different families over the initial 6 months of the program.

Seeing as our pop-up markets are mainly a social program, the primary part of the socioecological model address is the local level of public policy. We are also bringing in local organizations such as local food banks, the public health department, and local food non-profits to help inform the program activities. Doing so addresses the community level of the socioecological model. The organization aspect of the model will be addressed in a similar way by bringing in organizations and social institutions throughout the community. To get the word out about the program, we will likely distribute fliers to local social institutions such as community centers and churches. It is also possible that these social institutions will serve as market locations. Finally, the program will be addressing the individual level of the framework by providing people with a better ability to access fresh fruits and vegetables.

Community Partners

Members of the East Durham, Hayti District, and Old North Durham neighborhoods will be one of the most important groups of partners for this program. Because our program is specifically aimed at improving their access to health food, we will need their feedback to understand the most effective way to organize our program to serve their community. The Durham County Food Security Coordinator will be another important community partner as they already have in depth knowledge of the systems at play

within Durham County that will be able to assist us in creating a successful program. It is also possible that this program could be implemented in future locations; having the Food Security Coordinator on board with this program will help adapt the program for rural areas of the county that could also benefit from the program. Local food non-profits and food pantries are also key community partners for our program because they have working knowledge of these communities, the foods they prefer, and the best way to deliver foods to the community. The knowledge that these organizations hold is key to creating a successful program. Durham's County Commissioners as the final major partner of importance. The county commissioners represent the residents of the county; it will be important to garner their feedback about program activities and the impact it is having on communities will be important to ensuring that it serving community members as much as possible.

Budget

The budget in Table 4 is a description of the first year costs of the program with references; costs which will be recurring in future years of the programs are labeled in the table. Costs are broken down into three main categories: personnel, program resources, and fruits and vegetables purchases. Personnel and fruits and vegetables purchases are recurring expenses while some program resources may be one time purchases. Personnel will consist of a director, assistant director, and 4 employees which will be responsible for daily program activities such as executing and preparing for the markets. These expenses will comprise 84% of the first year's budget. Program resources include a van, ford transit connect wagon 2022, to transport market materials to the sites, gas to operate the van, market stands to present fruits and vegetables, and materials needed to operate and advertise the markets such as a tablet or laptop enabled with payment software. These devices will also be used to track market sales made in cash. Program resources will comprise 12% of the first year's budget. Finally, fruits and vegetables purchased by the program for sale at the markets will comprise 4% of the first year's budget.

This program will be fully funded by Durham County Public Health Department as a measure to improve the health of historically disadvantaged BIPOC communities. Based on the budget from 2019 in which Durham County allocated almost 4 million dollars for Health Education and Community

Transformation, it is clear that Durham County has a strong commitment to addressing the built environment of the communities in the county (Jacobs et al., 2019). Additionally, the 411,000 dollars needed to fund the program would only be 1.3% of the operating budget for the county based on the approved budget for Public Health of 31,800,000 dollars for 2022-2023 (Howerton et al., 2022). This program will increase the budget for the public health department relatively little while taking great steps towards improving food access.

Conclusion

Gorham et al. found that one advantage of their program was that they were able to bring produce to communities at a lower cost, and with higher quality, than local super markets (Gorham et al., 2015). This affordability will be further increased if markets are able to participate in the Double Bucks program (Gorham et al., 2015). Our pop-up market program has several other key advantages. First and foremost, it does not rely on creating additional store fronts or shopping areas; this comes with the added benefit that there are few considerations for the travel involved with increasing access to healthier food. We are taking the market to central locations in the communities that would be, at most, a 1 mile walk; this is likely manageable for most community members. There are also few recurring costs for the program outside of the personnel necessary to staff it. After the first year, the budget could be up to 50,000 dollars less making this program even more affordable. A final advantage of this program is that we are targeting specifically fresh fruits and vegetables, so any increase in food access also means that people are also gaining access to healthful foods.

One disadvantage of this program mentioned by Gorham et al. is that having a physical market booth was laborious and less cost effective than a fully mobile market (Gorham et al., 2015). Another disadvantage of this program is that it currently does not have a way to accommodate people who are differently abled. In the future, there may be space to make visits to specific homes to assist people that are not able to come to the pop-up markets, but the current plan does not include any such accommodations. The pop-up markets are also not a permanent fixture. Some community members may not be able to attend the market closest to them due to work hours or other obligations. This is slightly

remedied by having some overlap in market locations, but it does not entirely alleviate the issue of not having a permanent space that operates for 8 hours a day.

Overall, this program will provide better health food access for the majority of residents in the East Durham, Hayti District, and Old North Durham neighborhoods. There is simply no way to accommodate every need of those in the community, so we decided to focus on a program that would have the greatest net benefit. We decided to use a market stand model because it did not require the retrofitting of a vehicle to sell produce. For the first year, it would be much more simple to set up a canopy and shelves than to alter a vehicle for the purposes of the program. Working with communities to plan market times will maximize our ability to reach residents in the East Durham, Forest Hills, and Old North Durham neighborhoods; those residents able to participate will have increased access to healthier foods which will improve their well-being.

B.2.a. Appendix for Implementation Plan

Table 4. Year 1 Pop-Up Market Budget

Budget Category	Item	Amount (USD)
Personnel (Krasna et al., 2018)		$345,000
	Director (Recurring) – 1	$80,000
	Assistant Director (Recurring) – 1	$65,000
	Employees (Recurring) – 4	$50,000
Program Resources		$52,360
	Vehicles – 1 van (KBB, 2023)	$30,000
	Vehicle Coverage & Maintenance (Betterton, 2023)	$10,000
	Gas (Recurring) ($30/month*12 months/year) (Trip Calculator, 2023)	$360
	Market Stands Materials – Shelves – 2 Canopy – 1 (Cambro, 2023 & Instant Canopy, 2023)	$2,000
	Other Materials (office materials, laptops/tablets, payment software, etc.) (ACP, 2020)	$10,000
Fruit and Vegetable Purchases (USDA, 2023)		$13,000

	Fruits – $2/lb*50lbs/week*52 weeks/year	5,200
	Vegetables – $3/lb*50lbs/week*52 weeks/year	7,800
Total Budget		410,360

B.3 EVALUATION PLAN

Introduction

Our program focuses on built environment which is defined by the Environmental Protection Agency (EPA) as "the man-made or modified structures that provide people with living, working, and recreations spaces." (US EPA, 2017). According to the Durham County community health assessment, one of top issues that Durham County residents are facings is food access (Hicks & Mortiboy, 2021). Lack of food access is closely linked to redlined districts in the United States and remains a major source of inequity in Durham County (Li & Yuan, 2022). Concerns about the food access need to be addressed as food access has significant long term health effects (Decker & Flynn, 2018 & Suarez et al. 2015). Specifically, less than 1% of residents in East Durham (Census Tract 9 – Block Group 2), Forest Hills (Census Tract 7 – Block Group 2), and Old North Durham (Census Tract 2 – Block Group 1) have access to nearby grocery stores as compared to the county average of 13.9% (Data Works NC, 2023). Improving that access will improve both long term health outcomes as well as the day-to-day quality of life of the residents in those neighborhoods (Hanmer, DeWalt, and Berkowitz, 2021). Our program will bring fresh fruits and vegetables to members of those communities via a mobile market which has been adapted from Fresh to You to address the needs of those in the Durham community (Gorham et al., 2015). This program will set up markets in our target communities to help improve access to fresh fruits and vegetables for residents; our model will also help to lower the costs of fresh fruits and vegetables which will further increase accessibility (Gorham et al., 2015). The mobile market program will be housed within the Durham County Department of Public Health which will be the primary implementer.

Evidence Based Evaluation Plan

Study Design/Data Collection

In order to evaluate our program, we will be collecting descriptive information from market participants using a survey adapted from the 2020 census questionnaire. A copy of this questionnaire can be found in Figure 4. We expect that families in the East Durham, Forest Hills, and Old North Durham neighborhoods will increase their consumption of fresh fruits and vegetables by 0.4 cups per day by May

1st, 2025, 6 months following the program's start date. Measuring fruit and vegetable intake will provide information as to how the consumption of fresh fruits and vegetables was impacted by the mobile market (Gorham et al., 2015). A self-reported survey will be used to collected demographic information as well as descriptive data. Demographic data will be collected using via a component aimed specifically at assessing fruit and vegetable intake. This component is based on a dietary assessment tool created by the Thompson et al.; it is designed specifically to assess changes in dietary consumption of fruits and vegetable which will help us assess program effectiveness (Thompson et al., 2000). An additional benefit to using this specific survey component is that it consists of only 16 questions which will minimize burden on market participants completing the survey (Thompson et al., 2000). One modification will be made to the questionnaire following the precedent of Gorham et al.; instead of asking about the amount of servings, our fruit and vegetable survey will ask amount the amount of cups they consumed (Gorham et al., 2015). This will help us better map consumption to the Dietary Guidelines for Americans (DGAs), which tracks healthy fruit and vegetable consumption in cups, when completing the analysis of our data (USDA, 2020). See figure 5 for a sample of the original 16 question fresh fruit and vegetable questionnaire (FFVQ) from Thompson et al.

Sample and Sampling Strategy

Our goal is to collect 15 baseline surveys from each market site; with 6 sites, we will be collecting a total of 90 surveys. Fresh to You collected a total of 480 surveys across 176 different market locations with strict survey criteria, so we feel that 90 surveys across 6 sites is both realistic and sufficient for data analysis. (Gorham et al., 2015). These surveys will be completed by consenting participants on a first come first serve basis with a 10$ incentive for completing the first survey. After 6 months, the program director and assistant director will follow up with those survey participants using the contact information provided to administer a follow up survey; a 20$ incentive will be provided to those willing to complete the follow-up survey (Gorham et al. 2015). Surveys will be available in both English and Spanish to accommodate as much of the population as possible; other language barriers will be addressed on an as needed basis by the assistant director.

Specific Measures

The primary output measured by our program will be the number of patrons that attend our mobile markets; this will provide us data on how many community members we are reaching. In terms of program outcomes, we want to assess if market participants increase their consumption of fresh fruits and vegetables by 0.4 cups per day; We also want to asses if at least 50% of those served, in the East Durham, Forest Hills, and Old North Durham neighborhoods, will have traveled less that 1 mile indicating that there is improved food access in those areas. Finally, the primary construct we are interested in measuring is health related quality of life (HRQOL). To measure this, we will use the 9 HRQOL from the Behavior Risk Factor Surveillance System (BRFSS) from the Center for Disease Control and Prevention (CDC). A copy of these questions, which will be included in our baseline and follow-up surveys, can be found in table 5.

Timing

The program will start partner engagement activities before the first market takes place to assist with making decisions on locations for the markets in each neighborhood. Engagement activities will then occur at 6 month intervals corresponding with the release of data from each cycle. Data on our specific measures will be collected from market participants at baseline, then the same survey will be completed by participating market attendees on a 6 month interval (Gorham et al. 2015). After follow-up data is collected, a new round of data collection, from a different sample of participants, will start with the same parameters as the first; data from the two 6 months intervals will be compared at the end of each year. Progress will generally be defined as increasing fresh fruit and vegetable intake with a goal of increasing total intake among participants by 0.4 cups. If there is no evidence of increase fresh fruit and vegetable intake, our team will reevaluate the delivery of the program. The director and assistant director will be responsible for conducting focus groups with stakeholders to determine what could be improved within the program. We would especially ask about factors such as market timing and locations to determine if markets could be planned better for people in the communities; we would also try to collect information about market pricing and if participants are able to afford the prices of the market.

Analysis Plan

Data collected about fresh fruit and vegetable intake will only be quantitative. We are interested in the quantity of fresh fruits and vegetables consumed by market participants; specifically, we are interested in if there was an increase in the consumption among market participants, as whole, from baseline to 6 months. Because we are using a sample of market participants to approximate if there is a difference in all market participants, we will use a paired sample t-test to calculate a p-value which we will then assess to at a 0.05 p-value (95% significance level); values under 0.05 will be considered significant while those over will be considered non-significant. Data collected will also be used to calculate a 95% confidence interval (Gorham et al. 2015). P-values / confidence intervals will be calculated for data collected at each individual market, then data across all markets will be combined and a p-value / confidence interval will be calculated for the entire program. Program data will show the significance of the program county wide; individual market data will show significance of the program on individual communities.

Sources of Funding

This program, which is initially funded by the Durham County Department of Public Health, will continue to be sustained by that same organization. Our current operating budget is 1,100,000 dollars per year. There is no clear peer-reviewed evidence of what a program like this will cost, so this is a best estimate based on the cost of necessities calculated for Durham County. The director of the program will be responsible for drafting and submitting a budget for the program to the at the start of each budget cycle; this budget will include a complete breakdown of costs for the help department to evaluate. The Department of Public Health will be responsible for approving that budget which will provide yearly funding to the program. Yearly data, prepared by the assistant director, will be presented beside the budget each year following the first to help make the case for its continued inclusion in discretionary spending.

Data Use and Dissemination

Data will be initially used by the program to ensure that the goals set are being reached. If goals are being reached, qualitative data collected via focus groups and surveys will be used to assess how the program may be able to go above and beyond those goals. Data will also be used to inform strategies to meet any goals for which the program is currently falling short. The program director and assistant director will be responsible for this first level of data interpretation. Additionally, data will be reported back to the Department of Public Health in an impact packets prepared by the program director to provide support for ongoing funding by the department. Dissemination of data will take place at the end of every data collection cycle (every 6 months), and it will be distributed to community partners and market participants via email as well as via a pamphlet, which highlights key successes of the program and community members, at the mobile markets.

Conclusion

The mobile market program, in collaboration with Durham County Department of Public Health, will help improve the health equity of people living in historically under resources communities in Durham. Of the many facets of public health, we take specific aim to improve the nutrition of those in these communities in hopes that by nutrition we can also improve health related quality of life and general health outcomes. We have designed a program that will provide food assistance directly to citizens to reduce the barriers to quality nutrition; it is designed by an interdisciplinary group of public health professionals dedicated to changing the built environment of Durham County. Adopting this program will give residents access to fresh fruits and vegetables in a simple, sustainable, and equitable manner, and it can be continued for as long as the need continues to exist in Durham County.

B.3.a. Appendix from Evaluation Plan

Figure 4. Demographic Questionnaire

1. Print name of **Person 2**

First Name MI

Last Name(s)

2. Does this person usually live or stay somewhere else? *Mark ✗ all that apply.*

- ☐ No
- ☐ Yes, for college
- ☐ Yes, for a military assignment
- ☐ Yes, for a job or business
- ☐ Yes, in a nursing home
- ☐ Yes, with a parent or other relative
- ☐ Yes, at a seasonal or second residence
- ☐ Yes, in a jail or prison
- ☐ Yes, for another reason

3. How is this person related to Person 1? *Mark ✗ ONE box.*

- ☐ Opposite-sex husband/wife/spouse
- ☐ Opposite-sex unmarried partner
- ☐ Same-sex husband/wife/spouse
- ☐ Same-sex unmarried partner
- ☐ Biological son or daughter
- ☐ Adopted son or daughter
- ☐ Stepson or stepdaughter
- ☐ Brother or sister
- ☐ Father or mother
- ☐ Grandchild
- ☐ Parent-in-law
- ☐ Son-in-law or daughter-in-law
- ☐ Other relative
- ☐ Roommate or housemate
- ☐ Foster child
- ☐ Other nonrelative

4. What is this person's sex? *Mark ✗ ONE box.*

☐ Male ☐ Female

5. What is this person's age and what is this person's date of birth? *For babies less than 1 year old, do not write the age in months. Write 0 as the age.*

Print numbers in boxes.

Age on April 1, 2020 years | Month | Day | Year of birth

➜ **NOTE: Please answer BOTH Question 6 about Hispanic origin and Question 7 about race. For this census, Hispanic origins are not races.**

6. Is this person of Hispanic, Latino, or Spanish origin?

- ☐ **No**, not of Hispanic, Latino, or Spanish origin
- ☐ Yes, Mexican, Mexican Am., Chicano
- ☐ Yes, Puerto Rican
- ☐ Yes, Cuban
- ☐ Yes, another Hispanic, Latino, or Spanish origin – *Print, for example, Salvadoran, Dominican, Colombian, Guatemalan, Spaniard, Ecuadorian, etc.*

7. What is this person's race? *Mark ✗ one or more boxes* ***AND*** *print origins.*

- ☐ White – *Print, for example, German, Irish, English, Italian, Lebanese, Egyptian, etc.*
- ☐ Black or African Am. – *Print, for example, African American, Jamaican, Haitian, Nigerian, Ethiopian, Somali, etc.*
- ☐ American Indian or Alaska Native – *Print name of enrolled or principal tribe(s), for example, Navajo Nation, Blackfeet Tribe, Mayan, Aztec, Native Village of Barrow Inupiat Traditional Government, Nome Eskimo Community, etc.*
- ☐ Chinese
- ☐ Filipino
- ☐ Asian Indian
- ☐ Other Asian – *Print, for example, Pakistani, Cambodian, Hmong, etc.*
- ☐ Vietnamese
- ☐ Korean
- ☐ Japanese
- ☐ Native Hawaiian
- ☐ Samoan
- ☐ Chamorro
- ☐ Other Pacific Islander – *Print, for example, Tongan, Fijian, Marshallese, etc.*
- ☐ Some other race – *Print race or origin.*

➜ **If more people were counted in Question 1 on the front page, continue with Person 3 on the next page.**

INFORMATIONAL COPY

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(USDC, 2019)

Figure 5. FFVQ

Questions asked on new fruit and vegetable screener
In the last month, about how often did you drink (or eat):
100% orange juice or 100% grapefruit juice?
… other 100% fruit juices, such as apple or grape juice? (Do not count fruit drinks such as Hi-C.)
… French fries or fried potatoes?
… baked, boiled, or mashed potatoes?
Response categories are: never, 1–3 times last mo, 1–2 times/wk, 3–4 times/wk; 5–6 times/wk, 1 time/d, 2 times/d, and ≥3 times/d.
For morning, lunchtime and afternoon, and evening and nighttime separately:
On how may days did you eat fruit for your (timeframe) meals or snacks? (Do not count juices.)
Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day.
When you ate fruit in the (timeframe), how many total portions of fruit did you usually eat? (Count each piece or one-half cup you ate as one portion, whether it was one fruit or different fruits.)
Response categories are: 1 portion or less, 2 portions, ≥3 portions.
On how many days did you eat vegetables for your (timeframe) meal and snacks? (Do not count potatoes.)
Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day.
When you ate vegetables in the (timeframe), how many total portions of vegetables did you usually eat? (Count each one-half cup you ate as one portion, whether it was one vegetable or different vegetables.)
Response categories are: ≤1 portion, 2 portions, ≥3 portions.

(Thompson et al., 2000)

Table 5. Health Related Quality of Life Questionnaire

Table 1. Rotated structure matrix for nine HRQOL questions, 2001–2002

Question	*Factor loadings*			
	Physical health		*Mental health*	
	2001	*2002*	*2001*	*2002*
Would you say that in general your health is excellent, very good, good, fair, or poor?	0.542[a]	0.511[a]	0.297	0.332
Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?	0.816[a]	0.841[a]	0.329	0.332
Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?	0.391	0.449	0.744[b]	0.786[b]
During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?	0.720[a]	0.740[a]	0.437	0.495
During the past 30 days, for about how many days did pain make it hard for you to do your usual activities, such as self-care, work, or recreation?	0.673[a]	0.679[a]	0.360	0.410
During the past 30 days, for about how many days have you felt sad, blue, or depressed?	0.424	0.471	0.807[b]	0.819[b]
During the past 30 days, for about how many days have you felt worried, tense, or anxious?	0.341	0.408	0.742[b]	0.762[b]
During the past 30 days, for about how many days have you felt you did not get enough sleep or rest?	0.230	0.302	0.427[b]	0.442[b]
During the past 30 days, for about how many days have you felt very healthy and full of energy?	0.463[c]	0.496[c]	0.472[c]	0.497[c]

[a]Items assigned to physical health factor

[b]Items assigned to mental health factor

[c]Items loading similarly on both physical and mental health factors

HRQOL = health-related quality of life

(Horner-Johnson et al., 2009)

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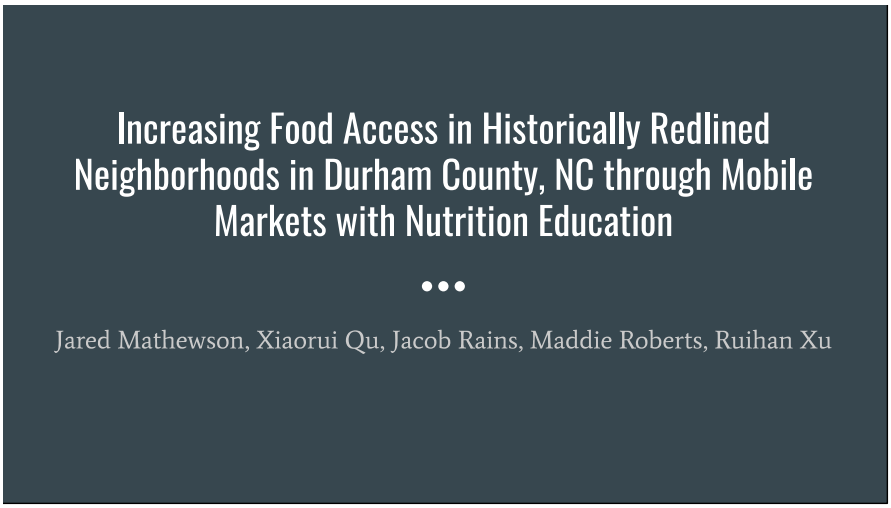
B.5 COMMON PROPOSAL PRESENTATION



Speaker: Jared Mathewson

Overview of the SDOH in the county

- Neighborhood and Built Environment
  - Living, working and recreational spaces
  - Link to long term health outcomes (Pickett, 2001)
    - Chronic disease
    - Exposure to violence
    - Mental health
- Food Access
  - Availability, accessibility, and affordability (USDHHS, 2022)
  - Durham's Forest Hills, East Durham, and Old North Durham
- Historically Redlined Neighborhoods
  - Closely linked to food access (Li & Yuan, 2022)
  - Black, immigrant, low SES neighborhoods (De Marco & Hunt, 2018)

Speaker: Jared Mathewson

Neighborhood and built environment is a key social determinant of health. It encompasses the spaces in which people live, work, eat, and play (USEPA, 2017). It is also linked to many long-term health outcomes.

Food access is one important aspect of built environment. Considered one of the key issues facing Durham County based on the 2020 community health assessment, food access encompasses food availability, accessibility, and affordability. Research also indicates that the built environment has a significant impact on people's ability to access food (DCDPH, 2021). Statistics from Data Works NC show that less than 1% of residents in Durham's Forest Hills, East Durham, and Old North Durham neighborhoods, where our program is focused, have access to nearby grocery stores. This is significantly lower than the average of Durham County at 13.9% (Data Works NC, 2023)

Redlining is also a contributing factor to the lack of food access in these neighborhoods (Li & Yuan, 2022). Redlining was the practice of deeming primarily black, immigrant, and low socio-economic status communities a high financial risk thus discouraging investment ((De Marco & Hunt, 2018). While it is now illegal, these historic practices still impact food access today; our program is designed with these injustices in mind.

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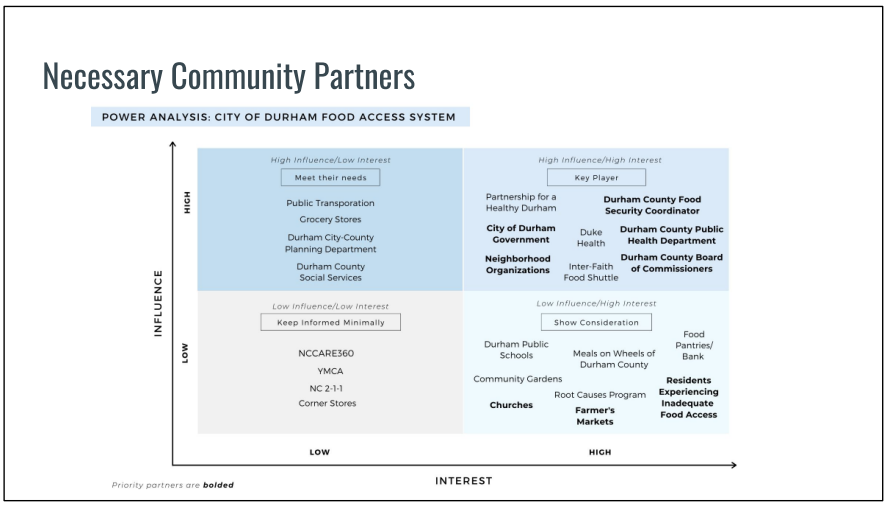
Speaker: Xiaorui (Jessica) Qu

Mobile markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address the key issue. Similar to the farmers market, the program will transport and distribute fresh fruit and vegetables at below-retail prices to the priority populations in our targeted neighborhoods (East Durham, Old North Durham, and Forest Hills). The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program) The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and will build a partnership with Durham's Innovative Nutrition Education (DINE program)

This program is designed based on an evidence-based mobile market program: *Fresh to You*, which is a public-private partnership program that serves fresh produce at below-retail prices to serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. At the 5-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among participants (Gorham et al., 2015). Given the success of the *Fresh to You* intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County County.

Reference:

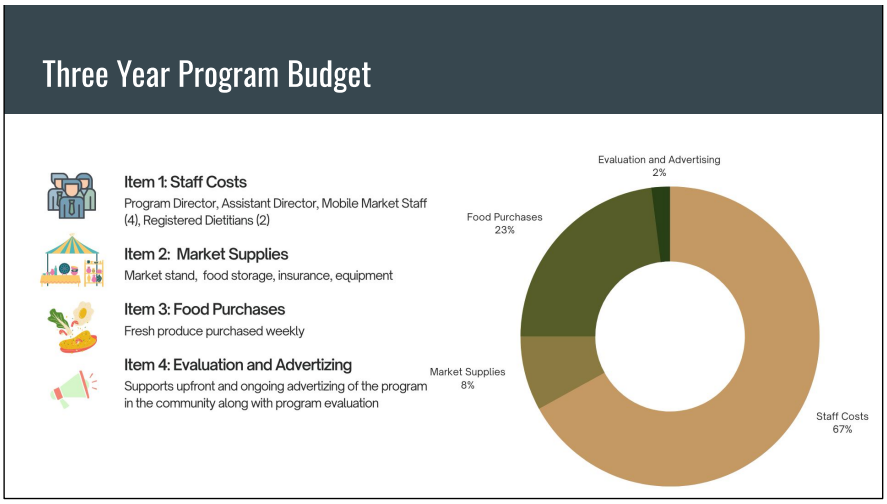
Gorham, G., Dulin-Keita, A., Risica, P. M., Mello, J., Papandonatos, G., Nunn, A., Gorham, S., Roberson, M., & Gans, K. M. (2015). Effectiveness of Fresh to You, a Discount Fresh Fruit and Vegetable Market in Low-Income Neighborhoods, on Children's Fruit and Vegetable Consumption, Rhode Island, 2010–2011. Preventing Chronic Disease, 12, E176.



Speaker: Maddie Roberts

Numerous community partners influence Durham's food access system. As detailed within this power analysis, community partners have varying levels of influence and interest within Durham's food access system. Given the context of our proposed program, priority partners are bolded throughout the analysis and include the Durham County Department of Public Health, the City of Durham, the Durham County Board of Commissioners, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represents a variety of sectors, as well as both formal and informal influence. For instance, while the Durham Board of County Commissioners has governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches have relational influence with Durham residents.

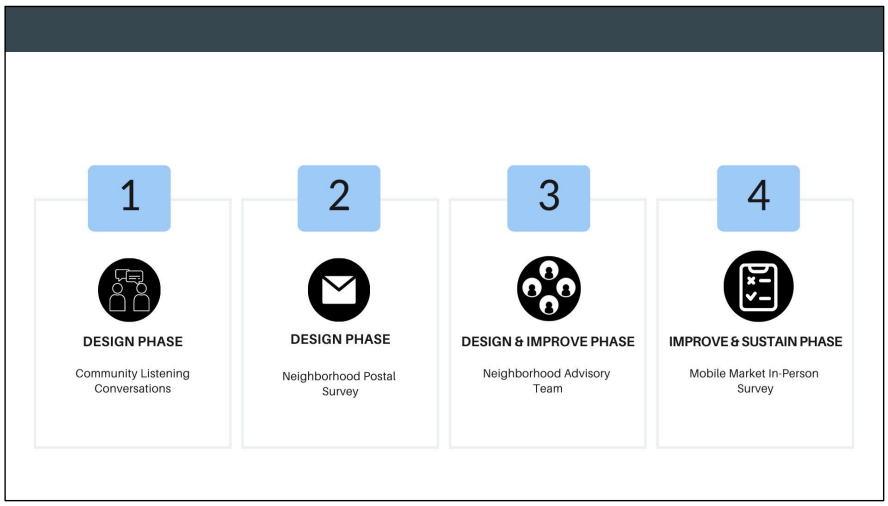
Of the priority partners within the system, Durham residents with inadequate food access are the most significant priority partners because of their experiential knowledge. Lived experience perspectives from Durham residents can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program. Despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners. The lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. Priority partners, like the Durham County Food Security Coordinator or the Durham County Department of Public Health, will play an important role in bridging the gap between residents with lived experience and governmental processes.



Speaker: Jacob Rains

Back to Agenda

We are requesting an increased appropriation of 3.29 million in county funds to the DCoDPH DINE program to administer the mobile market program for three years. These funds will be used to hire eight full time staff including a mobile market team with registered dieticians. Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) will purchased in line with other mobile market programs. Additional funds will be dedicated to covering the costs of advertising the program in the community and administering our comprehensive evaluation plan. Our mobile market budget is designed to be flexed to shift mobile market locations based on community needs at no additional cost to the County.



Speaker: Maddie Roberts

To initiate, facilitate, and sustain community partnerships to transform food access in the targeted neighborhoods, program staff will utilize the following engagement strategies throughout four phases:

1) First, during the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation. Insights from these conversations will be used to inform the design of the mobile markets.
2) Later in the design phase, our team will conduct a postal survey of residents in the targeted neighborhoods. The postal survey will inform residents about the mobile market program and collect data on food access challenges within each neighborhood.
3) Next, in the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team. The Neighborhood Advisory Team will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design and strategic priorities of the mobile market. The Neighborhood Advisory Team will be comprised of residents from the targeted neighborhoods who have experienced food access challenges.
4) Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets. After the first year of market operation, we will administer these surveys on a biannual basis.
1) The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood.

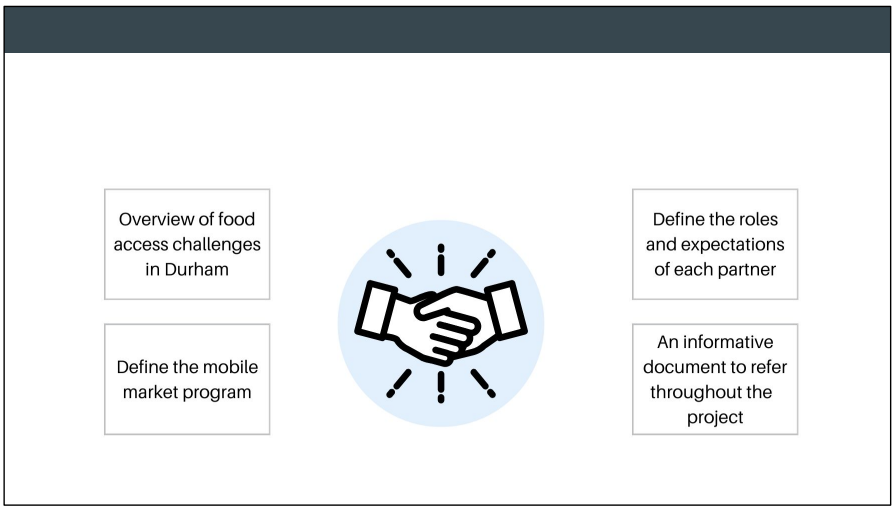
References:

Arnos, D., Kroll, E., Daly, H., Falkenburger, E., & Jaromin, E. (2021, October). *Tools and Resources for Project Based Community Advisory Boards*.

Centers for Disease Control and Prevention. (2014). Farmers Markets: Encouraging Farmers Markets in Underserved Areas . In *Healthier Food Retail: An Action Guide for Public Health Practitioners* (pp. 66–86). essay.

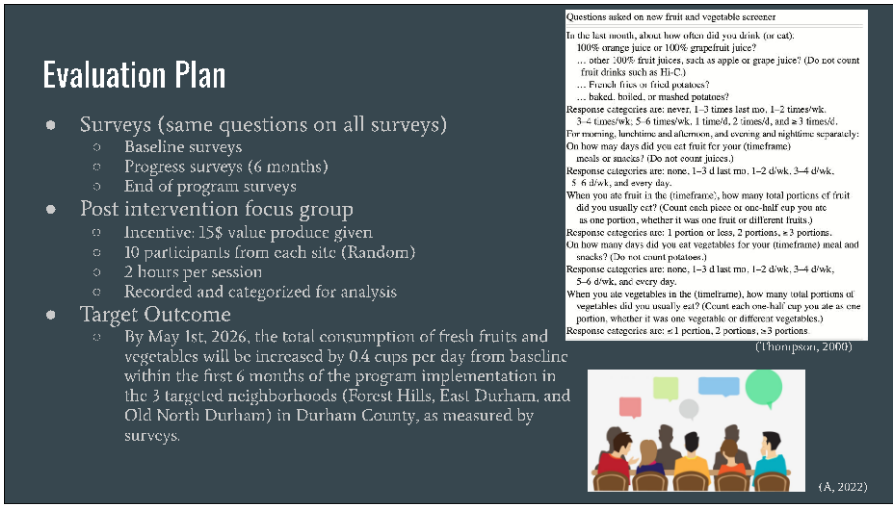
Parker, C., & Dewey, M. (2000). Assessing research outcomes by Postal Questionnaire with telephone follow-up. *International Journal of Epidemiology*, *29*(6), 1065–1069.

University of Kansas. (n.d.). *Section 17. leading a community dialogue on building a healthy community*. Chapter 3. Assessing Community Needs and Resources | Section 17. Leading a Community Dialogue on Building a Healthy Community | Main Section | Community Tool Box.



Speaker: Maddie Roberts

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding, or MOU, is crucial for success. An MOU is a formal agreement between community partners that outlines project and partner expectations. In the context of our program, an MOU will overview the history of food access challenges in Durham, with a particular focus on the targeted neighborhoods; outline how the establishment of mobile markets will effectively address food access challenges; define the trajectory of the mobile market program; define the roles and expectations of each partner; and act as an informative document to refer to throughout the entirety of the project. For example, given the context of the partners who are contributing to the mobile market program, an MOU between the Mobile Market Team and the Neighborhood Advisory Team will be necessary.



Speaker: Ruihan Xu

For program evaluation, we plan to use both surveys and focus groups for data collection. The examples of survey questions are listed on the top right figure, such as 'When you ate fruit in the last X month, how many total portions of fruits did you usually eat?'. There will be 3 survey collection periods, the baseline surveys, progress surveys (which will be collected every 6 months), and end of program surveys.

As for focus groups, we only plan to conduct post-intervention focus group sessions. Similar to what we see in other research studies, we expect to recruit 10 participants from each site for each focus group session (Gorham et al. 2015). To help recruit participants, we will provide fresh produce as an incentive. Each of the focus group sessions will last 2 hours, and the session will be recorded and categorized for later analysis.

One of the target outcomes of the program is listed here, which is related to fresh produce consumption measurement. So, after collecting the data from both surveys and focus groups, we will be able to analyze the data and see whether our target outcome is achieved. Some other data collected from focus groups might also be used to inform future modifications to the program.

References:

A. (2022a, March 4). *How Do Focus Group Works*. Spade Survey.

Gorham, G., Dulin-Keita, A., Risica, P. M., Mello, J., Papandonatos, G., Nunn, A., Gorham, S., Roberson, M., & Gans, K. M. (2015). Effectiveness of Fresh to You, a Discount Fresh Fruit and Vegetable Market in Low-Income Neighborhoods, on Children's Fruit and Vegetable Consumption, Rhode Island, 2010–2011. Preventing Chronic Disease, 12, E176.

Thompson, F. E., Kipnis, V., Subar, A. F., Krebs-Smith, S. M., Kahle, L., Midthune, D., Potischman, N., & Schatzkin, A. (2000). Evaluation of 2 brief instruments and a food-frequency questionnaire to estimate daily number of servings of fruit and vegetables. The American Journal of Clinical Nutrition, 71(6), 1503–1510.

Speaker: Ruihan Xu

Lastly, here are our references. Thank you so much for your time and consideration. We hope our presentation on low food access in historically redlined neighborhoods of Durham has captured your attention and compelled you to respond. Your financial support will greatly help with our program development and those people in need. Thank you again for your valuable time.

APPENDIX C: XIAORUI QU INDIVIDUAL DELIVERABLES

C.1 SOCIAL DETERMINANTS OF HEALTH ANALYSIS

Social Determinant of Health (SDoH):

Social Determinants of Health (SDoH) are defined as the living conditions where people are "born, live, learn, work, play, worship, and age" that play a significant impact on their physical/mental health, well-being, and quality-of-life (Healthy People 2030, n.d.). Neighborhood and Built Environments (NaBE), one of the five SDoH, have influences on residents' health outcomes in the neighborhoods where they live (New Mexico's Health Indicator Data & Statistics [NMHIDS], 2022). "Land use, transportation systems, public resources, and building characteristics" are examples of the multi-dimensions of the urban built environment (Schüle & Bolte, 2015). Similarly, Durham County Community Health Assessment (DCCHA) 2020 stated that NaBE design, such as zoning and land use, affect residents' "walkability and transportation options, access to services, and the availability of healthy foods" (North Carolina Department of Health and Human Services [NCDHHS], 2020). The association between features of NaBE and individual health outcomes is a complex mechanism because it involves multiple mechanisms (meditating and interacting mechanisms) or conceptual pathways (compositional and contextual effects). For example, factors at the individual level, such as health-related behaviors and socioeconomic position, between different neighborhoods result in different health outcomes, known as a compositional effect. On the other hand, the contextual effect is present at the neighborhood level while possible confounders at the individual level could lead to an ecological fallacy (Schüle & Bolte, 2015).

Four factors related to NaBE were classified by HealthyPeople 2020, including "Access to Healthy Foods, Quality of Housing, Crime and Violence, and Environmental Conditions, (NMHIDS, 2022)" which impact individuals' health outcomes or health-related behaviors (Schüle & Bolte, 2015). Although multiple risk factors, such as 45 years or older, lack of daily physical activities, and genetic variance, are associated with increasing the likelihood of the development of diabetes (Centers for Disease Control and Prevention [CDC], 2022-a), a NaBE-related factor, Access to Healthy Foods, is the primary risk factor being addressed to reduce the prevalence of diabetes and diabetes-related

complications. Individuals who have limited access to nutritious foods are at risk of developing type 2 diabetes (CDC, 2022-b). Adults who have experienced limited access to adequate food or nutritious food are twice to third as likely to develop diabetes compared to those who do not experience it (CDC, 2022-b). "Obesity, Diabetes, and Food Access" are one of the top five 2020 Durham County Health Priorities (NCDHHS, 2020). Survey responses collected from both the Durham County-wide sample and the Hispanic or Latino Neighborhood sample for the 2019 Durham CHA indicated that diabetes was ranked as the most critical health issue that needs to be addressed followed by mental health, drug use, and obesity or overweight, as shown in Figure 6 (NCDHHS, 2020).

Geographic and historical context:

Demographics of Durham County (2019) represents a diverse racial/ethnic population, including non-Hispanic African Americans (36.5%), non-Hispanic whites (51.9%), Hispanics (13.5%), Native American, Asian, and other ethnicities (11.6%). However, Black, Indigenous, and People of Color (BIPOC) are experiencing health disparities or inequities due to historical and structural racism. Grocery store chains often avoid construction in BIPOC neighborhoods because "historical redlining practices by the US Government assigned risk values for mortgage lending to neighborhoods based on racial factors." Therefore, BIPOC residents are at a higher chance to live in neighborhoods with more fast-food restaurants and a lack of access to stores selling more healthy food items compared to white residents (NCDHHS, 2020).

In 2015, the U.S. Department of Agriculture (USDA) indicated that 20-30% of residents living in Durham County have limited access to a grocery store. According to Durham Area Food Resources Locator (n.d.), only four Supermarkets and Grocery Stores take SNAP benefits in the selected regions located in Central and Northeastern Durham County [Figure 7]. Interestingly, all information was written in both English and Spanish on Food Resources in Durham, NC (n.d.), which could improve access to food resources for Hispanic or Latino residents. On the website, residents can also apply to the SNAP and WIC programs, which could provide adults and children with nutritious food, nutrition education, and social support. Other existing initiatives in Durham County, such as "The Durham County Department of

Social Services Food and Nutrition Services, Durham Farmers' Markets Double Bucks and Inter-Faith Food Shuttle, etc.," assist the improvements in accessing adequate food or nutritious food among residents, specifically BIPOC and living at low social economic status (NCDHHS, 2020).

Priority population:

The priority population chosen to improve access to healthy foods and reduce the prevalence of diabetes are residents living in Central and Northeastern Durham County. Many residents here are experiencing structural racism due to the physical infrastructure of historically redlined neighborhoods (Li & Yuan, 2022; NCDHHS, 2020). A majority of Hispanic or Latino residents live in these regions compared to the rest of Durham County; to view the specific locations, and reference track numbers, as shown in Figure 8 (Durham Neighborhood Compass, 2021). According to Durham Neighborhood Compass (2019), the percentages of Hispanic or Latino residents with diabetes in these regions have a higher percentage of diagnosed diabetes than the average for Durham County (12.9%); reference track numbers, as shown in Figure 9 and Figure 10. 2,023 residents out of 19,807 whole County residents currently live in the selected regions where the percentage of households near the grocery store is extremely low ranging from 0-5.4% compared to Durham County's average (13.9%), as shown in Figure 11 (Durham Neighborhood Compass, 2018).

The second random sample was collected only from eligible Latino and Hispanic residents and households in a neighborhood with more than 50% Hispanic or Latino residents. Diabetes and obesity/overweight are top health problems (2019) identified by Hispanic or Latino respondents. 2020 DCCHA reported that the prevalence of diabetes is also associated with income level. The prevalence of people with diabetes in North Durham was 15.5% compared to 9.7% in West Durham. The average household income is about $17,000 below the Durham County average ($58,190) in North Durham. However, people in West Durham live with $8,000 above the Durham County average. Approximately one-third of the respondents agree that diabetes ranked as the top health priorities need to be improved for maintaining positive health outcomes and quality of life (NCDHHS, 2020).

Measures of SDOH:

2020 DCCHA reported that diabetes disproportionately influences racial/ethnic minorities and people with low income. In 2017, the prevalence of diabetes among adults living in Durham County was 12.9%, which was higher than the average in North Carolina and the United States. The percentages of residents living with diabetes in Central and Northeastern Durham consistently over Durham County's average adult diabetes percentage with the highest rate of 21.6% (NCDHHS, 2020). Adults who have experienced limited access to enough food or healthy food are two to three times more likely to develop diabetes compared to those who do not experience it (CDC, 2022-b). For example, neighborhood residents who live in close proximity to a high density of supermarkets are more likely to have reduced blood pressure and Body Mass Index (BMI), whereas living close to fast food restaurants were associated with higher BMI (NMHIDS, 2022). Walkability in the neighborhood was related to physical activity level and health outcomes, like obesity (NMHIDS, 2022). The table presents health indicators associated with diabetes in Durham County and the County average in NC [Table 6] (North Carolina Division of Public Health [NCDPH], 2018). In addition to "access to healthy foods", risk factors for developing diabetes also include income level, education level, eating behavior or habits, and other factors [Table 7].

Rationale/Importance:

Diabetes is ranked as the most critical health issue by DCCHA 2020. Addressing NaBE to improve access to healthy food items among Latino or Hispanic residents could potentially reduce the prevalence of diabetes and diabetes-related health complications (i.e. visual impairment, chronic kidney disease, kidney failure, etc.) in Central and Northeastern Durham County (NCDHHS, 2020). Furthermore, reducing the prevalence of diabetes could reduce mortality and morbidity rate (NCDHHS, 2020). People with diabetes are two times more likely to develop coronary heart disease and 2.3 times more likely to develop cardiac death compared to those without diabetes. Cardiovascular disease is the leading cause of death in the United States and the second leading mortality rate in NC (NCDHHS, 2020).

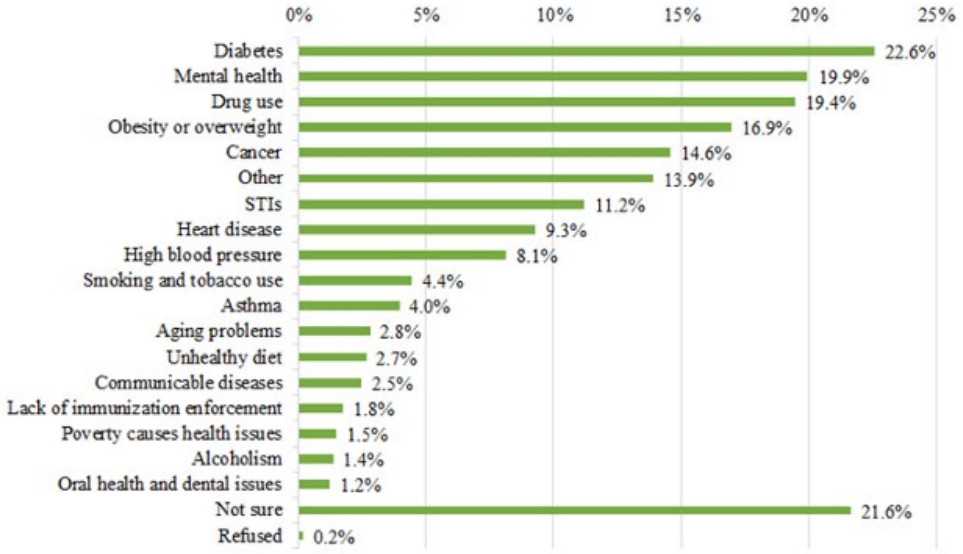
Disciplinary critique:

Beyond Registered Dietitians (RD) practicing knowledge of nutrition education and Medical

Nutrition Therapy, RDs also work on addressing external factors related to healthy food systems (Built environment) to increase access to healthy food choices among residents (Michnik et al., 2015). RDs can collaborate with city officials or legislators to develop standards that require grocery stores to meet, such as a limited number of Sugar Sweet Beverages in the store (Michnik et al., 2015). RDs can create interventions to improve community food infrastructure, such as mobile food trucks and community gardens, similar to outreach programs from the SNAP-Ed and Inter-faith Food shuttle (Michnik et al., 2015). Policymakers, Legislators, RD, and Neighborhood organizations work together to increase access to healthy foods (i.e. fresh fruits and vegetables) through building infrastructures (i.e. Walkability, Community Gardens) that could reduce the prevalence of diabetes and serious complications of diabetes, especially among BIPOC communities who consistently experience health disparities. Without addressing SDoH to reduce the prevalence of diabetes and its complications, diabetes-related costs would become an ongoing economic burden in Durham County, NC, and the U.S, and also add a burden on the NC Medicaid Program, private insurers, and employers (NCDHHS, 2020).

C.1.a Appendix from SDOH Analysis

Figure 6. Top Health Concerns, Durham County, 2019

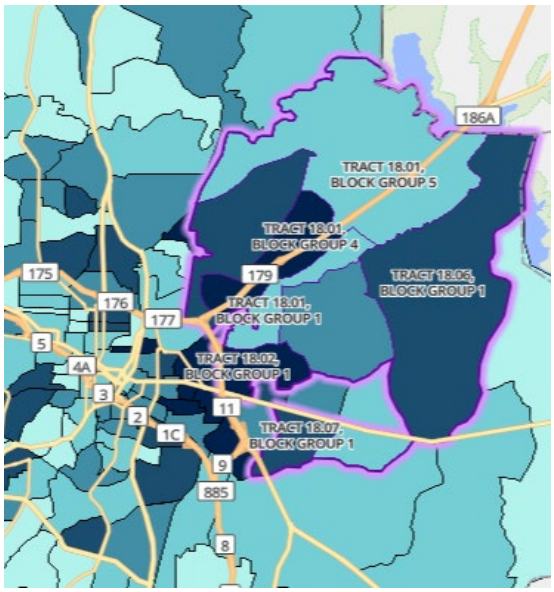


(NCDHHS, 2020)

Figure 7. Durham Area Food Resources Locator. Central and North Eastern of Durham County

(Durham Area Food Resources Locator, n.d.)

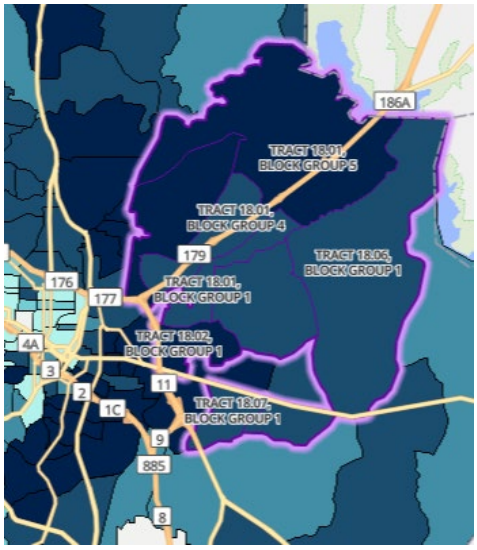
Figure 8. Demographics (Hispanic or Latino Population), Durham County, 2021



*Track 10.01, 10.02, 18.01, 18.02, 18.06, and 18.07

(Durham Neighborhood, 2021)

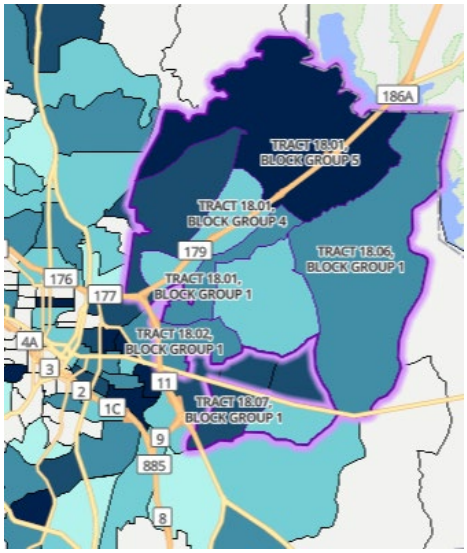
Figure 9. Diabetes (Adult Population), Durham County, 2019



*Track 10.01, 10.02, 18.01, 18.02, 18.06, 18.07

(Durham Neighborhood, 2019)

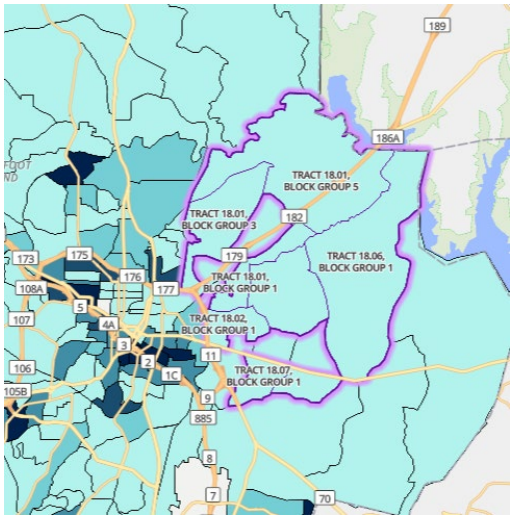
Figure 10: Diabetes (Hispanic or Latino/a Population), Durham County, 2019



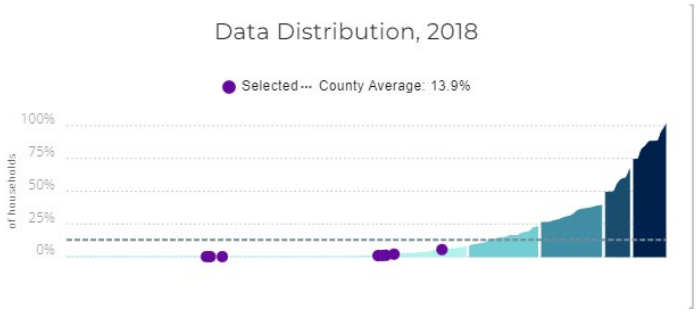
* Track 10.01, 10.02, 18.01, 18.02, 18.06, 18.07

(Durham Neighborhood, 2019)

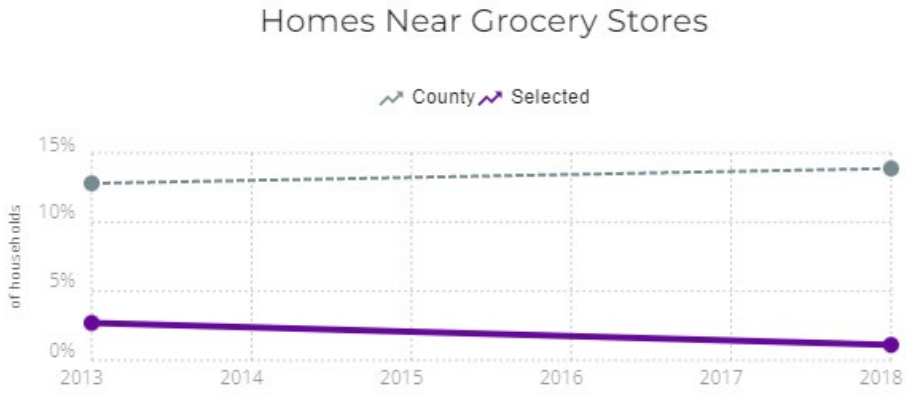
Figure 11: Homes Near Grocery Stores in selected areas, Durham County, 2018



*Track 10.01, 10.02, 18.01, 18.02, 18.06, 18.07



Durham County Average 13.9%



(Durham Neighborhood, 2018)

Table 6: Health Indicators associated with Diabetes (Durham County vs. County Average in NC)

Topics	Durham County	County average in NC	Detail Descriptions
Percentage of residents who live close to a park or recreational facility	92%	67%	"Percentage of residents who live close to a park (within a half mile) or a recreational facility (within three miles in rural areas, or within one mile in urban areas)."
Amount of support for healthy eating in the local food environment (0 is worst, 10 is best)	6.8	7.5	"Food Environment Index score (0 to 10) that equally weights two indicators: Percentage of people with limited access to healthy foods, and percentage of people with food insecurity."
Percentage of residents who lack access to reliable food sources	18%	16%	"Percentage of residents who lack constant access to a reliable food supply, including, but not solely focused on, fruits and vegetables."
Percentage of low-income residents who have limited access to a grocery store	7%	5%	"Percentage of residents who are low income (200% or less of the federal poverty threshold for the family size) and do not live close to a grocery store (over ten miles away in rural areas, or

			over one mile away in nonrural areas)."
Percent change in pedestrian and bicycle activity in monitored locations	Pedestrian change -0.2%; Bike use change -3.4%		"Percentage increase or decrease in the number of people observed walking and bicycling in certain locations in North Carolina (2015- 2017). Walking and bicycling are healthy behaviors, and research has helped fund ongoing monitoring of such activities"

*Highlight color indicates a higher level

(NCDPH, 2018)

Table 7: Reasons Residents Consume Unhealthy Good Options, Durham County, 2019

Reasons	% Residents chose this reason
Too time consuming	24.4%
Cost	15.7%
Always eating healthy	14.5%
Not in the mood to cook	13.8%
Hard to find healthy options while out	6.7%
Does not taste good	5.8%
Limited access to healthy foods	5.1%
Crave unhealthy options	4.1%

(NCDHHS, 2020)

C.2 PROGRAM ANALYSIS

Introduction

HealthyPeople 2020 developed four Neighborhood and Built Environments (NaBE)-related factors, including “Access to Healthy Foods, Quality of Housing, Crime and Violence, and Environmental Conditions" which affect residents’ health outcomes or health-related behaviors in the neighborhoods where they live (Healthy People 2020, n.d.; Schüle & Bolte, 2015). Durham County Community Health Assessment (DCCHA) 2020 stated that NaBE design, such as zoning and land use, have impacts on residents’ “walkability and transportation options, access to services, and the availability of healthy foods” (North Carolina Department of Health and Human Services [NCDHHS], 2020). Living in historically redlined neighborhoods is associated with residents having a higher chance to be surrounded by unhealthy retail food environments; this is especially true for minority neighborhoods (Li & Yuan, 2022). Grocery store chains often avoid building in Black, Indigenous, and People of Color (BIPOC) neighborhoods because of historical redlining practices by the Home Owner’s Loan Corporation (HOLC), which “assigned risk values for mortgage lending to neighborhoods based on racial factors" (NCDHHS, 2020). Therefore, BIPOC residents are at a higher chance to live in neighborhoods with more fast-food restaurants and a lack of access to stores selling more healthy food items compared to white residents (NCDHHS, 2020). According to Durham Neighborhood Compass (2018), less than one percent of households living in Forest Hills, East Durham, and Old North Durham, live in proximity to a grocery store compared to the average of 13.9% in Durham County, as shown in Figure 12. The targeted areas for the program are Forest Hills, East Durham, and Old North Durham, which have been classified as "C-Definitely Declining" and "D-Hazardous" areas by the HOLC due to their high poverty rates and predominant BIPOC population, as shown in Figure 13 (Mapping Inequality, n.d.; NCDHHS, 2020). “Obesity, Diabetes, and Food Access” are listed as one of the top five Durham County health priorities (NCDHHS, 2020). Limited food access is strongly associated with negative health outcomes and with lower health-related quality of life (HRQoL), such as "more emergency department visits, more inpatient

hospitalizations, and higher healthcare costs" (Hanmer et al., 2021).

Evidence-Based Nutrition Program

The development and implementation of an evidence-based nutrition program is needed to address limited access to healthy food among residents living in Forest Hills, East Durham, and Old North Durham, specifically among BIPOC communities. Residents with limited food access are at risk of developing nutrition-related chronic diseases, such as diabetes (NCDHHS, 2020). Adults who have experienced limited access to adequate food or nutritious food are two to three times more likely to develop diabetes compared to those who do not experience it (CDC, 2022). Individuals who consume poor-quality diets, including calorie-dense food and low nutrient consumption, are associated with different stages of diabetes mellitus (Ziso et al., 2022). The prevalence of diabetes in 2017 among adults living in Durham County (12.9%) was higher than the average prevalence of diabetes in NC and the U.S. (NCDHHS, 2020). According to the American Diabetes Association, the total costs of direct and indirect costs of diagnosed diabetes are an estimated $10.6 billion per year in NC. Individuals with diabetes are experiencing a higher burden of medical costs, about 2.3 times higher, compared to those without diagnosed diabetes (ADA, 2020).

Pop-Up Markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address limited access to healthy foods among residents in Forest Hills, East Durham, and Old North Durham. As a result, individuals with a diabetes diagnosis in Durham County could have improved access to healthy food.

An effective mobile markets, Fresh to You (FtY), is a public-private partnership program that serves fresh produce at below-retail prices to community organizations that serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce or culturally appropriate food or desirable fruits and vegetables grown outside of the U.S. At the 5-month follow-up, results indicated a significant increase in the

consumption of fruit and vegetable combined of 0.48 cups per day among parents (n=480) of children (Gorham et al., 2015).

Go Fresh, a Mobile Produce Market (MPM), has the potential to positively impact the availability of fruits and vegetables in low-income urban areas with limited access to healthy produce, particularly among older adults aged 60 and above, and individuals living alone. Most participants appreciated the location of Go Fresh MPM (72.7%), especially among older participants (82.0%). Almost all participants traveled to the Go Fresh MPM less than or equal to 5 miles (94.8%), with most traveling less than 1 mile (72.2%). This result showed that the mobility of MPM is an essential component in improving access to fruit and vegetable among residents with limited access to healthy food (Hsiao et al., 2018).

Evidence-Based Outcomes

Two short-term outcome objectives are expected to be met by May 1st, 2025. First, families living in Forest Hills, East Durham, and Old North Durham, will increase their combined consumption of fruits and vegetables combined by 0.4 cups per day by May 1st, 2025, 6 months following the program's start date. According to Goham et al. (2015), the mobile FtY market effectively increased fruit and vegetable daily intake among children (3 to 13 years old) who live in low-income households, and their caregivers shopped at the mobile market. The outcome, changes in participants' fruit and vegetable consumption, will be measured by a validated self-administered survey and interpreted by the program's director and assistant director. Second, by May 1st, 2025, the goal is for at least 50% of residents in Forest Hills, East Durham, and Old North Durham neighborhoods to have traveled less than 1 mile to access the mobile truck, indicating improved food access in these areasThis second short-term outcome is based on the essential component of Go Fresh MPM, accessibility dimensions of access, to improve fruit and vegetable access in low-income communities with limited access to healthy food (Hsiao et al., 2018). The second outcome will be measured via a validated self-administered survey distributed at Pop-up Market. The effectiveness of FtY and Go Fresh MPM did not last long enough to allow the evaluation of their long-term outcomes (Goham et al., 2015; Hsiao et al., 2018), and thereby, our program will not be expected for long-term outcomes.

Evidence-Based Implementation Strategies and Activities

The Pop-Up market program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program). Two components will be incorporated into the Pop-Up market programs. First, the Foodservice Distributor (FD) with CDL certified delivery driver will obtain fresh produce from either Durham County's local produce distributors the day before to ensure the quality of fresh produce (Goham et al., 2015). The FD will ensure various types of fresh produce are purchased. As shown in Figure 14, many local produce distributors locate in Central and East Durham in proximity to the community sites the program will serve. These local distributors could be potentially used to fill inventory and storage units for the markets to ensure fresh produce is safe to eat and prevent foodborne illness outbreaks. The second component of the program is the market setup and choice of locations. Each market will last 2 hours and offer >20 different fresh produce products (Goham et al., 2015). A refrigerated truck will be the main facility for this program to deliver the produce items to the community sites, and fresh produce will be kept in the refrigerated truck at the markets, but the demo food items or a list of food items will be laid out on the tables (Inter-Faith Food Shuttle [IFFS], n.d.). A van full of tables, chairs, equipment, and supplies, will be driven by volunteers or trained community members to set up the market (IFFS, n.d.). Pop-Up markets will serve the sites at independent times, so only one refrigerated truck and one van will be needed to deliver food and set up the markets. Flyers and brochures about this program will be developed in English and Spanish by the program manager (Goham et al., 2015) and handed out to community organizations, like the Food Bank of Central and Eastern North Carolina (FBCENC), to spread the word.

The DCDPH will hire one program director and one assistant director to oversee and manage the implementation of the Pop-Up market program. Other staff, including a FD, a CDL delivery driver, a program manager, volunteers, and/or trained community members, will spend the majority of time on sites and provide feedback to the director and assistant director. The Live Well, Viva Bien intervention found that offering educational resources, including DVDs, recipes, and taste tests, at the mobile market,

is associated with increased consumption of fruit and vegetable (Evans et al., 2022). DINE program is an existing program within the DCDPH, so it provides an opportunity for sharing resources and collaborating together. For instance, DINE provides nutrition education to any age group of residents in Durham County neighborhoods where they live (Public Health Durham County NC [PHDCNC], n.d.-a). Not only the Adult Education Program provides activities and resources related to healthy eating, but also the Healthy Environments Program partners with "corner stores, grocery stores, farmer's markets, and food pantries" to increase residents' access to healthy foods (PHDCNC, n.d.-b). For example, participants can access workshops, such as Healthy Eating on a Budget and Heart Health, etc, and resources, such as nutrition-related handouts and recipes, and taste tests (PHDCNC, n.d.-c).

The Pop-Up market, similar to the consolidated farmers market, transports and distributes food items at below-retail prices to the priority populations in the neighborhoods to ensure a majority of residents travel to the market within 1 mile (Hsiao et al., 2018). From baseline to 6 months, the Pop-Up market will be operated at 3 community sites, located in limited food access census tracts, as shown in Figure 12. Saint James Baptist Church, Christ Central Church, and Forest Hills park, located in East Durham, Old North Durham, and Forest Hills, respectively. The program expects to serve about 40 shoppers per site weekly. Based on the population per square mile in 2020 is 1,133 and the expected number of shoppers served in the Fresh to You market, the expected reach number of residences in Forest Hills, East Durham, and Old North Durham neighborhoods are approximately 3,000 for 6 months (United States Census, n.d.; Gorham et al., 2015).

The Pop-Up Market Program addresses the policy, community, organizational, and family/individual levels of the socio-ecological (SE) model. The program provides fresh produce at below-retail prices to advocate for local policy to increase the affordability of fresh produce, such as fruits and vegetables. At a community level, this mobile market distributes reduced-priced fresh produce to where the priority population lives within 1 mile and promotes increased access to healthy food. The program also involves partnering with community organizations, like DINE and FBCENC, to connect families with community resources (i.e, food assistance programs), and enhance the influence of the

program by handing out flyers and brochures to their target audiences. The target population can also access nutrition-related handouts and recipes, and taste tests at the Pop-Up market (DeWit et al., 2020).

Community Partners

Potential community partners consist of the City of Durham target populations, the Durham County Board of Commissioners (DCBCs), Food Access Organizations, and the Community Outreach program in DCDPH. The target populations will be responsible to gather the resident's experience with limited food access and share what priority issues with the program managers and other community partners in a focus group. DCBCs will provide the funding for the program, which is essential for the program to reach the outcomes by paying staff and purchasing produce, equipment, and supplies. Food Access Organizations, such as FBCENC, and IFFS, have sufficient experience to reach out to local residents with lack access to healthy food and nutrition-related resources, either through marketing strategies or spreading the word in communities via flyers (FBCENC, n.d.; IFFS, n.d.-b). Both FBCENC and IFFS have operated mobile markets, so it may increase the chance for the success of the Pop-Up market by receiving recommendations, such as choices of serving sites and the number of volunteers per site (FBCENC, n.d.; IFFS, n.d.-a).

Budget

A detailed description of the 6-month costs of the Pop-Up Market program, as shown in Table 8. According to DCDPH (2020), DCDPH funded $556,823 for Nutrition services in 2020. The program aims to ask for funding from DCBCs in a range from $175,000 to $185,000 for 6-month expenses. Funding will be applied to personnel, equipment, supplies, travel, and produce. Personnel including a director, an assistant director, a program manager, a CDL delivery driver, a foodservice distributor, volunteers, and community members, will be recurring expenses in the future years of the program. Equipment will be a one-time purchase but damaged equipment may be replaced with new equipment. Costs of supplies, travel, and fresh produce may vary depending on the ongoing market price. A van, Ford transit connect wagon 2022 will be purchased and a refrigerated truck will be rented from Enterprise. The expense of personnel, equipment, supplies, travel, and fresh produce, accounts for 69%, 18%, 5.6%, 3%,

and 3.7%, respectively, of the first six-month budget.

Conclusion

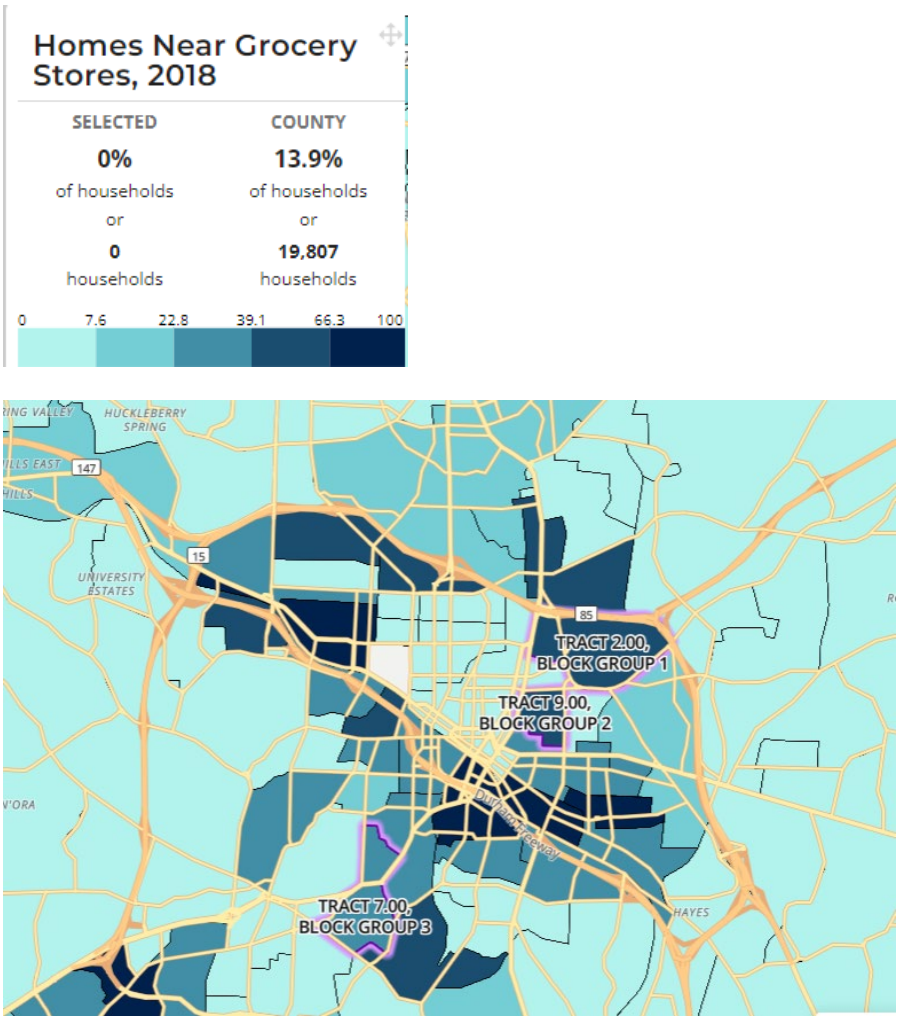
It is a harmful legacy that many residents living in these regions are experiencing historical systematic and structural racism due to structural racial inequalities in food market self-regulation and the physical infrastructure of historically redlined neighborhoods, resulting in disparities in access to healthy food grocery stores or supermarkets (Li & Yuan, 2022; NCDHHS, 2020). Improving access to healthy food is associated with improving health-related behaviors, but unemployment status, low quality of housing, and high rate of crime and violence need to be addressed through local or state policy and efforts among community organizations (Healthy People 2020; n.d.NCDHHS, 2020).

Similarly to the Pop-Up market at FBCENC and mobile markets at IFFS, the market provides the opportunity to reach the residents who are having a difficult time accessing food or nutrition services-related resources and address the gap with collected data from this practical implementation (FBCENC, n.d.; IFFS, n.d.-b). While providing fresh produce, participants receive nutrition education that can be applied in real-time grocery shopping. For example, teaching participants how to choose healthy foods on a limited budget. Additionally, participants who receive nutrition education at the mobile market are associated with increased consumption of fruit and vegetable (Evans et al., 2022).

A limited budget or lack of local distributors to purchase culturally appropriate food would make it difficult to provide different types of food to residents with diverse racial/ethnic backgrounds. The location of the market allows the residents to travel to the market less than 1 mile, which increases access to healthy food and also allows residents to bring families to shop together (Hsiao et al., 2018). Although the PopUp market will come to the local communities, some residents who are unable to drive, walk, or bike, may still have limited access to the PopUp market.

C.2.a Appendix from Program Analysis

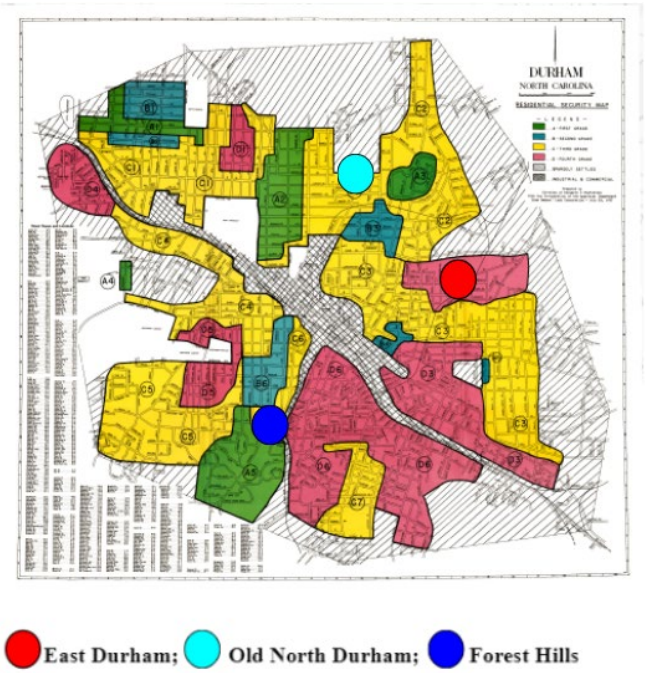
Figure 12: Homes Near Grocery Stores, 2018



**Tract 2.00, Block Group 1 (Old North Durham); Tract 7.00, Block Group 3 (Forest Hills), and Tract 9.00, Block Group 2 (East Durham)*

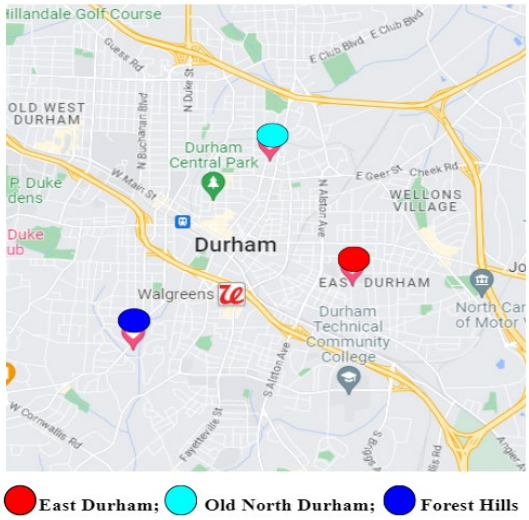
(Durham Neighborhood Compass, 2018)

Figure 13: Durham Redlining Map



Note: The yellow area indicates “C-Definitie Declining” and the red area indicates “D-Hazardous” (Mapping Inequality, n.d.)

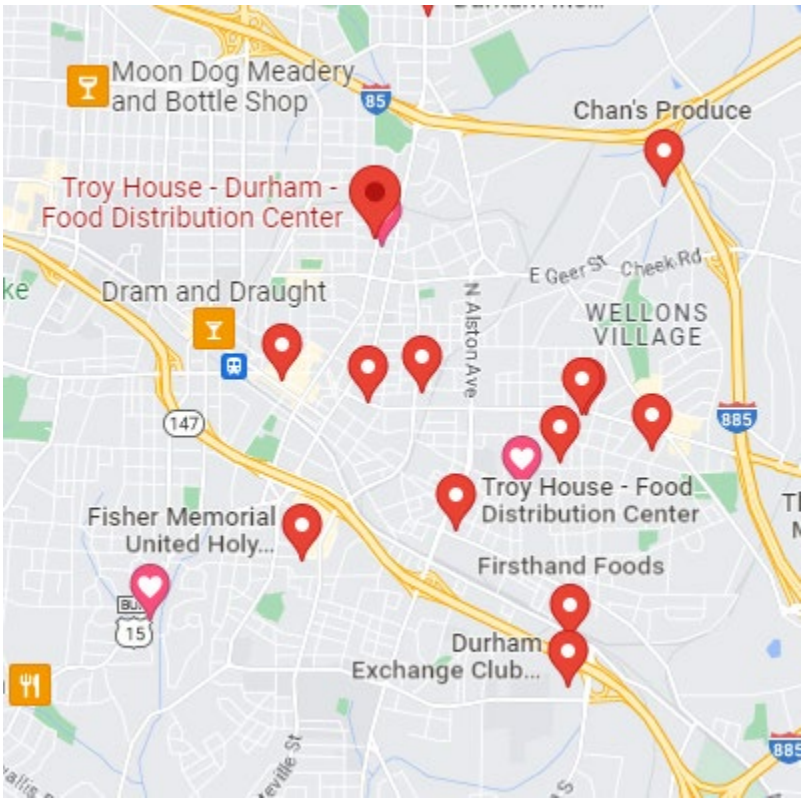
Figure 14: Durham Neighborhood Map



East Durham; Old North Durham; Forest Hills

(Google Maps, 2023)

Figure 15: Food Distributors in Durham



(Google Maps, 2023)

Table 8: A 6-month Pop-Up Market Budget

Nutrition Evidence-based Program		
Personnel (Krasna et al., n.d.)	**Salary**	**6 month Total Amount (USD)**
A Director (Recurring)	$6,650/month	$40,000.00
An Assistant Director (Recurring)	$5,400/month	$32,500.00
A Program Manager	$3,750/month	$22,500.00
CDL Delivery Driver (Indeed, n.d.)	$25/hr	$2,000-3,000
Volunteers (2 per site)	50$ gift card per one volunteer	$600.00
Community Members (total of 3)	50$ gift card per one CM	$300.00
Total Personnel		**$95,900.00**
Equipmet	**Unit**	**6 month Total Amount (USD)**
A van (KBB, 2023)		$30,000.00
A Refrigerated Truck (Costhack, n.d.)	230/day *182 days	$41.86
Market Stands Materials – Shelves – 2 Canopy – 1 (Cambro, 2023 & Instant Canopy, 2023)		$2,000.00
Total equipment		**$32,041.86**
Supplies	**Unit**	**6 month Total Amount (USD)**
Office materials (nutrition handouts & paper surveys), laptops/tablets, payment software, Paper plates and utensils, Kitchen utensil set (i.e. cutting board) (ACP,		$10,000.00
Total supplies		**$10,000.00**
Travel	**Unit**	**6 month Total Amount (USD)**
Gas (Recurring) ($30/month*12 months/year) (Trip Calculator, 2023)		$180.00
Vehicle Coverage & Maintenance (Betterton, 2023)		$5,000.00
Total travel		**$5,180.00**
Produce Purchases (USDA, 2023)	**Unit**	**6 month Total Amount (USD)**
Fruits	$2/lb*50lbs/week*26 weeks	$2,600.00
Vegetables	$3/lb*50lbs/week*26 weeks	$3,900.00
Total other		**$6,500.00**
Total budget		$149,621.86

C.3 EVALUATION PLAN

Introduction

Neighborhood and Built Environments (NaBE) is one of the Social Determinants of Health (SDoH) that can affect the health outcomes of residents in their communities (New Mexico's Health Indicator Data & Statistics [NMHIDS], 2022). "Access to Healthy Foods" is one of the NaBE-related factors, which affect residents' health-related behaviors (Healthy People 2020, n.d.; Schüle & Bolte, 2015). Limited access to healthy food is strongly associated with negative health outcomes and with

lower health-related quality of life (HRQoL), such as "more emergency department visits, more inpatient hospitalizations, and higher healthcare costs" (Hanmer et al., 2021). This is a concern, particularly in Black, Indigenous, and People of Color (BIPOC) communities in Durham county (NCDHHS, 2020). The focus of this group is to address limited access to healthy food caused by the built environment in Durham county, especially in BIPOC communities. To address the issue, Pop-Up Markets with the incorporation of nutrition education is the selected evidence-based nutrition program. This program aims to provide fresh fruits and vegetables to communities with limited access to healthy foods. The Durham County Department of Public Health (DCDPH) will oversee the program's implementation. Pop-Up Markets will be staffed with one program director, one assistant director, a Food Distribution (FD) personnel, a CDL delivery driver, a program manager, six volunteers, and three trained community members. The markets will rely heavily on volunteers and community champions to reduce staffing and capacity challenges (Kasprzak et al., 2021). The targeted areas for the program are Forest Hills, East Durham, and Old North Durham, which have been classified as "C-Definitely Declining" and "D-Hazardous" areas by the Home Owner's Loan Corporation (HOLC) due to their high poverty rates and predominant BIPOC population, as shown in Figure 15 (Mapping Inequality, n.d.; NCDHHS, 2020). Additionally, less than one percent of households living in these three regions, live in proximity to a grocery store compared to the average of 13.9% in Durham County, as shown in Figure 16 (Durham Neighborhood Compass, 2018).

Evidence Based Evaluation Plan

The Pop-up market aims to increase the combined consumption of fruits and vegetables by 0.4 cups per day among families residing in Forest Hills, East Durham, and Old North Durham by May 1st, 2026, six months after the program's launch. This result is consistent with Goham et al.'s (2015) findings that the Fresh to You (FtY) mobile market effectively increased the daily consumption of fruits and vegetables among children aged 3 to 13 and their caregivers from low-income households who shopped at the mobile market.

Study design/data collection:

The study is a cohort observational study that will collect preintervention and postintervention survey data from a convenience sample of Pop-up market shoppers. In addition, postintervention focus groups will be conducted with both participants and community partners. The evaluation will utilize a mixed-methods approach that combines quantitative and qualitative data collection methods. The quantitative method will be a self-administered survey that includes questions about demographic characteristics, such as DOB, sex, race/ethnicity, annual household income, educational levels, employment status, address (Zip codes), Medicaid status, and SNAP/WIC participant status (Goham et al., 2015). Additionally, a validated 16-item dietary screener will be included in the survey as an Appendix, as shown in Table 9, to measure intake of fruits and vegetables in cups by following the 2010 national dietary guidelines (Thompson et al., 2000). The screener includes 5 timeframes "morning, lunchtime, afternoon, dinner time and evening after dinner" and measurement of fruits and vegetable intake in cups by following 2010 national dietary guidelines (Goham et al., 2015). Participants will report their usual fruit and vegetable intake separately for each period, and the survey will be administered at baseline and 6-month follow-up with a cohort of residents who shopped at the Pop-Up markets (Thompson et al., 2000). The qualitative method will involve focus groups with participants and community partners to gather information related to perceptions of fresh produce retail prices and feedback on the Pop-Up markets. This will aid in identifying improvements for the program (Goham et al., 2015).

Sample and sampling strategy

This study will recruit participants from a cohort of residents who have shopped at the Pop-Up markets located in three community sites: Saint James Baptist Church, Christ Central Church, and Forest Hills Park. These sites are located in limited food access census tracts and historically redlined areas, as shown in Figure 16. To be eligible for the study, shoppers who are interested in participating the study will need to complete a screening survey, which will ask for their name, DOB, race/ethnicity, address (Zip codes), contact information, and visual, hearing, and cognitive status. Inclusion criteria are adult residents aged 18 years or older who live in the three communities, while exclusion criteria are visual,

hearing, and cognitive impairment that may interfere with completing the survey and focus groups. To maintain confidentiality, participant names will be removed and replaced with numbers. The assistant director will randomly select shoppers who meet the criteria during a 6-month period when the Pop-Up markets are open at each community site. A new community site will start every 6 weeks. Based on the population per square mile in 2020 is 1,133 and the number of shoppers recruited in the FtY market (n=480), the program expects to serve about 40 shoppers per site weekly and a total of approximately 3,000 participants during a 6-month period (United States Census, n.d.; Gorham et al., 2015). The program will prioritize recruiting BIPOC residents, who are more likely to live in areas with more fast-food restaurants and restricted access to healthy food compared to white residents (NCDHHS, 2020). The assistant director will use purposive sampling to identify individuals with diverse racial and ethnic backgrounds. Shoppers who complete the screening survey will receive a confirmation phone call and be asked to provide consent to participate in the study. They will also schedule a time to complete a paper self-administered survey at the first Pop-Up market they attend and at the 6-month follow-up (Goham et al., 2015). Upon completing the surveys, participants will receive vouchers for purchasing fresh produce. Flyers and face-to-face contact will be used to recruit participants for three post-intervention focus groups after 6 months of the program's launch, each lasting approximately 1 hour and conducted by the program manager. To participate, at least one participant in each group must be shoppers at the markets, and healthful refreshments will be provided upon completion. Community partners, including target populations representatives, volunteers, representatives from Food Access Organizations, and representatives from the Community Outreach program in DCDPH, will also be recruited to participate in the focus groups. The assistant director will be responsible for contacting and inviting the community partners.

Specific measures

To measure the frequency and number of portions of fruits and vegetables consumed by participants, a validated fruit and vegetable screener consisting of 16 questions will be used. Participants will be instructed that a portion is considered to be “one-half cup of fruit, one whole fruit, or one-half cup

of vegetables" (Thompson et al., 2000). The survey will assign servings to the three portion categories: "≤1 portion = 1 serving, 2 portions = 2 servings, ≥3 portions = 3 servings" (Thompson et al., 2000). The survey will also estimate the total number of servings for "orange and grapefruit juice, other 100% fruit juices, French fries or fried potatoes, and baked, boiled, or mashed potatoes, for which the number of portions was not asked" (Thompson et al., 2000). The validated survey will measure the outcome of participants' increased combined consumption of fruits and vegetables by 0.4 cups per day within the first 6 months of implementation (Gorham et al., 2015). The purposive sampling framework applied to the recruitment strategies will ensure that at least 50% of participants are BIPOC residents within the first 6 months of implementation, considering the historical redlining practices. It is expected that the program will serve approximately 3,000 shoppers in the first 6 months of implementation across three community sites, with trained mobile market staff keeping track of the number of shoppers at each site.

Timing

Evaluation and community partner engagement activities will occur at the 6-month mark. Progress will be defined by the program's ability to serve 40 shoppers per site weekly and 3,000 participants served over the 6-month program period. If progress does not occur as expected, the director will take follow-up actions to address the issue. This may involve reaching out to community partners to identify potential barriers to participation and collaborating with them to develop strategies to overcome these barriers. The program may also explore additional outreach efforts, such as increasing promotion on the Veggie Van Training Center Nesletter platforms or distributing flyers in the local community (e.g., Food banks) to increase awareness of the Pop-up market program (VVTC, n.d.). Overall, the program team will work closely with community partners to ensure that the program meets the needs of the community and achieves its goals. Postintervention focus groups also address this issue. If all community partners cannot be recruited because of schedule differences, individual interviews will be conducted with community partner representatives online or in person.

Analysis plan

To assess the effectiveness of the Pop-Up market program, the program will collect data through

a self-administered survey at baseline and 6-month follow-up. The data will be extracted into an Excel spreadsheet and presented in two tables with descriptive statistics. The first table will display the participants' demographic characteristics, and the second table will show the combined fruit and vegetable intake in cups per timeframe at baseline and 6-month follow-up, analyzed using paired t-tests in SAS version 9 (Gorham et al., 2015. The program will calculate the mean value, t-value, p-value, and 95% confidence interval for the consumption of combined fruits without juice and vegetables without potatoes. If the p-value is less than 0.05, it will indicate a significant increase in combined fruit and vegetable consumption. The program's director and assistant director will interpret the descriptive statistics. In addition, focus groups will be conducted, and audio recordings will be transcribed to scripts. Ethnographic methods will be used to identify themes related to the strengths and limitations of the market (Gorham et al., 2015). These themes, such as the quality, types, and affordability of fruits and vegetables, convenience of the markets, and strengths and weakness of the markets will inform future improvements for the Pop-Up market program. By analyzing the collected data, the program will assess its effectiveness in achieving its outcomes. If the results show progress, the program will continue to operate, and if not, the director and assistant director will consider making changes to improve its outcomes.

Sources of funding

The program plans to secure funding from the Durham County Board of Commissioners (DCBCs), with a budget range of $175,000 to $185,000 for a 6-month period (DCDPH, 2020). Due to the limitation of other effective mobile markets state no funding details, the program will utilize Rural Health Information Hub to apply the funding (Rural Health Information Hub, n.d.-a). If DCBCs cannot provide the necessary funds, the program will apply to the Colorado Fresh Food Financing Fund by April 1st, 2023, which accepts ongoing applications (Rural Health Information Hub, n.d.-a). Funding is expected to be received by July 1st, 2023, and the program will launch once funds are secured. The assistant director and director will provide monthly expense reports to DCBCs. After completing data collection, the program plans to apply for additional funding from DCBCs and the Minnesota Good Food Access

Program: Equipment and Physical Improvement Grant, which can support the program for up to three years (Rural Health Information Hub, n.d.-b).

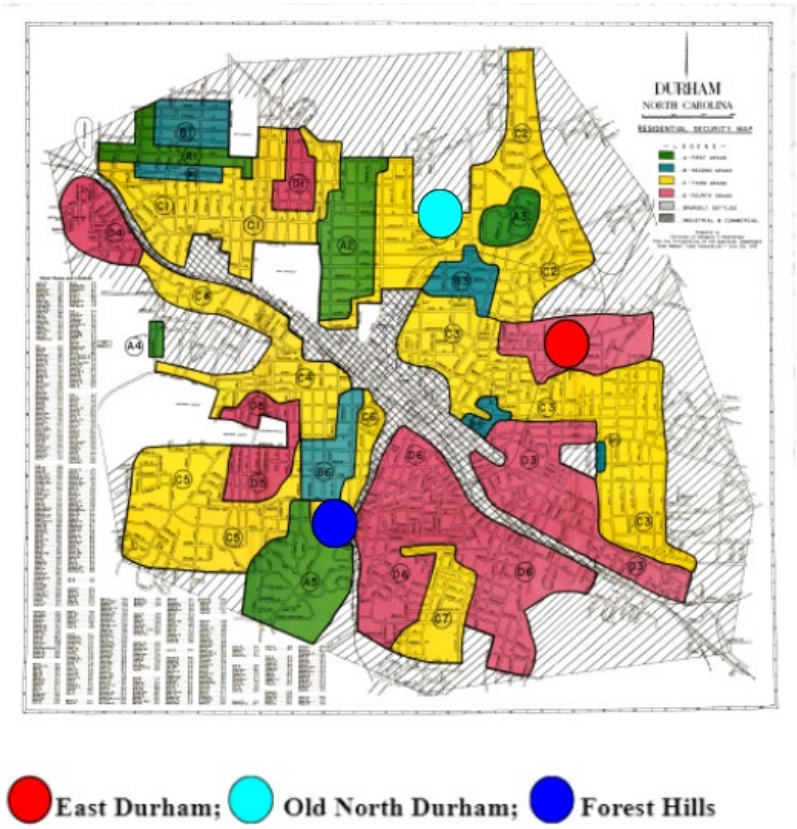
Data use and dissemination

To ensure efficient storage and dissemination of data, descriptive statistics on demographic characteristics and fruit and vegetable consumption will be stored at REDCap, while identified themes in the coding book will be stored at OneDrive. The program will share data with community partners, funders, and the community through email newsletters and meetings, as well as various channels such as reports, presentations, and social media platforms. Findings will be presented at VVTC and annual conferences hosted by the Center for Health Promotion and Disease Prevention (VVTC, n.d.). These conferences are attended by researchers, funders, and supporters of mobile markets. In addition, findings will be published on the DCDPH News & Events page and Twitter page (DCDPH, n.d.).

In conclusion, this evaluation plan relies on collaboration with community partners to achieve equitable access to healthy food in Forest Hills, East Durham, and Old North Durham. The Pop-Up market program is a critical public health initatives that aims to improve health outcomes and reduce limited food access in BIPOC communities. By collecting and dissemination data, the program can continuously evaluate its impact and identify areas for improvement. Through collaboration, interdisciplinary efforts, and a commitment to equity, the program could create a healthier, more resislienet community.

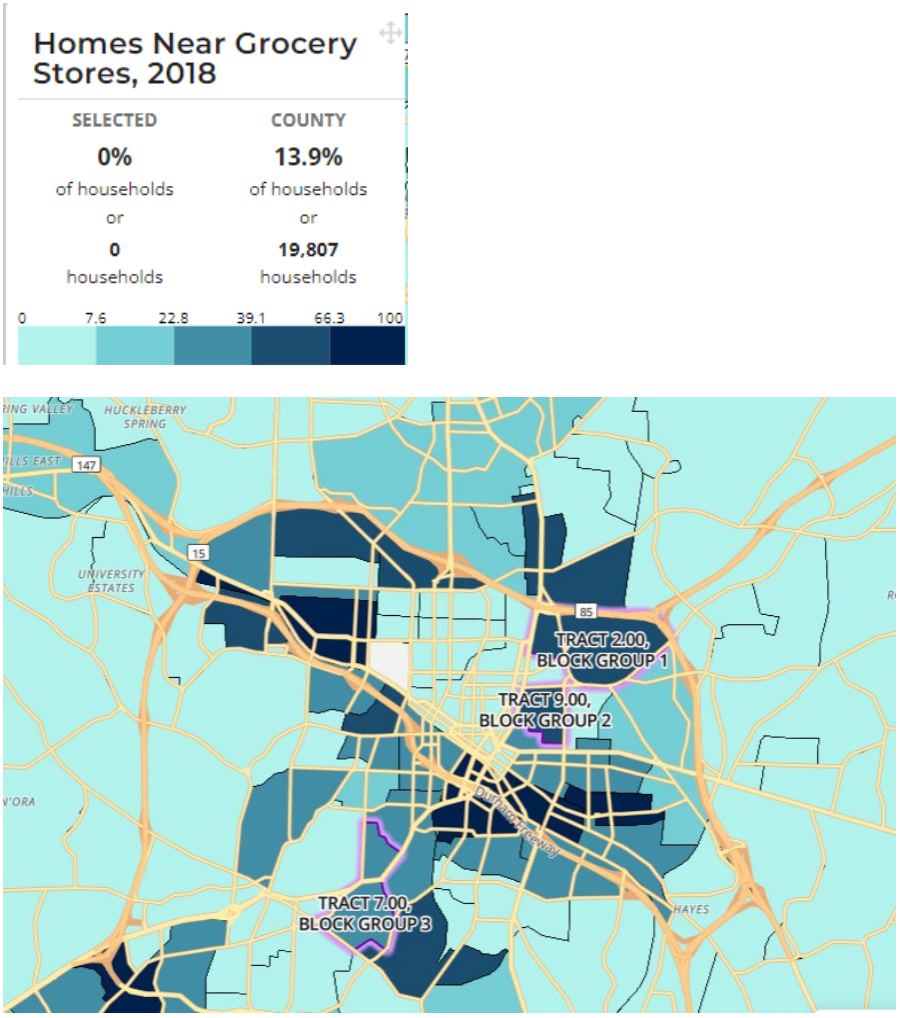
C.3.a Appendix from Evaluation Plan

Figure 16: Durham Redlining Map



Note: The yellow area indicates “C-Definitie Declining” and the red area indicates “D-Hazardous” (Mapping Inequality, n.d.).

Figure 17: Percent of Households Living in Forest Hills, East Durham, and Old North Durham Near Grocery Stores, 2018



**Tract 2.00, Block Group 1 (Old North Durham); Tract 7.00, Block Group 3 (Forest Hills), and Tract 9.00, Block Group 2 (East Durham)*

(Durham Neighborhood Compass, 2018)

Table 9: A Validated Self-Administered Fruit and Vegetable Screener

Questions asked on new fruit and vegetable screener
In the last month, about how often did you drink (or eat):
100% orange juice or 100% grapefruit juice?
… other 100% fruit juices, such as apple or grape juice? (Do not count fruit drinks such as Hi-C.)
… French fries or fried potatoes?
… baked, boiled, or mashed potatoes?
Response categories are: never, 1–3 times last mo, 1–2 times/wk, 3–4 times/wk; 5–6 times/wk, 1 time/d, 2 times/d, and ≥3 times/d.
For morning, lunchtime and afternoon, and evening and nighttime separately:
On how may days did you eat fruit for your (timeframe) meals or snacks? (Do not count juices.)
Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day.
When you ate fruit in the (timeframe), how many total portions of fruit did you usually eat? (Count each piece or one-half cup you ate as one portion, whether it was one fruit or different fruits.)
Response categories are: 1 portion or less, 2 portions, ≥3 portions.
On how many days did you eat vegetables for your (timeframe) meal and snacks? (Do not count potatoes.)
Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day.
When you ate vegetables in the (timeframe), how many total portions of vegetables did you usually eat? (Count each one-half cup you ate as one portion, whether it was one vegetable or different vegetables.)
Response categories are: ≤1 portion, 2 portions, ≥3 portions.

(Thompson et al., 2000)

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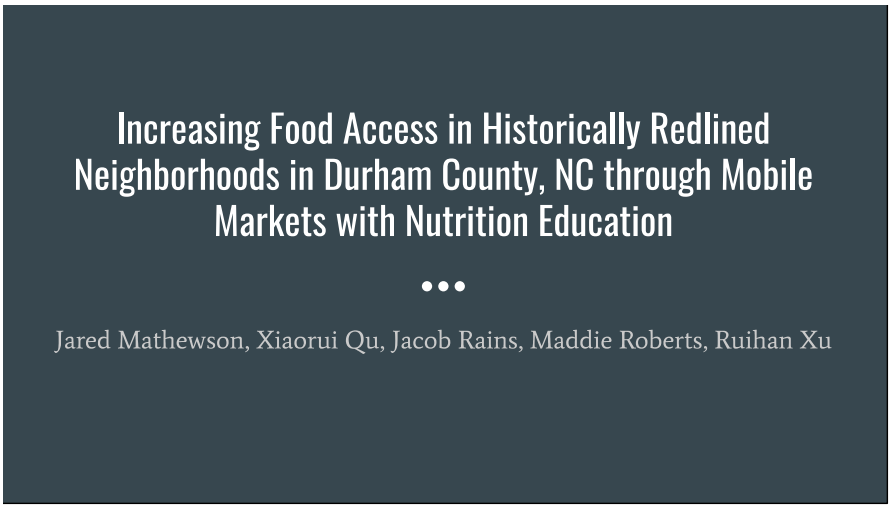
C.5 COMMON PROPOSAL PRESENTATION



Speaker: Jared Mathewson

Overview of the SDOH in the county

- Neighborhood and Built Environment
  - Living, working and recreational spaces
  - Link to long term health outcomes (Pickett, 2001)
    - Chronic disease
    - Exposure to violence
    - Mental health
- Food Access
  - Availability, accessibility, and affordability (USDHHS, 2022)
  - Durham's Forest Hills, East Durham, and Old North Durham
- Historically Redlined Neighborhoods
  - Closely linked to food access (Li & Yuan, 2022)
  - Black, immigrant, low SES neighborhoods (De Marco & Hunt, 2018)

Speaker: Jared Mathewson

Neighborhood and built environment is a key social determinant of health. It encompasses the spaces in which people live, work, eat, and play (USEPA, 2017). It is also linked to many long-term health outcomes.

Food access is one important aspect of built environment. Considered one of the key issues facing Durham County based on the 2020 community health assessment, food access encompasses food availability, accessibility, and affordability. Research also indicates that the built environment has a significant impact on people's ability to access food (DCDPH, 2021). Statistics from Data Works NC show that less than 1% of residents in Durham's Forest Hills, East Durham, and Old North Durham neighborhoods, where our program is focused, have access to nearby grocery stores. This is significantly lower than the average of Durham County at 13.9% (Data Works NC, 2023)

Redlining is also a contributing factor to the lack of food access in these neighborhoods (Li & Yuan, 2022). Redlining was the practice of deeming primarily black, immigrant, and low socio-economic status communities a high financial risk thus discouraging investment ((De Marco & Hunt, 2018). While it is now illegal, these historic practices still impact food access today; our program is designed with these injustices in mind.

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Speaker: Xiaorui (Jessica) Qu

Mobile markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address the key issue. Similar to the farmers market, the program will transport and distribute fresh fruit and vegetables at below-retail prices to the priority populations in our targeted neighborhoods (East Durham, Old North Durham, and Forest Hills). The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program) The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and will build a partnership with Durham's Innovative Nutrition Education (DINE program)

This program is designed based on an evidence-based mobile market program: *Fresh to You*, which is a public-private partnership program that serves fresh produce at below-retail prices to serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. At the 5-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among participants (Gorham et al., 2015). Given the success of the *Fresh to You* intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County County.

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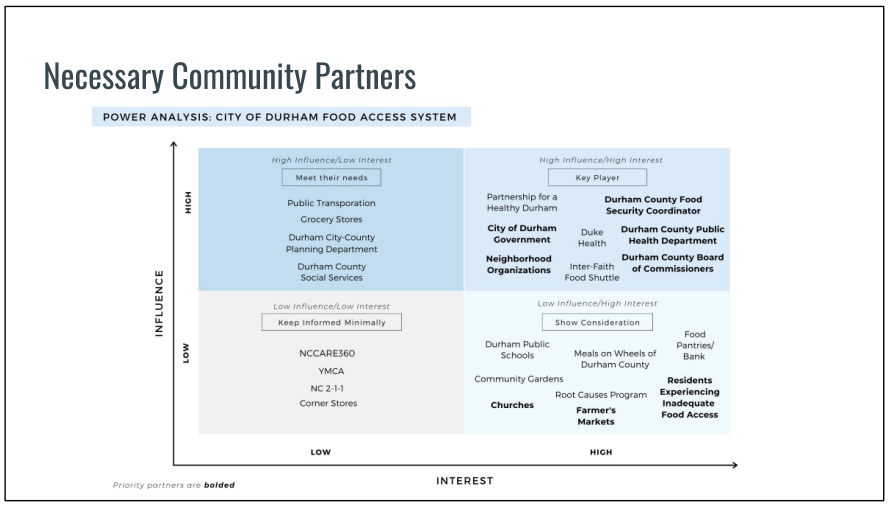
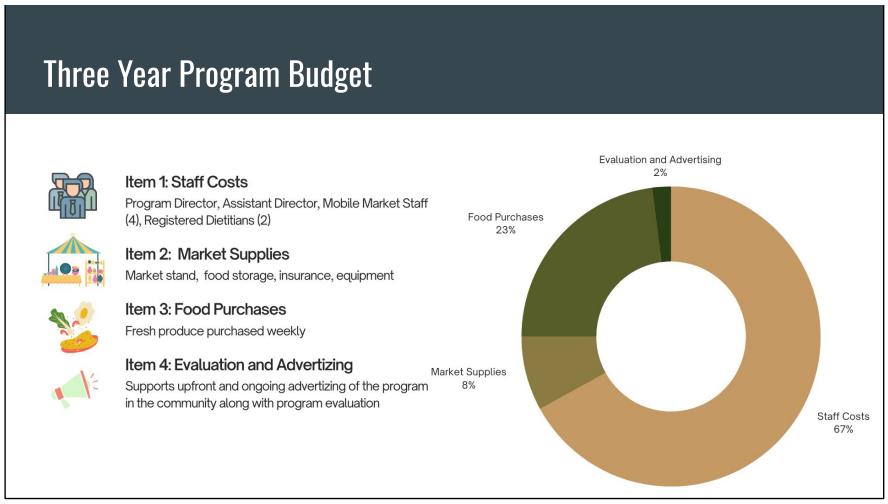


Speaker: Maddie Roberts

Numerous community partners influence Durham's food access system. As detailed within this power analysis, community partners have varying levels of influence and interest within Durham's food access system. Given the context of our proposed program, priority partners are bolded throughout the analysis and include the Durham County Department of Public Health, the City of Durham, the Durham County Board of Commissioners, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represents a variety of sectors, as well as both formal and informal influence. For instance, while the Durham Board of County Commissioners has governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches have relational influence with Durham residents.

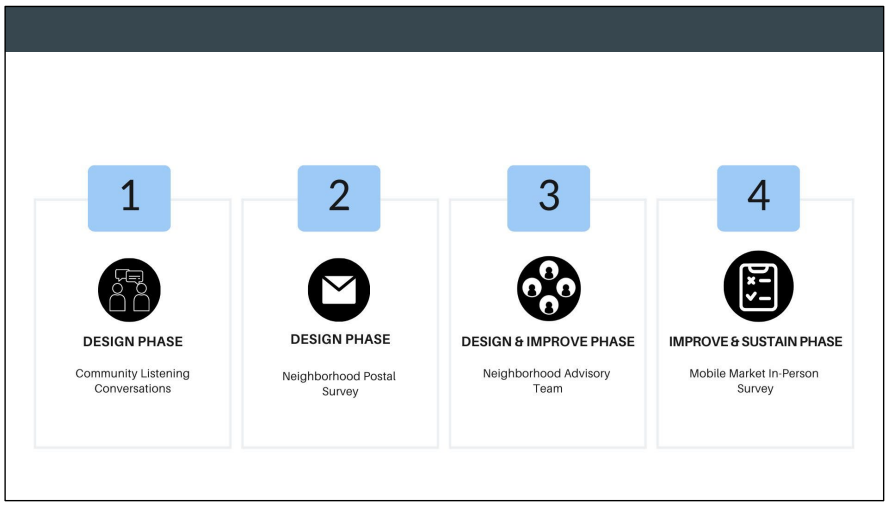
Of the priority partners within the system, Durham residents with inadequate food access are the most significant priority partners because of their experiential knowledge. Lived experience perspectives from Durham residents can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program. Despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners. The lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. Priority partners, like the Durham County Food Security Coordinator or the Durham County Department of Public Health, will play an important role in bridging the gap between residents with lived experience and governmental processes.



Speaker: Jacob Rains

Back to Agenda

We are requesting an increased appropriation of 3.29 million in county funds to the DCoDPH DINE program to administer the mobile market program for three years. These funds will be used to hire eight full time staff including a mobile market team with registered dieticians. Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) will purchased in line with other mobile market programs. Additional funds will be dedicated to covering the costs of advertising the program in the community and administering our comprehensive evaluation plan. Our mobile market budget is designed to be flexed to shift mobile market locations based on community needs at no additional cost to the County.



Speaker: Maddie Roberts

To initiate, facilitate, and sustain community partnerships to transform food access in the targeted neighborhoods, program staff will utilize the following engagement strategies throughout four phases:

1) First, during the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation. Insights from these conversations will be used to inform the design of the mobile markets.
2) Later in the design phase, our team will conduct a postal survey of residents in the targeted neighborhoods. The postal survey will inform residents about the mobile market program and collect data on food access challenges within each neighborhood.
3) Next, in the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team. The Neighborhood Advisory Team will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design and strategic priorities of the mobile market. The Neighborhood Advisory Team will be comprised of residents from the targeted neighborhoods who have experienced food access challenges.
4) Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets. After the first year of market operation, we will administer these surveys on a biannual basis.
1) The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood.

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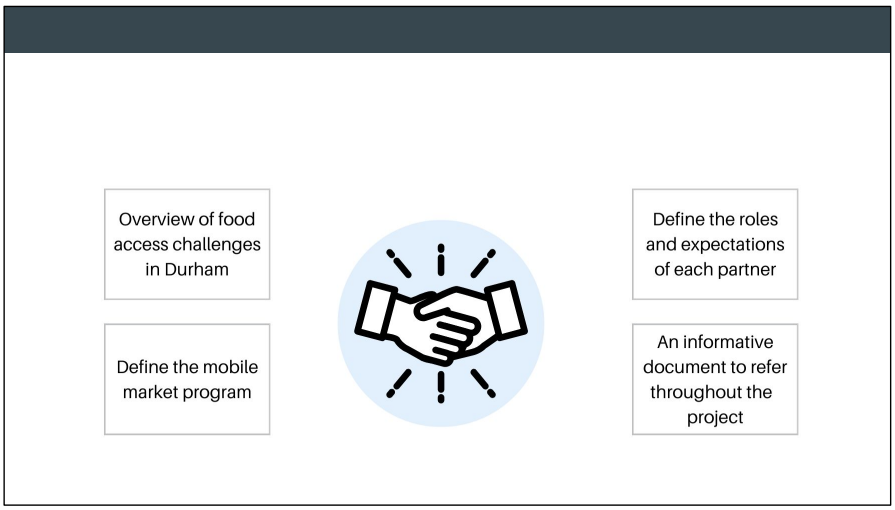
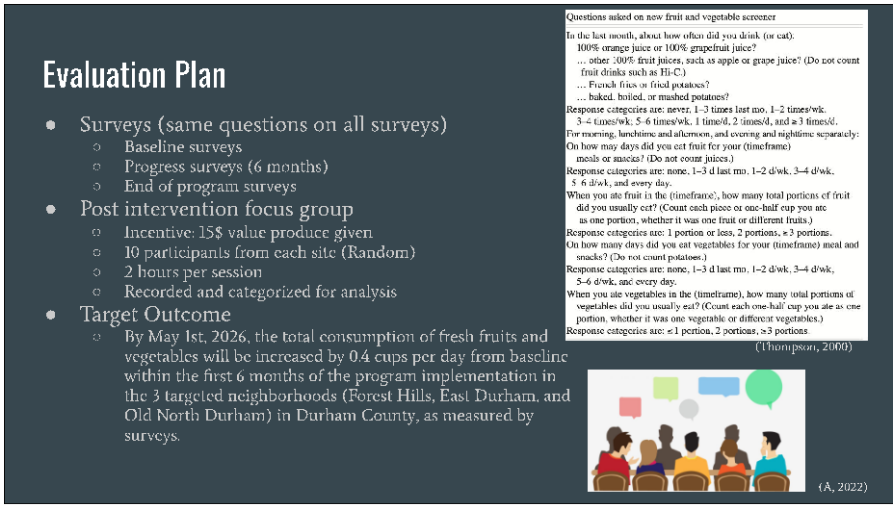


Speaker: Maddie Roberts

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding, or MOU, is crucial for success. An MOU is a formal agreement between community partners that outlines project and partner expectations. In the context of our program, an MOU will overview the history of food access challenges in Durham, with a particular focus on the targeted neighborhoods; outline how the establishment of mobile markets will effectively address food access challenges; define the trajectory of the mobile market program; define the roles and expectations of each partner; and act as an informative document to refer to throughout the entirety of the project. For example, given the context of the partners who are contributing to the mobile market program, an MOU between the Mobile Market Team and the Neighborhood Advisory Team will be necessary.



Speaker: Ruihan Xu

For program evaluation, we plan to use both surveys and focus groups for data collection. The examples of survey questions are listed on the top right figure, such as 'When you ate fruit in the last X month, how many total portions of fruits did you usually eat?'. There will be 3 survey collection periods, the baseline surveys, progress surveys (which will be collected every 6 months), and end of program surveys.

As for focus groups, we only plan to conduct post-intervention focus group sessions. Similar to what we see in other research studies, we expect to recruit 10 participants from each site for each focus group session (Gorham et al. 2015). To help recruit participants, we will provide fresh produce as an incentive. Each of the focus group sessions will last 2 hours, and the session will be recorded and categorized for later analysis.

One of the target outcomes of the program is listed here, which is related to fresh produce consumption measurement. So, after collecting the data from both surveys and focus groups, we will be able to analyze the data and see whether our target outcome is achieved. Some other data collected from focus groups might also be used to inform future modifications to the program.

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Speaker: Ruihan Xu

Lastly, here are our references. Thank you so much for your time and consideration. We hope our presentation on low food access in historically redlined neighborhoods of Durham has captured your attention and compelled you to respond. Your financial support will greatly help with our program development and those people in need. Thank you again for your valuable time.

APPENDIX D: JACOB RAINS INDIVIDUAL DELIVERABLES

D.1 SOCIAL DETERMINANTS OF HEALTH ANALYSIS

Social Determinant of Health (SDoH): Neighborhood and Built Environment

In the United States, Social Determinants of Health (SDoH) may affect as much as 50% of the variation in county-level health outcomes (Whitman et al., 2022). A Built Environment within a neighborhood is "the physical parts of where we live and work (e.g., homes, buildings, streets, open spaces, and infrastructure)" (CDC, 2017, pg. 1). Together, a person's neighborhood and built environment influence their health. The primary impact areas for this SDOH are access to healthy foods, housing quality, crime and violence, and environmental conditions (Cole & Fielding, 2007). Additional factors influenced by this SDoH mentioned in the Healthy People 2030 goals include physical activity, tobacco use, transportation, accessibility, and workplace conditions (OASH, 2020).

Neighborhoods and the Built Environment impact both short and long-term health outcomes. This analysis focuses on housing affordability as an SDoH that impacts the health of rent-burdened individuals in Durham County. Rent-burden occurs when there is a lack of affordable housing and households spend 30 percent or more on rent (Aratani et al., 2011). When households have to spend a high percentage of their income on rent they often have less income remaining to pay for food, transportation, education, and medical care. As a result, rent-burden can lead to health decline, particularly among low- and moderate-income individuals (Jenkins Morales & Robert, 2022).

Geographic and Historical Context: Durham County, NC

Durham County is located in the Piedmont region of North Carolina and had an estimated 321,126 residents as of July 2021 (Durham County DPH, 2020). The tobacco and textiles industries largely drove Durham's economy in the 1800s. African Americans have played an essential role in the upbringing and current vitality of the county. When the tobacco and textiles industries began to shrink in the mid-1900s the health care and life sciences industries became the economic engine for the County and City (Durham County DPH, 2020). North Carolina Central and Duke University play a critical role in educating county residents and attracting business to the County (Durham County DPH, 2020).

Durham County stands out as one of the most diverse counties in North Carolina. As of 2021 Durham County, 43.4% of county residents are non-Hispanic white alone, 35.9% are African American, 13.8% are Hispanic or Latino, 5.6% are Asian, 2.8% are multiracial, and 1% are American Indian or Alaska Natives (U. S. Census Bureau Quickfacts, n.d.). 13.4% of residents live in poverty, identical to the state average (U. S. Census Bureau Quickfacts, n.d.). Durham County is mainly urban/suburban, with only 5.6% of the population living in rural areas (Durham, North Carolina, n.d.). The Partnership for a Health Durham leads efforts to address this SDoH and facilitates the community health assessment process with large health systems and the Durham County Department of Health. The Durham County Housing Authority, in partnership with non-profit Housing Service Providers, has helped to increase the availability of housing, including affordable housing. (Durham County DPH, 2020).

Priority population: Areas and Persons Who are Rent-Burdened

Inadequate availability and affordability of housing units in Durham County force residents to spend a significant portion of their income on housing. As a result, some individuals become unhoused or rent-burdened. In 2021, 31% of Households in Durham County were rent-burdened, meaning that they had to spend 35% or more of their income to pay for housing (U.S. Census Bureau, 2010). Rent-burdened households are highly concentrated in census tracts in North, East, and South Durham County (Durham Neighborhood Compass, 2023). The lack of housing availability and affordability can lead to the development of chronic health conditions, including asthma and cardiovascular disease (City of Durham, 2015). Most public and affordable housing is in East Durham, with no public housing in West Durham (Durham Housing Authority, 2023).

Measures of SDOH:

In 2020, Durham had 349 unhoused persons, a decrease of 12 from 2019 (Durham County DPH, 2020). The ability to access housing in Durham County is strongly correlated with the availability of income and wealth to pay for housing. In Durham County, more than twice as many Black residents live below the poverty line than White residents. Four times as many Latinx/Hispanic residents live below the

federal poverty line vs. White residents (Durham County DPH, 2020). White residents are more likely to own a home than Black residents (73.6% compared to 50.1%) (Durham County DPH, 2020). Black and Latinx/Hispanic residents are more likely to rent housing, and in 2019 50.8% of renters were rent-burdened (Durham Neighborhood Compass, 2023). Rent-burden households are often overcrowded. Healthy People 2030 states that a lack of accessible and affordable housing "may affect mental health, stress levels, relationships, and sleep, and it may increase the risk of infectious disease" (OASH, 2020).

Rationale/Importance:

Durham County has already made strides in addressing the availability of housing units, including affordable housing via its $95 million Affordable Housing Bond Investment Plan (City of Durham, 2015). Despite these investments, the percentage of county residents who are rent burdened has only declined by 2% since 2015 (Durham Neighborhood Compass, 2023). Further progress is required to ensure no one goes unhoused in Durham and to reduce rent burden, which is negatively impacting health outcomes. High housing costs can force people to forgo needed medical care and prevent individuals from living near where they work and play (CBPP, 2022). Addressing the high rent burden is an evidence-based strategy for improving health, social, and economic outcomes (County Health Rankings, 2021).

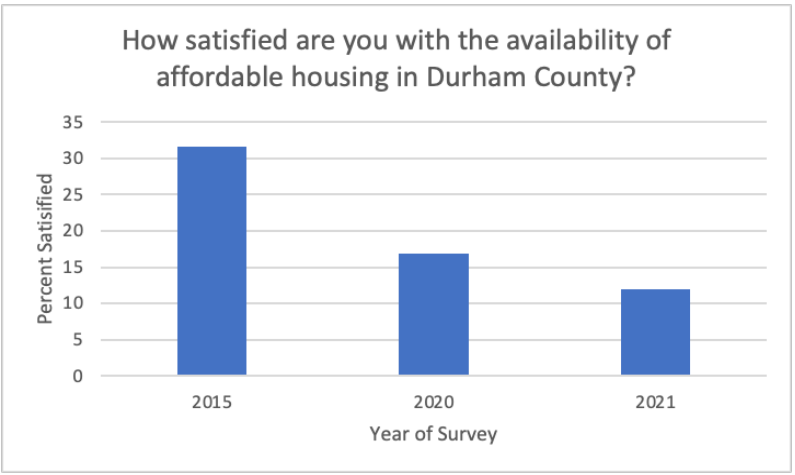
Disciplinary Critique:

Health policy professionals (HPPs) are critical to addressing the housing affordability crisis because of their unique ability to analyze available policy options and the intersection between policy and stakeholder viewpoints. HPPs have experience framing the problem and potential solutions for this SDoH in clear language for the County Commissioners and the public. In discussing this SDoH, an HPP would likely emphasize the positive economic impact of addressing the affordability crisis as individuals no longer burdened by rent are more likely to have money available for discretionary spending, bolstering Durham County's economy. Other benefits of tackling this SDoH include less reliance on county-funded housing supports, reduced spending on

medical care, greater access to healthy food, and increased use of public transportation. Finally, addressing this SDoH is politically popular. Per Figure 16, only 12% of Durham residents are currently satisfied with the availability of affordable housing (ETC Institute, 2022).

D.1.a. Appendix from SDOH Analysis

Figure 18: City of Durham Resident Survey Data on Housing Availability



ETC Institute, 2022

D.2 POLICY ANALYSIS

Background

Access to healthy foods is critical to maintaining good health (CDC, 2020). The 2020 Durham County Community Health Assessment identified food access as a top priority for the County (Durham DPH, 2021). A lack of nearby grocery stores contributes to food access challenges in parts of Durham (Data Works NC, 2023). Less than one percent of residents living in Tract 7.00, Block Group 3 (Forest Hills), Tract 9.00, Block Group 2 (East Durham), and
Tract 2.00, Block Group 1 (Old North Durham) have access to a grocery store nearby compared to the Durham County average of 13.9% (Data Works NC, 2023). Individuals living in neighborhoods without grocery stores nearby are more likely to have longer travel times to access healthy food, experience food insecurity, and be at higher risk for chronic conditions including hypertension, coronary heart disease (CHD), and diabetes (Hamrick et al., 2012; Kelli et al., 2019; Ohri-Vachaspati et al., 2019; Gregory & Coleman-Jensen, 2017). Current zoning and other regulations in Durham County discourage the construction of new grocery stores and limit County funding for farmers and pop-up markets in areas with low access to healthy food, creating barriers to addressing this problem (Durham Planning Department, 2022).

Policy Goal

This analysis's policy options seek to expand access to healthy foods in Tract 7.00, Block Group 3 (Forest Hills), Tract 9.00, Block Group 2 (East Durham), and Tract 2.00, Block Group 1 (Old North Durham).

Description of Policy Options

Policy option #1 would modify the county's zoning regulations to lower floor-area-ration (FAR) and parking requirements for grocery stores. This would incentivize grocery store construction in commercial and mixed-use zones near areas with low access to healthy food (Sustainable Development Code, 2021). Modifying grocery store zoning regulations can increase food access in a cost-neutral way for local government (Haines et al., 2018). Policy option #2 would increase Durham County funding for

pop-up food markets, in partnership with Durham's Innovative Nutrition Education (DINE) Program, administered by the Durham County Department of Public Health (Caslin, 2022; Durham County Department of Health, 2021). Funding PopUp food markets with nutrition education onsite is an evidence-based strategy for expanding food access in neighborhoods that lack nearby healthy food retailers (Villa et al., 2022; Hanson et al., 2022). These two policy options will be evaluated based on the following criteria: costs to the county, impact (number of people served by the policy), political feasibility, and equity.

Policy Analyses

Policy Option #1, Modifications to County Zoning Regulations. Durham County requires that new grocery stores meet minimum square footage and parking requirements (Durham Planning, 2022). These zoning requirements discourage the construction of grocery stores in urban areas where less land is available (Zhang & Debarchana., 2016). Several municipalities have modified or removed grocery store requirements like Durham's to encourage grocery store construction (Parlow, 2017). New York City modified its zoning rules to allow for the construction of slightly larger mixed-use buildings with reduced parking if the building has a grocery store that sells fresh meat, fruit, and vegetables (New York City Department of City Planning, 2023). From 2009 to 2022 more than 30 new grocery stores opened in underserved communities because of these changes (New York City Department of City Planning, 2023). Philadelphia adopted a similar program in 2011 that eliminated parking requirements for grocery stores, that led to the opening of at least three new fresh food markets (Sustainable Development Code, 2021). Durham County could establish a Supermarket Needs Index (SNI) to identify which areas lack nearby fresh grocers and implement the suggested zoning changes in these areas (New York City Department of City Planning, 2023). Zoning changes would have a low cost to the county, given that they would require limited resources (county-city planning staff time). However, the policy's impact may be comparatively low because the zoning change will only affect some neighborhoods and does not guarantee the construction of new grocery stores. Regarding political feasibility, this policy would garner support from community members who would appreciate expanded access to fresh grocers. Potential opponents include

county officials who oppose new development and grocery store owners who would like to limit new market entrants. Grocery store owners and officials supporting status quo zoning will likely engage on this issue. Grocers have successfully delayed or blocked the construction of new grocery stores in Durham in the past (Hoyle, 2017). This zoning change would positively address equity concerns by directly addressing the harm created by zoning policies that discourage grocery store construction in specific Durham communities.

Policy Option #2, Increase County Funding for Pop-Up Food Markets. Construction of new grocery stores in neighborhoods that do not have one nearby can take several years. Several cities have opened pop-up food markets selling food in underserved neighborhoods below market rates (County Health Rankings, 2020). In Baltimore City, a pop-up market program combined with onsite nutrition education reduced food insecurity by 19% and increased the purchase of fresh fruits and vegetables by 17% (Cueva et al., 2018). Mobile market programs in Nashville, St. Louis, and Washington D.C. have achieved similar results (Accordino et al., 2019). Offering nutrition education at these pop-up markets has been found to improve nutritional knowledge among participants (Hanson et al., 2022). Feeding America's Inter-Faith Food Shuttle currently provides intermittent mobile market services to parts of Durham and Raleigh (Feeding America, 2023).

Under this policy option, the County Commissioners would provide increased funding to the Department of Public Health's Durham's Innovative Nutrition Education (DINE) program to support the establishment of pop-up markets in Tract 7.00, Block Group 3 (Forest Hills), Tract 9.00, Block Group 2 (East Durham), and Tract 2.00, Block Group 1 (Old North Durham) (Durham County Department of Public Health, 2021). The Department of Public Health would be responsible for contracting with mobile grocer providers, leasing market space, and ensuring that market operations comply with local, state, and federal regulations. DCDPH has experience managing similar operations and would be incentivized to take on these responsibilities given its goal to "help increase access to healthy food throughout Durham" (DCDPH, 2021). Furthermore, the Department must apply with the U.S. Department of Agriculture to accept SNAP benefits (United States Department of Agriculture, 2022).

Expanding the number of pop-up markets would be a high cost to the county, given the need to hire staff and purchase equipment. However, this policy would reach a substantial number of people in the neighborhoods selected. Baltimore City's model has an uptake rate of nearly 25% in the neighborhoods served (Cueva et al., 2018). The expansion of pop-up markets has support from the residents of the impacted neighborhoods and nonprofits focused on addressing food insecurity. Convenience store owners may oppose this policy because it could drive some of their business away. The store owners have low-medium political power but are likely to lobby against this proposal if they view it as a threat to their businesses. Finally, pop-up market expansion centers equity by expanding access to nutritious foods for individuals who do not have easy access to them nearby.

Final Recommendation

To best address the lack of access to nearby grocery stores in Tract 7.00, Block Group 3 (Forest Hills), Tract 9.00, Block Group 2 (East Durham), and Tract 2.00, Block Group 1 (Old North Durham), our group proposes increasing Durham County funding for pop-up markets with nutrition education in partnership with DINE. Per the scoring matrix found in table 1 this policy option will cost more than zoning modifications. However, it will achieve a more significant impact in expanding access to healthy food for the priority population in the short run and with less political resistance. Additionally, the mobile nature of pop-up markets enables the county to pivot resources based on resident needs and the potential future construction of grocery stores in the neighborhoods where our priority population lives.

To evaluate the success of this intervention, we would use a community survey to identify what they would like the pop-up market to look like in terms of locations, service offerings, and hours. This baseline survey could include questions about food insecurity and healthy eating habits. An outcome measure based on this baseline survey's questions would be to reassess the percentage of our priority population that is experiencing food insecurity using a follow-up survey.

D.2.a. Appendix from Policy Analysis

Table 10: Policy Analysis Matrix

Score 1-5 (5 Is Best)	Costs to the County	Impact on County Residents	Political Feasibility	Equity (Double Weighted)	Total Score (Higher Score Is Better)
Zoning Modifications	**5**	**3**	**2**	**5**	**20/25**
Pop-Up Market Expansion	**3**	**5**	**4**	**5**	**22/25**

D.3 PROGRAM BUDGET

Program Summary – Durham County PopUp Market Program with Nutrition Education

Pop-up markets with nutrition education are a cost-effective strategy for quickly increasing access to fresh fruits and vegetables in low-income communities without grocery stores nearby (County Health Rankings, 2020; Hanson et al., 2022). We are asking the Durham County Commissioners to increase funding for the Department of Public Health's Durham's Innovative Nutrition Education (DINE) program to support the establishment of pop-up markets with nutrition education in Durham census tracts two, seven, and nine because these areas do not have access to fresh food nearby (DPH, 2021). The Durham County Department of Public Health (DCoDPH) would be responsible for operating free fresh produce markets in the identified census tracks weekly over the course of three years. DCoDPH would also be responsible for hiring staff, purchasing produce, market administration, and onsite nutrition education.

The primary goal for the pop-up market program is for at least 25% of residents in the neighborhoods near the markets to access fresh produce and receive nutrition education weekly. To achieve this goal, the pop-up markets will be advertised widely through partnerships with community-based food security organizations, religious organizations, and civic groups (e.g., End Hunger Durham, Food for Durham, Durham CAN). The mobile nature of the pop-up market program enables DCoDPH to modify the locations of the markets to better meet the needs of residents in the identified census tracks. Regular surveys will be distributed to the community, and focus groups will be held to ensure that the program reflects the community's needs and desires.

Figure 19: 3-Year Budget

PopUp Market + Nutrition Education Budget				
Category	**Year 1 Total**	**Year 2 Total**	**Year 3 Total**	**Total Budget YR1-3**
Income				
Funds Requested From Durham County Government	$1,120,548	$1,074,804.00	$1,096,300.00	$3,291,652.00
Expenses				
Personnel				
Salaries	$ 495,000	$ 504,900	$ 514,998	$ 1,514,898
Fringe (30%)	$ 148,500	$ 151,470	$ 154,499	$ 454,469
Training	$15,000	$ 15,300	$ 15,606	$ 45,906
Personnel expenses	**$ 658,500**	**$ 671,670**	**$ 685,103**	**$ 2,015,273**
Non-personnel				
Office Rent	$ 36,516	$ 37,246	$ 37,991	$ 111,754
Office Utilities	$2,520	$ 2,570	$ 2,622	$ 7,712
Vehicles – 1 Van	$ 45,000		$ -	$ 45,000
Insurance	$ 12,000	$ 12,240	$ 12,485	$ 36,725
Market Stand Supplies	$ 10,000	$ 10,200	$ 10,404	$ 30,604
Food Purchases	$ 218,400	$ 222,768	$ 227,223	$ 668,391
Food Storage	$ 15,744		$ -	$ 15,744
Evaluation	$10,000	$ 10,200	$ 10,404	$ 30,604
Advertising	$ 10,000	$ 10,200	$ 10,404	$ 30,604
Non-personnel expenses	**$ 360,180**	**$ 305,425**	**$ 311,533**	**$ 977,138**
Total specific costs	$ 1,018,680	$ 977,095	$ 996,637	$ 2,992,411
Allocation of Indirect Costs to Durham County Department of Public Health (10% of specific costs)	$ 101,868	$ 97,709	$ 99,664	$ 299,241
Total Income	**$1,120,548**	**$1,074,804.00**	**$1,096,300.00**	**$ 3,291,652**
Total Expenses	**$ 1,120,548**	**$ 1,074,804**	**$ 1,096,300**	**$ 3,291,652**

Table 11: Staffing Table

	FTE	Duration	Rate	Salary
Program Director	1	1	$80,000	$80,000
Assistant Director	1	1	$65,000	$65,000

Mobile Market Staff	4	1	$55,000	$220,000
Registered Dietician	2	1	$65,000	$130000
	8			**$495,000**

Budget Narrative

The three-year budget and staffing table are reflective of other pop-up markets administered in mid to large-sized counties (Cueva et al., 2018; Accordino et al., 2019). An increased appropriation of county funds entirely finances the proposed budget for the DCoDPH DINE program. The staffing model is based on the assumed need for a full-time director and assistant director to manage the program, as well as mobile market staff and registered dieticians to be available to run each pop-up market. Office rent and utility costs are based on publicly reported lease and utility data and the assumption that 150 sqft of office space will be needed per employee (Loopnet, 2023). Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) were estimated using the New York City fresh food box program with a downward adjustment to reflect lower produce costs in North Carolina (Katom Restaurant Suppl, 2023; Grow NYC, 2023).

Personnel expenses were calculated using publicly available salary data for Durham County employees with similar job titles and responsibilities (Gov Salaries, 2023). One vehicle will be required to pick up and transport food to and from the pop-up markets. Costs for a used vehicle purchase, insurance coverage, maintenance, and fuel were calculated using the Durabak Price estimator (*How Much Does a Semi Truck Cost?,* 2021) Finally, indirect costs were calculated at a 10% rate reflective of the industry standard for this type of program (Vecchio, 2021).

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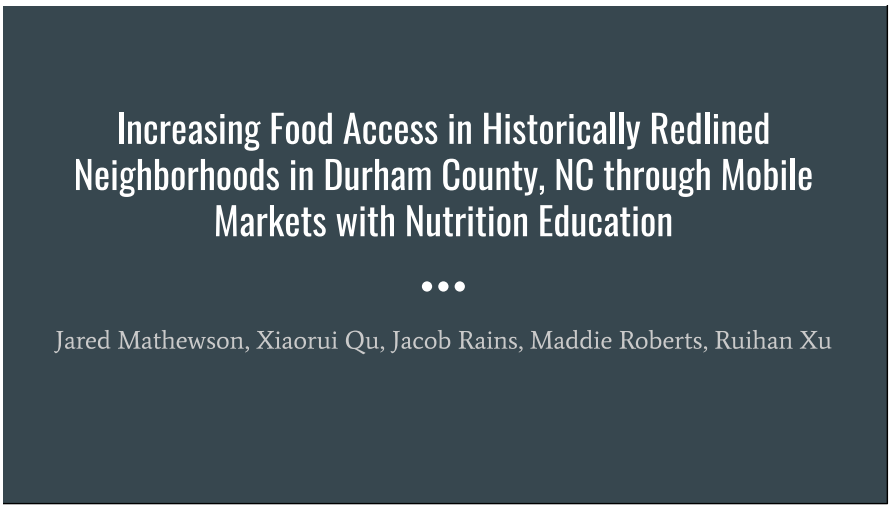
D.5 COMMON PROPOSAL PRESENTATION



Speaker: Jared Mathewson

Overview of the SDOH in the county

- Neighborhood and Built Environment
  - Living, working and recreational spaces
  - Link to long term health outcomes (Pickett, 2001)
    - Chronic disease
    - Exposure to violence
    - Mental health
- Food Access
  - Availability, accessibility, and affordability (USDHHS, 2022)
  - Durham's Forest Hills, East Durham, and Old North Durham
- Historically Redlined Neighborhoods
  - Closely linked to food access (Li & Yuan, 2022)
  - Black, immigrant, low SES neighborhoods (De Marco & Hunt, 2018)

Speaker: Jared Mathewson

Neighborhood and built environment is a key social determinant of health. It encompasses the spaces in which people live, work, eat, and play (USEPA, 2017). It is also linked to many long-term health outcomes.

Food access is one important aspect of built environment. Considered one of the key issues facing Durham County based on the 2020 community health assessment, food access encompasses food availability, accessibility, and affordability. Research also indicates that the built environment has a significant impact on people's ability to access food (DCDPH, 2021). Statistics from Data Works NC show that less than 1% of residents in Durham's Forest Hills, East Durham, and Old North Durham neighborhoods, where our program is focused, have access to nearby grocery stores. This is significantly lower than the average of Durham County at 13.9% (Data Works NC, 2023)

Redlining is also a contributing factor to the lack of food access in these neighborhoods (Li & Yuan, 2022). Redlining was the practice of deeming primarily black, immigrant, and low socio-economic status communities a high financial risk thus discouraging investment ((De Marco & Hunt, 2018). While it is now illegal, these historic practices still impact food access today; our program is designed with these injustices in mind.

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Speaker: Xiaorui (Jessica) Qu

Mobile markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address the key issue. Similar to the farmers market, the program will transport and distribute fresh fruit and vegetables at below-retail prices to the priority populations in our targeted neighborhoods (East Durham, Old North Durham, and Forest Hills). The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program) The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and will build a partnership with Durham's Innovative Nutrition Education (DINE program)

This program is designed based on an evidence-based mobile market program: *Fresh to You*, which is a public-private partnership program that serves fresh produce at below-retail prices to serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. At the 5-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among participants (Gorham et al., 2015). Given the success of the *Fresh to You* intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County County.

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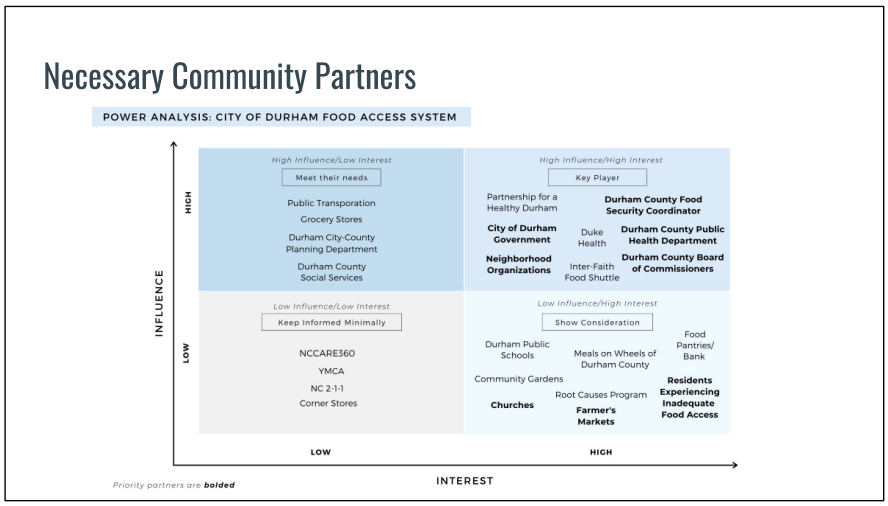
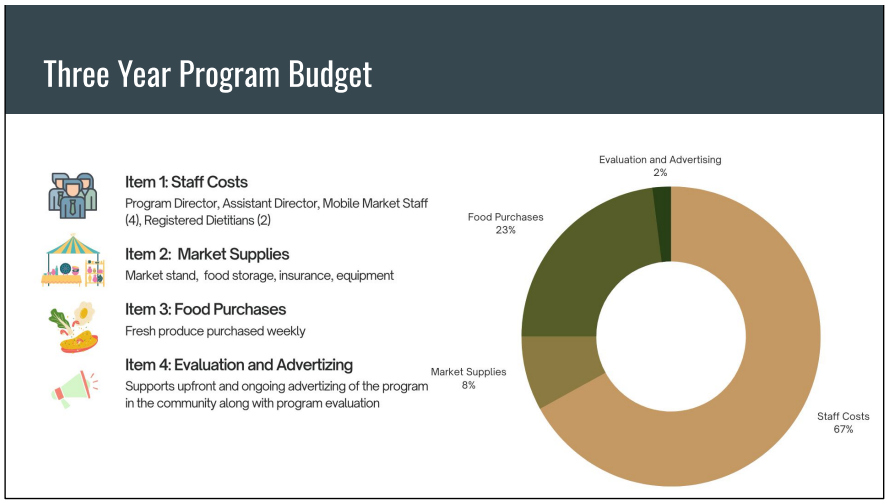


Speaker: Maddie Roberts

Numerous community partners influence Durham's food access system. As detailed within this power analysis, community partners have varying levels of influence and interest within Durham's food access system. Given the context of our proposed program, priority partners are bolded throughout the analysis and include the Durham County Department of Public Health, the City of Durham, the Durham County Board of Commissioners, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represents a variety of sectors, as well as both formal and informal influence. For instance, while the Durham Board of County Commissioners has governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches have relational influence with Durham residents.

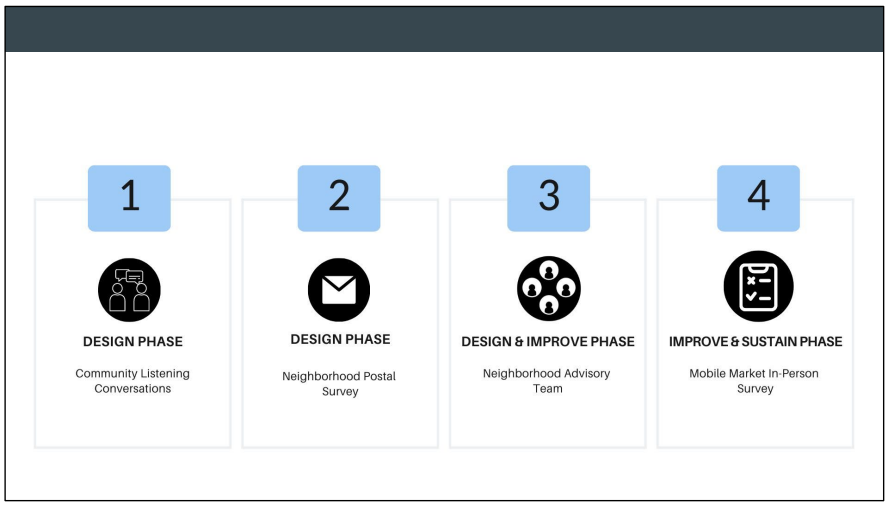
Of the priority partners within the system, Durham residents with inadequate food access are the most significant priority partners because of their experiential knowledge. Lived experience perspectives from Durham residents can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program. Despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners. The lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. Priority partners, like the Durham County Food Security Coordinator or the Durham County Department of Public Health, will play an important role in bridging the gap between residents with lived experience and governmental processes.



Speaker: Jacob Rains

Back to Agenda

We are requesting an increased appropriation of 3.29 million in county funds to the DCoDPH DINE program to administer the mobile market program for three years. These funds will be used to hire eight full time staff including a mobile market team with registered dieticians. Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) will purchased in line with other mobile market programs. Additional funds will be dedicated to covering the costs of advertising the program in the community and administering our comprehensive evaluation plan. Our mobile market budget is designed to be flexed to shift mobile market locations based on community needs at no additional cost to the County.



Speaker: Maddie Roberts

To initiate, facilitate, and sustain community partnerships to transform food access in the targeted neighborhoods, program staff will utilize the following engagement strategies throughout four phases:

1) First, during the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation. Insights from these conversations will be used to inform the design of the mobile markets.
2) Later in the design phase, our team will conduct a postal survey of residents in the targeted neighborhoods. The postal survey will inform residents about the mobile market program and collect data on food access challenges within each neighborhood.
3) Next, in the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team. The Neighborhood Advisory Team will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design and strategic priorities of the mobile market. The Neighborhood Advisory Team will be comprised of residents from the targeted neighborhoods who have experienced food access challenges.
4) Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets. After the first year of market operation, we will administer these surveys on a biannual basis.
1) The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood.

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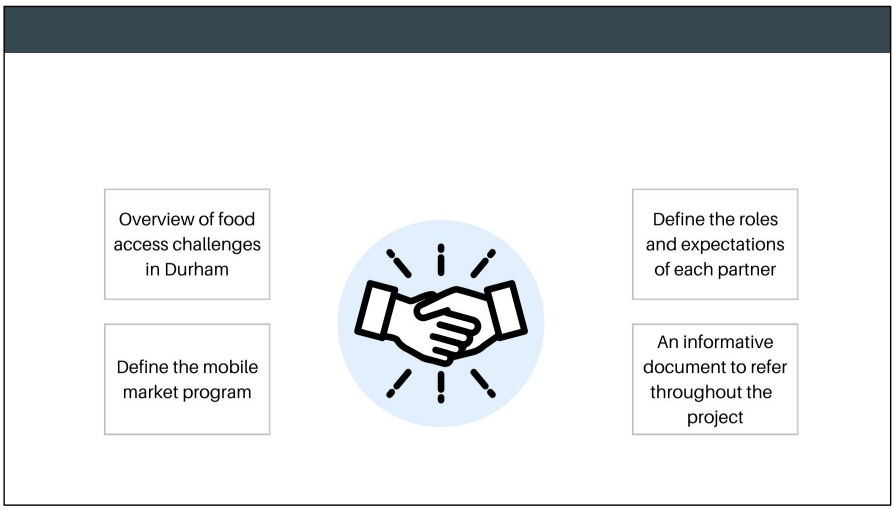
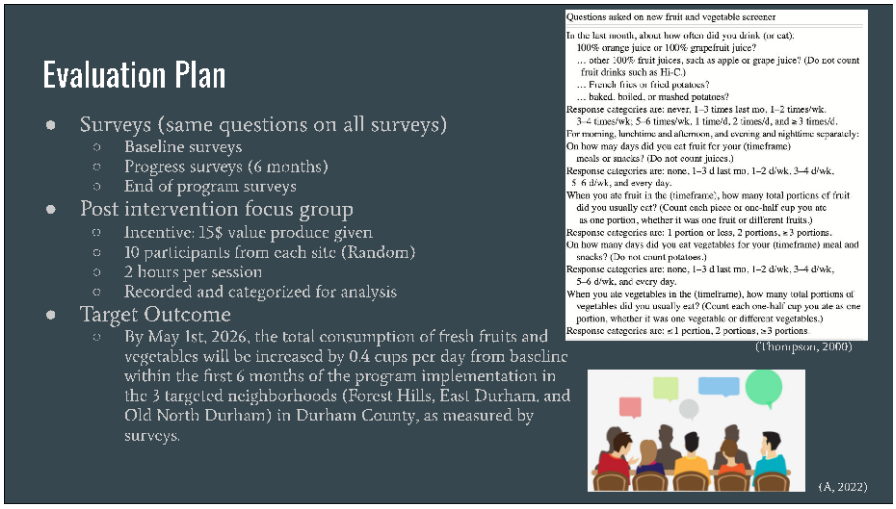


Speaker: Maddie Roberts

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding, or MOU, is crucial for success. An MOU is a formal agreement between community partners that outlines project and partner expectations. In the context of our program, an MOU will overview the history of food access challenges in Durham, with a particular focus on the targeted neighborhoods; outline how the establishment of mobile markets will effectively address food access challenges; define the trajectory of the mobile market program; define the roles and expectations of each partner; and act as an informative document to refer to throughout the entirety of the project. For example, given the context of the partners who are contributing to the mobile market program, an MOU between the Mobile Market Team and the Neighborhood Advisory Team will be necessary.



Speaker: Ruihan Xu

For program evaluation, we plan to use both surveys and focus groups for data collection. The examples of survey questions are listed on the top right figure, such as 'When you ate fruit in the last X month, how many total portions of fruits did you usually eat?'. There will be 3 survey collection periods, the baseline surveys, progress surveys (which will be collected every 6 months), and end of program surveys.

As for focus groups, we only plan to conduct post-intervention focus group sessions. Similar to what we see in other research studies, we expect to recruit 10 participants from each site for each focus group session (Gorham et al. 2015). To help recruit participants, we will provide fresh produce as an incentive. Each of the focus group sessions will last 2 hours, and the session will be recorded and categorized for later analysis.

One of the target outcomes of the program is listed here, which is related to fresh produce consumption measurement. So, after collecting the data from both surveys and focus groups, we will be able to analyze the data and see whether our target outcome is achieved. Some other data collected from focus groups might also be used to inform future modifications to the program.

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Speaker: Ruihan Xu

Lastly, here are our references. Thank you so much for your time and consideration. We hope our presentation on low food access in historically redlined neighborhoods of Durham has captured your attention and compelled you to respond. Your financial support will greatly help with our program development and those people in need. Thank you again for your valuable time.

APPENDIX E: MADISON GRACE ROBERTS INDIVIDUAL DELIVERABLES

E.1 SOCIAL DETERMINANTS OF HEALTH ANALYSIS

Neighborhood Infrastructure and Extreme Heat in Durham County, North Carolina

As identified by Healthy People 2030, Neighborhood and Built Environment is a primary social determinant of health (ODPHP, 2020). The overall health of an individual is largely influenced by their neighborhood. Social, economic, and environmental features of neighborhoods have been linked with outcomes like general health status, disability, chronic disease, mental health status, injuries, and exposure to violence (Pickett, 2001). In Durham County, North Carolina, extreme heat caused by climate change is exacerbated by a lack of neighborhood infrastructure (DCDPH, 2021). "Extreme heat" is defined as two or more days of temperatures above 90°F (U.S. Department of Homeland Security, 2022). Exposure to extreme heat can cause dehydration, heat exhaustion, heatstroke, hyperthermia, and death (EPA and CDC, 2016). Further, extreme heat worsens pre-existing health conditions like mental illness, cardiovascular disease, and asthma (EPA and CDC, 2016). Durham County is projected to experience 60 extreme heat days per year by 2030, and 75 extreme heat days by 2080 (DCDPH, 2021). Both the short- and long-term impacts of increased extreme heat days result in an uptick in heat-related illness and death (EPA and CDC, 2016). Currently, in North Carolina, an estimated 250 heat-related deaths occur annually (NCDHHS, 2022). However, it is anticipated that as the climate continues to warm, the state will experience upwards of 3,300 heat-related deaths per year (Shindell et al., 2020). Further, over time, extreme heat days will have a disproportionate impact on Durham County's low-income, racially diverse neighborhoods due to systemic racism and historic disinvestment (DCDPH, 2021). Extreme heat in Durham County is particularly problematic in neighborhoods that lack green infrastructure, indoor temperature regulations, and light-colored cooling surfaces (DCDPH, 2021).

Geographic and Historical Context of Durham County, North Carolina

Durham County, located in the Piedmont region of North Carolina, covers an area of 300 square miles (DCDPH, 2021). Durham County is often recognized for its prominence in the tobacco, textile, and

healthcare industries (DCDPH, 2021). As of 2019, Durham County is home to 311,848 individuals, with 91.5% of this population residing within the City of Durham (DCDPH, 2021; World Population Review, 2023). Durham County is ethnically diverse, with non-Hispanic African Americans and non-Hispanic whites comprising similar proportions of the county's population (36.5% vs. 51.9%) (DCDPH, 2021). Native American, Asian, and other ethnicities make up the remaining 11.6% (DCDPH, 2021). While this longstanding diversity has greatly contributed to Durham County's cultural identity and industrial advancement, the county is not without historic shortcomings. The discriminatory practice of redlining, though outdated and illegal, was once widespread in Durham County. With origins in the 1930s, the United States federal government designed redlining to decrease the number of residential foreclosures during the Great Depression. Neighborhoods were evaluated and mapped on characteristics like race, immigration status, and socioeconomic status, and were then determined whether they were eligible to receive certain financial services. Neighborhoods that were home to primarily Black residents, immigrants, and those of any race with low socioeconomic status were almost always mapped red and deemed hazardous—thus the term redlining (De Marco, A., & Hunt, H. 2018). Though redlining was deemed illegal in the 1960s, today, white families have nearly 10 times the net worth of Black families (Bhutta et al., 2019). This is true in Durham County, where the legacy of redlining impacts present-day home ownership, housing stock, and accumulated financial wealth among Black individuals (DCDPH, 2021). Further, City of Durham neighborhoods that were formerly redlined are, on average, 7°F warmer than non-redlined neighborhoods due to historic disinvestment, less green infrastructure (i.e., trees and parks), and more paved surfaces (DCDPH, 2021). The City of Durham, in partnership with Keep Durham Beautiful and Trees Durham, is responding to systemic, heat-related challenges by increasing Durham County's urban tree canopy with a primary focus on historically underserved neighborhoods (DCDPH, 2021). Additionally, the North Carolina Department of Health and Human Services distributes free fans to eligible adults to keep individuals cool during periods of extreme heat. Regardless of these efforts, Durham County requires an increasingly multi-faceted approach to effectively respond to the negative impacts of extreme heat.

Priority Population in Durham County

While all Durham County residents will be impacted by the rising temperatures of climate change, the consequences of extreme heat will have a disproportionate effect on those who reside in urban neighborhoods that experienced historic disinvestment and were formerly redlined. Thus, the population most likely to be impacted by extreme heat are individuals who live in the Southeast, East, and Northeast neighborhoods in the City of Durham (census tracts 9, 10.01, 10.02, 11, 13.01, 13.03, 14, and 23) (DCDPH, 2021). Further, as outlined in Figure 17, most residents in these neighborhoods are non-white, live below the federal poverty line, and rely on buses or walking to get around, even when it is extremely hot (DCDPH, 2021).

Measures of Social Determinants of Health

When compared with the broader Durham County population, individuals who reside in the City of Durham's Southeast, East, and Northeast neighborhoods are at higher risk of heat-related illness due to several factors. As depicted in Figure 1, there are several variables that contribute to heat-related illness in Durham's Southeast, East, and Northeast neighborhoods, including lack of health insurance, lack of transportation, race, lack of tree canopy, and housing status. Further, on an average summer day, 14% of Durham County's total area experiences temperatures at or above 84.5°F (DataWorks NC, 2021). Comparatively, on an average summer day, 27%-41% of Durham's Southeast, East, and Northeast neighborhoods experience temperatures at or above 84.5°F (DataWorks NC, 2021).

Rationale and Importance of Mitigating Heat-Related Illness in Durham County

As climate change progresses, temperatures in Durham County will inevitably rise. However, as noted in the 2020 Durham County Community Health Assessment, extreme heat is "one of the few climate health hazards that can be mitigated with advance planning," (DCDPH, 2021). Thus, Durham County has both the opportunity and responsibility to respond to heat-related challenges that have already emerged, while also establishing preventative measures that decrease the future burden of heat-related injury and death in Durham County. Further, as outlined earlier, extreme heat-related health challenges

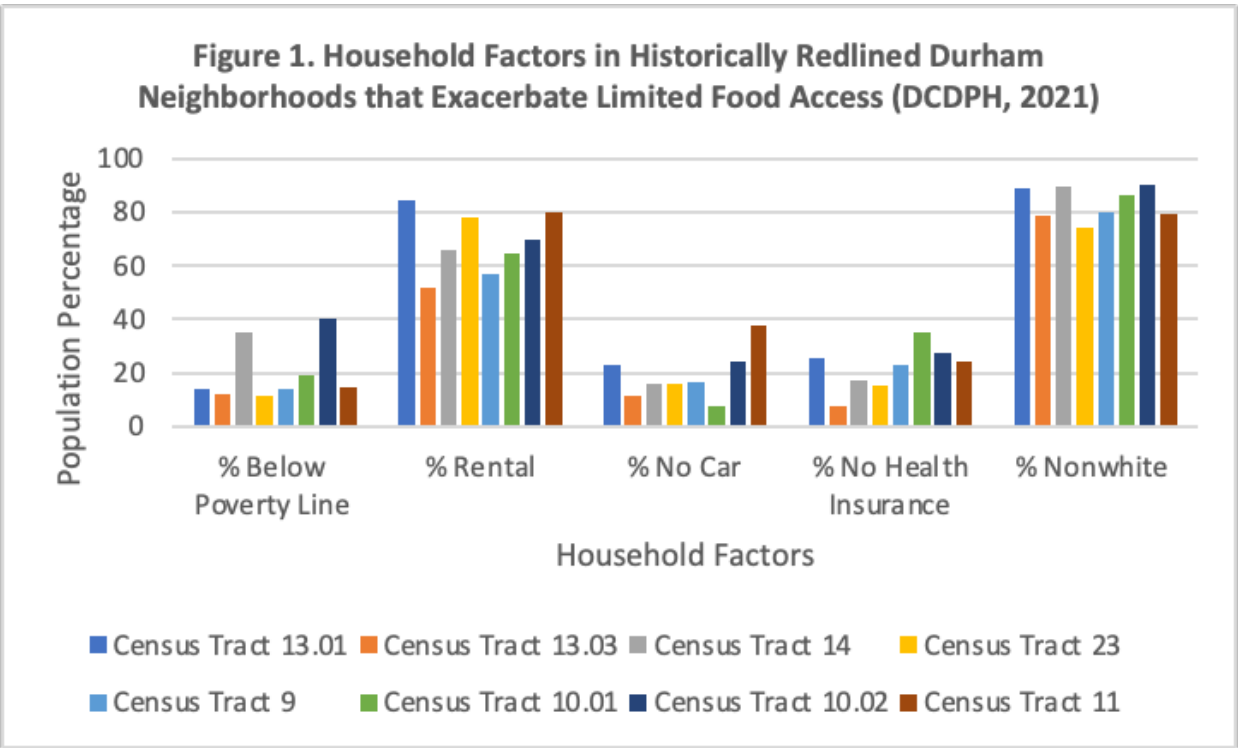
will eventually impact every Durham County resident. Therefore, any efforts to mitigate the effects of extreme heat in Durham County will have a wide-reaching impact.

Disciplinary Critique

While the overlap of social determinants of health and subsequent health outcomes is obvious to most public health practitioners, the general population likely requires further definition as to how social determinants impact health. Therefore, a public health leader must be prepared to describe how social determinants of health influence health outcomes to a variety of audiences. For instance, there is often a distinct difference between addressing an elected official and a community member. Further, a public health leader must be prepared to speak within a given context. In Durham County, systemic racism and historical policies have exacerbated the public health implications of extreme heat. Social determinants of health acknowledge the root cause of health inequities, provide a framework to respond to past harms, and anticipate the well-being of those to come. If the Durham County Board of Commissioners was hesitant to consider the challenge of extreme heat through a health equity lens, they may be open to considering it through a financial lens. Mitigating extreme heat will decrease the burden of heat-related illness and death on country-wide resources like emergency rooms, effectively lowering costs throughout Durham County.

E.1.a. Appendix from Social Determinants of Health

Figure 20: Household Factors in Historically Redlined Durham Neighborhoods that Exacerbate Limited Food Access



(DCDPH, 2021)

E.2 COMMUNITY PARTNER ANALYSIS

Food Access in the City of Durham, North Carolina

As identified by Healthy People 2030, neighborhood and built environment is a primary social determinant of health (ODPHP, 2020). The overall health of an individual is largely influenced by their neighborhood. Social, economic, and environmental features of neighborhoods have been linked with outcomes such as general health status, disability, chronic disease, mental health status, injuries, and exposure to violence (Pickett, 2001). In the City of Durham, North Carolina, food access is largely influenced by neighborhood and built environment (DCDPH, 2021). Food access is determined by availability (i.e., number of food sources), accessibility (i.e., transportation to a food source), and affordability (i.e., cost of food) (USDHHS, 2022). In Durham's Forest Hills neighborhood (census tract 7.03), East Durham neighborhood (census tract 9.02), and Old North Durham neighborhood (census tract 2.01), less than one percent of residents have access to a nearby grocery store (Data Works NC, 2023). Comparatively, in Durham County, 13.9% of residents have access to a nearby grocery store (Data Works NC, 2023). Further, as outlined in Figure 18, many residents in these neighborhoods live below the federal poverty line and rely on buses or walking to get around—factors that exacerbate the challenges of inadequate food access (DCDPH, 2021).

Program and Policy Recommendations to Increase Food Access

To increase food access in the Forest Hills, East Durham, and Old North Durham neighborhoods, one policy recommendation is to change zoning regulations to allow the construction of grocery stores and farmer's markets. Currently, Durham County restricts the construction of new grocery stores and farmer's markets to areas that are zoned as Commercial Centers (CC) or Mixed Use (MU) (Durham Planning, 2022). However, in cities similarly sized to Durham, modifying zoning regulations has been proven to bring about new construction of grocery stores and farmer's markets (Baltimore City Food Policy Task Force, 2009). Expanding the number of food sources in Forest Hills, East Durham, and Old North Durham would increase overall food access for neighborhood residents. A program recommendation that complements this policy is to host pop-up food markets in partnership with

Durham's Innovative Nutrition Education (DINE) Program, which is administered by the Durham County Department of Public Health (Caslin, 2022; Durham County Department of Health, 2021). These pop-up markets would feature onsite nutrition and health education and would be hosted in neighborhoods that lack nearby healthy food retailers. Given the mobile nature of pop-up food markets, the Durham County Department of Public Health could ensure that this program serves the neighborhoods that would most benefit.

The Impact of Historic Policies on Food Access in Durham

The present-day challenges of food access in Durham are compounded by historic policies. The discriminatory practice of redlining, though now illegal, was once widespread in Durham County. Starting in the 1930s, the United States federal government evaluated and mapped neighborhoods on characteristics like race, immigration status, and socioeconomic status and determined whether they were eligible to receive certain financial services. Neighborhoods that were home to primarily Black residents, immigrants, and those of any race with low socioeconomic status were almost always mapped red and deemed as financial high-risk areas for mortgage investors, even in middle-class neighborhoods that were predominantly Black or immigrant neighborhoods—thus the term redlining (De Marco, A., & Hunt, H. 2018). Redlining prohibited many Black residents from receiving loans or accessing mortgage financing, making it incredibly difficult for Black residents to become homeowners. Because homeownership is often a significant means of building and transferring intergenerational wealth building in the United States, the long-term effects of redlining created wealth inequalities that persist today (Nelson, 2020). Though redlining was deemed illegal in the 1960s, today, white families have nearly 10 times the net worth of Black families (Bhutta et al., 2019). This is true in Durham County, where the legacy of redlining impacts present-day home ownership, housing stock, and accumulated financial wealth among Black individuals (DCDPH, 2021). Further, due to the effects of redlining, grocery chains are often disincentivized from being built in communities of color, particularly in low-income communities of color (DCDPH, 2021). As a result, non-white residents are “more likely to live in areas with high density of fast-food restaurants and lower access to retailers with more healthy options compared to white

residents," (DCDPH, 2021). In Durham County, there are significant racial disparities surrounding food access, with Black residents (14.9%) being significantly more likely than white residents (6.6%) to skip or cut a meal due to cost (Partnership for a Healthy Durham, 2020).

Community Partner Analysis

There are several key community partners that influence Durham's food access system. I chose to identify and map community partners through an actor map, a Venn diagram, and a power analysis. The actor map depicts key partners that are directly affected by and/or have influence in the different sectors of Durham's food access system (Figure 19). The Venn diagram depicts which partners would be involved in either the policy recommendation, the program recommendation, or both (Figure 20). Finally, the power analysis depicts the influence and interest levels of community partners (Figure 21). In all the maps, I bolded priority partners to signify individuals and organizations that must be included throughout the policy and program development and implementation process.

The most significant priority partner is Durham residents who are experiencing inadequate food access. One barrier that may influence the representation and participation of Durham residents who are experiencing inadequate food access is that while this population has high interest, they have low influence and will require the support of more influential community partners. The lack of influence among this population is compounded by the longstanding impacts of redlining and the subsequent disinvestment within the neighborhoods in which this population resides. Given this context, a priority partner who can provide key support to Durham residents who are experiencing inadequate food access is the Durham County Food Security Coordinator. In the Spring of 2021, Durham County created the food security coordinator position to "create a strong and equitable food system for residents to find affordable and healthy food" (DCDPH, 2021). The Food Security Coordinator plays an important role in bridging the gap between residents with lived experience and governmental processes. Given the newness of the food security coordinator role within the county, our team hopes to fully utilize the potential of this community partner. Additional priority partners include the Durham County Board of Commissioners, the Durham County Department of Public Health, farmer's markets, neighborhood organizations, and public

transportation representatives. One facilitative factor that may influence transformative change is that proposed community partners represent a variety of sectors (i.e., health, social services, community resources, etc.), as well as both formal and informal influence (i.e., government agencies vs. neighborhood organizations and churches). For instance, while the Durham Board of County Commissioners holds governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches likely have greater relational influence with Durham residents.

Worldview Exploration

Two CATWOE analyses that portray varying perspectives within the system for adequate food access in Durham are that of a Durham resident who is experiencing inadequate food access and the owner of a neighborhood convenience store (Figure 22). The root definition for the Durham resident is as follows: The food system in Durham, NC is a system to provide access to high-quality, fresh foods to all city residents through the equitable distribution of food sources so that food throughout the city is affordable, accessible, and available. In particular, the worldview of the Durham resident is focused on having access to healthy and affordable food sources that not only meet their needs but also the needs of their community. Further, the Durham resident is interested in seeing the system transform to include a wide range of food sources.

The root definition for the owner of the convenience store is as follows: The food system in Durham, NC is a system to promote accessible food sources to neighborhood residents by supplying a variety of shelf-stable foods to meet the basic food needs of neighborhood residents while also supporting local businesses. The worldview of the store owner is somewhat narrow, focusing only on the role of the convenience store within the broader system. Similarly, the convenience store owner envisions a narrower system transformation, to see the convenience store be a one-stop-shop that meets the basic needs of neighborhood residents. It is likely that the owner of the convenience store would be hesitant to support our team's initiative because both our policy and program recommendation would decrease demand at the neighborhood convenience store.

Conclusions

While both the Durham resident who is facing inadequate food access and the Durham Farmer's Market Manager agree that all Durham residents should have access to food, their priorities and methods vary. The Durham resident is more concerned about having access to food sources that are consistent, affordable, and reliable, whereas the Durham Farmer's Market manager has a greater emphasis on local vendors, fresh food, and the overall farmer's market experience. Implications for this project include considering the quality, consistency, reliability, and feasibility of food sources. Further, this project will require an honest assessment of how the wants and needs of community partners should be prioritized.

To gain a greater understanding of the perspectives of community partners, I would like to ask the following questions:

1. What would success in this project look like to you?
2. As an individual who has experienced inadequate food access, how do you cope with challenges related to food access?
3. What is the most important type of food source that you or your community needs?
4. What do you believe is the biggest barrier to food access in your community?
5. As a neighborhood organization, how do you help neighbors who are experiencing inadequate food access? What supports do you need?
6. As a county commissioner, what research have you done to explore how other communities are addressing challenges related to food access? How might that research inform our proposed policy and program?
7. Which groups or leaders in your community would be most essential to include as we work to increase food access?
8. As the manager of an existing Durham farmer's market, how can we best prepare for pop-up markets? How do we consider the demands that additional markets may make on existing food systems (i.e., local farmers and crops)?

A strength of this community partner analysis is that many of these community partners either have positive working relationships with the Board of County Commissioners and/or have a longstanding track record of effective work within the greater Durham community. Another strength of this analysis is that it centers on neighborhoods and a population that has rarely benefited from past interventions. A limitation of this analysis is that it was done without talking to any community partners and was based on information found on the internet and/or general assumption. With this in mind, eventual policy and/or program development will require community-engaged research and conversations.

E.2.a. Appendix from Community Partner Analysis

Figure 21: Household Factors in Historically Redlined Durham Neighborhoods that Exacerbate Limited Food Access

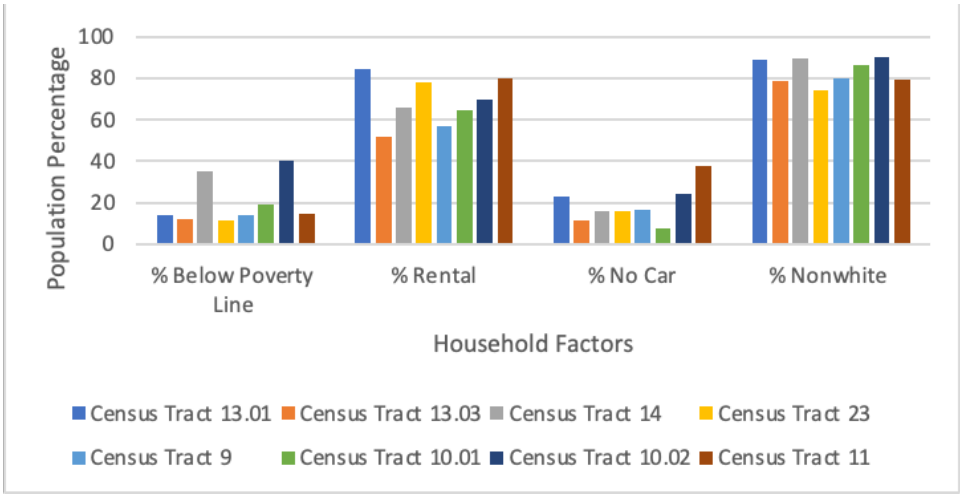


Figure 22: Actor Map

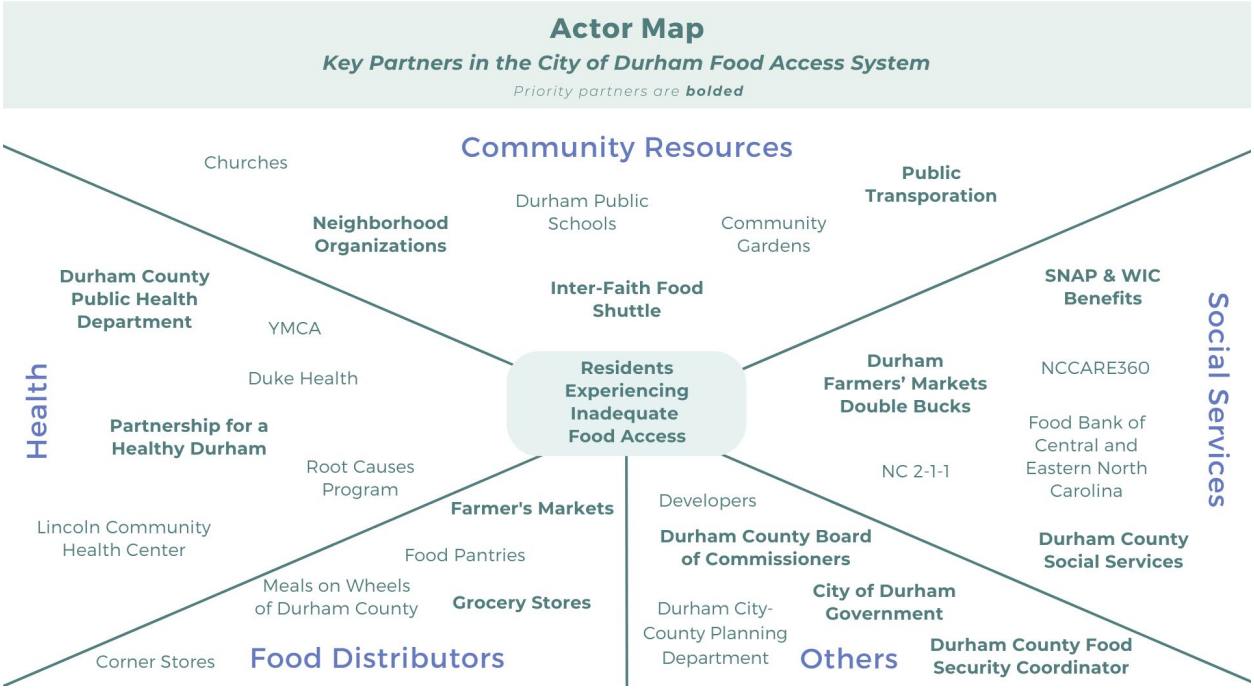
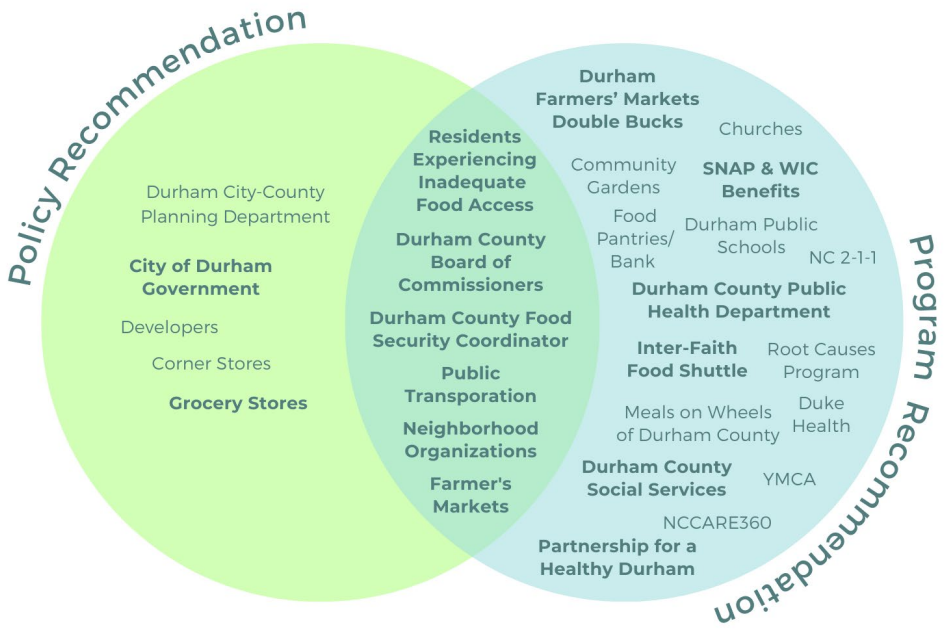


Figure 23: Policy and Program Recommendation Venn Diagram



*Priority partners are **bolded***

Figure 24: Power Analysis: City of Durham Food Security System

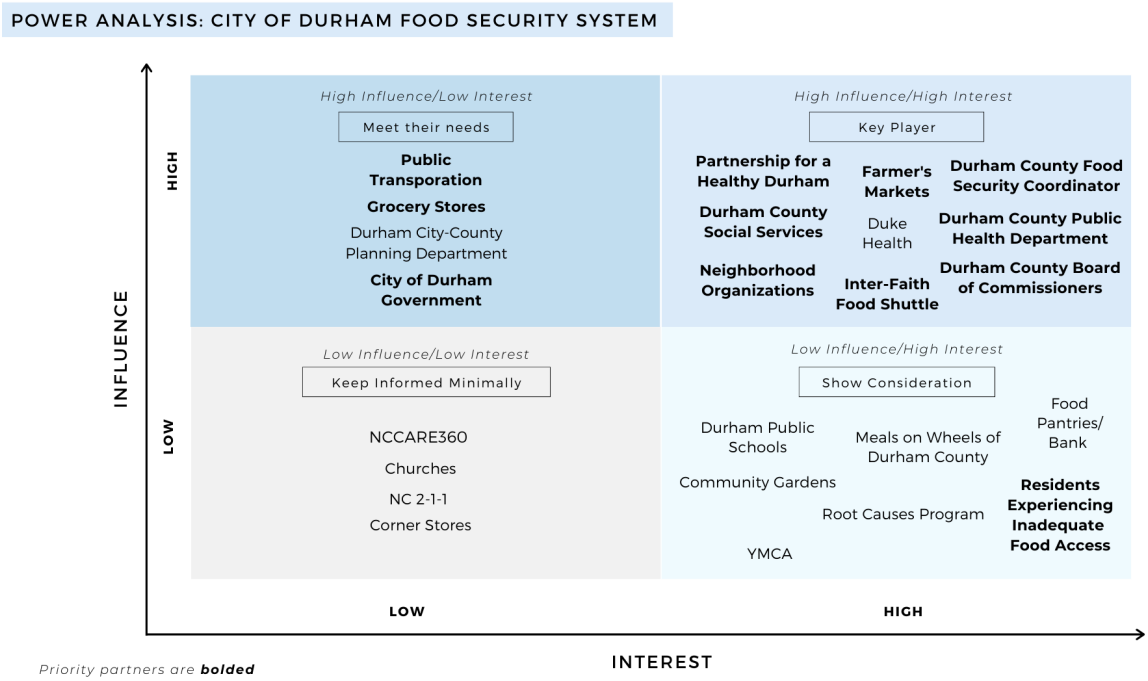


Figure 25: CATWOE and Root Definitions

Perspective: Durham resident who is experiencing inadequate food access

Transformation	To see my neighborhood have a wide range of food that is affordable, accessible, and available.
Worldview	I should have access to healthy and affordable food sources that meet my needs and those of my community.
Customer	Myself, as well as my neighbors who experience inadequate food access.
Actor	Local government, farmer's markets, grocery stores, public transportation
Owner	Local government, policymakers, developers, investors
Environment	Inadequate/unreliable public transportation, corner store within walking distance, grocery store within driving distance

Root Definition: The food system in Durham, NC is a system to provide access to high quality, fresh foods to all city residents through the equitable distribution of food sources in order that food throughout the city is affordable, accessible, and available.

Perspective: Owner of Neighborhood Convenience Store

Transformation	To see my convenience store be the one-stop shop for basic needs for all residents in the neighborhood.
Worldview	The convenience store plays a key role in providing food and other basic necessities to neighborhood residents.
Customer	Neighborhood residents, broader Durham population
Actor	Manager, employees, customers, product vendors
Owner	Store owner, City of Durham

Environment	Neighborhood location, hours of operation, customer demand

Root Definition: The food system in Durham, NC is a system to promote accessible food sources to neighborhood residents by supplying a variety of shelf-stable foods in order to meet the basic food needs of neighborhood residents while also supporting local businesses.

E.3 ENGAGEMENT PLAN

Background

The following community engagement plan overviews how to initiate, facilitate, and sustain equitable community partnerships to transform food access in Durham, North Carolina neighborhoods. When compared to the whole of Durham County, the Forest Hills, East Durham, and Old North Durham neighborhoods face significant food access challenges (Data Works NC, 2023). Because food access discrepancies within Durham County are exacerbated by neighborhood location, our team will implement a mobile market program in partnership with Durham's Innovative Nutrition Education (DINE) Program, which is administered by the Durham County Department of Public Health (Caslin, 2022; Durham County Department of Health, 2021). The mobile markets will feature onsite nutrition and health education and will be strategically located in neighborhoods that lack nearby healthy food retailers and/or face risk factors that exacerbate food access challenges. Given the mobile nature of pop-up food markets, the Durham County Department of Public Health can ensure that this program serves neighborhoods that would most benefit. Further, the engagement plan involves a broad range of community partners throughout the scope of the project, which will allow the mobile markets to be designed in a way that meets the unique needs of each targeted neighborhood.

Engagement Strategy Overview

There are several community partners who are integral to the success of the mobile market project. As outlined in the RASCI table (Table 12), each of these community partners play a specific and defined role in the implementation of the project. However, because of their lived experience, Durham residents who are experiencing inadequate food access are the most significant priority partners within the system. The lived experience of this population must inform the design and implementation of the mobile markets. Lived experience perspectives can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the project (Beames et al, 2021). As detailed in the methods, timing, and measures table (Table 13), the

following four methods will be used to engage with Durham residents experiencing food access challenges throughout each phase of the project.

Community Listening Conversations: During the design phase of the project, our team will host a series of community listening conversations in each targeted neighborhood (Forest Hills, East Durham, and Old North Durham). The community listening conversations will be facilitated as an opportunity for neighborhood residents to learn more about the mobile market project, express their hopes for collaboration, share concerns, and consider ways for continued participation within the project (University of Kansas, n.d.). The community listening conversations will be hosted in accessible and neutral spaces within each neighborhood (i.e., public library, community center, neighborhood park, etc.). One significant barrier that may influence the participation of Durham residents who are experiencing inadequate food access in these conversations is a potential lack of community trust. If neighborhood residents are skeptical of the feasibility or reliability of a mobile market, they may choose to not participate in the conversations. Further, if past community engagement attempts have disregarded neighborhood residents, resulting in harms or broken trust, the conversations will require increased intentionality and tact (Matthews, 2022). Alternatively, some facilitators that may increase participation is that the conversations will provide a platform for neighborhood residents to share their thoughts and experiences. Additionally, our team has allocated funding to provide incentives like childcare and food for those who participate in the conversations. The success of the conversations will be measured through the number of conversations hosted in each neighborhood, the number of participants at each conversation, as well as the number of participants who are interested in continued involvement in the project. The content of the conversations will be assessed through a qualitative analysis of transcripts and/or notes from each conversation. Conversation content will be used to inform the design of the mobile markets.

Neighborhood Postal Survey: Continued in the design phase, and in addition to the community listening conversations, our team will conduct a postal survey that targets residents in the Forest Hills, East Durham, and Old North neighborhoods (Parker and Dewey, 2000). The postal survey will inform

residents about the mobile market project and will collect both qualitative and quantitative data on food access challenges within each neighborhood. The surveys will also provide an opportunity for respondents to indicate if they would like to be involved in future phases of the project. While each postal survey will include a postage-paid envelope for return, respondents will also have the option of completing the survey online. One barrier that may influence participation in the survey is that this method requires intentionality for completion. Additionally, there may be a language barrier for some respondents. Our team will ensure the survey is available in both English and Spanish. Facilitators for the postal survey include convenience and anonymity for respondents. The success of the survey will be measured through number of responses and the number of respondents who are interested in continued involvement in the project. The survey responses will be assessed through qualitative and quantitative data analysis which will overview aggregate data, as well as data trends specific to each neighborhood.

Neighborhood Advisory Team: In the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team (NAT) (Arnos et al., 2021). As noted within the community partner analysis, one barrier that may influence the participation of Durham residents facing food access challenges is that while this population has high interest, they have low influence within the system. An additional, compounding barrier is that there are few formal opportunities to consistently engage with neighborhood residents. In response to these barriers, the establishment of the NAT provides a platform for neighborhood residents to formally engage with one another and other partners within the system and influence the design of the mobile market. The NAT will be comprised of residents from the Forest Hills, East Durham, and Old North Durham neighborhoods who have experienced food access challenges. NAT members will be identified and recruited through community listening conversations and surveys that will take place during the design phase of the project. Additionally, other partners within the system, especially churches and neighborhood organizations, will help to identify and recruit neighborhood residents who may be interested in participating on the NAT. At a minimum, the NAT will meet monthly over the span of six months, with the opportunity for NAT members to meet more frequently if desired. The success of the NAT will be measured by the number of

neighborhood blocks represented by members, the number of members who commit to the six-month period, and the number of strategic priorities that emerge from the NAT upon the completion of the six-month period. The work of the NAT will be periodically assessed through an advisory board charter that will be created at the initial NAT meeting. Additionally, the work of the NAT will be assessed by the quality of the strategic priorities.

Mobile Market In-Person Survey: Finally, during the improve and sustain/scale phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets (CDC, 2014). After the first year of market operation, we will administer these surveys on a biannual basis. The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of neighborhood residents. Additionally, based on the opportunities and needs identified by respondents, the data collected will inform how future funding is requested and allocated. One barrier that may influence participation is that in-person surveys require an unexpected time commitment and may compromise the respondent's sense of anonymity. A facilitator that may influence participation is the opportunity for market clientele to inform how the mobile markets continue to grow and evolve. The success of the survey will be measured through number of respondents, demographics, and the distribution of respondents within the targeted neighborhoods. The survey responses will be assessed through qualitative and quantitative data analysis which will overview aggregate data, as well as data trends specific to each market location.

Accountability Plan

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding (MOU) is crucial for success. Given the context of the partners who are contributing to the mobile market project, an MOU between the Mobile Market Team and the NAT will be necessary. The MOU between the Mobile Market Team and the NAT will overview the history of food access challenges in Durham, with a particular focus on the Forest Hills, East Durham, and Old North Durham neighborhoods; explain why the establishment of a mobile market will effectively address food access

challenges; define the trajectory of the mobile market project; define the roles and expectations of each partner; and act as an informative document to return and refer to throughout the entirety of the project.

The roles and expectations for members of the NAT include the following: a six-month commitment where members attend at least 75% of the monthly meetings; the ability to provide input and feedback on the design of the mobile market; a willingness to work closely with the Mobile Market Team to ensure that the mobile markets reflect the values and needs of the neighborhood; and the capacity to compile a minimum of five strategic priorities to guide the development of the mobile markets by the end of the six-month period. The roles and expectations for the Mobile Market Team include the following: keep the NAT apprised on the development of the mobile market project; liaison between the NAT and other relevant community partners; and incorporate the NAT-identified strategic priorities into the design of the mobile market. If, for whatever reason, the Mobile Market Team cannot incorporate a strategic priority into the mobile market design, they are responsible for meeting with the NAT to refine the strategic priority into a feasible option.

The MOU will be discussed and drafted by the Mobile Market Team and the NAT at the NAT's initial meeting. Both the Mobile Market Team and NAT members will have an opportunity to review the initial draft and identify any concerns or anticipated challenges. The MOU will be revised based off feedback and will be presented at the second NAT meeting for consensus. Regarding publication and dissemination, the roles of the NAT and the Mobile Market Team will be highlighted on the mobile market website, as well as on the Durham County Public Health Department DINE website. Further, once established, the selected strategic priorities will be publicly available on both websites for reference throughout the entirety of the mobile market project. As the mobile market project progresses, periodic updates will be shared on both websites.

E.3.a. Appendix from Engagement Plan

Table 12: RASCI Table

RASCI Table		
<u>Policy/Program</u> – In the City of Durham, North Carolina, food access is largely influenced by neighborhood and built environment (DCDPH, 2021). In Durham's Forest Hills neighborhood (census tract 7.03), East Durham neighborhood (census tract 9.02), and Old North Durham neighborhood (census tract 2.01), less than one percent of residents have access to a nearby grocery store (Data Works NC, 2023). Comparatively, in Durham County, 13.9% of residents have access to a nearby grocery store (Data Works NC, 2023). To increase food access in the Forest Hills, East Durham, and Old North Durham neighborhoods, our team will host mobile markets in partnership with Durham's Innovative Nutrition Education (DINE) Program, which is administered by the Durham County Department of Public Health (Caslin, 2022; Durham County Department of Health, 2021). These mobile markets will feature onsite nutrition and health education and will be hosted in neighborhoods that lack nearby healthy food retailers. Given the mobile nature of pop-up food markets, the Durham County Department of Public Health can ensure that this program serves neighborhoods that would most benefit.		
RASCI Levels Who is…	**Community Partners**	**Rationale**
Responsible=owns the challenge/ project	1. Mobile Market Team 2. Durham County Food Security Coordinator	1)The Mobile Market Team is employed through the Durham County Public Health Department DINE program. The team is comprised of one director, one assistant director, and four employees. The Mobile Market Team are responsible for all logistical details leading up to the markets, as well as day-of, on-the-ground details. The Mobile Market Team is necessary for the success of the mobile market. 2) The Durham County Food Security

		Coordinator exists to "create a strong and equitable food system for residents to find affordable and healthy food," (DCDPH, 2021). The Food Security Coordinator plays an important role in bridging the gap between residents with lived experience, governmental processes, and community resources (like the mobile markets).
Accountable=ultimately answerable for the correct and thorough completion of the deliverable or task, and the one who delegates the work to those *responsible*	3. Durham County Board of Commissioners	3) The DBOC will authorize the program, provide necessary funding, and delegate program tasks to responsible partners.
Supportive=can provide resources or can play a supporting role in implementation	4. Neighborhood organizations 5. City of Durham Government 6. Churches 7. Mobile Market Volunteers	4) Neighborhood organizations have integral knowledge of neighborhood spaces, preferences, layouts, and more. Neighborhood organizations may also have physical resources that could be used to determine the location of mobile markets (i.e., property, parking lot, transportation opportunities, etc.) 5) The City of Durham Government can help with the formalities of securing locations for the mobile food markets

		including permits, traffic control, marketing, etc. 6) Similar to neighborhood organizations, churches often have intimate knowledge of neighborhoods, as well as the primary needs of neighbors. Churches may also have physical resources that could be used to determine the location of mobile markets (i.e., property, parking lot, transportation opportunities, etc.) 7) Mobile Market Volunteers can provide day-of support and can assist with logistical tasks (i.e., greeting customers, directing parking, etc.)
Consulted=has information and/or capability necessary to complete the work	8. Residents experiencing inadequate food access	8) More than any other partner, residents experiencing inadequate food access can provide necessary information regarding their lived experience. This population can help inform the location, frequency, and food sources of the mobile markets.
Informed=must be notified of results, process, and methods, but need not be consulted	9. Durham County Social Services	9) The Durham County Social Services will be informed once the mobile market schedule

		and locations are determined. This partner will inform other partners in the system as needed.

Table 13: Methods, Timing, and Measures Table (Table 2)

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Community Listening Conversations	Group	Inform, Consult, Involve	B: Lack of community trust to show up to/participate in conversation F: Desire to have a platform to share experiences and thoughts. Incentives like childcare, food, and/or gift cards.	Design	# of community listening conversations in each neighborhood # of attendees # of participants who show interest in joining the NAT	Qualitative analysis of transcripts and/or notes from each conversation	1-3 in each target neighborhood (Forest Hills, East Durham, and Old North Durham)	Although there are no policy implications for this step, county commissioners could be invited to come and *listen* to the conversations.

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Neighborhood Postal Survey (sent via mail)	Individual	Inform, Consult, and Involve	B: Survey requires intentionality to complete, potential language barrier F: No in-person requirement, anonymity, can do on own timeline	Design	# of responses (mail-in and online) # of participants who show interest in joining the NAT	Quantitative /qualitative analysis of survey responses (aggregate, as well as neighborhood specific)	Once in each target neighborhood	County Commissioners to be briefed on survey results.

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Establish Neighborhood Advisory Team (NAT)	Group	Collaborate and Empower	B: Requires commitment and may be difficult for team to rally around common objectives/project design. F: Opportunity to enact meaningful change in community, childcare, refreshments	Design and Improve	# of neighborhood blocks represented # of individuals who commit # of priority strategic goals that emerge from NAT	The NAT will create an advisory board charter that will be referenced throughout the project. Performance indicators which will inform the design of the mobile markets.	Monthly, for six months	County Commissioners to consider policy-related implications (I.e., Allowing mobile markets to operate year-round, rather than only April to October.)

Engagement Method	Format	Participation Level (source)	Facilitator/ Barrier	Phase(s)	Performance measure	Assessment method	Frequency	County Commissioner Implication
Mobile Market Survey (in-person at markets)	Individual	Consult and Involve	B: Survey requires intentionality to complete, potential language barrier F: Opportunity to share thoughts	Improve and Sustain /Scale	# of responses	Quantitative /qualitative analysis of survey responses (aggregate, as well as neighborhood specific)	Quarterly throughout year 1; biannual throughout year 2 and beyond	Expansion of DINE program funding to better meet the identified needs of community members County Commissioners to be briefed on survey results.

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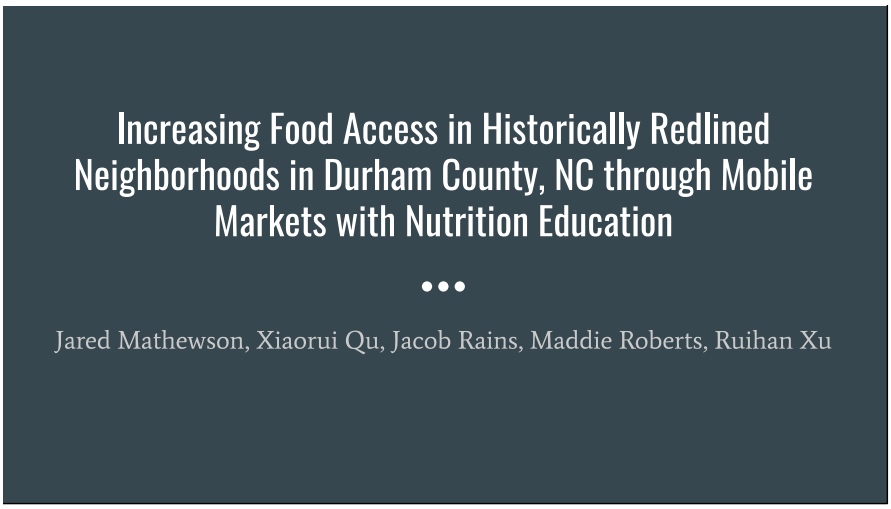
E.5 COMMON PROPOSAL PRESENTATION



Speaker: Jared Mathewson

Overview of the SDOH in the county

- Neighborhood and Built Environment
  - Living, working and recreational spaces
  - Link to long term health outcomes (Pickett, 2001)
    - Chronic disease
    - Exposure to violence
    - Mental health
- Food Access
  - Availability, accessibility, and affordability (USDHHS, 2022)
  - Durham's Forest Hills, East Durham, and Old North Durham
- Historically Redlined Neighborhoods
  - Closely linked to food access (Li & Yuan, 2022)
  - Black, immigrant, low SES neighborhoods (De Marco & Hunt, 2018)

Speaker: Jared Mathewson

Neighborhood and built environment is a key social determinant of health. It encompasses the spaces in which people live, work, eat, and play (USEPA, 2017). It is also linked to many long-term health outcomes.

Food access is one important aspect of built environment. Considered one of the key issues facing Durham County based on the 2020 community health assessment, food access encompasses food availability, accessibility, and affordability. Research also indicates that the built environment has a significant impact on people's ability to access food (DCDPH, 2021). Statistics from Data Works NC show that less than 1% of residents in Durham's Forest Hills, East Durham, and Old North Durham neighborhoods, where our program is focused, have access to nearby grocery stores. This is significantly lower than the average of Durham County at 13.9% (Data Works NC, 2023)

Redlining is also a contributing factor to the lack of food access in these neighborhoods (Li & Yuan, 2022). Redlining was the practice of deeming primarily black, immigrant, and low socio-economic status communities a high financial risk thus discouraging investment ((De Marco & Hunt, 2018). While it is now illegal, these historic practices still impact food access today; our program is designed with these injustices in mind.

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Speaker: Xiaorui (Jessica) Qu

Mobile markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address the key issue. Similar to the farmers market, the program will transport and distribute fresh fruit and vegetables at below-retail prices to the priority populations in our targeted neighborhoods (East Durham, Old North Durham, and Forest Hills). The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program) The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and will build a partnership with Durham's Innovative Nutrition Education (DINE program)

This program is designed based on an evidence-based mobile market program: *Fresh to You*, which is a public-private partnership program that serves fresh produce at below-retail prices to serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. At the 5-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among participants (Gorham et al., 2015). Given the success of the *Fresh to You* intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County County.

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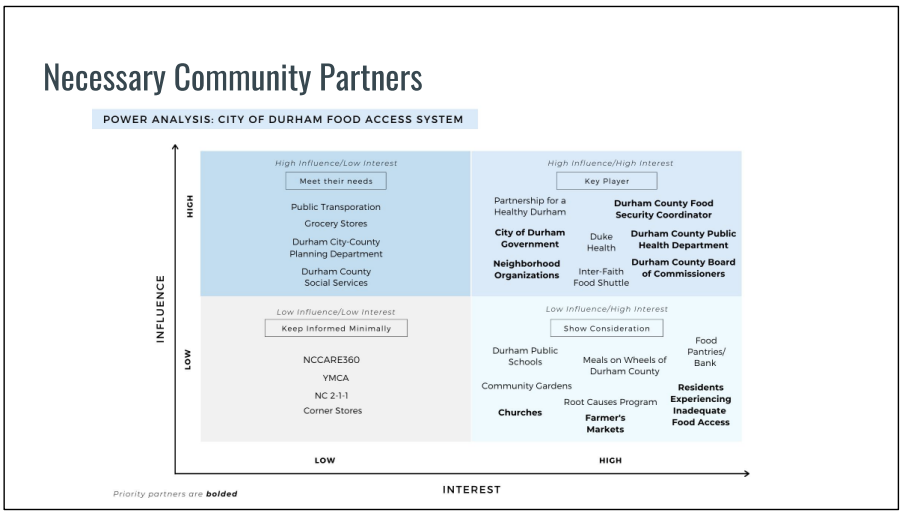
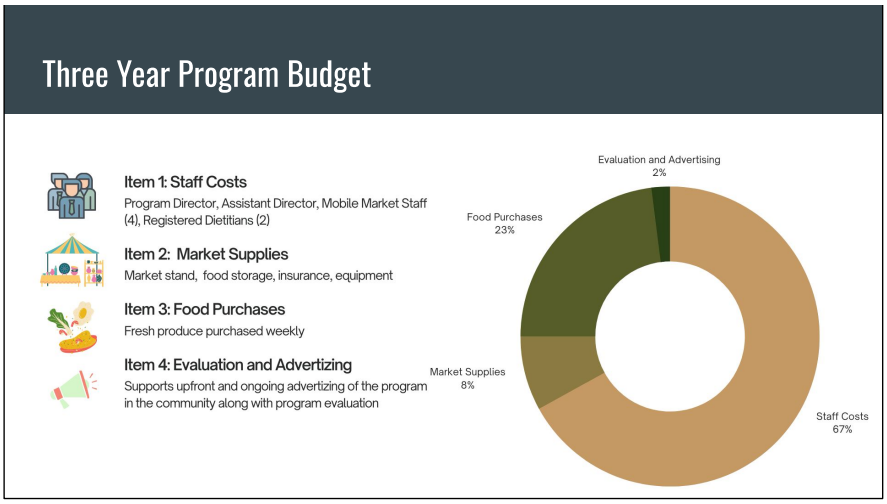


Speaker: Maddie Roberts

Numerous community partners influence Durham's food access system. As detailed within this power analysis, community partners have varying levels of influence and interest within Durham's food access system. Given the context of our proposed program, priority partners are bolded throughout the analysis and include the Durham County Department of Public Health, the City of Durham, the Durham County Board of Commissioners, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represents a variety of sectors, as well as both formal and informal influence. For instance, while the Durham Board of County Commissioners has governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches have relational influence with Durham residents.

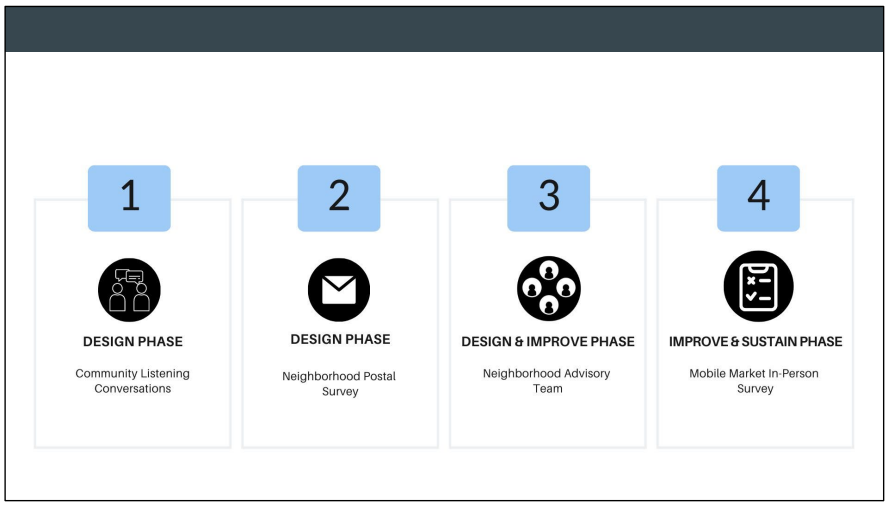
Of the priority partners within the system, Durham residents with inadequate food access are the most significant priority partners because of their experiential knowledge. Lived experience perspectives from Durham residents can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program. Despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners. The lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. Priority partners, like the Durham County Food Security Coordinator or the Durham County Department of Public Health, will play an important role in bridging the gap between residents with lived experience and governmental processes.



Speaker: Jacob Rains

Back to Agenda

We are requesting an increased appropriation of 3.29 million in county funds to the DCoDPH DINE program to administer the mobile market program for three years. These funds will be used to hire eight full time staff including a mobile market team with registered dieticians. Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) will purchased in line with other mobile market programs. Additional funds will be dedicated to covering the costs of advertising the program in the community and administering our comprehensive evaluation plan. Our mobile market budget is designed to be flexed to shift mobile market locations based on community needs at no additional cost to the County.



Speaker: Maddie Roberts

To initiate, facilitate, and sustain community partnerships to transform food access in the targeted neighborhoods, program staff will utilize the following engagement strategies throughout four phases:

1) First, during the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation. Insights from these conversations will be used to inform the design of the mobile markets.
2) Later in the design phase, our team will conduct a postal survey of residents in the targeted neighborhoods. The postal survey will inform residents about the mobile market program and collect data on food access challenges within each neighborhood.
3) Next, in the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team. The Neighborhood Advisory Team will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design and strategic priorities of the mobile market. The Neighborhood Advisory Team will be comprised of residents from the targeted neighborhoods who have experienced food access challenges.
4) Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets. After the first year of market operation, we will administer these surveys on a biannual basis.
1) The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood.

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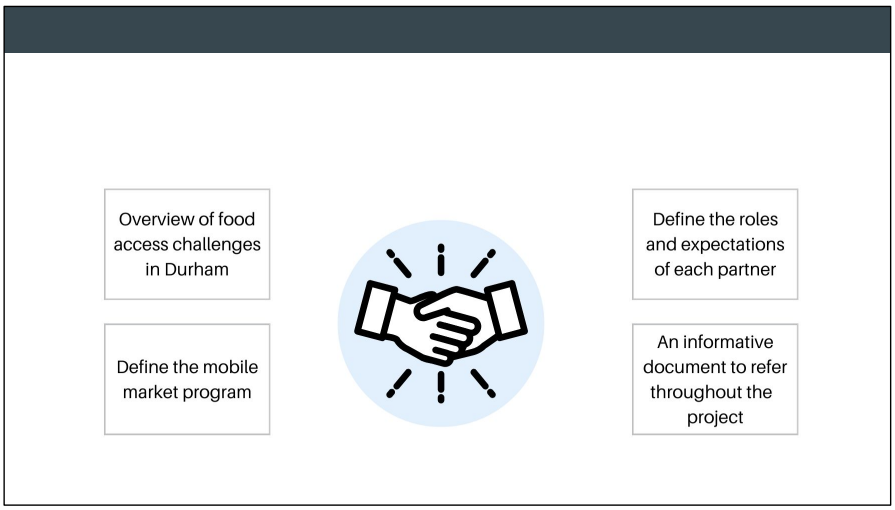
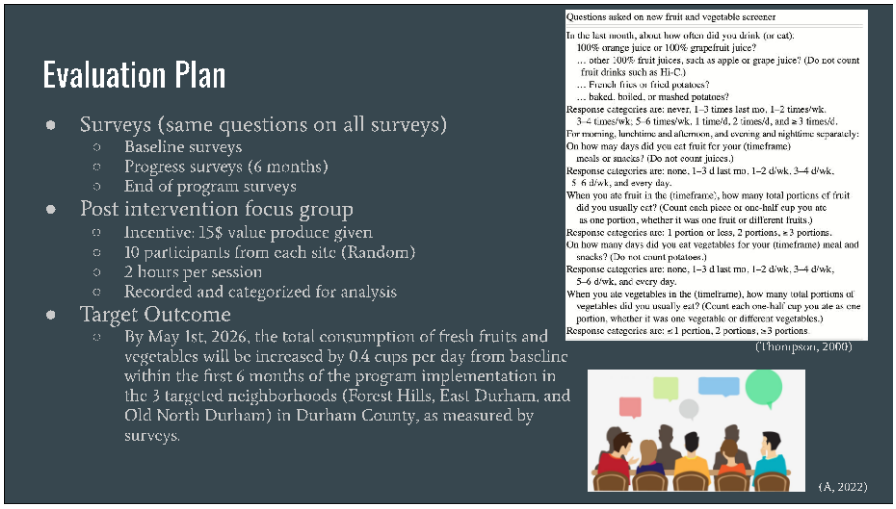


Speaker: Maddie Roberts

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding, or MOU, is crucial for success. An MOU is a formal agreement between community partners that outlines project and partner expectations. In the context of our program, an MOU will overview the history of food access challenges in Durham, with a particular focus on the targeted neighborhoods; outline how the establishment of mobile markets will effectively address food access challenges; define the trajectory of the mobile market program; define the roles and expectations of each partner; and act as an informative document to refer to throughout the entirety of the project. For example, given the context of the partners who are contributing to the mobile market program, an MOU between the Mobile Market Team and the Neighborhood Advisory Team will be necessary.



Speaker: Ruihan Xu

For program evaluation, we plan to use both surveys and focus groups for data collection. The examples of survey questions are listed on the top right figure, such as 'When you ate fruit in the last X month, how many total portions of fruits did you usually eat?'. There will be 3 survey collection periods, the baseline surveys, progress surveys (which will be collected every 6 months), and end of program surveys.

As for focus groups, we only plan to conduct post-intervention focus group sessions. Similar to what we see in other research studies, we expect to recruit 10 participants from each site for each focus group session (Gorham et al. 2015). To help recruit participants, we will provide fresh produce as an incentive. Each of the focus group sessions will last 2 hours, and the session will be recorded and categorized for later analysis.

One of the target outcomes of the program is listed here, which is related to fresh produce consumption measurement. So, after collecting the data from both surveys and focus groups, we will be able to analyze the data and see whether our target outcome is achieved. Some other data collected from focus groups might also be used to inform future modifications to the program.

References:

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Speaker: Ruihan Xu

Lastly, here are our references. Thank you so much for your time and consideration. We hope our presentation on low food access in historically redlined neighborhoods of Durham has captured your attention and compelled you to respond. Your financial support will greatly help with our program development and those people in need. Thank you again for your valuable time.

APPENDIX F: RUIHAN XU INDIVIDUAL DELIVERABLES

F.1 SOCIAL DETERMINANTS OF HEALTH ANALYSIS

Issue: Lack of healthy food access at local grocery stores/other food sources in Durham County

Social Determinant of Health (SDoH)— Neighborhood and built environment

There are 5 domains of social determinants of health (SDOH), this analysis will mainly focus on neighborhood and built environment. The neighborhood is essentially where people live, work, learn, and play; and having a safe, healthy, and well-constructed neighborhood could have a great impact on public health. (Healthy People 2030, n.d.) The issue that this project will focus on is to increase healthy food access to lower-income families in Durham country. This issue was chosen because one of the top 5 health priorities mentioned in Durham Country Community Health Assessment (CHA) 2020 was food access (Durham County Public Health, 2021). Each county may have different health priorities, the top 5 priority in Durham County was affordable housing; access to healthcare insurance; poverty; mental health; obesity, diabetes, and food access (Durham County Public Health, 2021, p22). By addressing food access and the neighborhood environment, we're targeting one of the top health priorities in the country, which could potentially help a greater number of people in need. The low-income families in this analysis will be referring to a household that has an income level of 80 percent or less of the area median (Affordable Housing, n.d.).

The short-term health outcomes of not having affordable healthy food options would be the development of stress, fatigue, or concentration difficulties (The Risks of Poor Nutrition, n.d.). While in the long term, people might be more likely to become overweight or obese, have tooth decay problems, be susceptible to some types of cancer, be prone to eating disorders or depression, and chronic diseases like high blood pressure and diabetes (The Risks of Poor Nutrition, n.d.). Having access to healthy food options should not be a privilege for wealthy families, all communities should have built healthy food stores available within commutable distance.

Geographic and historical context

This project will focus on Durham County as a whole. Durham is considered the site of an ancient Native American tribe named Adshusheer. Part of the Great Indian Trading Path is also located in Durham, and it was the Native Americans who assisted with establishing settlement sites, transportation, and other valuable natural resources. Then, around the mid-1700s, the Europeans settled on this land and named this area "the flower of the Carolinas" (Overview of Durham History - Museum of Durham History, n.d.). By July 2021, the total population estimate in the county was 326,126; 19.9% of the population was under the age of 18, and 14.3% were 65 years or older; the dominant race ethnicity group is White, which was 54.5% of the population, while Black or African American was about 35.9% of the population. As for the income level, 13.4% of the population lived in poverty, the median household income was 67,000$ and the per capita income in 2021 was 39,602$. (U.S. Census Bureau QuickFacts: Durham County, North Carolina, n.d.) Poverty is defined as a family's total income was less than their poverty threshold. (US Census Bureau, 2023)

There are many good initiatives and activities related to making healthy food options more accessible that have been done and we can continue to work on them in the future. Some good examples of what Durham County has done that are listed on the Durham CHA 2020 are, providing local assistance in the SNAP program application process, allowing double counting SNAP benefits at the farmer's markets on fresh food options, providing nutritious home-delivered and congregate meals to local seniors, and promote healthy eating by supporting local urban gardening and cooking classes such as SEEDS. (Durham County Public Health, 2021)

Priority population—Low-income households

The priority population of interest is the low-income families in Durham County. No specific race or ethnic group is considered more vulnerable than the other, the idea is that people from lower-income families are usually more prone to have inadequate consumption of healthy food. From the 2019 Durham County CHA survey data, the second most popular reason that residents do not eat healthily was the high cost of food (15.7% of the participants) (Durham County Public Health, 2021).

Measures of SDOH:

The biggest disparity seen in terms of healthy food access was the difference between Black, indigenous, and people of Color (BIPOC) communities and other population groups. Indeed, the BIPOC residents often live in areas with lower access to affordable healthy food in stores. The 2019 Durham country CHA survey data also highlighted the disparity caused by racial ethnicity differences, in which black residents are more likely to skip or cut a meal because of the cost and economic reasons. According to Durham County CHA, among the 14% of food insecure individuals in NC, 25.1% of them were African Americans, 15.7% were Hispanics and only 9.4% were identified as white. (Durham County Public Health et al., 2021) According to Feeding America, black individuals are nearly 3 times as likely to face hunger as white individuals in the US, and black kids also tend to experience hunger compared to children from other ethnic groups. (Feeding America, n.d.)

Rationale/Importance:

This issue was chosen because one of the top 5 health priorities mentioned in Durham Country Community Health Assessment (CHA) 2020 was food access (Durham County Public Health, 2021). Because most people that suffer from a lack of affordable healthy food access were low-income families, if we want to resolve the issue of lack of healthy food access, this could be a good starting point. Besides, if more and more people can follow healthy eating patterns, it could potentially reduce the healthcare burden in the long run by reducing the risk of health-related issues mentioned in the SDOH section above (Scrafford et al., 2019). Research studies have shown that if Americans can follow the Dietary Guidelines for Americans (DGA) 2015-2020 closely, we can save billions of dollars invested in healthcare (Scrafford et al., 2019). The two maps in Figures 23 (Durham Super Markets and Farmers Markets, 2020) (Google Map Search: Fast Food Restaurants in Durham County, n.d.) indicated the locations of farmer's markets vs. fast food restaurants in Durham County. Although farmer's markets certainly are not the only healthy food option available in the county, fast food restaurants cannot represent the whole unhealthy food category either. However, just by comparing the two maps, the clear distinction between the number of location sites is indisputable. To help people make healthy food options, we first need to make healthy food more available and affordable to the community members.

Disciplinary critique:

The importance of involving nutrition professionals in addressing lack of affordable healthy food access would be providing counseling support for our population of interest. In this way, our target population can better identify healthy food options when they have access. Sometimes they can still maintain healthy eating patterns with lower costs, but they might just have limited knowledge to make those choices. So, the role of nutrition professionals is very crucial in addressing this SDOH.

In terms of secondary benefits, having more accessible healthy food options can not only decrease the healthcare cost in the long term but also a more sustainable and equitable food system.

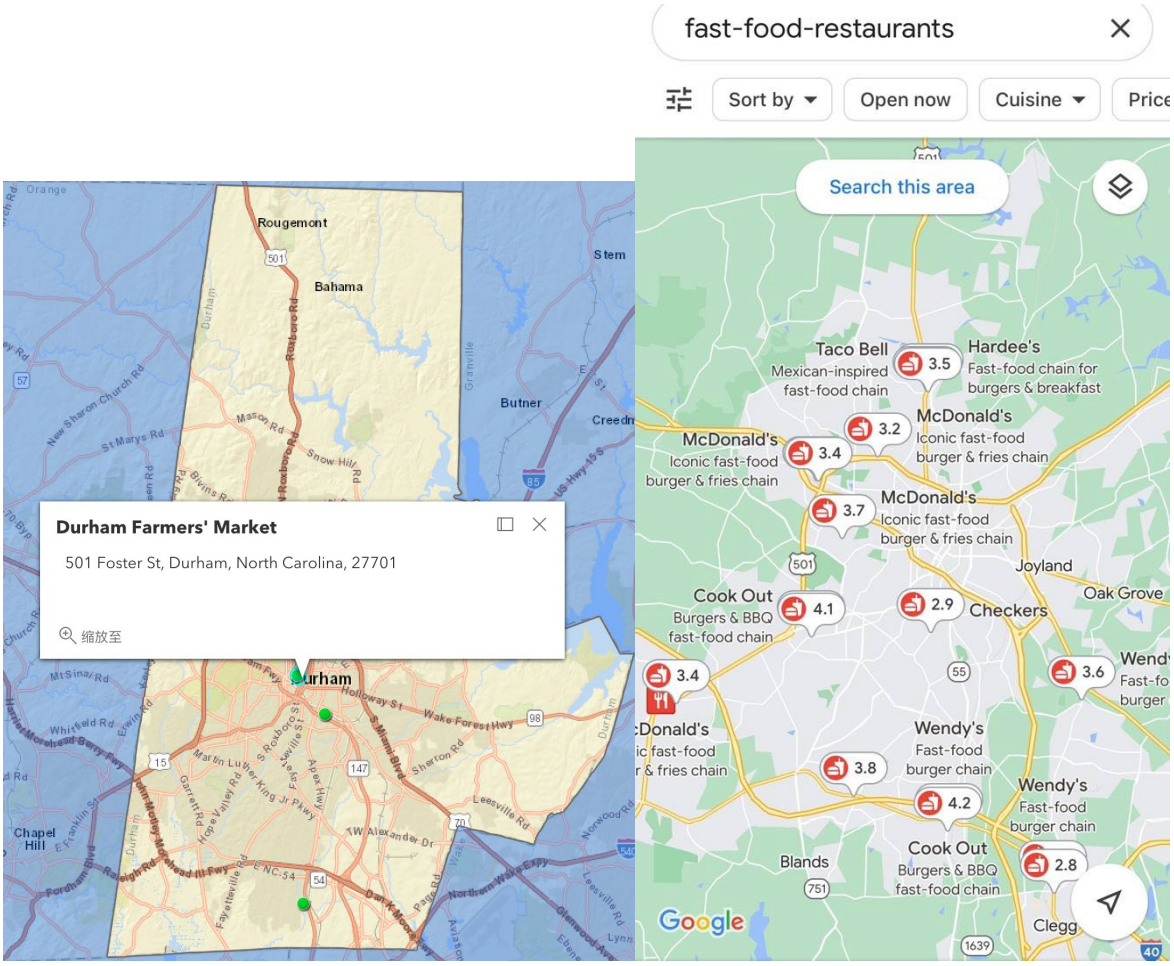
F.1.a. Appendix from SODH Analysis

Table 14: Comparison of the Percentage Food Insecurity, Lack of Food Access, and Skipping Meals Due to Cost in County, State, and Country Level

	Durham county (Durham County Public Health et al., 2021)	NC	US
Food insecurity (%)	13.5	14 (Durham County Public Health et al., 2021)	10.2 (household) (USDA ERS - Key Statistics & Graphics, n.d.)
Limited food access	20-30%	7% (NC department of health and Human Services & North Carolina Istitute of Medicine, 2020)	N/A
Skipping meals due to cost	10.2%	N/A	1 in 5 individual (McInnis, 2022)

Note: (Different citation sources are cited as in-text citation accordingly.)

Figure 26: Locations of Farmers Markets in Durham County vs. Fast Food Restaurants



(Durham Super Markets and Farmers Markets, 2020), (Google Map Search: Fast Food Restaurants in Durham County, n.d.)

F.2 PROGRAM ANALYSIS

Introduction

A neighborhood is where people live, work, learn, and play; having a safe, healthy, and well-constructed neighborhood could have a great impact on public health. (Social Determinants of Health, n.d.). Among the five Social Determinants of Health (SDOH), this paper will concentrate on the neighborhood and built environment. The key issue that will be addressed by the proposed program is low food access in Durham's Southeast, East, and Northeast Neighborhoods. This issue was chosen because one of the top 5 health priorities mentioned in Durham Country Community Health Assessment (CHA) 2020 was food access (Durham County Public Health et al., 2021). Until 2018, there are only 0-1% of households living in the Southeast, East, and Northeast neighborhoods of Durham with access to grocery stores within ¼ miles away from their home compared to 13.9% of the households in Durham Country. See Figure 24 in Appendix F.2.a. (Data Works NC, 2023). Among those 3 neighborhood areas, our group decided to focus on 3 specific neighborhoods that are located in each of those areas, which are Forest Hills, East Durham, and Old North Durham. The 2019 Durham country CHA survey data also highlighted the disparity caused by racial ethnicity differences, in which black residents are more likely to skip or cut a meal because of the cost and economic reasons (Durham County Public Health, 2021). The USDA defines food insecurity as a lack of consistent access to enough food for every person in a household to live an active, healthy life. This can be a temporary situation for a family or can last a long time. (What Is Food Insecurity, n.d.). If an upstream approach can potentially reduce the number of people suffering from food insecurity* by increasing food access, we might save billions of dollars that was invested in healthcare (Scrafford et al., 2019)

Having limited food access for a prolonged period can lead to food insecurity (DiDomenico, 2021), which might cause various negative health outcomes. People with food insecurity tend to be more likely to become overweight or obese, have tooth decay problems, be susceptible to some types of cancer, be prone to eating disorders or depression, and chronic diseases like high blood pressure and diabetes compared to people that are food secured (The Risks of Poor Nutrition, n.d.).

Evidence Based Nutrition Policy or Program

Research data from Feeding America demonstrated that food insecurity tends to have a greater impact on black, indigenous, people of color (BIPOC) individuals (Definition of BIPOC, n.d.) compared to their white counterparts (Food Insecurity in Black Communities - Feeding America, n.d.).

The program that this paper proposes is a Pop-up Market program supported by the North Carolina food bank (Caslin, 2022). Studies have shown that mobile markets can facilitate purchase and eating of healthy food by increasing accessibility of the food (Horning et al., 2020). Additional studies have also proved the effectiveness of implementing Pop-up market in low food access communities, leads to an increase in fresh fruits and vegetables intake by 0.48 cups in 5 months (Gorham et al. 2015). In addition, the collaboration with the Durham's Innovative Nutrition Education (DINE) program will provide complementary nutrition education for our shoppers. This specific program was selected as it is a local nutrition education program that has been successfully implementing nutrition education in different settings, such as schools and community centers (DINE Program, n.d.). The 2021-2022 Durham Public Schools DINE program implementation found that about 60% of the teachers reported students are making/bringing healthier meals or snacks to school (DINE Impact, n.d.), which indicated the effectiveness of the DINE program. Although limited evidence can prove the collaboration between Pop-up Market and DINE program will help increase food access for low-income communities, there are similar nutrition education service being implemented into the Pop-up markets such as the Well- Fed program in Arkansas and shown effects of nutrition education in Pop-up markets (Education, n.d.).

Evidence Based Outcomes

There are two short term objectives that our program is aiming to achieve. First, by May 1st, 2025, the consumption of fresh fruits and vegetables will be increased by 0.4 cups per day within the first 6 months of the program implementation in the three targeted neighborhoods (Forest Hills, East Durham, and Old North Durham) in Durham County (Gorham et al. 2015). Second, by May 1st, 2025, at least 50% of the shoppers served in our three targeted neighborhoods will have traveled less than 1 mile indicating that there is improved food access in those areas. (Hsiao et al., 2018)

The program's long-term goal is to increase healthy food access among community members via surveys distributed at Pop-up Market (Horning et al., 2020). Both short term outcomes can be measured via surveys distributed at the Pop-up market in the first week of the program implementation and the last 2 weeks before May 1st, 2025.

The long-term goal of the program was to increase healthy food access among community members (Horning et al., 2020), which can also be measured by distributing surveys before and after the program implementation. However, Horning et al's study did not mention an exact percentage of participants that had increased access to healthy food or a date on when they achieve this long-term goal. Thus, the long-term outcome is not determined for this program.

Evidence Based Implementation Strategies and Activities

The Pop-up market and nutrition education are the major 2 components of our program. Similar to the method used in Gorham et al.'s study mentioned in the evidence-based program section (Gorham et al. 2015), we plan to set up weekly Pop-up markets that last for 2 hours at each target community. The Pop-up market aims to provide lower cost (15-20% lower than retail price) fresh produce, groceries, as well as prepared meals to low food access communities in Durham County. There will be a total of 3 sites, 1 site for each of the 3 target neighborhoods. The 3 sites will be visited on different days of the week so that only 1 van is needed to deliver the Pop-up market to designated sites. For future consideration, the Pop-up market schedule and food preference of each site can be adjusted if needed. Surveys can be distributed at the Pop-up market to ask for shoppers' preferences on their weekly availability and food preferences. The second component of the program is the nutrition education piece, which we plan to achieve through collaboration with the DINE program. By providing low-cost healthy food recipes and nutrition education materials in the market through handouts, consumers will not only have access to healthy food options in the market, but also strategies/knowledge to prepare them. The handouts will be designed according to local community members' suggestions and distributed weekly at the Pop-up market. The contact information of our collaborator at DINE will be given on the handout so that shoppers can send ideas on what they want to know more about nutrition.

The Food Bank of Central and Eastern North Carolina would help carry out the implementation as the major carrier. Since the Food Bank of Central and Eastern North Carolina has been conducting Pop-up markets during disasters and in rural areas, it might be easier for them to utilize the existing facilities and make minor adjustments on the implementation processes. They will collaborate with the DINE program to design nutrition handouts for the target community. In Gorham et al.'s article, the potential outreach of their 'Fresh to You' program (similar to Pop-up market) was 37 shoppers per week (in the first 5 months period) per site in low-income neighborhoods. Thus, in a similar setting, the anticipated program outreach of the Pop-up market would be an average of 40 shoppers per week per site at the first 6 months of our program implementation. This data can be collected by having sales employees record the number of people coming to the market each time on each site.

This program is mainly targeting 3 levels of the socioecological model, the community, interpersonal, and individual levels. Because we're setting the Pop-up market in the local communities, it will have the community level impact on our population of interest. Then, after the consumer purchased food from the market, they might inform their families or friends about this market, which leads to an increased outreach of the program by addressing the interpersonal level of the model. Lastly, as the food was served to individuals, it might be able to address individual level food insecurity in the community.

Community Partners

There are 3 community partners identified for our program. First of all, the food distributors. They're responsible for providing food at lower costs, which is a key component of the program implementation. Because the Pop-up market cannot operate without food supplies. Examples of food distributors could be local food banks or food pantries. Because these organizations have experiences in providing lower cost food at community levels, their partnership would be valuable to our program implementation. Next, we have the Durham County Board of Commissioners which will provide funding for our program. The funding is fundamental to the program initiation. As the board of commissioners consists of people who live in the local communities, a program that's beneficial to the local community development would likely be endorsed. Lastly, the neighborhood organizations will help with advertising

and letting the residents know about our program, the time and location of the Pop-up market. For example, posters can be made to put in community centers to advertise our program so that we can get better program outreach.

Budget

Funding will be obtained upon approval of the Durham County Board of Commissioners. It is anticipated that the budget may change as the program develops. In the beginning stage (anticipated the first 3 months of program implementation), 30% of the budget might be used for food purchasing, 50% will be used on personnel, and the rest 20% will be used on program resources. But if the program goes well, more budgets might go towards food purchase as more shoppers come in. The budget breakdown is designed based on the specific setup of our program. Thus, there is limited evidence on the total budget or similar budget breakdown. For the food purchase section, the detailed breakdown includes fresh fruits and vegetables, shelf-stable food, and frozen food/meals. The personnel includes 1 program director, 1 program manager/analyst, and 6 employees. Lastly, for the program resources, we will need 1 van for the Pop-up market and food delivery; an office for program management with computers, printer, and other office equipment; a market stand and storage containers will be needed for Pop-up market operation; and the cost of gas, papers, and maintenance fee will be taken into consideration as well. See Appendix F.2.a., table 15 for details on budget.

Conclusion

The advantage of the program of recommendation is its high mobility so that people in low food access neighborhoods have better access to healthy food options (Horning et al., 2020). However, this should still not be the long-term intervention. It should be a temporary strategy before the grocery stores reach all communities in need. In addition, the education piece can help people receive nutrition education at no cost, which helps them to make healthier food options and maintain healthy lifestyles in the long run (DINE IMPACT, n.d.).

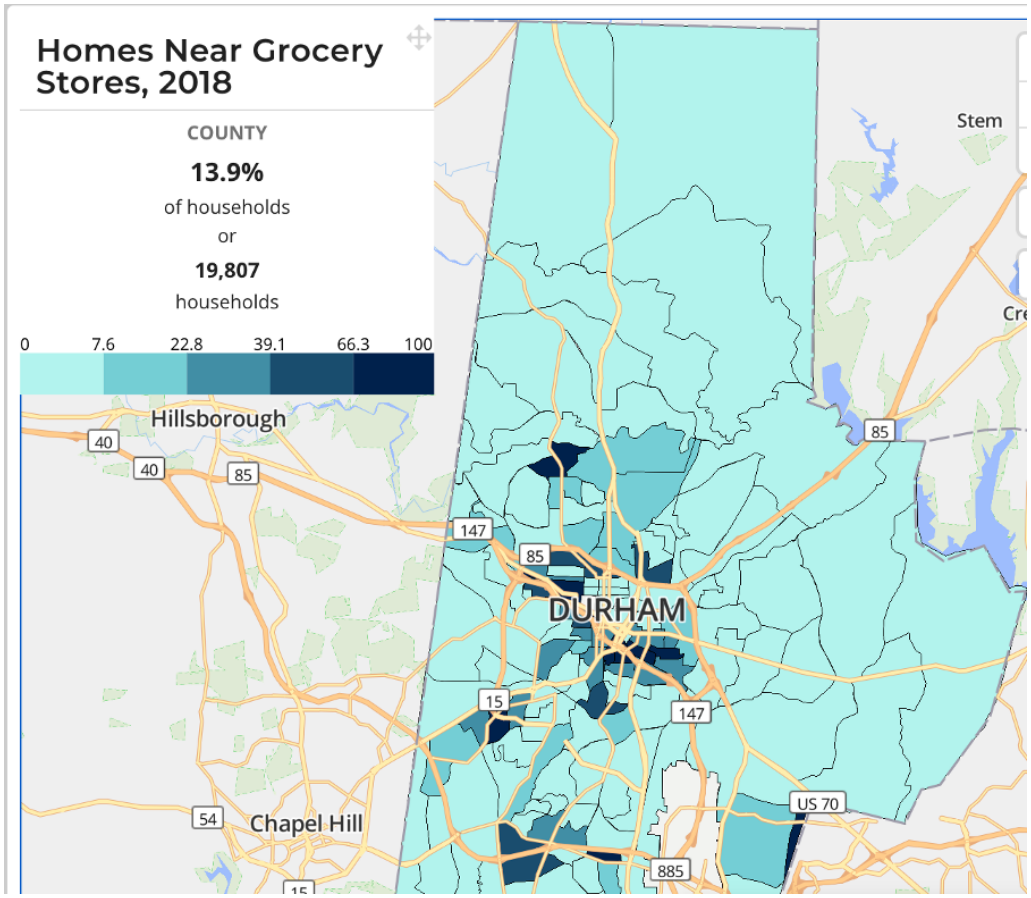
The biggest disadvantage is the cost. Opening a Pop-Up market is surprisingly hard compared to regular grocery stores. Because the food prices are set lower in the Pop-up market, it's hard to make

profits considering all the extra costs (such as fuel costs). (Kasprzak et al., 2022). Besides, people with disabilities might not be able to come to the Pop-up market stand due to mobility limitations. Lastly, we're also uncertain about whether our target population would be interested or trust in this method of food purchase (Kasprzak et al., 2022).

The priority of this program is to increase its outreach so that we can help as many people with food insecurity as possible and generate as much revenue as we can. As the revenue increases, we will be able to provide additional services such as food delivery for people in need. By achieving this goal, we might need to put more effort into adjusting the program to accommodate the local community members' preferences. For example, food delivery services, having more frozen meals/produce, or being able to use SNAP benefits to purchase food, etc. Considering all the strengths and weaknesses, this proposed program is still considered to have positive impacts on public health in addressing low-food access issues (Horning et al., 2020). If positive public health outcomes were generated in our target neighborhood, similar intervention might be worth consideration in other low food access neighborhoods in Durham County.

F.2.a. Appendix from Program Analysis

Figure 27: Homes Near Grocery Stores in Durham County, 2018



(Data Works NC, 2023)

Table 15: Budget Details for Pop-up Market Program Implementation

Personnel (50%)	
	1 program director
	1 program manager
	6 employees
Food purchase (30%)	
	Fresh produce
	Shelf stable food
	Frozen food products
Program resources (20%)	
	1 office with required equipment such as computer, printer, desks, and chairs, etc.
	1 van (big enough to hold food products, market stand, and storage containers for frozen food)
	1 market stand, 1 container for frozen food, and other containers for other food products if needed.
	Other costs such as fuel, paper for handout printing, maintenance fee, etc.

(Self-created table)

F.3 EVALUATION PLAN

Introduction

Among the 5 Social Determinants of Health (SDOH), this paper will concentrate on the neighborhood and built environment. The key issue that will be addressed by the proposed program is the low food access* in Durham's Southeast, East, and Northeast Neighborhoods. The program that we propose is a Pop-up Market program supported by the North Carolina food bank. The NC food bank Pop-Up market has been providing food to people in rural areas and during disasters periodically, but we're trying to elaborate on this program by providing regular support to our target low-food access communities (Caslin, 2022). In addition, the collaboration with the DINE program will provide complementary nutrition education for our shoppers (providing nutrition knowledge handouts or low-cost healthy recipes). We plan to set up weekly Pop-up markets that last for 2 hours at each target community. There will be a total of three sites, one site for each of the three target neighborhoods.

Outcome selected

By May 1st, 2025, the total consumption of fresh fruits and vegetables will be increased by 0.4 cups per day from baseline within the first 6 months of the program implementation in the 3 targeted neighborhoods (Forest Hills, East Durham, and Old North Durham) in Durham County (Gorham et al. 2015), as measured by surveys.

Study design/data collection

We plan to use a mix-method evaluation by using descriptive qualitative methods and quantitative methods measured by surveys and focus groups. Similar methods and tools are used in Gorham et al's study for data collection (Gorham et al. 2015).

There will be the same survey questions for the baseline survey, monthly surveys, and end-of-program survey distributed at the market during our program implementation. Examples of survey questions may include 'How many cups of fruits or vegetables are you consuming each day?' and 'How far are you traveling from home to this market?'. Detailed validated survey questions can be found on Appendix F.3.a (Thompson et al., 2000).

According to a previous research study, a total of six postintervention focus group sessions were conducted with thirty participants in each focus group with six on-site mobile markets. As we have three Pop-up market sites, we decided to recruit a total of three focus groups with thirty participants in each group. Each postintervention focus group session might last about 2 hours (Gorham et al. 2015).

Sample and sampling strategy

No sampling strategy was utilized in either Gorham et al or Horning et al's study. Gorham stated in their study that participant recruitment was conducted 'using flyers and posters and by face-to-face contact'(Gorham et al. 2015). However, Horning et al mentioned purposeful sampling would be appropriate for focus groups as it can generate a more inclusive representation of shoppers at Pop-up Market. Thus, random sampling will be utilized in our study. To recruit the participants, we plan to post our contact information in the community center, on the nutrition handouts, on monthly surveys, and on posters at our Pop-up Markets. We plan to recruit 30 participants from each site by random sampling participants that registered for focus groups using the randomizer website (Research Randomizer, n.d.). A 15$ value of fresh produce will be given to participants as an incentive for participating in the focus group session. In this case, we will have a better representation of the shoppers that came to the Pop-up market. (Gorham et al. 2015)

Specific measures

The primary outputs that we're looking for are the population reached (via recording the number of daily shoppers), daily sales of fresh fruits and vegetables, and the number of surveys filled out. Other secondary outputs include community engagement activities, and staff training (on recording data at the market sites), As for the outcome, we're looking at the change in daily fruits and vegetables intake before and after program implementation, which is a 0.4 cup increase in fruits and vegetable intake 6 months after the program implementation as mentioned in the above section. The disparities that we anticipate to measure are race/ethnicity as well as income levels (via focus group participant demographic data collection). For example, if the focus groups we recruited are overrepresented by a single demographic characteristic such as a certain race or certain income level, then our data collected might not be a good

representation of people that has other demographic characteristics. Lastly, the constructs that we want to measure is the healthy eating patterns, which can be measured by collecting survey data. It can be hard to define healthy eating patterns and ways to measure them, none of the research studies we looked into mentioned anything about this. However, it is still considered an important construct to measure so that we know whether our program has generated an impact on public health. Thus, in our program, we decided to set our own definition of a healthy eating pattern as having a total 0.8 cup increase in daily fresh fruits and vegetables intake by the end of the program.

Timing

Unfortunately, since the articles we looked at were only trying to evaluate the program's impact on the community, none of them looked into community engagement plans before program implementation. Thus, to fully advertise our program, the community partner engagement activities will be initiated 6 months before the program implementation. The funding source will need to be secured first, then posters will be made to put at community centers for advertisement, and food distributors will be contacted to sign contracts on food supplies. At the end of program implementation (at a 24-month time point), postintervention focus group sessions will be conducted for evaluation purposes. We're expecting the number of shoppers at each site to stay constant or increase on a weekly basis as the program goes on (which means more and more community members know about our program). If this process does not occur 6 months after the program implementation, community member engagement plans will need to be made to identify motivations for local community members to come in as well as increase advertisement by sending out flyers to local community members' mailboxes.

Analysis plan

There will be a mixture of data being collected. The quantitative data will be gathered from monthly Pop-up Market sales of fresh fruits and vegetables as well as survey data on fresh fruits and vegetables daily consumption. The fresh fruits and vegetables that were sold daily will be recorded by the on-site Pop-Market staff on the record sheet manually. The focus groups will be utilized to collect

qualitative data that represents feedback about our Pop-up Market and any suggestions for improvement. The focus group sessions will be recorded and categorized by identifying analytical coding/themes.

Sources of funding

There isn't evidence support for the specific funding amount on similar programs. But according to the website Funds for NGOs, large Pop-up market projects may be eligible on receiving grants of up to $85,000. Funding is expected to be obtained from the Durham County Board of Commissioners (likely 6 months before program implementation), and a detailed program implementation plan will be made based on the funding provided the week after funding was obtained. After community partner engagement, the program will be able to initiate. After the first month of program implementation, all expenditures, incomes, and other program measures will be assessed to make sure everything is within budget limits. If not, adjustments can be made to make sure the sustainability of the program. The same follow-up assessment will be made in the third month, the sixth month, the twelve months, and the eighteen months. The sales of the Pop-Up market are expected to be our future revenue that keeps the program going. If that's not enough funding, we may continue to apply for funding and come up with more ideas on community engagement activities to attract shoppers.

Data use and dissemination

The data collected will be stored on the computer at the program office. After the focus group sessions and all program evaluations are done, program effectiveness will be measured to assess the feasibility of the program for future use. We will be looking for the difference in fresh fruits and vegetable consumption as well as how applicable/sustainable the program is by comparing program cost and Pop-up Market revenue. This information will provide guidance on how much/how often the program requires funding, and how much of an impact it has on community public health. Even though neither Gorham et al nor Horning et al's study mentioned the dissemination of data to the public, we believe the end program results can be presented to community partners, community members, and funders in various formats like posters in the community center and presentations specific to the target audience.

Conclusion

With a mixture of qualitative and quantitative data, we hope to generate a more inclusive and validated data set that demonstrates the effectiveness of our program on public health. Because we're targeting low-food access areas in the community, we also anticipate generating an impact that addresses health disparities in the community. But this Pop-Up market should not be the long-term resolution for low food access in the community, an increase in the number of grocery stores or other stores that sells fresh produce.

F.3.a. Appendix from Evaluation Plan

Table 16: Validated Survey Questions

Questions asked on new fruit and vegetable screener
In the last month, about how often did you drink (or eat): 100% orange juice or 100% grapefruit juice? … other 100% fruit juices, such as apple or grape juice? (Do not count fruit drinks such as Hi-C.) … French fries or fried potatoes? … baked, boiled, or mashed potatoes? Response categories are: never, 1–3 times last mo, 1–2 times/wk, 3–4 times/wk; 5–6 times/wk, 1 time/d, 2 times/d, and ≥3 times/d. For morning, lunchtime and afternoon, and evening and nighttime separately: On how may days did you eat fruit for your (timeframe) meals or snacks? (Do not count juices.) Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day. When you ate fruit in the (timeframe), how many total portions of fruit did you usually eat? (Count each piece or one-half cup you ate as one portion, whether it was one fruit or different fruits.) Response categories are: 1 portion or less, 2 portions, ≥3 portions. On how many days did you eat vegetables for your (timeframe) meal and snacks? (Do not count potatoes.) Response categories are: none, 1–3 d last mo, 1–2 d/wk, 3–4 d/wk, 5–6 d/wk, and every day. When you ate vegetables in the (timeframe), how many total portions of vegetables did you usually eat? (Count each one-half cup you ate as one portion, whether it was one vegetable or different vegetables.) Response categories are: ≤1 portion, 2 portions, ≥3 portions.

(Thompson et al., 2000)

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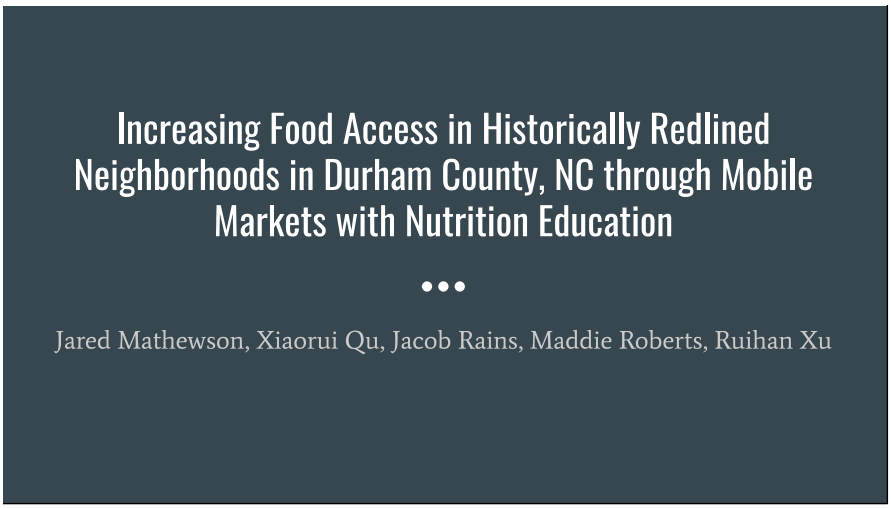
F.5 COMMON PROPOSAL PRESENTATION



Speaker: Jared Mathewson

Overview of the SDOH in the county

- Neighborhood and Built Environment
  - Living, working and recreational spaces
  - Link to long term health outcomes (Pickett, 2001)
    - Chronic disease
    - Exposure to violence
    - Mental health
- Food Access
  - Availability, accessibility, and affordability (USDHHS, 2022)
  - Durham's Forest Hills, East Durham, and Old North Durham
- Historically Redlined Neighborhoods
  - Closely linked to food access (Li & Yuan, 2022)
  - Black, immigrant, low SES neighborhoods (De Marco & Hunt, 2018)

Speaker: Jared Mathewson

Neighborhood and built environment is a key social determinant of health. It encompasses the spaces in which people live, work, eat, and play (USEPA, 2017). It is also linked to many long-term health outcomes.

Food access is one important aspect of built environment. Considered one of the key issues facing Durham County based on the 2020 community health assessment, food access encompasses food availability, accessibility, and affordability. Research also indicates that the built environment has a significant impact on people's ability to access food (DCDPH, 2021). Statistics from Data Works NC show that less than 1% of residents in Durham's Forest Hills, East Durham, and Old North Durham neighborhoods, where our program is focused, have access to nearby grocery stores. This is significantly lower than the average of Durham County at 13.9% (Data Works NC, 2023)

Redlining is also a contributing factor to the lack of food access in these neighborhoods (Li & Yuan, 2022). Redlining was the practice of deeming primarily black, immigrant, and low socio-economic status communities a high financial risk thus discouraging investment ((De Marco & Hunt, 2018). While it is now illegal, these historic practices still impact food access today; our program is designed with these injustices in mind.

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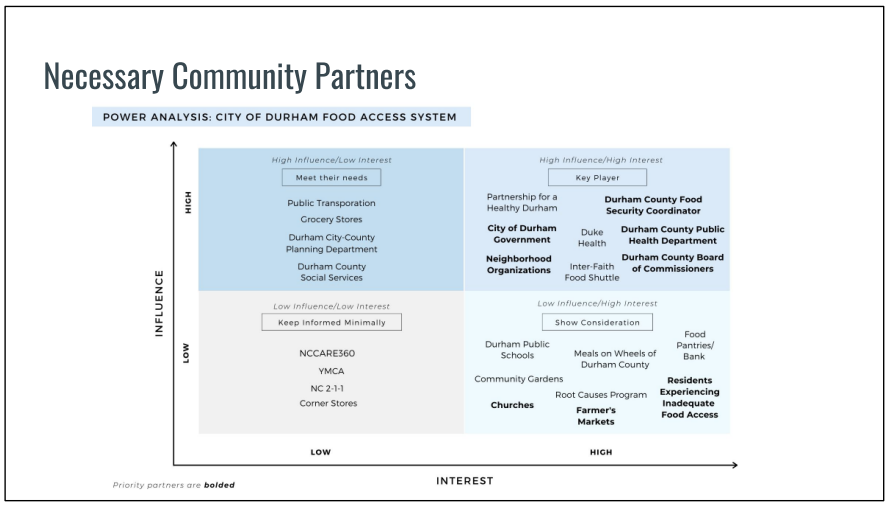
Speaker: Xiaorui (Jessica) Qu

Mobile markets with the incorporation of nutrition education is the selected evidence-based nutrition program to address the key issue. Similar to the farmers market, the program will transport and distribute fresh fruit and vegetables at below-retail prices to the priority populations in our targeted neighborhoods (East Durham, Old North Durham, and Forest Hills). The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and potentially build a partnership with Durham's Innovative Nutrition Education (DINE program) The program will be incorporated into the Community Services in the Durham County Department of Public Health (DCDPH) and will build a partnership with Durham's Innovative Nutrition Education (DINE program)

This program is designed based on an evidence-based mobile market program: *Fresh to You*, which is a public-private partnership program that serves fresh produce at below-retail prices to serve a majority of low-income households in Rhode Island. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. The Fresh to You markets targeted children (3-13 years old) who lives in low-income families and with diverse racial/ethnic background. More than half of the participants are Hispanic (59.2%). FtY did not solely address the fruit and vegetable intake among younger adults, but disparities in access to fresh produce. At the 5-month follow-up, results indicated a significant increase in the consumption of fruit and vegetable combined of 0.48 cups per day among participants (Gorham et al., 2015). Given the success of the *Fresh to You* intervention, we are confident that a similarly designed mobile market program will meet the food access needs of the targeted neighborhoods in Durham County County.

Reference:

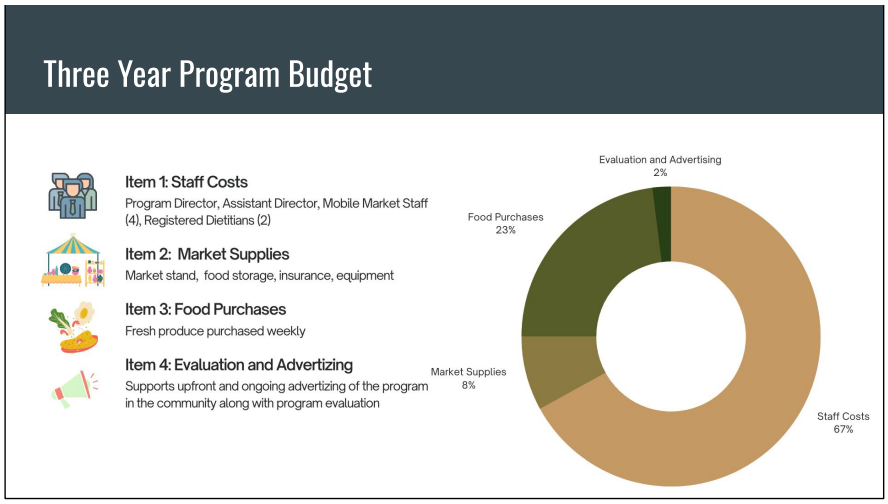
Gorham, G., Dulin-Keita, A., Risica, P. M., Mello, J., Papandonatos, G., Nunn, A., Gorham, S., Roberson, M., & Gans, K. M. (2015). Effectiveness of Fresh to You, a Discount Fresh Fruit and Vegetable Market in Low-Income Neighborhoods, on Children's Fruit and Vegetable Consumption, Rhode Island, 2010–2011. Preventing Chronic Disease, 12, E176.



Speaker: Maddie Roberts

Numerous community partners influence Durham's food access system. As detailed within this power analysis, community partners have varying levels of influence and interest within Durham's food access system. Given the context of our proposed program, priority partners are bolded throughout the analysis and include the Durham County Department of Public Health, the City of Durham, the Durham County Board of Commissioners, farmer's markets, neighborhood organizations, Durham residents, and churches. Each of these community partners represents a variety of sectors, as well as both formal and informal influence. For instance, while the Durham Board of County Commissioners has governmental influence to make policy decisions and allocate funds, neighborhood organizations and churches have relational influence with Durham residents.

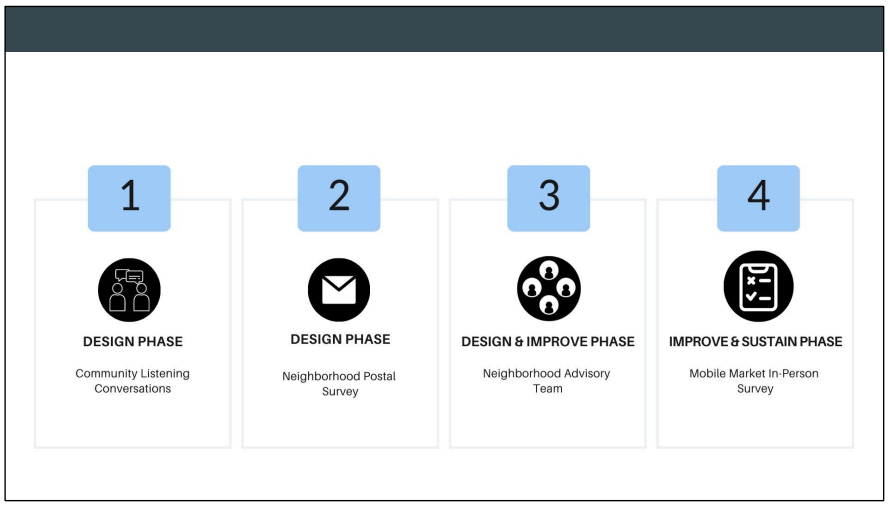
Of the priority partners within the system, Durham residents with inadequate food access are the most significant priority partners because of their experiential knowledge. Lived experience perspectives from Durham residents can be used to identify gaps within the design of the mobile markets, consider new methods of implementation, and provide insight into the overall trajectory of the program. Despite high interest in a food access program, Durham residents of these low-income neighborhoods have low political influence and will require the support of other community partners. The lack of political influence among these Durham residents is attributable to the long-term impacts of redlining and the subsequent disinvestment within their neighborhoods. Priority partners, like the Durham County Food Security Coordinator or the Durham County Department of Public Health, will play an important role in bridging the gap between residents with lived experience and governmental processes.



Speaker: Jacob Rains

Back to Agenda

We are requesting an increased appropriation of 3.29 million in county funds to the DCoDPH DINE program to administer the mobile market program for three years. These funds will be used to hire eight full time staff including a mobile market team with registered dieticians. Food storage equipment, the cost of produce, and market stand supplies (e.g., tents, food baskets, signage) will purchased in line with other mobile market programs. Additional funds will be dedicated to covering the costs of advertising the program in the community and administering our comprehensive evaluation plan. Our mobile market budget is designed to be flexed to shift mobile market locations based on community needs at no additional cost to the County.



Speaker: Maddie Roberts

To initiate, facilitate, and sustain community partnerships to transform food access in the targeted neighborhoods, program staff will utilize the following engagement strategies throughout four phases:

1) First, during the design phase of the project, our team will host a series of community listening conversations in each neighborhood. The community listening conversations are an opportunity for neighborhood residents to learn about the mobile markets, express hopes for collaboration, share concerns, and consider ways for continued participation. Insights from these conversations will be used to inform the design of the mobile markets.
2) Later in the design phase, our team will conduct a postal survey of residents in the targeted neighborhoods. The postal survey will inform residents about the mobile market program and collect data on food access challenges within each neighborhood.
3) Next, in the design and improve phase of the project, our team will facilitate the establishment of a Neighborhood Advisory Team. The Neighborhood Advisory Team will provide a platform for neighborhood residents to formally engage with one another and other partners within the system and also influence the design and strategic priorities of the mobile market. The Neighborhood Advisory Team will be comprised of residents from the targeted neighborhoods who have experienced food access challenges.
4) Finally, during the improve and sustain phase of the project, our team will conduct quarterly, in-person surveys throughout the first year of the mobile markets. After the first year of market operation, we will administer these surveys on a biannual basis.
1) The surveys will allow us to engage with market clientele and continue learning how the mobile markets can evolve to best meet the needs of each neighborhood.

References:

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Parker, C., & Dewey, M. (2000). Assessing research outcomes by Postal Questionnaire with telephone follow-up. *International Journal of Epidemiology*, *29*(6), 1065–1069.

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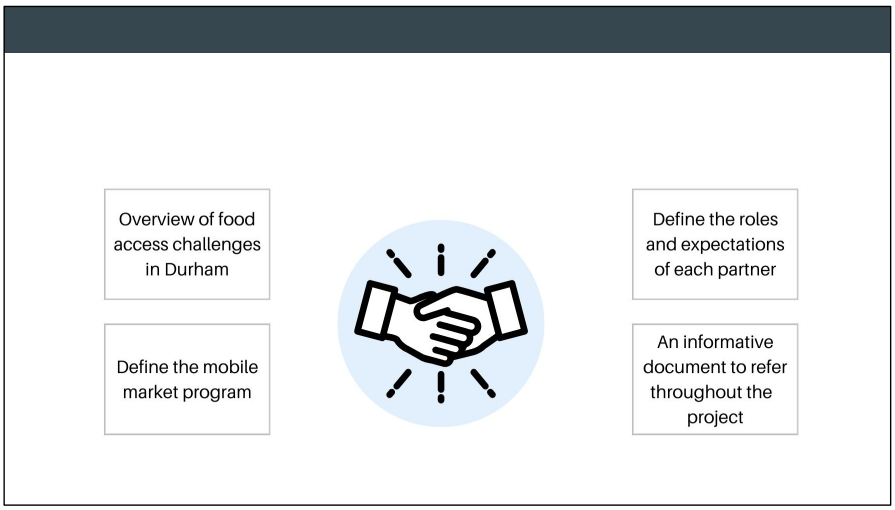
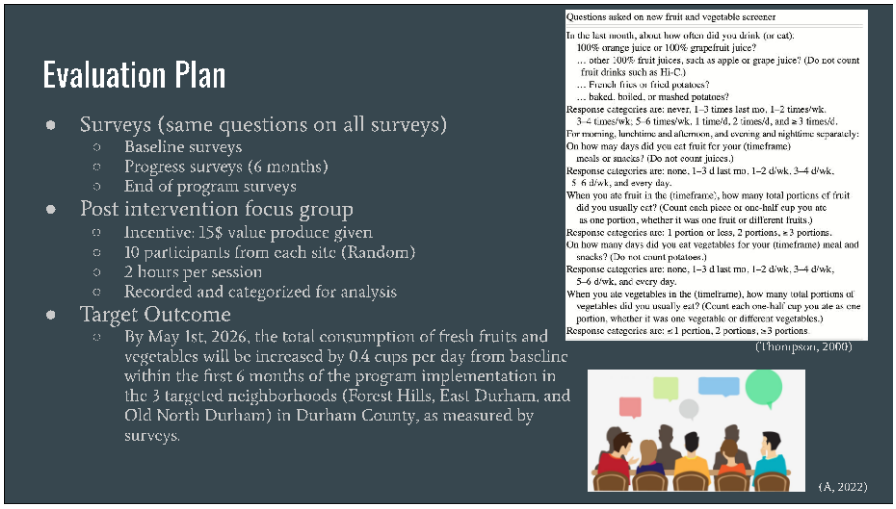


Speaker: Maddie Roberts

When working with multiple partners to accomplish a shared goal, establishing a Memorandum of Understanding, or MOU, is crucial for success. An MOU is a formal agreement between community partners that outlines project and partner expectations. In the context of our program, an MOU will overview the history of food access challenges in Durham, with a particular focus on the targeted neighborhoods; outline how the establishment of mobile markets will effectively address food access challenges; define the trajectory of the mobile market program; define the roles and expectations of each partner; and act as an informative document to refer to throughout the entirety of the project. For example, given the context of the partners who are contributing to the mobile market program, an MOU between the Mobile Market Team and the Neighborhood Advisory Team will be necessary.



Speaker: Ruihan Xu

For program evaluation, we plan to use both surveys and focus groups for data collection. The examples of survey questions are listed on the top right figure, such as 'When you ate fruit in the last X month, how many total portions of fruits did you usually eat?'. There will be 3 survey collection periods, the baseline surveys, progress surveys (which will be collected every 6 months), and end of program surveys.

As for focus groups, we only plan to conduct post-intervention focus group sessions. Similar to what we see in other research studies, we expect to recruit 10 participants from each site for each focus group session (Gorham et al. 2015). To help recruit participants, we will provide fresh produce as an incentive. Each of the focus group sessions will last 2 hours, and the session will be recorded and categorized for later analysis.

One of the target outcomes of the program is listed here, which is related to fresh produce consumption measurement. So, after collecting the data from both surveys and focus groups, we will be able to analyze the data and see whether our target outcome is achieved. Some other data collected from focus groups might also be used to inform future modifications to the program.

References:

A. (2022a, March 4). *How Do Focus Group Works*. Spade Survey.

Gorham, G., Dulin-Keita, A., Risica, P. M., Mello, J., Papandonatos, G., Nunn, A., Gorham, S., Roberson, M., & Gans, K. M. (2015). Effectiveness of Fresh to You, a Discount Fresh Fruit and Vegetable Market in Low-Income Neighborhoods, on Children's Fruit and Vegetable Consumption, Rhode Island, 2010–2011. Preventing Chronic Disease, 12, E176.

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Speaker: Ruihan Xu

Lastly, here are our references. Thank you so much for your time and consideration. We hope our presentation on low food access in historically redlined neighborhoods of Durham has captured your attention and compelled you to respond. Your financial support will greatly help with our program development and those people in need. Thank you again for your valuable time.